



Wood Buffalo Environmental Association

JULY 2016

MONTHLY REPORT

CONTINUOUS MONITORING
INTEGRATED MONITORING
August 29, 2016

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



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August 29, 2016

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

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

The continuous ambient air quality monitoring network stations are:

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

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

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



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

Aboriginal Communities

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

Government and Non-Industrial Organizations

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

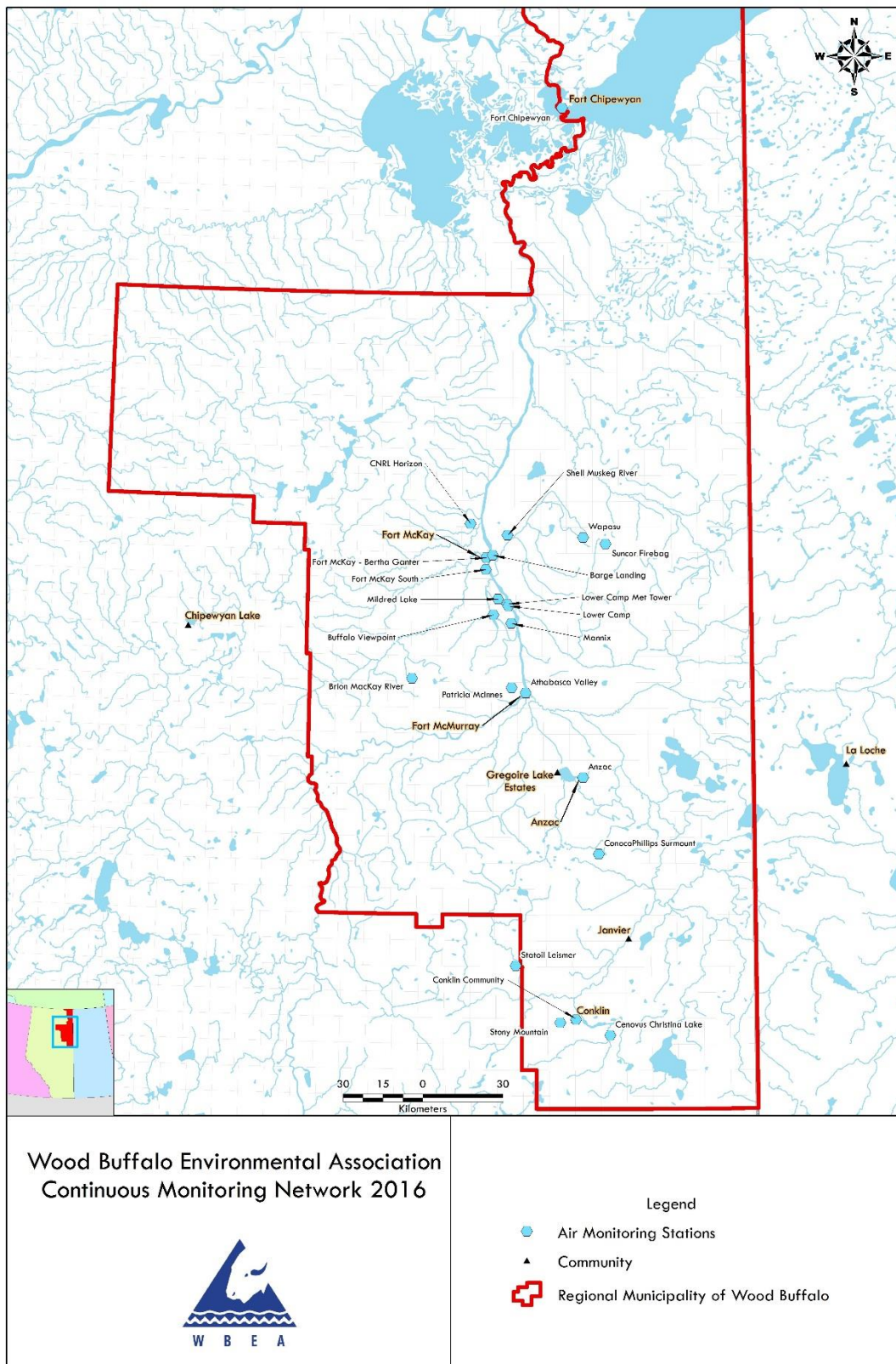


Figure 1: Map of WBEA Air Monitoring Network.

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

1.0 Concentrations in Excess of Alberta Ambient Air Quality Objectives

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

There were 6 H₂S ambient ground level concentrations in excess of the 1-hour H₂S air quality objectives reported to the Energy and Environmental Response Centre in real time. After data processing to account for analyzer drift with baseline correction, there were 6 concentrations in excess of the 1-hour H₂S air quality objective.

There was 1 ambient ground level concentration of Particulate Matter (PM_{2.5}) in excess of the PM_{2.5} 24-hour air quality objective reported to the Energy and Environmental Response Centre in real time. After data processing to account for valid analyzer response and correction, there was 1 concentration in excess of the PM_{2.5} air quality objective.

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

<u>Site</u>	<u>Parameter</u>	<u>Date / Time</u>	<u>Reference</u>	<u>Period</u>	<u>Concentration ppb or ug/m³</u>		<u>Status</u>
					<u>Reported</u>	<u>Final</u>	
AMS 5 Mannix	H ₂ S	25Jul 16, 23:00	314254	1hr	11	10	exc
AMS 5 Mannix	H ₂ S	28Jul 16, 01:00	314351	1hr	12	12	exc
AMS 15 CNRL Horizon	TRS	26Jul 16, 01:00	314256	1hr	13	13	exc
AMS 15 CNRL Horizon	TRS	26Jul 16, 02:00	314256	1hr	20	20	exc
AMS 15 CNRL Horizon	TRS	26Jul 16, 04:00	314256	1hr	16	16	exc
AMS 15 CNRL Horizon	TRS	27Jul 16, 21:00	314348	1hr	14	14	exc
AMS 15 CNRL Horizon	PM _{2.5}	17Jul 16, 24:00	313937	24hr	40	39.5	exc

*status legend:

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

1.1 Data Processing and Validation

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

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

1.2 Revisions to AEP Airdata Warehouse

There were no revisions to historical data stored at the AEP Airdata Warehouse with this monthly report.

2.0 Operational Status

Continuous Monitoring

In July 2016, there were 3 incidents resulting in compliance monitoring instruments operating less than 90% of the time:

1. The ammonia (NH₃) analyzer at AMS 1 – Fort McKay Bertha Ganter operated less than 90% of the time in July 2016.

The NH₃ analyzer required additional time to stabilize to levels below ambient concentrations following the automated daily spans and routine monthly multipoint calibrations. Additional time for stabilization after exposure to high concentrations of NH₃ gas is an inherent behavior in the NH₃ analyzer operations resulting from the properties of the NH₃ gas. Data for 2 to 4 hours following the daily spans have been reported as invalid for a total of 82 hours this month. Maintenance to the data logger and station wiring on July 15 interrupted the routine operation of the NH₃ analyzer for 2 hours.

To address the stabilization issue on the NH₃ analyzer, a request will be submitted to AEP to lower the effective range of the analyzer. The lower effective range will allow for a shorter stabilization period, minimizing downtime for this analyzer.

In July, the NH₃ analyzer at AMS 1 operated for 89% of the reporting period. This incident was reported to Alberta Environment and Parks on August 26, 2016 (reference number 315539).

2. The Total Reduced Sulphur (TRS) analyzer at AMS 7 – Athabasca Valley operated less than 90% of the time in July 2016.

Multiple issues affected the routine operations of the TRS analyzer, resulting in a total of 83 hours of invalid data:

- Station maintenance activities on July 4 and July 17 resulted in 4 hours of invalid data.
- Operation outside of AMD criteria for daily span responses on July 20 and 29 resulted in 29 and 20 hours of invalid data, respectively.
- On-site repairs and recalibrations to the TRS analyzer on July 21 and July 29 resulted in 7 hours of invalid data.
- Sample pump failure on July 25 followed by replacement and recalibration on July 26 affected the routine operations of the TRS analyzer for 23 hours.

The analyzer was removed from service on July 29 and replaced on July 30 with a backup analyzer. The failed analyzer will be investigated further at the WBEA Field Operations Centre before being re-deployed.

In July 2016, the TRS analyzer at AMS 7 operated for 89% of the reporting period. This incident was reported to Alberta Environment and Parks on August 26, 2016 (reference number 315540).

3. The Fine Particulate Matter (PM_{2.5}) analyzer at AMS 8 in Fort Chipewyan operated less than 90% of the month for July 2016.

The instrument diagnostics indicate instrument failure started on July 2 at 00:00 MST during the daily automated exchange of sample tape. The site visitation on July 5th confirmed a broken sample tape as the cause of the instrument malfunction. The sample tape was replaced and a follow-up calibration was performed to confirm instrument operations. Data flow was restored at 11:00 MST on July 5, 2016.

After initial flagging and processing the resulting downtime is 85 hours. This non-compliance was reported to the Energy and Environmental Response Centre on July 22, 2016 (Vincent, AEP reference number 314163).

In July 2016, there was 1 incident of a monitoring instrument not required for air quality compliance operating less than 90% of the time. A new data collection program and revision uploads to the data logger interrupted the normal data collection of the precipitation collector on July 14 for 420 hours. Data collection was restored in early August.

Intermittent Monitoring

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

3.0 Monitoring Notes

General Network Notes

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

Standardized program revisions and uploads to the data logger resulted in intermittent communication errors to some continuous analyzers. These communication errors resulted in single 5-minute data points being invalidated and did not affect operational times or averages unless specifically stated in the monitoring notes below.

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

Station 1, Fort McKay - Bertha Ganter

The NH₃ analyzer required additional time to stabilize to levels below ambient concentrations following the automated daily spans and routine monthly multipoint calibrations. Additional time for stabilization after exposure to high concentrations of NH₃ gas is an inherent behavior in the NH₃ analyzer operations resulting from the properties of the NH₃ gas. Data for 2 to 4 hours following the daily spans have been reported as invalid for a total of 82 hours this month.

Maintenance to the data logger and station wiring on July 15 interrupted the routine operation of all parameters for 2 to 3 hours.

Station operator activities on July 19 affected the normal operations of the O₃ for 19 hours.

Maintenance and cleaning of the sample manifold on July 28 interrupted the normal operations of all air quality analyzers for 1 hour.

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

Station 2, Mildred Lake

Maintenance and cleaning of the sample manifold on July 14 interrupted the normal operations of the H₂S analyzer for 1 hour.

Station 3, Lower Camp B - Meteorology

There were 2 instances of intermittent unstable operation which affected the output signal of the 167m elevation wind sensors for a total of 4 hours of downtime this month.

Station 4, Buffalo Viewpoint

A station power outage on July 24 interrupted the normal operations of all air quality analyzers for 4 hours.

The July 24 power outage resulted in automated daily spans being outside of AMD criteria (+\|-10% span target). Investigation into the span response on July 25 interrupted the routine operations of the SO₂ and THC analyzer for 1 hour and determined that the calibrator had lost stored variables due to the power outage. Verification and re-entry of MFC flow values to the calibrator on July 26 interrupted the routine operations of all air quality analyzers for 1 to 4 hours. The calibration system was plugged into an uninterruptible power supply (UPS) system to prevent future occurrences of this nature.

Station 5, Mannix

Maintenance performed on the calibration system on July 11 interrupted the routine operations of all air quality analyzers for 4 to 5 hours.

Maintenance to the zero air generator on July 15 affected the routine operation of the THC analyzer for 2 hours.

Maintenance to the data logger and station wiring on July 15 interrupted the routine operation of all air quality analyzers for 1 hour.

Intermittent unstable operation of the 90m elevation wind sensor on July 31 resulted in 2 hours of invalid data.

Station 6, Patricia McInnes

The NH₃ analyzer required additional time to stabilize to levels below ambient concentrations following the automated daily span and routine monthly multipoint calibration periods. Additional time for stabilization after exposure to high concentrations of the NH₃ gas is an inherent behavior in the NH₃ analyzer operations resulting from the properties of the NH₃ gas. Data for 1 to 7 hours following each daily span has been reported as invalid for a total of 69 hours this month.

A power spike at the station and subsequent stabilization on July 5 interrupted the routine operations of the NH₃ analyzer for 2 hours.

Maintenance to replace the carrier gas cylinder on July 28 interrupted the normal operations of the THC analyzer for 2 hours.

Station 7, Athabasca Valley

Maintenance to the zero air generator on July 4 interrupted the routine operations of all air quality analyzers for 1 to 2 hours.

Maintenance and cleaning of the sample manifold on July 7 interrupted the normal operations of the SO₂, THC, NO₂, O₃, and CO analyzers for 1 hour.

Maintenance to the data logger and station wiring on July 17 interrupted the routine operations of all parameters for 3 hours.

Installation of a new gas dilution calibrator on July 26 interrupted the routine operations of the SO₂, THC, NO₂, O₃, and CO analyzers for 6 to 7 hours. This calibrator uses an internal reference analyzer to determine ozone output rather than relying on NO₂ calibration GPT (gas phase titration) concentrations to determine ozone calibration points.

An updated data logger program installed on July 18 interrupted the routine operations of the CO analyzer for 15 hours.

There were 8 issues associated with the operation of the TRS analyzer that resulted in a total of 83 hours of invalid data. Maintenance to the zero air generator on July 4 interrupted the routine operation of the TRS analyzer for 1 hour. Station wiring and data logger upgrades on July 17 interrupted the routine operations of the TRS analyzer for 3 hours. Operation outside of AMD criteria for daily span responses on July 20 and 29 resulted in 29 and 20 hours of invalid data, respectively. Maintenance to diagnose and repair the TRS analyzer on July 21 and July 29 resulted in 2 and 5 hours of invalid data, respectively. Failure of the sample pump on July 25 resulted in 16 hours of invalid data. Maintenance to replace the sample pump and recalibrate the analyzer on July 26 affected the routine operations of the TRS analyzer for 7 hours. The analyzer was removed from service on July 29 and replaced on July 30 with a backup analyzer.

The THC analyzer had 2 instances of unstable operation on July 8 and 9 resulting in a total of 3 hours of invalid data. Maintenance to collect diagnostic information on July 8 interrupted the routine operations of the THC analyzer for 3 hours. Maintenance to replace the carrier gas cylinder on July 27 interrupted the normal operations of the THC analyzer for 1 hour.

Analyzer failure on July 22 due to debris in the sample chamber affected the routine operations of the PM_{2.5} analyzer for 10 hours. Maintenance to clean the sample inlet and chamber on July 22 interrupted the routine operations of the PM_{2.5} analyzer for 3 hours. Stabilization following the analyzer maintenance resulted in an additional 19 hours of invalid data. Multiple instances of excessive baseline drift affected the routine operations of the PM_{2.5} analyzer for 17 hours this reporting period.

Station 8, Fort Chipewyan

The PM_{2.5} analyzer filter tape broke on July 12 during an automated filter tape advancement, resulting in 81 hours of invalid data. Maintenance by the station operator on July 5 to repair the filter tape resulted in an additional 2 hours of invalid data.

Maintenance to the data logger and station wiring on July 12 interrupted the routine operations of all parameters for 2 hours.

A station power spike followed by stabilization on July 28 affected the routine operations the NO₂ analyzer for 1 hour.

Six instances of intermittent unstable operation affected the normal operations of the O₃ analyzer for 8 hours this reporting period.

Station 9, Barge Landing

Maintenance to the data logger and station wiring on July 19 interrupted the routine operation of all parameters for 1 hour.

Maintenance and cleaning of the sample manifold on July 26 interrupted the normal operation of the THC analyzer for 2 hours.

Station 11, Lower Camp

Maintenance to the data logger and station wiring on July 27 interrupted the routine operation of all parameters for 1 hour.

Maintenance to the zero air generator on July 27 affected the routine operation of the THC analyzer for 4 hours.

Station 13, Fort McKay South

Maintenance to the data logger and station wiring on July 15 interrupted the routine operation of all parameters for 1 hour.

Maintenance and cleaning of the sample manifold on July 26 interrupted the normal operations of the TRS and O₃ analyzers for 1 hour.

Station 14, Anzac

Maintenance to the data logger and station wiring on July 17 interrupted the routine operation of all parameters for 1 to 2 hours.

A station power outage on July 21 interrupted the normal operations of all air quality analyzers for 2 to 5 hours. Unstable operation following the power outage on July 21 affected the normal operations of the SO₂ analyzer for 11 hours.

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

Station 15, CNRL Horizon

Maintenance to the data logger and station wiring on July 13 interrupted the routine operation of all parameters for 2 hours.

Maintenance and cleaning of the sample manifold on July 15 interrupted the normal operations of the TRS analyzer for 1 hour.

Station 16, Shell Muskeg River

A station power outage on July 4 interrupted the normal operations of all air quality analyzers for 4 to 16 hours.

A station power outage on July 9 interrupted the normal operations of all air quality analyzers for 2 hours.

Unstable operation following the power outage on July 4 affected the normal operations of the PM_{2.5} analyzer for 16 hours.

Maintenance and cleaning of the sample manifold on July 18 interrupted the normal operations of the SO₂ and THC analyzers for 1 hour.

Station 17, Wapasu

Maintenance to the data logger and station wiring on July 20 interrupted the routine operation of all parameters for 1 to 2 hours.

Station operator activities on July 21 affected the normal operation of the SO₂, H₂S, THC and NO₂ analyzers for 1 hour.

A new data collection program and revision uploads to the data logger interrupted the normal data collection of the THC analyzer and precipitation collector on July 21 for 10 and 12 hours, respectively.

There were 3 issues with the operation of the O₃ analyzer resulting in 37 hours of invalid data. Unstable operations on July 20 affected the normal operations of the O₃ analyzer for 17 hours. Maintenance to diagnose and repair on July 21 interrupted the normal operations of the O₃ analyzer for 4 hours. The O₃ analyzer required removal for shop repairs and was replaced with a backup analyzer on July 22 resulting in 16 hours of invalid data.

Maintenance to remove for service and install a backup analyzer on July 22 interrupted the routine operations of the PM_{2.5} analyzer for 3 hours.

Station 18, Stony Mountain

Maintenance to the data logger and station wiring on July 14 interrupted the routine operation of all parameters for 1 to 2 hours.

Depletion and replacement of the carrier gas cylinder at the station on July 21 interrupted the normal operations of the THC analyzer for 1 hour.

Station operator activities to verify analyzer response and operation on July 28 interrupted the routine operations of the PM_{2.5} analyzer for 1 hour.

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

A new data collection program and revision uploads to the data logger interrupted the normal data collection of the precipitation collector on July 14 for 420 hours. Data collection was restored in early August.

Station 19, Firebag

Maintenance to the data logger and station wiring on July 21 interrupted the routine operation of all parameters for 2 hours.

A station power spike on July 10 interrupted the routine operations of the THC analyzer for 1 hour. Sample pump failure on July 31 affected the routine operations of the THC analyzer for 20 hours. The THC analyzer was repaired and recalibrated on August 1.

A flat-line in the output signal of the wind sensor resulted in 2 hours of invalid data this reporting period.

Station 20, Brion MacKay River

Unstable operations due to excessive baseline drift on July 4 affected the normal operations of the H₂S analyzer for 1 hour.

A station power outage on July 31 interrupted the routine operation of all air quality analyzers for 4 to 5 hours.

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

Station 21, Conklin Community

Maintenance and cleaning of the sample manifold on July 4 interrupted the normal operations of the SO₂, THC, NO₂, and O₃ analyzers for 2 hours.

Maintenance to replace the carrier gas cylinder on July 28 interrupted the normal operations of the THC analyzer for 2 hours.

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

Station 500, Cenovus Christina Lake

Maintenance to calibration system on July 20 interrupted the routine operations of the all air quality analyzers for 5 to 6 hours.

Maintenance to verify analyzer response through a remote zero/span sequence on July 29 interrupted the normal operations of the H₂S analyzer for 2 hours.

Station 502, ConocoPhillips Surrmont

Maintenance to the data logger and station wiring on July 20 interrupted the routine operation of all parameters for 2 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 Technician

Sanjay Prasad
Air Quality Scientist



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

JULY 2016
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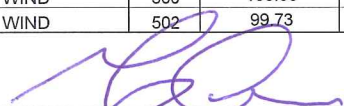
Prepared: Aug 26 2016 13:17

APPROVAL NUMBERS	REPORT DATE						
	MONTH	YEAR					
	7	2016					
289664-00-00	CONTINUOUS AMBIENT MONITORING						
254465-00-00				ONE-HOUR AVERAGE		24-HOUR AVERAGE	
149968-00-01	PARAMETER	STN. NO.	% TIME OPERATIONAL	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION
48522-01-00	SO2(ppm)	1	99.60	0.059	0	0.005	0
240008-00-03	SO2(ppm)	2	100.00	0.058	0	0.008	0
48263-00-00	SO2(ppm)	4	99.06	0.113	0	0.011	0
224816-00-03	SO2(ppm)	5	99.33	0.150	0	0.016	0
189942-00-02	SO2(ppm)	6	100.00	0.056	0	0.009	0
206355-00-00	SO2(ppm)	7	98.52	0.025	0	0.006	0
46586-00-00	SO2(ppm)	8	99.73	0.013	0	0.002	0
216466-00-04	SO2(ppm)	11	99.73	0.095	0	0.014	0
137467-00-00	SO2(ppm)	13	99.87	0.037	0	0.004	0
20809-01-00	SO2(ppm)	14	98.12	0.007	0	0.002	0
241311-00-00	SO2(ppm)	15	99.73	0.023	0	0.004	0
094-02-00	SO2(ppm)	16	97.45	0.027	0	0.005	0
305529-00-00	SO2(ppm)	17	99.73	0.018	0	0.003	0
026-02-00	SO2(ppm)	18	99.87	0.003	0	0.001	0
228044-00-00	SO2(ppm)	19	99.73	0.030	0	0.003	0
73203-01-00	SO2(ppm)	20	99.46	0.011	0	0.004	0
	SO2(ppm)	21	99.73	0.002	0	0.001	0
	SO2(ppm)	500	99.19	0.006	0	0.002	0
	SO2(ppm)	502	99.73	0.019	0	0.005	0
	H2S(ppm)	2	99.87	0.004	0	0.001	0
	H2S(ppm)	4	98.92	0.007	0	0.001	0
	H2S(ppm)	5	99.19	0.012	2	0.002	0
	H2S(ppm)	11	99.73	0.009	0	0.002	0
	H2S(ppm)	17	99.73	0.001	0	0.000	0
	H2S(ppm)	19	99.73	0.002	0	0.000	0
	H2S(ppm)	20	99.33	0.002	0	0.000	0
	H2S(ppm)	500	99.06	0.001	0	0.000	0
	H2S(ppm)	502	99.73	0.003	0	0.001	0
	TRS(ppm)	1	99.60	0.004	0	0.001	0
	TRS(ppm)	6	100.00	0.002	0	0.001	0
	TRS(ppm)	7	88.84	0.002	0	0.001	0
	TRS(ppm)	9	99.87	0.006	0	0.001	0
	TRS(ppm)	13	99.73	0.003	0	0.000	0
	TRS(ppm)	14	99.33	0.002	0	0.000	0
	TRS(ppm)	15	99.60	0.020	4	0.003	0
	TRS(ppm)	18	99.87	0.000	0	0.000	0
	TRS(ppm)	21	100.00	0.001	0	0.001	0
	THC(ppm)	1	99.60	3.2	-	2.2	-
	THC(ppm)	2	100.00	4.9	-	2.6	-
	THC(ppm)	4	99.06	3.5	-	2.6	-
	THC(ppm)	5	99.06	6.2	-	2.7	-
	THC(ppm)	6	99.87	3.1	-	2.2	-
	THC(ppm)	7	97.45	2.5	-	2.0	-
	THC(ppm)	9	99.73	3.4	-	2.4	-
	THC(ppm)	11	99.46	5.6	-	2.7	-
	THC(ppm)	13	99.87	3.9	-	2.6	-
	THC(ppm)	14	99.33	2.5	-	2.1	-
	THC(ppm)	15	99.73	3.3	-	2.4	-
	THC(ppm)	16	97.45	13.2	-	3.1	-
	THC(ppm)	17	98.39	3.4	-	2.3	-
	THC(ppm)	18	99.73	2.2	-	2.1	-
	THC(ppm)	19	96.91	3.4	-	2.4	-
	THC(ppm)	20	99.33	2.6	-	2.2	-
	THC(ppm)	21	99.46	3.0	-	2.1	-
	O3(ppm)	1	96.91	0.054	0	0.032	-
	O3(ppm)	6	100.00	0.053	0	0.038	-
	O3(ppm)	7	98.39	0.058	0	0.035	-

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

JULY 2016
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Prepared: Aug 26 2016 13:17

APPROVAL NUMBERS	REPORT DATE						
	MONTH	YEAR					
289664-00-00	7	2016					
254465-00-00	CONTINUOUS AMBIENT MONITORING						
149968-00-01			ONE-HOUR AVERAGE		24-HOUR AVERAGE		
48522-01-00	PARAMETER	STN. NO.	% TIME OPERATIONAL	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION
240008-00-03	O3(ppm)	8	98.66	0.050	0	0.041	-
48263-00-00	O3(ppm)	13	99.73	0.051	0	0.029	-
224816-00-03	O3(ppm)	14	99.60	0.050	0	0.036	-
189942-00-02	O3(ppm)	17	95.03	0.055	0	0.036	-
206355-00-00	O3(ppm)	18	99.87	0.054	0	0.044	-
46586-00-00	O3(ppm)	21	99.73	0.054	0	0.036	-
216466-00-04	NO2(ppm)	1	99.73	0.015	0	0.005	-
137467-00-00	NO2(ppm)	6	100.00	0.012	0	0.006	-
20809-01-00	NO2(ppm)	7	98.52	0.019	0	0.006	-
241311-00-02	NO2(ppm)	8	99.60	0.005	0	0.001	-
094-02-00	NO2(ppm)	13	99.87	0.024	0	0.005	-
305529-00-00	NO2(ppm)	14	99.19	0.012	0	0.003	-
026-02-00	NO2(ppm)	15	99.73	0.020	0	0.006	-
228044-00-00	NO2(ppm)	16	97.58	0.029	0	0.013	-
73203-01-00	NO2(ppm)	17	99.60	0.014	0	0.003	-
	NO2(ppm)	18	99.87	0.005	0	0.001	-
	NO2(ppm)	19	99.73	0.013	0	0.003	-
	NO2(ppm)	20	99.46	0.016	0	0.004	-
	NO2(ppm)	21	99.73	0.008	0	0.001	-
	NO2(ppm)	500	99.19	0.011	0	0.003	-
	NO2(ppm)	502	99.73	0.010	0	0.004	-
	CO(ppm)	7	96.24	0.4	0	0.2	-
	NH3(ppm)	1	88.71	0.000	0	0.000	-
	NH3(ppm)	6	90.46	0.019	0	0.002	-
	PM2.5(ug/m3)	1	99.73	63.6	-	27.4	0
	PM2.5(ug/m3)	6	100.00	55.5	-	22.1	0
	PM2.5(ug/m3)	7	93.01	52.4	-	20.6	0
	PM2.5(ug/m3)	8	88.58	117.9	-	27.3	0
	PM2.5(ug/m3)	13	99.87	53.6	-	23.6	0
	PM2.5(ug/m3)	14	99.60	38.8	-	15.7	0
	PM2.5(ug/m3)	15	99.73	102.3	-	39.5	1
	PM2.5(ug/m3)	16	97.04	61.7	-	27.7	0
	PM2.5(ug/m3)	17	99.46	45.8	-	17.2	0
	PM2.5(ug/m3)	18	99.60	38.0	-	12.6	0
	PM2.5(ug/m3)	21	100.00	44.3	-	9.1	0
	WIND	1	99.73	-	-	-	-
	WIND	2	100.00	-	-	-	-
	WIND	4	100.00	-	-	-	-
	WIND	5	100.00	-	-	-	-
	WIND	6	100.00	-	-	-	-
	WIND	7	99.60	-	-	-	-
	WIND	8	99.73	-	-	-	-
	WIND	9	99.87	-	-	-	-
	WIND	11	99.73	-	-	-	-
	WIND	13	99.87	-	-	-	-
	WIND	14	99.46	-	-	-	-
	WIND	15	99.73	-	-	-	-
	WIND	16	100.00	-	-	-	-
	WIND	17	99.87	-	-	-	-
	WIND	18	99.73	-	-	-	-
	WIND	19	99.46	-	-	-	-
	WIND	20	99.60	-	-	-	-
	WIND	21	99.46	-	-	-	-
	WIND	500	100.00	-	-	-	-
	WIND	502	99.73	-	-	-	-
							
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
JULY 2016

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

August 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT McKAY - BERTHA GANTER (AMS 1)
 JULY 2016

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2(ppb) Average	706	35	38	99.60	59	0	5	0
TRS(ppb) Average	706	35	38	99.60	4	0	1	0
THC(ppm) Average	706	35	38	99.60	3.2	-	2.2	-
NMHC(ppm) Average	706	35	38	99.60	0.736	-	0.197	-
CH4(ppm) Average	706	35	38	99.60	2.6	-	2.1	-
O3 (ppb) Average	688	33	56	96.91	54	0	32	-
NO2 (ppb) Average	707	35	37	99.73	15	0	5	-
NO (ppb) Average	707	35	37	99.73	20	-	3	-
NOX (ppb) Average	707	35	37	99.73	33	-	8	-
NH3 (ppb) Average	612	48	132	88.71	0	0	0	-
PM2.5 (ug/m3) Average	740	2	4	99.73	63.6	-	27.4	0
Wind Speed 10 m (km/h) Average	742	0	2	99.73	26	-	13	-
Wind Direction 10 m (deg) Average	742	0	2	99.73	-	-	-	-
Temperature 2 m (C) Average	742	0	2	99.73	31.1	-	22.3	-
Temperature 10 m (C) Average	742	0	2	99.73	30	-	22.8	-
Relative Humidity (%) Average	742	0	2	99.73	99	-	95	-
Precipitation (mm) Total	741	0	3	99.60	7.7	-	18.7	-
Leaf Wetness (% of range) Average	742	0	2	99.73	49	-	20	-
Global Solar Radiation (W/m2) Average	742	0	2	99.73	876	-	341	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BERTHA GANTER FORT McKAY (AMS 1)
 JULY 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	706	0.7	3	-	0	0	0	0	0	1	59
TRS (ppb) Average	706	0.5	0	-	0	0	0	0	1	1	4
THC (ppm) Average	706	2.07	0.2	-	1.9	1.9	2	2	2.1	2.3	3.2
NMHC(ppm) Average	706	0.067	0.126	-	0	0	0	0	0.1	0.2	0.736
CH4(ppm) Average	706	2	0.1	-	1.9	1.9	1.9	2	2	2.1	2.6
O3 (ppb) Average	688	21.8	11	-	2	8	13	21	30	37	54
NO2 (ppb) Average	707	2.3	3	-	0	0	1	1	3	6	15
NO (ppb) Average	707	0.7	2	-	0	0	0	0	0	2	20
NOX (ppb) Average	707	3	4	-	0	0	1	2	3	7	33
NH3 (ppb) Average	612	0	0	-	0	0	0	0	0	0	0
PM2.5 (ug/m3) Average	740	9.11	7.3	-	0.4	2.1	4.3	7.5	12.2	18.8	63.6
Wind Speed 10 m (km/h) Average	742	7	4	-	0	3	4	6	9	13	26
Wind Direction 10 m (deg) Average	742	-	-	-	-	-	-	-	-	-	-
Temperature 2 m (C) Average	742	18.85	5.1	-	3.1	12.6	15.3	18.1	22.9	25.9	31.1
Temperature 10 m (C) Average	742	18.96	4.5	-	4.6	13.7	16	18.3	22.3	25.2	30
Relative Humidity (%) Average	742	69.3	20	-	24	41	52	72	87	95	99
Precipitation (mm) Total	741	-	-	47.72	-	-	-	-	-	-	-
Leaf Wetness (% of range) Average	742	3.3	9	-	-2	-1	-1	0	1	14	49
Global Solar Radiation (W/m2) Average	742	226.2	261	-	0	0	1	105	411	672	876

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

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
ALL PARAMETERS	15 Jul 2016 11:00	15 Jul 2016 12:00	2	Maintenance - wiring/data logger upgrades
O3, Precipitation Collector	15 Jul 2016 11:00	15 Jul 2016 13:00	3	Maintenance - wiring/data logger upgrades
AIR QUALITY ANALYZERS	28 Jul 2016 10:00	28 Jul 2016 10:00	1	Maintenance - manifold cleaning
O3	19 Jul 2016 15:00	20 Jul 2016 09:00	19	Analyzer failure - data not recorded
NH3	01 Jul 2016 06:00	31 Jul 2016 07:00	82	Stabilization after daily span

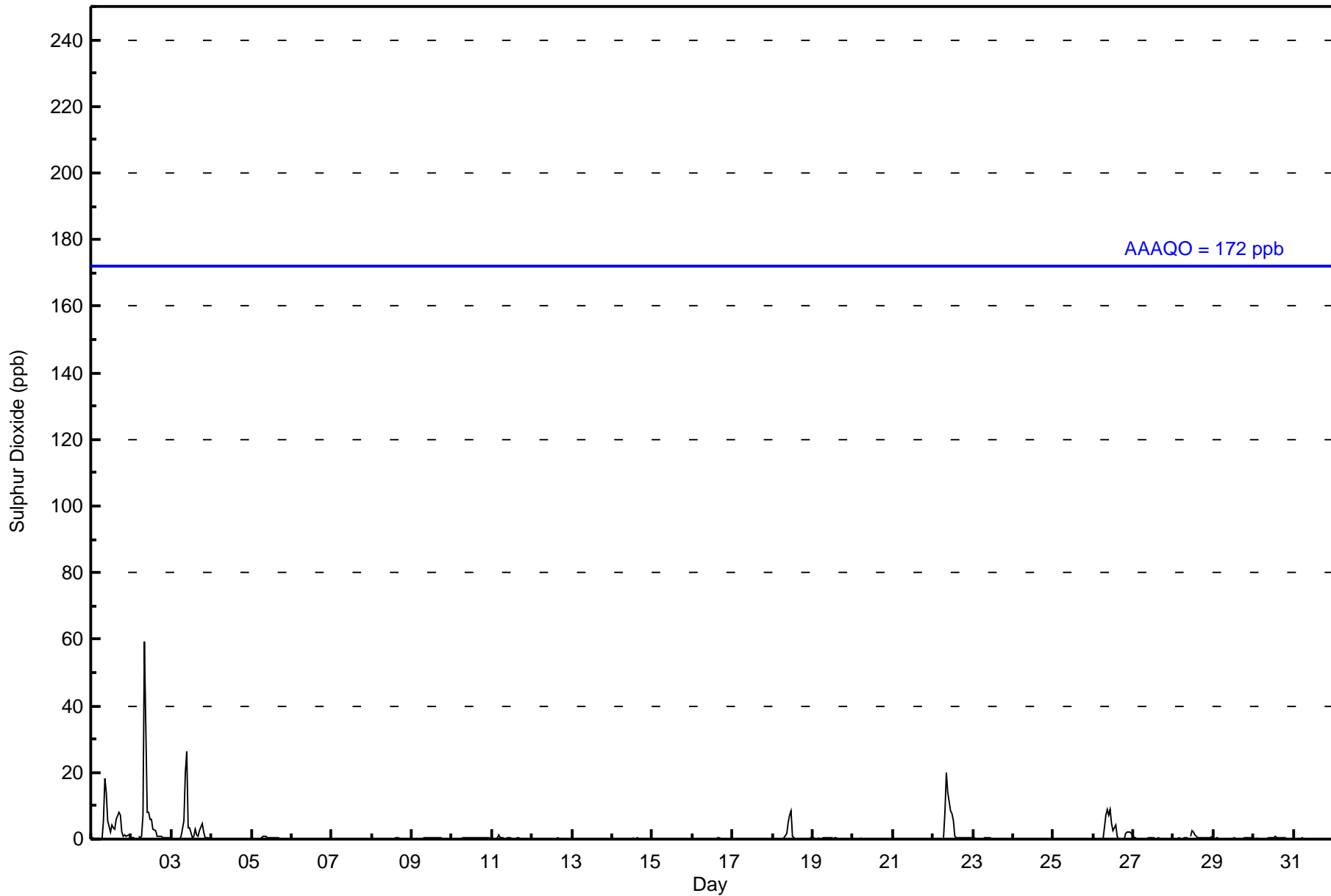


Number of Exceedences (AAAQO):		1-hr: 0 24-hr: 0		Hours in Service: 744																						
Maximum Value: 59 ppb on Jul 2 09:00		Maximum Daily Average: 4.7 ppb on Jul 2		Hours of Data: 706																						
Minimum Value: 0 ppb on Jul 18 01:00		Minimum Daily Average: 0.1 ppb on Jul 21		Hours of Missing Data: 38																						
Maximum Diurnal Average: 4.4 ppb at hour 9		Minimum Diurnal Average: 0.2 ppb at hour 4		Hours of Calibration: 35																						
Monthly Average: 0.7 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 14		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-Jul	0	0	Z	0	0	0	0	6	18	14	5	2	4	3	3	6	8	7	2	1	1	1	1	1	3.7	18
2-Jul	1	0	1	Z	1	0	1	7	59	8	8	6	6	3	3	1	1	1	1	0	0	0	0	0	4.7	59
3-Jul	0	0	0	0	Z	0	1	5	20	26	3	3	0	1	3	1	1	3	5	2	0	0	0	0	3.3	26
4-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
5-Jul	Z	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
6-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
7-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
8-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
9-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
10-Jul	0	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
11-Jul	Z	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
12-Jul	0	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
13-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
14-Jul	0	0	0	Z	0	0	0	0	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
15-Jul	0	0	0	0	Z	0	0	0	0	0	M	M	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
16-Jul	0	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
17-Jul	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
18-Jul	0	Z	0	0	0	0	0	1	2	5	7	8	1	0	0	0	0	0	0	0	0	0	0	0	1.1	8
19-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
20-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
21-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
22-Jul	0	0	0	0	0	Z	0	8	20	14	8	8	5	1	0	0	0	0	0	0	0	0	0	0	2.9	20
23-Jul	Z	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
24-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
25-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
26-Jul	0	0	0	Z	0	0	0	7	9	7	9	5	2	4	1	0	0	0	0	2	2	2	2	2	2.4	9
27-Jul	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
28-Jul	0	0	0	0	0	Z	0	0	0	M	1	3	2	1	1	1	0	0	0	0	0	0	0	1	0.6	3
29-Jul	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.2	1
30-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.3	1
31-Jul	0	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
		0.2	0.2	0.2	0.2	0.2	0.2	1.2	4.4	2.7	1.6	1.3	0.8	0.6	0.5	0.4	0.5	0.5	0.4	0.3	0.3	0.3	0.3	0.2	Diurnal Average	
		1	1	1	1	1	0	1	8	59	26	9	8	6	4	3	6	8	7	5	2	2	2	2	Diurnal Maximum	
Z - zerospan C - Calibration M - Maintenance																										
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb																										



Wood Buffalo Environmental Association
Hourly Averages

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





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	699	99.01	99.01
11 - 20	5	0.71	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 (SO₂) - ppb
Fort McKay - Bertha Ganter - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	133	35	18	13	15	9	17	55	69	51	28	23	25	61	62	85	699
11 - 20	0	0	0	0	0	0	0	4	1	0	0	0	0	0	0	0	5
21 - 60	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	2
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	133	35	18	13	15	9	18	59	71	51	28	23	25	61	62	85	706

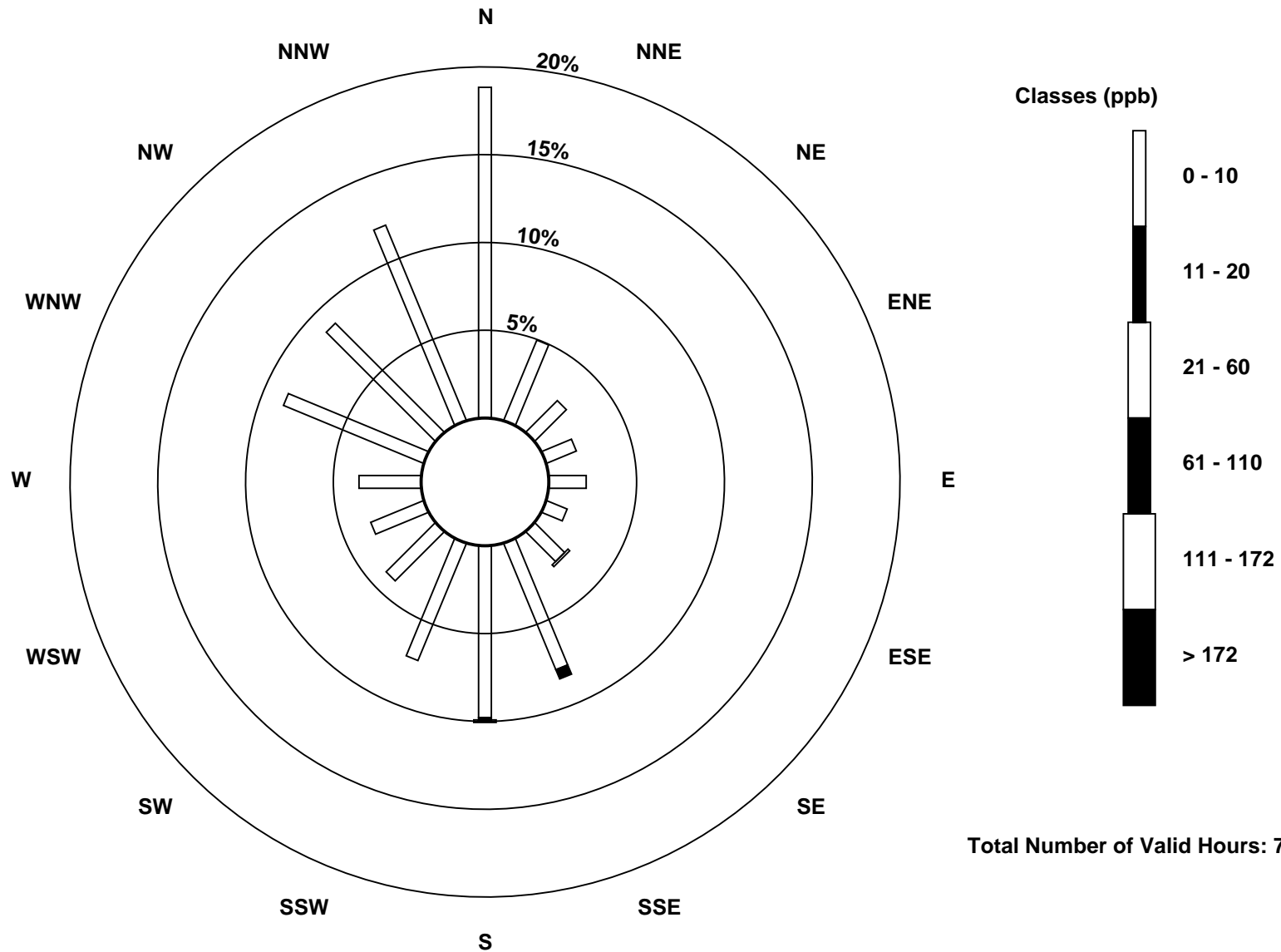
Total Number of Valid Hours: 706

Total Number of Hours: 744

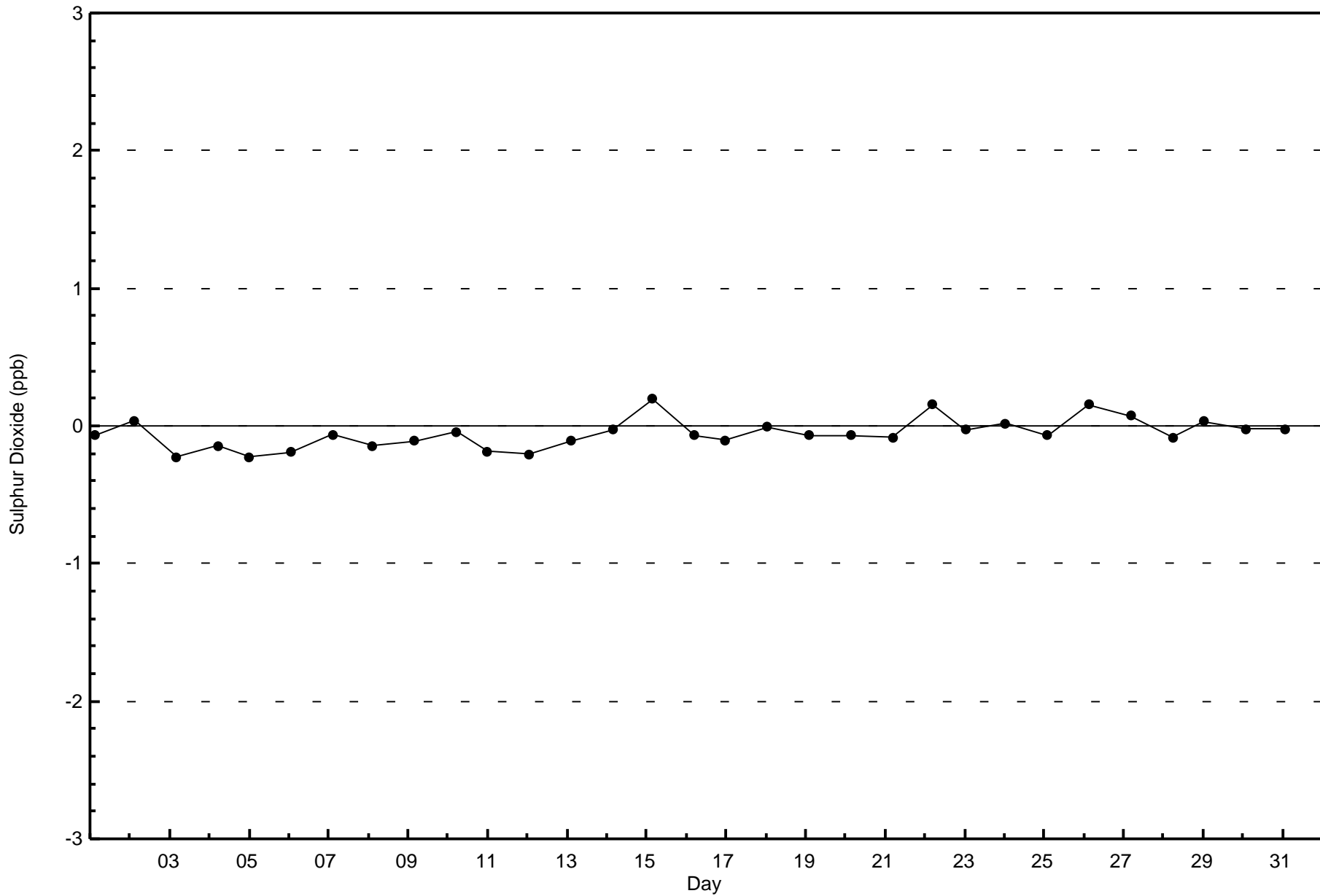


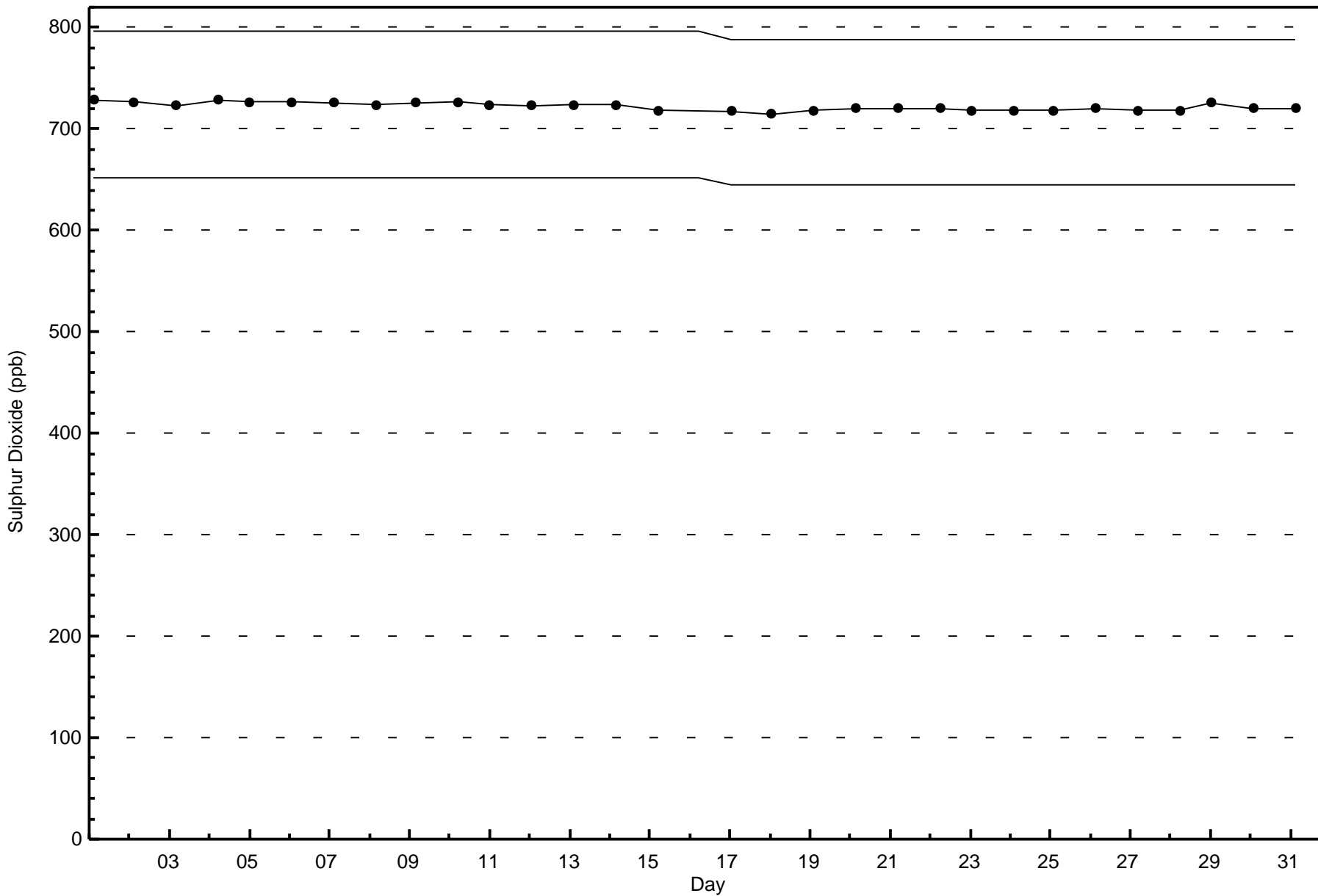
Wood Buffalo Environmental Association
Wind Rose Jul 2016

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



Total Number of Valid Hours: 706







Wood Buffalo Environmental Association

Summary of Hour Averages

Total Reduced Sulphur (TRS) - ppb

Fort McKay - Bertha Ganter - July 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 4 ppb on Jul 3 09:00	Maximum Daily Average: 0.8 ppb on Jul 26		Hours of Data:	706
Minimum Value: 0 ppb on Jul 4 11:00	Minimum Daily Average: 0.4 ppb on Jul 4		Hours of Missing Data:	38
Maximum Diurnal Average: 0.7 ppb at hour 9	Minimum Diurnal Average: 0.4 ppb at hour 14		Hours of Calibration:	35
Monthly Average: 0.5 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 1 P ₉₉ = 2		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-Jul	1	1	1	Z	1	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0	0	1	1	1	0.6	1
2-Jul	1	1	1	1	Z	1	1	1	1	1	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0.6	1
3-Jul	0	0	1	1	1	Z	1	1	4	2	0	1	1	0	1	0	0	0	1	0	0	1	0	0	0.8	4
4-Jul	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.4	1
5-Jul	1	Z	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1
6-Jul	0	0	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
7-Jul	0	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
8-Jul	0	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
9-Jul	0	0	0	0	0	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1
10-Jul	1	0	0	0	0	0	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1
11-Jul	0	Z	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
12-Jul	0	0	Z	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
13-Jul	0	1	0	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
14-Jul	0	0	0	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0.4	1
15-Jul	1	1	0	0	0	Z	0	0	0	0	M	M	0	0	0	0	0	0	0	0	0	1	1	0	0.5	1
16-Jul	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0.4	1
17-Jul	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0.5	1
18-Jul	0	1	Z	0	1	1	1	1	2	2	2	C	C	C	C	0	0	0	0	0	0	0	0	0	0.8	2
19-Jul	0	1	0	Z	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0.4	1
20-Jul	1	1	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
21-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	0.5	1
22-Jul	0	0	0	1	0	1	Z	2	1	1	1	1	1	0	0	0	0	0	0	0	1	0	0	1	0.6	2
23-Jul	0	Z	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
24-Jul	0	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
25-Jul	0	0	0	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0.5	1
26-Jul	1	1	1	1	Z	1	1	2	2	1	1	1	1	0	0	0	0	0	0	1	1	1	2	2	0.8	2
27-Jul	1	1	0	0	0	Z	0	0	0	1	1	1	1	0	1	0	0	0	0	1	1	1	1	3	0.7	3
28-Jul	2	1	1	1	1	1	Z	1	1	M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	2
29-Jul	1	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0.6	1
30-Jul	1	1	Z	1	1	1	1	0	0	0	0	0	0	0	1	1	1	0	0	0	1	1	1	1	0.6	1
31-Jul	1	1	1	Z	1	1	1	1	1	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0.5	1

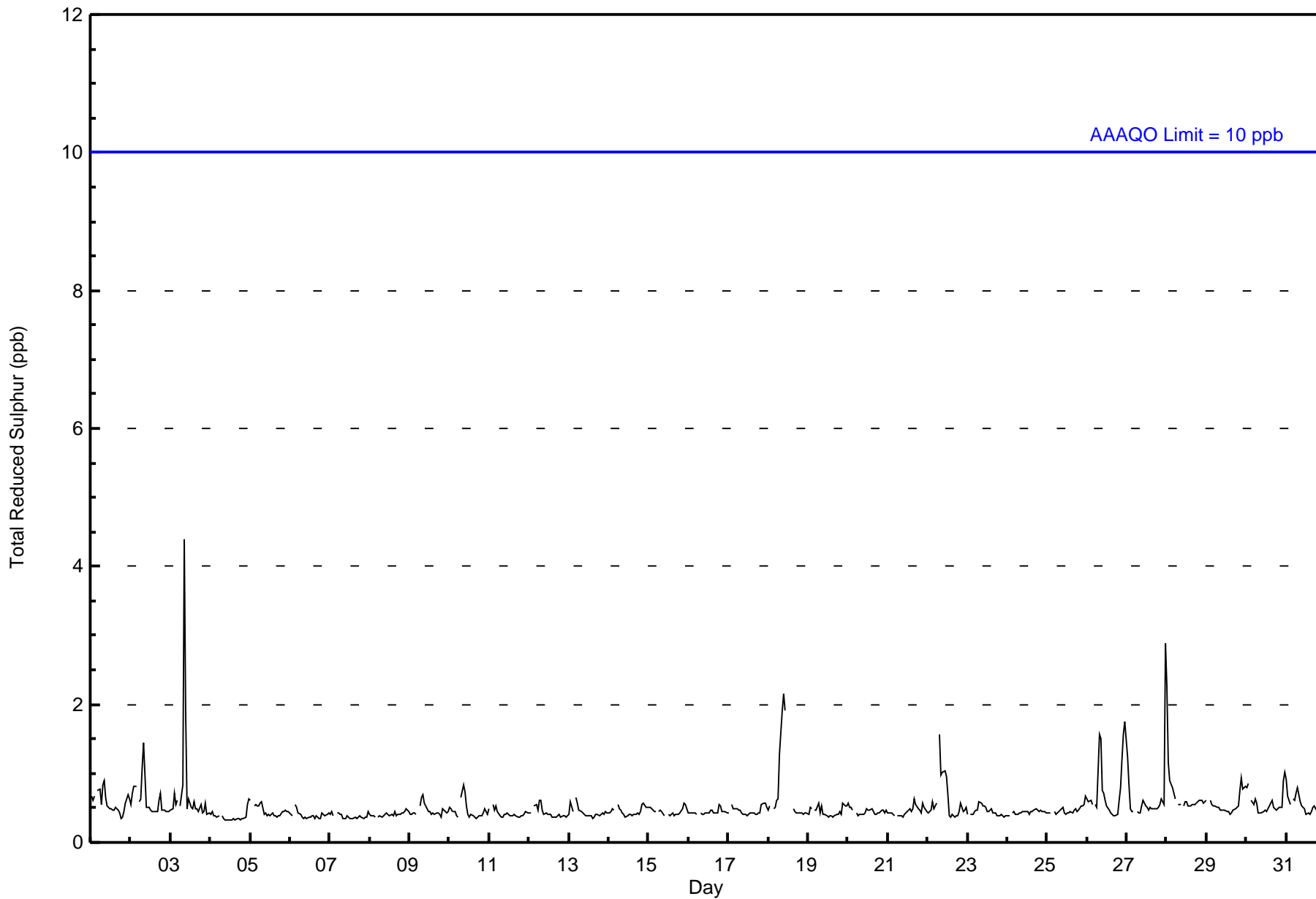
0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.7	0.6	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.6	Diurnal Average
2	1	1	1	1	1	1	2	4	2	2	1	1	1	1	1	1	1	1	1	1	1	1	2	3	Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	704	99.72	99.72
3 - 4	2	0.28	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 706

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

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

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	132	36	18	13	15	10	19	58	65	53	28	25	23	63	62	84	704
3 - 4	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	2
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	132	36	18	13	15	10	19	59	65	53	28	25	23	63	63	84	706

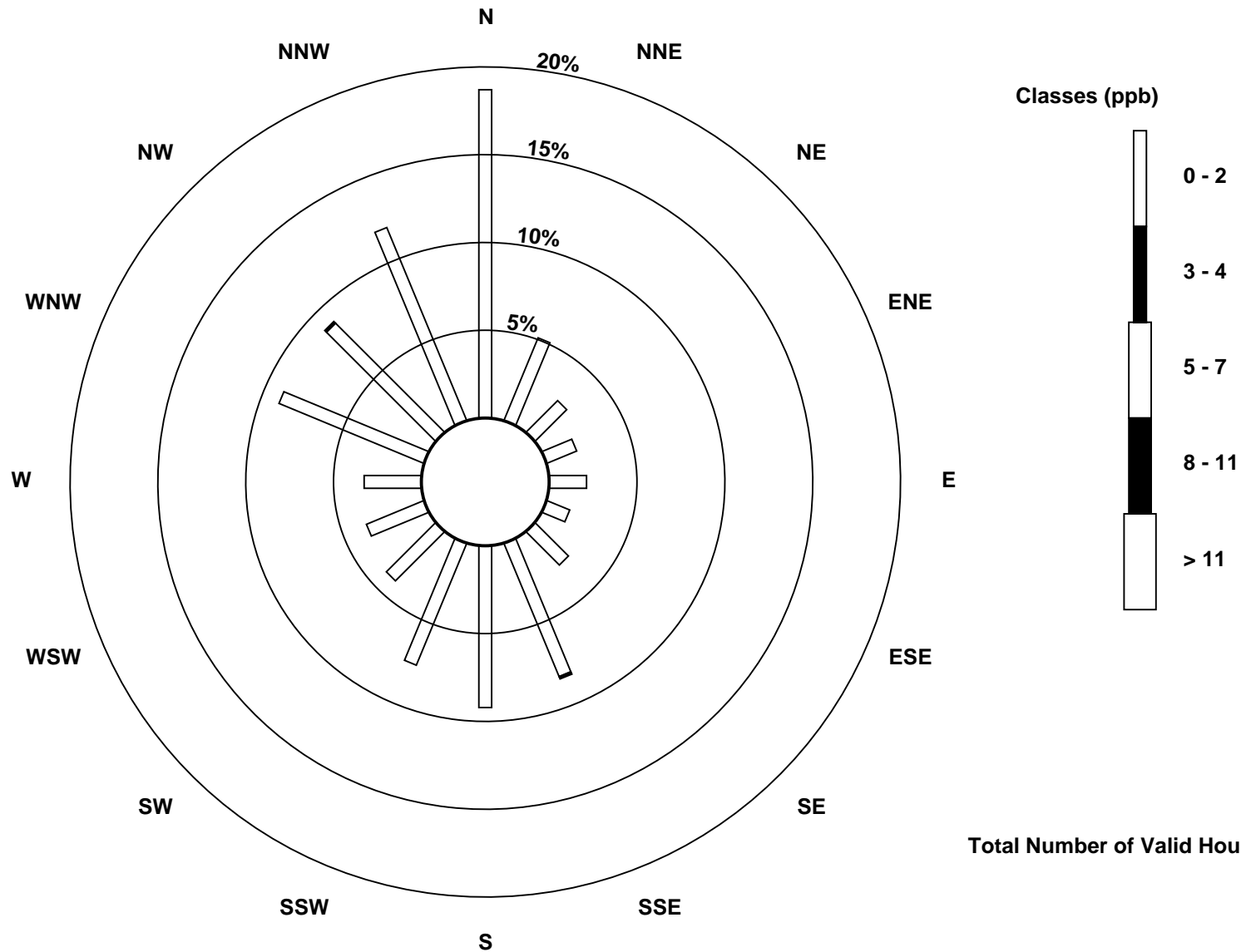
Total Number of Valid Hours: 706

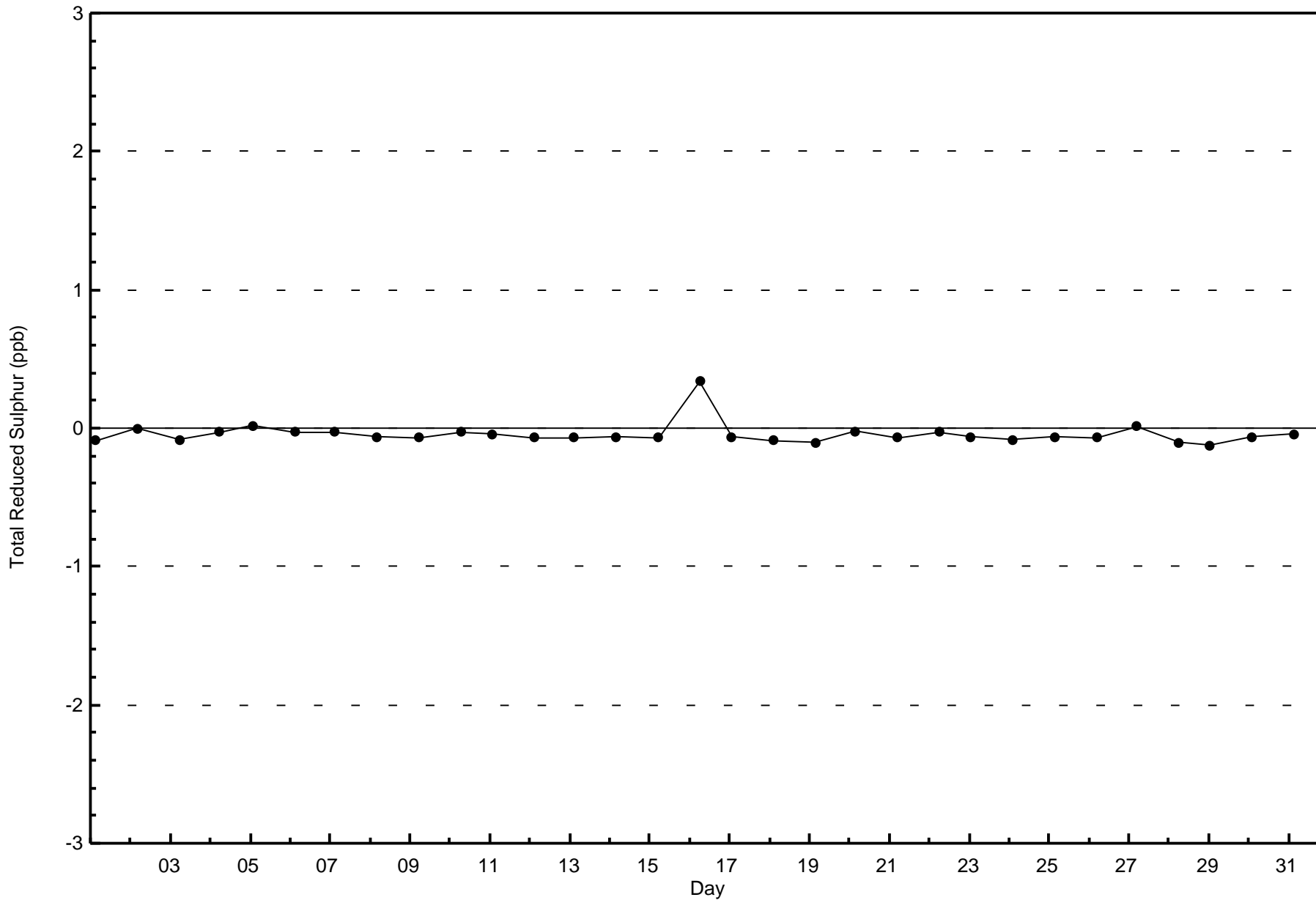
Total Number of Hours: 744

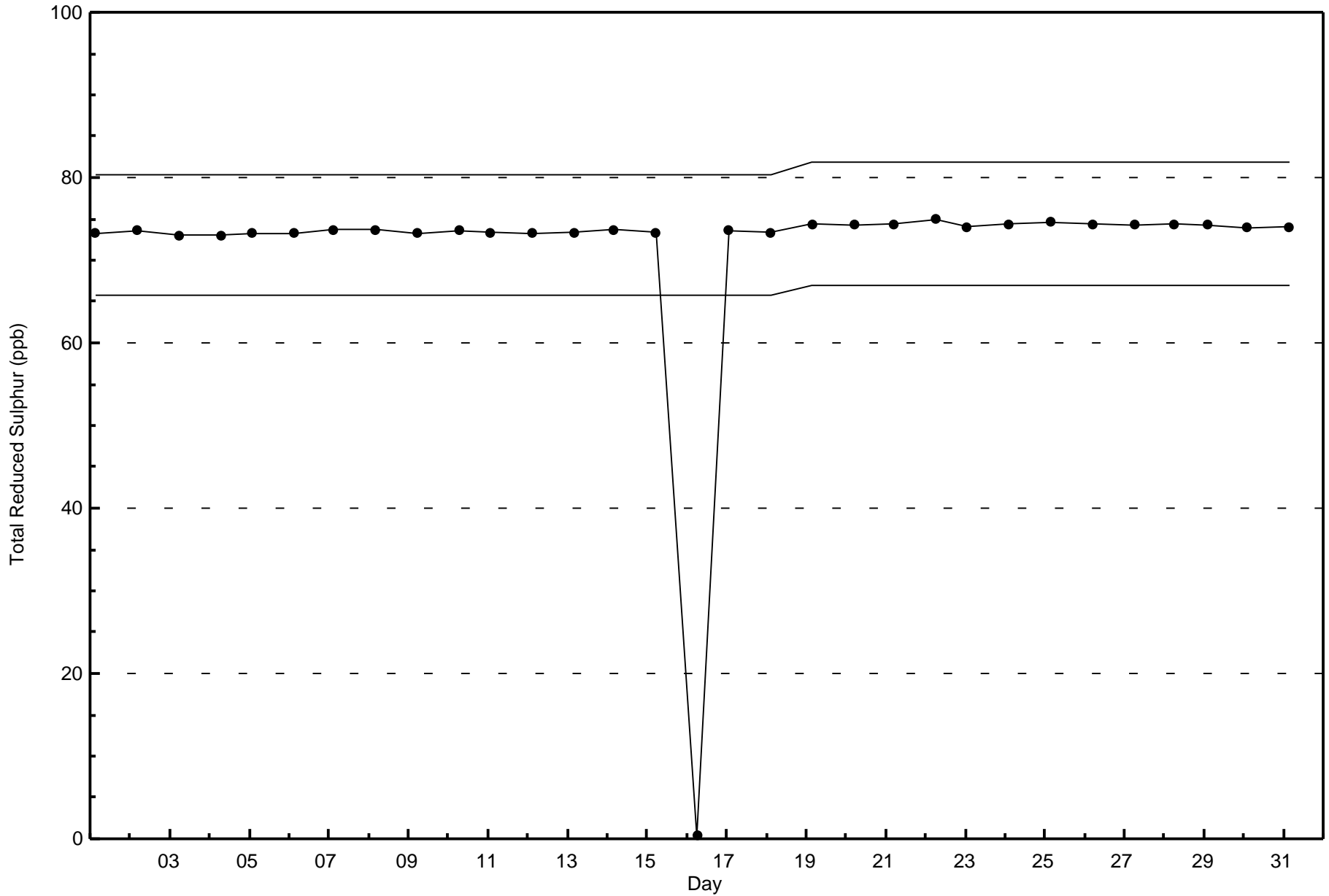


Wood Buffalo Environmental Association
Wind Rose Jul 2016

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









Wood Buffalo Environmental Association
Summary of Hour Averages

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

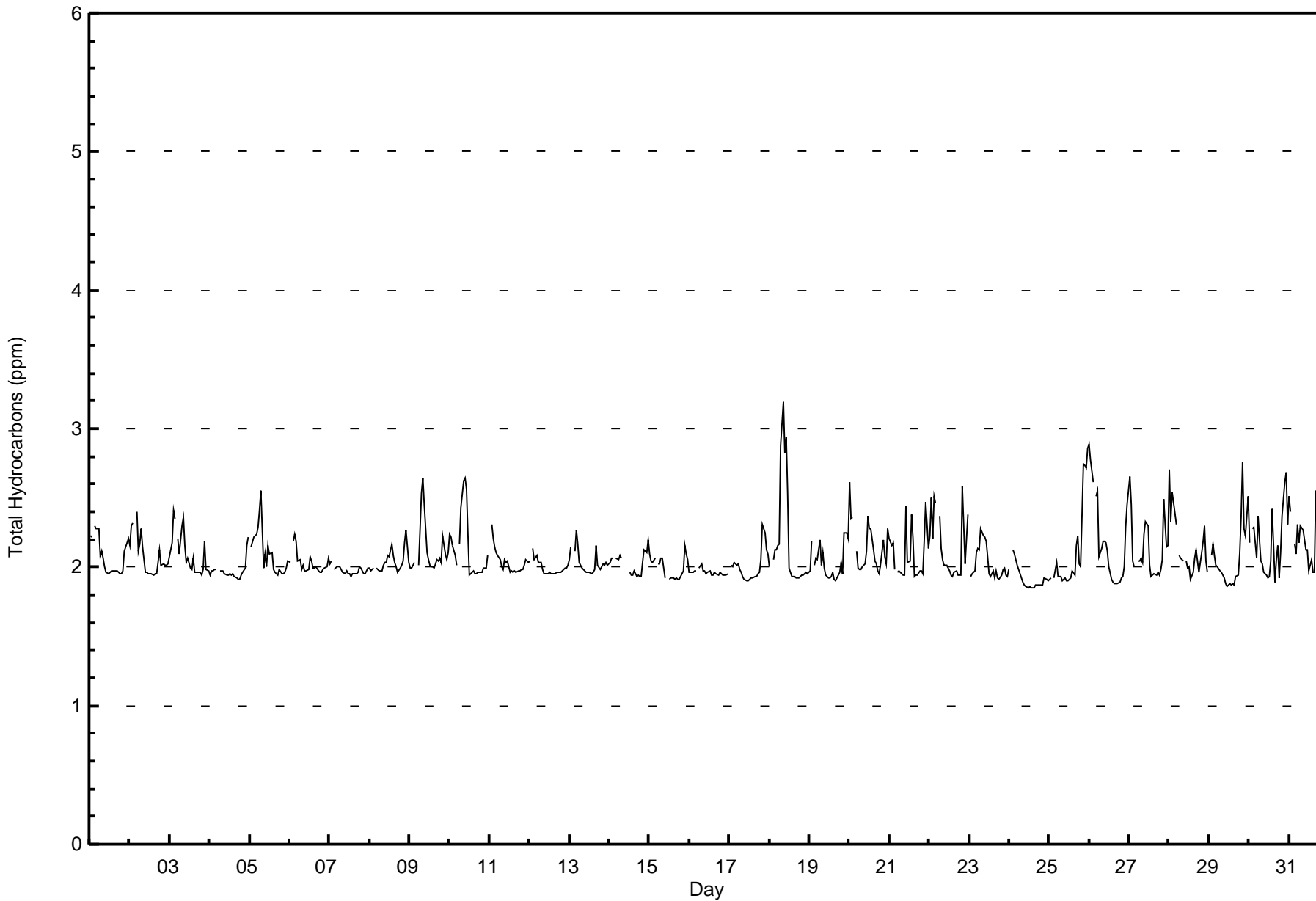
Maximum Value: 3.2 ppm on Jul 18 09:00		Maximum Daily Average: 2.2 ppm on Jul 18		Hours in Service:	744																						
Minimum Value: 1.9 ppm on Jul 24 16:00		Minimum Daily Average: 1.9 ppm on Jul 24		Hours of Data:	706																						
Maximum Diurnal Average: 2.2 ppm at hour 1		Minimum Diurnal Average: 2.0 ppm at hour 16		Hours of Missing Data:	38																						
Monthly Average: 2.07 ppm		Percentiles: P ₁ = 1.9 P ₁₀ = 1.9 Q ₁ = 2.0 Median = 2.0 Q ₃ = 2.1 P ₉₀ = 2.3 P ₉₉ = 2.7		Hours of Calibration:	35																						
				Percent Operational Time:	99.6																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Jul	2.2	2.2	Z	2.3	2.3	2.3	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.2	2.2	2.1	2.3		
2-Jul	2.2	2.3	2.3	Z	2.4	2.1	2.2	2.3	2.1	2.0	2.0	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.1	2.4		
3-Jul	2.1	2.2	2.4	2.4	Z	2.2	2.1	2.3	2.4	2.2	2.0	2.1	2.0	2.0	2.1	2.0	2.0	2.0	1.9	2.0	2.2	2.0	2.0	2.1	2.4		
4-Jul	1.9	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.2	2.2	2.0	2.2		
5-Jul	Z	2.1	2.2	2.2	2.2	2.3	2.4	2.6	2.0	2.1	2.0	2.2	2.1	2.1	2.0	2.0	1.9	2.0	1.9	2.0	1.9	2.0	2.0	2.1	2.6		
6-Jul	2.0	Z	2.2	2.2	2.2	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.2		
7-Jul	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	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		
8-Jul	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	2.2	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.2	2.3	2.0	2.3		
9-Jul	2.0	2.0	2.0	2.0	Z	2.0	2.3	2.5	2.6	2.5	2.1	2.1	2.0	2.0	2.0	2.0	2.1	2.0	2.1	2.0	2.2	2.1	2.1	2.1	2.6		
10-Jul	2.2	2.2	2.2	2.1	2.0	Z	2.2	2.4	2.6	2.6	2.6	2.2	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.6			
11-Jul	Z	2.3	2.2	2.1	2.1	2.1	2.1	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.3		
12-Jul	2.0	Z	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	1.9	2.0	2.0	2.0	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1		
13-Jul	2.1	2.1	Z	2.1	2.3	2.2	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.2	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.3		
14-Jul	2.0	2.1	2.1	Z	2.1	2.1	2.1	2.1	2.1	C	C	C	C	2.0	1.9	1.9	2.0	1.9	1.9	1.9	2.0	2.1	2.1	2.2	2.2		
15-Jul	2.1	2.0	2.0	2.1	Z	2.0	2.0	2.1	2.1	1.9	M	M	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.2	2.1	2.1	2.2		
16-Jul	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	1.9	1.9	2.0	2.0	1.9	2.0	2.0	1.9	1.9	1.9	1.9	2.0	2.0	
17-Jul	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	2.1	2.3	2.2	2.1	2.1	2.0	2.3
18-Jul	2.0	Z	2.1	2.1	2.1	2.2	2.2	2.9	3.2	2.8	2.9	2.5	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.2	3.2	
19-Jul	2.0	2.2	Z	2.0	2.1	2.1	2.2	2.0	2.1	2.0	1.9	1.9	1.9	1.9	2.0	1.9	1.9	1.9	2.0	2.0	2.0	2.2	2.2	2.2	2.0	2.2	
20-Jul	2.6	2.3	2.4	Z	2.1	2.0	2.0	2.0	2.0	2.0	2.1	2.4	2.3	2.3	2.1	2.0	2.0	2.0	2.0	2.0	2.2	2.1	2.0	2.3	2.1	2.6	
21-Jul	2.2	2.2	2.2	2.0	Z	2.0	2.0	2.0	1.9	1.9	2.4	2.0	2.0	2.4	2.2	1.9	1.9	1.9	2.0	2.0	2.0	2.2	2.5	2.1	2.1	2.5	
22-Jul	2.2	2.5	2.2	2.5	2.5	Z	2.4	2.1	2.0	2.0	2.0	2.0	2.0	1.9	1.9	2.0	2.0	1.9	1.9	1.9	2.6	2.0	2.2	2.4	2.1	2.6	
23-Jul	Z	1.9	2.0	2.0	2.1	2.1	2.1	2.3	2.2	2.2	2.2	2.1	2.0	1.9	2.0	1.9	2.0	1.9	1.9	1.9	2.0	2.0	1.9	1.9	2.0	2.3	
24-Jul	2.0	Z	2.1	2.1	2.1	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.1	
25-Jul	1.9	1.9	Z	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	2.2	2.2	2.0	2.0	2.7	2.7	2.7	2.9	2.1	2.9	
26-Jul	2.9	2.8	2.6	Z	2.5	2.6	2.1	2.1	2.2	2.2	2.2	2.1	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.3	2.5	2.2	2.9	
27-Jul	2.6	2.4	2.0	2.0	Z	2.0	2.0	2.1	2.0	2.2	2.3	2.3	2.0	1.9	1.9	2.0	1.9	2.0	1.9	2.0	2.0	2.5	2.1	2.2	2.1	2.6	
28-Jul	2.7	2.3	2.5	2.4	2.3	Z	2.1	2.1	2.0	M	2.0	2.0	2.0	1.9	2.0	2.1	2.1	2.0	2.0	2.1	2.2	2.3	2.0	2.0	2.1	2.7	
29-Jul	Z	2.1	2.2	2.1	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.1	2.4	2.8	2.3	2.2	2.5	2.1	2.8
30-Jul	2.2	Z	2.3	2.3	2.1	2.4	2.2	2.0	2.0	2.0	1.9	1.9	1.9	2.0	2.4	1.9	2.1	2.2	1.9	2.1	2.4	2.6	2.7	2.3	2.2	2.7	
31-Jul	2.5	2.4	Z	2.2	2.1	2.3	2.2	2.3	2.3	2.2	2.1	2.1	2.0	2.1	2.0	2.0	2.5	2.4	2.1	2.0	1.9	1.9	1.9	1.9	2.1	2.5	
																								Diurnal Average		Diurnal Maximum	
																								2.1		2.9	
																								2.9		2.9	

Z - zerospan C - Calibration M - Maintenance



Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	450	63.74	63.74
2.1 - 3.0	255	36.12	99.86
3.1 - 10.0	1	0.14	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
Fort McKay - Bertha Ganter - July 2016**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	103	25	5	5	10	6	9	34	48	40	18	12	16	36	32	51	450
2.1 - 3.0	30	10	13	8	5	3	9	24	23	11	10	11	9	25	30	34	255
3.1 - 10.0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	133	35	18	13	15	9	18	59	71	51	28	23	25	61	62	85	706

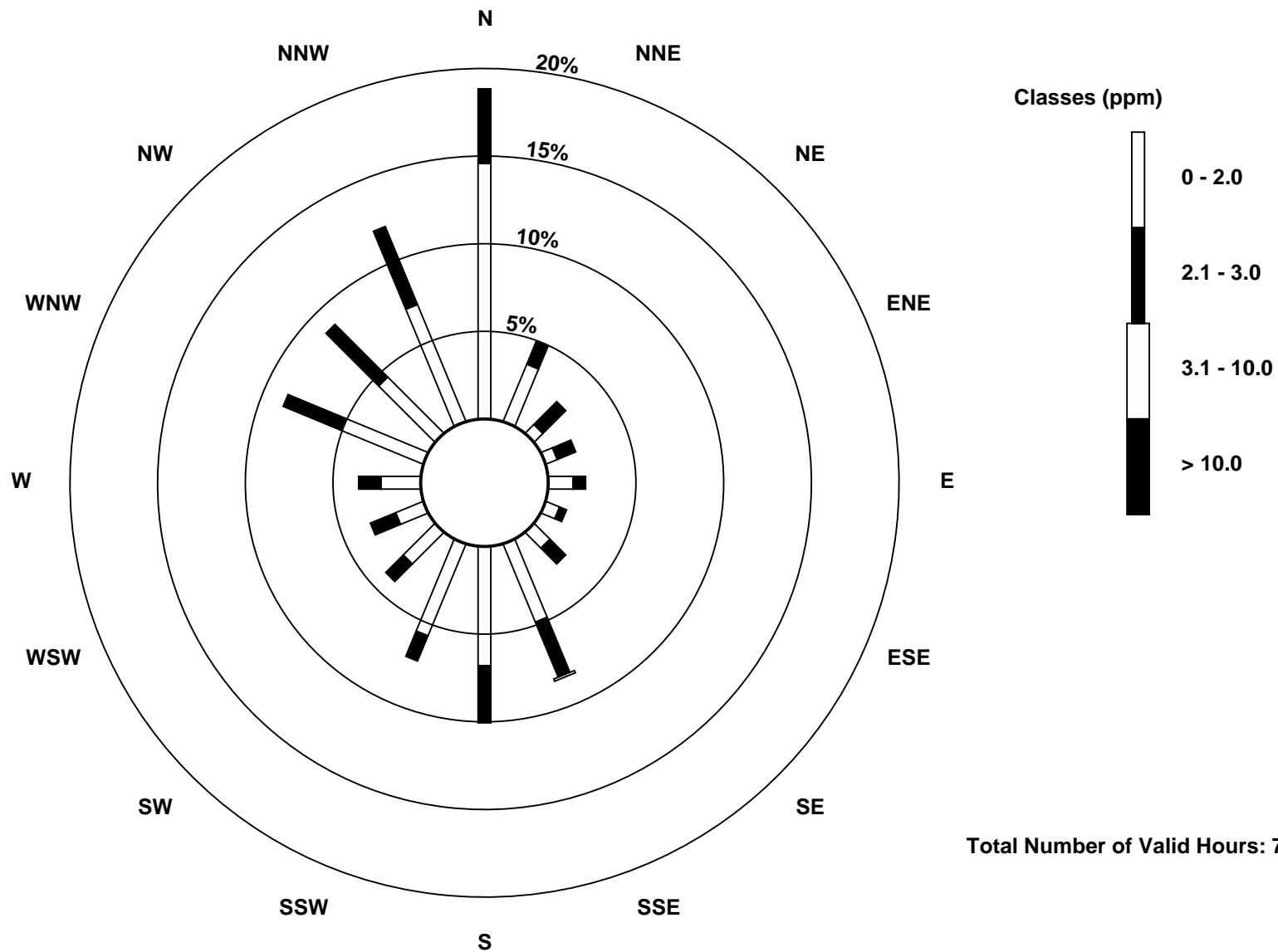
Total Number of Valid Hours: 706

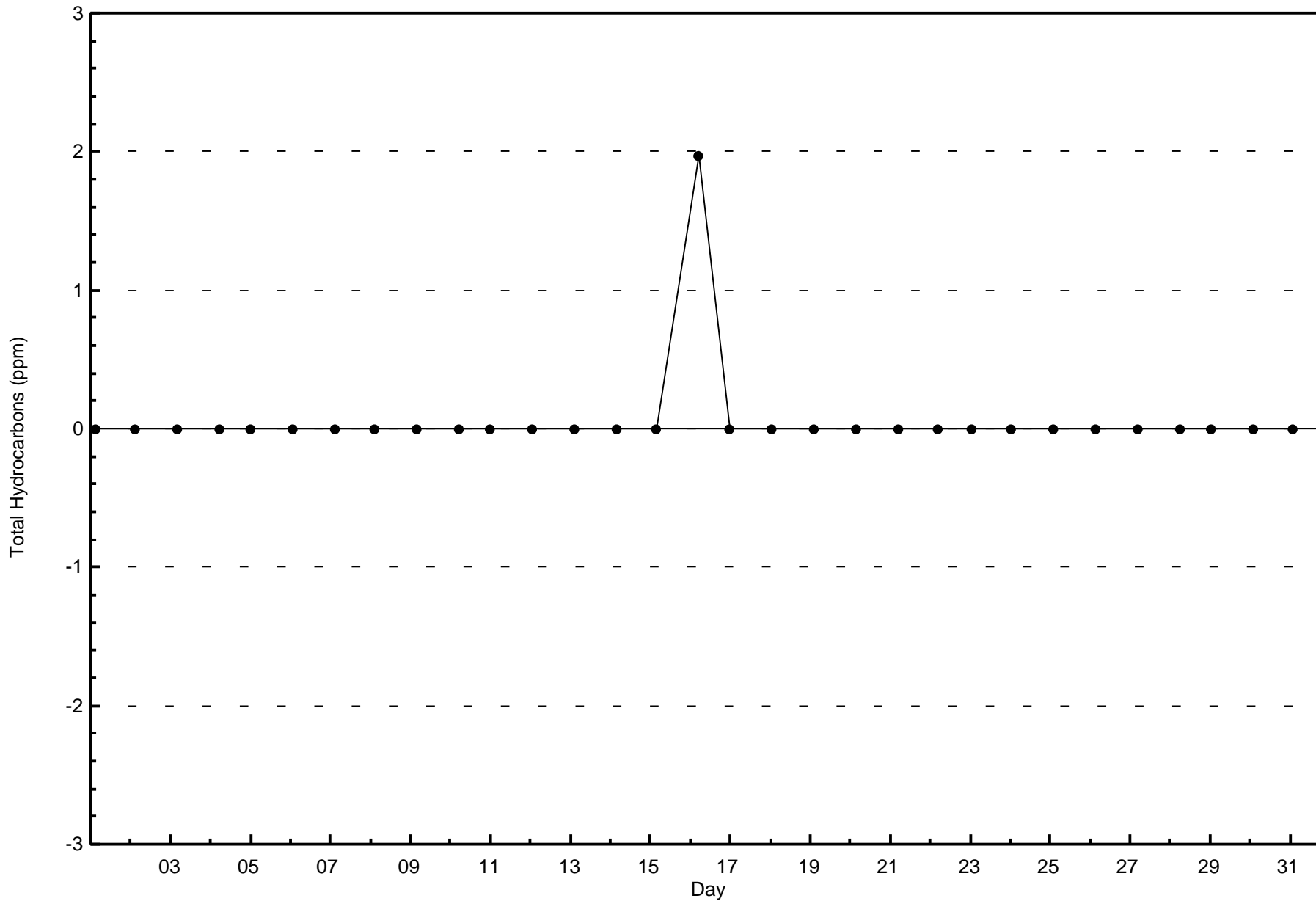
Total Number of Hours: 744

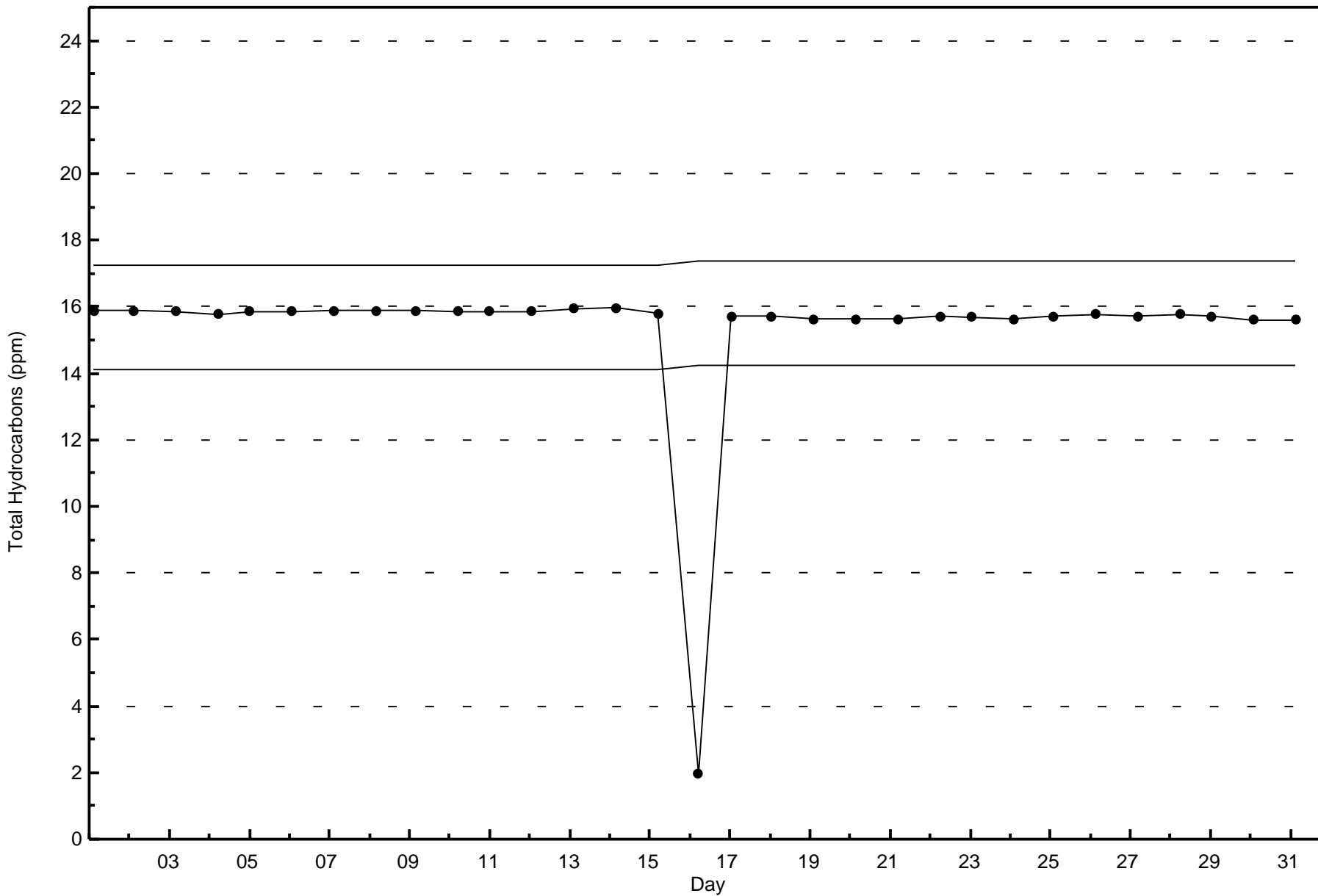


Wood Buffalo Environmental Association
Wind Rose Jul 2016

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

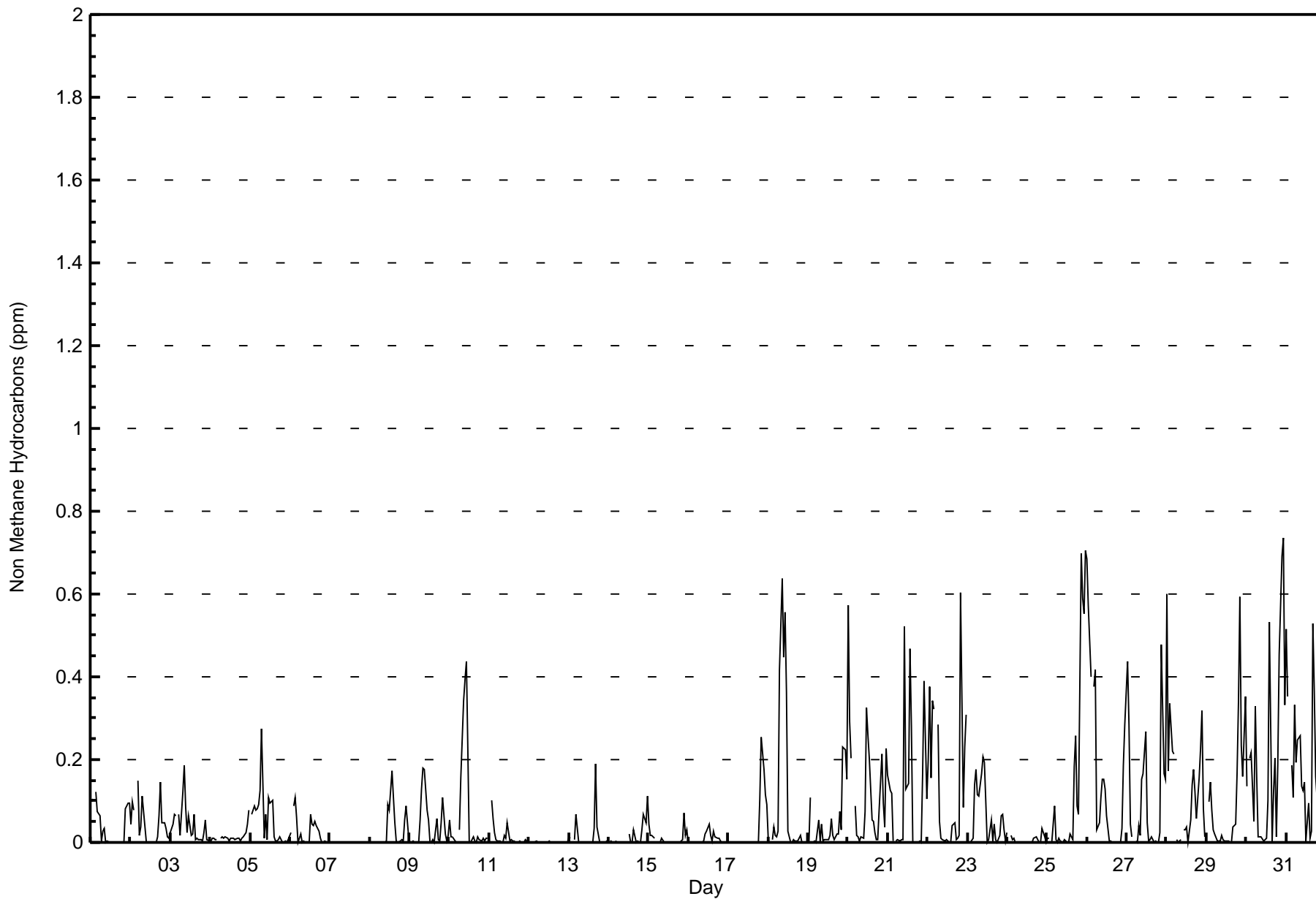








Maximum Value: 0.736 ppm on Jul 30 23:00		Maximum Daily Average: 0.197 ppm on Jul 30		Hours in Service: 744																																													
Minimum Value: 0.000 ppm on Jul 1 12:00		Minimum Daily Average: 0.000 ppm on Jul 7		Hours of Data: 706																																													
Maximum Diurnal Average: 0.140 ppm at hour 1		Minimum Diurnal Average: 0.017 ppm at hour 16		Hours of Missing Data: 38																																													
Monthly Average: 0.067 ppm		Percentiles: P ₁ = 0.0 P ₁₀ = 0.0 Q ₁ = 0.0 Median = 0.0 Q ₃ = 0.1 P ₉₀ = 0.2 P ₉₉ = 0.6		Hours of Calibration: 35																																													
				Percent Operational Time: 99.6																																													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Jul	0.098	0.105	Z	0.121	0.074	0.065	0.003	0.027	0.032	0.001	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.080	0.094	0.094	0.035	0.121																							
2-Jul	0.046	0.097	0.077	Z	0.149	0.017	0.038	0.112	0.076	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013	0.066	0.147	0.048	0.047	0.035	0.013	0.011	0.043	0.149																							
3-Jul	0.023	0.046	0.068	0.064	Z	0.068	0.018	0.123	0.185	0.085	0.025	0.064	0.017	0.019	0.067	0.008	0.012	0.006	0.008	0.003	0.025	0.055	0.008	0.003	0.043	0.185																							
4-Jul	0.003	0.009	0.010	0.008	0.008	Z	0.010	0.014	0.012	0.012	0.009	0.003	0.012	0.012	0.009	0.008	0.011	0.010	0.005	0.010	0.012	0.025	0.043	0.079	0.014	0.079																							
5-Jul	Z	0.069	0.089	0.077	0.080	0.093	0.125	0.274	0.011	0.067	0.008	0.109	0.096	0.101	0.013	0.004	0.002	0.005	0.012	0.001	0.000	0.003	0.000	0.006	0.054	0.274																							
6-Jul	0.024	Z	0.088	0.110	0.061	0.002	0.021	0.000	0.003	0.000	0.000	0.000	0.069	0.046	0.040	0.050	0.040	0.027	0.009	0.000	0.000	0.002	0.000	0.003	0.026	0.110																							
7-Jul	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																							
8-Jul	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.092	0.077	0.173	0.110	0.048	0.004	0.000	0.002	0.008	0.004	0.056	0.087	0.006	0.029	0.173																						
9-Jul	0.000	0.000	0.002	0.000	Z	0.000	0.053	0.128	0.180	0.175	0.078	0.053	0.003	0.001	0.008	0.001	0.058	0.008	0.003	0.047	0.108	0.022	0.003	0.016	0.041	0.180																							
10-Jul	0.054	0.013	0.013	0.002	0.000	Z	0.031	0.158	0.343	0.395	0.436	0.227	0.003	0.000	0.013	0.002	0.000	0.013	0.006	0.003	0.010	0.003	0.010	0.010	0.076	0.436																							
11-Jul	Z	0.103	0.057	0.025	0.006	0.002	0.003	0.000	0.000	0.016	0.010	0.046	0.004	0.005	0.004	0.002	0.000	0.000	0.002	0.000	0.001	0.000	0.008	0.000	0.013	0.103																							
12-Jul	0.000	Z	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004																							
13-Jul	0.014	0.012	Z	0.005	0.067	0.034	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.033	0.189	0.037	0.000	0.000	0.000	0.000	0.000	0.002	0.017	0.189																							
14-Jul	0.001	0.003	0.000	Z	0.002	0.000	0.000	0.000	0.000	C	C	C	C	0.021	0.000	0.000	0.031	0.000	0.003	0.000	0.000	0.031	0.068	0.048	0.113	0.017	0.113																						
15-Jul	0.043	0.016	0.016	0.009	Z	0.000	0.000	0.000	0.000	0.009	0.000	M	M	0.000	0.001	0.000	0.000	0.000	0.001	0.001	0.000	0.007	0.072	0.016	0.029	0.010	0.072																						
16-Jul	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.005	0.019	0.027	0.043	0.017	0.003	0.027	0.014	0.010	0.012	0.003	0.000	0.000	0.000	0.000	0.008	0.043																							
17-Jul	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	0.000	0.105	0.256	0.175	0.115	0.092	0.032	0.256																						
18-Jul	0.010	Z	0.008	0.038	0.016	0.012	0.026	0.417	0.636	0.448	0.556	0.364	0.028	0.002	0.002	0.007	0.003	0.004	0.004	0.017	0.000	0.000	0.000	0.000	0.113	0.636																							
19-Jul	0.000	0.108	Z	0.000	0.003	0.001	0.053	0.003	0.043	0.004	0.008	0.006	0.007	0.016	0.057	0.017	0.006	0.022	0.021	0.075	0.029	0.231	0.225	0.152	0.047	0.231																							
20-Jul	0.571	0.292	0.203	Z	0.088	0.016	0.013	0.004	0.013	0.009	0.074	0.324	0.261	0.204	0.054	0.053	0.022	0.006	0.008	0.078	0.214	0.094	0.037	0.228	0.125	0.571																							
21-Jul	0.163	0.125	0.118	0.005	Z	0.003	0.005	0.002	0.007	0.008	0.521	0.127	0.141	0.467	0.281	0.000	0.000	0.000	0.000	0.003	0.000	0.165	0.389	0.105	0.115	0.521																							
22-Jul	0.199	0.377	0.154	0.341	0.323	Z	0.284	0.051	0.010	0.005	0.002	0.006	0.004	0.000	0.000	0.039	0.047	0.007	0.010	0.015	0.603	0.084	0.230	0.310	0.135	0.603																							
23-Jul	Z	0.000	0.000	0.012	0.139	0.175	0.114	0.112	0.166	0.207	0.193	0.099	0.001	0.007	0.053	0.005	0.043	0.008	0.001	0.017	0.064	0.069	0.029	0.004	0.066	0.207																							
24-Jul	0.023	Z	0.017	0.008	0.010	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.010	0.014	0.008	0.000	0.000	0.000	0.033	0.015	0.000	0.006	0.033																							
25-Jul	0.009	0.011	Z	0.000	0.088	0.008	0.000	0.011	0.003	0.000	0.006	0.002	0.000	0.000	0.019	0.006	0.184	0.257	0.087	0.069	0.698	0.589	0.554	0.704	0.144	0.704																							
26-Jul	0.684	0.574	0.400	Z	0.378	0.419	0.031	0.047	0.109	0.153	0.152	0.130	0.063	0.002	0.002	0.000	0.000	0.000	0.000	0.000	0.002	0.035	0.186	0.285	0.159	0.684																							
27-Jul	0.436	0.285	0.043	0.012	Z	0.003	0.002	0.040	0.018	0.153	0.166	0.268	0.046	0.003	0.007	0.012	0.000	0.003	0.001	0.001	0.023	0.477	0.165	0.151	0.101	0.477																							
28-Jul	0.599	0.173	0.336	0.219	0.215	Z	0.008	0.000	0.008	M	0.030	0.029	0.038	0.002	0.054	0.138	0.177	0.123	0.057	0.157	0.227	0.318	0.082	0.013	0.136	0.599																							
29-Jul	Z	0.098	0.145	0.079	0.032	0.020	0.002	0.005	0.004	0.016	0.008	0.004	0.003	0.003	0.001	0.001	0.036	0.044	0.165	0.339	0.592	0.232	0.158	0.352	0.102	0.592																							
30-Jul	0.136	Z	0.202	0.216	0.050	0.329	0.157	0.013	0.014	0.015	0.004	0.008	0.010	0.100	0.531	0.003	0.123	0.203	0.012	0.186	0.454	0.690	0.736	0.331	0.197	0.736																							
31-Jul	0.516	0.352	Z	0.186	0.110	0.333	0.193	0.249	0.259	0.136	0.127	0.146	0.004	0.096	0.011	0.027	0.530	0.365	0.160	0.050	0.002	0.009	0.005	0.030	0.169	0.530																							
																								0.140	0.110	0.082	0.059	0.073	0.061	0.038	0.058	0.071	0.066	0.084	0.074	0.031	0.041	0.043	0.017	0.049	0.040	0.024	0.040	0.110	0.117	0.105	0.101	Diurnal Average	
																								0.684	0.574	0.400	0.341	0.378	0.419	0.284	0.417	0.636	0.448	0.556	0.364	0.261	0.467	0.531	0.138	0.530	0.365	0.165	0.339	0.698	0.690	0.736	0.704	Diurnal Maximum	
Z - zerospan			C - Calibration			M - Maintenance																																											





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 0.005	299	42.35	42.35
0.006 - 0.05	205	29.04	71.39
0.06 - 0.1	95	13.46	84.84
> 0.1	107	15.16	100.00

Total Number of Valid Hours: 706

Total Number of Hours: 744



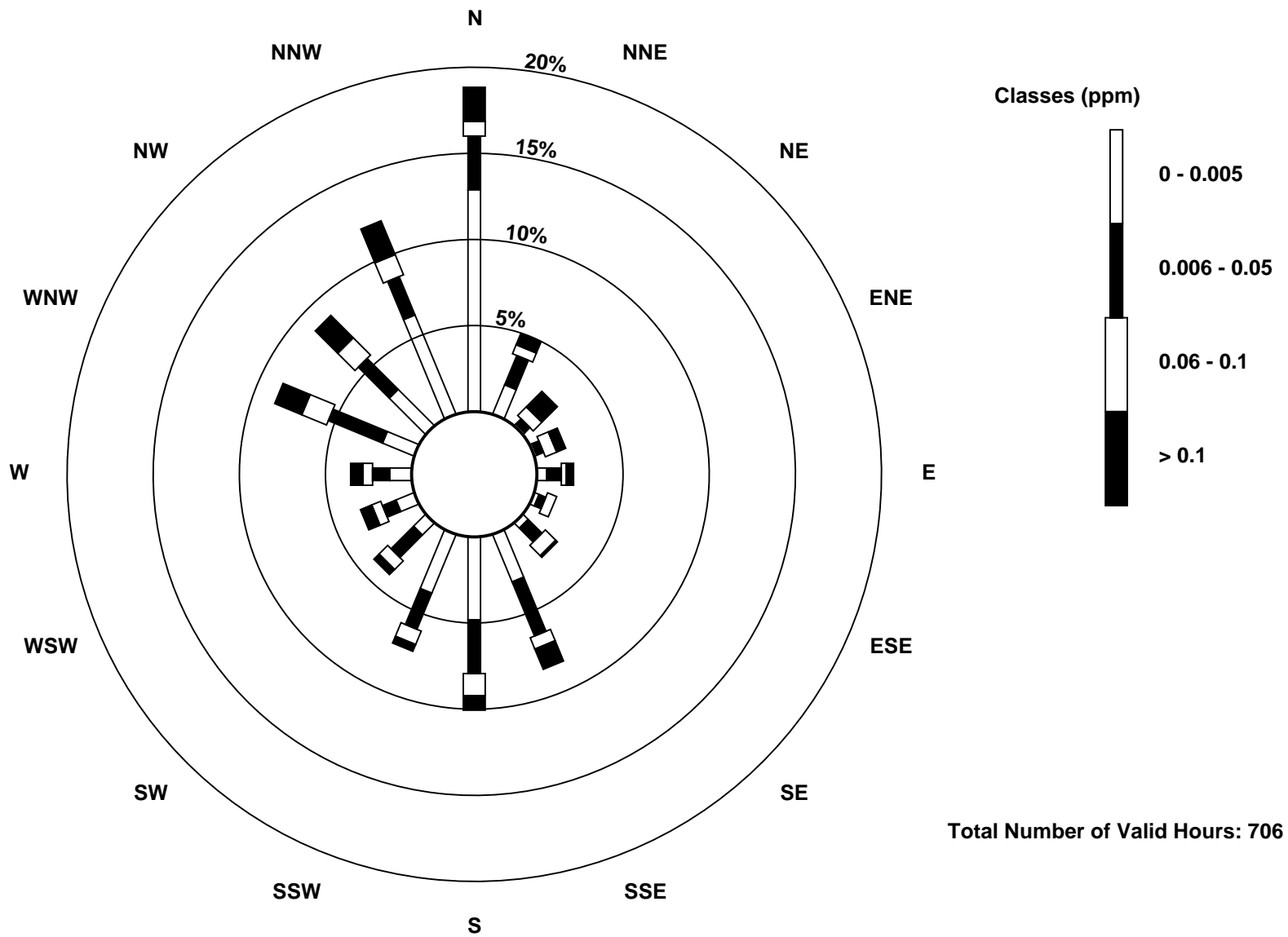
**Wood Buffalo Environmental Association
Frequency Distribution**

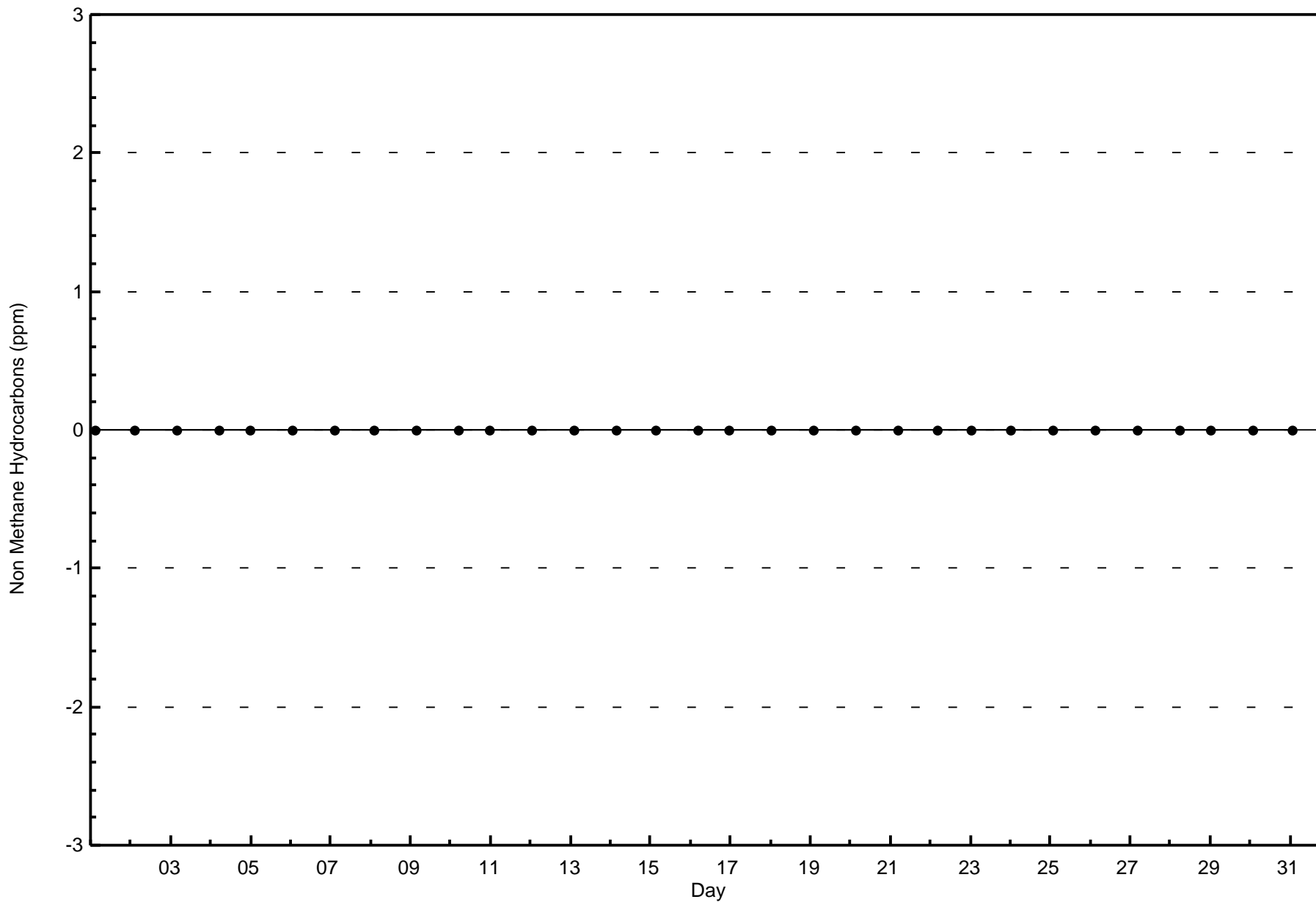
**Non Methane Hydrocarbons (NMHC) - ppm
Fort McKay - Bertha Ganter - July 2016**

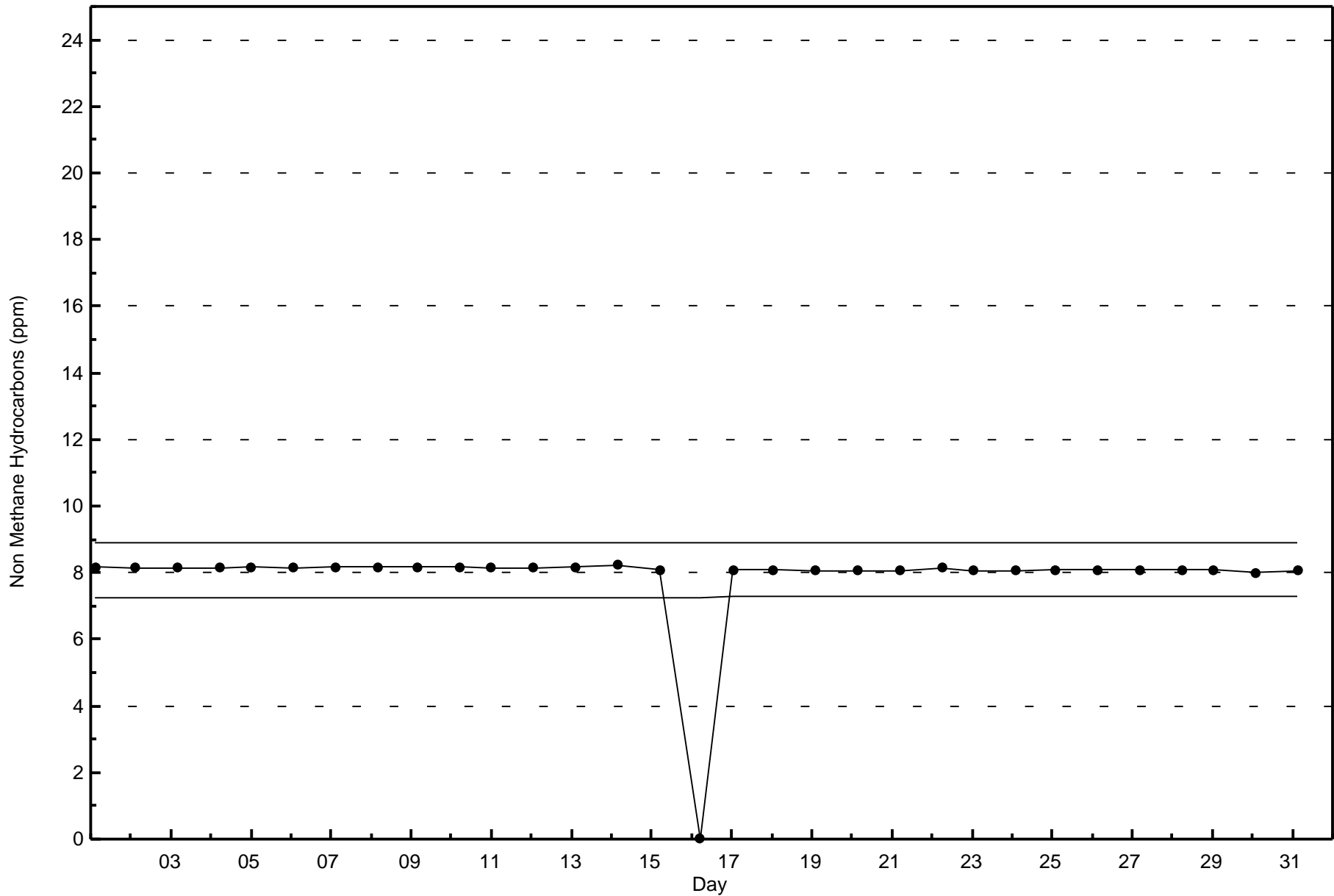
Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 0.005	91	13	1	1	4	2	3	21	34	26	7	8	9	14	21	44	299
0.006 - 0.05	22	13	3	3	6	3	8	24	22	16	13	6	7	24	18	17	205
0.06 - 0.1	6	4	5	5	2	4	6	5	9	6	5	4	4	11	10	9	95
> 0.1	14	5	9	4	3	0	1	9	6	3	3	5	5	12	13	15	107
Totals	133	35	18	13	15	9	18	59	71	51	28	23	25	61	62	85	706

Total Number of Valid Hours: 706

Total Number of Hours: 744









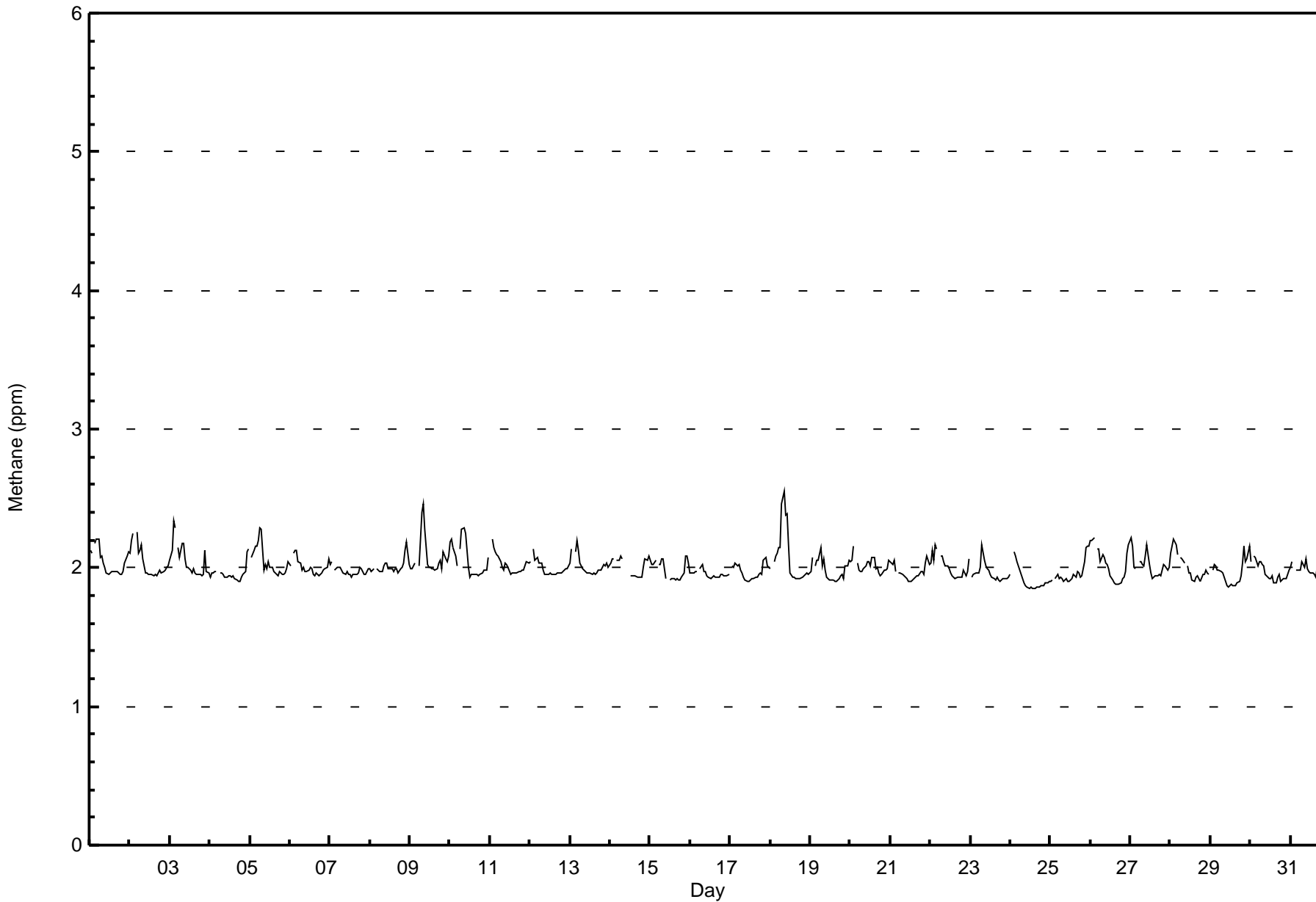
Wood Buffalo Environmental Association

Summary of Hour Averages

Methane (CH₄) - ppm

Fort McKay - Bertha Ganter - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 2.6 ppm on Jul 18 09:00 Maximum Daily Average: 2.1 ppm on Jul 9														Hours in Service: 744 Hours of Data: 706													
Minimum Value: 1.9 ppm on Jul 24 16:00 Minimum Daily Average: 1.9 ppm on Jul 24 Maximum Diurnal Average: 2.1 ppm at hour 3 Minimum Diurnal Average: 1.9 ppm at hour 16														Hours of Missing Data: 38 Hours of Calibration: 35													
Monthly Average: 2.00 ppm Percentiles: P ₁ = 1.9 P ₁₀ = 1.9 Q ₁ = 1.9 Median = 2.0 Q ₃ = 2.0 P ₉₀ = 2.1 P ₉₉ = 2.3														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-Jul	2.1	2.1	Z	2.2	2.2	2.2	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.0	2.2		
2-Jul	2.1	2.2	2.2	Z	2.3	2.1	2.1	2.2	2.1	2.0	2.0	1.9	1.9	1.9	1.9	2.0	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.3
3-Jul	2.1	2.1	2.3	2.3	Z	2.1	2.1	2.2	2.2	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	2.0	2.1	2.0	2.0	2.1	2.3	
4-Jul	1.9	2.0	2.0	2.0	2.0	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	2.0	2.1	2.1	2.1	2.0	2.1	
5-Jul	Z	2.1	2.1	2.2	2.2	2.2	2.3	2.3	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	2.0	2.0	2.0	2.3	
6-Jul	2.0	Z	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	1.9	2.0	1.9	1.9	2.0	2.0	2.0	2.0	2.1	2.0	2.1	
7-Jul	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	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
8-Jul	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	2.1	2.2	2.0	2.0	2.2	
9-Jul	2.0	2.0	2.0	2.0	Z	2.0	2.2	2.4	2.5	2.3	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.1	2.1	2.0	2.1	2.1	2.5	
10-Jul	2.2	2.2	2.1	2.1	2.0	Z	2.1	2.3	2.3	2.3	2.1	2.0	1.9	2.0	2.0	2.0	2.0	1.9	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.3	
11-Jul	Z	2.2	2.2	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.2	
12-Jul	2.0	Z	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	1.9	2.0	2.0	2.0	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	
13-Jul	2.0	2.1	Z	2.1	2.2	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.2	
14-Jul	2.0	2.1	2.1	Z	2.1	2.1	2.1	2.1	2.1	C	C	C	C	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.1	2.1	2.1	2.1	2.1	
15-Jul	2.1	2.0	2.0	2.1	Z	2.0	2.0	2.1	2.1	1.9	M	M	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.1	2.1	2.0	2.1		
16-Jul	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	2.0	2.0	1.9	1.9	1.9	1.9	1.9	2.0	
17-Jul	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	2.1	2.1	2.0	2.0	2.1	
18-Jul	2.0	Z	2.0	2.1	2.1	2.1	2.1	2.5	2.6	2.4	2.4	2.2	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.1	2.6	
19-Jul	2.0	2.1	Z	2.0	2.1	2.1	2.1	2.0	2.1	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	2.0	2.0	2.1	2.0	2.1	
20-Jul	2.0	2.1	2.2	Z	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	1.9	1.9	2.0	2.0	2.0	2.1	2.0	2.2	
21-Jul	2.0	2.0	2.1	2.0	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	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.1	
22-Jul	2.0	2.1	2.1	2.2	2.1	Z	2.1	2.1	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	1.9	2.0	2.1	2.0	2.2	
23-Jul	Z	1.9	2.0	2.0	2.0	2.0	2.0	2.2	2.1	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.2	
24-Jul	2.0	Z	2.1	2.1	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.1	
25-Jul	1.9	1.9	Z	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	2.0	2.0	1.9	1.9	2.0	2.2	2.2	2.2	2.0	2.2	
26-Jul	2.2	2.2	2.2	Z	2.1	2.1	2.0	2.1	2.1	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.1	2.2	2.0	2.2	
27-Jul	2.2	2.2	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.1	2.2	2.0	2.0	1.9	1.9	1.9	1.9	1.9	2.0	1.9	2.0	2.0	2.0	2.0	2.0	2.2	
28-Jul	2.1	2.2	2.2	2.2	2.1	Z	2.1	2.1	2.0	M	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	2.0	2.2	
29-Jul	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	2.0	2.2	2.0	2.1	2.2	2.0	2.2	
30-Jul	2.0	Z	2.1	2.1	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	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.1	
31-Jul	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	1.9	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	2.0	2.1	
																								Diurnal Average			
																								Diurnal Maximum			
Z - zerospan C - Calibration M - Maintenance																											





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	555	78.61	78.61
2.1 - 3.0	151	21.39	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 (CH₄) - ppm
Fort McKay - Bertha Ganter - July 2016**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	115	31	16	13	13	9	13	37	54	45	26	14	20	45	43	61	555
2.1 - 3.0	18	4	2	0	2	0	5	22	17	6	2	9	5	16	19	24	151
3.1 - 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	133	35	18	13	15	9	18	59	71	51	28	23	25	61	62	85	706

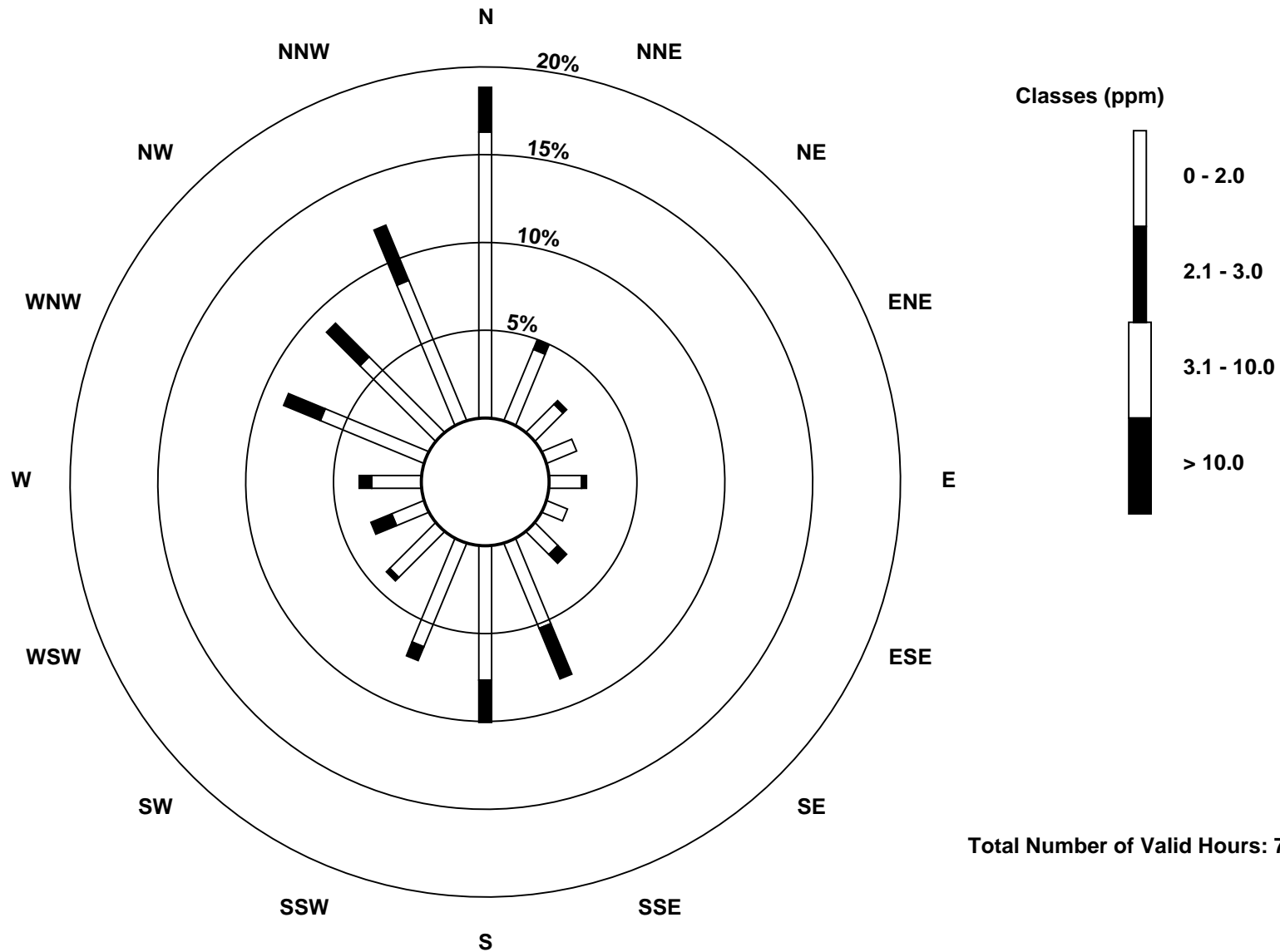
Total Number of Valid Hours: 706

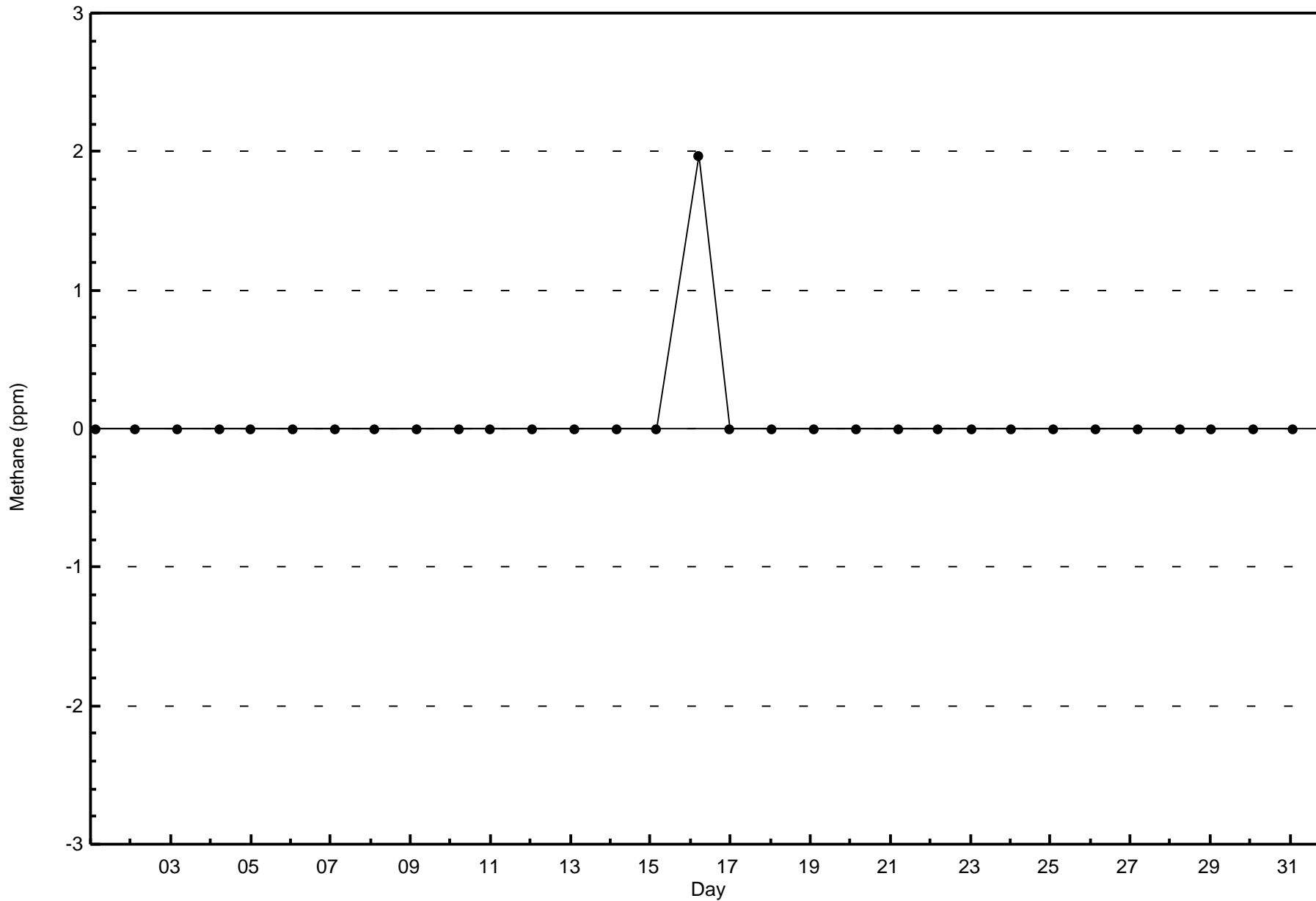
Total Number of Hours: 744

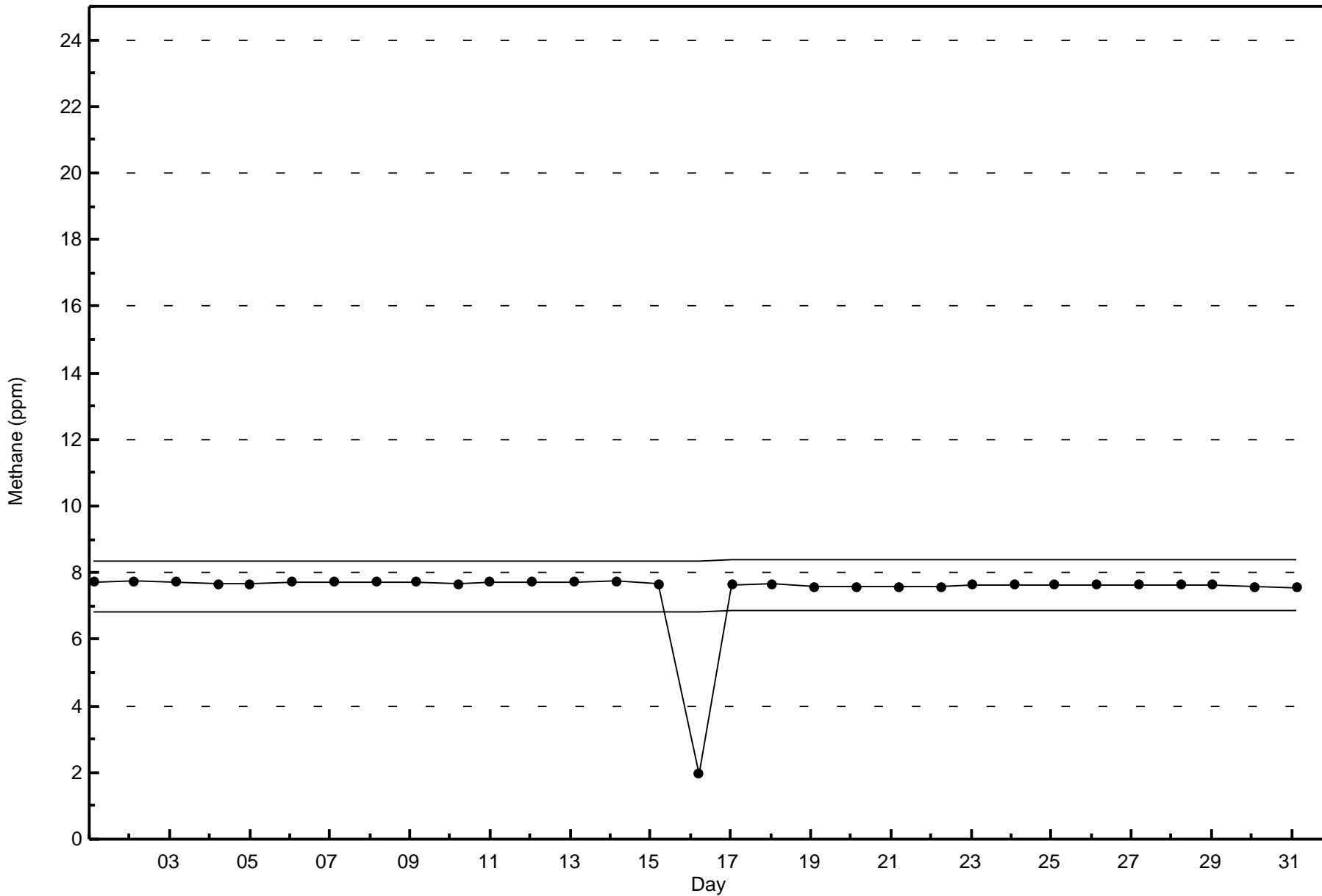


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Methane (CH₄) - ppm
Fort McKay - Bertha Ganter (AMS 1)







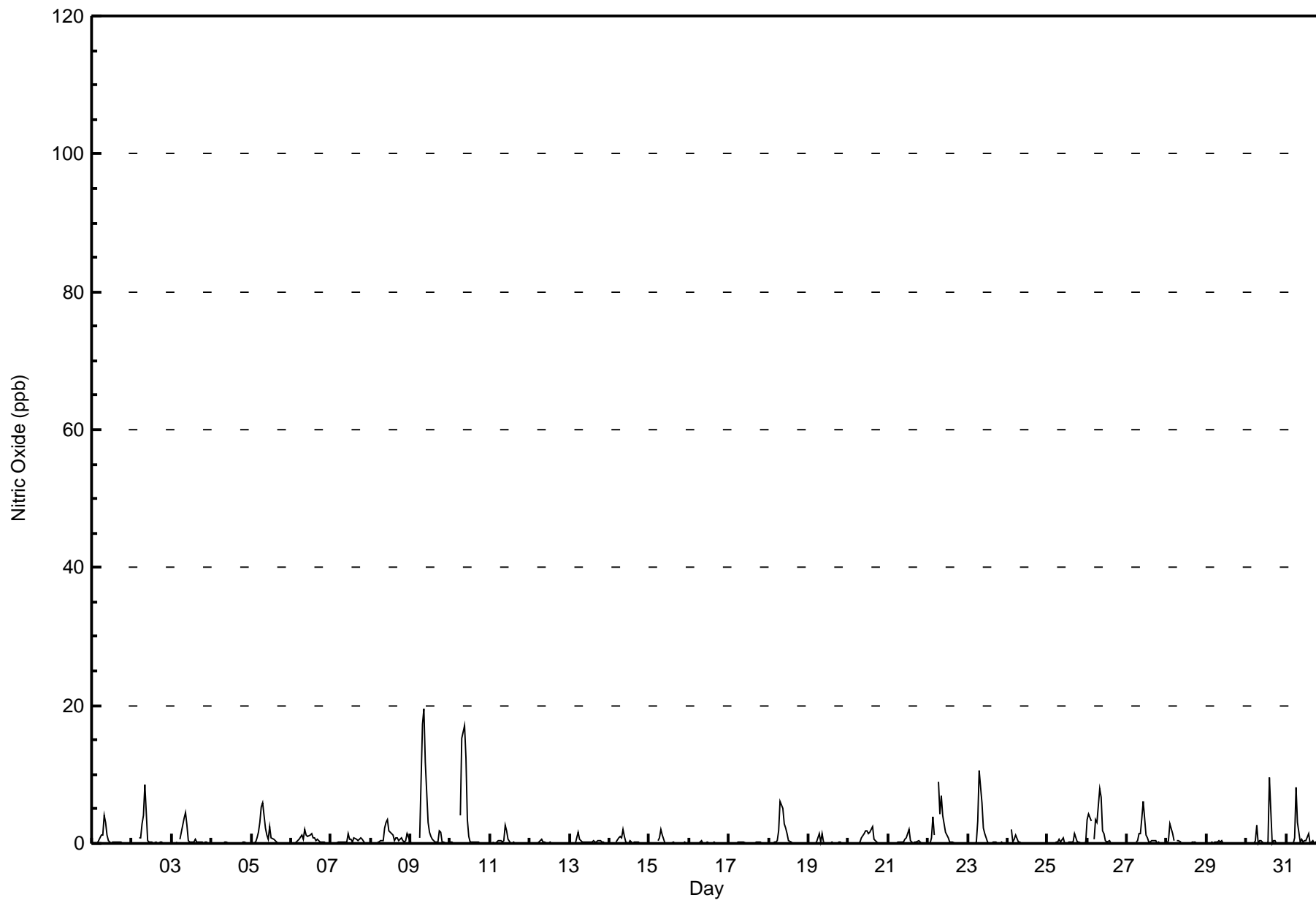


Maximum Value: 20 ppb on Jul 9 09:00																	Maximum Daily Average: 3.1 ppb on Jul 9																	Hours in Service: 744	
Minimum Value: 0 ppb on Jul 15 13:00																	Minimum Daily Average: 0.1 ppb on Jul 16																	Hours of Data: 707	
Maximum Diurnal Average: 3.0 ppb at hour 9																	Minimum Diurnal Average: 0.0 ppb at hour 24																	Hours of Missing Data: 37	
Monthly Average: 0.7 ppb																	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 2 P ₉₉ = 10																	Hours of Calibration: 35	
																																		Percent Operational Time: 99.7	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24											
1-Jul	0	0	Z	0	0	1	1	4	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	4									
2-Jul	0	0	0	Z	1	1	3	4	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	8									
3-Jul	0	0	0	0	Z	1	2	4	4	3	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.7	4									
4-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0									
5-Jul	Z	0	0	1	2	3	5	6	2	1	1	2	1	1	0	0	0	0	0	0	0	0	0	0	1.1	6									
6-Jul	0	Z	0	0	0	1	1	1	2	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0.6	2									
7-Jul	0	0	Z	0	0	0	0	0	0	0	1	1	1	0	1	1	0	1	1	1	0	0	0	0	0.4	1									
8-Jul	0	0	0	Z	0	0	0	0	2	3	3	2	2	1	1	1	1	0	1	0	0	0	1	0	0.9	3									
9-Jul	0	0	0	0	Z	1	9	17	20	12	3	2	1	1	0	0	0	2	2	0	0	0	0	0	3.1	20									
10-Jul	0	0	0	0	0	Z	4	15	17	12	3	1	0	0	0	0	0	0	0	0	0	0	0	0	2.4	17									
11-Jul	Z	0	0	0	0	0	0	0	0	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3	3									
12-Jul	0	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1									
13-Jul	0	0	Z	0	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	2									
14-Jul	0	0	0	Z	0	1	1	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	2									
15-Jul	0	0	0	0	Z	0	1	2	1	0	M	M	0	0	0	0	0	0	0	0	0	0	0	0	0.3	2									
16-Jul	0	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									
17-Jul	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0									
18-Jul	0	Z	0	0	0	0	2	6	5	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0.9	6									
19-Jul	0	0	Z	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1									
20-Jul	0	0	0	Z	0	0	0	0	1	1	2	2	1	2	3	1	0	0	0	0	0	0	0	0	0.6	3									
21-Jul	0	0	0	0	Z	0	0	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0.3	2									
22-Jul	0	0	1	4	1	Z	9	4	7	4	2	1	1	0	0	0	0	0	0	0	0	0	0	0	1.5	9									
23-Jul	Z	0	0	0	0	0	3	11	6	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1.1	11									
24-Jul	0	Z	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	2									
25-Jul	0	0	Z	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0.2	1									
26-Jul	3	4	3	Z	1	4	3	8	7	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1.6	8									
27-Jul	0	0	0	0	Z	0	0	2	1	4	6	1	1	0	0	0	0	0	0	0	0	0	0	0	0.7	6									
28-Jul	0	0	3	2	0	Z	0	0	0	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0.4	3									
29-Jul	Z	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									
30-Jul	0	Z	0	0	0	0	3	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0.6	10									
31-Jul	0	0	Z	0	0	1	8	3	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0.7	8									
																								Diurnal Average											
																								Diurnal Maximum											
Z - zerospan C - Calibration M - Maintenance																																			



Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	707	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

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

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	133	35	18	13	15	10	19	57	72	51	28	23	25	61	62	85	707
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	133	35	18	13	15	10	19	57	72	51	28	23	25	61	62	85	707

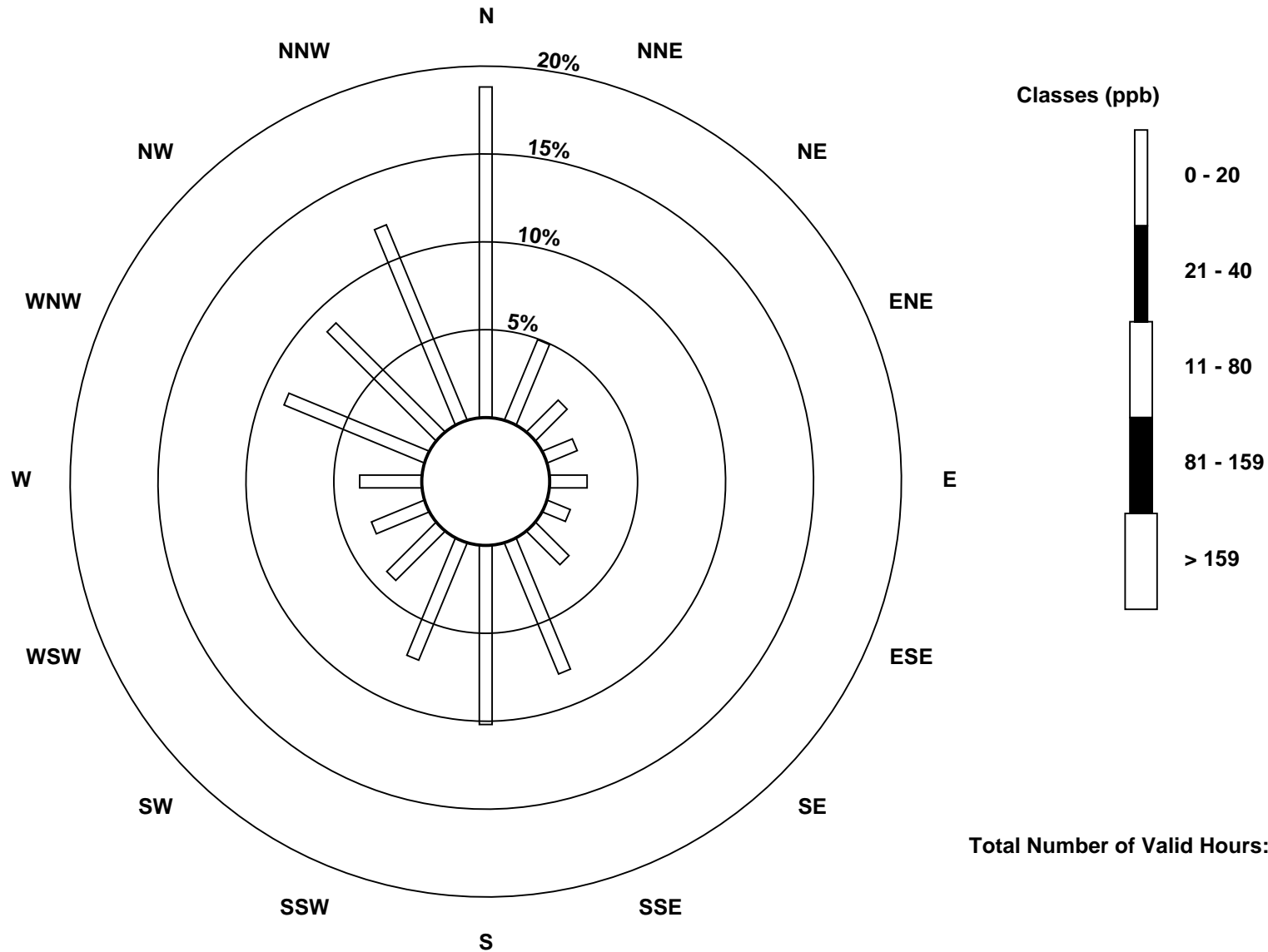
Total Number of Valid Hours: 707

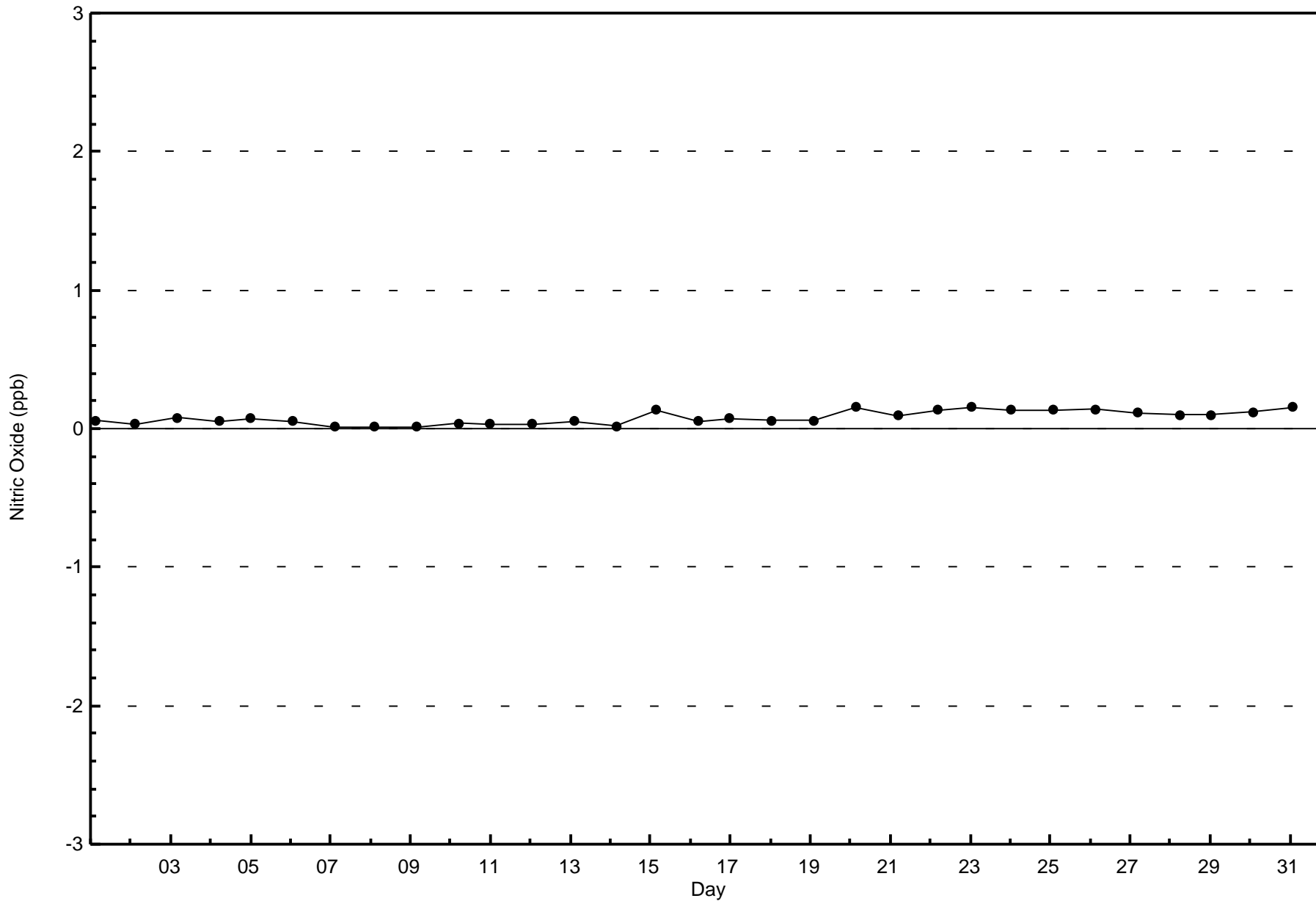
Total Number of Hours: 744

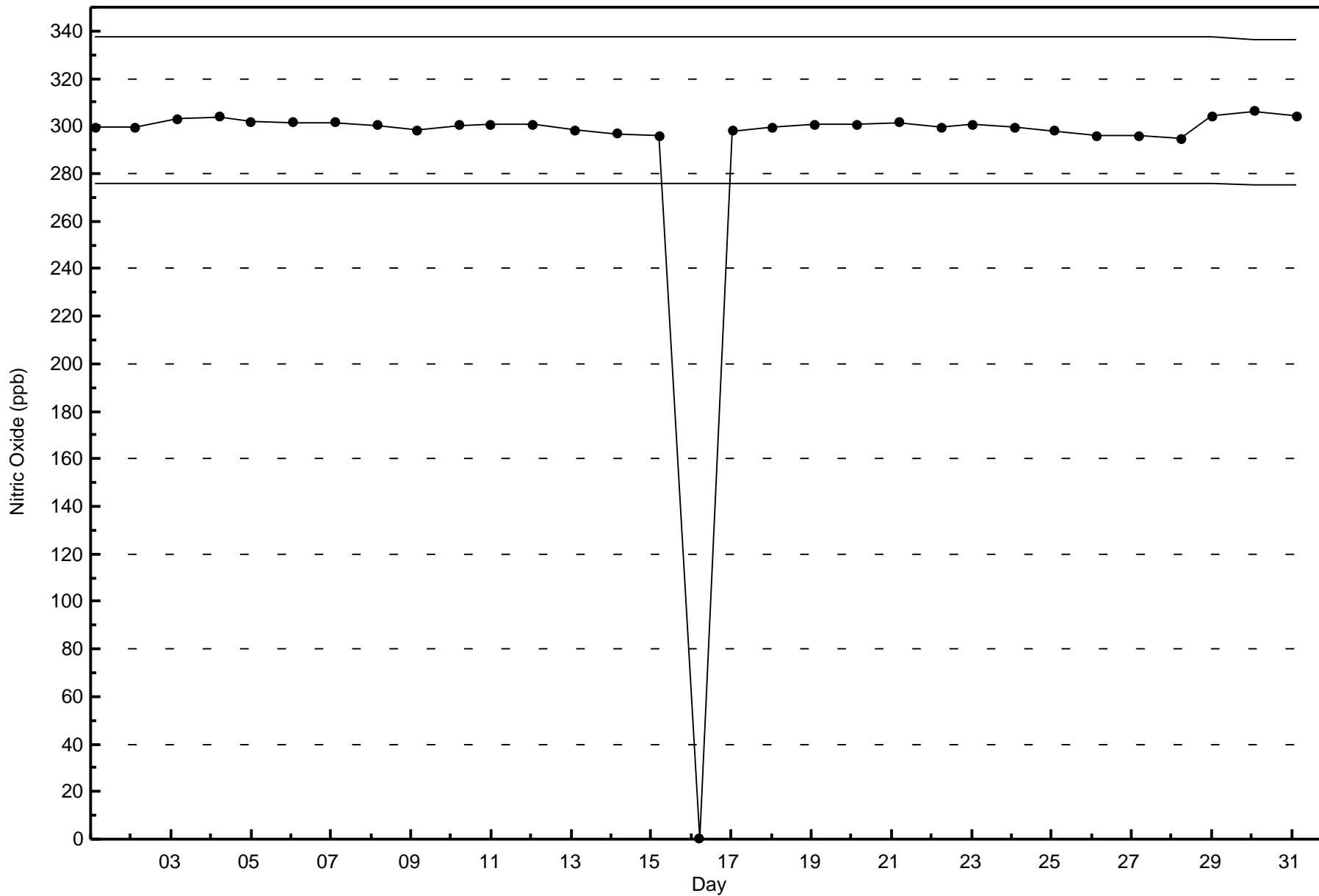


Wood Buffalo Environmental Association
Wind Rose Jul 2016

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









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

Fort McKay - Bertha Ganter - July 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 15 ppb on Jul 8 23:00	Maximum Daily Average: 4.8 ppb on Jul 9		Hours of Data:	707
Minimum Value: 0 ppb on Jul 4 11:00	Minimum Daily Average: 0.6 ppb on Jul 12		Hours of Missing Data:	37
Maximum Diurnal Average: 4.2 ppb at hour 9	Minimum Diurnal Average: 1.2 ppb at hour 16		Hours of Calibration:	35
Monthly Average: 2.3 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 1 Q ₃ = 3 P ₉₀ = 6 P ₉₉ = 12		Percent Operational Time:	99.7

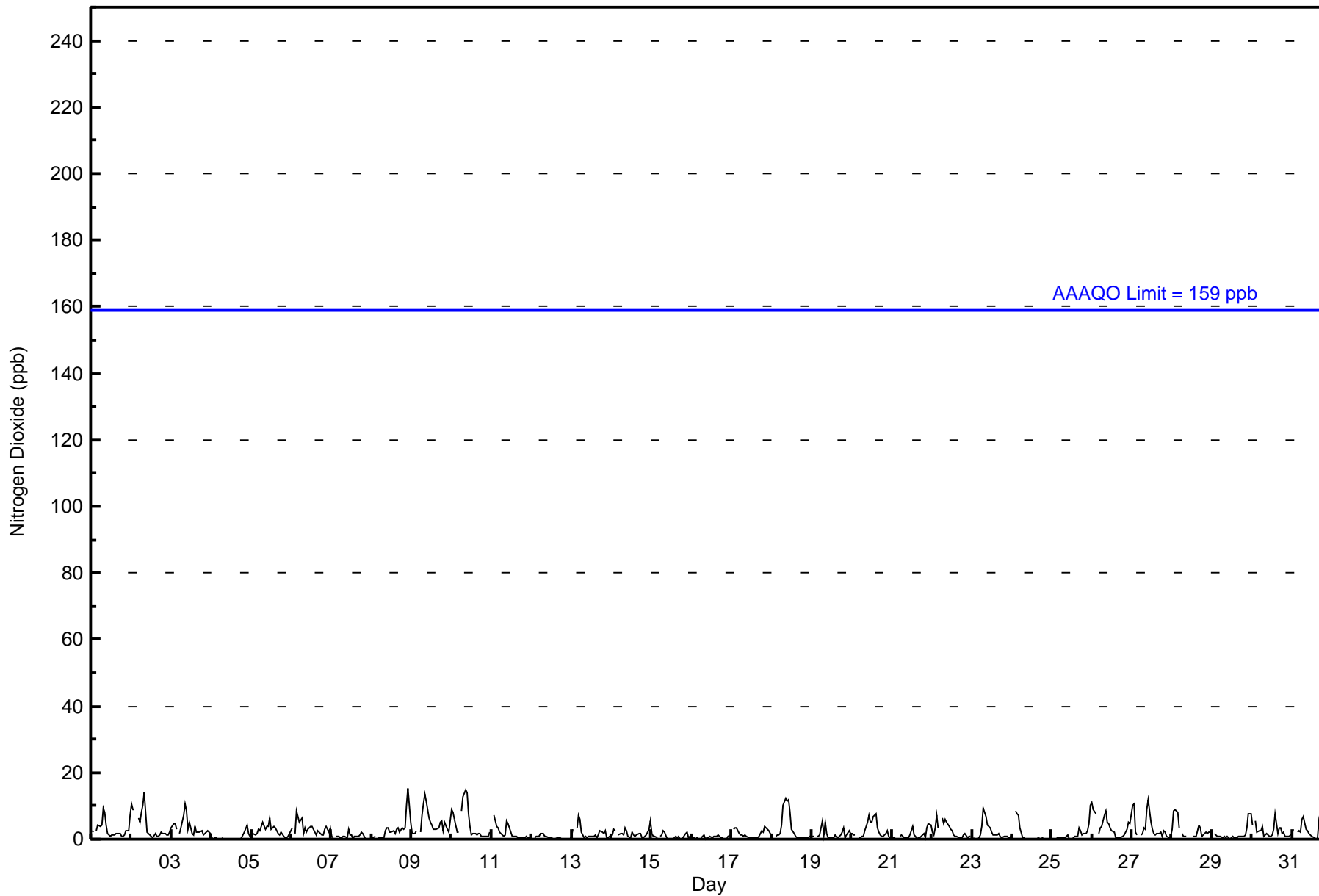
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	2	2	Z	3	4	4	4	9	8	4	2	1	1	1	1	2	2	2	1	1	1	2	3	7	3.0	9
2-Jul	11	9	9	Z	6	5	8	10	14	2	2	1	1	1	2	1	1	1	2	2	2	1	1	2	4.0	14
3-Jul	3	5	5	3	Z	2	3	7	11	8	3	5	2	1	4	2	2	2	3	1	2	2	3	2	3.5	11
4-Jul	1	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	4	2	1	0.6	4
5-Jul	Z	2	1	2	3	3	4	5	3	4	4	6	3	4	3	3	2	1	2	1	1	1	1	2	2.5	6
6-Jul	3	Z	2	9	7	5	6	2	4	2	3	4	4	3	2	1	3	2	1	1	3	4	2	4	3.3	9
7-Jul	1	0	Z	1	1	0	1	1	1	1	3	1	1	0	1	1	1	1	2	2	0	0	0	0	0.9	3
8-Jul	0	1	1	Z	0	0	1	1	2	4	4	2	2	3	2	3	3	2	3	3	3	10	15	5	3.1	15
9-Jul	2	2	2	3	Z	2	7	11	14	12	6	5	4	3	3	3	3	5	6	3	5	3	2	5	4.8	14
10-Jul	9	8	6	2	2	Z	8	13	15	14	8	4	1	2	2	1	2	2	1	1	1	1	1	2	4.5	15
11-Jul	Z	7	6	4	3	2	1	1	1	6	5	3	1	1	1	1	0	0	0	0	1	1	1	0	2.0	7
12-Jul	0	Z	1	1	1	2	2	2	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0.6	2
13-Jul	1	3	Z	3	7	6	2	1	1	1	1	1	1	1	1	1	1	3	2	2	3	0	1	1	1.8	7
14-Jul	1	3	3	Z	1	2	2	1	3	2	1	1	2	1	1	1	2	2	0	1	1	1	3	6	1.8	6
15-Jul	2	1	1	1	Z	1	1	3	2	0	M	M	0	0	1	1	1	0	0	0	2	2	0	1	0.9	3
16-Jul	1	0	0	0	0	Z	1	1	0	1	0	1	1	1	1	1	1	0	1	0	0	0	1	1	0.6	1
17-Jul	Z	3	3	3	2	1	1	1	1	1	1	1	1	1	1	1	1	2	3	2	4	3	3	2	1.7	4
18-Jul	1	Z	1	1	1	2	4	10	12	12	12	8	3	2	1	1	1	1	1	0	1	1	1	1	3.3	12
19-Jul	1	1	Z	1	1	1	5	1	5	2	1	0	0	0	1	1	0	1	2	3	1	1	2	2	1.5	5
20-Jul	2	1	1	Z	0	1	1	1	2	5	7	5	5	7	8	3	2	1	1	1	2	3	1	0	2.6	8
21-Jul	0	0	0	0	Z	1	1	1	1	0	1	1	4	1	1	0	0	0	1	2	1	3	5	4	1.2	5
22-Jul	2	1	3	7	4	Z	6	5	6	5	4	3	2	1	1	1	1	0	1	1	2	0	1	1	2.5	7
23-Jul	Z	0	0	0	0	1	4	9	7	4	4	3	2	1	1	2	1	0	1	1	1	1	0	0	2.0	9
24-Jul	1	Z	8	8	7	3	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1.4	8
25-Jul	0	0	Z	0	0	1	0	1	0	1	0	0	0	0	1	1	3	3	1	2	2	2	5	10	1.5	10
26-Jul	11	9	8	Z	2	3	4	7	8	5	5	3	2	2	1	1	0	0	1	1	2	3	5	5	3.8	11
27-Jul	10	10	2	1	Z	1	2	4	3	9	12	5	3	2	1	2	2	2	1	2	2	1	1	1	3.4	12
28-Jul	3	8	9	8	3	Z	2	1	1	C	C	C	C	1	1	3	4	3	1	2	2	2	2	2	3.0	9
29-Jul	Z	2	1	1	1	1	1	1	1	1	0	0	1	0	0	0	1	1	1	1	1	3	8	8	1.5	8
30-Jul	4	Z	6	2	3	2	4	1	1	2	1	1	1	3	8	2	3	4	2	2	1	1	1	1	2.4	8
31-Jul	2	3	Z	2	3	2	6	7	3	3	2	1	1	1	0	0	5	2	2	1	0	0	0	0	1.9	7
	2.9	3.2	3.1	2.5	2.4	2.1	3.0	3.7	4.2	3.6	3.0	2.4	1.7	1.4	1.6	1.2	1.6	1.4	1.4	1.3	1.5	1.8	2.2	2.5	Diurnal Average	
	11	10	9	9	7	6	8	13	15	14	12	8	5	7	8	3	5	5	6	3	5	10	15	10	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	707	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

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

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	133	35	18	13	15	10	19	57	72	51	28	23	25	61	62	85	707
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	133	35	18	13	15	10	19	57	72	51	28	23	25	61	62	85	707

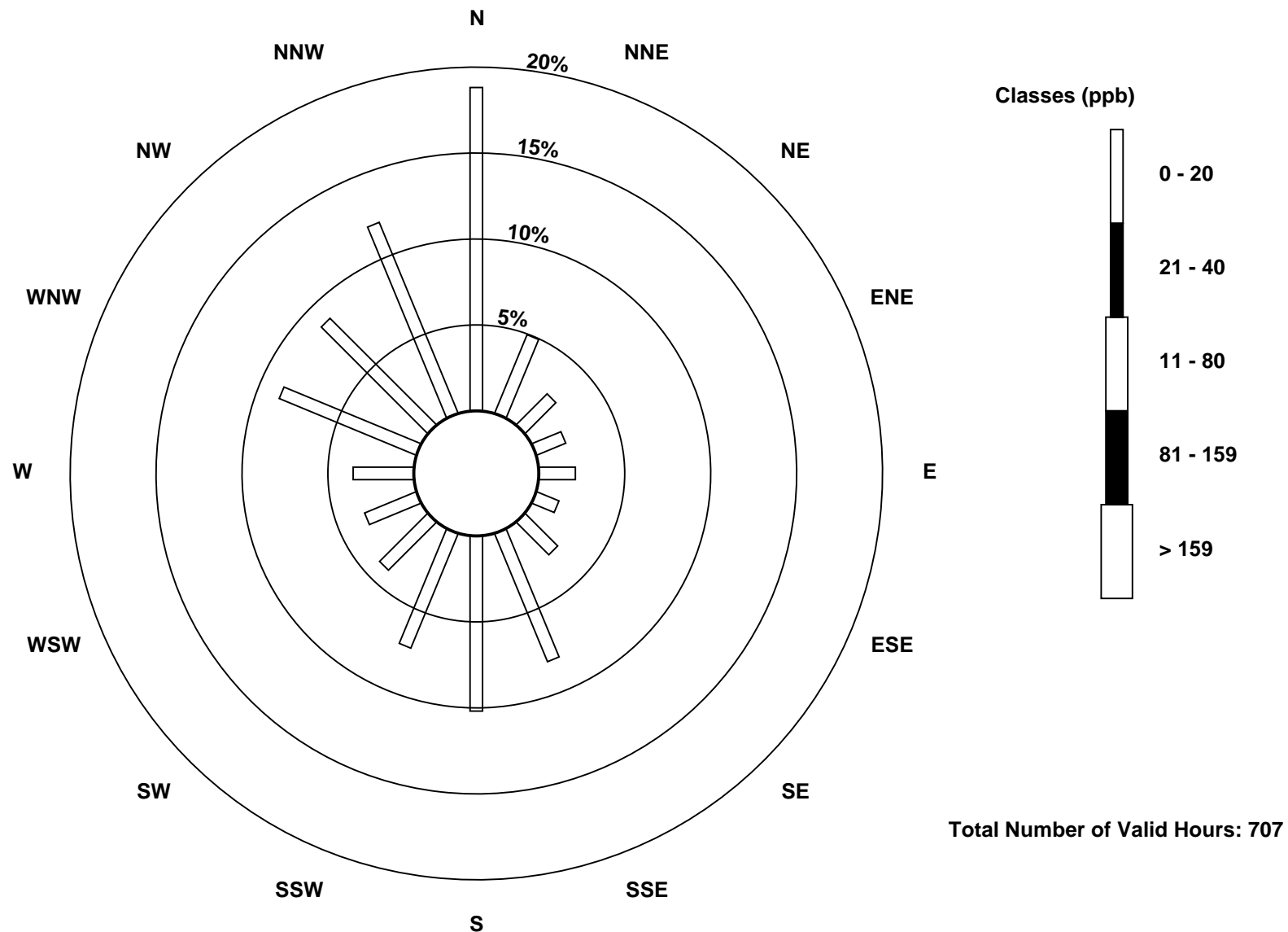
Total Number of Valid Hours: 707

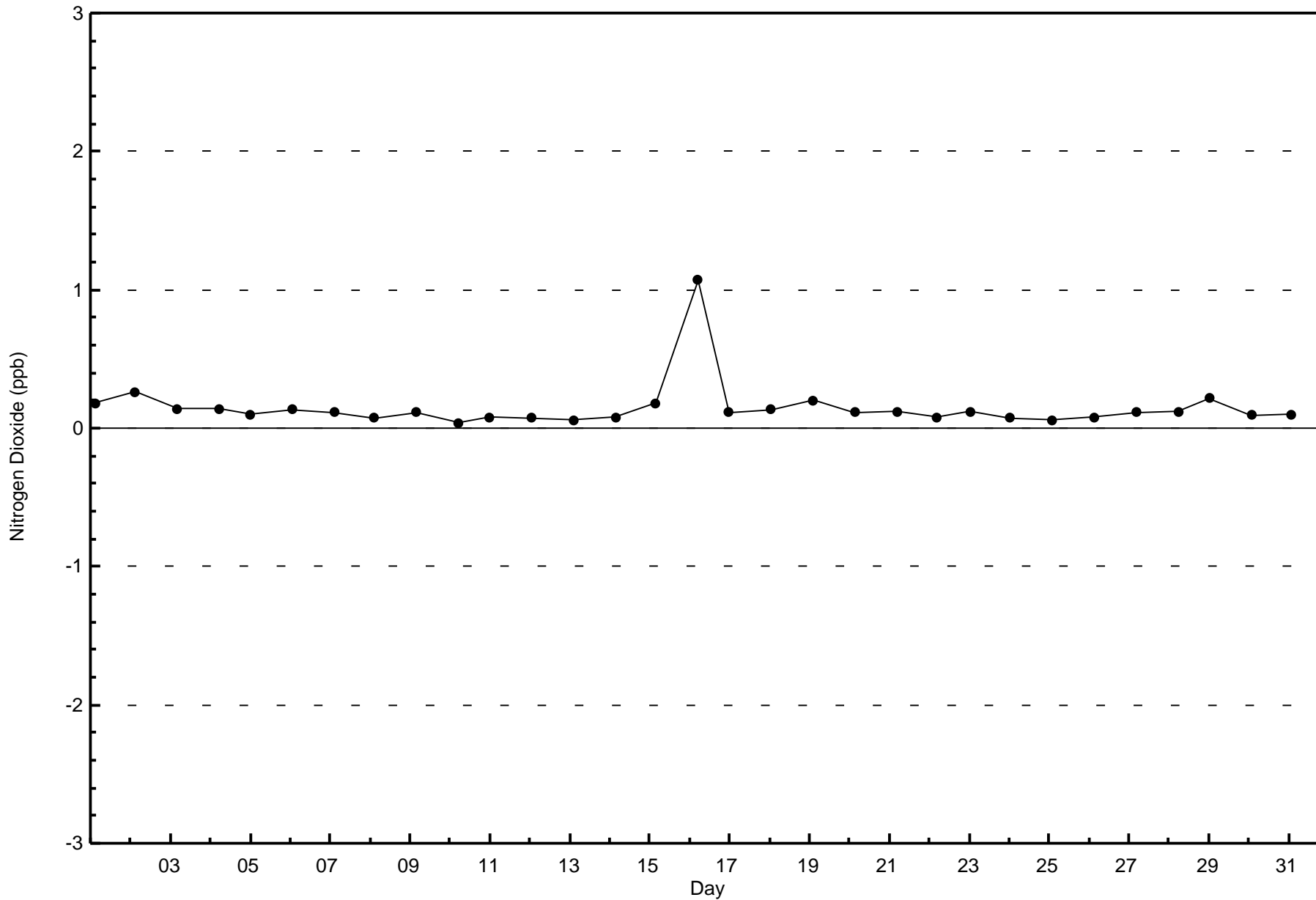
Total Number of Hours: 744

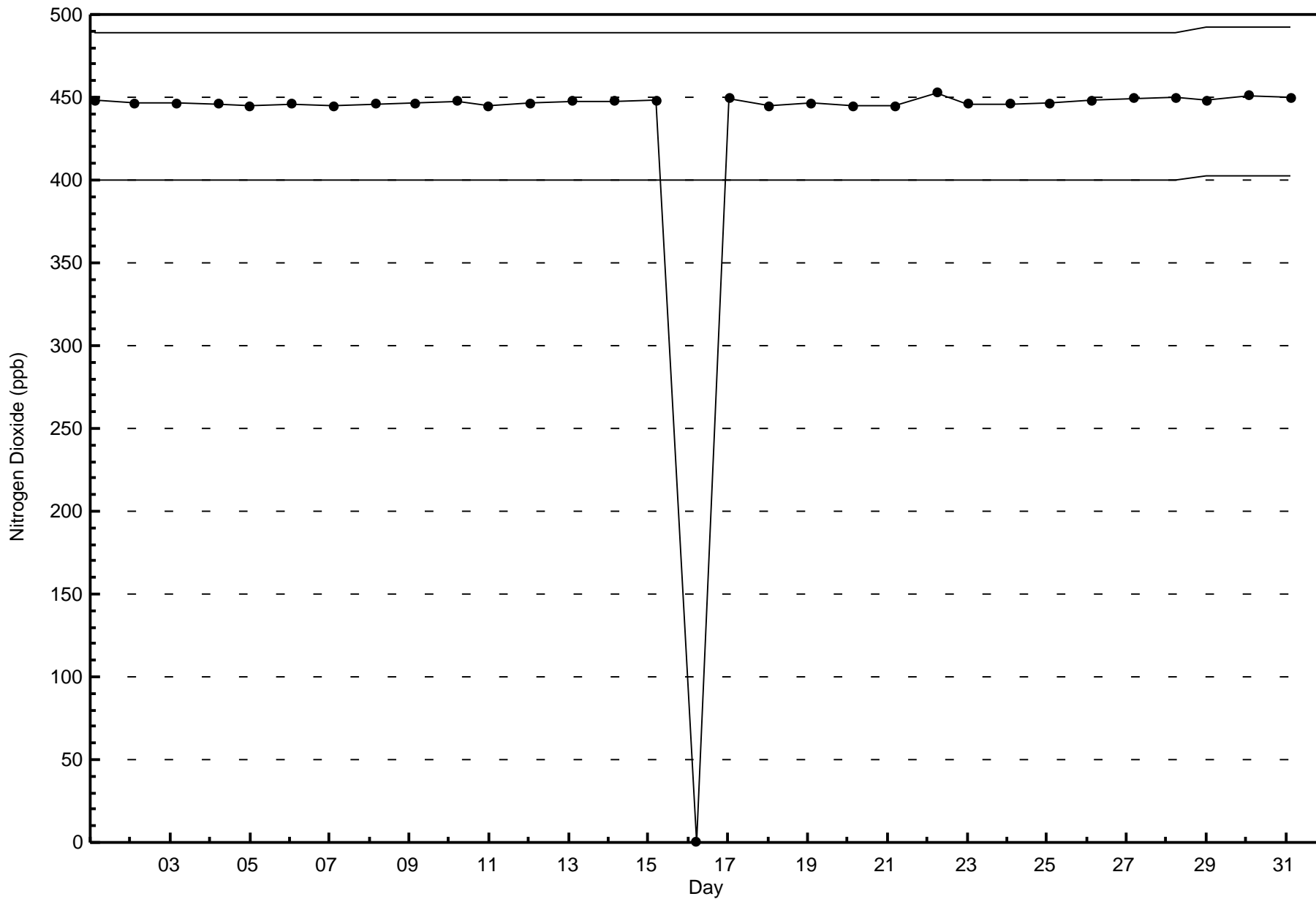


Wood Buffalo Environmental Association
Wind Rose Jul 2016

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









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxides (NO_x) - ppb

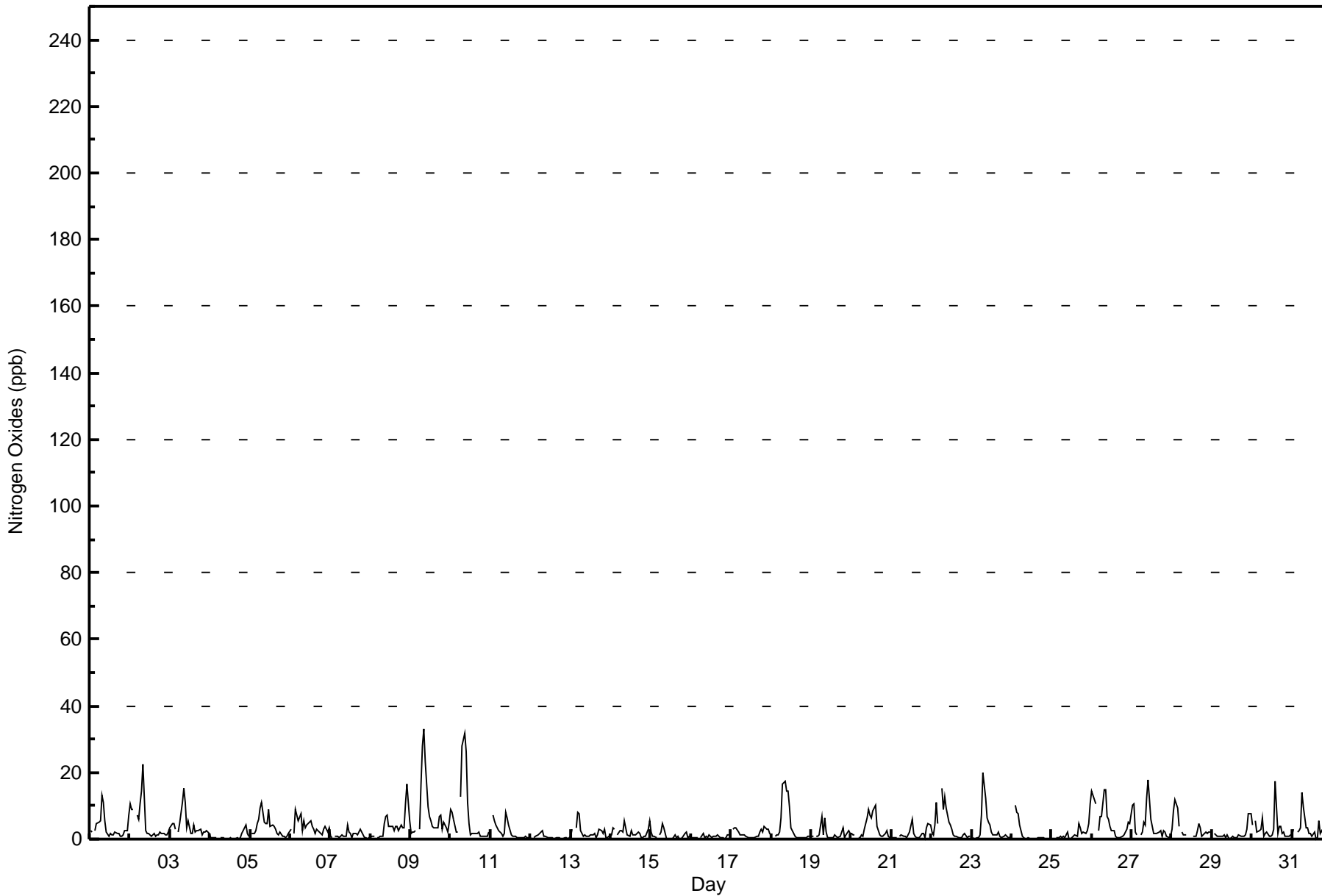
Fort McKay - Bertha Ganter - July 2016

Maximum Value: 33 ppb on Jul 9 09:00		Maximum Daily Average: 7.9 ppb on Jul 9		Hours in Service: 744																						
Minimum Value: 0 ppb on Jul 24 14:00		Minimum Daily Average: 0.6 ppb on Jul 12		Hours of Data: 707																						
Maximum Diurnal Average: 7.2 ppb at hour 9		Minimum Diurnal Average: 1.4 ppb at hour 16		Hours of Missing Data: 37																						
Monthly Average: 3.0 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 2 Q ₃ = 3 P ₉₀ = 7 P ₉₉ = 22		Hours of Calibration: 35																						
				Percent Operational Time: 99.7																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	2	2	Z	3	5	5	6	13	11	5	2	1	2	1	1	2	2	2	1	1	1	2	2	7	3.5	13
2-Jul	11	9	9	Z	7	6	11	14	22	3	2	2	1	1	2	1	1	1	2	2	2	1	1	2	4.9	22
3-Jul	3	5	5	3	Z	2	5	11	15	11	3	5	2	1	4	2	2	2	3	1	2	2	3	2	4.2	15
4-Jul	1	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	4	2	1	0.7	4
5-Jul	Z	2	1	3	5	6	9	11	5	5	4	9	4	4	4	3	2	1	2	1	1	1	1	2	3.7	11
6-Jul	3	Z	2	9	7	6	7	2	5	3	4	5	6	4	3	2	3	2	2	1	3	4	2	4	3.8	9
7-Jul	1	0	Z	1	1	1	1	1	1	1	4	2	2	0	2	2	1	2	3	2	0	0	0	0	1.3	4
8-Jul	0	1	1	Z	0	1	1	1	5	7	7	4	4	4	2	4	4	2	4	3	4	10	17	5	4.0	17
9-Jul	2	2	2	3	Z	3	17	28	33	23	10	7	5	4	4	3	4	7	7	3	5	3	2	5	7.9	33
10-Jul	9	8	6	2	2	Z	13	28	32	26	11	5	1	2	2	2	2	2	1	1	1	1	1	2	6.9	32
11-Jul	Z	7	6	4	3	3	2	1	2	8	7	4	1	1	1	1	0	0	0	0	1	1	1	0	2.4	8
12-Jul	0	Z	1	1	1	2	2	2	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0.6	2
13-Jul	1	3	Z	3	8	8	3	1	1	1	1	1	1	1	2	1	1	3	2	2	3	0	1	1	2.1	8
14-Jul	1	3	3	Z	1	3	3	2	5	4	1	1	2	1	1	2	2	0	0	1	1	3	6	2.1	6	
15-Jul	2	1	1	1	Z	1	2	5	3	0	M	M	0	0	1	1	1	0	0	0	2	0	1	1.2	5	
16-Jul	1	0	0	0	0	Z	1	2	0	1	0	1	0	1	1	1	0	1	0	0	0	1	1	0.7	2	
17-Jul	Z	3	3	3	2	1	1	1	1	1	1	1	1	1	1	1	1	2	3	2	4	3	3	2	1.8	4
18-Jul	1	Z	1	1	1	2	6	16	17	14	14	10	3	2	1	1	1	1	1	1	0	0	1	1	4.2	17
19-Jul	1	1	Z	1	1	1	7	1	7	2	1	0	0	0	1	1	0	1	2	3	1	1	2	2	1.6	7
20-Jul	2	1	1	Z	0	1	1	1	3	6	9	7	6	8	10	4	3	1	1	1	2	3	1	0	3.2	10
21-Jul	0	0	0	0	Z	1	1	1	1	0	1	2	6	2	1	0	0	0	2	2	0	3	4	4	1.5	6
22-Jul	2	1	4	11	5	Z	15	9	13	9	5	4	3	1	1	1	0	1	1	1	2	0	1	1	4.0	15
23-Jul	Z	0	0	0	0	1	7	20	12	6	5	4	2	1	1	1	2	1	1	1	1	1	0	0	3.1	20
24-Jul	1	Z	10	8	8	4	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1.6	10
25-Jul	0	0	Z	0	1	1	1	1	1	2	0	0	0	0	1	1	1	5	3	2	2	2	5	10	1.7	10
26-Jul	15	13	11	Z	2	7	7	15	15	7	6	4	3	3	1	1	0	0	1	1	2	3	5	5	5.4	15
27-Jul	10	10	2	1	Z	1	2	5	4	12	18	6	4	2	2	2	2	2	1	2	2	1	1	1	4.1	18
28-Jul	3	9	12	9	4	Z	2	1	1	C	C	C	C	1	1	3	4	4	1	2	2	2	2	2	3.4	12
29-Jul	Z	2	1	1	1	1	1	1	1	1	0	0	1	0	0	0	1	1	1	1	1	3	7	8	1.5	8
30-Jul	4	Z	6	2	3	3	6	1	2	2	1	1	1	3	17	2	4	4	2	2	1	1	1	1	3.0	17
31-Jul	1	3	Z	2	3	3	14	10	3	3	2	2	1	2	0	0	5	2	2	1	0	0	0	0	2.6	14
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan C - Calibration M - Maintenance																										



Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	700	99.01	99.01
21 - 40	7	0.99	100.00
11 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

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

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	131	32	17	13	15	10	19	57	71	51	28	23	25	61	62	85	700
21 - 40	2	3	1	0	0	0	0	0	1	0	0	0	0	0	0	0	7
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	133	35	18	13	15	10	19	57	72	51	28	23	25	61	62	85	707

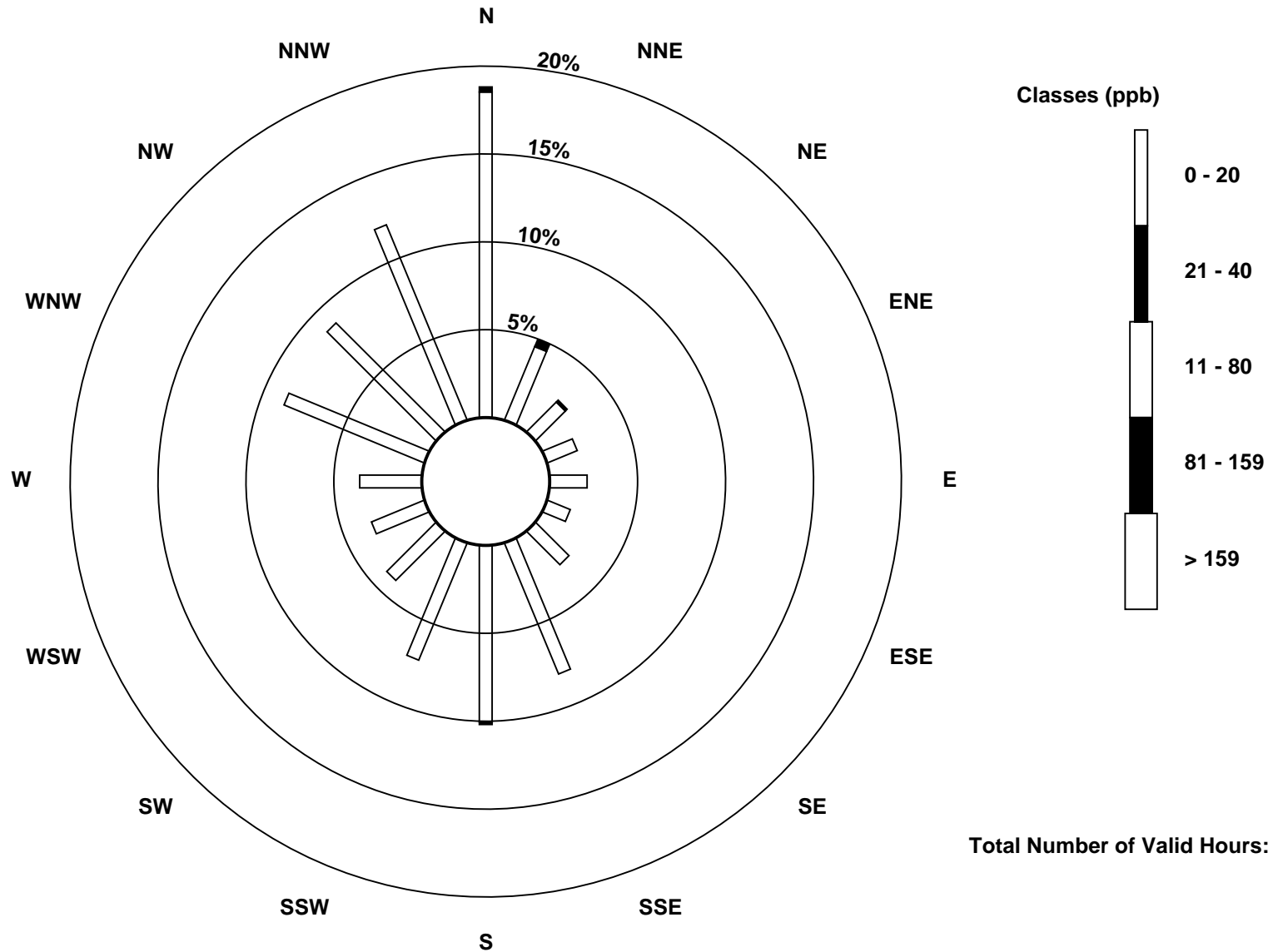
Total Number of Valid Hours: 707

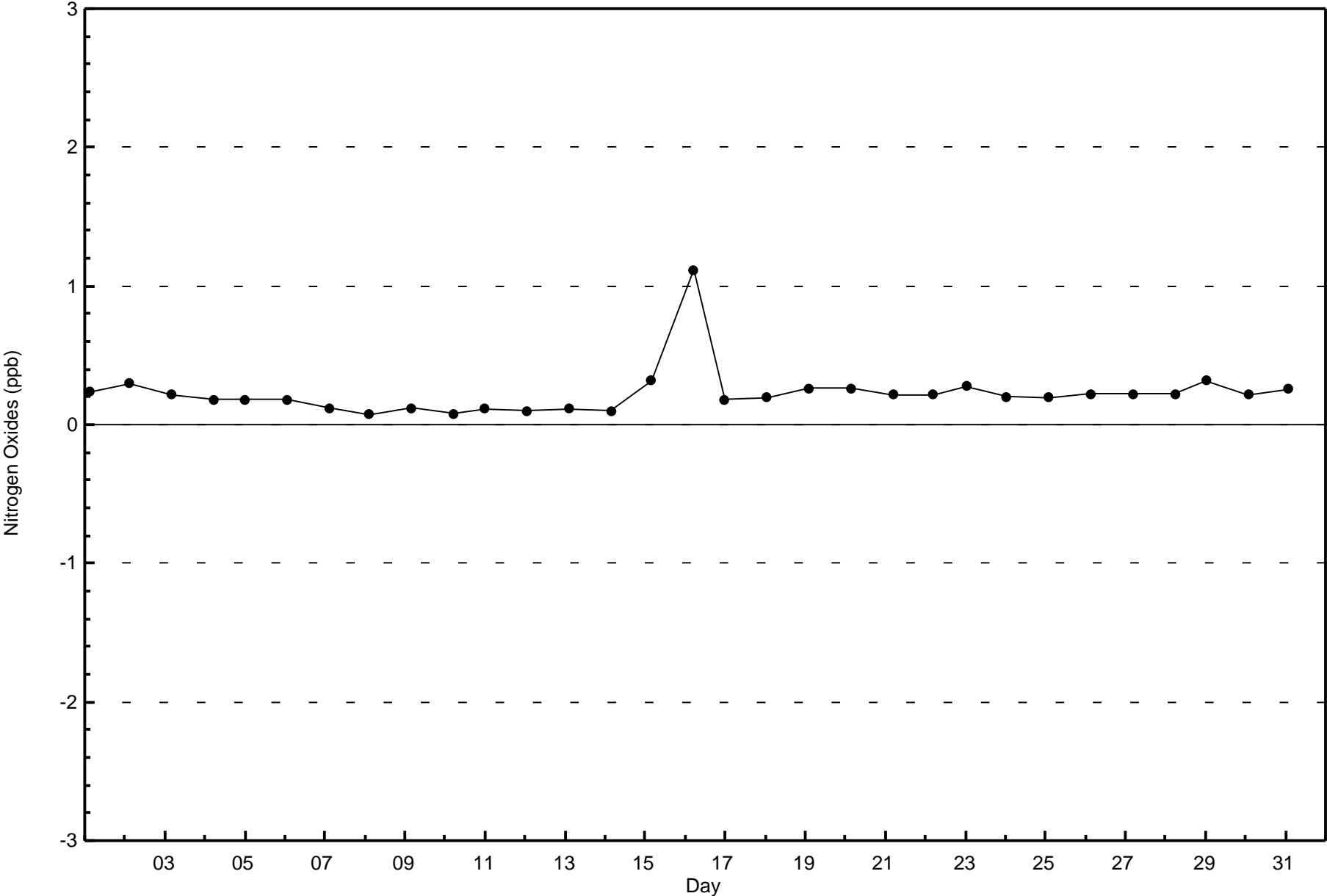
Total Number of Hours: 744

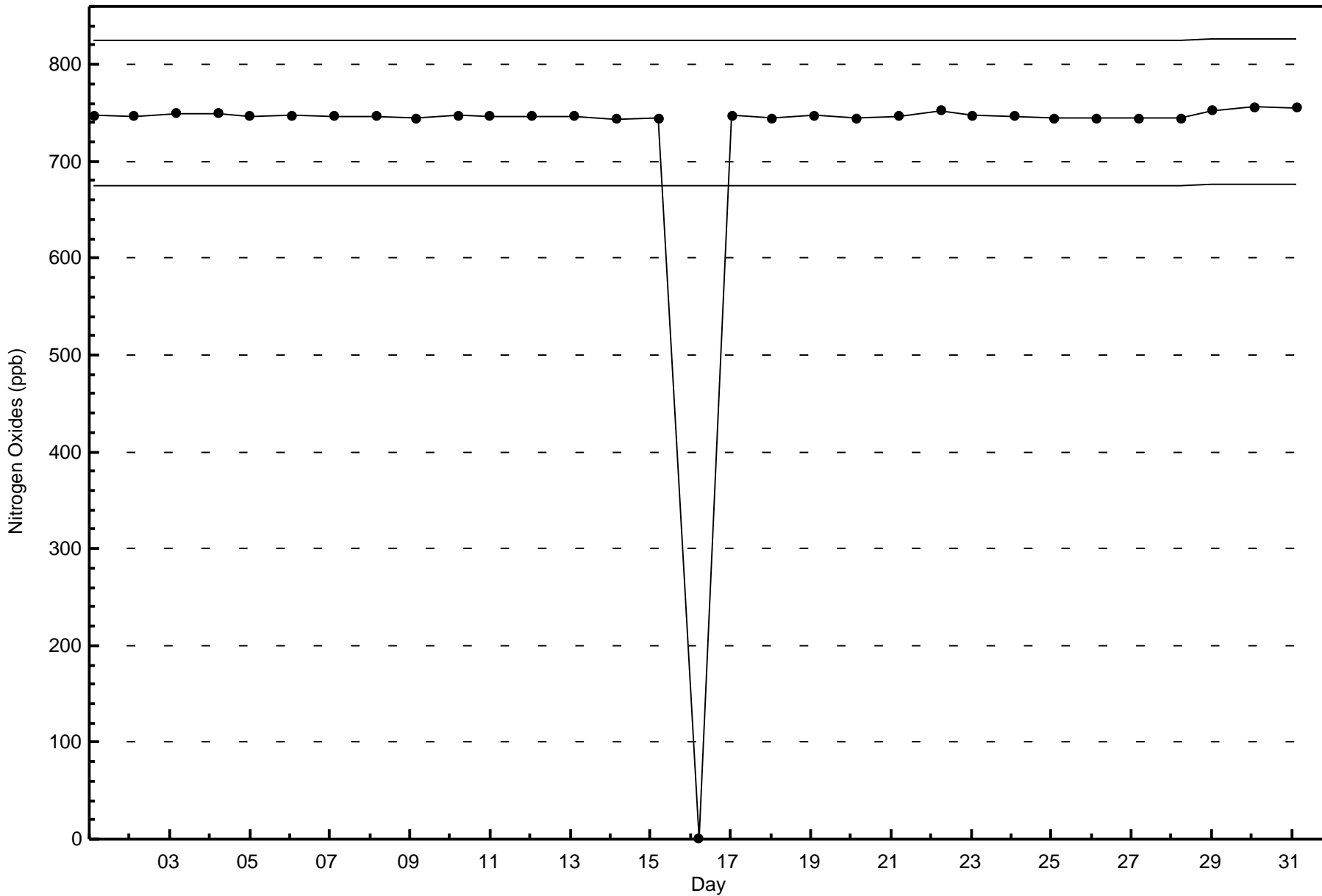


Wood Buffalo Environmental Association
Wind Rose Jul 2016

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









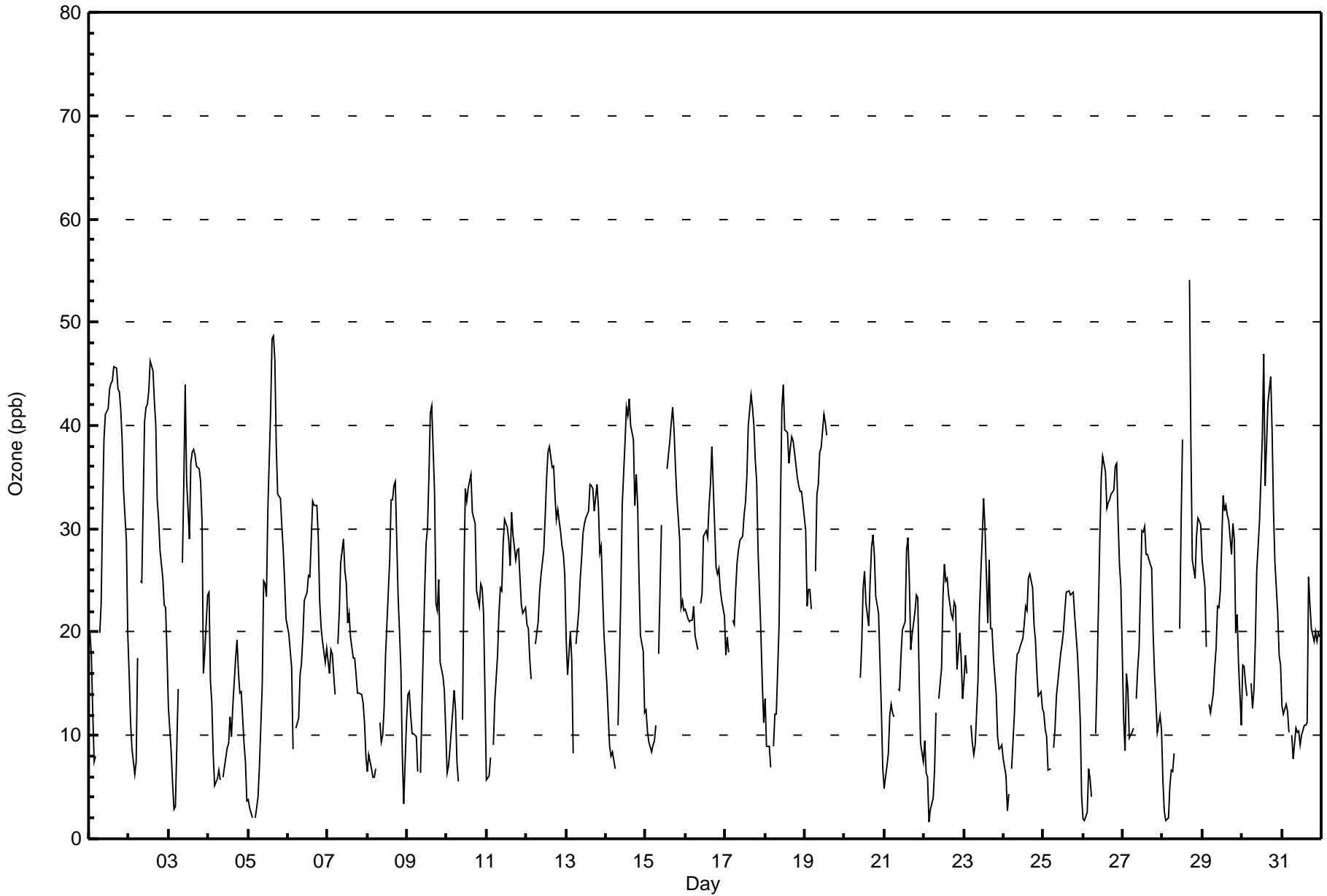
Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O₃) - ppb

Fort McKay - Bertha Ganter - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																																							
Maximum Value: 54 ppb on Jul 28 17:00										Maximum Daily Average: 31.9 ppb on Jul 1										Hours of Data: 688																													
Minimum Value: 2 ppb on Jul 22 04:00										Minimum Daily Average: 10.9 ppb on Jul 4										Hours of Missing Data: 56																													
Maximum Diurnal Average: 32.8 ppb at hour 17										Minimum Diurnal Average: 9.9 ppb at hour 5										Hours of Calibration: 33																													
Monthly Average: 21.8 ppb										Percentiles: P ₁ = 3 P ₁₀ = 8 Q ₁ = 13 Median = 21 Q ₃ = 30 P ₉₀ = 37 P ₉₉ = 45										Percent Operational Time: 96.9																													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Jul	20	18	12	8	8	Z	20	23	32	39	41	42	44	44	44	46	46	44	43	42	39	34	29	20	31.9	46																							
2-Jul	16	11	9	6	7	18	Z	25	25	40	42	42	43	46	45	42	40	33	31	28	25	23	22	18	27.7	46																							
3-Jul	13	8	5	3	3	9	14	Z	27	34	44	35	29	36	37	38	37	36	36	35	31	16	18	24	24.7	44																							
4-Jul	24	15	13	8	5	6	7	6	Z	6	8	9	12	10	13	17	19	16	14	14	9	7	4	10.9	24																								
5-Jul	4	3	2	Z	2	3	4	7	15	25	25	23	32	41	48	49	46	38	33	33	30	28	25	21	23.4	49																							
6-Jul	20	18	17	9	Z	11	12	16	17	19	23	24	26	25	29	33	32	32	29	23	21	19	17	18	21.3	33																							
7-Jul	17	16	18	18	14	Z	19	22	27	29	26	25	21	22	20	18	18	16	14	14	14	13	11	8	18.2	29																							
8-Jul	6	8	7	6	6	7	Z	11	9	10	13	18	21	27	33	33	34	35	23	20	16	8	3	11	15.9	35																							
9-Jul	14	14	12	10	10	10	7	Z	6	13	24	29	30	35	41	42	34	23	22	25	17	16	14	11	19.9	42																							
10-Jul	6	7	9	12	14	12	8	6	Z	12	26	34	33	34	35	32	31	31	24	23	25	24	22	14	20.5	35																							
11-Jul	6	6	8	Z	9	13	18	22	24	24	29	31	30	29	26	32	29	27	28	28	25	23	22	22	22.2	32																							
12-Jul	21	20	17	15	Z	19	20	21	24	26	28	31	35	37	38	36	36	33	31	32	30	28	28	26	27.5	38																							
13-Jul	19	16	20	17	8	Z	19	22	25	27	30	30	31	32	34	34	34	32	34	32	28	28	24	20	25.9	34																							
14-Jul	15	12	9	8	8	7	Z	11	17	24	32	38	42	41	43	40	39	32	35	32	25	20	18	12	24.4	43																							
15-Jul	13	10	9	8	9	10	11	Z	18	30	M	M	M	36	39	40	42	40	36	33	29	22	23	22	24.0	42																							
16-Jul	22	21	21	21	21	23	20	18	Z	23	24	29	30	29	32	34	38	30	26	26	26	24	23	22	25.4	38																							
17-Jul	18	20	18	Z	21	21	24	27	28	29	29	31	33	35	40	43	42	40	37	35	28	20	15	11	28.0	43																							
18-Jul	14	9	9	7	Z	9	12	12	21	33	42	44	40	39	36	38	39	38	37	35	34	34	34	32	28.1	44																							
19-Jul	30	22	24	24	22	Z	26	33	34	37	38	41	40	39	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	41																							
20-Jul	AF	AF	AF	AF	AF	AF	AF	AF	AF	16	19	24	26	23	21	25	28	29	27	23	22	17	13	7	--	29																							
21-Jul	5	7	8	12	13	12	12	Z	14	14	18	20	21	28	29	25	18	20	22	24	23	16	9	7	16.4	29																							
22-Jul	9	6	6	2	3	4	7	12	Z	14	17	24	27	25	25	24	22	21	23	23	16	20	17	14	15.6	27																							
23-Jul	15	18	16	Z	11	9	8	9	15	22	26	29	33	30	21	27	20	20	18	14	10	9	9	9	17.3	33																							
24-Jul	8	6	3	4	Z	7	12	16	18	18	19	19	21	22	22	25	26	24	21	19	16	14	14	13	16.0	26																							
25-Jul	12	11	10	7	7	Z	9	11	14	17	18	19	20	22	24	24	24	24	24	24	22	18	15	11	4	15.8	24																						
26-Jul	2	2	3	7	6	4	Z	10	16	22	29	35	37	36	32	33	33	33	34	36	36	31	27	24	22.9	37																							
27-Jul	12	9	16	15	10	10	11	Z	14	16	18	30	30	30	27	27	27	26	20	16	13	10	12	11	17.8	30																							
28-Jul	6	3	2	2	5	7	6	8	Z	M	20	30	39	C	C	C	54	38	27	25	29	31	31	30	20.7	54																							
29-Jul	27	24	19	Z	13	12	14	17	18	22	22	24	33	32	32	31	31	27	30	29	20	22	17	11	23.0	33																							
30-Jul	17	17	15	14	Z	15	13	14	19	26	31	35	39	47	34	42	43	45	39	32	27	22	18	17	26.9	47																							
31-Jul	13	12	13	12	10	Z	10	8	11	10	10	9	10	11	11	11	25	23	20	19	20	19	20	20	14.3	25																							
																								14.1	12.3	11.6	10.2	9.9	10.7	13.1	15.5	19.5	22.6	25.6	28.5	30.1	31.5	31.4	32.3	32.8	30.3	28.1	26.3	23.6	20.5	18.4	16.1	Diurnal Average	
																								30	24	24	24	22	23	26	33	34	40	44	44	44	47	48	49	54	45	43	42	39	34	34	32	Diurnal Maximum	
Z - zerospan C - Calibration M - Maintenance AF - Analyzer Failure																																																	
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb																																																	





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	328	47.67	47.67
21 - 50	359	52.18	99.85
51 - 82	1	0.15	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 688

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

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

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	61	7	1	1	2	1	2	23	28	25	15	20	22	47	29	44	328
21 - 50	69	27	16	11	11	9	15	33	41	30	11	5	2	12	28	39	359
51 - 82	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	130	34	18	12	13	10	17	56	69	55	26	25	24	59	57	83	688

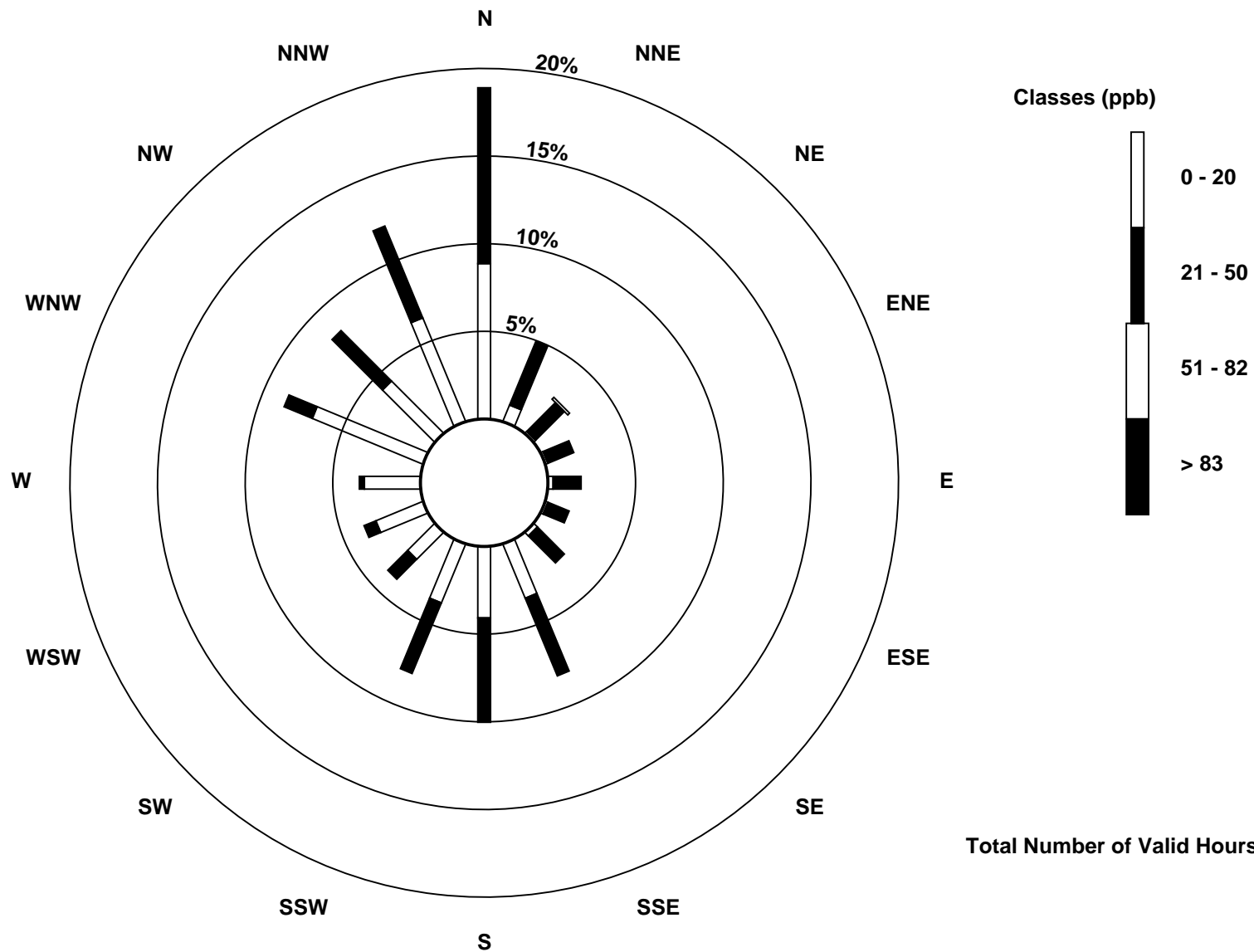
Total Number of Valid Hours: 688

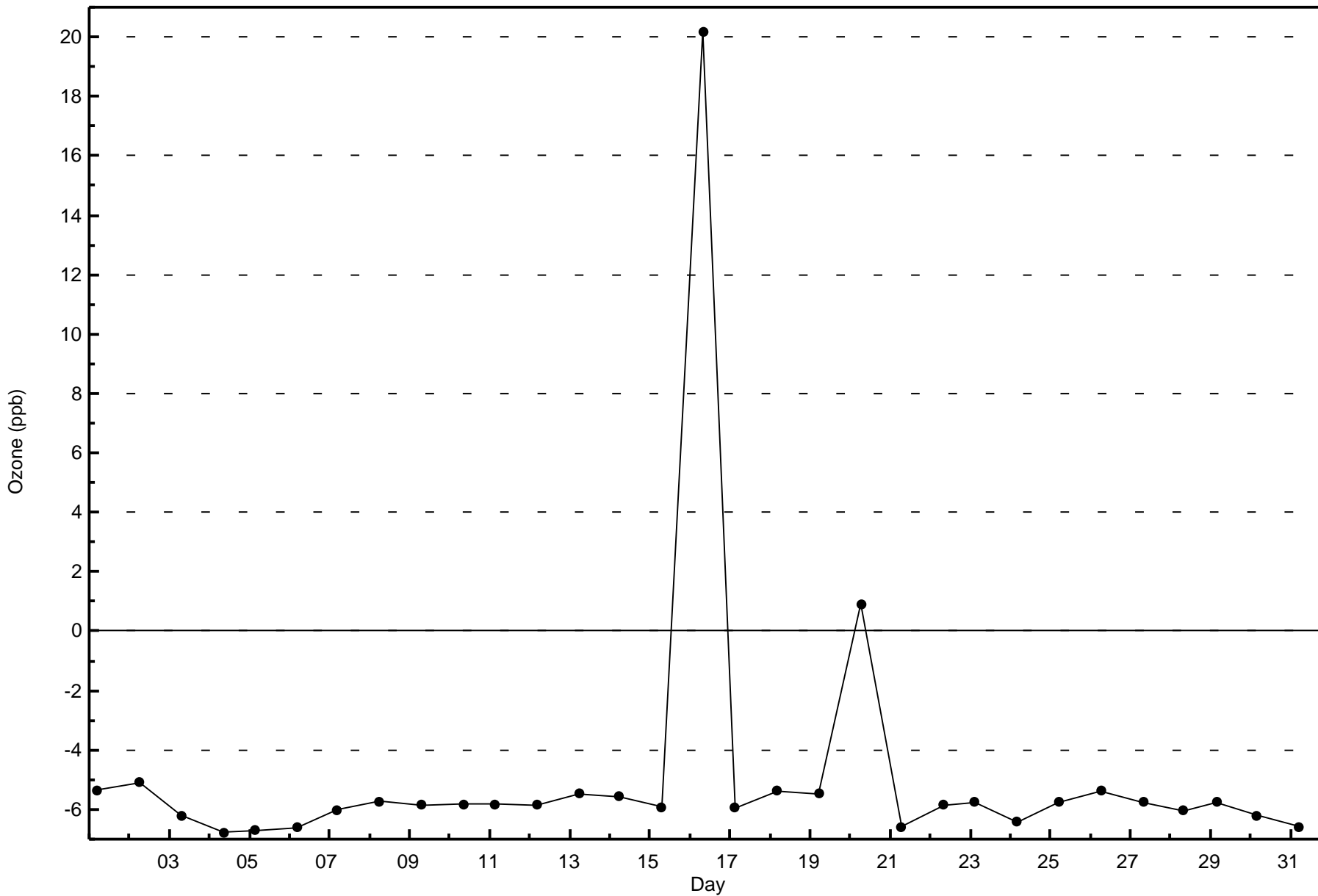
Total Number of Hours: 744

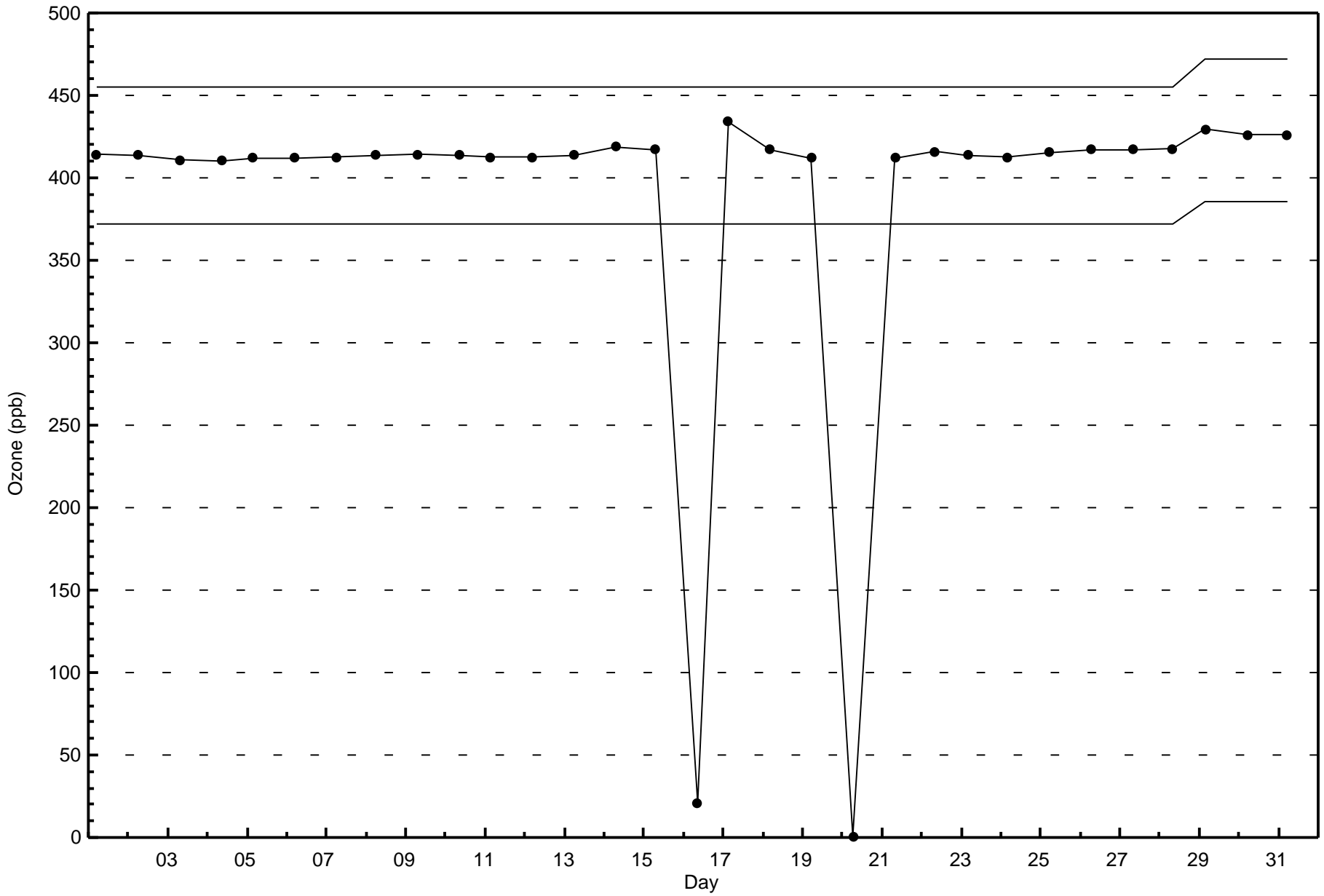


Wood Buffalo Environmental Association
Wind Rose Jul 2016

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









Wood Buffalo Environmental Association

Summary of Hour Averages

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

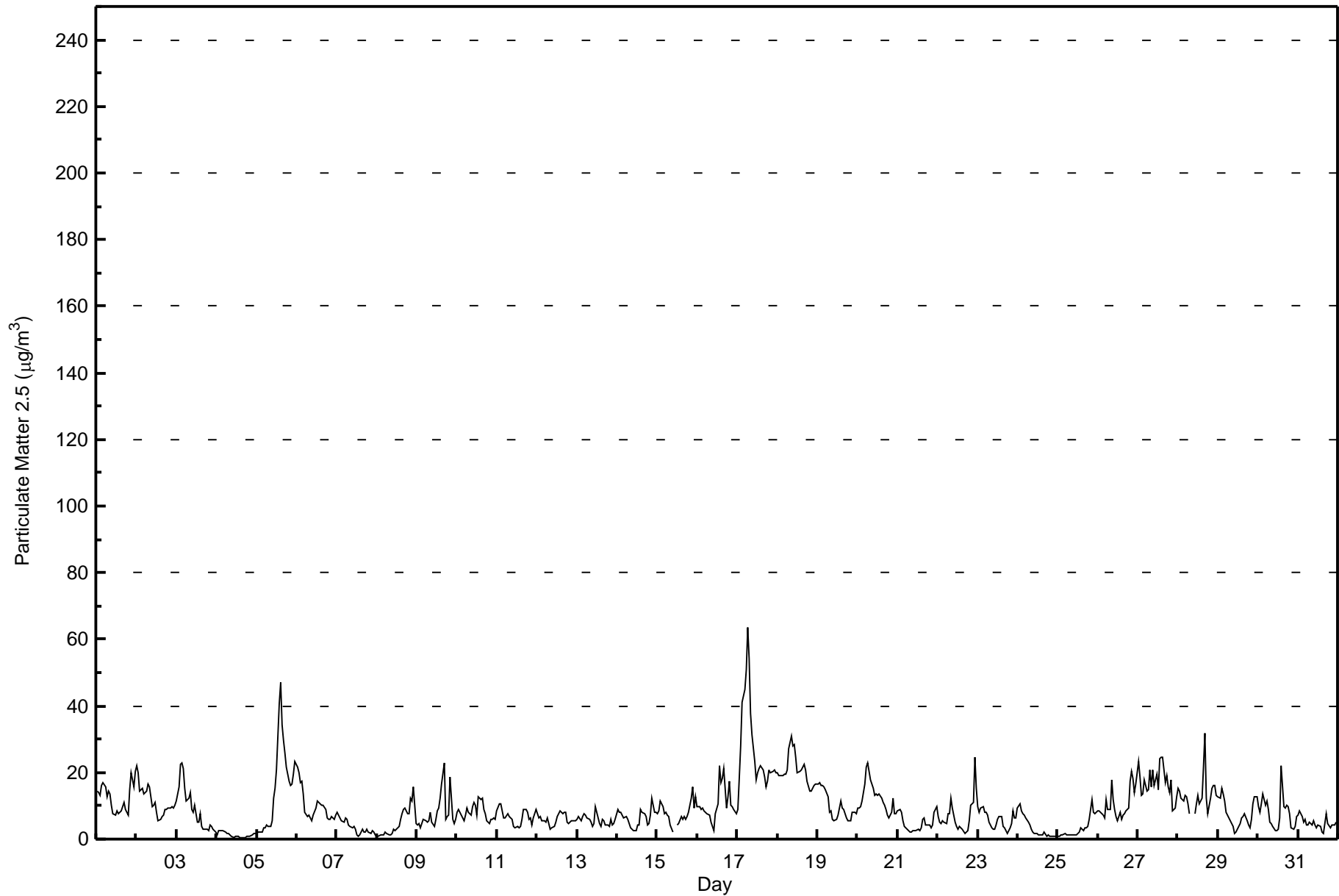
Fort McKay - Bertha Ganter - July 2016

Number of Exceedences (AAAQO):		24-hr: 0		Hours in Service:		744																																													
Maximum Value: 63.6 µg/m ³ on Jul 17 07:00		Maximum Daily Average: 27.4 µg/m ³ on Jul 17		Hours of Data:		740																																													
Minimum Value: 0.4 µg/m ³ on Jul 4 16:00		Minimum Daily Average: 1.3 µg/m ³ on Jul 4		Hours of Missing Data:		4																																													
Maximum Diurnal Average: 10.4 µg/m ³ at hour 4		Minimum Diurnal Average: 7.0 µg/m ³ at hour 11		Hours of Calibration:		2																																													
Monthly Average: 9.11 µg/m ³		Percentiles: P ₁ = 0.8 P ₁₀ = 2.1 Q ₁ = 4.3 Median = 7.5 Q ₃ = 12.2 P ₉₀ = 18.8 P ₉₉ = 40.1		Percent Operational Time:		99.7																																													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																											
1-Jul	14.3	13.9	13.2	16.0	17.0	15.7	12.9	14.5	13.5	10.3	7.7	7.2	8.3	7.5	7.9	8.6	10.9	8.8	7.9	7.3	14.9	19.9	15.5	20.3	12.3	20.3																									
2-Jul	22.2	19.9	14.5	15.1	13.7	13.9	14.3	16.4	15.6	9.9	10.0	11.2	7.9	5.5	5.9	6.9	7.2	8.8	9.0	9.3	9.3	9.6	9.5	10.2	11.5	22.2																									
3-Jul	11.6	15.6	22.4	22.9	21.2	15.1	11.4	12.3	13.9	8.8	8.1	10.0	5.3	4.9	7.6	3.8	2.8	3.0	3.0	2.4	4.2	4.0	3.2	2.2	9.1	22.9																									
4-Jul	1.4	2.4	2.7	2.7	2.4	2.1	1.6	1.6	1.4	0.9	0.5	0.7	0.9	0.8	0.6	0.4	0.5	0.5	0.9	0.9	1.4	1.8	1.8	1.8	1.3	2.7																									
5-Jul	1.6	2.1	2.0	2.1	3.5	3.5	4.2	3.7	3.9	5.6	12.5	15.4	21.0	40.6	46.9	34.2	29.6	25.9	21.6	17.5	16.1	16.4	19.3	23.3	15.5	46.9																									
6-Jul	21.6	19.7	17.0	17.5	13.5	8.0	6.7	7.4	6.2	5.7	7.3	9.4	11.5	11.0	10.5	10.1	10.2	8.7	6.6	6.1	6.1	6.9	5.9	7.2	10.0	21.6																									
7-Jul	8.2	7.2	6.3	5.5	5.3	6.6	6.0	4.4	3.9	3.4	3.8	3.1	1.3	1.1	1.5	3.0	2.3	1.9	2.8	2.0	1.8	2.6	2.0	1.1	3.6	8.2																									
8-Jul	1.0	1.0	1.1	1.3	1.4	1.9	1.9	1.3	1.5	1.8	2.9	2.6	3.0	3.9	6.0	7.7	8.9	9.2	7.7	7.6	12.5	11.3	15.5	4.6	4.9	15.5																									
9-Jul	4.3	4.8	3.2	4.8	6.1	5.6	4.9	5.6	8.2	5.2	3.7	5.9	8.5	9.3	12.3	16.4	22.7	5.9	6.6	7.4	18.8	5.8	4.7	6.0	7.8	22.7																									
10-Jul	8.2	8.8	8.2	6.3	5.6	7.2	9.3	7.9	7.2	9.8	11.0	10.3	7.2	12.9	12.0	12.4	8.8	7.8	5.4	4.6	6.1	5.8	6.3	6.0	8.1	12.9																									
11-Jul	8.5	10.6	10.6	8.5	6.2	6.3	7.5	6.8	6.3	5.8	3.8	3.6	3.8	3.3	4.0	5.7	8.8	8.9	7.9	6.0	6.5	4.4	6.2	9.1	6.6	10.6																									
12-Jul	7.7	6.6	6.8	5.6	5.5	5.1	6.3	4.5	2.9	3.3	3.6	5.0	7.0	7.6	8.5	7.5	8.0	8.0	5.1	4.6	5.6	5.7	5.7	5.6	5.9	8.5																									
13-Jul	6.0	6.9	5.4	6.7	7.6	7.4	6.5	5.7	5.0	3.9	4.8	9.8	8.0	4.5	3.7	5.9	5.7	4.4	4.4	3.7	5.7	4.1	4.5	6.0	5.7	9.8																									
14-Jul	8.9	7.9	8.1	7.1	6.4	6.7	5.9	4.8	3.5	3.1	2.5	2.7	4.4	4.1	9.1	8.3	7.7	6.6	4.4	4.5	7.3	12.5	7.9	7.9	6.3	12.5																									
15-Jul	7.5	8.6	11.6	9.9	7.8	8.0	7.3	6.9	4.3	2.2	M	M	4.3	4.5	7.0	6.1	6.9	5.9	6.7	7.9	12.3	15.6	9.2	12.5	7.9	15.6																									
16-Jul	9.8	9.8	8.8	9.4	8.5	8.1	7.6	7.1	5.2	3.7	2.5	7.5	10.6	22.1	17.0	18.2	21.2	9.4	12.7	17.2	10.2	9.9	9.0	7.5	10.5	22.1																									
17-Jul	9.0	18.4	27.8	41.2	44.9	50.9	63.6	54.1	37.5	31.6	23.3	17.7	19.7	21.1	21.8	20.8	18.8	15.7	17.2	20.6	20.1	20.4	20.8	20.1	27.4	63.6																									
18-Jul	20.1	19.1	18.9	19.0	19.6	19.7	20.9	27.1	30.9	28.0	28.3	24.6	19.9	20.5	20.8	21.5	22.5	20.6	17.6	14.3	14.2	15.1	16.1	16.5	20.7	30.9																									
19-Jul	16.3	16.8	16.2	16.2	15.6	14.9	12.6	8.2	8.5	5.9	5.4	6.0	7.4	9.3	11.3	9.5	9.1	6.3	5.5	5.4	5.5	7.9	7.9	7.7	9.8	16.8																									
20-Jul	9.3	9.1	9.6	11.4	16.4	21.7	22.9	20.5	17.9	15.3	13.0	13.7	13.3	13.5	12.3	10.9	10.2	8.9	7.4	6.5	8.1	12.2	7.6	7.7	12.5	22.9																									
21-Jul	8.6	8.7	8.0	5.6	4.0	3.2	2.9	2.2	2.3	2.7	2.4	2.4	2.9	2.7	3.5	6.1	6.4	4.3	4.0	4.3	3.3	4.1	8.2	9.6	4.7	9.6																									
22-Jul	6.8	4.9	4.8	5.7	4.9	4.8	7.5	7.4	12.4	9.3	5.2	3.7	3.2	3.6	3.4	2.8	1.8	2.2	2.7	5.7	10.3	11.0	24.6	15.2	6.8	24.6																									
23-Jul	9.6	8.2	9.4	9.7	8.3	7.9	7.1	5.0	3.2	2.9	2.8	4.1	5.8	6.6	6.9	3.6	3.3	2.4	1.9	3.3	4.6	8.4	6.5	6.3	5.7	9.7																									
24-Jul	9.4	10.7	8.5	7.8	7.1	6.3	5.2	4.2	3.1	2.1	1.7	1.6	1.4	1.3	1.3	1.3	2.0	1.0	1.4	0.9	0.8	0.8	0.8	0.9	3.4	10.7																									
25-Jul	1.0	1.0	1.1	1.5	1.6	1.1	1.3	1.3	1.1	1.4	1.2	1.4	1.7	2.3	3.3	2.7	3.4	3.2	3.7	6.0	12.0	8.1	7.6	7.9	3.2	12.0																									
26-Jul	8.4	8.3	7.7	7.0	6.5	11.7	8.8	8.7	17.9	11.9	8.8	7.0	5.3	8.1	5.8	7.1	7.5	8.4	9.4	17.2	20.5	18.3	14.1	16.5	10.5	20.5																									
27-Jul	23.3	18.5	13.2	13.5	17.7	14.3	14.9	20.6	15.8	20.6	16.1	19.6	14.8	24.0	24.6	24.7	17.1	19.3	15.6	14.0	17.6	8.6	9.2	12.6	17.1	24.7																									
28-Jul	15.1	14.4	12.4	11.4	13.1	12.5	10.5	7.8	C	C	7.6	10.5	13.1	10.5	12.3	21.6	31.7	12.3	7.5	12.2	15.4	16.2	16.2	13.3	13.5	31.7																									
29-Jul	12.8	12.3	15.1	13.6	11.4	8.0	6.2	5.6	4.5	3.7	1.9	2.0	3.9	4.8	6.4	6.9	7.6	5.4	4.2	3.4	6.0	10.5	12.9	12.8	7.6	15.1																									
30-Jul	9.7	8.2	10.7	13.4	10.2	11.3	9.0	5.3	4.8	3.8	2.4	2.4	2.9	6.6	21.9	9.8	9.4	10.0	9.8	7.8	3.5	3.1	3.9	6.7	7.8	21.9																									
31-Jul	7.2	8.4	6.8	5.3	5.8	4.3	4.3	4.9	4.4	5.6	4.3	3.5	4.3	3.7	2.3	1.8	4.8	7.7	4.7	3.6	4.3	4.3	4.2	5.0	4.8	8.4																									
																								10.0	10.1	10.1	10.4	10.3	10.1	10.1	9.5	8.9	7.6	7.0	7.5	7.5	9.1	10.3	9.9	10.2	8.1	7.3	7.6	9.2	9.2	9.3	9.4	Diurnal Average			
																								23.3	19.9	27.8	41.2	44.9	50.9	63.6	54.1	37.5	31.6	28.3	24.6	21.0	40.6	46.9	34.2	31.7	25.9	21.6	20.6	20.5	20.4	24.6	23.3	Diurnal Maximum			
C - Calibration																								M - Maintenance																											
Alberta Ambient Air Quality Objectives (AAAQO):																								24-hr		30 µg/m ³																									



Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	230	31.08	31.08
6 - 15	373	50.41	81.49
16 - 25	101	13.65	95.14
26 - 80	18	2.43	97.57
> 81.0	0	0.00	97.57

Total Number of Valid Hours: 740

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

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

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	53	10	7	6	6	5	6	10	16	11	11	11	7	30	18	23	230
6 - 15	57	17	9	5	7	4	11	40	40	33	13	8	12	29	36	52	373
16 - 25	22	5	1	2	2	1	3	6	15	11	6	5	2	0	10	10	101
26 - 80	4	4	1	0	0	0	0	4	0	0	0	0	0	0	1	4	18
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	136	36	18	13	15	10	20	60	71	55	30	24	21	59	65	89	722

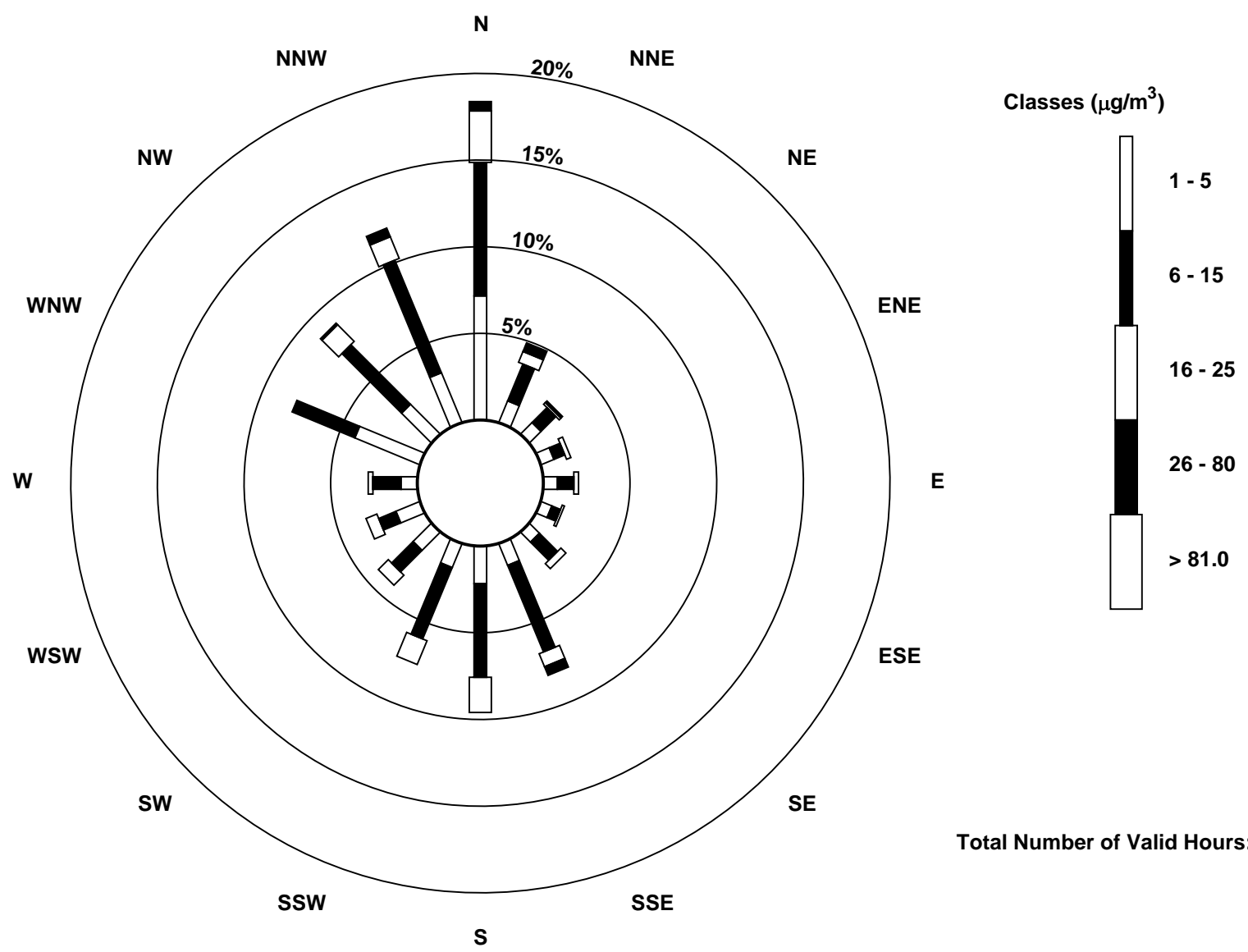
Total Number of Valid Hours: 740

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

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





Number of Exceedences (AAAQO):	1-hr: 0	Hours in Service:	744
Maximum Value: 0 ppb on Jul 1 01:00	Maximum Daily Average: 0.0 ppb on Jul 1	Hours of Data:	612
Minimum Value: 0 ppb on Jul 1 01:00	Minimum Daily Average: 0.0 ppb on Jul 1	Hours of Missing Data:	132
Maximum Diurnal Average: 0.0 ppb at hour 1	Minimum Diurnal Average: 0.0 ppb at hour 1	Hours of Calibration:	48
Monthly Average: 0.0 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 0	Percent Operational Time:	88.7

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

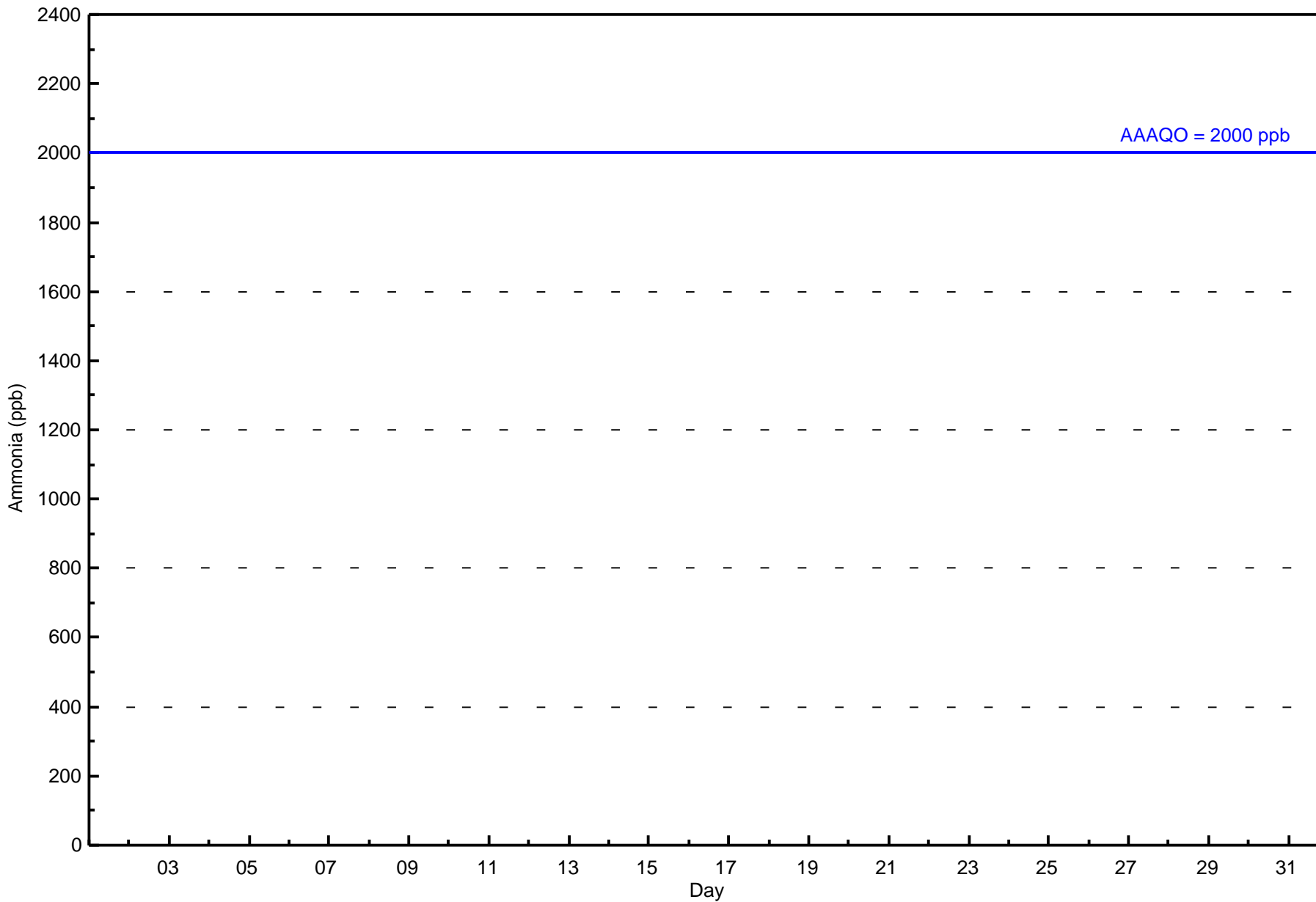
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Diurnal Average
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ammonia (NH₃) - ppb
Fort McKay - Bertha Ganter - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 5	612	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: 612

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Ammonia (NH₃) - ppb
Fort McKay - Bertha Ganter - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	118	33	16	10	14	9	15	45	52	48	25	21	19	57	52	78	612
6 - 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16 - 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 - 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	118	33	16	10	14	9	15	45	52	48	25	21	19	57	52	78	612

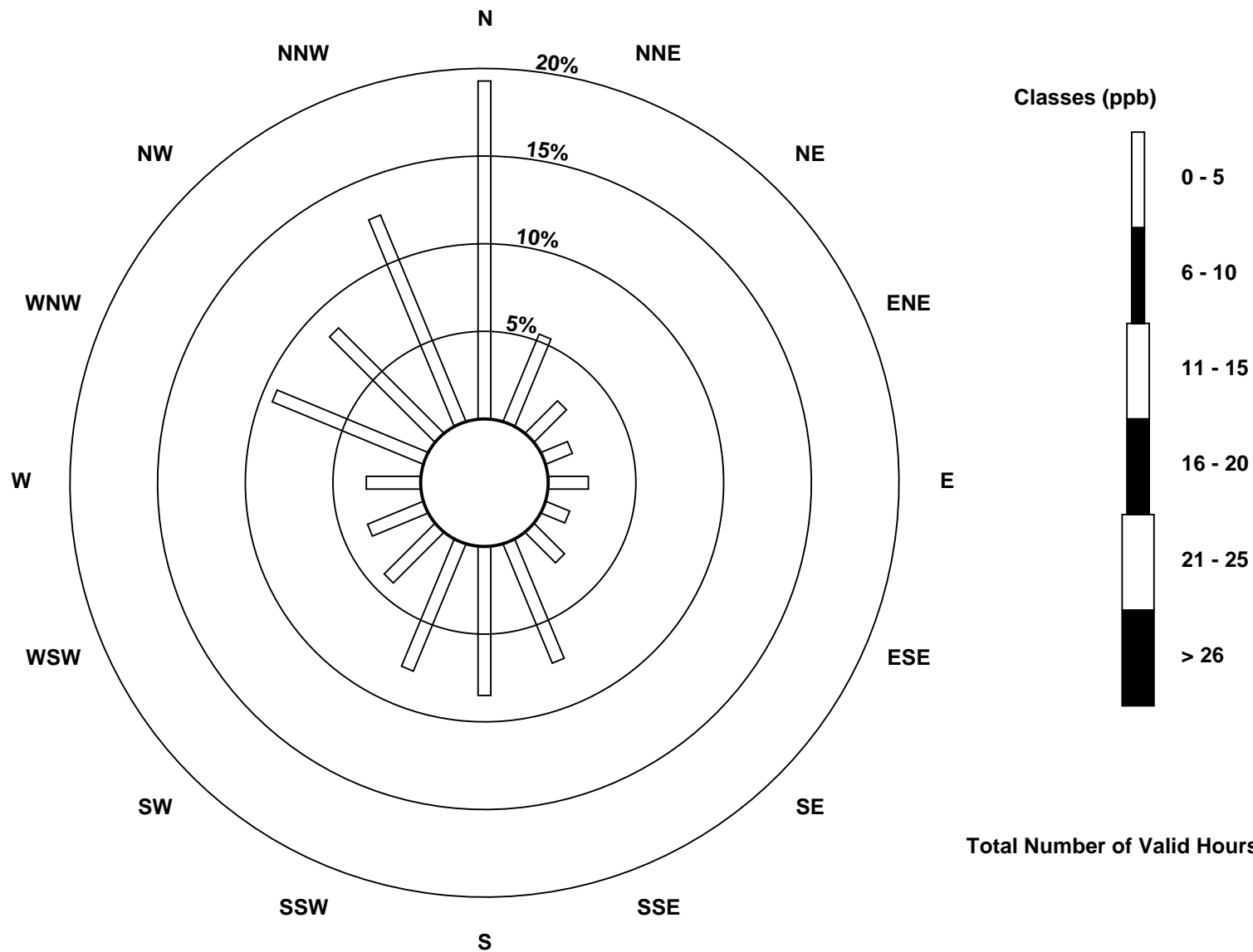
Total Number of Valid Hours: 612

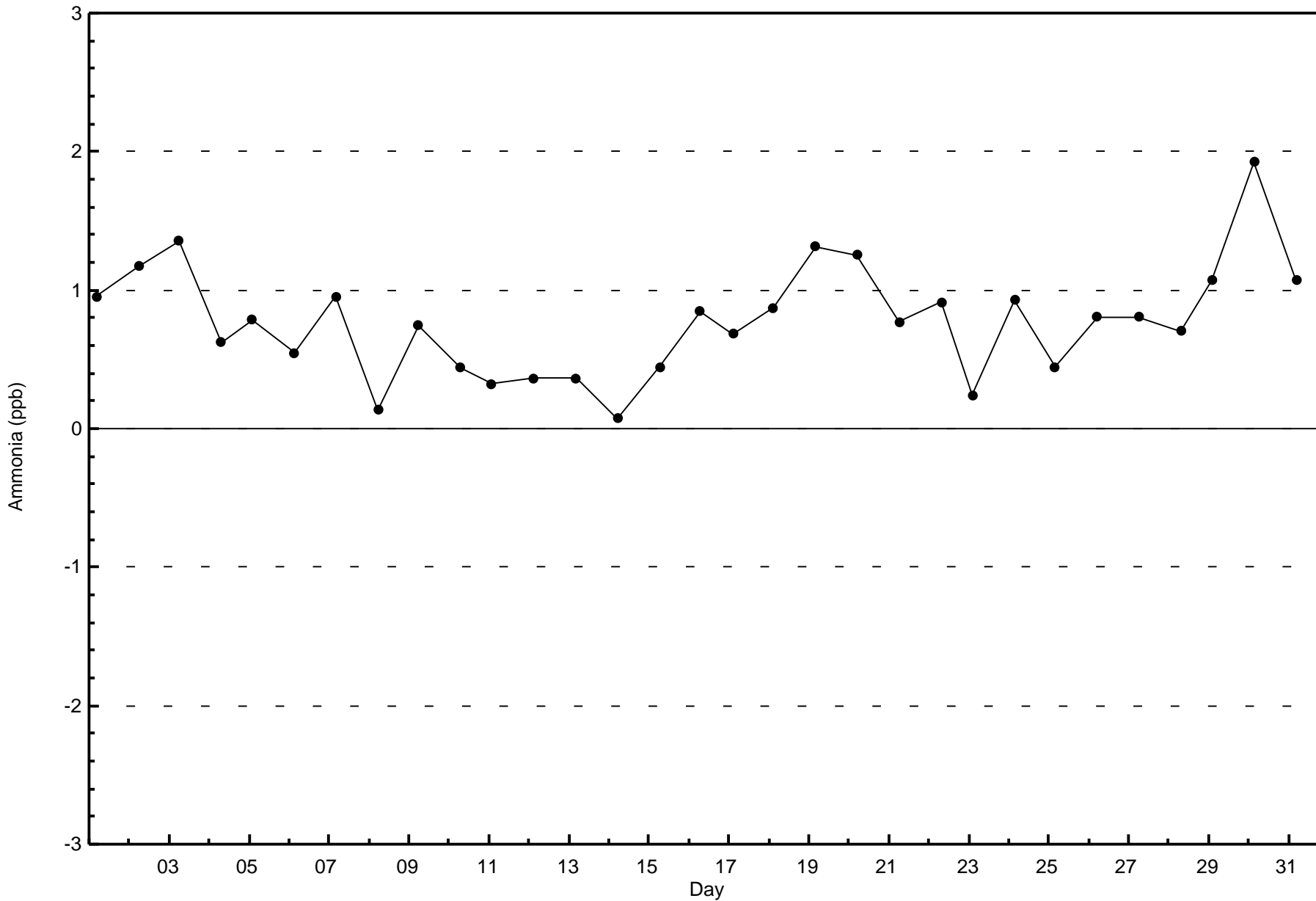
Total Number of Hours: 744

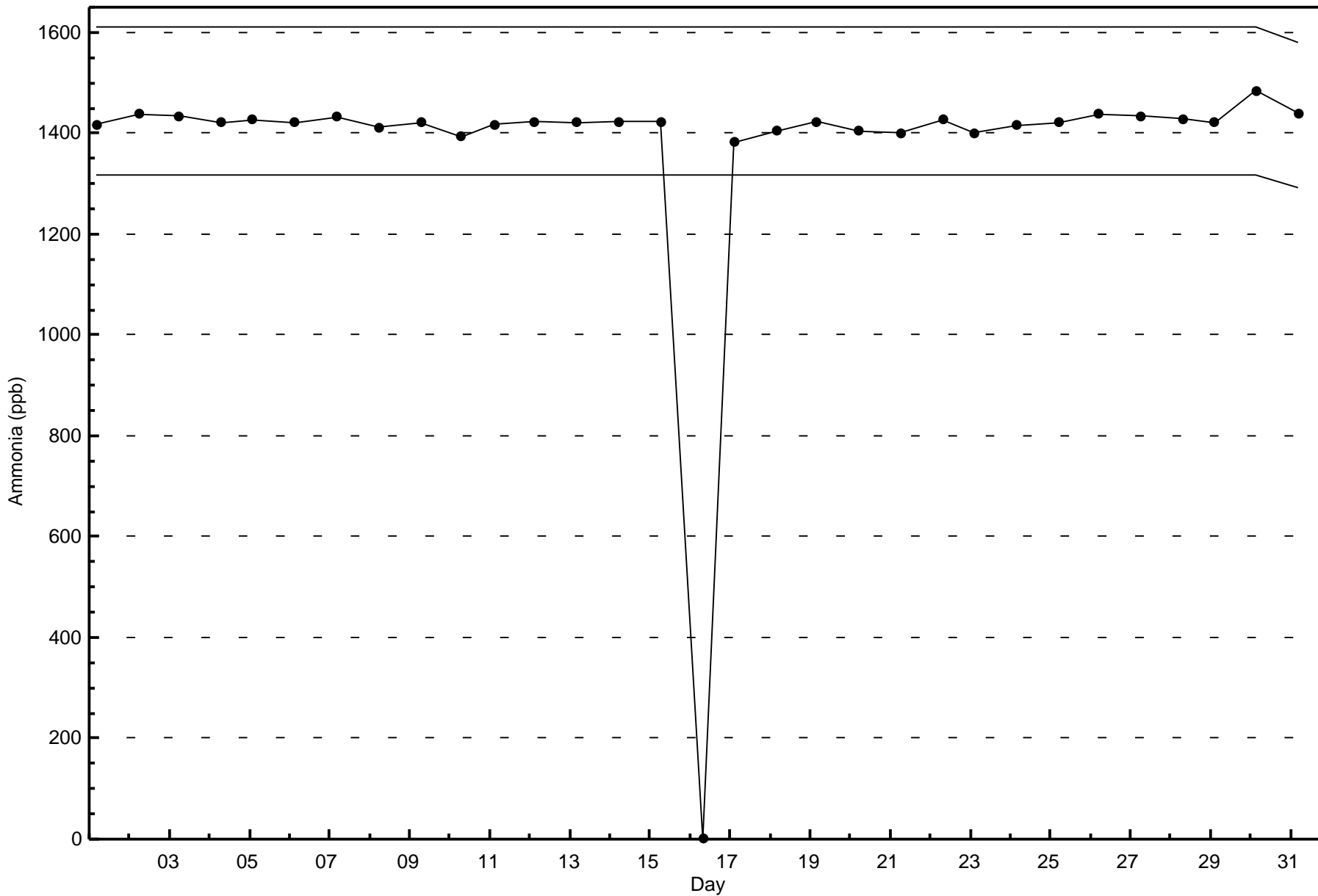


Wood Buffalo Environmental Association
Wind Rose Jul 2016

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







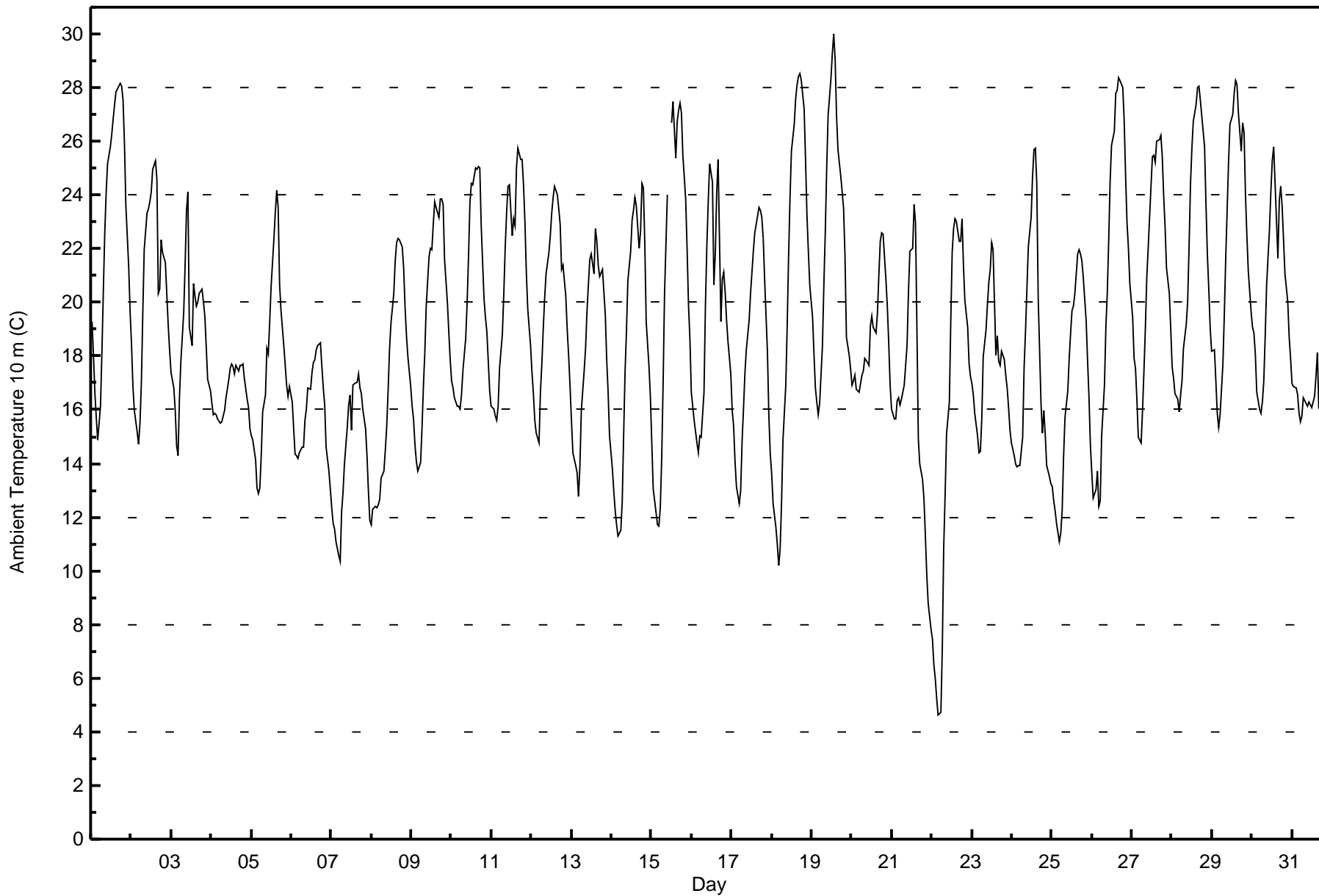


Maximum Value: 30.0 C on Jul 19 14:00		Maximum Daily Average: 22.8 C on Jul 1		Hours in Service: 744																						
Minimum Value: 4.6 C on Jul 22 05:00		Minimum Daily Average: 14.3 C on Jul 7		Hours of Data: 742																						
Maximum Diurnal Average: 23.2 C at hour 16		Minimum Diurnal Average: 13.8 C at hour 5		Hours of Missing Data: 2																						
Monthly Average: 18.96 C		Percentiles: P ₁ = 7.8 P ₁₀ = 13.7 Q ₁ = 16.0 Median = 18.3 Q ₃ = 22.3 P ₉₀ = 25.2 P ₉₉ = 28.3		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-Jul	19.3	18.1	16.6	15.7	14.9	16.2	18.1	20.4	22.5	24.1	25.2	25.8	26.3	26.9	27.4	27.9	28.1	28.2	28.0	27.5	25.9	23.6	21.3	19.7	22.8	28.2
2-Jul	18.4	16.9	16.0	15.2	14.7	15.5	17.0	19.6	22.0	23.4	23.5	23.7	24.1	25.0	25.3	24.6	20.4	20.5	22.3	21.9	21.5	20.4	19.2	18.2	20.4	25.3
3-Jul	17.4	16.8	16.0	14.6	14.3	16.4	17.8	19.6	21.4	23.4	24.1	19.0	18.4	20.7	20.3	19.9	20.0	20.4	20.5	20.0	19.5	18.4	17.1	16.7	18.9	24.1
4-Jul	16.2	15.8	15.9	15.8	15.7	15.5	15.5	15.8	16.0	16.4	17.1	17.6	17.7	17.3	17.3	17.7	17.5	17.7	17.6	17.7	17.2	16.4	16.1	15.3	16.6	17.7
5-Jul	15.0	14.9	14.1	13.1	12.9	13.1	14.3	15.9	16.6	18.3	18.1	19.3	20.6	22.4	23.4	24.2	23.6	20.7	19.7	18.4	17.7	16.9	16.5	16.9	17.8	24.2
6-Jul	16.3	15.3	14.3	14.3	14.2	14.4	14.6	14.6	15.6	16.0	16.8	16.8	17.4	17.7	17.9	18.3	18.4	18.5	17.6	16.8	16.2	14.6	13.7	13.0	16.0	18.5
7-Jul	12.3	11.8	11.6	11.1	10.5	10.3	12.2	12.9	14.0	15.3	16.2	16.6	15.2	16.9	17.0	17.0	17.4	16.8	16.6	16.0	15.3	14.3	13.0	11.9	14.3	17.4
8-Jul	11.7	12.3	12.4	12.4	12.4	12.6	13.4	13.7	14.5	15.4	16.8	18.3	19.2	20.3	21.5	22.2	22.4	22.3	22.1	21.3	19.8	18.8	18.0	16.9	17.1	22.4
9-Jul	16.1	15.7	14.7	14.1	13.7	14.0	15.3	16.9	18.1	19.8	21.7	22.0	21.9	22.9	23.8	23.5	23.2	23.8	23.8	23.6	21.6	20.0	18.9	17.9	19.5	23.8
10-Jul	17.1	16.8	16.4	16.1	16.1	16.0	16.6	17.4	18.6	20.0	21.7	23.7	24.4	24.4	25.0	25.0	25.1	25.0	22.8	20.1	19.4	18.9	17.8	16.7	20.1	25.1
11-Jul	16.1	16.0	15.7	15.6	16.1	17.6	18.8	20.3	22.0	23.3	24.4	24.4	22.5	23.1	22.8	25.0	25.8	25.3	25.3	24.4	23.0	21.1	19.7	18.4	21.1	25.8
12-Jul	17.4	16.6	15.6	15.1	14.8	16.7	17.7	19.0	20.2	21.1	21.9	22.5	23.3	23.9	24.3	24.0	23.5	22.9	21.2	21.4	20.2	18.9	18.0	16.8	19.9	24.3
13-Jul	15.6	14.4	13.9	13.6	12.8	13.9	16.0	17.4	18.3	19.7	20.7	21.6	21.8	21.1	22.8	22.3	21.4	21.0	21.2	20.4	19.5	17.9	16.6	15.0	18.3	22.8
14-Jul	13.8	13.0	12.2	11.7	11.3	11.5	12.5	15.0	17.4	18.9	20.8	21.9	23.1	23.4	23.9	23.6	22.0	22.6	24.4	24.3	22.2	19.3	17.6	16.5	18.5	24.4
15-Jul	14.7	13.0	12.6	11.7	11.7	12.4	14.2	16.9	20.3	24.0	M	M	26.7	27.5	25.4	26.8	27.2	27.4	27.0	25.5	23.9	22.0	19.9	18.7	20.4	27.5
16-Jul	16.6	15.6	15.2	14.8	14.4	15.0	15.0	16.7	19.9	22.0	23.8	25.2	24.5	20.7	21.8	24.1	25.3	19.3	20.9	21.1	20.4	19.3	18.6	17.3	19.5	25.3
17-Jul	16.0	15.4	14.1	13.2	12.5	13.0	14.8	16.0	17.3	18.2	19.3	20.3	21.1	21.9	22.6	23.2	23.6	23.5	23.2	22.4	20.9	18.1	15.8	14.3	18.4	23.6
18-Jul	13.6	12.5	11.6	11.0	10.2	10.8	12.5	14.9	16.9	19.1	21.7	23.9	25.6	26.6	27.6	28.1	28.4	28.5	28.3	27.2	25.3	23.3	21.9	20.6	20.4	28.5
19-Jul	19.4	18.1	16.8	16.3	15.8	16.2	18.4	20.7	22.6	24.9	26.9	28.3	29.3	30.0	29.1	27.0	25.7	24.7	24.1	23.5	21.7	18.7	18.0	17.5	22.2	30.0
20-Jul	16.9	17.1	17.3	16.8	16.6	17.0	17.3	17.4	17.9	17.7	17.7	19.1	19.5	19.1	18.8	19.6	21.0	22.3	22.6	22.5	20.8	19.8	18.5	16.9	18.8	22.6
21-Jul	16.0	15.7	15.7	16.3	16.5	16.2	16.4	16.9	17.7	18.4	20.4	21.9	22.0	23.6	23.0	19.0	14.9	14.0	13.4	12.6	11.3	9.8	8.8	7.8	16.2	23.6
22-Jul	7.4	6.5	6.0	5.2	4.6	4.7	7.1	10.9	12.8	15.1	16.3	19.3	21.9	22.8	23.1	23.0	22.3	22.3	23.1	21.4	20.1	19.1	17.7	17.2	15.4	23.1
23-Jul	17.0	16.6	15.9	15.0	14.4	14.5	15.7	18.0	19.0	19.9	20.7	21.3	22.2	22.0	18.0	18.8	17.8	17.7	18.2	17.8	17.3	16.8	16.1	15.2	17.7	22.2
24-Jul	14.8	14.3	14.0	13.9	13.9	13.9	15.0	17.6	18.9	20.5	22.1	23.2	24.7	25.7	24.4	20.2	16.2	15.1	16.0	15.1	13.9	13.5	13.2	11.7	17.7	25.7
25-Jul	13.1	12.6	12.2	11.8	11.1	11.4	12.2	14.2	15.7	16.7	17.9	18.9	19.7	19.8	20.3	21.8	22.0	21.8	21.6	20.9	19.3	17.9	16.5	14.7	16.8	22.0
26-Jul	13.6	12.7	13.0	13.7	12.4	12.6	15.1	16.9	19.1	20.3	22.3	24.5	25.9	26.4	27.8	27.9	28.4	28.3	28.0	26.8	24.7	23.0	22.0	20.7	21.1	28.4
27-Jul	19.4	17.9	17.6	16.4	15.0	14.8	16.0	17.4	19.0	20.9	22.0	24.3	25.4	25.5	25.2	26.0	26.0	26.2	25.4	24.0	22.8	21.3	20.3	19.0	21.2	26.2
28-Jul	17.6	17.2	16.6	16.4	15.9	16.6	17.1	18.3	19.2	20.0	22.1	24.4	25.8	26.7	27.4	28.0	28.1	27.5	26.9	25.8	23.7	21.7	20.5	19.0	21.8	28.1
29-Jul	18.2	18.2	17.1	15.9	15.4	15.8	17.7	19.6	21.6	23.4	25.2	26.7	27.0	27.8	28.3	28.1	27.1	25.7	26.7	26.3	24.0	22.5	21.2	19.6	22.5	28.3
30-Jul	19.0	18.9	18.1	16.7	16.0	15.9	16.3	17.1	18.8	20.7	22.7	24.1	25.2	25.8	24.4	21.7	23.8	24.3	23.6	22.3	21.1	20.0	18.7	17.9	20.5	25.8
31-Jul	17.0	16.9	16.8	16.6	15.9	15.5	15.8	16.4	16.3	16.2	16.3	16.2	16.1	16.5	17.2	18.1	16.1	16.0	16.1	15.8	15.5	15.4	15.4	15.2	16.2	18.1
																								Diurnal Average		
																								Diurnal Maximum		
M - Maintenance																										



Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	10	1.35	1.35
10 - 20	441	59.43	60.78
> 20	291	39.22	100.00

Total Number of Valid Hours: 742

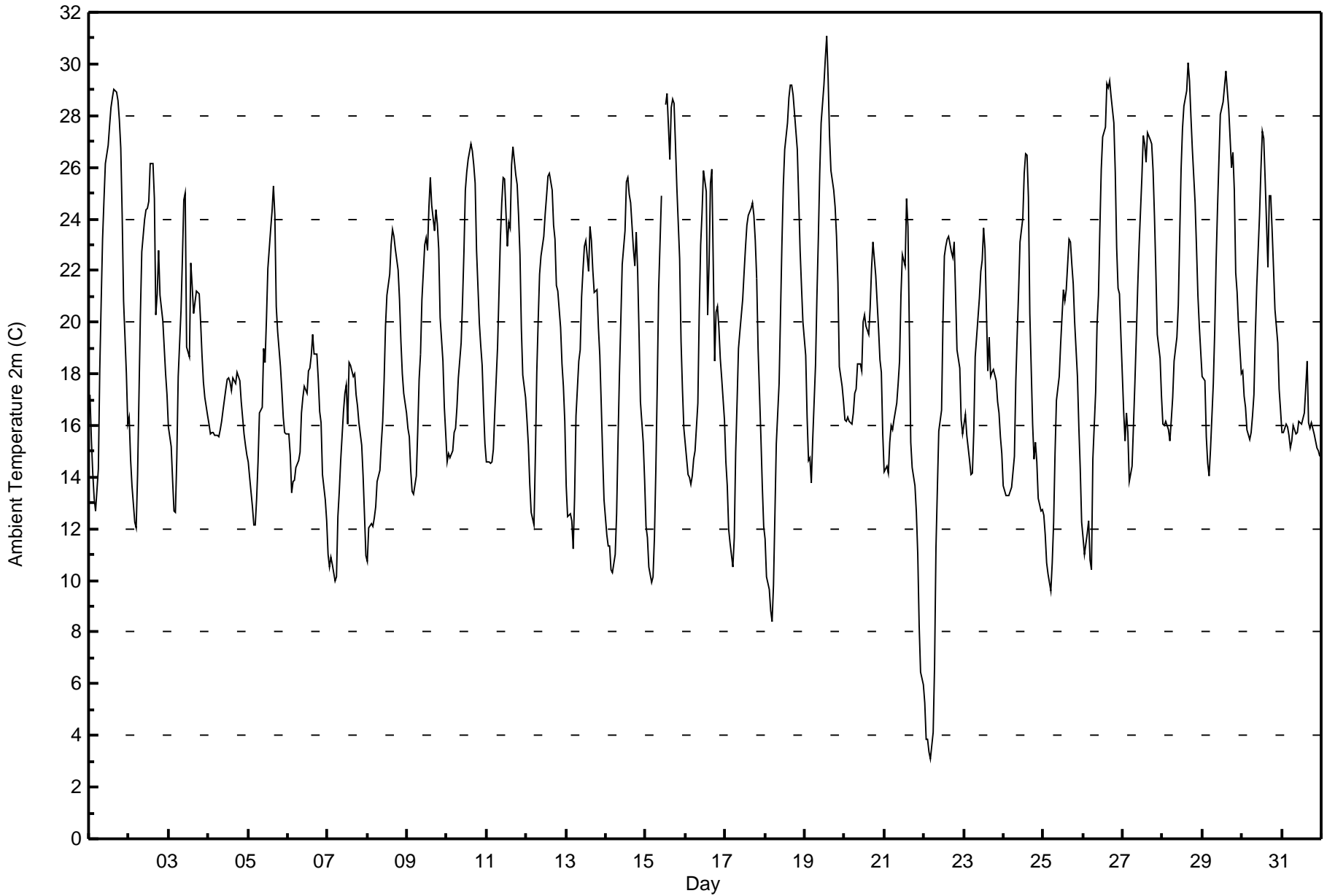
Total Number of Hours: 744



Wood Buffalo Environmental Association
Summary of Hour Averages

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

Maximum Value: 31.1 C on Jul 19 14:00 Maximum Daily Average: 22.3 C on Jul 29																						Hours in Service: 744 Hours of Data: 742																									
Minimum Value: 3.1 C on Jul 22 05:00 Minimum Daily Average: 14.4 C on Jul 7 Maximum Diurnal Average: 24.2 C at hour 16 Minimum Diurnal Average: 12.7 C at hour 5 Monthly Average: 18.85 C Percentiles: P ₁ = 6.4 P ₁₀ = 12.6 Q ₁ = 15.3 Median = 18.1 Q ₃ = 22.9 P ₉₀ = 25.9 P ₉₉ = 29.3																						Hours of Missing Data: 2 Hours of Calibration: 0 Percent Operational Time: 99.7																									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																							
1-Jul	17.2	15.5	14.2	13.2	12.7	14.3	18.2	20.8	23.2	24.7	26.1	26.9	27.6	28.3	28.7	29.0	28.9	28.6	27.8	26.7	24.2	20.8	18.0	16.1	22.2	29.0																					
2-Jul	16.3	14.7	13.7	12.3	12.1	14.1	17.2	20.3	22.7	24.0	24.4	24.4	24.7	26.2	26.1	24.8	20.3	21.1	22.8	21.0	20.1	19.1	18.0	17.2	19.9	26.2																					
3-Jul	16.0	15.2	13.9	12.7	12.6	14.8	17.9	20.4	22.5	24.7	25.0	19.0	18.7	22.3	21.3	20.3	20.8	21.2	21.1	20.0	18.7	17.7	17.1	16.4	18.8	25.0																					
4-Jul	16.1	15.7	15.7	15.7	15.6	15.6	15.5	15.8	16.1	16.6	17.4	17.8	17.8	17.7	17.4	17.8	17.6	18.1	17.9	17.7	16.9	15.7	15.3	14.9	16.6	18.1																					
5-Jul	14.6	14.0	12.9	12.1	12.1	13.2	14.6	16.5	16.7	19.0	18.4	20.1	22.1	23.6	24.3	25.3	24.1	20.6	19.6	18.3	17.3	16.3	15.7	15.7	17.8	25.3																					
6-Jul	15.7	14.9	13.4	13.8	13.9	14.4	14.7	15.0	16.5	17.1	17.5	17.2	18.1	18.2	18.7	19.5	18.8	18.7	17.8	16.5	16.1	14.1	13.1	12.3	16.1	19.5																					
7-Jul	11.0	10.5	10.9	10.6	10.0	10.1	12.5	13.5	14.7	16.5	17.3	17.6	16.1	18.4	18.4	17.9	18.0	17.2	16.7	16.1	15.2	14.1	12.6	10.9	14.4	18.4																					
8-Jul	10.8	12.0	12.2	12.1	12.4	12.8	13.9	14.3	15.3	16.2	17.7	19.8	21.0	21.9	23.0	23.6	23.3	22.8	22.0	20.9	19.3	18.0	17.2	16.5	17.5	23.6																					
9-Jul	15.9	15.5	14.3	13.4	13.3	14.0	15.8	17.8	18.8	20.9	23.0	23.3	22.8	24.5	25.6	24.5	23.5	24.4	23.8	22.8	20.2	18.5	16.7	15.7	19.5	25.6																					
10-Jul	14.6	14.9	14.8	15.0	15.7	15.9	16.7	17.9	19.2	20.8	22.7	25.1	25.8	26.3	26.9	26.6	26.1	25.4	22.8	19.9	19.1	18.3	16.7	15.3	20.1	26.9																					
11-Jul	14.6	14.6	14.5	14.6	15.1	16.5	19.0	21.1	23.2	24.6	25.6	25.5	23.0	23.8	23.6	26.1	26.8	25.7	25.3	24.1	22.6	19.7	17.9	17.1	21.0	26.8																					
12-Jul	16.2	15.2	13.7	12.6	12.1	14.9	18.0	20.0	21.8	22.6	23.3	24.2	24.9	25.6	25.8	25.1	23.8	23.2	21.4	21.2	19.8	18.4	17.5	16.1	19.9	25.8																					
13-Jul	13.7	12.5	12.6	12.3	11.2	13.2	16.4	18.5	18.9	21.0	22.0	23.0	23.2	22.0	23.7	23.2	22.0	21.2	21.2	19.8	18.7	16.9	14.9	13.1	18.1	23.7																					
14-Jul	11.8	11.3	11.3	10.4	10.3	11.0	12.6	15.4	18.0	20.1	22.3	23.6	25.4	25.6	25.0	24.6	22.8	22.2	23.5	22.0	19.6	16.9	15.4	13.9	18.1	25.6																					
15-Jul	12.1	11.7	10.5	9.9	10.2	11.7	14.3	17.5	21.3	24.9	M	M	28.4	28.8	26.3	28.3	28.6	28.5	26.9	25.2	22.5	19.3	17.4	15.9	20.0	28.8																					
16-Jul	15.3	14.1	14.0	13.7	14.0	14.7	15.0	16.9	20.5	23.0	24.3	25.9	25.1	20.3	22.3	25.4	25.9	18.5	20.4	20.6	19.8	18.6	17.8	16.2	19.3	25.9																					
17-Jul	14.6	13.6	12.0	11.5	10.5	11.7	15.0	16.9	19.0	19.6	20.9	21.9	22.9	23.7	24.1	24.4	24.6	24.2	23.1	21.7	19.0	15.6	13.7	12.1	18.2	24.6																					
18-Jul	11.6	10.2	9.7	8.8	8.4	9.8	12.5	15.3	17.6	20.3	23.0	25.3	26.7	27.7	28.7	29.2	29.2	28.8	28.1	26.7	24.8	22.8	21.4	20.0	20.3	29.2																					
19-Jul	18.7	16.3	14.7	14.8	13.8	15.5	18.3	21.0	23.2	25.7	27.7	29.2	30.2	31.1	29.5	27.2	25.9	25.1	24.4	23.3	21.5	18.3	17.5	16.9	22.1	31.1																					
20-Jul	16.2	16.2	16.3	16.2	16.1	16.5	17.3	17.4	18.4	18.4	18.1	20.0	20.3	19.9	19.5	20.6	22.1	23.1	22.5	21.8	19.7	18.6	18.1	15.7	18.7	23.1																					
21-Jul	14.2	14.4	14.2	15.4	16.0	15.9	16.2	16.9	17.6	18.5	21.0	22.6	22.2	24.8	23.7	19.7	15.4	14.4	13.7	12.6	11.0	8.2	6.4	6.0	15.9	24.8																					
22-Jul	5.2	3.9	3.9	3.4	3.1	4.1	6.7	11.3	13.5	15.8	16.6	20.1	22.6	23.0	23.2	23.3	22.7	22.5	23.1	21.1	18.9	18.2	16.2	15.7	14.9	23.3																					
23-Jul	16.0	16.4	15.6	14.7	14.1	14.1	15.8	18.7	20.2	20.9	21.9	22.4	23.6	22.8	18.1	19.4	17.9	18.1	18.2	17.7	16.9	16.5	15.6	14.9	17.9	23.6																					
24-Jul	13.7	13.3	13.3	13.3	13.4	13.6	14.8	17.7	19.5	21.2	23.1	24.0	25.8	26.5	26.5	24.8	20.3	16.1	14.7	15.3	14.6	13.2	12.7	12.7	17.7	26.5																					
25-Jul	12.5	11.8	10.7	10.3	9.6	10.7	12.3	14.9	17.0	17.9	19.1	20.2	21.2	20.8	21.3	23.2	23.1	22.2	21.5	20.0	17.9	16.0	14.3	12.3	16.7	23.2																					
26-Jul	11.7	11.0	11.8	12.3	10.8	10.4	14.7	17.3	19.9	21.0	23.6	25.9	27.2	27.6	29.2	29.1	29.3	28.7	27.7	25.8	22.9	21.3	21.1	19.5	20.8	29.3																					
27-Jul	16.6	15.4	16.5	15.8	13.8	14.5	16.0	17.6	19.4	21.3	23.0	25.6	27.2	26.9	26.2	27.4	27.1	26.9	25.9	24.1	21.9	19.6	18.6	17.1	21.0	27.4																					
28-Jul	16.1	16.0	16.2	15.8	15.4	16.2	17.1	18.5	19.4	20.7	23.3	25.9	27.5	28.3	29.0	30.1	29.3	28.0	26.7	24.6	22.9	21.0	19.9	18.8	21.9	30.1																					
29-Jul	17.9	17.8	15.6	14.6	14.1	15.1	17.6	19.7	22.3	24.4	26.3	28.0	28.5	29.1	29.7	29.0	28.3	26.0	26.6	25.1	21.9	21.1	19.8	18.0	22.3	29.7																					
30-Jul	18.1	17.2	16.7	15.8	15.4	15.7	16.4	17.2	19.5	21.4	24.1	25.9	27.4	27.1	25.6	22.1	24.9	24.9	23.6	22.1	20.5	19.2	17.4	16.6	20.6	27.4																					
31-Jul	15.8	15.7	16.0	15.9	15.6	15.1	15.4	16.0	15.7	15.7	16.2	16.1	16.1	16.5	17.5	18.5	16.1	15.9	16.1	15.7	15.4	15.2	15.0	14.8	15.9	18.5																					
																						14.5	13.9	13.4	13.0	12.7	13.5	15.4	17.4	19.1	20.6	21.8	22.9	23.7	24.2	24.2	24.2	23.5	22.7	22.2	21.0	19.4	17.6	16.4	15.3	Diurnal Average	
																						18.7	17.8	16.7	16.2	16.1	16.5	19.0	21.1	23.2	25.7	27.7	29.2	30.2	31.1	29.7	30.1	29.3	28.8	28.1	26.7	24.8	22.8	21.4	20.0	Diurnal Maximum	
M - Maintenance																																															





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	17	2.29	2.29
10 - 20	430	57.95	60.24
> 20	295	39.76	100.00

Total Number of Valid Hours: 742

Total Number of Hours: 744



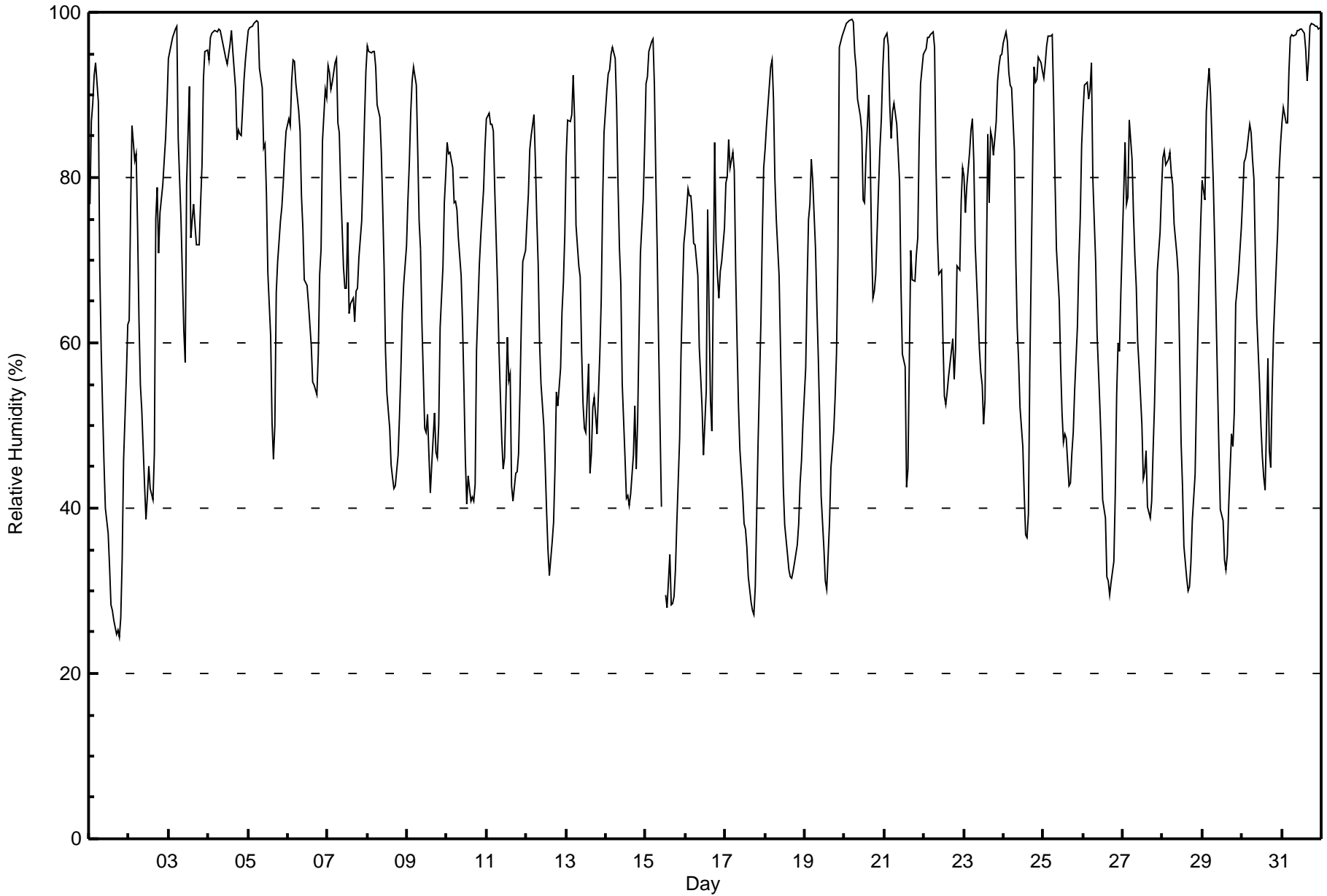
Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

Fort McKay - Bertha Ganter - July 2016

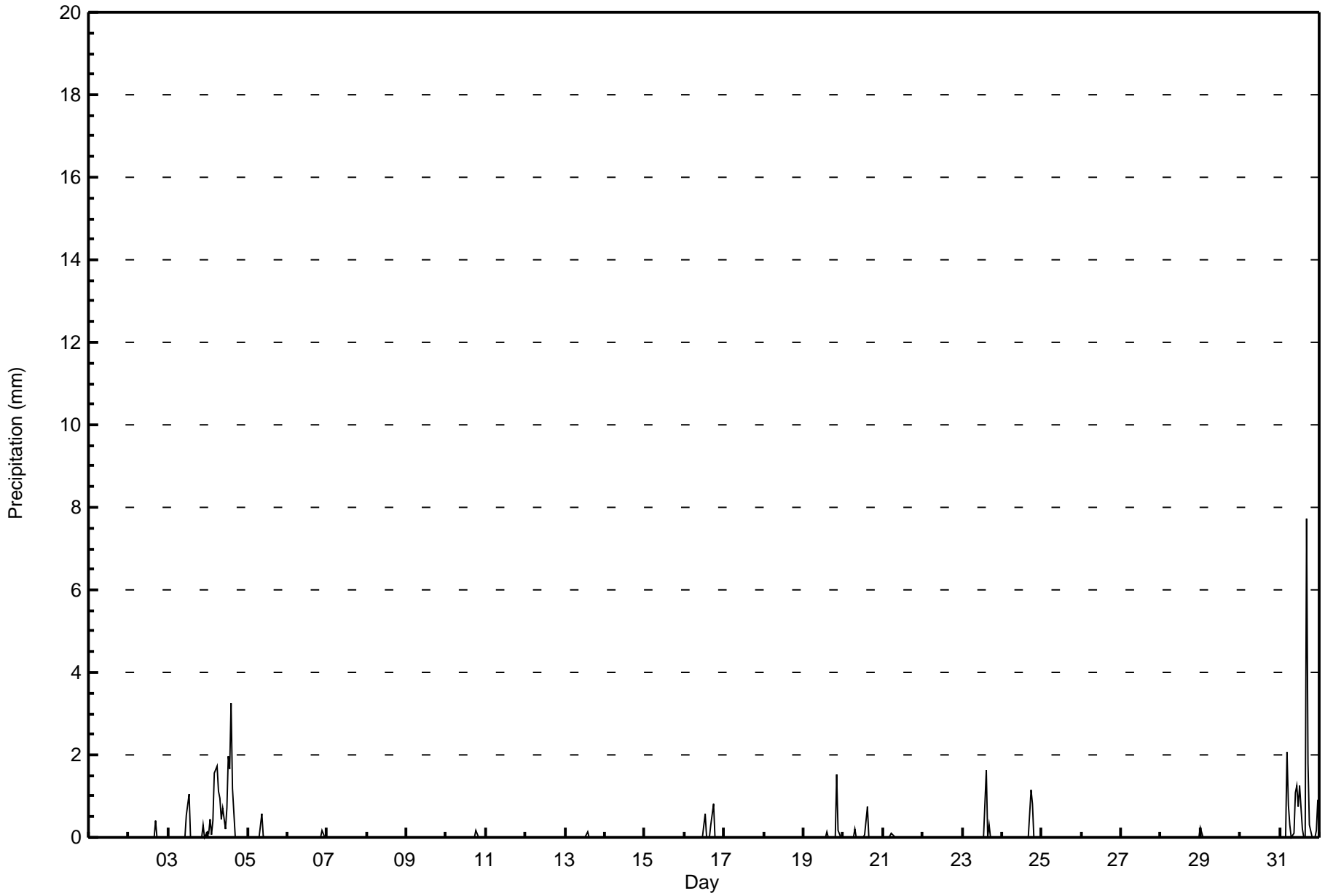
Maximum Value: 99 % on Jul 20 05:00																			Maximum Daily Average: 95.3 % on Jul 31						Hours in Service: 744																				
Minimum Value: 24 % on Jul 1 19:00																			Minimum Daily Average: 51.9 % on Jul 1						Hours of Data: 742																				
Maximum Diurnal Average: 90.5 % at hour 5																			Minimum Diurnal Average: 49.4 % at hour 16						Hours of Missing Data: 2																				
Monthly Average: 69.3 %																			Percentiles: P ₁ = 28 P ₁₀ = 41 Q ₁ = 52 Median = 72 Q ₃ = 87 P ₉₀ = 95 P ₉₉ = 99						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-Jul	77	87	89	92	94	89	69	59	52	46	40	37	33	28	28	26	25	25	24	27	34	46	56	62	51.9	94																			
2-Jul	63	76	86	82	83	74	63	55	52	43	39	41	45	42	41	47	75	79	71	76	79	82	85	89	65.3	89																			
3-Jul	94	96	97	97	98	98	85	75	68	61	58	79	91	73	75	77	74	72	72	77	81	92	95	95	82.6	98																			
4-Jul	94	97	97	98	98	98	98	98	97	96	94	94	95	96	98	95	91	85	86	85	85	92	94	96	94.0	98																			
5-Jul	98	98	98	99	99	99	99	99	93	91	84	84	78	68	61	50	46	50	66	70	75	76	79	83	86	80.4	99																		
6-Jul	87	86	92	94	94	91	88	86	78	74	68	67	65	62	60	55	55	54	59	68	71	84	91	90	75.8	94																			
7-Jul	93	93	91	91	94	94	87	85	79	69	67	67	75	64	65	65	63	66	67	70	75	80	87	93	78.3	94																			
8-Jul	96	95	95	95	95	93	89	87	83	76	69	59	54	50	45	44	42	43	46	51	57	64	67	72	69.5	96																			
9-Jul	77	82	88	92	93	91	83	75	71	62	50	49	51	46	42	45	52	47	46	50	62	69	77	80	65.9	93																			
10-Jul	84	83	83	81	77	77	76	73	68	62	55	46	41	44	41	41	41	43	59	70	73	76	78	84	64.8	84																			
11-Jul	87	88	86	86	86	78	67	59	54	48	45	46	61	55	56	43	41	44	44	47	54	63	70	71	61.6	88																			
12-Jul	75	78	83	85	88	82	75	69	60	55	50	45	40	35	32	36	38	45	54	52	57	64	67	73	59.9	88																			
13-Jul	82	87	87	88	92	87	74	69	68	59	53	50	49	58	44	47	52	53	49	54	59	65	77	85	66.2	92																			
14-Jul	91	93	93	95	96	94	89	79	72	67	55	46	41	41	40	42	47	52	45	50	61	71	77	84	67.5	96																			
15-Jul	91	92	95	96	97	91	80	71	60	40	M	M	29	28	34	28	29	29	33	38	48	59	66	72	59.5	97																			
16-Jul	74	79	78	78	76	72	72	68	60	56	52	46	54	76	64	53	49	84	72	68	65	69	70	74	67.0	84																			
17-Jul	79	80	85	81	83	81	69	60	52	47	42	38	37	35	32	29	28	27	30	39	48	62	73	81	55.0	85																			
18-Jul	83	86	91	93	94	90	80	75	68	59	51	43	38	34	33	32	32	32	33	36	38	43	46	50	56.7	94																			
19-Jul	57	67	75	77	82	80	71	64	58	51	42	35	31	30	34	38	45	49	53	59	71	96	97	98	60.8	98																			
20-Jul	98	99	99	99	99	99	95	93	89	87	86	77	77	83	90	83	72	65	66	68	79	84	87	93	86.2	99																			
21-Jul	97	97	96	89	85	88	89	86	83	80	67	59	57	42	45	58	71	68	67	71	73	84	91	95	76.6	97																			
22-Jul	95	96	97	97	97	98	96	82	73	68	69	60	54	53	54	56	59	61	56	59	69	69	77	81	73.9	98																			
23-Jul	80	76	79	83	86	87	82	72	64	59	56	55	50	53	85	77	86	85	83	87	92	93	95	95	77.4	95																			
24-Jul	96	98	96	93	91	91	83	70	62	58	52	48	42	37	36	39	57	81	93	92	92	95	94	93	74.5	98																			
25-Jul	92	94	96	97	97	97	89	80	71	65	57	51	48	49	48	43	43	47	49	54	62	70	75	84	69.2	97																			
26-Jul	88	91	92	90	91	94	80	70	61	57	52	48	41	39	32	31	30	31	34	42	54	60	59	66	59.6	94																			
27-Jul	78	84	77	78	87	82	76	71	67	60	57	50	44	44	47	40	39	41	47	52	60	69	73	78	62.5	87																			
28-Jul	82	83	81	82	83	81	79	74	71	68	58	48	43	35	32	30	31	33	39	44	53	61	69	75	59.8	83																			
29-Jul	80	77	88	91	93	90	79	72	64	55	47	40	38	34	33	34	40	49	47	52	65	66	68	74	61.6	93																			
30-Jul	78	82	82	83	86	85	82	80	71	63	55	50	46	44	42	58	47	45	54	61	65	74	81	84	66.7	86																			
31-Jul	87	89	87	87	93	97	97	97	97	98	98	98	98	97	95	92	94	98	99	98	98	98	98	98	98	95.3	99																		
																			85.0	87.3	89.0	89.3	90.5	88.7	82.0	75.7	69.8	63.7	58.9	55.0	52.8	50.6	50.1	49.4	51.4	54.9	56.4	60.4	66.4	73.5	78.2	82.3	Diurnal Average		
																			98	99	99	99	99	99	99	98	97	98	98	98	98	97	98	95	94	98	99	98	98	98	98	98	98	Diurnal Maximum	
M - Maintenance																																													





Wood Buffalo Environmental Association
Hourly Averages

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





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Concentration Ranges (mm)	Number of Hours	%	Cumulative %
0 - 0.3	708	95.55	95.55
0.4 - 0.5	4	0.54	96.09
0.6 - 0.7	6	0.81	96.90
0.8 - 1.4	13	1.75	98.65
1.5 - 10	10	1.35	100.00
> 10	0	0.00	100.00

Total Number of Valid Hours: 741

Total Number of Hours: 744



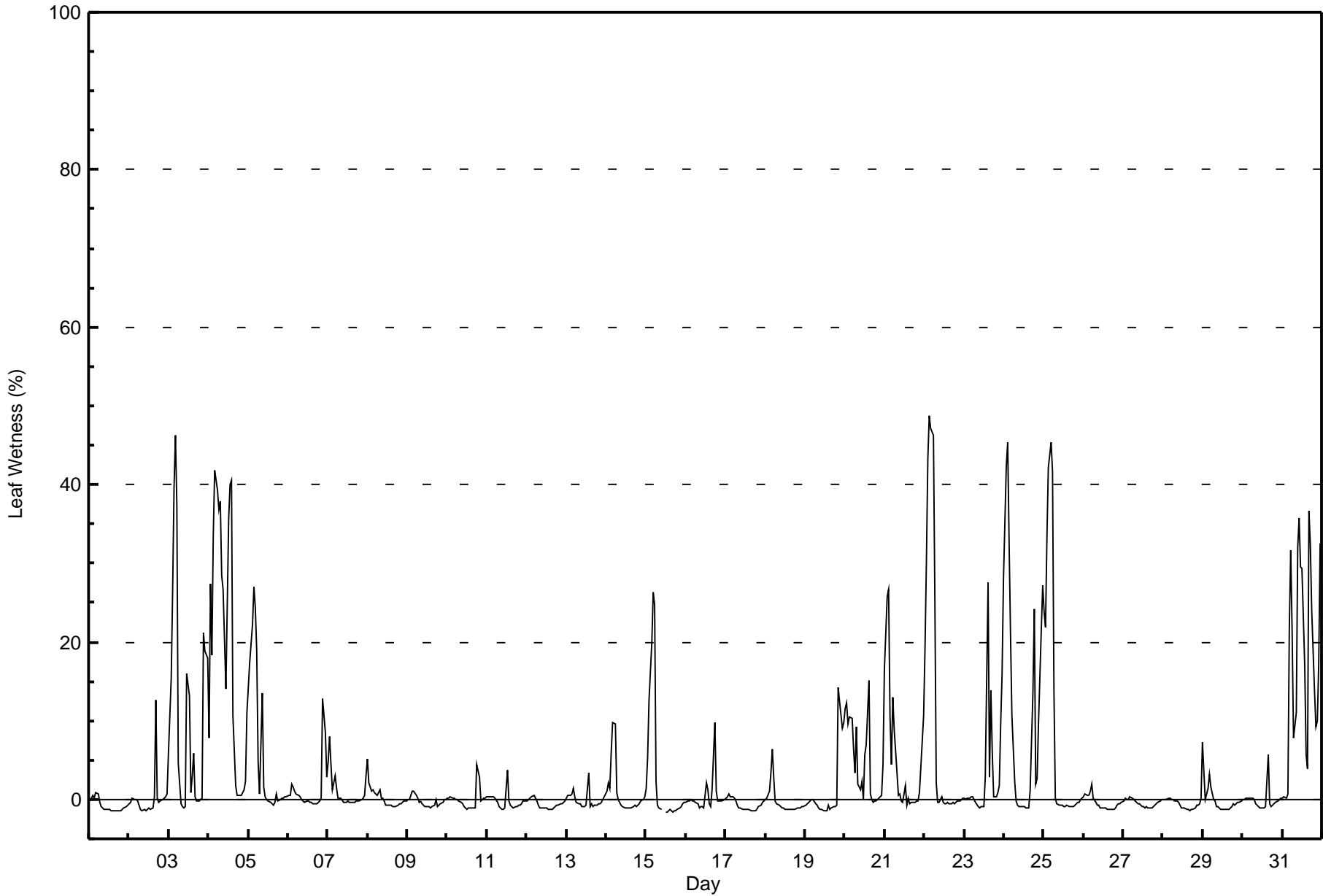
Wood Buffalo Environmental Association

Summary of Hour Averages

Leaf Wetness (LW) - %

Fort McKay - Bertha Ganter - July 2016

Maximum Value: 49 % on Jul 22 04:00																		Maximum Daily Average: 20.1 % on Jul 4																		Hours in Service: 744	
Minimum Value: -2 % on Jul 15 14:00																		Minimum Daily Average: -0.8 % on Jul 1																		Hours of Data: 742	
Maximum Diurnal Average: 10.3 % at hour 5																		Minimum Diurnal Average: 0.1 % at hour 20																		Hours of Missing Data: 2	
Monthly Average: 3.3 %																		Percentiles: P ₁ = -1 P ₁₀ = -1 Q ₁ = -1 Median = 0 Q ₃ = 1 P ₉₀ = 14 P ₉₉ = 41																		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-Jul	0	0	0	0	1	1	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-2	-2	-1	-1	-1	-1	-1	-1	-0.8	1											
2-Jul	-1	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	13	0	0	0	0	0	0	1	0.1	13											
3-Jul	6	16	27	40	46	37	5	-1	-1	-1	-1	16	13	1	3	6	0	0	0	0	21	19	18	11.2	46												
4-Jul	8	27	18	34	42	39	37	38	28	27	14	25	36	40	41	11	2	1	1	1	1	2	11	20.1	42												
5-Jul	14	17	22	27	24	19	5	1	14	2	0	0	0	0	0	-1	0	1	0	0	0	0	0	6.0	27												
6-Jul	1	0	2	2	1	1	1	0	0	0	0	0	0	0	0	-1	0	0	0	0	0	13	9	3	1.1	13											
7-Jul	5	8	4	1	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	1.0	8											
8-Jul	5	2	1	1	1	1	0	1	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	0	0.2	5											
9-Jul	0	0	1	1	1	1	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	0	-1	-1	0	0	0	0	-0.3	1											
10-Jul	0	0	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	5	3	0	0	0	0	0.0	5											
11-Jul	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	4	0	-1	-1	-1	-1	-1	-1	-1	0	0	0	-0.3	4											
12-Jul	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	-0.6	0											
13-Jul	0	0	1	1	1	0	0	-1	0	-1	-1	-1	-1	3	-1	-1	-1	-1	-1	-1	0	0	0	0	-0.1	3											
14-Jul	1	2	1	6	10	10	1	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	0	0.8	10											
15-Jul	1	5	13	20	26	25	2	-1	-1	-1	M	M	-2	-2	-1	-1	-2	-2	-1	-1	-1	-1	0	3.4	26												
16-Jul	0	0	0	0	0	0	0	0	-1	-1	-1	-1	2	1	-1	-1	1	10	1	0	0	0	0	0	0.3	10											
17-Jul	0	0	1	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	-0.7	1											
18-Jul	0	0	1	3	6	3	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-0.2	6											
19-Jul	-1	-1	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	14	12	9	10	1.2	14											
20-Jul	12	12	10	10	10	6	3	9	2	1	2	0	6	7	15	1	0	0	0	0	0	0	1	5	4.7	15											
21-Jul	17	26	27	11	4	13	9	3	0	1	0	0	2	-1	0	-1	0	0	0	0	0	1	4	11	5.2	27											
22-Jul	19	30	43	49	47	46	26	2	0	0	0	0	-1	-1	0	0	0	0	0	0	0	0	0	0	10.8	49											
23-Jul	0	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	3	28	3	14	6	0	0	1	2	10	16	3.2	28											
24-Jul	28	42	45	33	21	11	2	0	-1	-1	-1	-1	-1	-1	-1	-1	1	13	24	2	3	10	22	27	11.6	45											
25-Jul	24	22	33	42	45	42	14	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	0	8.8	45											
26-Jul	0	1	0	0	1	2	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	-0.4	2											
27-Jul	0	0	0	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	-0.5	0											
28-Jul	0	0	0	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	-0.6	0											
29-Jul	7	0	1	1	3	2	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	0.0	7											
30-Jul	0	0	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	6	-1	-1	-1	-1	0	0	0	0	-0.1	6											
31-Jul	0	0	0	1	22	32	21	8	11	32	36	29	29	17	6	4	37	32	24	14	9	10	17	33	17.6	37											
4.7 6.9 8.1 9.2 10.3 9.4 4.0 1.7 1.2 1.3 1.0 1.5 2.2 1.6 2.2 0.2 1.5 1.4 1.1 0.1 0.5 2.0 2.8 4.3																								Diurnal Average													
28 42 45 49 47 46 37 38 28 32 36 29 36 40 41 11 37 32 24 14 14 21 22 33																								Diurnal Maximum													
M - Maintenance																																					





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

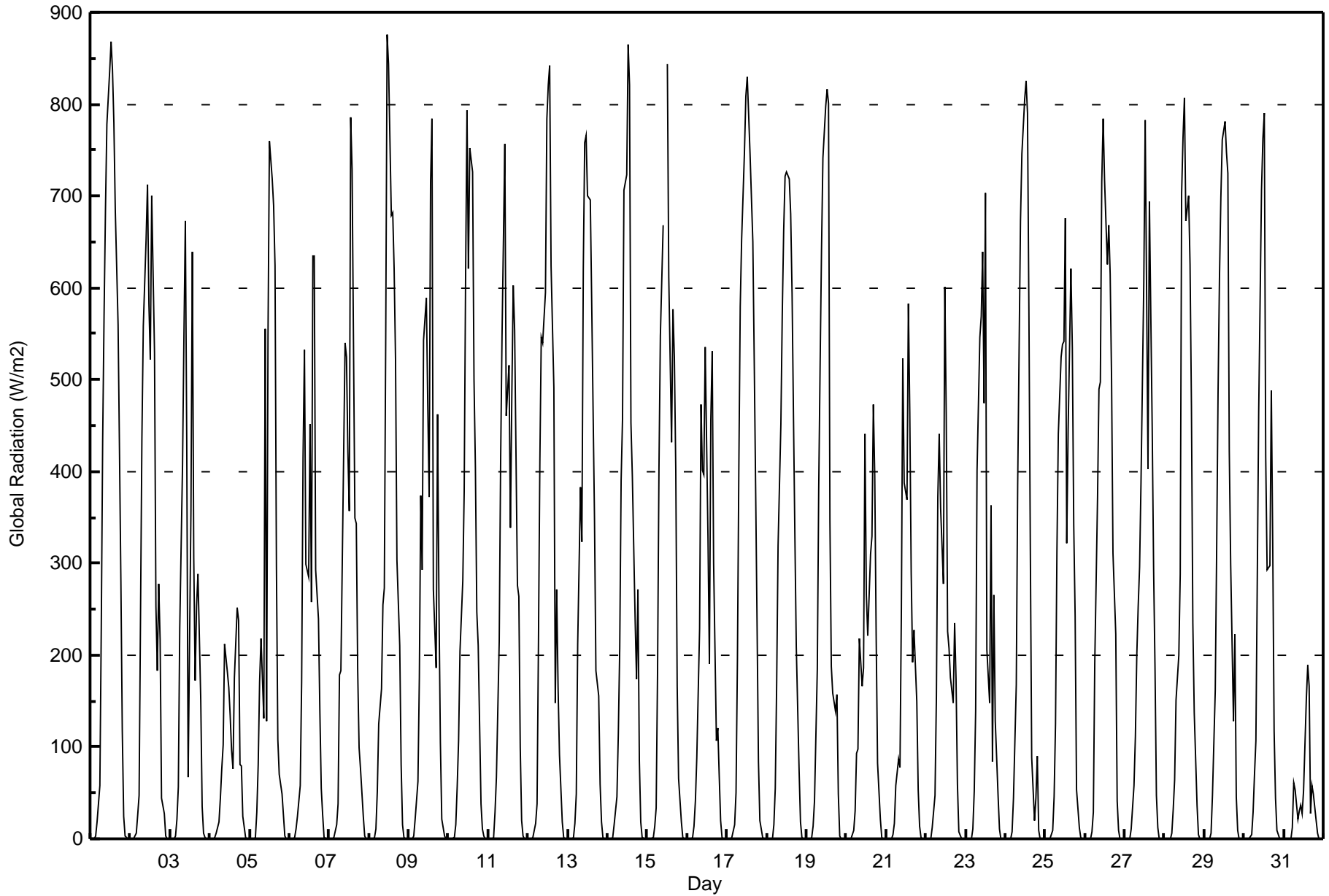
Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 0.3	92	28.13	28.13
0.4 - 0.5	26	7.95	36.09
0.6 - 0.7	15	4.59	40.67
0.8 - 1.4	29	8.87	49.54
1.5 - 10	71	21.71	71.25
> 10	94	28.75	100.00

Total Number of Valid Hours: 327

Total Number of Hours: 744



Maximum Value: 876 W/m2 on Jul 8 12:00		Maximum Daily Average: 341.2 W/m2 on Jul 1		Hours in Service: 744																							
Minimum Value: 0 W/m2 on Jul 1 01:00		Minimum Daily Average: 40.2 W/m2 on Jul 31		Hours of Data: 742																							
Maximum Diurnal Average: 611.6 W/m2 at hour 13		Minimum Diurnal Average: 0.0 W/m2 at hour 3		Hours of Missing Data: 2																							
Monthly Average: 226.2 W/m2		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 105 Q ₃ = 411 P ₉₀ = 672 P ₉₉ = 833		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-Jul	0	0	0	3	19	58	229	433	571	685	779	835	868	837	779	685	560	423	280	118	25	3	0	0	341.2	868	
2-Jul	0	0	0	6	27	47	241	436	558	652	712	583	522	701	530	253	183	277	217	45	27	4	0	0	250.8	712	
3-Jul	0	0	0	3	21	56	229	407	548	673	433	68	357	639	307	172	253	288	151	35	6	1	0	0	193.7	673	
4-Jul	0	0	0	1	6	18	44	76	102	212	181	165	134	96	76	176	251	238	81	79	24	2	0	0	81.9	251	
5-Jul	0	0	0	2	28	80	170	218	132	555	128	547	760	718	690	623	298	108	71	49	25	3	0	0	216.9	760	
6-Jul	0	0	0	2	11	24	58	171	415	532	299	285	451	258	634	635	293	240	138	54	25	1	0	0	188.6	635	
7-Jul	0	0	0	2	15	38	178	183	303	540	525	422	357	786	729	350	344	183	100	76	25	3	0	0	214.9	786	
8-Jul	0	0	0	2	11	51	125	164	255	274	545	876	843	679	683	621	522	304	211	81	15	2	0	0	260.9	876	
9-Jul	0	0	0	2	21	63	175	374	293	542	589	473	373	714	784	271	186	462	254	105	21	2	0	0	237.7	784	
10-Jul	0	0	0	1	15	57	107	204	280	379	612	793	621	752	726	500	404	247	211	38	11	3	0	0	248.3	793	
11-Jul	0	0	0	1	29	67	214	411	547	651	756	461	515	339	483	603	553	276	263	99	19	2	0	0	262.1	756	
12-Jul	0	0	0	2	16	38	213	410	547	540	595	784	821	841	623	491	148	272	165	92	18	2	0	0	275.8	841	
13-Jul	0	0	0	2	17	49	212	383	324	621	758	765	700	695	585	465	347	183	156	59	18	2	0	0	264.3	765	
14-Jul	0	0	0	1	15	46	114	207	391	457	707	722	864	820	453	394	238	174	272	85	18	2	0	0	249.2	864	
15-Jul	0	0	0	1	14	34	182	403	548	668	M	M	843	612	432	577	523	401	166	65	18	1	0	0	249.5	843	
16-Jul	0	0	0	1	13	41	89	229	473	402	397	536	327	191	456	531	300	106	121	68	20	1	0	0	179.3	536	
17-Jul	0	0	0	1	15	50	195	402	579	653	747	809	830	789	746	650	519	379	235	83	20	1	0	0	321.0	830	
18-Jul	0	0	0	1	15	56	170	319	452	571	662	721	726	718	681	594	459	329	209	74	18	1	0	0	282.3	726	
19-Jul	0	0	0	1	14	41	184	380	516	641	742	798	817	801	346	188	158	138	158	49	3	1	0	0	249.0	817	
20-Jul	0	0	0	0	9	31	92	98	218	166	187	441	266	222	310	330	472	396	221	82	21	1	0	0	148.5	472	
21-Jul	0	0	0	0	4	17	59	87	78	250	523	388	368	583	464	290	192	227	150	53	14	1	0	0	156.3	583	
22-Jul	0	0	0	1	13	47	156	373	441	360	278	601	462	225	207	175	148	234	174	60	8	0	0	0	165.1	601	
23-Jul	0	0	0	0	10	51	138	401	546	570	640	475	704	206	148	363	84	265	128	47	11	1	0	0	199.6	704	
24-Jul	0	0	0	0	8	45	168	386	532	673	745	805	825	791	576	320	89	19	45	89	10	0	0	0	255.2	825	
25-Jul	0	0	0	0	9	46	125	313	441	525	538	542	675	322	445	620	535	341	243	53	12	1	0	0	241.1	675	
26-Jul	0	0	0	0	8	29	191	373	490	498	716	784	716	625	668	614	500	311	222	42	9	0	0	0	283.2	784	
27-Jul	0	0	0	0	10	58	111	201	254	296	387	605	782	596	403	693	447	294	186	48	13	0	0	0	224.4	782	
28-Jul	0	0	0	0	6	32	65	151	200	289	703	765	806	673	700	625	471	235	137	37	4	0	0	0	245.8	806	
29-Jul	0	0	0	0	6	47	162	316	486	610	699	762	781	748	725	422	300	128	222	46	9	0	0	0	269.6	781	
30-Jul	0	0	0	0	5	29	70	107	285	465	706	763	790	416	293	297	488	323	118	44	8	0	0	0	217.0	790	
31-Jul	0	0	0	0	1	12	61	53	22	31	37	28	52	153	190	166	28	57	48	19	7	0	0	0	40.2	190	
		0.0	0.0	0.0	1.2	13.3	43.8	146.1	279.6	381.5	483.3	544.1	586.7	611.6	565.9	512.0	441.8	332.1	253.6	172.6	63.8	15.6	1.3	0.0	0.0	Diurnal Average	
		0	0	0	6	29	80	241	436	579	685	779	876	868	841	784	693	560	462	280	118	27	4	0	0	Diurnal Maximum	
M - Maintenance																											





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Concentration Ranges (W/m2)	Number of Hours	%	Cumulative %
0 - 20	271	36.52	36.52
21 - 100	99	13.34	49.87
101 - 300	136	18.33	68.19
301 - 600	134	18.06	86.25
601 - 900	102	13.75	100.00
> 900	0	0.00	100.00

Total Number of Valid Hours: 742

Total Number of Hours: 744



Maximum Speed: 26 km/h on Jul 21 16:00	Maximum Daily Speed Average: 12.4 km/h on Jul 12	Hours in Service: 744
Minimum Speed Value: 0 km/h on Jul 27 08:00	Minimum Daily Speed Average: 0.5 km/h on Jul 28	Hours of Data: 742
Maximum Diurnal Speed Average: 4.5 km/h at hour 17	Minimum Diurnal Speed Average: 0.2 km/h at hour 13	Hours of Missing Data: 2
Monthly Average Velocity: 2.0 km/h 331.7 deg	Percentiles: P ₁ = 1 P ₁₀ = 3 Q ₁ = 4 Median = 6 Q ₃ = 9 P ₉₀ = 13 P ₉₉ = 19	Percent Operational Time: 99.7

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	S3	SSW2	WSW1	W2	NW2	SE2	SSE6	SSE7	SSE11	S16	SSE18	SSE16	SSE16	SSE14	S12	SSE13	S12	S11	SSE12	SSE13	S6	S5	S4	S4	SSE8.2	SSE18
2-Jul	S5	SSE4	S3	W2	NNW1	SSE4	SSE5	SSE6	S6	S19	SSE19	SSE17	SSE15	SSE16	S14	SSE15	SSE15	SSE6	SE8	SSE3	SSE3	SSE6	SSE5	SSE5	SSE8.0	SSE19
3-Jul	SSE4	SSE3	E0	NW5	NW3	SE2	SSE6	SE6	SSE5	SE5	S10	S13	N6	E6	ESE7	ESE6	E7	SE9	SE7	ESE5	S3	SE2	SSE6	WNW4	SE3.4	S13
4-Jul	WSW2	NW3	SSW3	SSW3	WSW4	W5	W4	W3	S4	WSW5	WNW4	W3	SSW5	W5	WNW6	W7	SW7	WNW5	SSE6	S7	S8	SSE4	SSE3	NNW3	WSW3.0	S8
5-Jul	NNW3	NW3	WNW4	WNW4	NW5	WNW3	NNW3	N9	N7	NNW5	N7	NE3	SE3	NNE5	NNE8	NNE7	N10	NNW10	NW13	NW14	NW12	NW10	NW3	NNW9	NNW5.6	NW14
6-Jul	N8	NNE5	NNW6	NNW7	NNW7	N11	N12	N13	N13	N12	N10	N12	NE7	NNE7	NE10	ENE9	NNE10	ENE6	N7	NW2	NNW8	NW8	NNW8	NNW7	N7.8	N13
7-Jul	NNW6	NNW8	N10	N9	NNW7	NW8	N10	N11	N12	N10	NNE10	N12	N13	N16	N13	N14	N15	N11	N13	N11	N11	N12	NNW8	NNW7	N10.6	N16
8-Jul	NNW5	N7	NNW6	NNW5	NNW7	NNW6	N8	N7	N7	N8	NNE7	ENE7	ENE6	NE3	ESE3	NNE7	N9	N7	N9	N8	N8	N8	N8	N9	N6.3	N9
9-Jul	N9	N10	N7	N7	N7	N7	N6	NNE6	NNE5	NNE5	N2	NW1	WNW6	NW7	N8	SE4	ENE3	NNE9	N9	NNE4	N5	N7	N7	NNW4	N5.5	N10
10-Jul	NNW6	NNW6	N5	N6	N7	N5	N5	N7	N5	NE4	NE3	ENE5	E6	SE10	E8	E8	E5	SE2	NW13	WNW6	WNW8	NW11	NNW8	N6	N3.4	NW13
11-Jul	NW4	WNW3	NW3	NW5	NW4	NNW5	N6	NNE7	NNE4	NNE6	NE5	NNE3	SW4	NNW10	NW9	N12	N14	N15	N15	N13	N13	NNW8	NNW9	NNW9	N7.0	N15
12-Jul	NNW9	NNW8	NNW9	NW9	NW7	N5	N11	N12	N13	N13	N14	N15	N17	N17	N18	NNW15	N15	N20	N19	N13	N10	NNW12	NNW13	NNW9	N12.4	N20
13-Jul	NNW7	NNW8	NNW9	NNW8	NW7	NW5	NNW9	N14	N14	N17	N17	N16	N19	NNE10	NNE13	NNE14	NE8	NNE8	N14	N8	NNW8	N8	NNW6	W3	N9.7	N19
14-Jul	W4	WNW4	WNW3	WNW4	WNW4	WSW3	W1	WSW1	S4	SE5	SE5	ESE5	E4	NW9	WNW2	NNE6	SE5	NW5	NW7	NW6	NW7	WNW3	WNW4	WNW4	WNW1.8	NW9
15-Jul	WNW5	WNW2	SW2	SW2	SSW3	S4	SSE4	SSE5	SSE6	WNW4	M	M	SSE7	NW6	NNW17	NNW12	NW11	NW8	NW9	NNW10	NNW4	NW7	NW4	SSW3	NW3.3	NNW17
16-Jul	SSW3	SW3	W4	SSW5	SSW5	SSW5	S5	SSW6	S5	SSE5	SW4	WSW5	WNW6	SSW2	S7	S4	NW5	NNW14	NNW13	NNW15	NNW15	NNW12	NNW11	NNW9	WNW3.0	NNW15
17-Jul	NNW9	NNW8	NW9	NNW9	NNW7	NNW7	N7	N12	N11	N14	N11	NNE11	N11	N11	N13	NNE12	N11	N12	N10	NE4	NNW1	W3	WSW3	WSW3	N7.8	NNE14
18-Jul	SW3	WSW2	SW3	SW3	WSW3	SSW3	S4	SSE6	SSE7	SSE8	SSE10	SSE11	S10	S10	SSW8	SSW9	SSW8	SSW8	SSW8	SSW8	SSW7	SSW8	SSW8	SSW6	SSW6.1	SSE11
19-Jul	SW6	NNW2	SW2	S5	S3	S6	S9	S8	S10	SSW8	SSW10	SW10	SW10	SSW11	WNW10	WNW12	WNW11	NNW11	SSE5	SW3	NW6	SW1	WNW4	NW4	SW4.1	WNW12
20-Jul	NW4	NNW5	NNW5	NW7	N5	N7	N6	N6	NNW7	N7	NNE5	E4	NNE3	N6	N5	NNW7	NW3	SE0	SSE2	SSW2	SE4	SSW5	SSW5	NNW3	NNW3.0	N7
21-Jul	WNW2	W2	WSW1	SSW4	SSW5	SSW6	S6	SW4	W4	SW4	SW5	WNW9	WNW9	NW17	NNW19	N26	N22	N15	NNE12	N13	N9	N4	WSW3	SSW4	NNW5.0	N26
22-Jul	S4	WSW1	WSW3	W1	WNW4	WNW3	SSE1	S11	SSE12	SSE13	SSE14	SSE16	S14	S8	SSW7	NW7	NW7	S6	NW5	NNW8	NW8	NNW5	SW1	W3	SSW3.3	SSE16
23-Jul	WSW4	W5	WNW7	WNW7	NW7	NW4	NW5	NNE4	E5	NE4	E4	ESE3	ESE4	NNE5	SW5	S4	NW7	S4	SSW7	SW6	SSW3	SW4	SW4	S5	WSW1.3	SSW7
24-Jul	SSW4	SSW5	S7	S9	S6	S6	SSW8	SSW8	WSW9	WSW8	W10	SW11	WSW10	SW13	SW12	WSW9	NW23	WNW12	WNW7	WNW6	WNW6	WNW6	WNW5	W6	WSW6.4	NW23
25-Jul	WNW4	WNW3	WNW5	WSW4	W2	WNW5	WNW6	NNW11	NNW9	NW9	NNW11	NNW10	NE5	E6	NE5	NE5	NE7	ENE6	NE4	NNE4	N5	NNW3	NNW4	NNW4	NNW3.8	NNW11
26-Jul	NNW4	NW4	N4	SSE1	NW4	WSW1	SE6	SSE9	SSE11	S9	S8	S9	S10	S9	SSW7	S10	SSW7	SSW7	SSW6	S7	S5	S6	S8	SSW5	S5.0	SSE11
27-Jul	WSW3	SSW4	SSW6	SSW5	S4	S5	S3	ENE0	ESE1	N3	N7	N6	N13	NNE11	N12	N13	N10	NNE6	N10	N8	N5	NNW4	WNW4	NW5	N3.5	N13
28-Jul	NW5	WNW4	NW5	WNW2	WNW2	SW2	SSW2	SSW3	W3	SSE6	SSE6	SSE7	SE5	E2	NNE5	E4	NE6	ENE3	ESE4	ENE2	W5	NNW4	S4	SSW4	S0.5	SSE7
29-Jul	SSW7	SW4	SW2	SSW2	S5	S4	S6	S6	S9	S9	S7	SSW6	S10	S9	S10	SSW8	NNW6	N5	ENE2	ENE3	SSE3	SSE5	S6	NNW4	S4.1	S10
30-Jul	N7	SSE2	S5	WNW3	SW3	W2	SSW3	WSW3	WNW4	NNW4	ENE6	ESE6	SE7	WSW1	NNW14	SSE7	NE6	NE6	E4	N7	N8	NNW8	NNW6	WNW2	N1.7	NNW14
31-Jul	NW5	NW2	WNW4	WNW3	W2	NNW6	N7	N4	NW5	NW5	SW3	WNW5	W7	WNW10	WNW8	WNW5	N4	WNW2	WNW6	W3	WNW8	WNW7	WNW9	NW9	NW4.8	WNW10

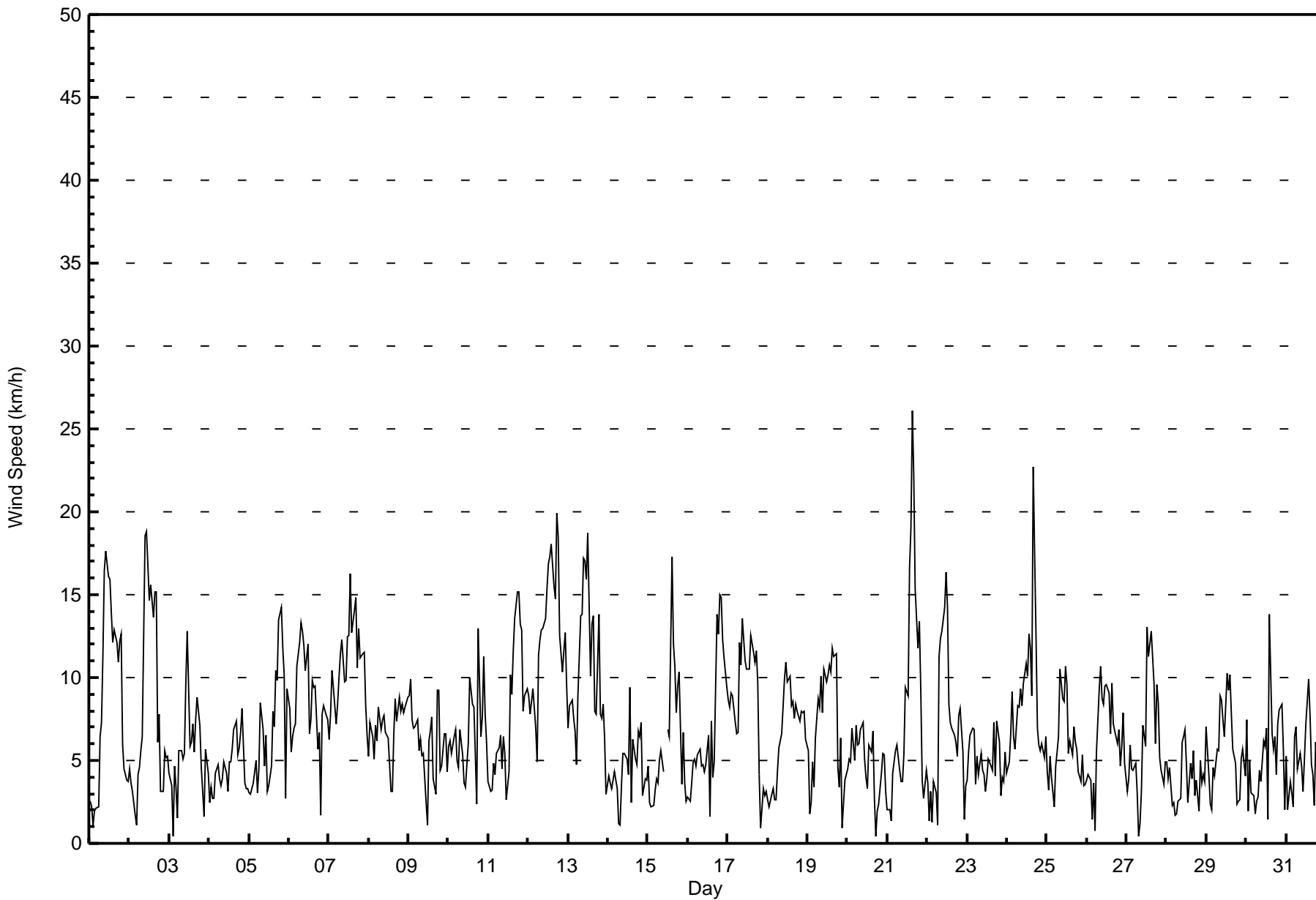
NW2.7	NW2.5	NW2.6	NNW2.5	NNW2.6	NNW1.6	NNW1.0	N1.1	N0.8	NNE0.6	ESE0.8	SE0.7	ESE0.2	NNW1.6	NNW2.8	N2.6	N4.5	N4.0	N3.7	NNW3.2	NNW3.7	NW3.5	NW2.5	NW3.0	Diurnal Average	
N9	N10	N10	N9	NNW7	N11	N12	N14	N14	S19	SSE19	SSE17	N19	N17	NNW19	N26	NW23	N20	N19	NNW15	NNW15	NNW12	NNW13	NNW9	Diurnal Maximum	

M - Maintenance
 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 - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	316	42.59	42.59
6 - 11	326	43.94	86.52
12 - 19	96	12.94	99.46
20 - 28	4	0.54	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 742

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

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

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	15	14	10	7	9	7	13	23	27	29	23	21	22	41	31	24	316
6 - 11	72	17	8	6	6	3	7	22	39	27	5	5	4	23	28	54	326
12 - 19	46	5	0	0	0	0	0	17	7	0	2	0	0	2	5	12	96
20 - 28	3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	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
Totals	136	36	18	13	15	10	20	62	73	56	30	26	26	66	65	90	742

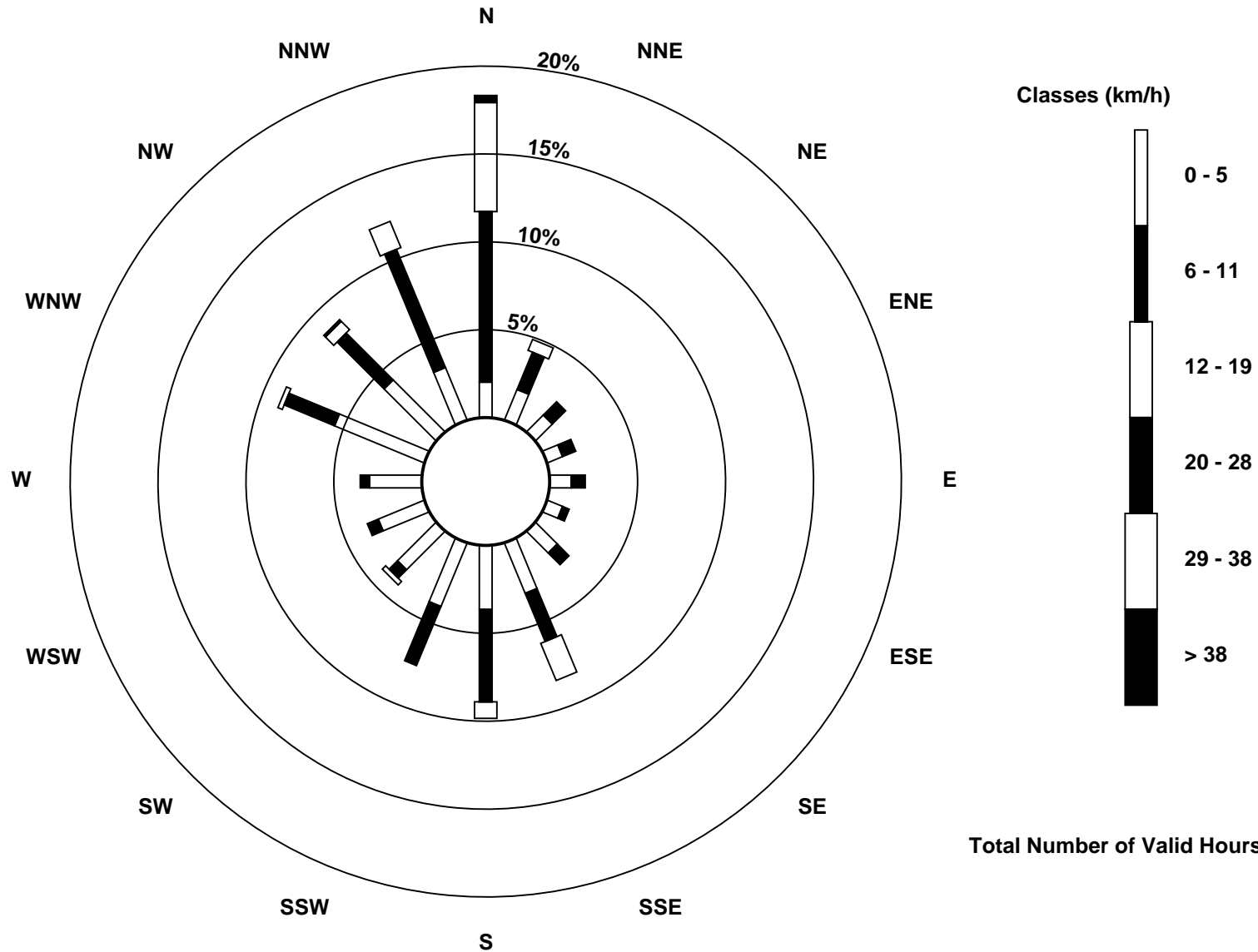
Total Number of Valid Hours: 742

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

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





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

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

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 8 km/h on Jul 16 13:00	Hours of Data: 742
Minimum Value: 1 km/h on Jul 2 03:00	Hours of Missing Data: 2
Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 3 P ₉₀ = 4 P ₉₉ = 6	Hours of Calibration: 0
	Percent Operational Time: 99.7

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

M - Maintenance



Wood Buffalo Environmental Association
Summary of Hour Averages

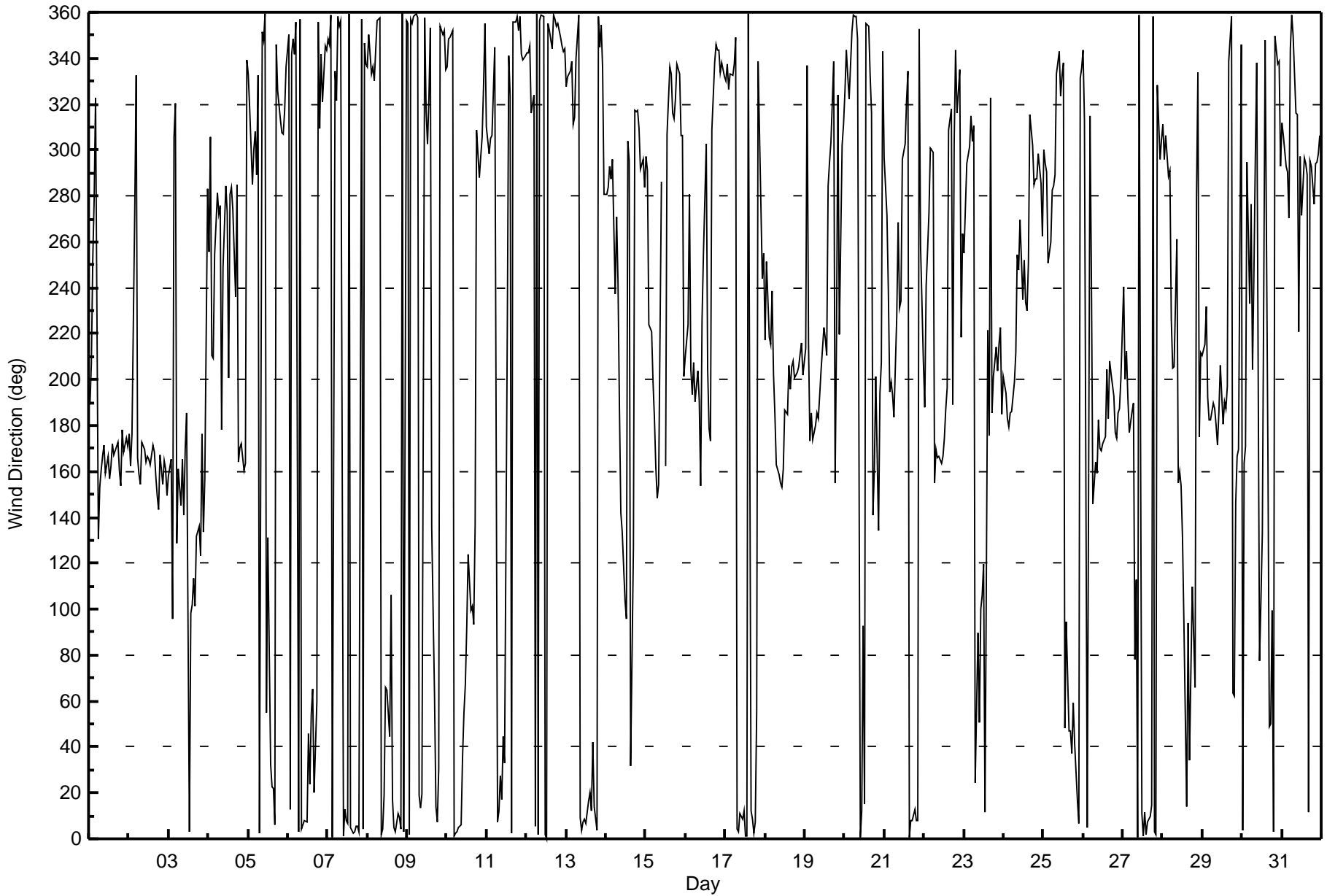
Wind Direction (WD) - deg
Fort McKay - Bertha Ganter - July 2016

Direction of Maximum Speed: 1 deg on Jul 21 16:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 351.9 deg on Jul 12	Hours of Data: 742
Direction of Minimum Speed: 78 deg on Jul 27 08:00	Hours of Missing Data: 2
Direction of Minimum Daily Speed Average: 0.5 deg on Jul 28	Percent Operational Time: 99.7
Monthly Average Direction: 299.5 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-Jul	189	207	252	279	323	130	153	160	167	172	159	166	157	162	172	167	171	173	160	154	178	169	175	171	166.4
2-Jul	177	162	176	275	333	166	158	154	173	170	164	166	165	163	172	168	158	150	143	167	154	165	161	149	164.3
3-Jul	158	166	96	306	320	129	161	145	165	141	170	186	3	98	102	113	101	132	136	123	177	134	157	283	143.6
4-Jul	255	306	210	209	254	281	272	276	178	249	284	273	201	281	284	274	236	285	164	170	172	160	164	339	239.7
5-Jul	333	319	285	300	308	289	333	3	351	348	359	55	131	32	22	22	6	346	326	313	307	307	317	336	338.0
6-Jul	350	13	342	348	342	356	3	357	4	6	8	8	46	24	54	65	20	60	356	310	341	321	346	343	5.4
7-Jul	348	346	359	1	334	322	358	354	356	1	13	8	7	359	5	3	3	6	6	3	357	4	347	337	358.4
8-Jul	337	351	333	336	330	344	356	358	2	4	19	66	64	45	106	17	5	3	11	9	5	360	3	356	4.6
9-Jul	355	2	357	355	358	359	357	19	13	20	358	316	303	323	353	136	62	14	7	31	354	350	352	335	359.5
10-Jul	336	348	349	352	1	2	3	5	6	36	55	67	92	124	100	101	94	137	309	288	297	306	328	355	4.4
11-Jul	310	298	305	306	325	345	7	12	28	17	44	33	227	341	323	2	356	356	358	352	358	342	339	341	349.8
12-Jul	342	342	346	316	324	6	359	2	356	359	358	2	0	355	352	344	359	357	354	355	349	345	343	344	351.9
13-Jul	327	332	334	338	311	314	340	359	9	4	7	8	7	16	20	12	42	14	4	358	345	354	335	281	358.5
14-Jul	281	284	293	287	296	238	271	242	188	142	134	104	96	304	295	32	127	317	317	317	309	292	296	284	298.6
15-Jul	297	291	224	221	199	183	162	148	154	286	M	M	162	307	336	333	316	313	322	337	333	306	306	201	306.0
16-Jul	210	224	281	204	194	207	190	204	191	154	226	255	303	204	179	173	308	338	346	343	343	334	338	332	300.5
17-Jul	330	337	326	333	333	338	349	4	3	11	8	12	1	1	359	12	8	2	8	56	339	277	244	255	355.2
18-Jul	217	251	218	215	239	202	185	163	159	155	153	161	187	185	206	196	205	208	201	203	206	211	216	202	192.1
19-Jul	214	337	216	173	186	174	180	185	183	193	205	223	218	211	284	294	303	338	155	219	324	219	302	311	230.8
20-Jul	325	344	332	322	351	359	358	358	348	1	12	93	15	355	354	333	316	141	161	201	134	194	207	343	347.8
21-Jul	296	272	238	194	199	193	184	228	268	231	234	296	302	322	334	1	8	8	13	8	8	353	258	208	334.1
22-Jul	188	241	256	273	301	299	155	169	166	166	163	167	175	187	197	309	318	189	304	344	316	335	219	264	200.0
23-Jul	255	275	294	301	315	304	311	25	90	51	100	106	120	12	221	175	323	186	201	214	204	215	223	185	255.0
24-Jul	202	194	183	179	186	186	199	212	255	248	269	235	252	234	230	251	315	302	285	287	288	299	286	262	249.9
25-Jul	300	294	291	251	260	283	285	289	333	343	324	332	338	48	95	47	47	37	59	41	17	7	331	336	344.2
26-Jul	344	313	5	159	315	242	146	164	159	182	170	169	172	175	205	183	208	202	193	177	175	186	187	200	182.4
27-Jul	241	200	212	192	177	186	190	78	113	1	359	11	1	12	2	7	10	15	358	3	2	328	296	305	354.6
28-Jul	311	296	306	289	291	226	205	205	261	155	160	154	131	94	14	94	34	73	110	66	280	334	175	212	175.2
29-Jul	211	216	232	192	182	182	190	187	180	172	186	206	181	190	187	197	338	358	64	62	147	167	170	346	187.9
30-Jul	4	164	171	295	233	276	205	246	297	338	78	104	133	237	348	166	49	50	99	3	349	337	339	293	7.8
31-Jul	312	307	293	290	270	344	359	350	316	316	221	297	271	296	294	289	11	295	293	276	294	295	298	307	303.9

307.5 314.8 306.7 299.9 302.5 304.4 325.4 353.3 351.9 32.1 108.0 131.7 111.7 332.4 341.2 2.1 357.7 355.4 351.8 345.5 329.6 319.6 305.4 309.2
 Diurnal Average

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





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

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

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 106 deg on Jul 20 18:00	Hours of Data: 742
Minimum Value: 7 deg on Jul 3 04:00	Hours of Missing Data: 2
Percentiles: P ₁ = 10 P ₁₀ = 15 Q ₁ = 19 Median = 27 Q ₃ = 46 P ₉₀ = 62 P ₉₉ = 89	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-Jul	61	33	76	42	35	61	16	19	19	18	17	21	21	23	23	24	18	18	14	16	12	26	19	76	
2-Jul	11	14	14	50	84	21	28	22	25	16	17	19	18	19	23	19	17	18	16	29	29	15	15	15	84
3-Jul	15	19	91	7	22	84	23	22	37	42	24	38	58	59	34	27	29	21	19	10	32	79	25	52	91
4-Jul	61	46	49	42	44	35	45	42	27	46	49	62	22	45	43	52	47	58	21	16	24	31	45	39	62
5-Jul	46	31	26	22	11	37	36	20	48	40	19	68	75	72	40	44	37	22	15	12	13	11	88	20	88
6-Jul	20	38	17	21	16	16	15	18	26	30	30	18	52	38	51	48	34	51	48	76	18	15	22	19	76
7-Jul	14	14	15	14	23	12	21	18	18	31	29	27	21	23	24	21	16	17	16	18	12	19	21	31	84
8-Jul	23	19	13	15	14	21	17	20	22	24	41	50	56	80	75	50	30	36	25	20	12	13	11	15	80
9-Jul	16	14	16	17	16	16	19	39	34	46	89	103	42	44	38	56	61	29	17	50	28	14	15	21	103
10-Jul	18	15	15	16	15	13	16	18	32	56	71	60	51	30	42	38	41	78	23	39	29	17	27	17	78
11-Jul	27	60	60	16	22	18	19	29	58	41	59	90	71	56	32	20	21	19	19	18	17	16	14	13	90
12-Jul	18	19	13	10	18	41	17	19	20	24	21	21	20	22	21	21	19	18	19	17	17	16	16	15	41
13-Jul	12	12	10	14	10	24	20	19	20	20	21	19	20	33	31	43	52	25	16	18	15	13	21	45	52
14-Jul	31	36	23	29	21	24	64	86	50	24	52	57	69	44	89	62	29	64	23	17	9	55	33	15	89
15-Jul	17	63	43	38	24	19	28	22	33	62	M	M	57	78	22	23	22	37	19	19	48	19	65	53	78
16-Jul	46	60	38	27	20	40	22	32	35	37	52	56	72	88	20	46	64	20	19	18	18	16	16	13	88
17-Jul	13	15	9	11	14	14	24	17	23	21	33	36	34	30	31	29	25	21	20	50	81	23	32	23	81
18-Jul	42	47	18	21	33	43	18	26	19	20	18	18	32	29	46	49	43	30	22	20	19	20	24	18	49
19-Jul	24	70	66	15	39	22	18	23	24	36	38	45	46	41	55	39	33	24	24	56	44	85	18	12	85
20-Jul	12	18	22	15	17	14	17	17	21	16	24	51	62	25	22	28	77	106	90	91	20	13	24	29	106
21-Jul	56	59	66	26	23	22	20	53	52	51	57	46	36	37	20	19	17	18	21	17	15	29	39	15	66
22-Jul	21	55	40	81	17	28	95	18	18	18	16	17	22	22	23	47	35	19	61	20	13	23	60	24	95
23-Jul	36	43	27	22	15	29	25	58	47	61	66	77	76	50	52	34	44	47	23	29	37	36	53	14	77
24-Jul	24	22	16	12	14	17	22	34	51	57	56	53	55	48	46	55	21	26	48	39	32	22	41	44	57
25-Jul	45	39	17	22	82	33	43	38	25	31	41	35	53	54	43	58	46	49	48	48	44	18	34	25	82
26-Jul	22	11	20	82	35	76	24	18	18	29	32	34	37	39	70	37	48	36	26	14	9	9	14	39	82
27-Jul	33	29	20	20	24	14	23	101	80	39	24	55	22	28	22	23	32	44	16	14	12	14	19	11	101
28-Jul	9	29	24	47	51	85	82	68	61	16	22	29	66	83	70	73	59	69	28	62	37	43	64	35	85
29-Jul	24	49	47	59	11	15	25	32	23	30	42	67	42	54	41	43	48	27	71	41	50	24	13	63	71
30-Jul	20	79	45	55	51	66	75	55	47	55	44	48	46	89	22	68	65	44	31	50	16	15	52	77	89
31-Jul	12	79	30	33	68	63	24	41	27	33	56	48	46	32	29	51	77	55	35	64	30	23	22	23	79
	61	79	91	82	84	85	95	101	80	62	89	103	76	89	89	73	77	106	90	91	81	85	88	77	
	Diurnal Maximum																								

M - Maintenance



Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	July 14, 2016	Last Calibration	June 1, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Reason:	Routine		
Start Time (MST)	8:25	End Time (MST)	12:00
Gas Cert Reference	LL107945	Station temp.	21 Deg C
Cal Gas Concentration	49.7 ppm	Cal Gas Exp Date	08/09/2018
Calibrator Make/Model	Sabio 4010	Serial Number	1730512
ZAG Make/Model	API 701	Serial Number	587
DACS make/model	Campbell Scientific CR3000	DACS serial No.	2582

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-614	-614
Analyzer IP address	192.168.1.43		Lamp voltage	813	809
Calculated slope	0.989640	0.996606	Chamber temp	44.9	45.0
Calculated intercept	0.444017	0.441203	Pressure	679.2	694.2
Analyzer Background	13.2	12.9	Flow	0.493	0.501
Analyzer Coefficient	0.954	0.944	Intensity	91	91

Analyzer make Thermo 43i Analyzer serial # JC1501301448

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5500	0.0	0.0	-0.1	----
as found span	5500	81.3	734.7	738.0	0.996
calibrator zero	5500	0.0	0.0	0.2	----
high point	5500	81.3	734.7	737.1	0.997
second point	5500	45.6	412.1	412.7	0.998
third point	5500	22.8	206.0	205.6	1.002
as left zero	5500	0.0	0.0	0.3	----
as left span	5500	81.3	734.7	735.9	0.998
Average Correction Factor					0.999

Corrected As found 738.1 Previous response 741.9 % change 0.5%

Notes:

Inlet filter changed after as founds. Span adjusted.

Calibration Performed By:

Devin Russell



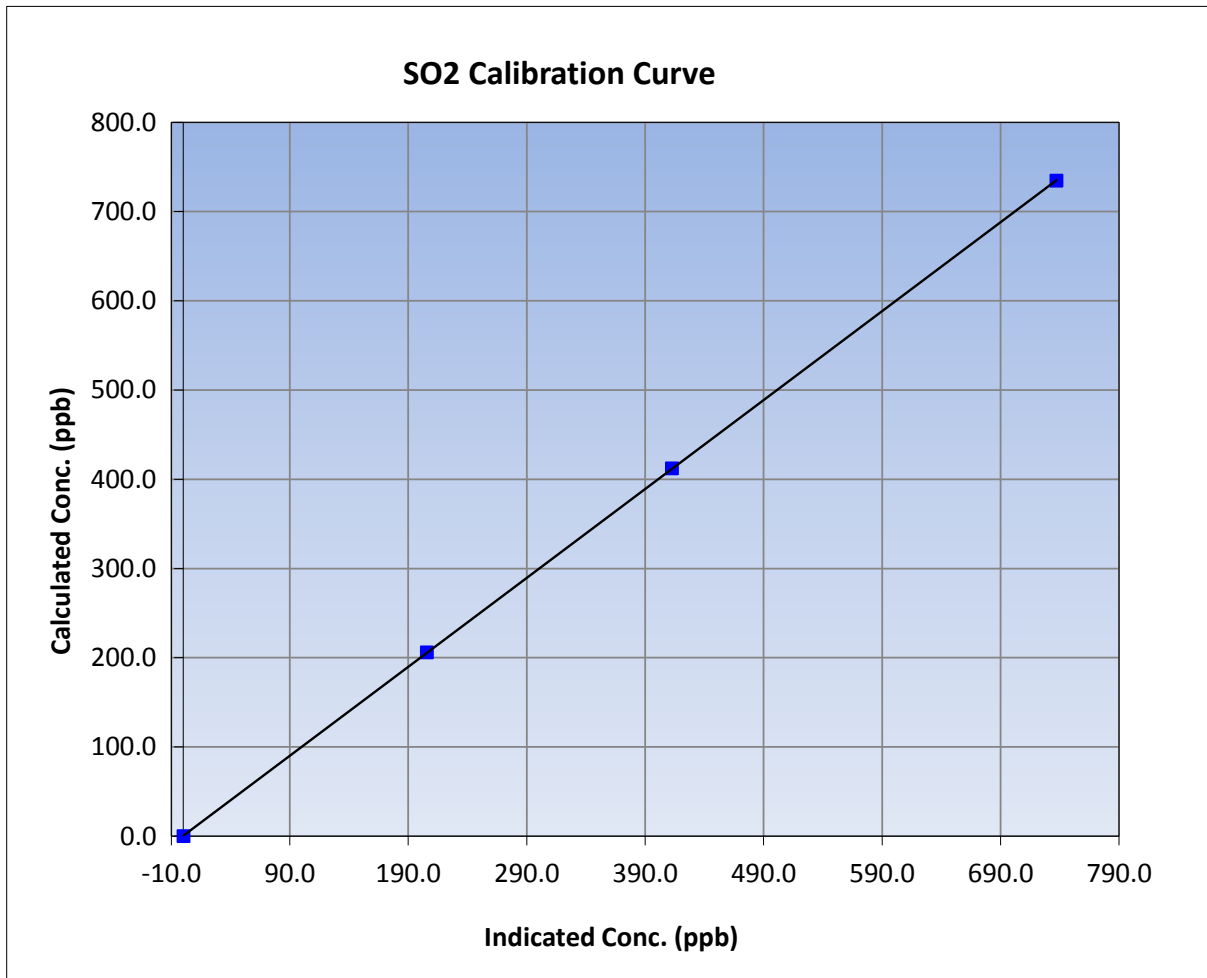
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	July 14, 2016	Previous Calibration	June 1, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	8:25	End Time (MST)	12:00
Analyzer make	Thermo 43i	Analyzer serial #	JC1501301448

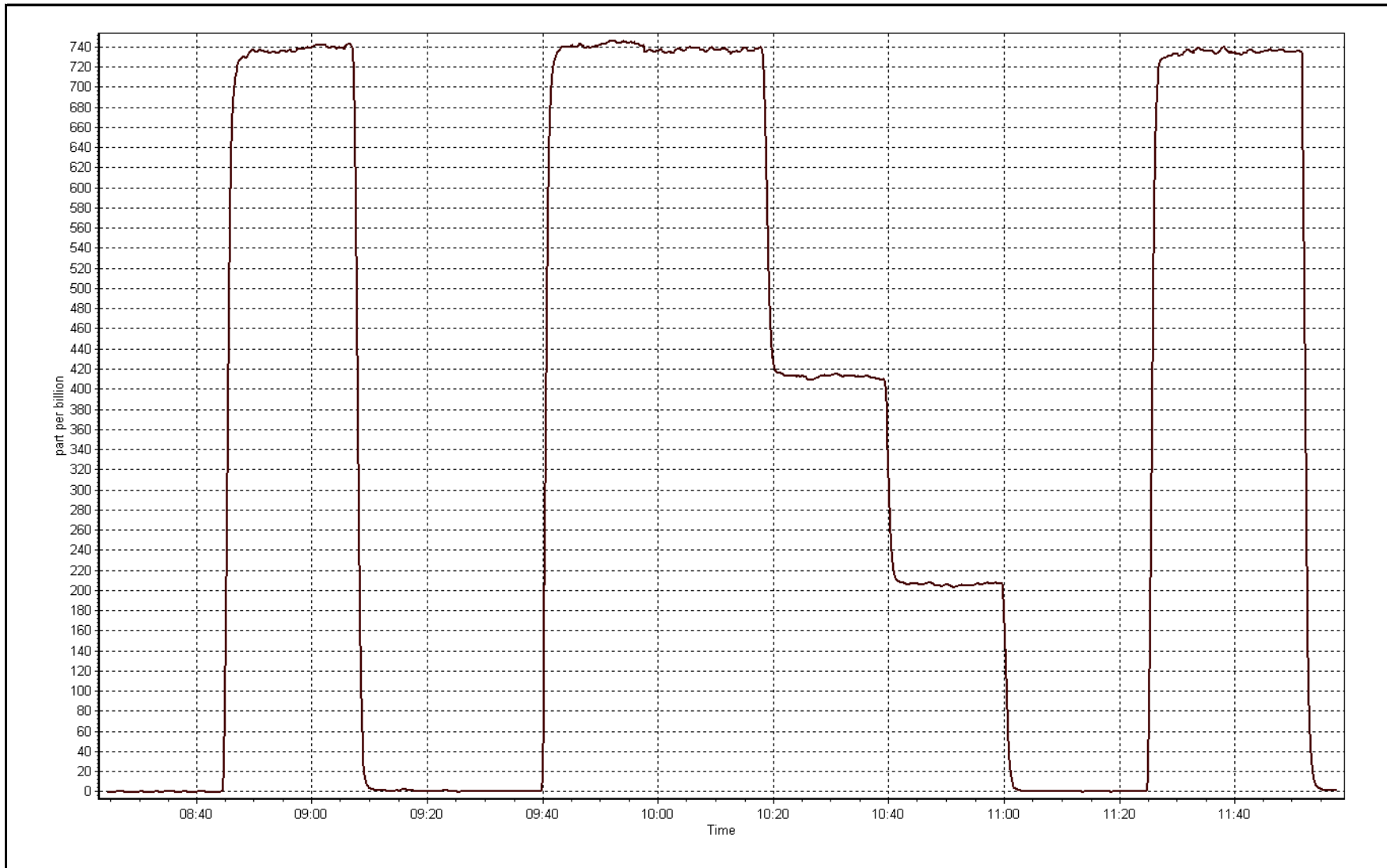
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	----	Correlation Coefficient	0.999996
734.7	737.1	0.9967		
412.1	412.7	0.9985	Slope	0.996606
206.0	205.6	1.0021		
			Intercept	0.441203



SO2 Calibration Plot

Date: July 14, 2016





Wood Buffalo Environmental Association TRS Calibration Report

Station Information

Calibration Date	July 18, 2016	Last Calibration	June 8, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Reason:	Routine		
Start Time (MST)	10:55	End Time (MST)	14:30
Gas Cert Reference	LL27480	Station temp.	21 Deg C
Cal Gas Concentration	10.6 ppm	Cal Gas Exp Date	21/12/2012
Calibrator Make/Model	Sabio 4010	Serial Number	1730512
Dil air Make/Model	API 701	Serial Number	587
DACS make/model	Campbell Scientific CR3000	DACS serial No.	9036
SO2 gas concentration	49.7 ppm	SO2 gas cert/exp	SA140071A 26/Sep/17

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-860	-860
Analyzer IP address	192.168.1.42		Lamp voltage	1146	1134
Calculated slope	1.005606	0.986103	Chamber temp	45	45
Calculated intercept	-0.058537	-0.097139	Pressure	672.1	673.0
Analyzer Background	1.9	1.93	Flow	0.437	0.438
Analyzer Coefficient	1.029	1.043	Intensity	79	80
			Converter temp.	800	800
Analyzer make/model	Thermo 43i-TLE		Analyzer serial #	1218153461	
Converter make/model	CDN-101		Converter serial #	470	

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	6000	0.0	0.0	-0.1	----
as found span	6500	46.0	75.0	74.0	1.013
SO2 scrubber check	5500	22.8	206.0	0.5	----
calibrator zero	6500	0.0	0.0	0.2	----
high point	6500	46.0	75.0	76.2	0.985
second point	6500	24.6	40.1	40.8	0.984
third point	6500	12.3	20.1	20.4	0.985
as left zero	6000	0.0	0.0	0.1	----
as left span	6500	46.0	75.0	76.9	0.976
Average Correction Factor					0.984

Corrected As found	74.1	Previous response	74.7	% change	0.8%
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Notes:

Inlet filter changed after as founds. Scrubber check completed after as founds. Span adjusted.

Calibration Performed By:

Devin Russell



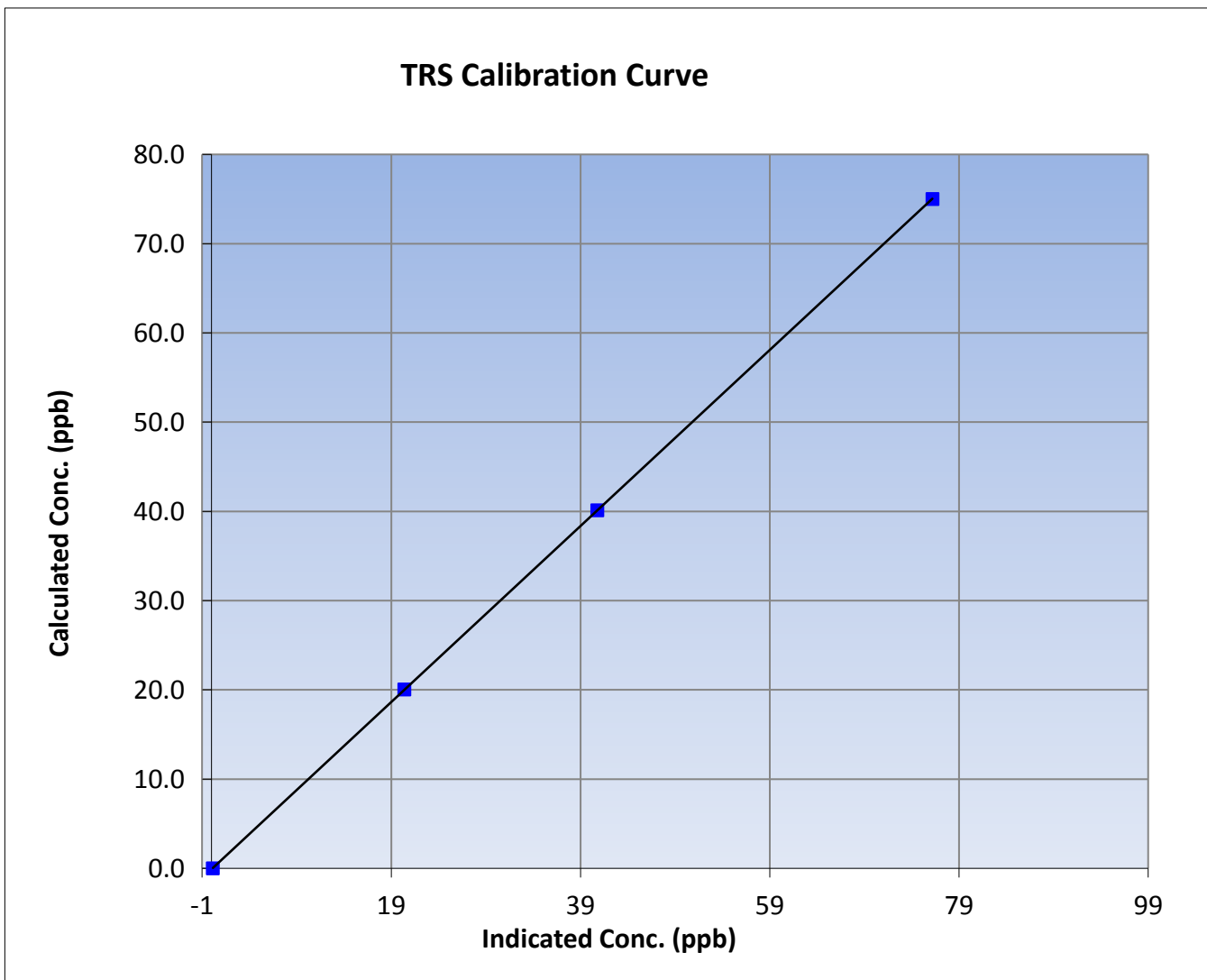
Wood Buffalo Environmental Association TRS Calibration Report

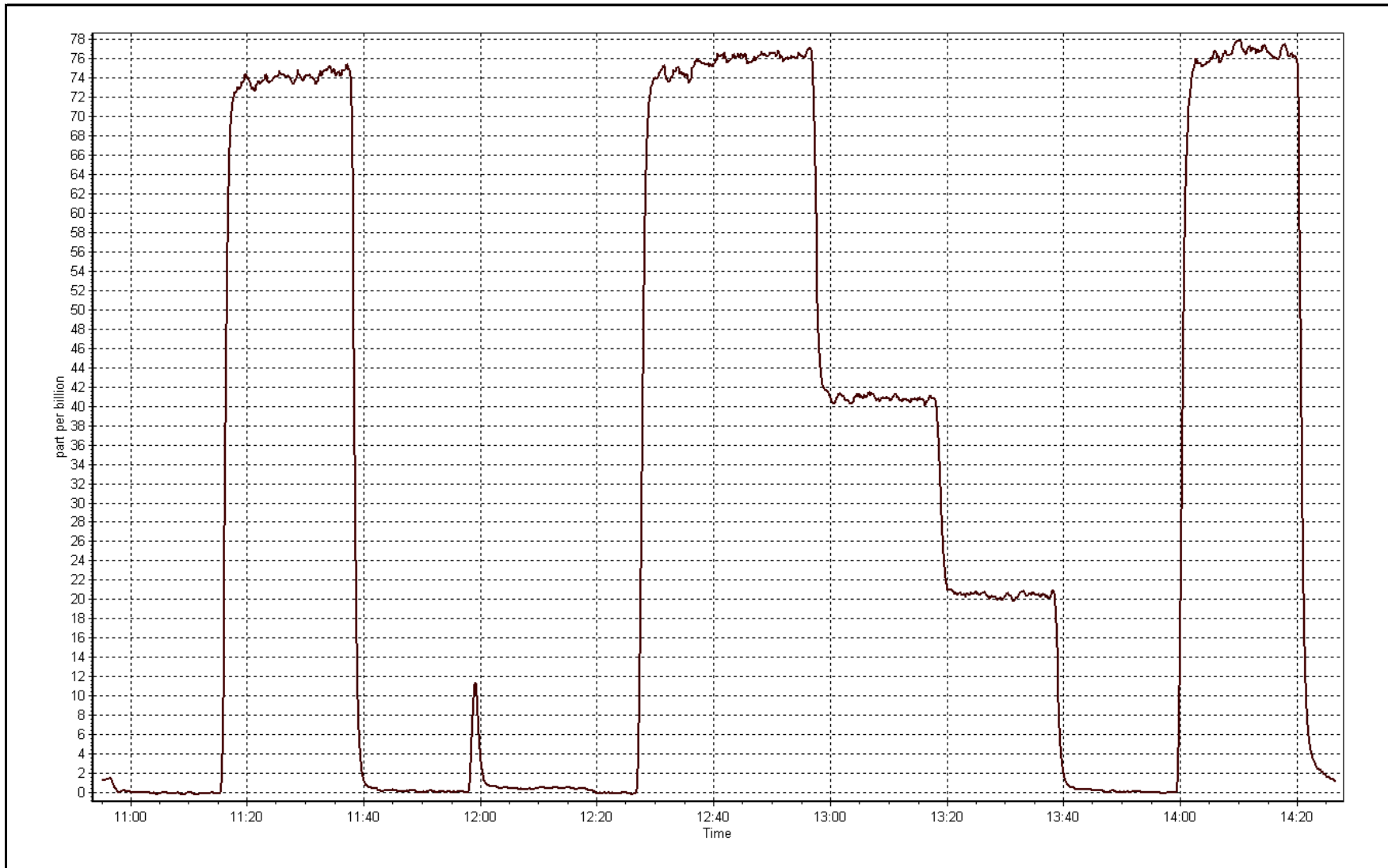
Station Information

Calibration Date	July 18, 2016	Previous Calibration	June 8, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	10:55	End Time (MST)	14:30
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1218153461

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	----	Correlation Coefficient	0.999998
75.0	76.2	0.9846		
40.1	40.8	0.9837	Slope	0.986103
20.1	20.4	0.9847		
			Intercept	-0.097139







Wood Buffalo Environmental Association THC / NMHC Calibration Report

Station Information

Calibration Date	July 14, 2016	Last Calibration	June 1, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Reason:	Routine		
Start Time (MST)	8:25	End Time (MST)	12:00
Gas Cert Reference	LL107945	Cal Gas Expiry Date	September-08-18
CH4 Cal Gas Conc.	515.0 ppm	CH4 Equiv Conc.	1065.0 ppm
C3H8 Cal Gas Conc.	200.0 ppm	Station temp.	21 Deg C
Calibrator Model	Sabio 4010	Serial Number	1730512
ZAG make/model	Teledyne API 701	Serial Number	587
DACS make/model	Campbell Scientific CR3000	Serial Number	2582

Analyzer Information

	Before	After		Before	After
THC Range (ppm)	0 - 50 ppm		Column Temp	75.2	75.1
NMHC Range (ppm)	0 - 25 ppm		Detector Temp	175.0	175.1
Analyzer IP address	192.168.1.55		Flame Temp	405.0	405.0
THC Calc slope	0.998743	0.997472	Carrier Pressure	37.3	37.3
THC Calc intercept	0.025928	0.022652	Fuel Pressure	44.3	44.3
NMHC Calc slope	0.998322	0.997507	Air Pressure	39.0	39.0
NMHC Calc intercept	-0.011193	-0.013114			

Analyzer make Thermo 55i Analyzer serial # 1152430012

THC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5500	0.0	0.00	0.00	----
as found span	5500	81.3	15.74	16.00	0.984
calibrator zero	5500	0.0	0.00	0.00	----
high point	5500	81.3	15.74	15.78	0.998
second point	5500	45.6	8.83	8.80	1.003
third point	5500	22.8	4.41	4.39	1.006
as left zero	5500	0.0	0.00	0.00	----
as left span	5500	81.3	15.74	15.77	0.998
Average Correction Factor					1.002

Corrected As found 16.00 Previous response 15.74 % change -1.6%

Notes:

Inlet filter changed after as founds. N2 cylinder changed after as founds. Span adjusted.

Calibration Performed By: Devin Russell



Wood Buffalo Environmental Association

THC / NMHC Calibration Report

NMHC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5500	0	0.00	0.00	----
as found span	5500	81.3	8.13	8.25	0.985
calibrator zero	5500	0.0	0.00	0.00	----
high point	5500	81.3	8.13	8.16	0.996
second point	5500	45.6	4.56	4.58	0.996
third point	5500	22.8	2.28	2.32	0.983
as left zero	5500	0.0	0.00	0.00	----
as left span	5500	81.3	8.13	8.16	0.996
Average Correction Factor					0.992

Corrected As found 8.25 Previous response 8.15 % change -1.2%

CH4 Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5500	0	0.00	0.00	----
as found span	5500	81.3	7.61	7.74	0.984
calibrator zero	5500	0.0	0.00	0.00	----
high point	5500	81.3	7.61	7.63	0.998
second point	5500	45.6	4.27	4.21	1.014
third point	5500	22.8	2.13	2.07	1.031
as left zero	5500	0.0	0.00	0.00	----
as left span	5500	81.3	7.61	7.61	1.000
Average Correction Factor					1.014

Corrected As found 7.74 Previous response 7.58 % change -2.0%



Wood Buffalo Environmental Association

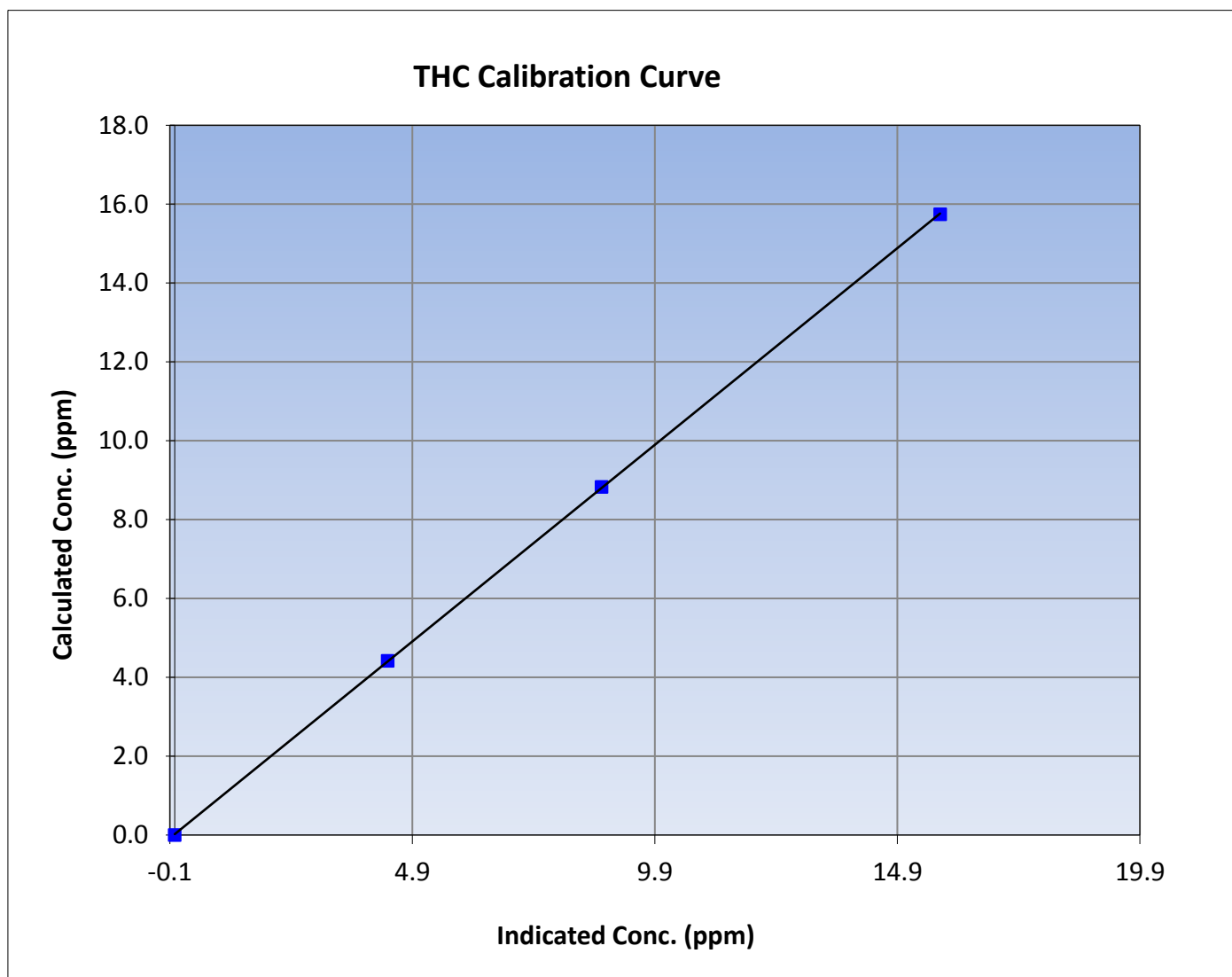
THC Calibration Summary

Station Information

Calibration Date	July 14, 2016	Previous Calibration	June 1, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	8:25	End Time (MST)	12:00
Analyzer make	Thermo 55i	Analyzer serial #	1152430012

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999985
15.74	15.78	0.9976		
8.83	8.80	1.0034	Slope	0.997472
4.41	4.39	1.0057		
			Intercept	0.022652





Wood Buffalo Environmental Association

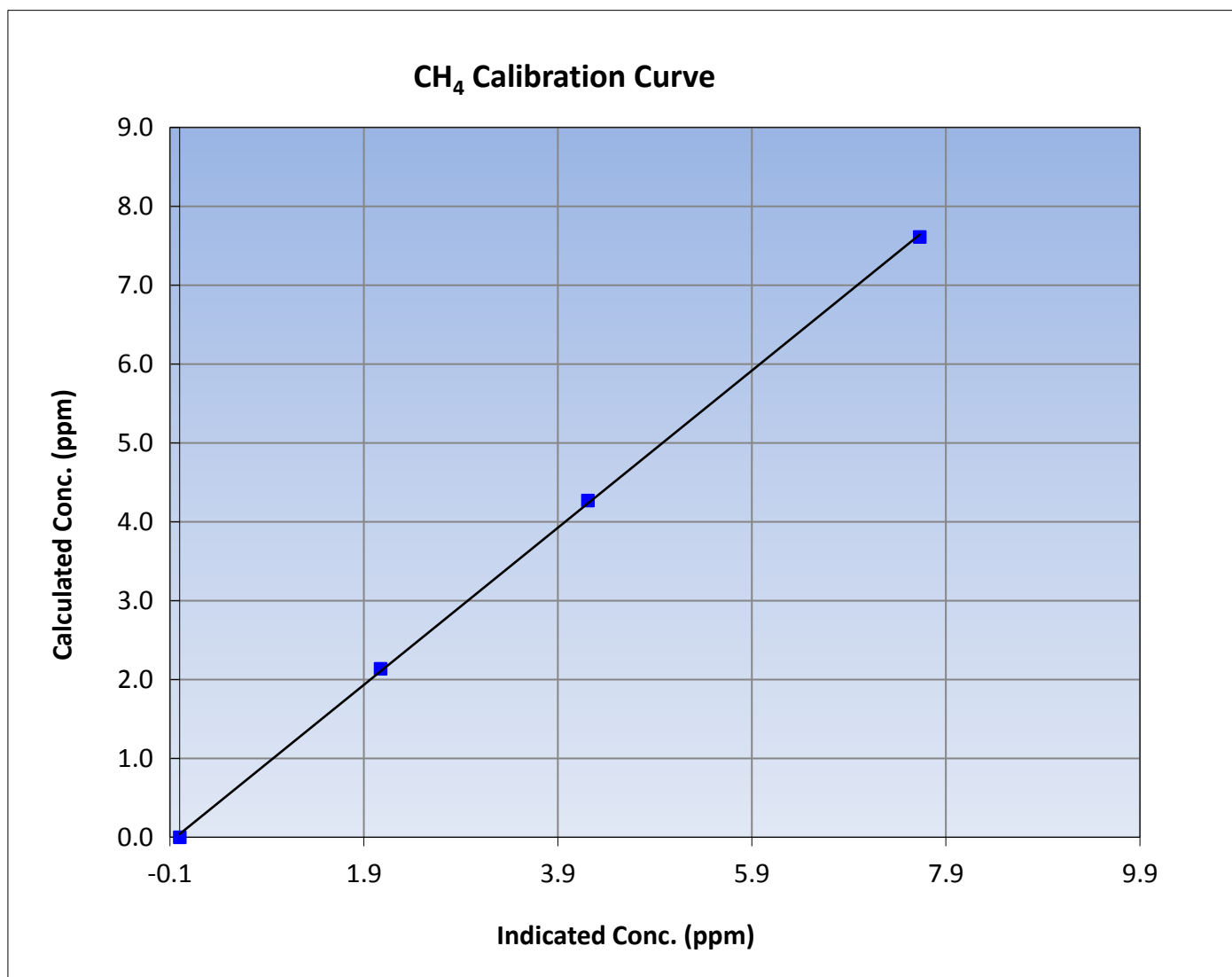
CH₄ Calibration Summary

Station Information

Calibration Date	July 14, 2016	Previous Calibration	June 1, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	8:25	End Time (MST)	12:00
Analyzer make	Thermo 55i	Analyzer serial #	1152430012

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999849
7.61	7.63	0.9977		
4.27	4.21	1.0142	Slope	0.996244
2.13	2.07	1.0314		
			Intercept	0.039903





Wood Buffalo Environmental Association

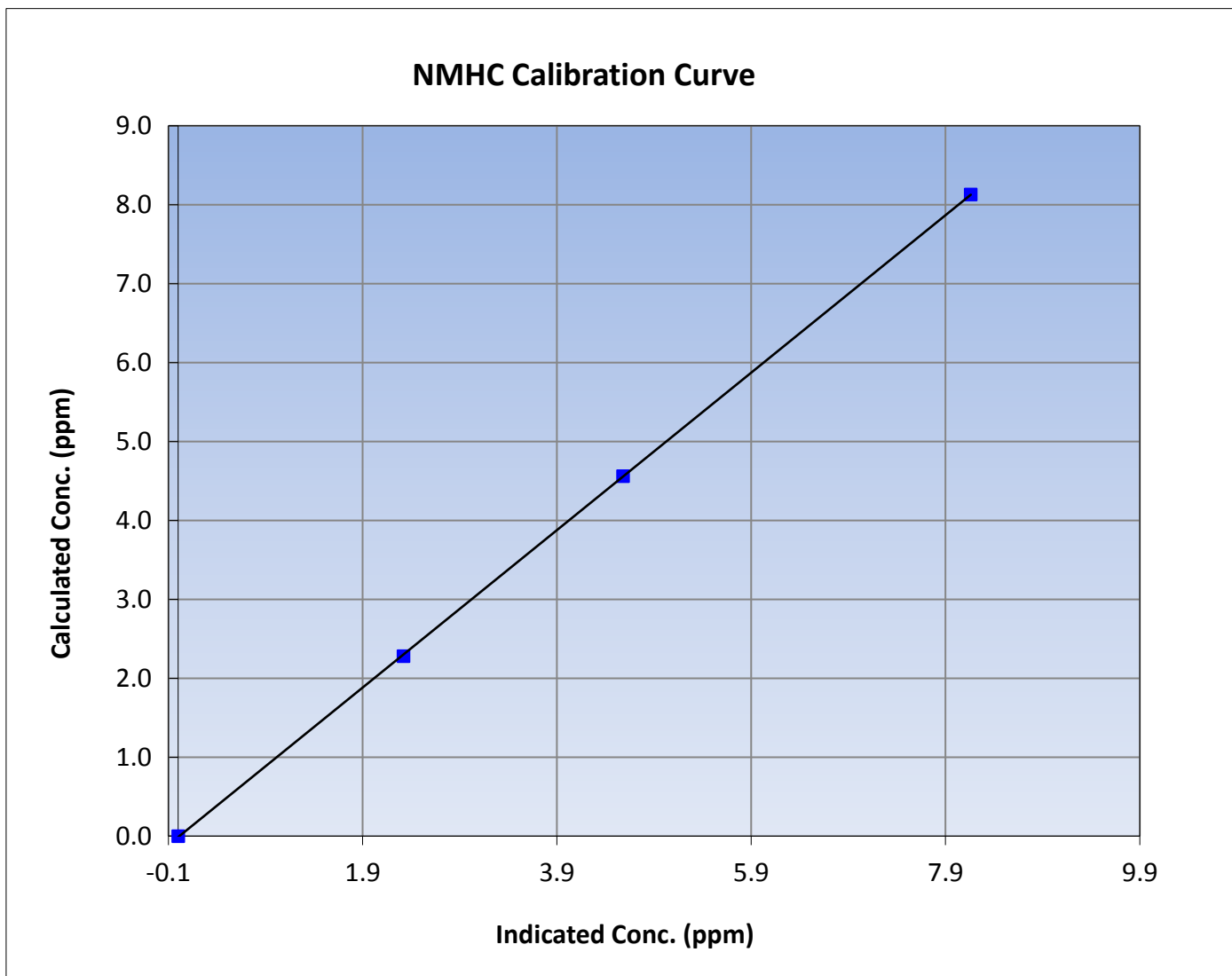
NMHC Calibration Summary

Station Information

Calibration Date	July 14, 2016	Previous Calibration	June 1, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	8:25	End Time (MST)	12:00
Analyzer make	Thermo 55i	Analyzer serial #	1152430012

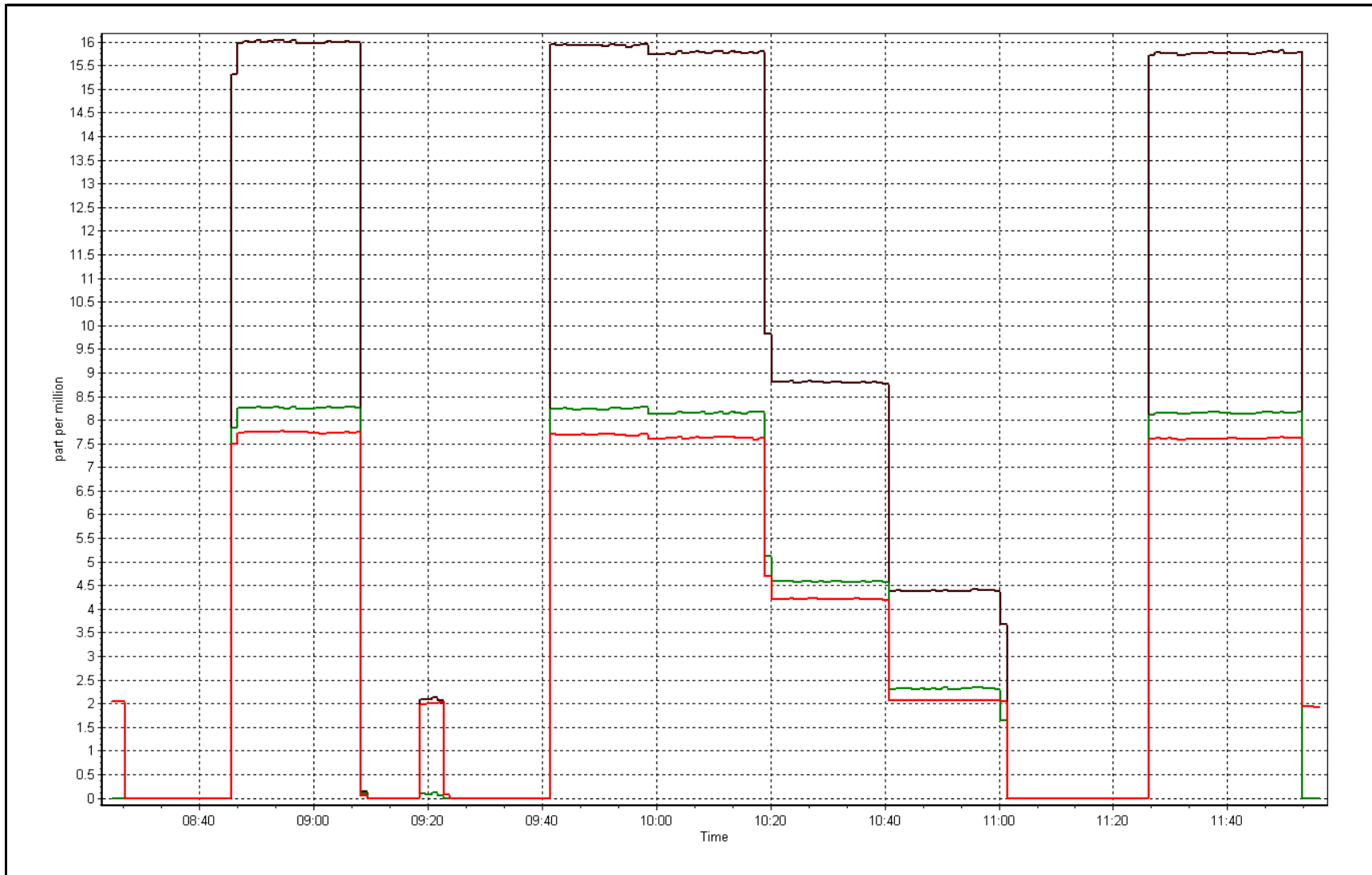
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999982
8.13	8.16	0.9963		
4.56	4.58	0.9956	Slope	0.997507
2.28	2.32	0.9828		
			Intercept	-0.013114



THC Calibration Plot

Date: July 14, 2016





Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	July 28, 2016	Previous Calibration	June 21, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Reason:	Routine		
Start Time (MST)	12:55	End Time (MST)	16:15
NO2 GPT Ref date	July-28-16	Transfer Standard	N/A
Calibrator Make/Model	Sabio 4010	Station temp.	23 Deg C
ZAG make/model	Teledyne API 701	Serial Number	1730512
DACS make/model	Campbell Scientific CR3000	Serial Number	587
		Serial Number	9036

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Bench temp.	29.0	29.3
Analyzer IP address	192.168.1.79		Lamp temp.	54.0	53.6
Calculated slope	0.999126	0.998271	Pressure	718.0	730.0
Calculated intercept	-1.401120	-1.682532	Flow cell A	0.776	0.774
Analyzer Background	-2.3	-2.4	Flow cell B	0.815	0.828
Analyzer Coefficient	1.029	1.062	Cell A Intensity	74xxx	73xxx
			Cell B Intensity	87xxx	88xxx

Analyzer make	49i	Analyzer serial #	1152220026
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Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator Lamp Intensity	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
	5000	0.00	0.0	0.4	----
	5000	0.98	422.0	408.6	1.033
calibrator zero	5000	0.00	0.0	0.0	----
high point	5000	0.98	422.0	423.3	0.997
second point	5000	0.56	250.0	253.0	0.988
third point	5000	0.34	129.4	133.2	0.972
As Left Zero	5000	0.00	0.0	0.1	----
As Left Span	5000	0.98	422.0	433.8	0.973
Average Correction Factor					0.986

Corrected As found	408.3	Previous response	423.8	% change	3.8%
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Notes:

Inlet filter changed after as founds. Span adjusted.

Calibration Performed By: Devin Russell



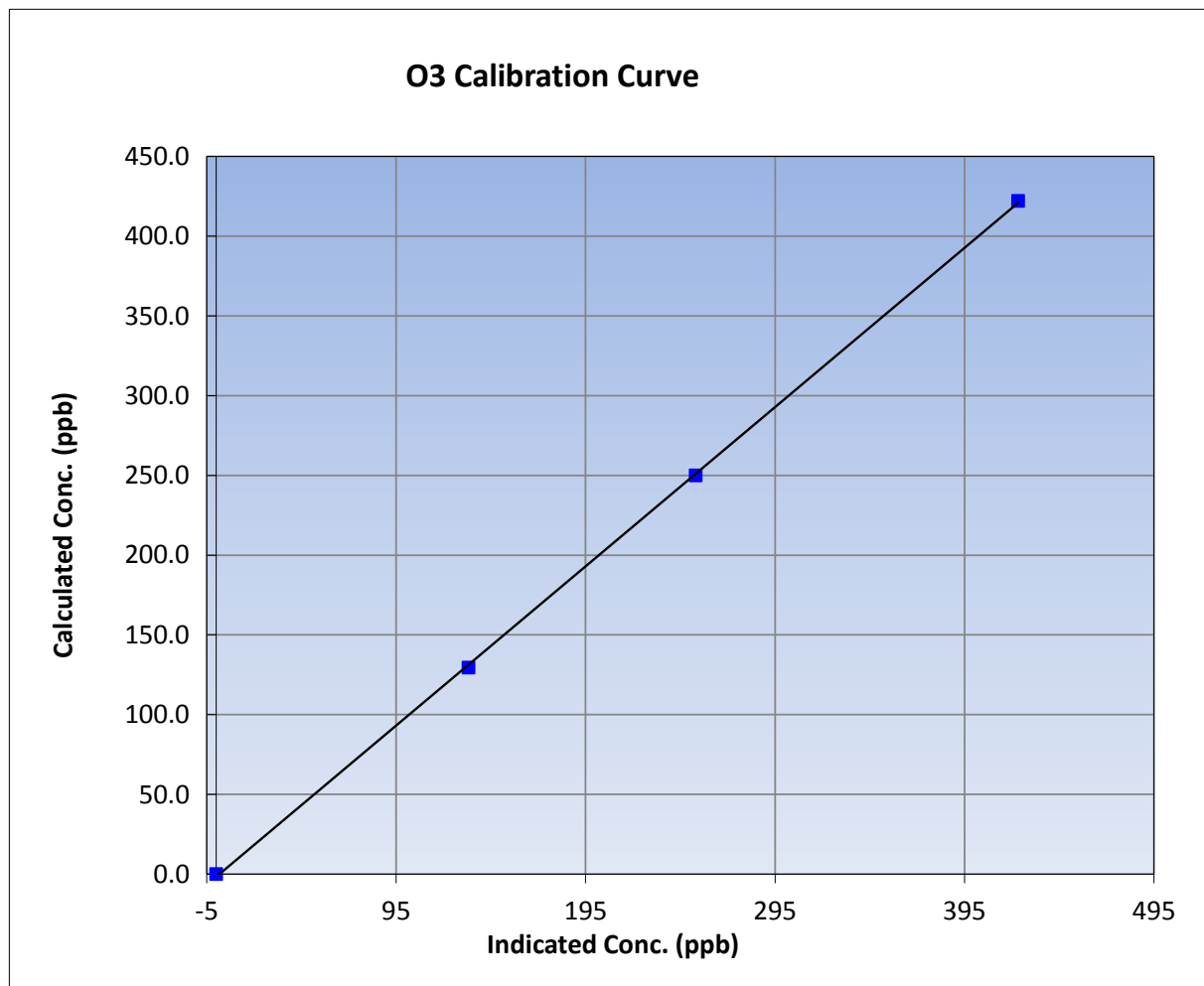
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	July-28-16	Previous Calibration	June 21, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	12:55	End Time (MST)	16:15
Analyzer make	49i	Analyzer serial #	1152220026

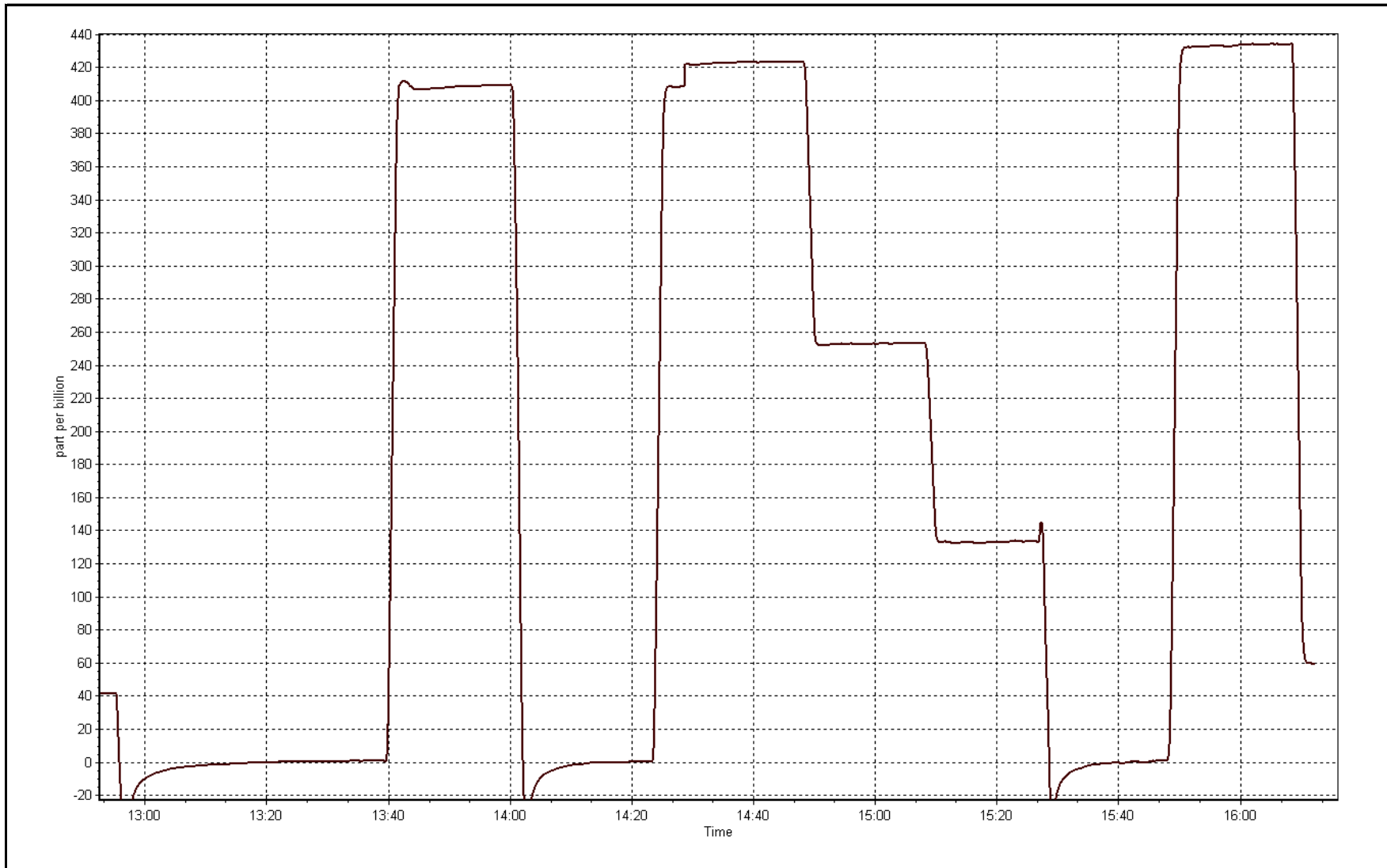
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999914
422.0	423.3	0.9970		
250.0	253.0	0.9880	Slope	0.998271
129.4	133.2	0.9715		
			Intercept	-1.682532



O3 Calibration Plot

Date: July 28, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	July 28, 2016	Previous Calibration	June 1, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Reason:	Routine		
Start Time (MST)	8:58	End Time (MST)	13:00
NO Cal Gas Conc	50.7 ppm	Gas Cert Reference	LL107945
NOX Cal Gas Conc	50.9 ppm	Cal Gas Expiry Date	09/08/2018
Calibrator	Sabio 4010	Serial Number	1730512
Zero air Generator	Teledyne API T701	Serial Number	587

DACS Information

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

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.998522	0.998272	1.001850
	Data Offset	-0.316248	0.090752	0.577622
Current Calibration	Data Slope	0.997312	0.997106	1.001685
	Data Offset	-0.337386	-0.236390	-0.128388

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1218153357
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.42		192.168.1.42	
NO coefficient	0.854		0.863	
NOX coefficient	1.003		1.002	
NO2 coefficient	1.000		1.000	
NO bkgrnd	5.4		5.4	
NOX bkgrnd	5.4		5.5	
Chamber Temp	50.4	Deg C	50.5	Deg C
Moly Temp	327.4	Deg C	327.4	Deg C
PMT voltage	-816.2	V	-817	V
PMT Temp	-2.6	Deg C	-2.9	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	157.2	mmHg	158.7	mmHg
R Cell Press Nox	157.2	mmHg	158.7	mmHg
NO sample flow	0.653	lpm	0.655	lpm
Nox sample Flow	0.653	lpm	0.655	lpm

Notes:

Inlet filter changed after as founds. Span adjusted. As lefts not completed.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

July 28, 2016

Station Number:

AMS 1

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5500	0.0	0.0	0.0	0.0	0.3	0.1	0.2	----	----
as found span	5500	81.4	753.3	750.4	3.0	746.3	742.5	3.8	1.0094	1.0106
calibrator zero	5500	0.0	0.0	0.0	0.0	0.3	0.2	0.1	----	----
high point	5500	81.4	753.3	750.4	3.0	755.6	752.7	3.0	0.9970	0.9970
second point	5500	45.6	422.0	420.3	1.7	423.7	422.1	1.6	0.9961	0.9959
third point	5500	22.8	211.0	210.2	0.8	211.8	210.9	0.9	0.9961	0.9965
as left zero										
as left span										
Average Correction Factor									0.9964	0.9964

Corrected As found NO_x= 746.0 NO= 742.4 Percent Change NO_x= 1.2% NO= 1.2%
 Previous Response NO_x= 754.8 NO= 751.6

GPT Calibration Data

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

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
1st NO ref point		3.0	758.8	756.7	0.1	0.9928	0.9917	----	----
1st NO2 (300)	334.7	424.9	759.1	334.7	424.4	0.9925	----	1.0014	99.9%
2nd NO2 (200)	506.6	253.0	759.3	506.6	252.7	0.9921	----	1.0012	99.9%
3rd NO2 (100)	627.3	132.4	759.5	627.3	132.2	0.9918	----	1.0008	99.9%
2nd NO ref point	----	3.0	759.4	757.2	2.2	0.9920	0.9910	----	----
Average Correction Factor						0.9921		1.0011	99.9%

Calibration Performed By: Devin Russell



Wood Buffalo Environmental Association

NO_x Calibration Summary

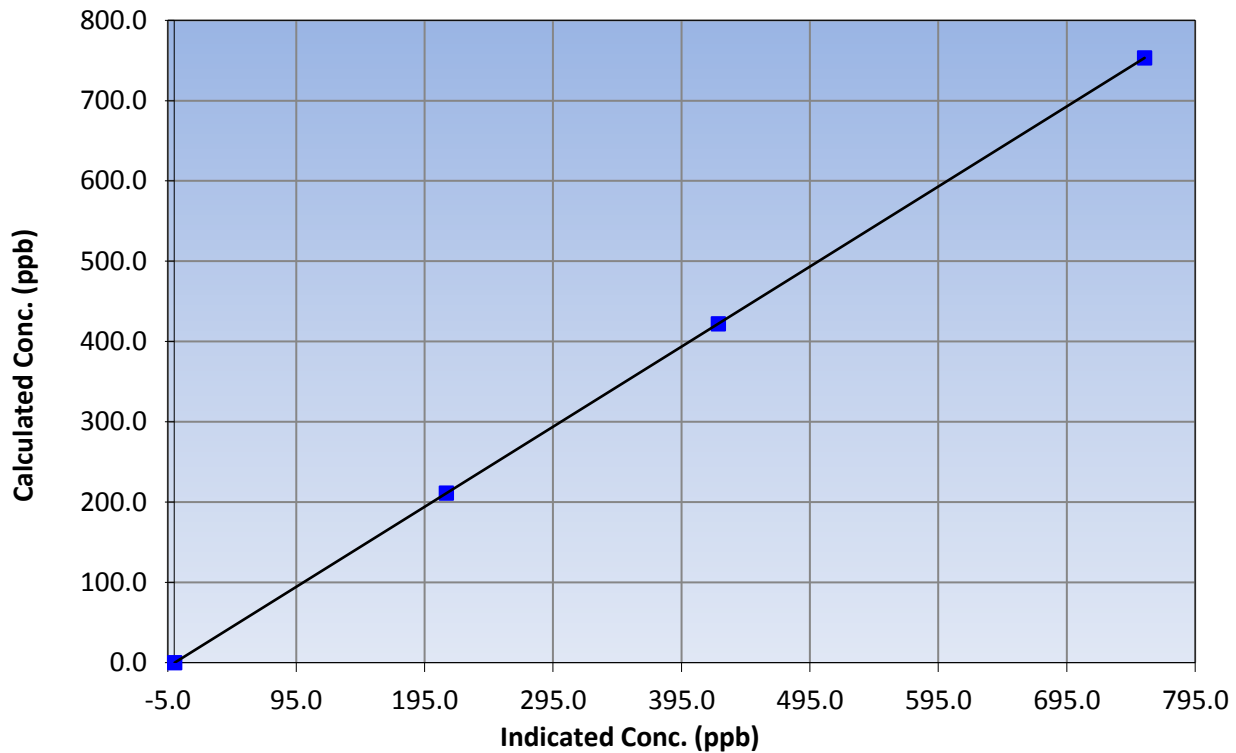
Station Information

Calibration Date	July 28, 2016	Previous Calibration	June 1, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	8:58	End Time (MST)	13:00
Analyzer make	Thermo 42i	Analyzer serial #	1218153357

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	----	Correlation Coefficient	1.000000
753.3	755.6	0.9970		
422.0	423.7	0.9961	Slope	0.997312
211.0	211.8	0.9961		
			Intercept	-0.337386

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

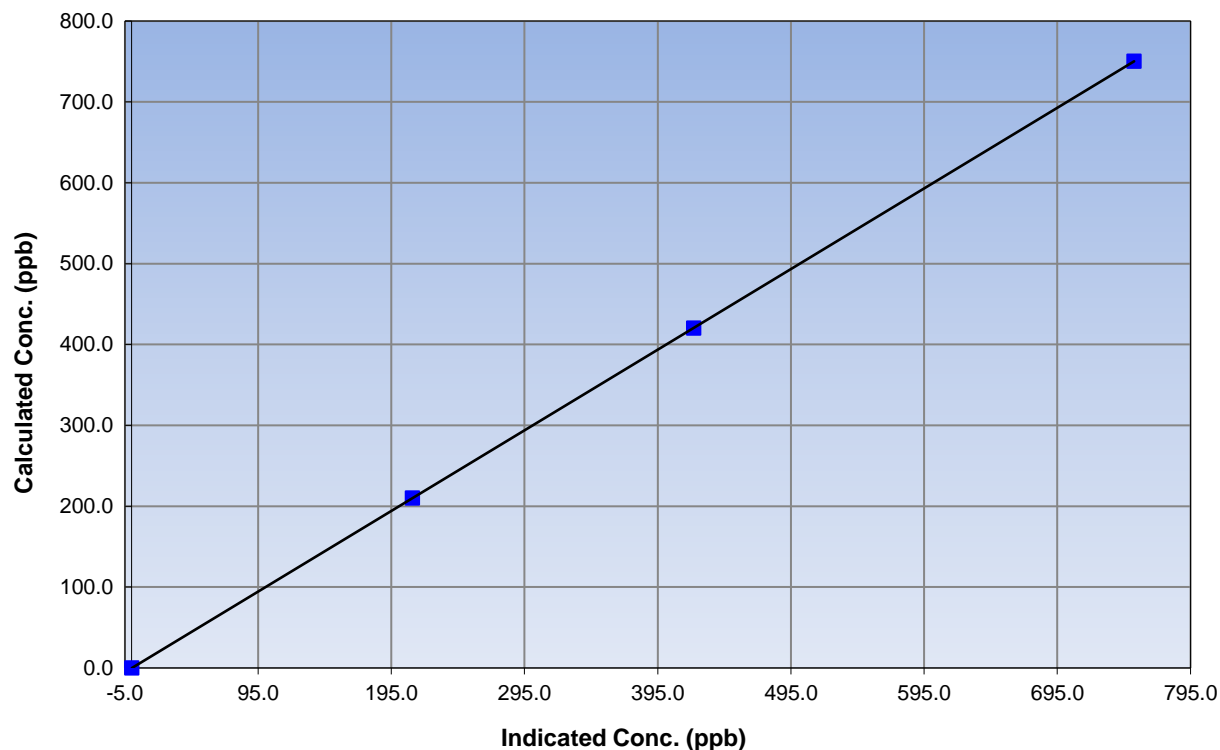
Station Information

Calibration Date	July 28, 2016	Previous Calibration	June 1, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	8:58	End Time (MST)	13:00
Analyzer make	Thermo 42i	Analyzer serial #	1218153357

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	N/A	Correlation Coefficient	1.000000
750.4	752.7	0.9970		
420.3	422.1	0.9959	Slope	0.997106
210.2	210.9	0.9965		
			Intercept	-0.236390

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

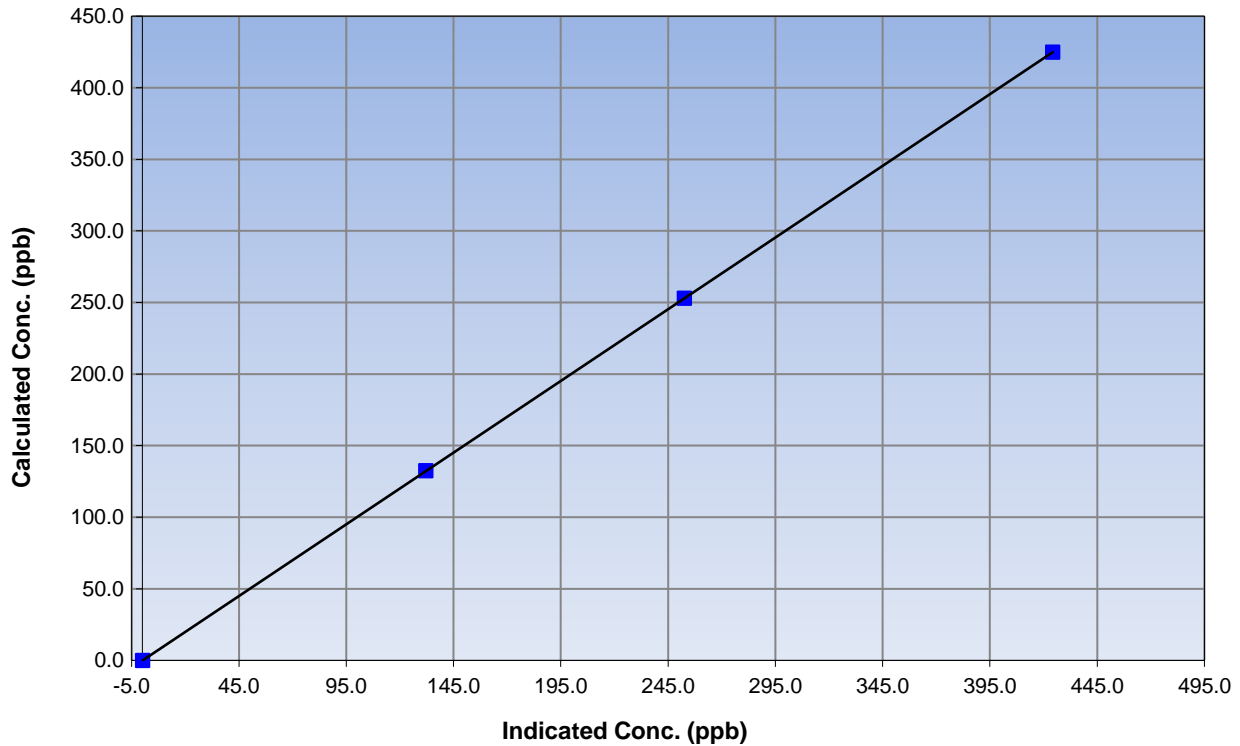
Station Information

Calibration Date	July 28, 2016	Previous Calibration	June 1, 2016
Station Number	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	8:58	End Time (MST)	13:00
Analyzer make	Thermo 42i	Analyzer serial #	1218153357

Calibration Information

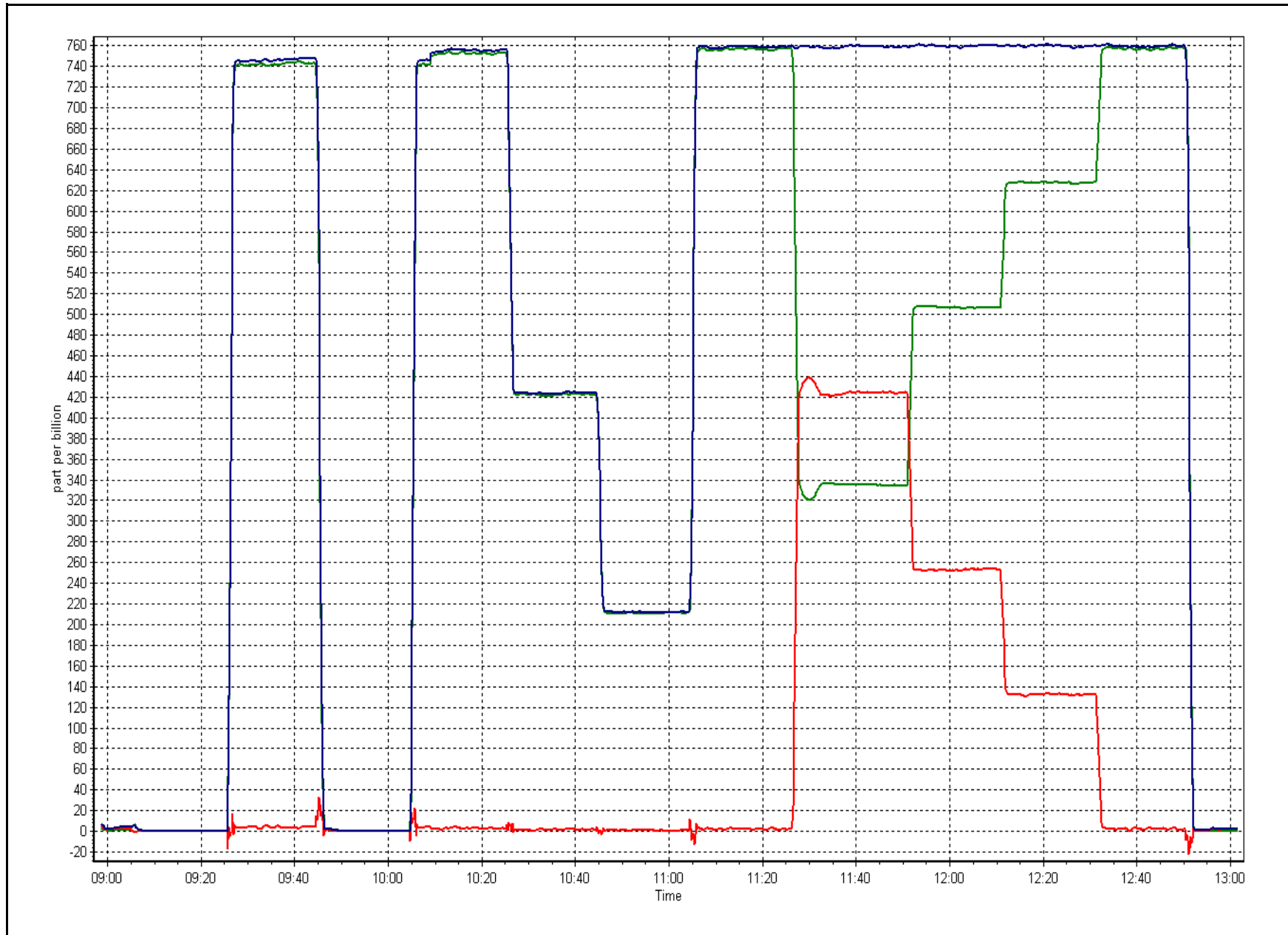
Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	N/A	Correlation Coefficient	1.000000
424.9	424.4	1.0014		
253.0	252.7	1.0012	Slope	1.001685
132.4	132.2	1.0008		
			Intercept	-0.128388

NO₂ Calibration Curve



NOX Calibration Plot

Date: July 28, 2016





Wood Buffalo Environmental Association

N_t-NO_x-NH₃ Calibration Report

Station Information

Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
NOX Calibration Date	July 28, 2016	NOX Previous Cal Date	June 1, 2016
NH3 Calibration Date	July 29, 2016	NH3 Previous Cal Date	June 2, 2016
Reason:	Routine		
Start Time (MST)	8:58	End Time (MST)	13:00
Calibrator	Sabio 4010	Station Temperature	21.0 Deg C
NH3 Cal Gas Conc	30.6 ppm	Serial Number	14300410
NOx Cal Gas Conc	50.9 ppm	NH3 Expiry Date / SN	9/Dec/2010 LL76495
NO Cal Gas Conc	50.7 ppm	NO Expiry Date / SN	8/Sep/2018 LL107945

DACS Information

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

Parameter		NH3	Nt	NOx	NO	NO2
Cal Stats As Found	Data Slope	1.004477	0.995359	0.998802	0.998586	1.006793
	Data Offset	-5.123507	-5.4544927	0.095795	0.361896	0.488104
Cal Stats After	Data Slope			0.997176	0.995381	1.008350
	Data Offset			-0.003373	0.478264	1.707710
IP address		192.168.1.77				

Analyzer Information

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

Test Point	before		after	
NH3 Conc range	0-2500	ppb	2500	ppb
NOx Conc range	0-1000	ppb	1000	ppb
NO BKG	-0.1	ppb	-0.1	ppb
NOx BKG	0.0	ppb	0.0	ppb
Nt BKG	0.1		0.1	
NO coefficient	1.211		1.198	
NO2 coefficient	1.000	ppb	1.000	ppb
NOx coefficient	1.343		1.329	
NH3 coefficient	0.951		0.951	
Nt coefficient	1.387		1.376	
NH3 conv temp	825	DegC	825	Deg C
Chamber Temp	50.0	Deg C	50.0	Deg C
Moly Temp	314.7	Deg C	315.0	Deg C
PMT Temp	7.0	Deg C	7.0	Deg C
O3 flow	84.0	ccm	85.0	ccm
R Cell Press	4.9	mmHg	5.1	mmHg
PMT Voltage	645.0	v	645.0	v
Sample Flow 1 NO	547.0	ccm	554.0	ccm
Sample Flow 2 Nox	527.0	ccm	525.0	ccm
Sample Flow 3 Nt	510.0	ccm	518.0	ccm

Notes:

Inlet filter changed after as founds. NO/NOx Span adjusted. Second high NO point used for GPT reference. NH3 as founds completed. Converter cleaned of dust particle build up. NH3 cylinder changed. See separate cal sheet for remainder of calibration with new cylinder.



Wood Buffalo Environmental Association

NH₃ Calibration Report

Station Information

Calibration Date:

July 29, 2016

Station Number:

AMS 1

NH₃ Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated Nt conc (ppb)	Calculated NOx conc (ppb)	Calculated NH ₃ conc (ppb)	Indicated Nt conc (ppb)	Indicated NOx conc (ppb)	Indicated NH ₃ conc (ppb)	Nt Correction factor	NH ₃ Correction factor
as found zero	5500	0.0	0.0	0.0	0.0	1.6	0.1	1.5	----	----
as found NO	5500	81.3	752.4	752.4	----	736.9	738.6	-1.7	1.021	----
calibrator zero	5500	0.0	0.0	0.0	0.0	0.0	-0.3	0.3	----	----
high NO point	5500	81.3	752.4	752.4	----	754.5	755.2	-0.6	0.997	----
NO/O ₃ point	5500	81.3	752.4	752.4	----	754.4	754.4	-0.1	0.997	----
as found NH ₃	1500	88.2	1799.3	NA	1799.3	1779.1	16.9	1762.2	1.011	1.021
first NH ₃	1500	88.2	1799.3	NA	1799.3					
second NH ₃	1500	49.0	999.6	NA	999.6					
third NH ₃	1500	24.6	501.8	NA	501.8					
Average Correction Factor									0.9973	

Nt Corrected As Found Nt = 735.2 ppb
 NOx Corrected As Found NOx = 738.5 ppb
 NH₃ Previous Converter Efficiency = 95.1 %

Previous Response Nt = 761.4 ppb
 Previous Response NOx = 753.2 ppb
 NH₃ Current Converter Efficiency = 95.1 %

Nt percent change 3.6%
 NOx percent change 2.0%
 NH₃ percent change 0.0%



Wood Buffalo Environmental Association

NO_x(NH₃) Calibration Report

Station Information

Calibration Date:

July 28, 2016

Station Number:

AMS 1

NO_x / NO / Nt Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NO _x conc (ppb)	Calculated NO conc (ppb)	Calculated Nt conc (ppb)	Indicated NO _x conc (ppb)	Indicated NO conc (ppb)	Indicated Nt conc (ppb)	NO _x Correction factor	NO Correction factor
as found zero	5500	0.0	0.0	0.0	0.0	-0.6	0.0	-0.2	----	----
as found span	5500	81.4	753.3	750.4	753.3	760.6	760.4	759.2	0.9904	0.9867
calibrator zero	5500	0.0	0.0	0.0	0.0	-0.3	-0.2	0.0	----	----
high point	5500	81.4	753.3	750.4	753.3	755.2	753.4	754.5	0.9975	0.9960
second point	5500	45.6	422.0	420.3	422.0	423.6	422.0	423.6	0.9963	0.9961
third point	5500	22.8	211.0	210.2	211.0	211.8	210.2	211.8	0.9964	0.9998
Average Correction Factor									0.9967	0.9973

	<u>Nt</u>	<u>NOX</u>	<u>NO</u>	<u>NO2</u>
Corrected As found	759.3	761.2	760.4	----
Previous Response	762.3	754.1	751.1	----
Percent Change	0.4%	-0.9%	-1.2%	0.3%

GPT Calibration Data

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

O ₃ Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO ₂ conc (ppb)	Indicated NO _x conc (ppb)	Indicated NO conc (ppb)	Indicated NO ₂ conc (ppb)	NO _x Correction factor	NO Correction factor	NO ₂ Correction factor	Converter Efficiency
1st NO ref point	----	3.0	754.4	754.7	-0.2	0.9986	0.9943	----	----
1st NO ₂ (300)	332.6	425.0	753.5	332.6	420.9	0.9998	----	1.0099	99.0%
2nd NO ₂ (200)	503.7	253.9	753.0	503.7	249.3	1.0004	----	1.0185	98.2%
3rd NO ₂ (100)	625.6	132.0	753.0	625.6	127.4	1.0005	----	1.0366	96.5%
2nd NO ref point	----	3.0	755.5	755.7	-0.1	0.9971	0.9930	----	----
Average Correction Factor						0.9994	0.9936	1.0216	97.9%

Calibration Performed By: Devin Russell



Wood Buffalo Environmental Association

NH3 Calibration Summary

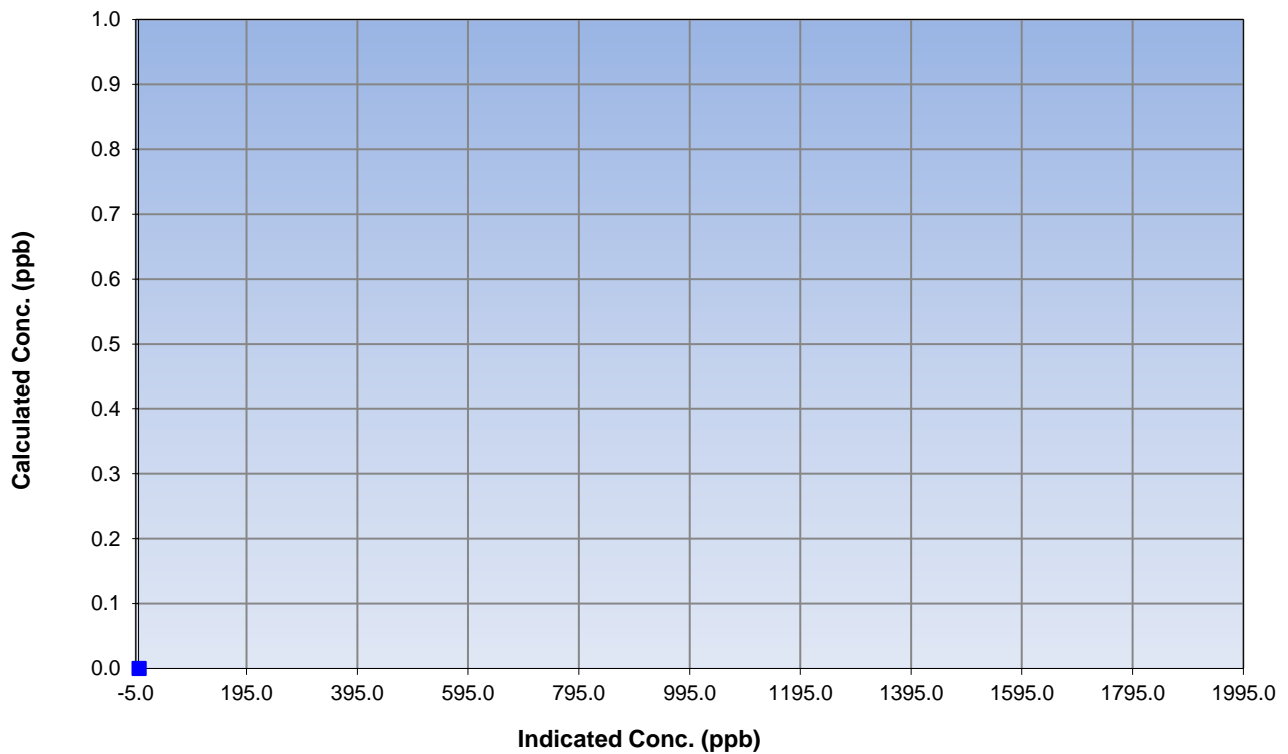
Station Information

Calibration Date	July 29, 2016	Previous Calibration	June 1, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	8:58	End Time (MST)	13:00
Analyzer make	API T201	Analyzer serial #	152

NH3 Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	----	Correlation Coefficient	
1799.3				
999.6			Slope	
501.8				
			Intercept	

NH3 Calibration Curve





Wood Buffalo Environmental Association

Nt Calibration Summary

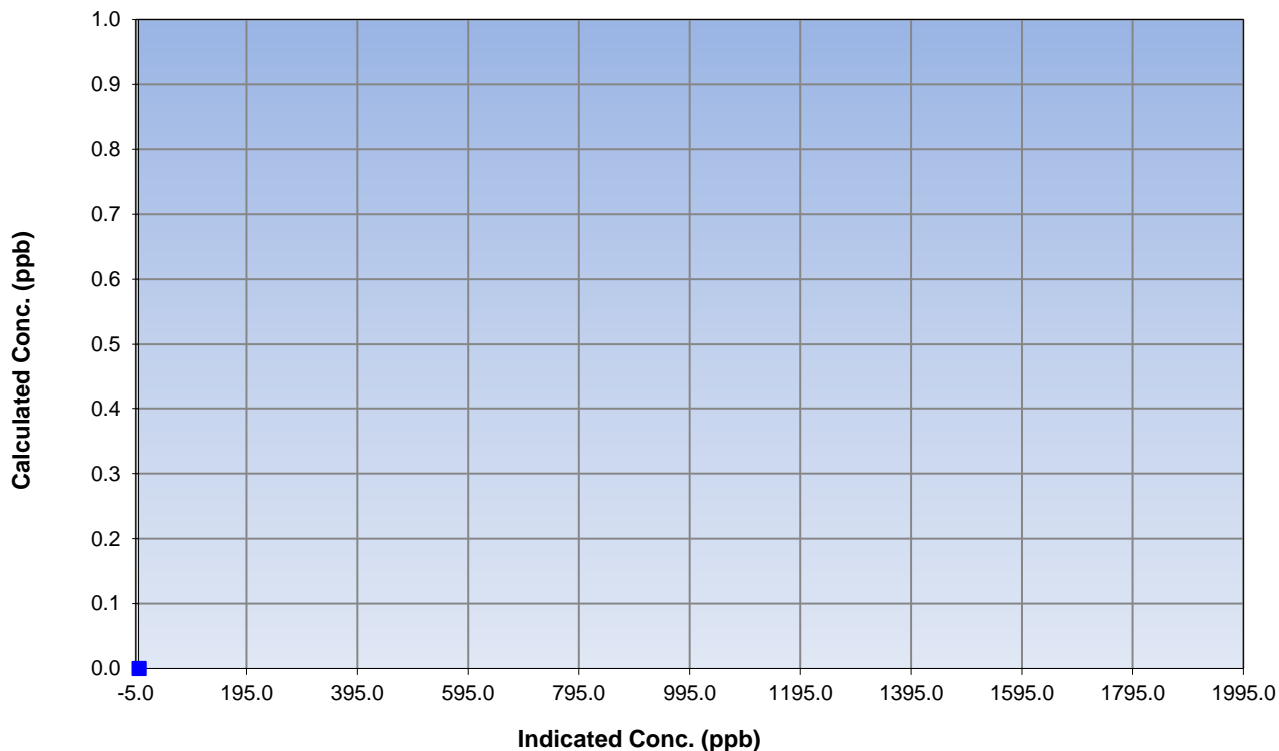
Station Information

Calibration Date	July 29, 2016	Previous Calibration	June 1, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	8:58	End Time (MST)	13:00
Analyzer make	API T201	Analyzer serial #	152

Nt (NH₃) Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	
1799.3				
999.6			Slope	
501.8				
			Intercept	

Nt Calibration Curve





Wood Buffalo Environmental Association

NOx Calibration Summary

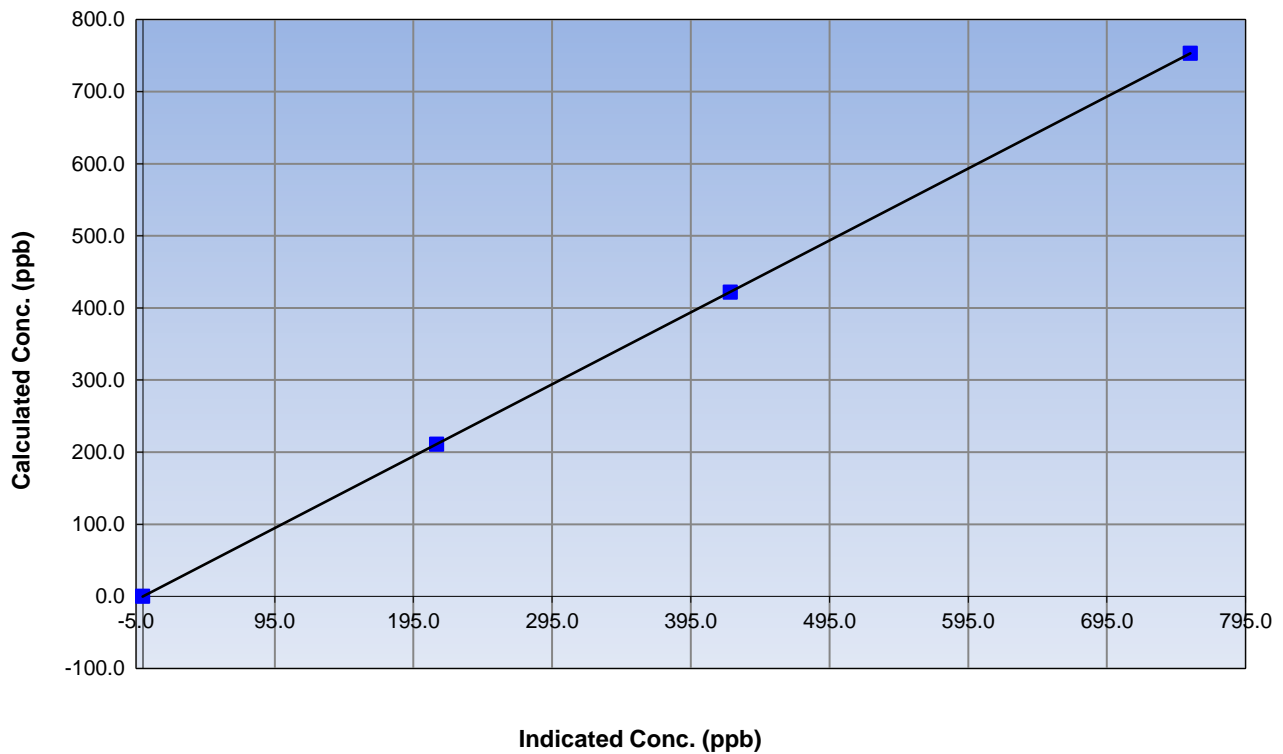
Station Information

Calibration Date	July 28, 2016	Previous Calibration	June 1, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	8:58	End Time (MST)	13:00
Analyzer make	API T201	Analyzer serial #	152

NO_x Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.3	----	Correlation Coefficient	0.999999
753.3	755.2	0.9975		
422.0	423.6	0.9963	Slope	0.997176
211.0	211.8	0.9964		
			Intercept	-0.003373

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

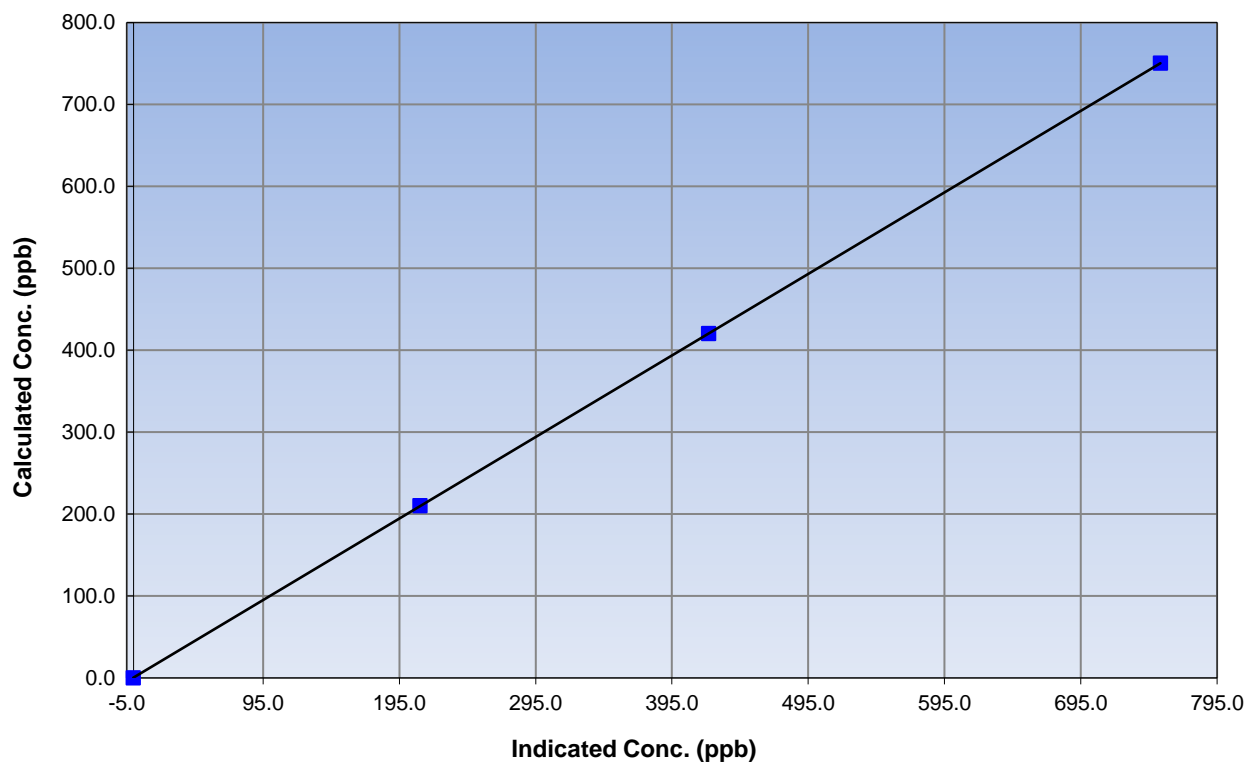
Station Information

Calibration Date	July 28, 2016	Previous Calibration	June 1, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	8:58	End Time (MST)	13:00
Analyzer make	API T201	Analyzer serial #	152

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	----	Correlation Coefficient	0.999999
750.4	753.4	0.9960		
420.3	422.0	0.9961	Slope	0.995381
210.2	210.2	0.9998		
			Intercept	0.478264

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

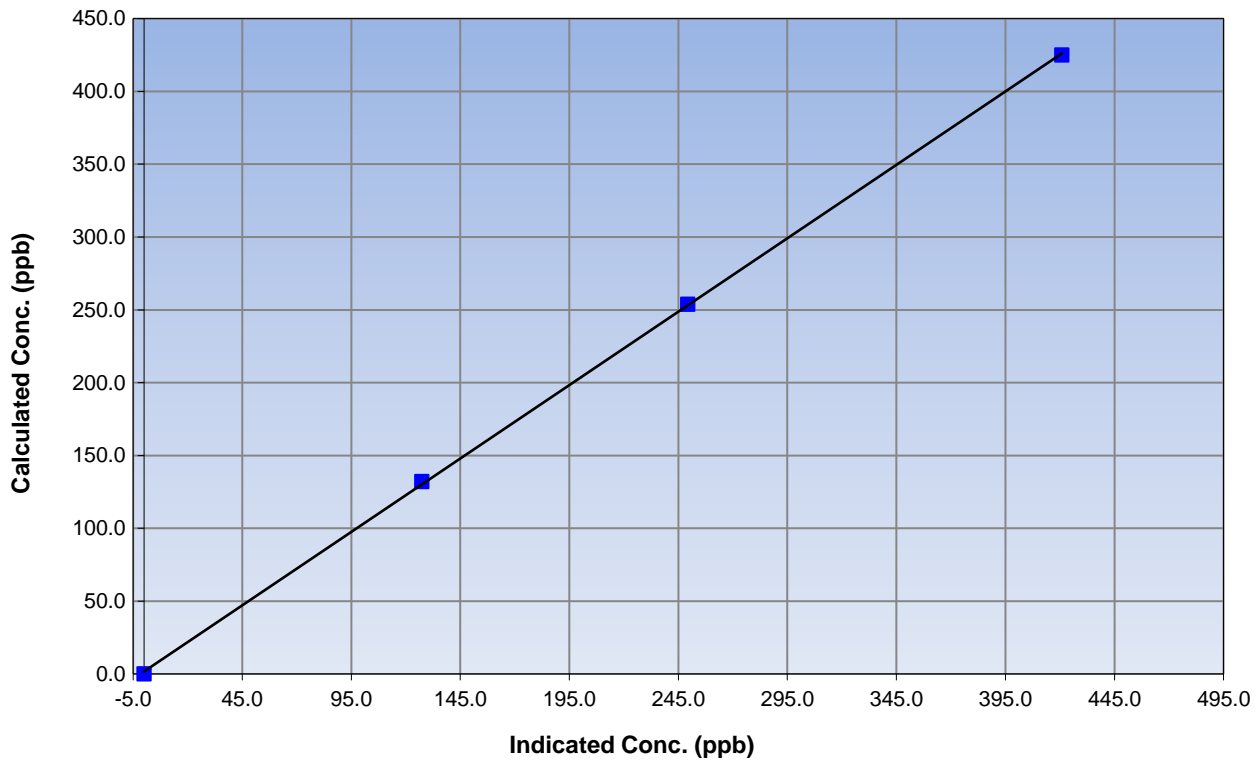
Station Information

Calibration Date	July 28, 2016	Previous Calibration	June 1, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	8:58	End Time (MST)	13:00
Analyzer make	API T201	Analyzer serial #	152

Calibration Information

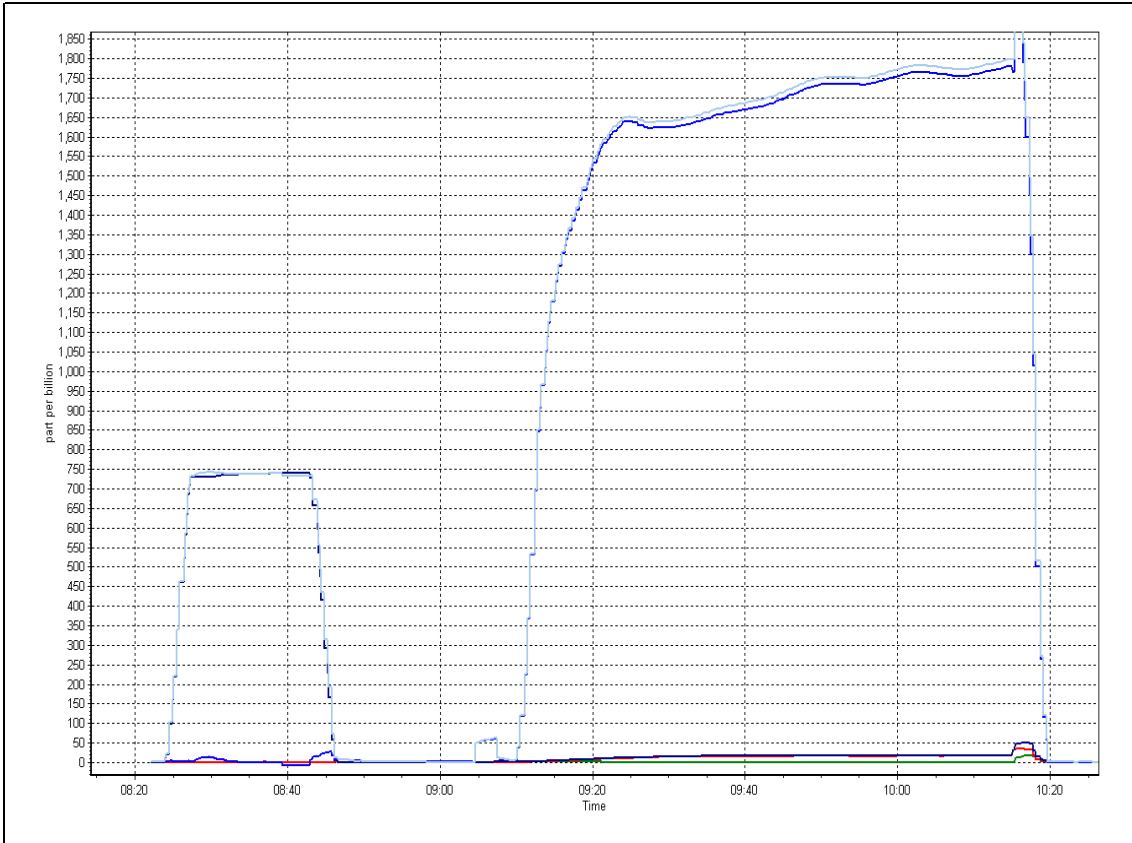
Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999918
425.0	420.9	1.0099		
253.9	249.3	1.0185	Slope	1.008350
132.0	127.4	1.0366		
			Intercept	1.707710

NO₂ Calibration Curve



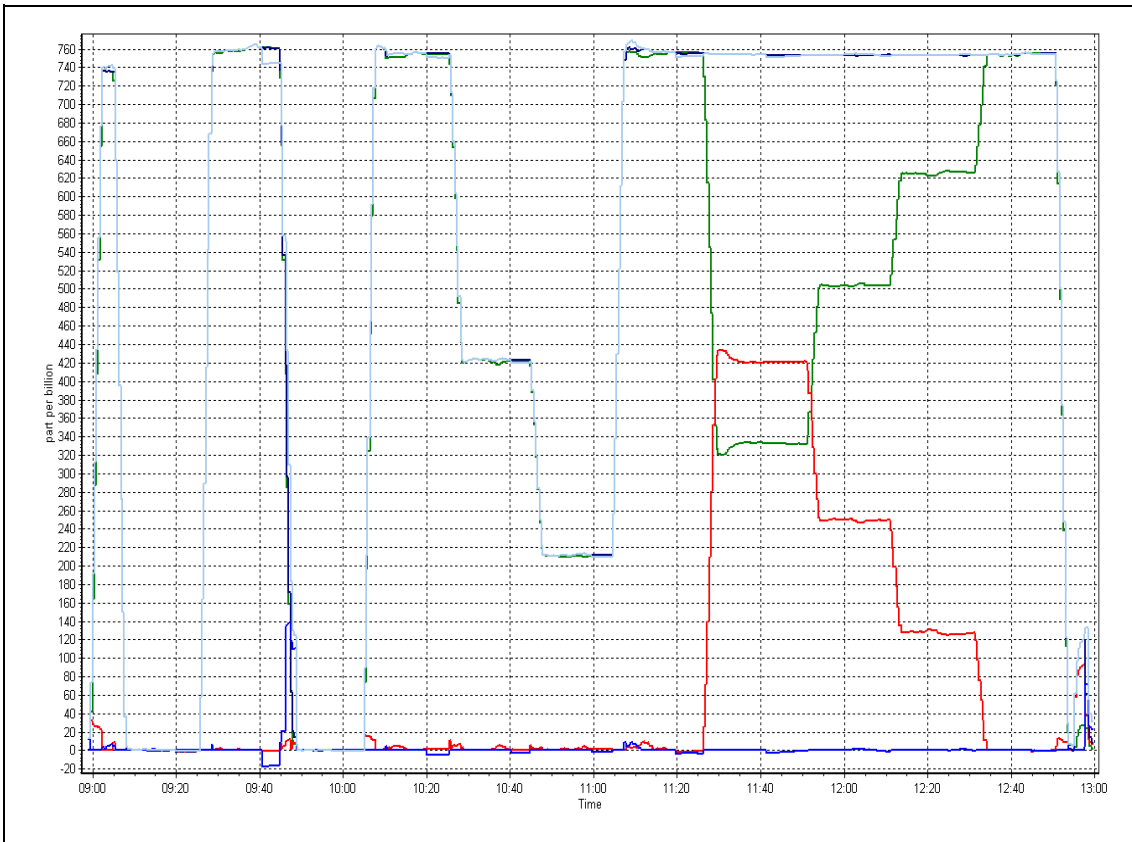
NH₃ Calibration Plot

Date: July 29, 2016



NO_x Calibration Plot

Date: July 28, 2016





Wood Buffalo Environmental Association

N_t-NO_x-NH₃ Calibration Report

Station Information

Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
NOX Calibration Date	July 28, 2016	NOX Previous Cal Date	June 1, 2016
NH3 Calibration Date	July 29, 2016	NH3 Previous Cal Date	June 2, 2016
Reason:	Routine		
Start Time (MST)	8:58	End Time (MST)	15:30
Calibrator	Sabio 4010	Station Temperature	21.0 Deg C
NH3 Cal Gas Conc	95.5 ppm	Serial Number	14300410
NOx Cal Gas Conc	50.9 ppm	NH3 Expiry Date / SN	24/May/2017 LL23123
NO Cal Gas Conc	50.7 ppm	NO Expiry Date / SN	8/Sep/2018 LL107945

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	9036
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Parameter		NH3	Nt	NOx	NO	NO2
Cal Stats As Found	Data Slope	1.004477	0.995359	0.998802	0.998586	1.006793
	Data Offset	-5.123507	-5.4544927	0.095795	0.361896	0.488104
Cal Stats After	Data Slope	1.021758	1.012149			
	Data Offset	-24.51	-25.69			
IP address		192.168.1.77				

Analyzer Information

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

Test Point	before		after	
NH3 Conc range	0-2500	ppb	2500	ppb
NOx Conc range	0-1000	ppb	1000	ppb
NO BKG	-0.1	ppb	-0.1	ppb
NOx BKG	0.0	ppb	0.0	ppb
Nt BKG	0.1		0.1	
NO coefficient	1.211		1.198	
NO2 coefficient	1.000	ppb	1.000	ppb
NOx coefficient	1.343		1.329	
NH3 coefficient	0.951		0.989	
Nt coefficient	1.387		1.376	
NH3 conv temp	825	DegC	825	Deg C
Chamber Temp	50.0	Deg C	50.0	Deg C
Moly Temp	314.7	Deg C	315.0	Deg C
PMT Temp	7.0	Deg C	7.0	Deg C
O3 flow	84.0	ccm	85.0	ccm
R Cell Press	4.9	mmHg	5.1	mmHg
PMT Voltage	645.0	v	645.0	v
Sample Flow 1 NO	547.0	ccm	554.0	ccm
Sample Flow 2 Nox	527.0	ccm	525.0	ccm
Sample Flow 3 Nt	510.0	ccm	518.0	ccm

Notes:

NH3 cylinder changed. This calibration report is the NH3 portion of the calibration after the cylinder change. Converter was cleaned out after as founds. Span was adjusted.



Wood Buffalo Environmental Association

NH₃ Calibration Report

Station Information

Calibration Date:

July 29, 2016

Station Number:

AMS 1

NH₃ Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated Nt conc (ppb)	Calculated NOx conc (ppb)	Calculated NH ₃ conc (ppb)	Indicated Nt conc (ppb)	Indicated NOx conc (ppb)	Indicated NH ₃ conc (ppb)	Nt Correction factor	NH ₃ Correction factor
as found zero										
as found NO										
calibrator zero										
high NO point										
NO/O ₃ point										
as found NH ₃										
first NH ₃	5000	94.2	1799.2	NA	1799.2	1805.8	17.9	1787.7	0.996	1.006
second NH ₃	5000	52.3	998.9	NA	998.9	1004.8	10.6	994.1	0.994	1.005
third NH ₃	5000	26.2	500.4	NA	500.4	524.5	6.0	518.5	0.954	0.965
Average Correction Factor										0.9922

Nt Corrected As Found Nt = NA ppb
 NOx Corrected As Found NOx = NA ppb
 NH₃ Previous Converter Efficiency = 95.1 %

Previous Response Nt = NA ppb
 Previous Response NOx = NA ppb
 NH₃ Current Converter Efficiency = 98.9 %

Nt percent change NA
 NOx percent change NA
 NH₃ percent change 3.8%



Wood Buffalo Environmental Association

NO_x(NH₃) Calibration Report

Station Information

Calibration Date: July 28, 2016 Station Number: AMS 1

NO_x / NO / Nt Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NO _x conc (ppb)	Calculated NO conc (ppb)	Calculated Nt conc (ppb)	Indicated NO _x conc (ppb)	Indicated NO conc (ppb)	Indicated Nt conc (ppb)	NO _x Correction factor	NO Correction factor
as found zero										
as found span										
calibrator zero										
high point										
second point										
third point										
Average Correction Factor										

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

GPT Calibration Data

Dilution Flow (total) _____ ccm Source Gas Flow _____ ccm NO_x ref calc conc = _____ ppb NO ref calc conc = _____ ppb

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

Calibration Performed By: Devin Russell



Wood Buffalo Environmental Association

NH3 Calibration Summary

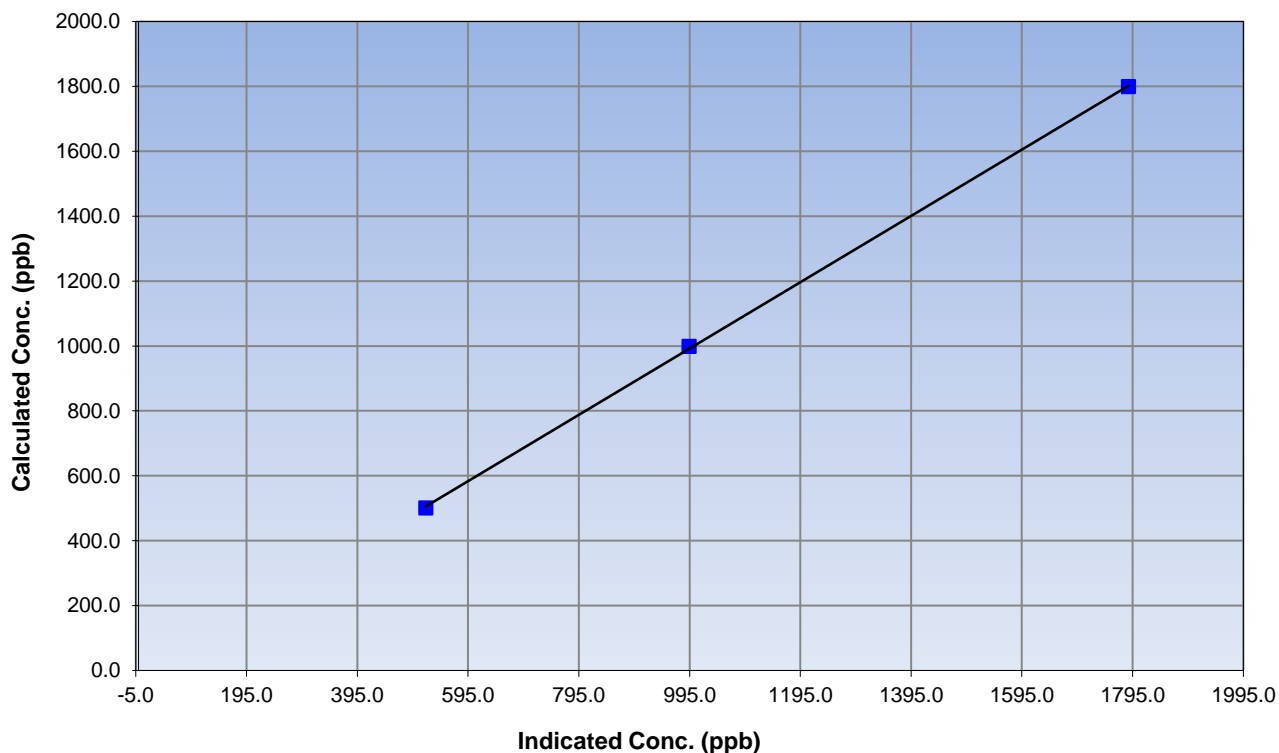
Station Information

Calibration Date	July 29, 2016	Previous Calibration	June 1, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	8:58	End Time (MST)	15:30
Analyzer make	API T201	Analyzer serial #	152

NH3 Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
1799.2	1787.7	1.0064	Correlation Coefficient	0.999894
998.9	994.1	1.0049		
500.4	518.5	0.9652	Slope	1.021758
			Intercept	-24.506096

NH3 Calibration Curve





Wood Buffalo Environmental Association

Nt Calibration Summary

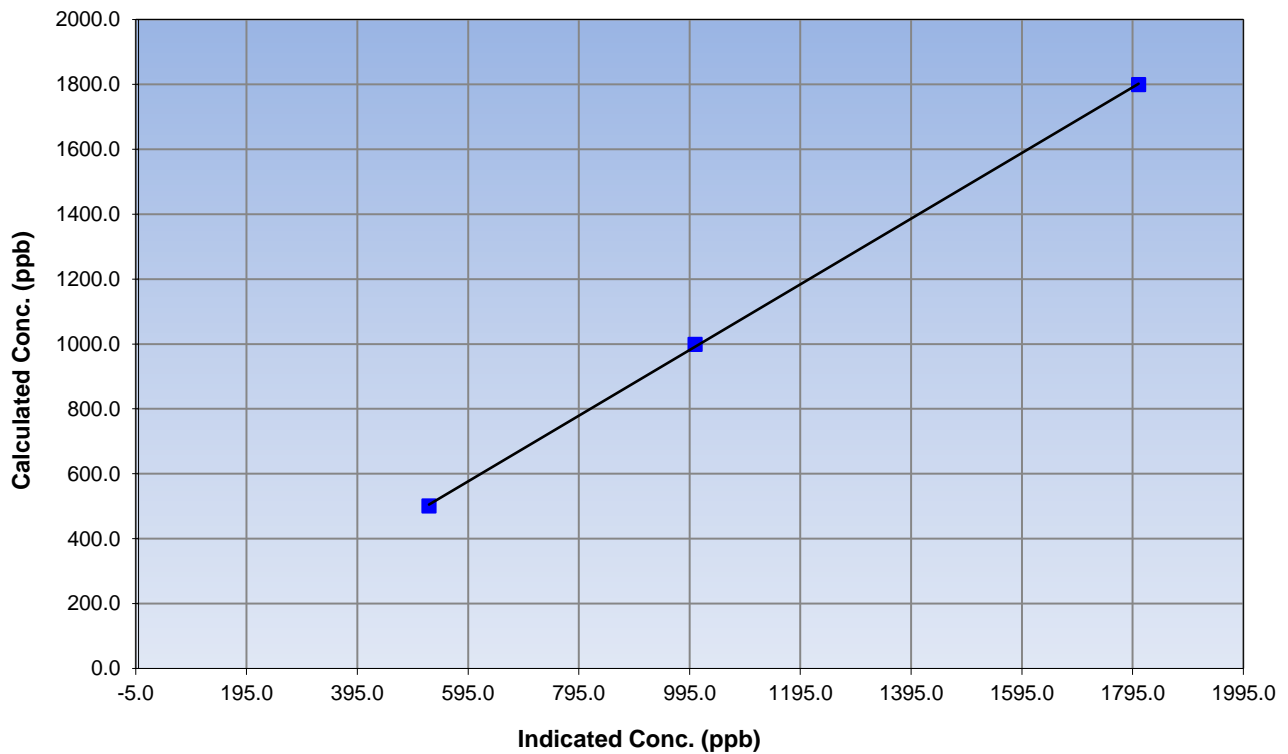
Station Information

Calibration Date	July 29, 2016	Previous Calibration	June 1, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	8:58	End Time (MST)	15:30
Analyzer make	API T201	Analyzer serial #	152

Nt (NH₃) Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
1799.2	1805.8	0.9963	Correlation Coefficient	0.999897
998.9	1004.8	0.9941		
500.4	524.5	0.9541	Slope	1.012149
			Intercept	-25.689879

Nt Calibration Curve





Wood Buffalo Environmental Association

NOx Calibration Summary

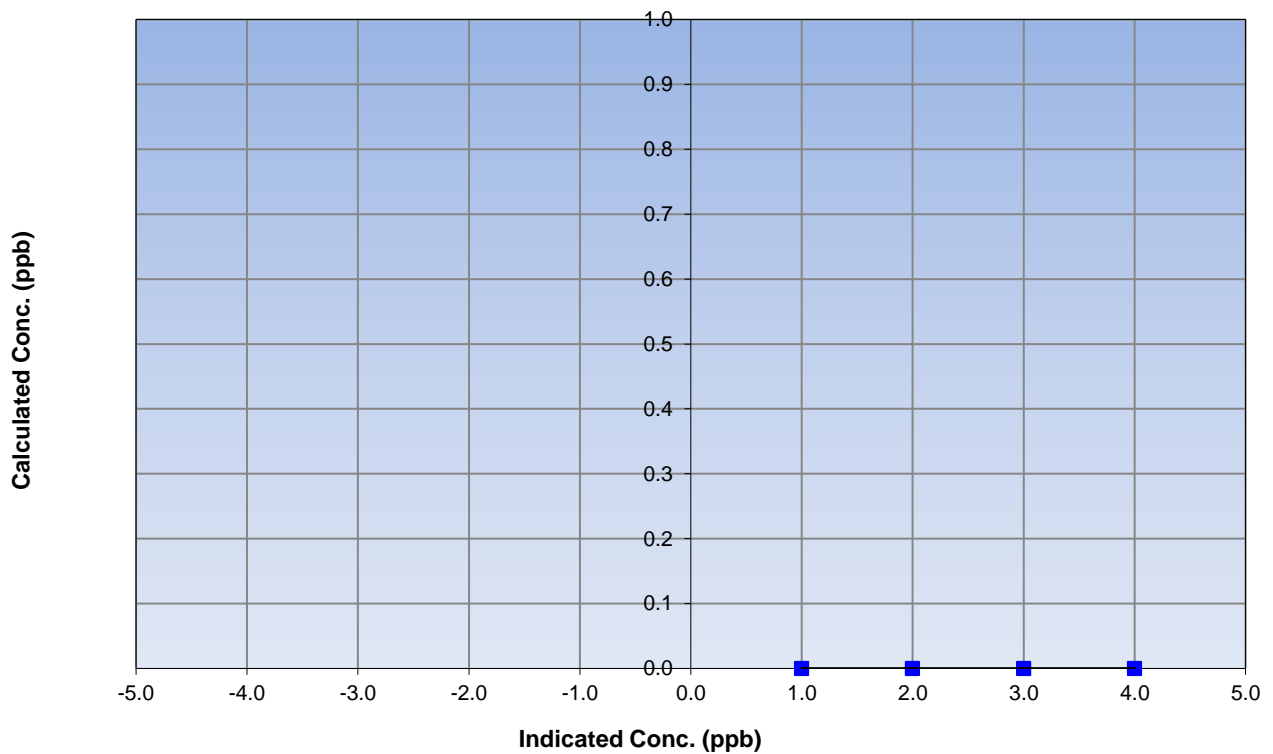
Station Information

Calibration Date	July 28, 2016	Previous Calibration	June 1, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	8:58	End Time (MST)	15:30
Analyzer make	API T201	Analyzer serial #	152

NO_x Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
			Correlation Coefficient	
			Slope	
			Intercept	

NOx Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

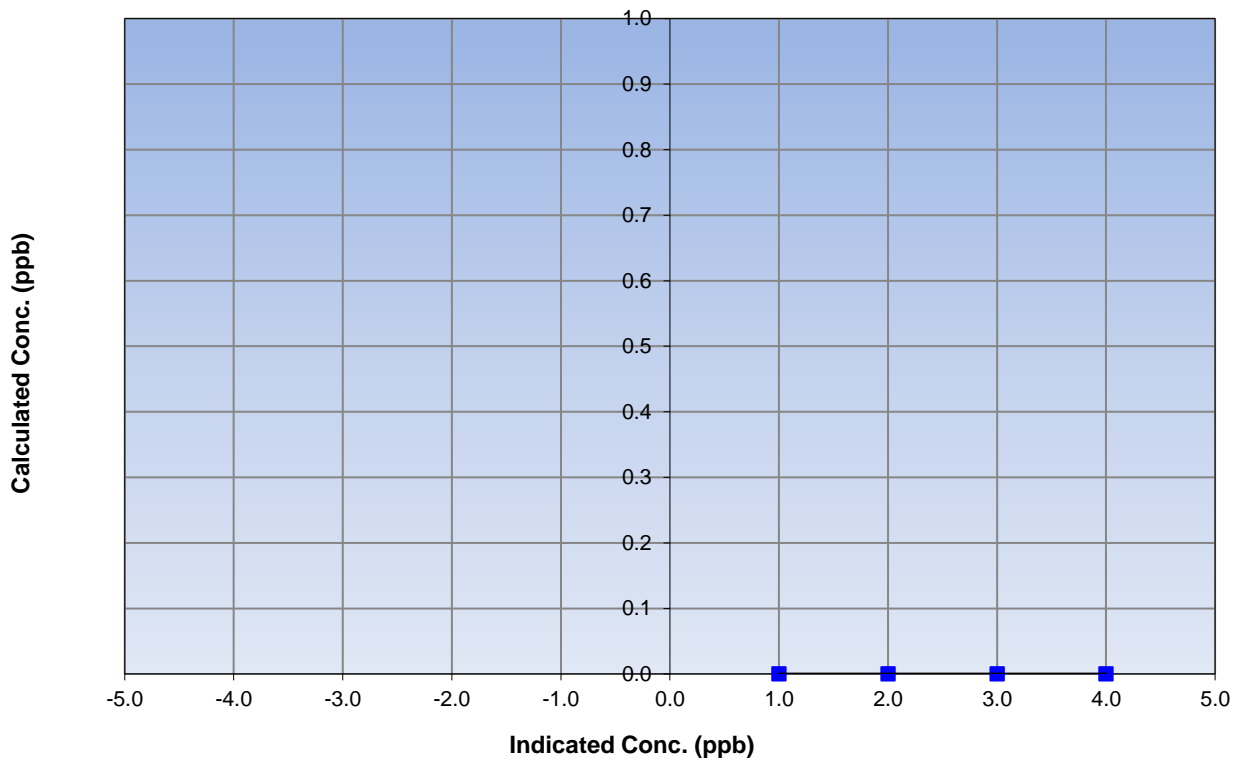
Station Information

Calibration Date	July 28, 2016	Previous Calibration	June 1, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	8:58	End Time (MST)	15:30
Analyzer make	API T201	Analyzer serial #	152

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
			Correlation Coefficient	
			Slope	
			Intercept	

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

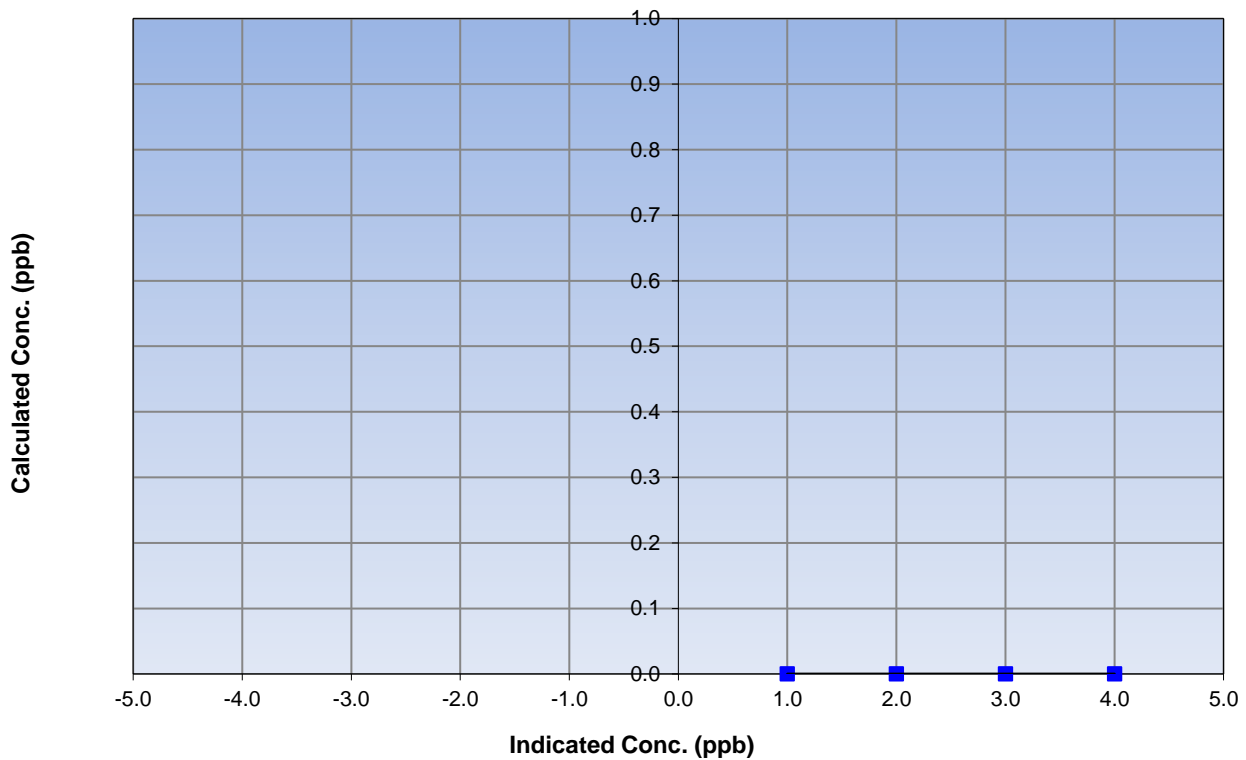
Station Information

Calibration Date	July 28, 2016	Previous Calibration	June 1, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	8:58	End Time (MST)	15:30
Analyzer make	API T201	Analyzer serial #	152

Calibration Information

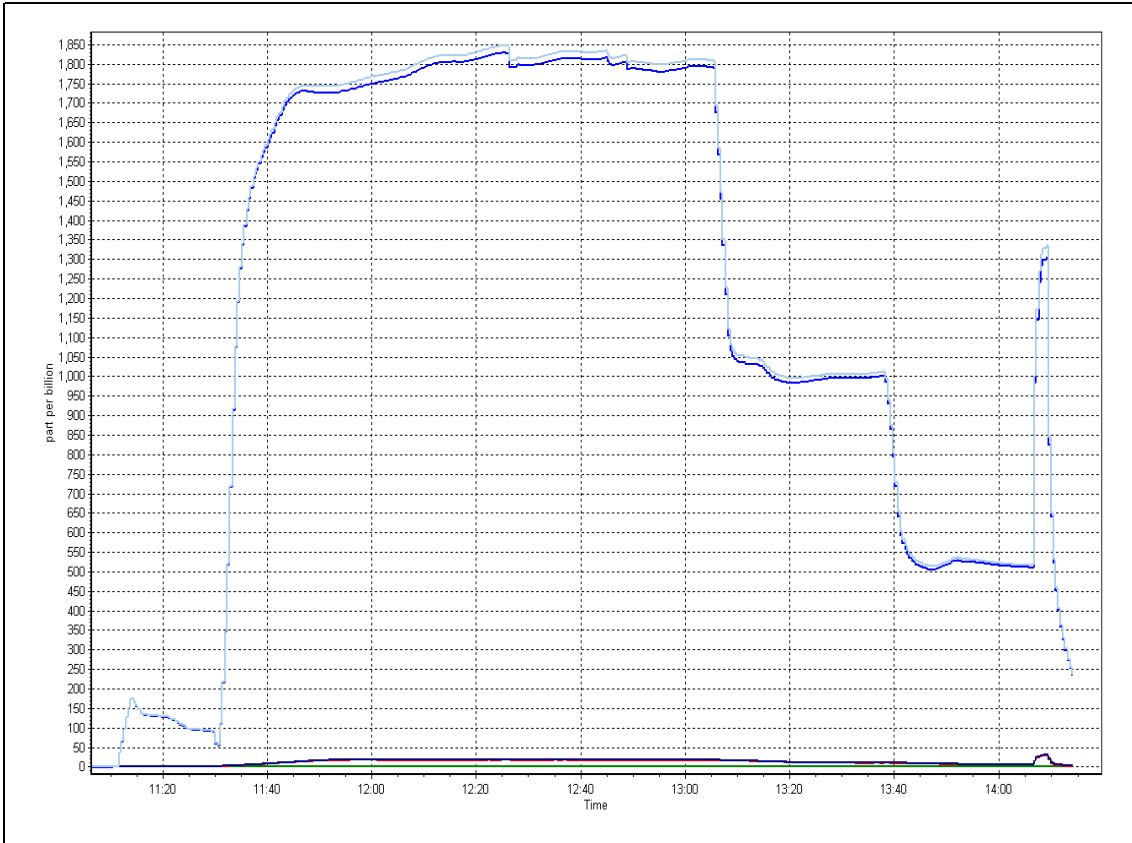
Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
			Correlation Coefficient	
			Slope	
			Intercept	

NO₂ Calibration Curve



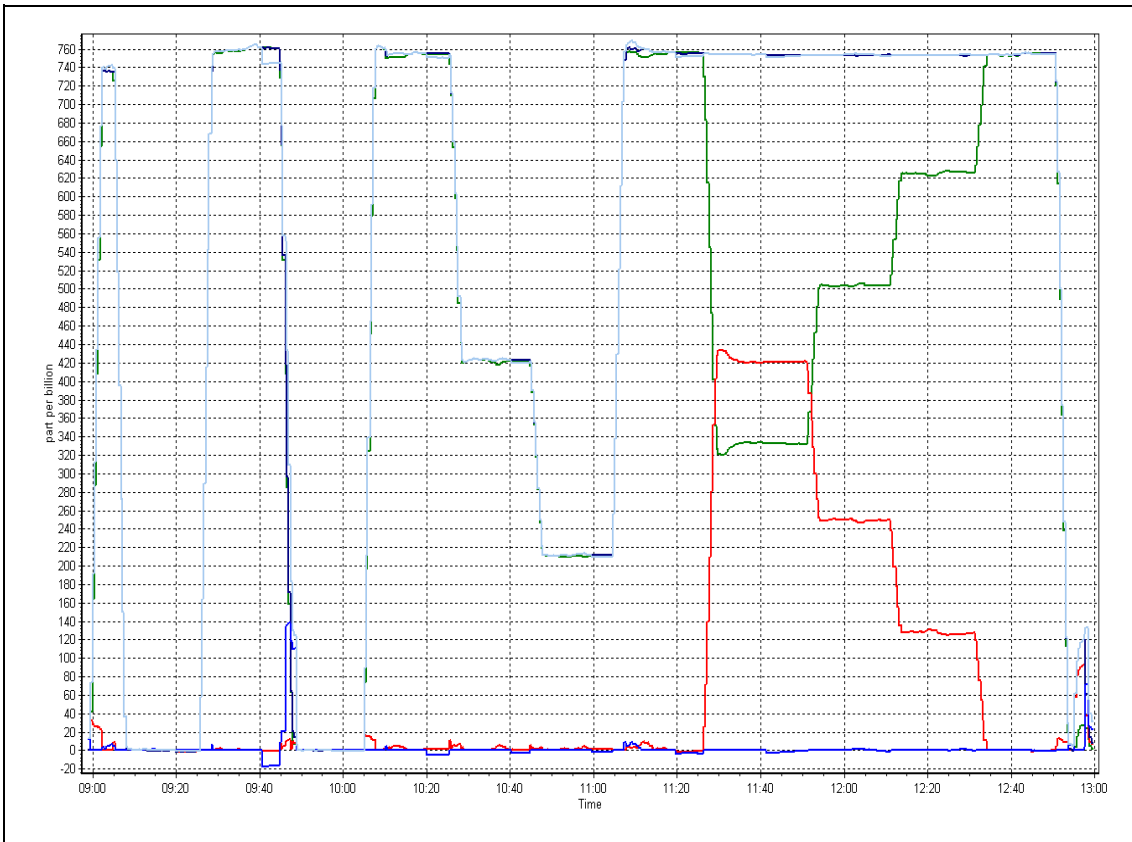
NH₃ Calibration Plot

Date: July 29, 2016



NO_x Calibration Plot

Date: July 28, 2016





Wood Buffalo Environmental Association

SHARP CALIBRATION

STATION INFORMATION			
Calibration Date:	July 28, 2016	Previous Calibration:	June 8, 2016
Station Name:	Bertha Ganter - Fort McKay	Station Number:	AMS 1
Start Time (MST):	8:00	End Time (MST):	9:26
Calibrator Make/Model:	Delta Cal	Calibrator Serial Number:	141228

SHARP INFORMATION			
Particulate Fraction:	PM2.5		
Make/Model:	Thermo / SHARP 5030		
Serial Number	E-1486		
C ₁₄ Source SN:	5691		
Confirmation of Time settings:	Yes <input checked="" type="checkbox"/>	No	<input type="checkbox"/>
Parameters Checked:	T1 <input checked="" type="checkbox"/>	T2 <input checked="" type="checkbox"/>	T3 <input checked="" type="checkbox"/> T4 <input checked="" type="checkbox"/> P3 <input checked="" type="checkbox"/> Main Flow <input checked="" type="checkbox"/> Beta <input type="checkbox"/> Neph <input checked="" type="checkbox"/>

CALIBRATION DATA				
Temperature (°C)				
Sensor	Indicated	Measured	Difference (Limit +/- 2.0°C)	Final Indicated
T1	19.0	18.5	-0.5	19.0
T2	31.0	NA	#VALUE!	31.0
T3	27.0	NA	#VALUE!	27.0
T4	40.0	NA	#VALUE!	40.0
RH (%)	64.0	NA	#VALUE!	64.0

Pressure (Hpa)				
Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	984	982.6	-1.4	984

Main Flow (Lph)				
Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1000	998	-2	998	1000

Nephelometer Calibration			
Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	206		206
Neph	0		0
C14	-16.1		-16.1
Indicated Concentration (ug/m3)	0	no	0
Offset 1	206.5		206.5
Offset 2	34		34

Leak Check (Quarterly)			
Leak Check Date:		Previous Leak Check Date:	June 8, 2016
	Measured		Difference LPM (Limit +/- 0.42 LPM)
Flow without adaptor (LPM):			0.00
*Flow with adaptor (LPM):			
<i>*Note - do not attach adaptor without shutting off the pump first</i>			

Mass Foil Calibration (Annually)			
Foil Calibration Date:		Previous Foil Calibration:	June 8, 2016
Zeroed?:			
Foil Mass:			Mass foil set S/N:2582
Previous Correction Factor:			
New Correction Factor:			

INSPECTION DATA		
Item	Condition	Date of install or rebuild
Cyclone	Good/clean	28/07/2016
Pump	Good	
Filter Tape	Good	
Mass Foil Cal Set	Good	
HEPA filter	Good	28/07/2016

NOTES:

T1, P3, and flow checked. No issues. Nephelometer zero check completed with hepa filter. No adjustments made.

Calibration Performed By: Devin Russell



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY MONITORING PROGRAM MONTHLY REPORT

AMS 2 MILDRED LAKE JULY 2016

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

August 29, 2016



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

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	709	35	35	100.00	58	0	8	0
H2S (ppb) Average	709	34	35	99.87	4	0	1	0
THC (ppm) Average	709	35	35	100.00	4.9	-	2.6	-
Temperature (C) Average	744	0	0	100.00	30.8	-	23.6	-
Relative Humidity (%) Average	744	0	0	100.00	100	-	95	-
Wind Speed 10 m (km/h) Average	744	0	0	100.00	22	-	14	-
Wind Direction 10 m (deg) Average	744	0	0	100.00	-	-	-	-

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

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

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	709	1.6	5	-	0	0	0	0	1	4	58
H2S (ppb) Average	709	0.4	0	-	0	0	0	0	0	1	4
THC (ppm) Average	709	2.3	0.3	-	2	2.1	2.1	2.2	2.4	2.7	4.9
Temperature 2 m (C) Average	744	19.09	4.5	-	6.1	13.7	16.1	18.4	22.4	25.4	30.8
Relative Humidity (%) Average	744	67.6	19	-	23	41	51	70	83	93	100
Wind Speed 10 m (km/h) Average	744	8.4	4	-	0	4	6	8	11	13	22
Wind Direction 10 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-

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

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
H2S	14 Jul 2016 13:00	14 Jul 2016 13:00	1	Maintenance - sample manifold cleaning



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

Mildred Lake - July 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 58 ppb on Jul 28 14:00	Maximum Daily Average: 8.5 ppb on Jul 28		Hours of Data:	709
Minimum Value: 0 ppb on Jul 1 20:00	Minimum Daily Average: 0.0 ppb on Jul 7		Hours of Missing Data:	35
Maximum Diurnal Average: 4.0 ppb at hour 14	Minimum Diurnal Average: 0.3 ppb at hour 22		Hours of Calibration:	35
Monthly Average: 1.6 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 1 P ₉₀ = 4 P ₉₉ = 27		Percent Operational Time:	100.0

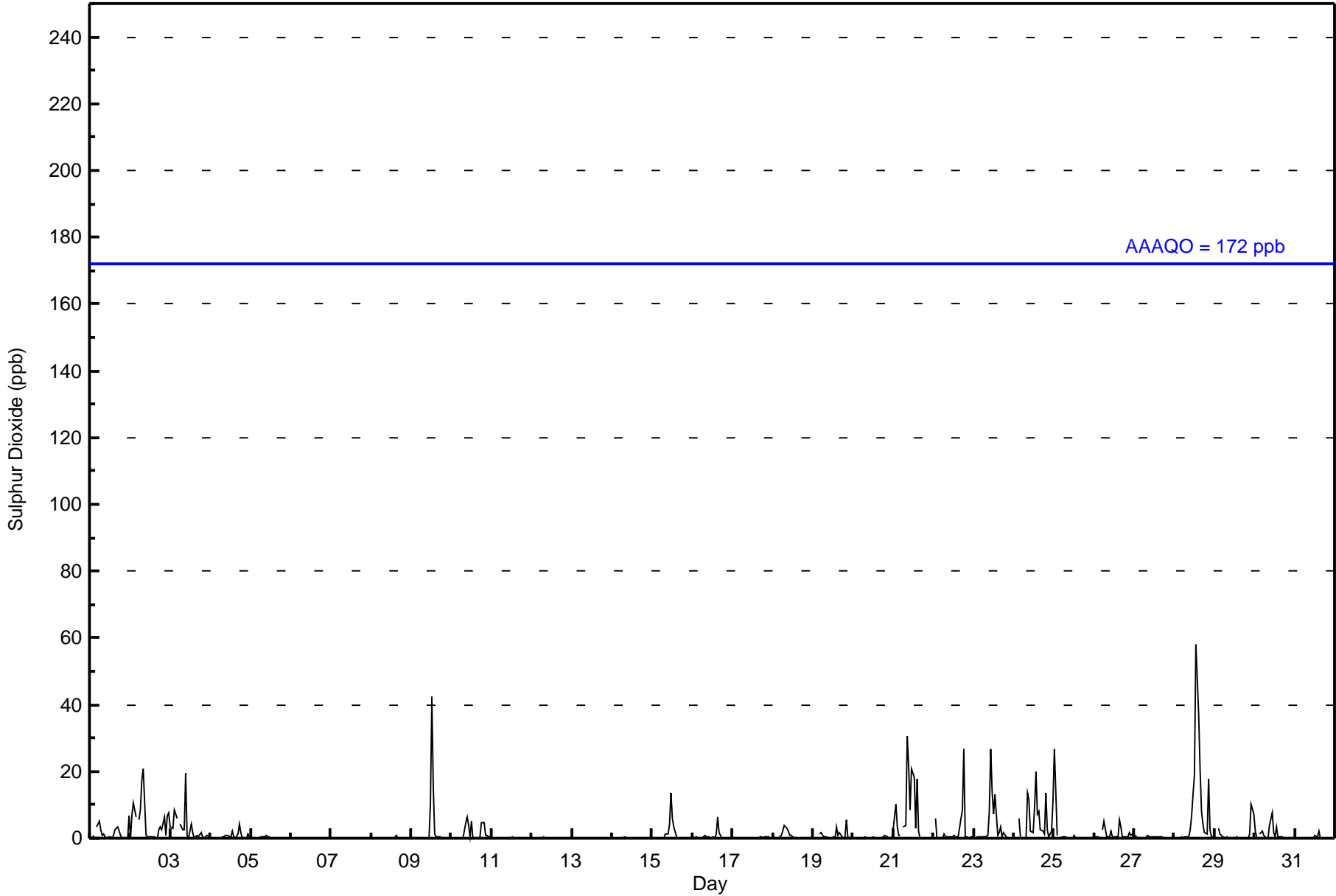
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	0	0	1	Z	3	5	3	1	1	0	0	0	0	0	1	3	3	2	1	0	0	0	0	7	1.4	7
2-Jul	0	7	10	7	Z	6	9	17	21	1	0	0	0	0	0	0	0	3	3	3	6	1	7	8	4.8	21
3-Jul	3	3	8	7	6	Z	4	2	3	20	1	0	4	2	0	0	1	1	2	0	0	0	1	0	3.0	20
4-Jul	Z	0	0	0	0	0	0	1	0	1	1	0	0	2	0	0	1	4	2	0	0	0	1	0	0.7	4
5-Jul	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
6-Jul	0	0	Z	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-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
8-Jul	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
9-Jul	0	0	0	0	0	Z	0	0	0	0	0	11	42	15	1	0	0	0	0	0	0	0	0	0	3.1	42
10-Jul	Z	0	0	0	0	0	0	0	5	6	4	1	5	0	0	0	0	0	5	5	1	1	1	0	1.5	6
11-Jul	0	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
12-Jul	0	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-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
14-Jul	0	0	0	0	Z	0	0	0	0	0	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0.1	0
15-Jul	0	0	0	0	0	Z	0	0	1	1	4	14	6	3	0	0	0	0	0	0	0	0	0	0	1.3	14
16-Jul	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	1	6	2	0	0	0	0	0	0	0	0.6	6
17-Jul	0	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-Jul	1	0	Z	0	0	1	2	4	3	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.7	4
19-Jul	0	0	0	Z	1	1	0	0	0	0	0	0	0	0	3	1	2	0	0	1	5	0	0	0	0.8	5
20-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.2	1
21-Jul	3	10	3	1	1	Z	3	4	30	22	8	21	18	3	18	2	0	0	0	0	0	0	0	0	6.4	30
22-Jul	Z	6	0	0	0	0	1	1	0	0	0	0	1	0	0	1	6	8	27	1	0	0	0	0	2.4	27
23-Jul	1	Z	0	1	0	0	0	0	1	8	27	14	7	13	1	2	3	0	1	0	0	0	0	0	3.5	27
24-Jul	0	0	Z	6	1	0	0	0	14	11	2	2	9	20	7	8	2	2	1	14	3	1	2	11	5.0	20
25-Jul	27	14	1	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1.9	27
26-Jul	0	1	0	0	Z	3	5	1	0	0	2	1	0	0	0	5	3	1	0	0	0	2	1	1	1.2	5
27-Jul	1	0	0	0	0	Z	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
28-Jul	Z	0	0	0	0	0	1	1	0	3	7	13	19	58	37	20	8	4	2	1	18	2	0	0	8.5	58
29-Jul	0	Z	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	10	7	1.1	10
30-Jul	2	1	Z	1	2	1	0	0	0	4	7	2	0	4	1	1	0	0	0	0	0	0	0	0	1.1	7
31-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0.2	2
	1.5	1.7	1.1	1.0	0.7	0.7	1.0	1.1	2.7	2.7	2.3	2.7	3.9	4.0	2.4	1.7	1.1	0.9	1.5	0.8	1.1	0.3	0.8	1.2		Diurnal Average
	27	14	10	7	6	6	9	17	30	22	27	21	42	58	37	20	8	8	27	14	18	2	10	11		Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	680	95.91	95.91
11 - 20	19	2.68	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 (SO₂) - ppb
Mildred Lake - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	152	92	25	14	13	12	18	43	45	37	53	29	18	37	29	63	680
11 - 20	0	0	0	1	0	0	2	0	0	2	1	5	4	2	2	0	19
21 - 60	0	0	0	0	0	0	0	1	0	1	2	0	1	4	0	1	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
Totals	152	92	25	15	13	12	20	44	45	40	56	34	23	43	31	64	709

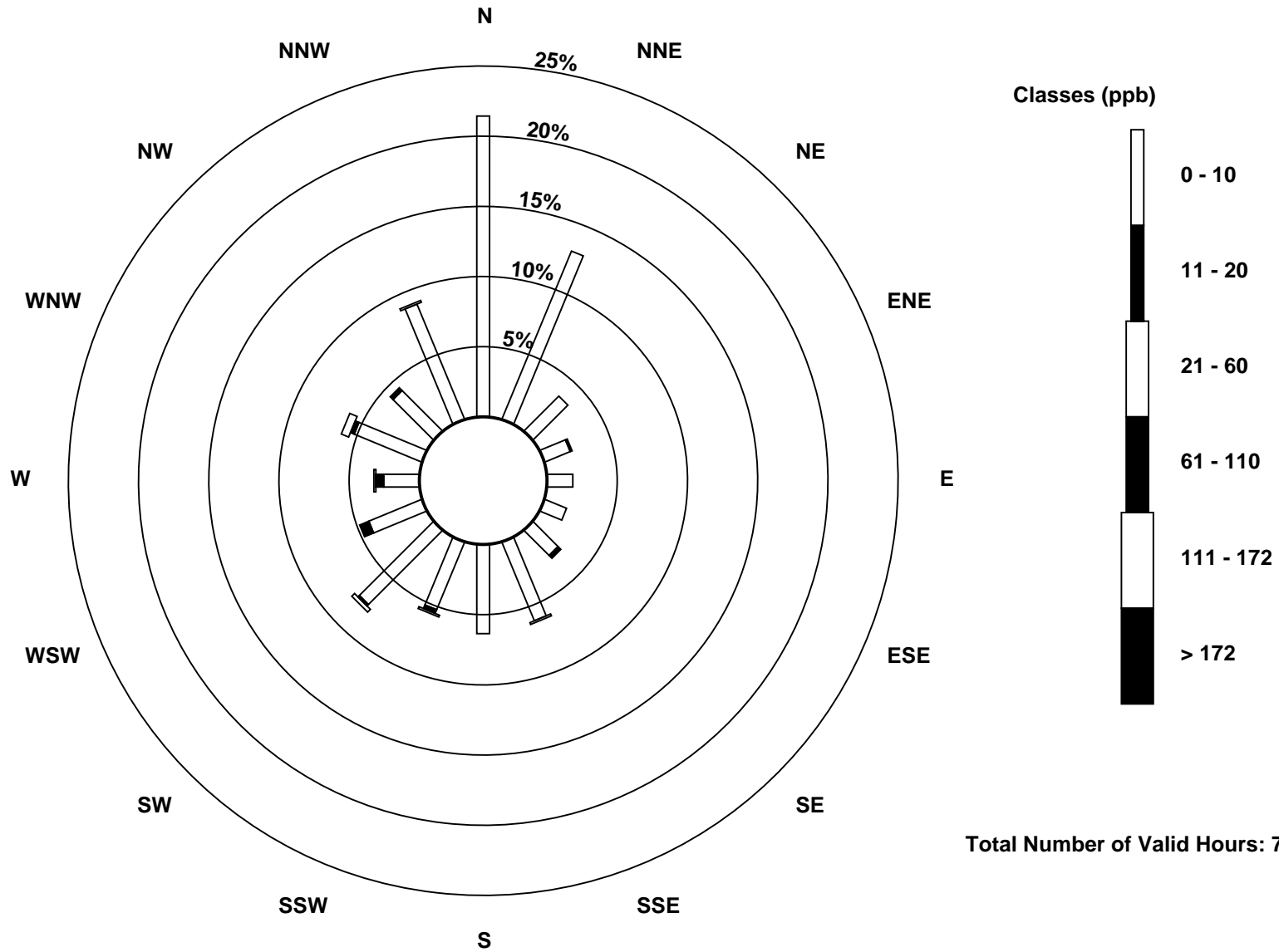
Total Number of Valid Hours: 709

Total Number of Hours: 744

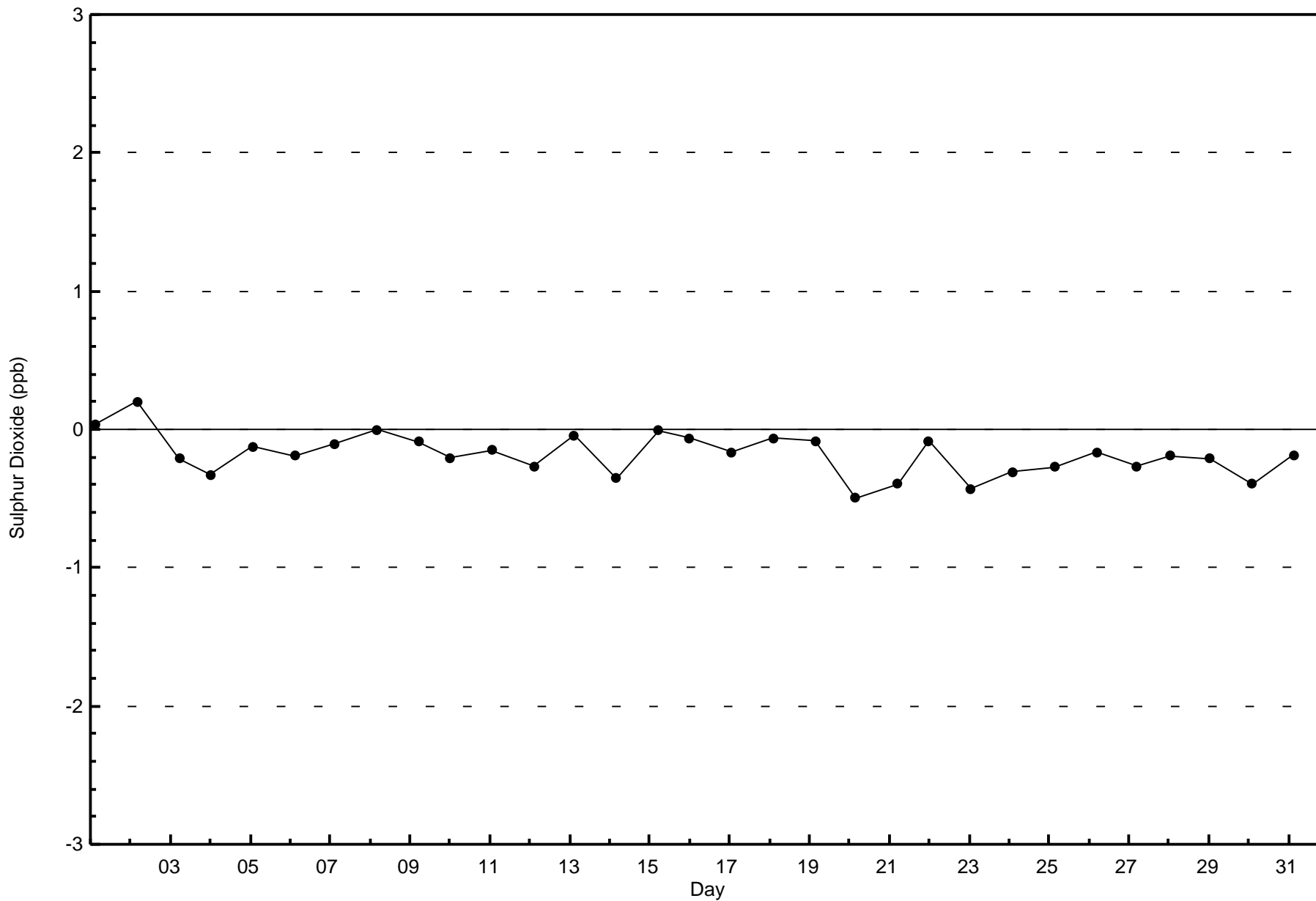


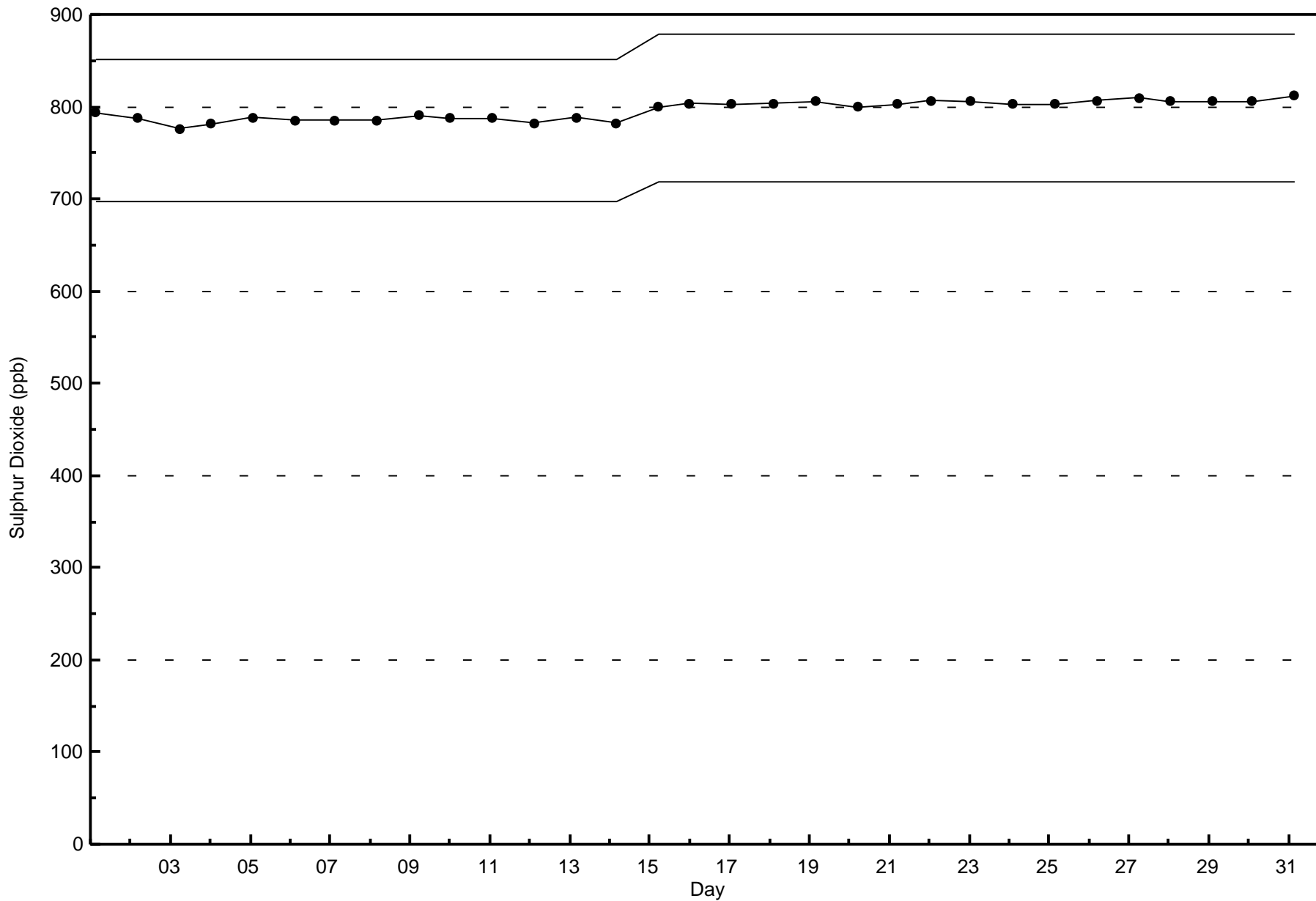
Wood Buffalo Environmental Association
Wind Rose Jul 2016

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



Total Number of Valid Hours: 709





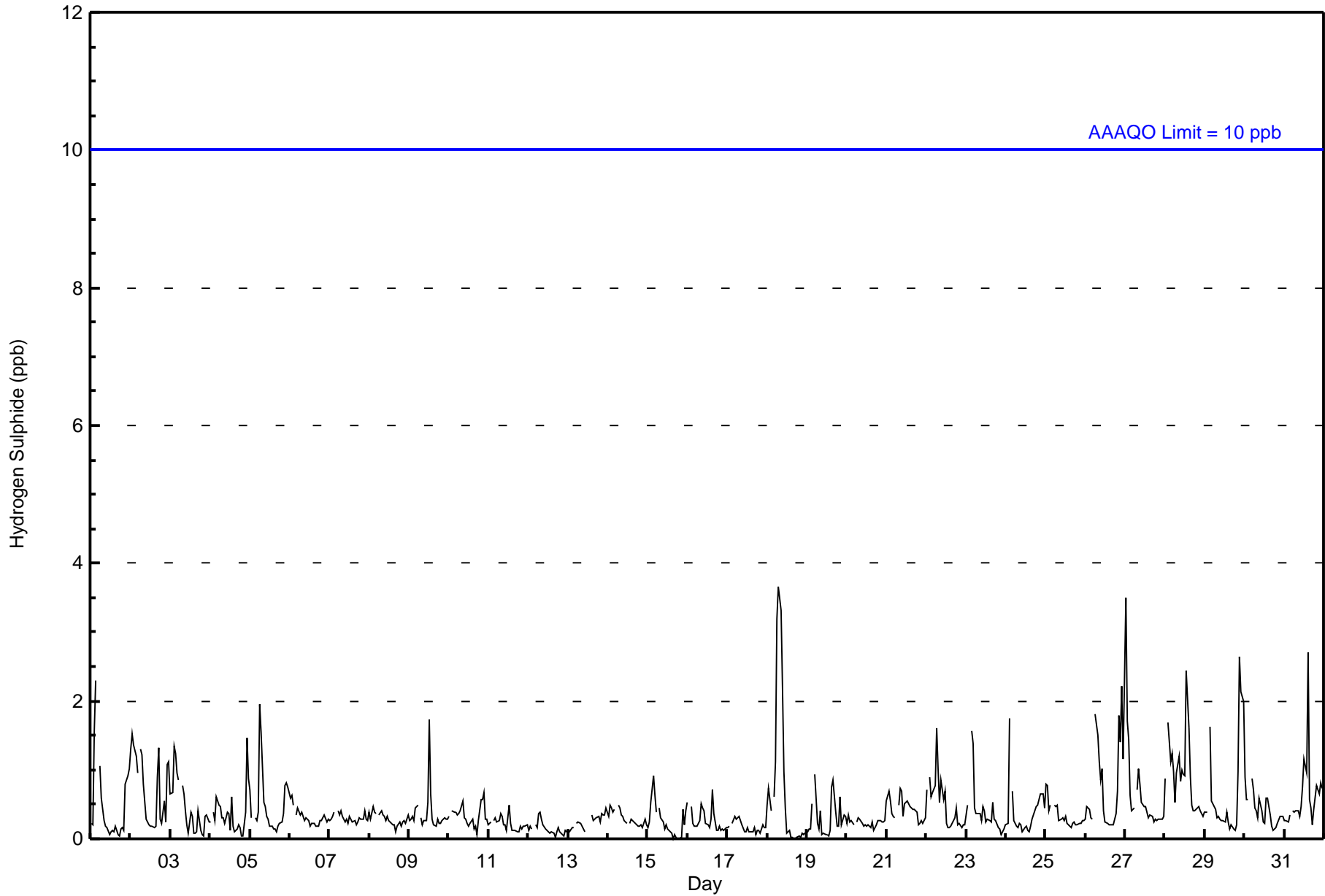


Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 4 ppb on Jul 18 08:00 Maximum Daily Average: 0.9 ppb on Jul 28																	Hours in Service: 744 Hours of Data: 709									
Minimum Value: 0 ppb on Jul 15 19:00 Minimum Daily Average: 0.1 ppb on Jul 12 Maximum Diurnal Average: 0.7 ppb at hour 7 Minimum Diurnal Average: 0.2 ppb at hour 19 Monthly Average: 0.4 ppb Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 2																	Hours of Missing Data: 35 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-Jul	0	0	2	2	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0.5	2
2-Jul	1	2	1	1	1	Z	1	1	1	0	0	0	0	0	0	0	1	1	0	0	1	0	1	1	0.7	2
3-Jul	1	1	1	1	1	1	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
4-Jul	0	Z	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	0.4	1
5-Jul	1	0	Z	0	0	0	0	2	2	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0.5	2
6-Jul	1	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
7-Jul	0	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
8-Jul	0	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-Jul	0	0	0	0	0	0	Z	0	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0	0	0.4	2
10-Jul	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0.3	1
11-Jul	0	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-Jul	0	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-Jul	0	0	0	0	Z	0	0	0	0	0	0	C	C	C	0	0	0	0	0	0	0	0	0	0	0.2	0
14-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	M	0	0	0	0	0	0	0	0	0	0	0	0.3	0
15-Jul	0	0	1	1	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
16-Jul	1	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.3	1
17-Jul	0	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-Jul	0	1	0	Z	1	1	3	4	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	4
19-Jul	0	0	0	1	Z	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0.3	1
20-Jul	0	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-Jul	1	1	1	0	0	0	Z	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0.4	1
22-Jul	1	Z	1	1	1	1	2	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.5	2
23-Jul	0	0	Z	2	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.4	2
24-Jul	0	0	2	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0.4	2
25-Jul	1	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
26-Jul	0	0	0	0	0	Z	2	1	1	1	1	0	0	0	0	0	0	0	0	1	2	1	2	1	0.8	2
27-Jul	3	2	1	1	0	0	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	3
28-Jul	1	Z	2	1	1	1	1	1	1	1	1	1	1	2	2	1	0	0	0	0	0	0	0	0	0.9	2
29-Jul	0	0	Z	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	2	2	0.6	3
30-Jul	1	1	1	Z	1	1	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0.4	1
31-Jul	0	0	0	0	Z	0	0	0	0	0	0	1	1	1	3	1	0	0	0	1	1	1	1	1	0.6	3
0.5 0.5 0.7 0.6 0.5 0.5 0.7 0.6 0.5 0.4 0.3 0.3 0.3 0.4 0.3 0.3 0.3 0.2 0.2 0.2 0.3 0.4 0.5 0.5																								Diurnal Average		
3 2 2 2 1 1 3 4 3 2 1 1 2 2 3 1 1 1 0 1 2 3 2 2																								Diurnal Maximum		
Z - zerospan C - Calibration M - Maintenance Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb 24-hr 3 ppb																										



Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	703	99.15	99.15
3 - 4	6	0.85	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 (H₂S) - ppb
Mildred Lake - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	155	91	25	16	13	13	20	42	42	39	58	34	22	42	29	62	703
3 - 4	0	0	0	0	0	0	1	1	2	1	0	0	0	1	0	0	6
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	155	91	25	16	13	13	21	43	44	40	58	34	22	43	29	62	709

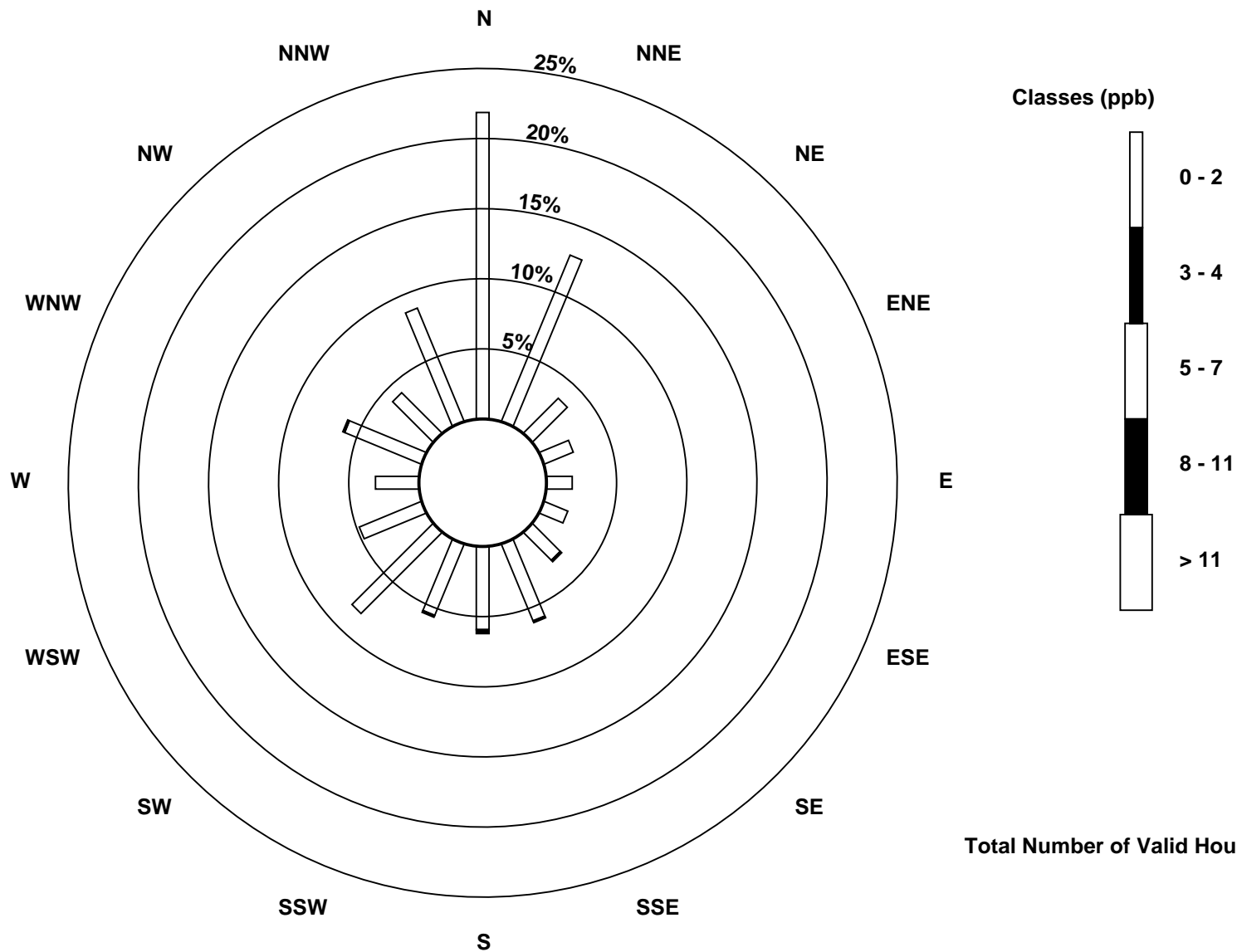
Total Number of Valid Hours: 709

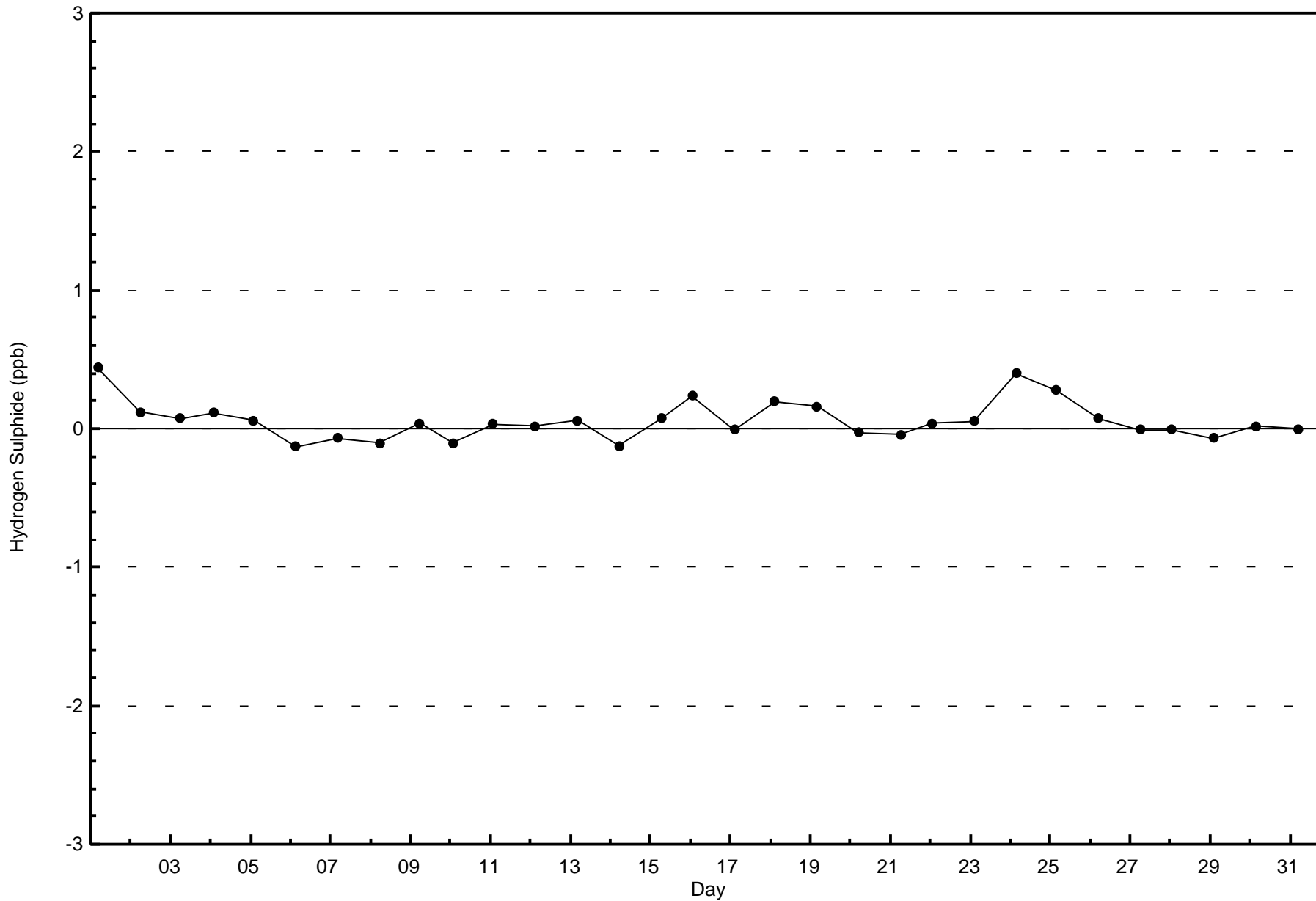
Total Number of Hours: 744

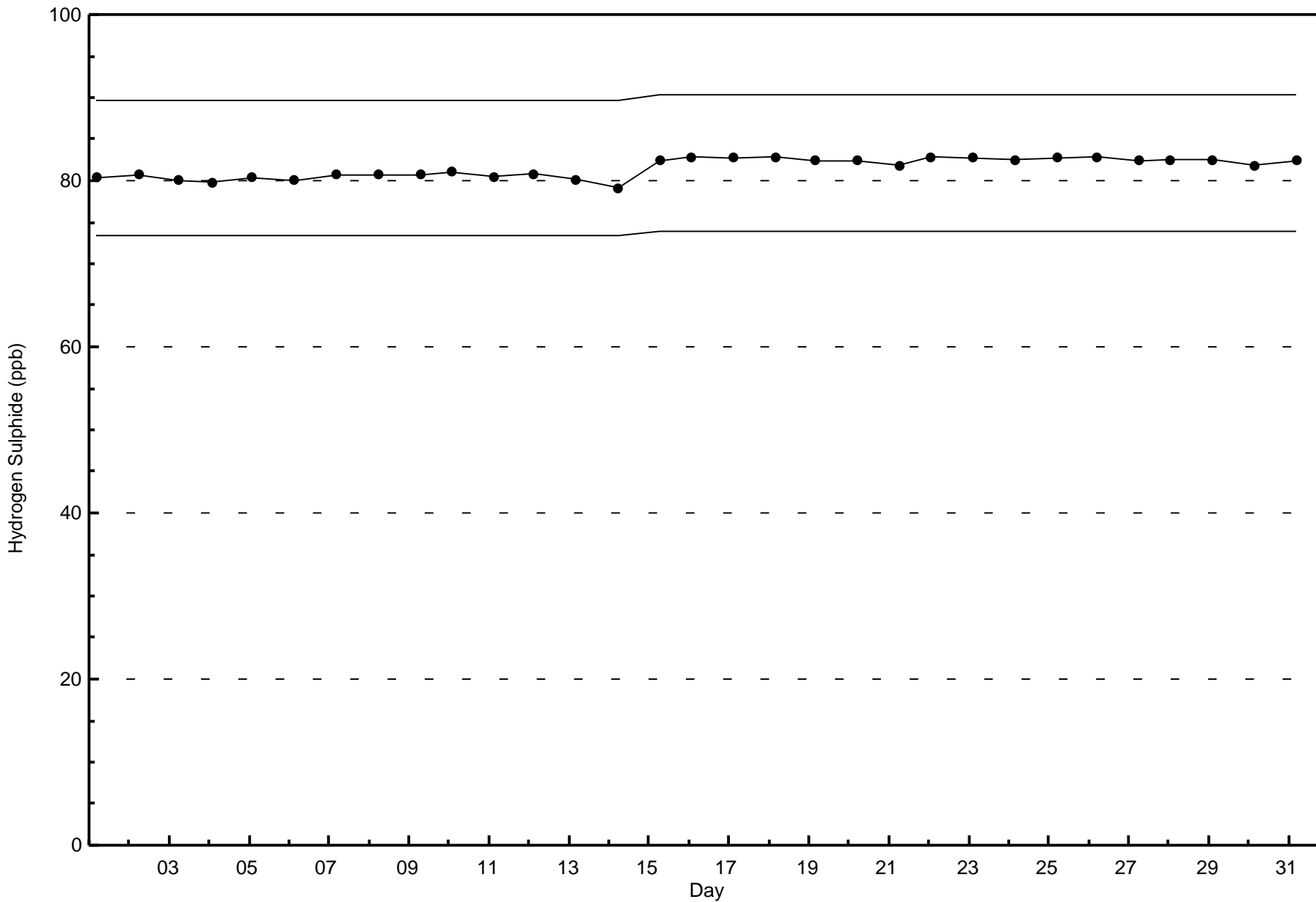


Wood Buffalo Environmental Association
Wind Rose Jul 2016

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





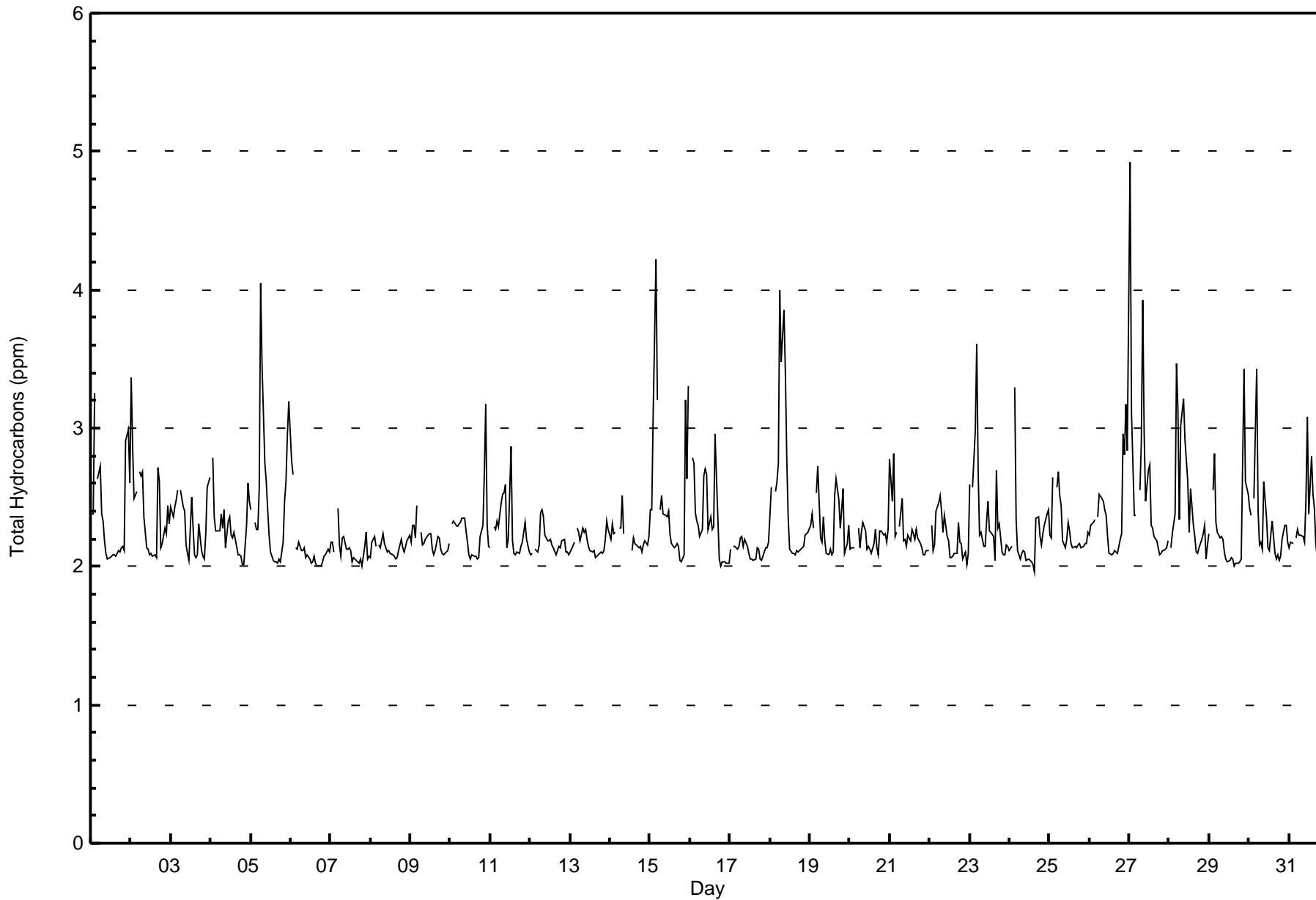




Wood Buffalo Environmental Association
Summary of Hour Averages

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

Maximum Value: 4.9 ppm on Jul 27 01:00		Maximum Daily Average: 2.6 ppm on Jul 27		Hours in Service: 744																						
Minimum Value: 2.0 ppm on Jul 24 16:00		Minimum Daily Average: 2.1 ppm on Jul 17		Hours of Data: 709																						
Maximum Diurnal Average: 2.5 ppm at hour 5		Minimum Diurnal Average: 2.1 ppm at hour 19		Hours of Missing Data: 35																						
Monthly Average: 2.30 ppm		Percentiles: P ₁ = 2.0 P ₁₀ = 2.1 Q ₁ = 2.1 Median = 2.2 Q ₃ = 2.4 P ₉₀ = 2.7 P ₉₉ = 3.5		Hours of Calibration: 35																						
				Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	2.4	2.4	3.3	Z	2.6	2.7	2.4	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	2.9	3.0	2.6	2.3	3.3
2-Jul	3.4	2.9	2.5	Z	2.7	2.7	2.7	2.7	2.4	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.7	2.6	2.1	2.2	2.3	2.2	2.4	2.3	2.4	3.4
3-Jul	2.4	2.4	2.4	2.5	2.5	Z	2.6	2.4	2.4	2.2	2.1	2.0	2.5	2.3	2.1	2.1	2.1	2.3	2.1	2.1	2.1	2.2	2.6	2.6	2.3	2.6
4-Jul	Z	2.8	2.4	2.3	2.3	2.3	2.4	2.3	2.4	2.1	2.3	2.4	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.0	2.0	2.3	2.6	2.5	2.3	2.8
5-Jul	2.4	Z	2.3	2.3	2.3	2.6	4.0	3.4	2.7	2.6	2.4	2.2	2.1	2.0	2.0	2.0	2.0	2.1	2.0	2.2	2.5	2.6	3.0	3.2	2.5	4.0
6-Jul	2.8	2.7	Z	2.1	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.8
7-Jul	2.2	2.2	2.1	Z	2.4	2.2	2.1	2.2	2.2	2.1	2.1	2.1	2.1	2.0	2.1	2.0	2.0	2.0	2.1	2.0	2.1	2.3	2.1	2.1	2.1	2.4
8-Jul	2.1	2.2	2.2	2.1	Z	2.2	2.1	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.1	2.2	2.2	2.1	2.2
9-Jul	2.2	2.3	2.3	2.2	2.4	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.4
10-Jul	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.3	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.3	2.7	3.2	2.3	2.1	2.3	3.2
11-Jul	2.1	Z	2.3	2.3	2.3	2.3	2.5	2.5	2.5	2.6	2.1	2.2	2.9	2.2	2.1	2.1	2.1	2.1	2.1	2.2	2.3	2.3	2.2	2.1	2.3	2.9
12-Jul	2.1	2.1	Z	2.1	2.1	2.2	2.4	2.4	2.4	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.1	2.1	2.1	2.2	2.4
13-Jul	2.1	2.1	2.2	Z	2.3	2.3	2.2	2.3	2.2	2.3	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.3	2.3	2.2	2.3
14-Jul	2.2	2.3	2.2	2.3	Z	2.3	2.3	2.5	2.2	C	C	C	C	2.1	2.2	2.2	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.5
15-Jul	2.4	2.4	3.1	4.2	3.2	Z	2.4	2.5	2.4	2.4	2.4	2.4	2.2	2.2	2.1	2.1	2.2	2.2	2.0	2.0	2.1	3.2	2.6	3.3	2.5	4.2
16-Jul	Z	2.8	2.7	2.4	2.3	2.3	2.2	2.3	2.7	2.7	2.7	2.3	2.4	2.3	2.3	3.0	2.6	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.3	3.0
17-Jul	2.1	Z	2.1	2.1	2.1	2.1	2.2	2.2	2.1	2.2	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.1	2.2	2.1	2.2
18-Jul	2.4	2.6	Z	2.5	2.6	2.7	4.0	3.5	3.8	3.4	2.8	2.4	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.5	4.0
19-Jul	2.3	2.4	2.3	Z	2.5	2.7	2.2	2.2	2.4	2.2	2.1	2.1	2.1	2.1	2.1	2.5	2.6	2.5	2.3	2.4	2.6	2.1	2.2	2.3	2.3	2.7
20-Jul	2.1	2.1	2.1	2.1	Z	2.3	2.1	2.3	2.3	2.3	2.1	2.1	2.1	2.1	2.2	2.3	2.1	2.1	2.3	2.3	2.2	2.2	2.2	2.3	2.2	2.3
21-Jul	2.8	2.5	2.8	2.2	2.2	Z	2.3	2.5	2.2	2.2	2.1	2.2	2.2	2.3	2.2	2.2	2.3	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.3	2.8
22-Jul	Z	2.3	2.1	2.2	2.4	2.5	2.5	2.4	2.2	2.4	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.3	2.2	2.2	2.1	2.1	2.0	2.1	2.2	2.5
23-Jul	2.6	Z	2.6	3.0	3.6	2.7	2.2	2.2	2.1	2.1	2.3	2.5	2.3	2.2	2.2	2.0	2.7	2.3	2.3	2.1	2.1	2.1	2.2	2.1	2.4	3.6
24-Jul	2.1	2.2	Z	3.3	2.3	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.4	2.4	2.2	2.2	2.2	2.3	2.4	2.4	2.2	2.2	3.3
25-Jul	2.2	2.2	2.6	Z	2.6	2.7	2.5	2.4	2.2	2.1	2.2	2.3	2.3	2.2	2.1	2.1	2.1	2.2	2.2	2.1	2.1	2.2	2.2	2.2	2.3	2.7
26-Jul	2.2	2.3	2.3	2.3	Z	2.4	2.5	2.5	2.5	2.4	2.4	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	3.0	2.8	3.2	2.8	2.4	3.2
27-Jul	4.9	3.1	2.7	2.4	2.4	Z	2.6	2.9	3.9	3.0	2.5	2.7	2.7	2.3	2.3	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.6	4.9
28-Jul	Z	2.1	2.2	2.4	3.5	3.1	2.3	3.0	3.2	2.9	2.8	2.6	2.3	2.6	2.3	2.2	2.1	2.1	2.1	2.2	2.2	2.3	2.1	2.2	2.5	3.5
29-Jul	2.2	Z	2.6	2.8	2.3	2.3	2.2	2.2	2.2	2.1	2.1	2.0	2.0	2.1	2.1	2.0	2.0	2.0	2.0	2.1	2.7	3.4	2.6	2.5	2.3	3.4
30-Jul	2.4	2.4	Z	2.5	3.4	2.4	2.2	2.2	2.1	2.6	2.3	2.1	2.1	2.2	2.3	2.1	2.1	2.1	2.0	2.1	2.2	2.3	2.3	2.2	2.3	3.4
31-Jul	2.1	2.2	2.2	Z	2.2	2.3	2.2	2.2	2.2	2.2	2.5	3.1	2.4	2.8	2.5	2.4	2.2	2.1	2.6	2.7	2.7	2.8	2.7	2.9	2.4	3.1
	2.4	2.4	2.4	2.5	2.5	2.4	2.4	2.4	2.4	2.3	2.3	2.2	2.2	2.2	2.1	2.2	2.2	2.2	2.1	2.2	2.2	2.4	2.3	2.3		Diurnal Average
	4.9	3.1	3.3	4.2	3.6	3.1	4.0	3.5	3.9	3.4	2.8	3.1	2.9	2.8	2.5	3.0	2.7	2.6	2.6	2.7	3.0	3.4	3.2	3.3		Diurnal Maximum
Z - zerospan		C - Calibration																								





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	45	6.35	6.35
2.1 - 3.0	637	89.84	96.19
3.1 - 10.0	27	3.81	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 - July 2016**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	6	6	4	5	0	0	0	0	0	4	4	7	0	0	0	9	45
2.1 - 3.0	143	86	21	10	13	12	19	40	40	35	51	25	23	40	26	53	637
3.1 - 10.0	3	0	0	0	0	0	1	4	5	1	1	2	0	3	5	2	27
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	152	92	25	15	13	12	20	44	45	40	56	34	23	43	31	64	709

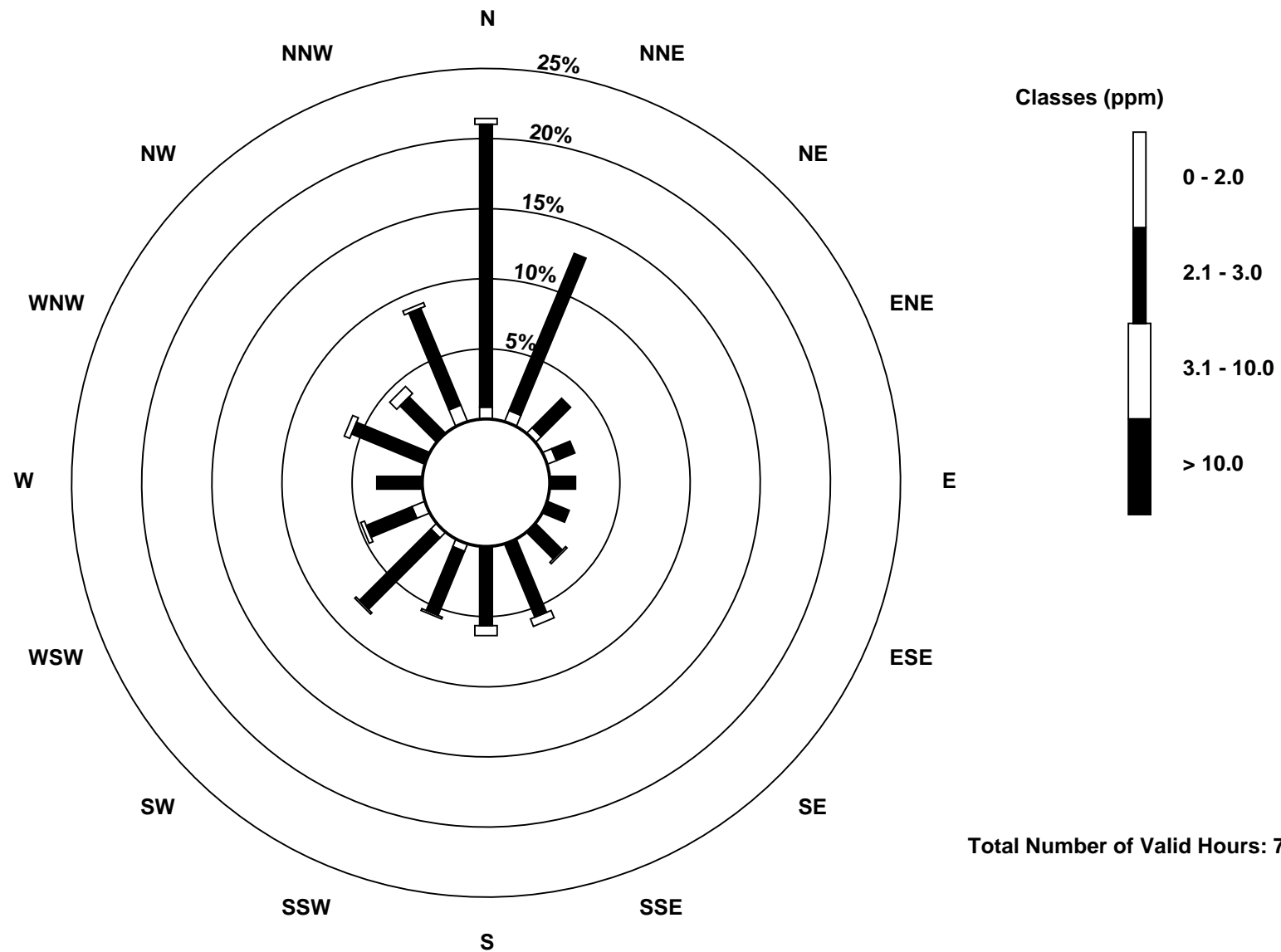
Total Number of Valid Hours: 709

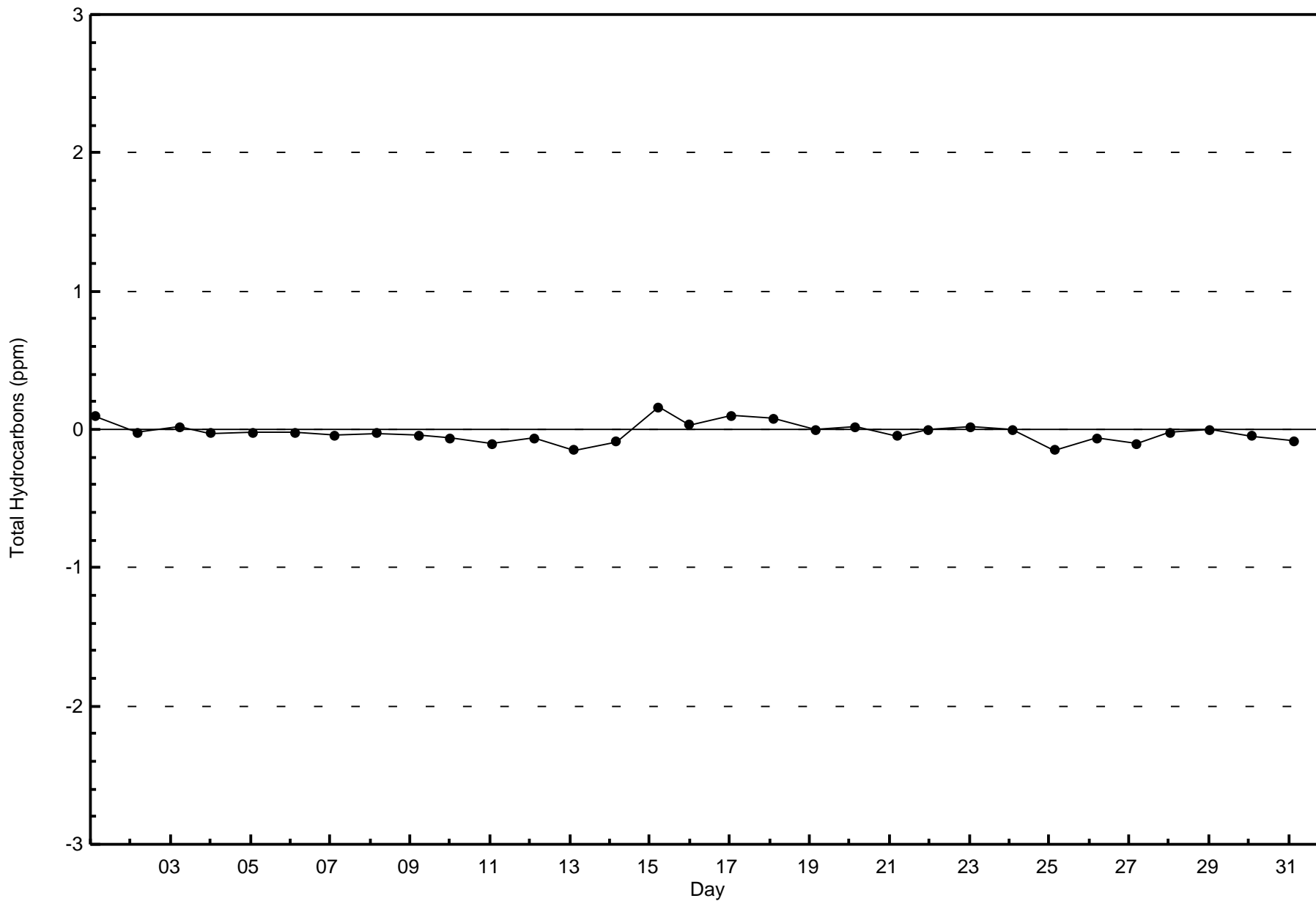
Total Number of Hours: 744

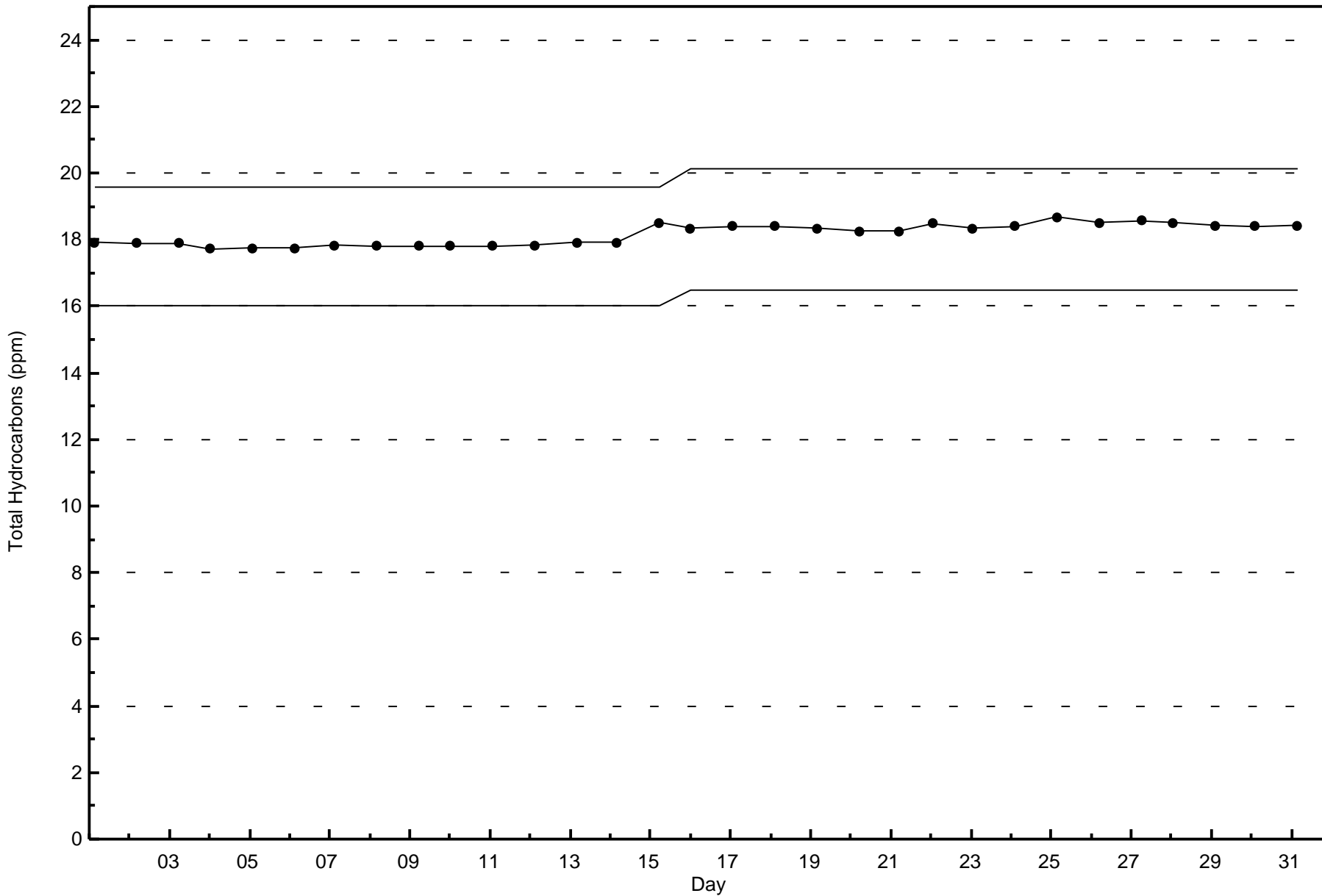


Wood Buffalo Environmental Association
Wind Rose Jul 2016

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





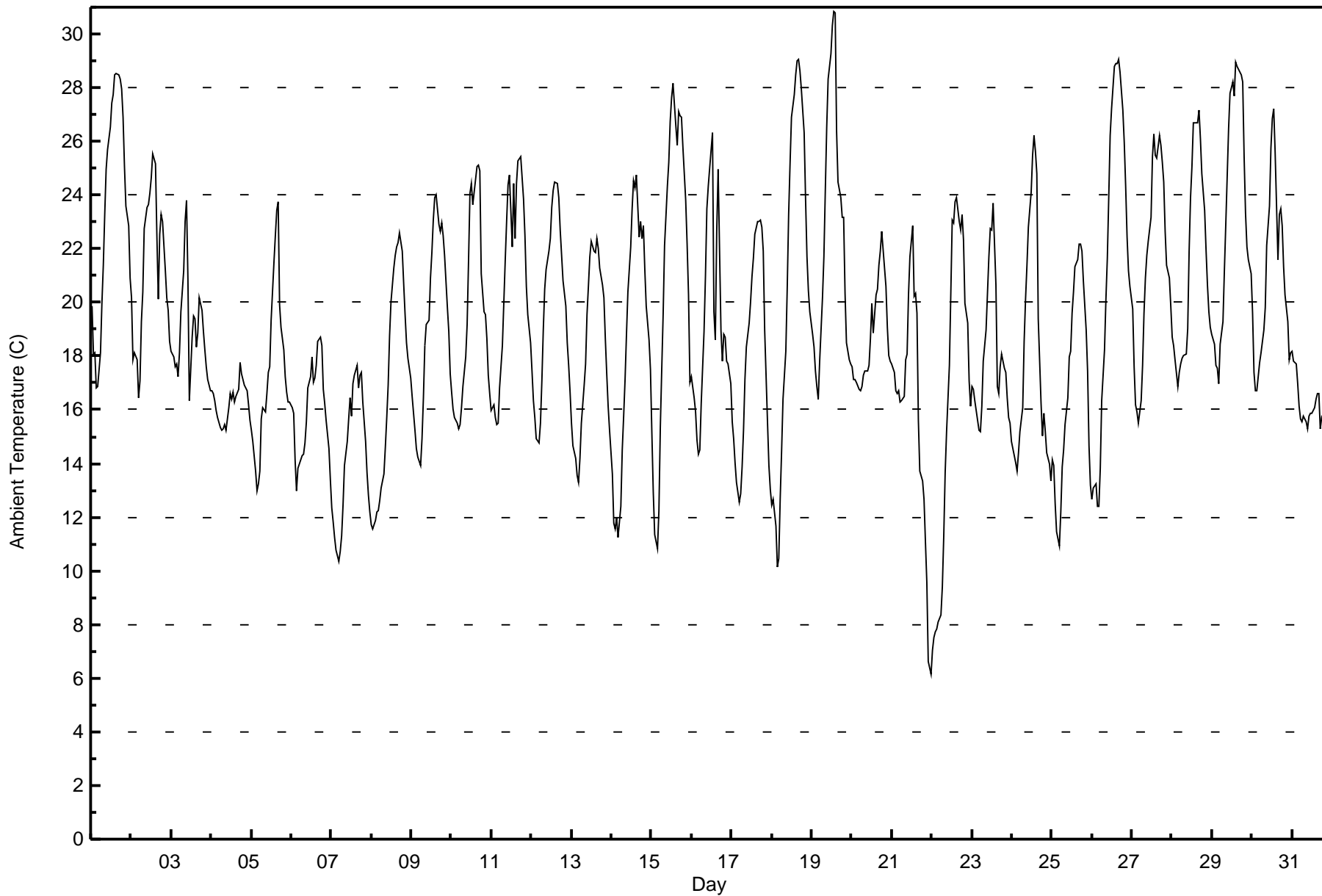




Wood Buffalo Environmental Association
Summary of Hour Averages

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

Maximum Value: 30.8 C on Jul 19 14:00		Maximum Daily Average: 23.6 C on Jul 1		Hours in Service: 744																																												
Minimum Value: 6.1 C on Jul 22 00:00		Minimum Daily Average: 14.2 C on Jul 7		Hours of Data: 744																																												
Maximum Diurnal Average: 23.3 C at hour 14		Minimum Diurnal Average: 14.3 C at hour 5		Hours of Missing Data: 0																																												
Monthly Average: 19.09 C		Percentiles: P ₁ = 8.3 P ₁₀ = 13.7 Q ₁ = 16.1 Median = 18.4 Q ₃ = 22.4 P ₉₀ = 25.4 P ₉₉ = 29.0		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-Jul	19.8	18.1	18.1	16.8	16.9	18.1	19.9	21.4	23.3	24.9	25.7	26.5	27.4	27.7	28.5	28.5	28.5	28.3	27.9	26.9	25.1	23.6	22.9	20.9	23.6	28.5																						
2-Jul	20.2	17.9	18.1	17.8	16.5	17.1	19.3	20.4	22.7	23.6	23.7	24.1	24.6	25.6	25.2	22.4	20.1	22.6	23.3	23.0	21.2	20.2	19.7	18.6	21.1	25.6																						
3-Jul	18.2	18.0	17.6	17.7	17.2	18.1	19.7	21.2	23.0	23.8	20.8	16.4	18.7	19.5	19.4	18.3	18.9	20.2	19.7	18.9	18.2	17.6	17.1	16.7	19.0	23.8																						
4-Jul	16.7	16.6	16.4	16.0	15.7	15.4	15.2	15.3	15.5	15.3	16.1	16.6	16.4	16.6	16.3	16.5	16.8	17.7	17.4	17.2	16.9	16.7	16.2	15.6	16.3	17.7																						
5-Jul	15.2	14.8	13.7	13.0	13.3	13.7	15.6	16.1	15.9	16.6	17.4	17.6	19.3	21.5	22.5	23.4	23.8	19.9	19.1	18.2	17.2	16.6	16.3	16.3	17.4	23.8																						
6-Jul	16.1	15.9	14.1	13.0	13.8	14.0	14.3	14.4	14.8	15.5	16.8	17.2	18.0	17.0	17.2	17.7	18.5	18.7	18.4	16.8	16.2	15.6	14.6	13.4	15.9	18.7																						
7-Jul	12.3	11.8	11.2	10.8	10.4	10.7	11.3	12.5	13.9	14.8	15.7	16.4	15.8	17.0	17.3	17.6	16.8	17.3	17.4	16.3	14.8	13.7	12.8	12.2	14.2	17.6																						
8-Jul	11.7	11.6	11.9	12.2	12.3	12.6	13.1	13.6	14.6	15.7	16.9	18.8	20.0	21.3	21.8	22.1	22.2	22.6	21.9	20.7	19.5	18.5	17.9	17.2	17.1	22.6																						
9-Jul	16.5	15.8	15.2	14.5	14.2	13.9	14.9	16.4	18.4	19.2	19.4	20.9	21.8	23.1	23.9	24.0	22.9	22.6	22.9	22.5	21.7	19.8	18.9	17.3	19.2	24.0																						
10-Jul	16.7	16.0	15.7	15.5	15.3	15.4	16.1	16.9	18.0	19.2	21.6	24.1	24.4	23.6	24.6	25.1	25.1	24.9	21.1	19.6	19.6	18.7	17.3	16.6	19.6	25.1																						
11-Jul	16.0	16.2	15.7	15.4	15.5	16.8	18.4	20.0	21.5	23.0	24.4	24.8	22.1	24.4	22.4	24.4	25.3	25.4	24.6	23.8	22.5	20.6	19.5	18.5	20.9	25.4																						
12-Jul	17.5	16.3	15.7	14.9	14.8	15.5	17.1	19.0	20.5	21.2	21.9	22.4	23.6	24.1	24.5	24.4	23.9	22.7	21.7	20.8	19.8	18.5	17.6	16.6	19.8	24.5																						
13-Jul	15.5	14.7	14.2	13.6	13.3	14.2	15.5	16.9	17.7	19.5	20.6	21.7	22.3	21.9	21.9	22.4	22.0	21.3	20.7	20.2	18.7	17.3	16.1	15.2	18.2	22.4																						
14-Jul	13.6	11.8	11.6	12.0	11.2	12.4	14.5	15.7	17.2	18.8	20.4	22.1	23.5	24.6	24.3	24.8	22.4	23.0	22.4	22.8	21.2	19.8	18.6	17.5	18.6	24.8																						
15-Jul	15.1	12.9	11.4	10.8	12.2	15.3	17.5	19.5	22.1	24.3	25.2	26.7	27.6	28.2	26.6	25.8	27.1	26.9	26.9	25.8	23.8	22.2	20.3	17.0	21.3	28.2																						
16-Jul	17.3	16.5	15.9	14.9	14.3	14.5	16.2	18.9	21.0	23.5	24.3	25.0	26.3	19.6	18.6	22.7	24.9	19.0	17.8	18.8	18.7	17.8	17.7	17.0	19.2	26.3																						
17-Jul	15.6	14.9	14.0	13.3	12.5	12.9	13.9	15.2	17.1	18.4	19.2	20.0	20.9	21.6	22.5	23.0	23.0	23.1	22.8	21.9	19.0	15.6	13.9	13.1	17.8	23.1																						
18-Jul	12.4	12.6	11.6	10.1	10.4	12.7	14.5	16.4	18.2	20.6	23.3	25.1	26.9	27.7	28.5	29.0	29.0	28.7	28.0	26.3	23.9	21.7	20.4	19.7	20.7	29.0																						
19-Jul	18.8	18.3	17.4	16.9	16.4	17.8	20.2	21.7	24.2	26.5	28.3	29.3	30.3	30.8	30.8	26.4	24.5	23.9	23.2	23.2	20.3	18.5	17.9	17.7	22.6	30.8																						
20-Jul	17.6	17.1	17.1	17.0	16.8	16.7	16.9	17.3	17.4	17.4	17.6	18.6	20.0	18.8	20.3	20.5	21.4	21.9	22.7	22.0	20.6	19.1	18.0	17.8	18.8	22.7																						
21-Jul	17.7	17.4	16.7	16.6	16.7	16.3	16.4	16.5	17.8	18.1	20.3	21.7	22.9	20.2	20.3	19.6	15.6	13.7	13.4	12.7	11.1	9.6	6.6	6.1	16.0	22.9																						
22-Jul	7.0	7.5	7.7	7.8	8.1	8.4	9.4	11.3	13.7	15.2	17.7	20.3	23.1	22.9	23.8	23.9	23.0	22.7	23.3	22.3	20.0	19.2	17.1	16.1	16.3	23.9																						
23-Jul	16.9	16.7	16.3	15.6	15.3	15.2	16.1	17.8	18.9	20.3	21.7	22.7	22.7	23.7	20.7	16.9	16.6	17.6	18.1	17.6	17.4	16.4	15.7	15.5	18.0	23.7																						
24-Jul	14.8	14.3	14.0	13.7	14.4	15.2	16.1	18.6	20.1	21.4	22.8	24.1	25.5	26.2	25.6	24.8	19.4	16.3	15.0	15.8	15.2	14.4	14.0	13.3	18.1	26.2																						
25-Jul	14.1	13.9	12.5	11.4	11.0	12.2	13.9	14.5	15.5	16.5	18.0	18.2	19.6	20.4	21.3	21.6	22.2	22.2	21.9	20.8	19.0	17.4	14.7	13.2	16.9	22.2																						
26-Jul	12.7	13.1	13.2	12.4	12.4	13.8	16.3	18.2	20.1	21.7	23.9	26.2	27.2	28.8	28.9	28.9	29.0	28.6	27.2	25.9	24.3	22.5	21.2	20.6	21.6	29.0																						
27-Jul	19.8	17.6	16.2	15.9	15.5	16.3	17.6	19.6	20.9	21.8	22.3	23.1	25.4	26.3	25.5	25.4	26.2	25.9	25.2	24.5	22.7	21.4	20.9	19.8	21.5	26.3																						
28-Jul	18.7	18.4	17.9	16.9	17.4	17.7	17.9	18.0	18.1	19.0	21.9	23.9	25.1	26.7	26.7	26.7	27.2	26.1	24.8	23.4	22.0	20.7	19.7	19.1	21.4	27.2																						
29-Jul	18.8	18.5	17.6	17.6	17.0	18.5	19.3	21.2	22.9	24.7	26.5	27.8	28.2	27.7	28.9	28.8	28.7	28.5	28.2	25.4	23.3	22.1	21.6	21.1	23.5	28.9																						
30-Jul	19.6	17.4	16.7	16.7	17.8	18.1	18.6	19.0	19.8	22.1	23.6	25.7	26.8	27.2	25.6	21.6	23.3	23.5	22.8	21.4	20.3	19.3	17.9	18.1	21.0	27.2																						
31-Jul	18.2	17.8	17.7	17.0	16.1	15.6	15.5	15.7	15.6	15.3	15.8	15.8	15.9	16.1	16.4	16.6	16.6	15.3	15.7	15.4	15.4	15.3	15.3	15.3	16.1	18.2																						
																								16.2	15.5	15.0	14.4	14.3	15.0	16.2	17.4	18.7	19.9	21.1	22.1	23.0	23.3	23.2	23.0	22.7	22.3	21.8	21.0	19.7	18.4	17.4	16.6	Diurnal Average
																								20.2	18.5	18.1	17.8	17.8	18.5	20.2	21.7	24.2	26.5	28.3	29.3	30.3	30.8	30.8	29.0	29.0	28.7	28.2	26.9	25.1	23.6	22.9	21.1	Diurnal Maximum





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	10	1.34	1.34
10 - 20	444	59.68	61.02
> 20	290	38.98	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

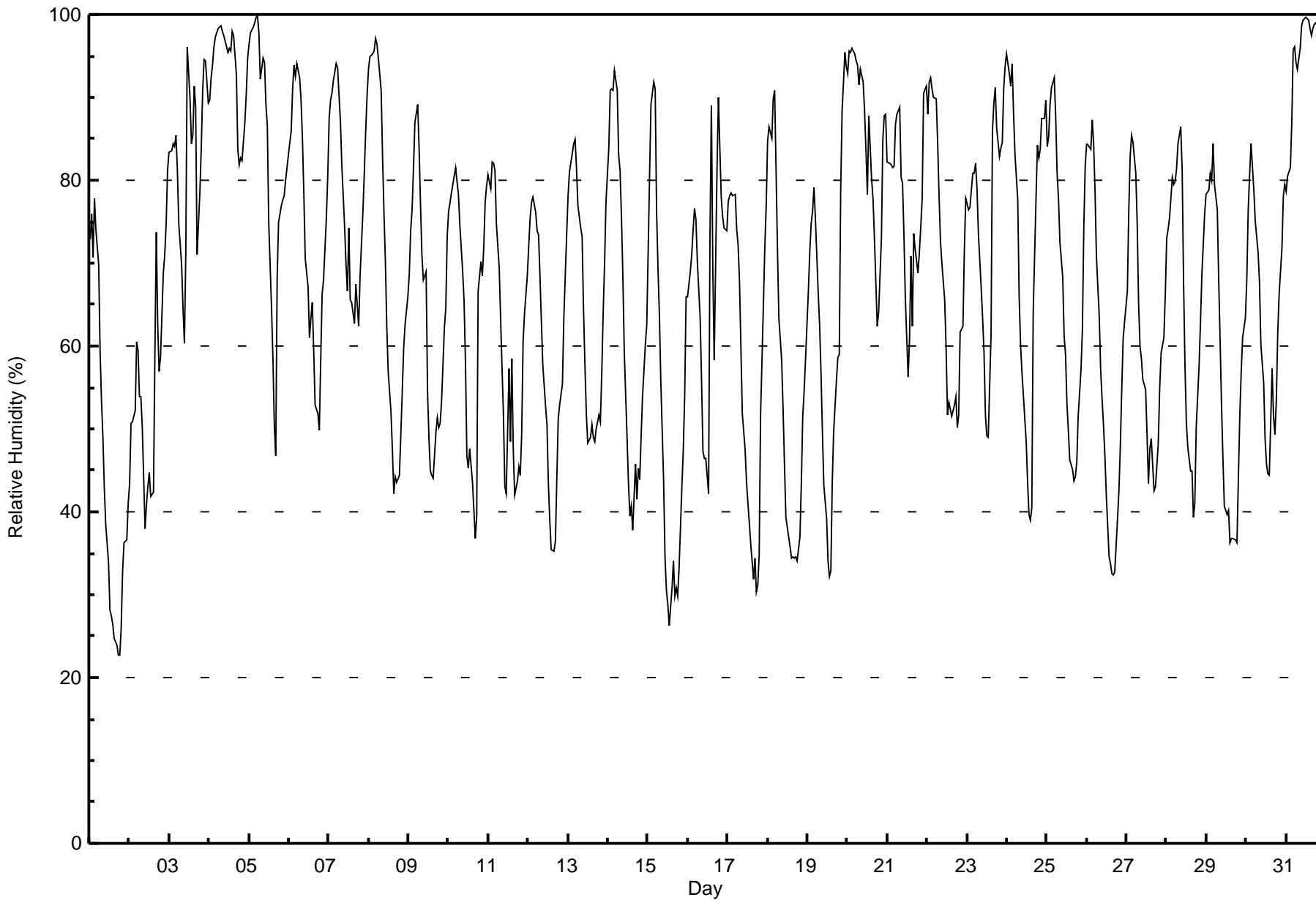
Mildred Lake - July 2016

Maximum Value: 100 % on Jul 5 06:00																		Maximum Daily Average: 94.7 % on Jul 31																		Hours in Service: 744							
Minimum Value: 23 % on Jul 1 18:00																		Minimum Daily Average: 44.4 % on Jul 1																		Hours of Data: 744							
Maximum Diurnal Average: 85.7 % at hour 5																		Minimum Diurnal Average: 52.3 % at hour 14																		Hours of Missing Data: 0							
Monthly Average: 67.6 %																		Percentiles: P ₁ = 27 P ₁₀ = 41 Q ₁ = 51 Median = 70 Q ₃ = 83 P ₉₀ = 93 P ₉₉ = 99																		Hours of Calibration: 0							
																																				Percent Operational Time: 100.0							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																			
1-Jul	73	76	71	78	74	70	59	53	49	43	38	34	28	28	26	25	24	23	23	26	33	36	37	41	44.4	78																	
2-Jul	43	51	51	52	60	59	54	54	50	38	41	43	45	42	42	59	74	63	57	59	69	71	75	81	55.5	81																	
3-Jul	83	83	84	84	86	81	75	70	64	60	71	96	90	84	85	91	89	71	79	84	91	95	94	89	82.5	96																	
4-Jul	90	92	94	96	97	98	99	99	98	97	96	95	96	96	98	97	93	84	82	83	82	87	90	95	93.1	99																	
5-Jul	96	98	98	99	100	100	98	92	95	94	89	87	75	65	58	50	47	68	75	77	78	78	80	82	82.4	100																	
6-Jul	85	86	91	94	93	94	92	90	85	78	71	67	61	63	65	59	53	52	50	58	66	68	75	80	74.0	94																	
7-Jul	87	90	91	92	94	94	90	87	82	74	70	67	74	66	65	63	67	65	62	68	76	81	86	90	78.4	94																	
8-Jul	93	95	95	96	97	96	95	91	83	76	70	62	57	52	47	42	44	44	44	49	54	60	63	66	69.7	97																	
9-Jul	69	74	76	81	87	89	84	77	71	68	69	54	49	45	44	44	50	51	50	51	53	62	65	73	64.1	89																	
10-Jul	76	77	79	81	81	80	78	75	69	65	58	47	45	48	44	40	37	40	67	70	68	72	77	79	64.7	81																	
11-Jul	81	79	82	82	81	75	70	63	58	52	43	42	57	49	58	48	42	44	45	44	49	61	64	68	59.9	82																	
12-Jul	72	75	77	78	76	74	73	69	63	58	53	51	43	39	35	35	36	44	51	53	55	63	68	73	59.0	78																	
13-Jul	78	81	83	84	85	81	77	74	73	64	58	52	48	49	51	49	49	50	52	51	57	64	70	78	64.9	85																	
14-Jul	84	91	91	91	93	91	83	81	76	68	59	49	43	39	41	38	46	42	45	44	49	54	60	63	63.4	93																	
15-Jul	71	81	89	92	91	76	69	64	56	44	34	31	29	26	31	34	30	31	30	33	43	47	54	66	52.2	92																	
16-Jul	66	69	71	74	77	75	70	63	56	47	46	46	42	73	89	69	58	81	90	84	78	76	74	74	68.8	90																	
17-Jul	77	78	78	78	78	74	72	68	60	52	47	44	41	39	36	32	34	30	31	35	52	65	72	77	56.3	78																	
18-Jul	85	86	85	90	91	81	72	63	58	52	46	39	38	36	34	35	34	35	34	37	43	52	55	59	55.8	91																	
19-Jul	67	71	75	76	79	75	66	63	57	50	43	39	34	32	33	44	50	56	59	59	79	88	95	94	61.8	95																	
20-Jul	93	96	96	96	95	94	94	92	93	92	88	84	78	88	80	78	73	68	62	64	73	85	88	88	84.9	96																	
21-Jul	82	82	82	82	82	87	88	89	80	80	74	66	56	61	71	62	74	72	69	71	74	78	91	91	76.8	91																	
22-Jul	88	92	92	91	90	90	85	78	73	70	66	60	52	53	52	51	53	54	50	52	62	62	71	78	69.4	92																	
23-Jul	77	76	77	81	81	82	79	74	67	63	59	52	49	49	61	86	89	91	86	83	84	85	91	94	75.7	94																	
24-Jul	95	93	91	94	88	83	78	66	60	57	54	48	44	40	39	41	64	78	84	83	84	88	87	90	72.0	95																	
25-Jul	84	85	89	91	92	88	81	78	73	68	61	59	53	50	46	45	44	44	46	51	57	62	74	82	66.9	92																	
26-Jul	84	84	84	87	84	79	71	63	57	54	50	47	42	35	34	32	32	33	39	42	48	55	61	63	56.7	87																	
27-Jul	67	76	83	85	85	81	75	65	60	59	56	55	49	43	48	49	42	43	46	48	55	59	61	66	60.6	85																	
28-Jul	73	74	75	80	79	80	81	84	86	81	68	58	51	48	45	45	39	41	50	57	63	69	72	76	65.7	86																	
29-Jul	78	79	81	80	84	79	76	68	61	53	47	41	40	40	36	37	37	37	36	44	52	57	61	63	56.9	84																	
30-Jul	68	76	81	84	79	75	73	71	68	60	56	49	46	45	44	57	52	49	53	62	66	72	78	79	64.3	84																	
31-Jul	79	81	82	87	96	96	94	93	96	99	99	100	100	99	98	97	98	99	99	98	98	97	95	95	94.7	100																	
																		78.9	81.5	83.0	85.1	85.7	83.2	79.1	74.7	70.2	65.1	60.7	56.8	53.4	52.3	52.9	52.8	53.3	54.2	56.4	58.8	64.2	69.2	73.7	77.2	Diurnal Average	
																		96	98	98	99	100	100	99	99	98	99	99	100	100	99	98	97	98	99	99	98	98	97	95	95	Diurnal Maximum	



Wood Buffalo Environmental Association
Hourly Averages

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





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed (WS) - km/h

Mildred Lake - July 2016

Maximum Speed: 22 km/h on Jul 24 18:00	Maximum Daily Speed Average: 13.9 km/h on Jul 12	Hours in Service: 744
Minimum Speed Value: 0 km/h on Jul 31 04:00	Minimum Daily Speed Average: 1.3 km/h on Jul 30	Hours of Data: 744
Maximum Diurnal Speed Average: 4.8 km/h at hour 17	Minimum Diurnal Speed Average: 0.9 km/h at hour 11	Hours of Missing Data: 0
Monthly Average Velocity: 2.3 km/h 339.2 deg	Percentiles: P ₁ = 1 P ₁₀ = 4 Q ₁ = 6 Median = 8 Q ₃ = 11 P ₉₀ = 13 P ₉₉ = 18	Percent Operational Time: 100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	SSW5	S4	SSE6	S5	SE4	SE7	SSE12	SSE14	SSE14	S16	SSE19	SSE18	SSE15	SSE13	S12	SSE12	SSE11	SSE14	SSE14	S13	S11	SSE11	SSE12	SSE10	SSE11.1	SSE19
2-Jul	SSE9	SE6	SE10	SSE9	ESE3	SSE8	SSE7	SE9	SSE13	SSE21	SSE18	SSE17	S16	S17	S14	SSW17	S12	SE11	SSE13	SSE10	SE7	ESE10	SE9	SE7	SSE10.7	SSE21
3-Jul	SE8	SSE9	SSE9	SSE7	ESE5	SE6	SSE9	S9	S8	SE8	S14	WSW5	NNW2	E8	E6	E6	ESE7	SE9	ESE7	ESE4	SE3	SE7	S3	NW8	SE5.2	S14
4-Jul	WNW6	NW7	WNW5	W4	WNW7	WNW8	W6	W5	WSW5	W8	WNW8	W7	WSW7	WNW9	W8WSW13	WSW9WNW10	SW7	SW8	SSW10	S7	SE5	NE1	NE1	W5.5	WSW13	
5-Jul	NNE4	N5	N5	N6	N7	NNW6	WNW3	W10	NNE7	NE3	E5	E3	N7	N8	NE7	ENE5	ENE4	N11	NNW13	NNW14	NW8	WNW7	NW8	NW8	N5.6	NNW14
6-Jul	WNW8	NW9	NNW8	NW7	NNW8	N9	NNE7	N11	NNE13	NNE13	NE11	NNE11	NNE12	NE13	ENE13	ENE12	ENE11	ENE11	NE10	N7	N7	N10	N10	N9	NNE8.4	NNE13
7-Jul	N10	N9	N9	N8	N10	N9	N10	N9	NNW11	N13	N10	N9	N13	N12	NNE14	NNE14	NNE12	NNE13	N13	NNE10	N9	N9	N9	N7	N10.2	NNE14
8-Jul	N8	N6	N5	N4	N5	N6	N7	NNE8	NNE8	N8	N8	NNE9	NNE8	N6	N8	NNE4	ENE4	NNE9	NNE9	NNE8	NNE8	NNE9	NNE9	N9	NNE7.0	N9
9-Jul	N11	N10	N10	N10	NNE10	NNE8	NNE8	NNE6	N4	N6	NNW6	NW4	NNW3	ENE3	NNE6	NE7	NE8	E6	E7	E7	ENE5	NE5	NNE5	N8	NNE6.0	N11
10-Jul	NNE7	N9	N8	N8	NNE6	NNE4	NNE4	NNE5	NNE6	NE4	N6	SE1	ESE9	E12	E12	E11	ENE9	S5WSW14	WNW13	WNW9	NNW7	NNW7	N6	NNE3.9	WSW14	
11-Jul	N6	N6	NNW2	NNW5	N5	N5	N5	N6	N7	NNE7	N12	N13	NW11	NNW14	NNW16	N12	N12	N13	N13	N13	N9	N8	N10	N12	N9.1	NNW16
12-Jul	N13	N10	N12	N10	N12	N11	N12	N14	N13	N14	N14	N15	N17	N18	N19	NNW21	N18	N17	N19	N15	N12	N10	N11	N9	N13.9	NNW21
13-Jul	N8	N9	N10	N9	NNW11	NNW12	N15	N15	NNE14	N17	NNE16	NNE16	NNE16	NNE19	NNE17	NE15	NE15	NNE12	NNE10	N11	N7	N8	N8	NE6	NNE11.6	NNE19
14-Jul	NNE5	NE2	NNE5	N5	N3	N3	NNE2	N4	NNE4	NNE4	N7	NNE4	NNW5	NNW8	NNW12	NNW11	NNE13	N7	N8	NNW7	NNW6	N7	N8	N8	N5.9	NNE13
15-Jul	NNW4	NW4	WNW2	WSW1	SW4	SW4	SW5	SSW6	SW5	W3	NW6	W3	SSW6	SW5	NNW10	NNW15	NW11	NNW13	NNW11	NNW12	NNW7	NNW8	NNW7	N2	NW4.3	NNW15
16-Jul	W5	W5	W6	WSW6	WSW6	SW7	WSW6	SW5	WNW6	NW6	NNW7	NW8	NW8	NNW13	WNW2	ESE3	WNW2	N17	NNW8	NNW10	NNW13	NNW12	NNW13	NNW12	NW5.8	N17
17-Jul	NNW11	N10	N11	N10	N9	N9	N10	N10	N12	N13	N13	N12	N14	N12	N13	N15	NNE10	NNE10	NNE9	NNE7	NNE4	NNE3	NE3	SSW3	N9.1	N15
18-Jul	SSW4	SSW4	SW4	SSE2	S2	S7	SSW9	SSE7	S7	S8	S7	S7	SSW8	SW7	SW7	SW7	SW7	SW8	SW9	SW9	SW7	SSW7	SSW8	SW6	SSW6.2	SW9
19-Jul	SW5	WSW3	S5	SE5	ESE2	S5	SSW8	SSW10	SSW7	SSW10	SW9	SW12	SW11	SW12	WSW11	NW17	WNW17	WNW9	SW6	W3	NW8	ENE1	NNW3	NNE9	WSW4.8	NW17
20-Jul	NE7	NNE7	NNE7	N8	N8	N7	N6	N6	N4	NNE5	ENE3	ENE3	N4	N7	NNW8	NNW10	NNW8	N6	NNW5	N2	SW3	SSW5	SW6	SW6	N4.0	NNW10
21-Jul	WSW6	WNW8	WSW7	WSW10	SW8	SW7	WSW7	WSW11	WNW11	WNW8	WSW7	W10	WNW13	W13	W12	N16	NNE20	NNE21	NNE15	NNE13	NNE11	NE6	E3	SE5	NW5.1	NNE21
22-Jul	SE7	S8	SSW10	S10	S10	S12	SSE15	S14	S14	S15	S15	SSE18	SSW16	SW10	SSW11	SW9	NW11	NW9	WNW13	NNW12	N8	N9	N5	WNW3	SSW5.7	SSE18
23-Jul	W4	W7	WNW9	WNW8	NW8	NNW7	NNW7	NNE5	NNW5	S1	SW6	W5	NNW5	WSW5	NW8	N7	WNW7	E3	SW8	SW5	W5	W5	W5	SW7	WNW3.9	WNW9
24-Jul	SW6	S7	SSE7	S7	S8	SW7	SW11	WSW13	WSW12	WSW13	WSW13	WSW15	WSW16	WSW17	WSW15	WSW15	NW21	NW22	WNW13	WNW11	WNW15	WNW14	WNW11	WSW11	W10.0	NW22
25-Jul	WNW14	NW12	NNW6	N4	N2	NW7	WNW9	NW12	NNW11	NNW7	NNW5	NW7	NNW7	NNW9	NNE6	NE8	N8	NNE8	ENE7	NE8	NE7	NNE6	NNE6	NNE5	NNW5.9	WNW14
26-Jul	NNE3	ESE1	NNE5	NNE4	ESE6	SE6	SSE10	SSE12	S10	S8	SSW7	SSW9	SW9	SW8	SW7	SW8	SSW8	S11	SSE12	SSE10	SSE8	SSE7	S8	S5.9	SSE12	
27-Jul	S8	S6	S5	SSW6	SSW5	SW4	SW4	SW3	NW2	N6	NNE8	N9	N8	N13	NNE11	NE10	N13	NNE9	NNE7	NE6	NNE7	N8	NNE7	NNE5	N3.6	N13
28-Jul	N6	N7	N5	NW2	N3	WSW4	WSW4	NNE2	NW1	SSW4	SSW6	SSW4	SSW7	SSW7	SW5	SW1	ESE5	ESE2	NNW1	WSW3	W10	SW8	SSW10	SW5	SW2.1	W10
29-Jul	SW6	WSW5	W5	WNW6	WSW5	SW5	SSW8	SW8	SSW8	SSW8	SW9	SW8	SSW8	S5	SW7	SSW9	SSW9	SW7	SW5	S6	SSE7	SE7	SSE10	SSE8	SSW6.0	SSE10
30-Jul	N7	E4	SSE5	W1	NW5	WSW8	SW7	SW5	SW4	ESE0	SE1	SSW6	SSW7	SSE8	S16	N17	NNE11	NE11	NE8	NNE9	NNE10	N6	NE4	NNE7	NNE1.3	N17
31-Jul	NNE9	NE8	NNE7	ENE0	NE2	N11	NNE8	NNW9	N11	NNW6	NNW3	WNW3	WNW9	WNW10	WNW11	W3	NNW5	N6	WNW8	WNW7	WNW10	WNW9	WNW10	NW9	NNW5.7	N11

NNW2.7	NNW2.6	NNW1.9	NNW1.8	NNW2.2	NW1.7	W1.0	NW1.2	NNW1.6	NNW1.1	NW0.9	NNW1.6	NNW2.6	NW2.7	NW3.0	N4.0	N4.8	N4.8	N3.2	NNW3.6	NNW3.4	N2.6	NNW2.3	NNW2.4	Diurnal Average	
WNW14	NW12	N12	N10	N12	NNW12	SSE15	N15	SSE14	SSE21	SSE19	SSE18	N17	NNE19	N19	NNW21	NW21	NW22	N19	N15	WNW15	WNW14	NNW13	N12	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

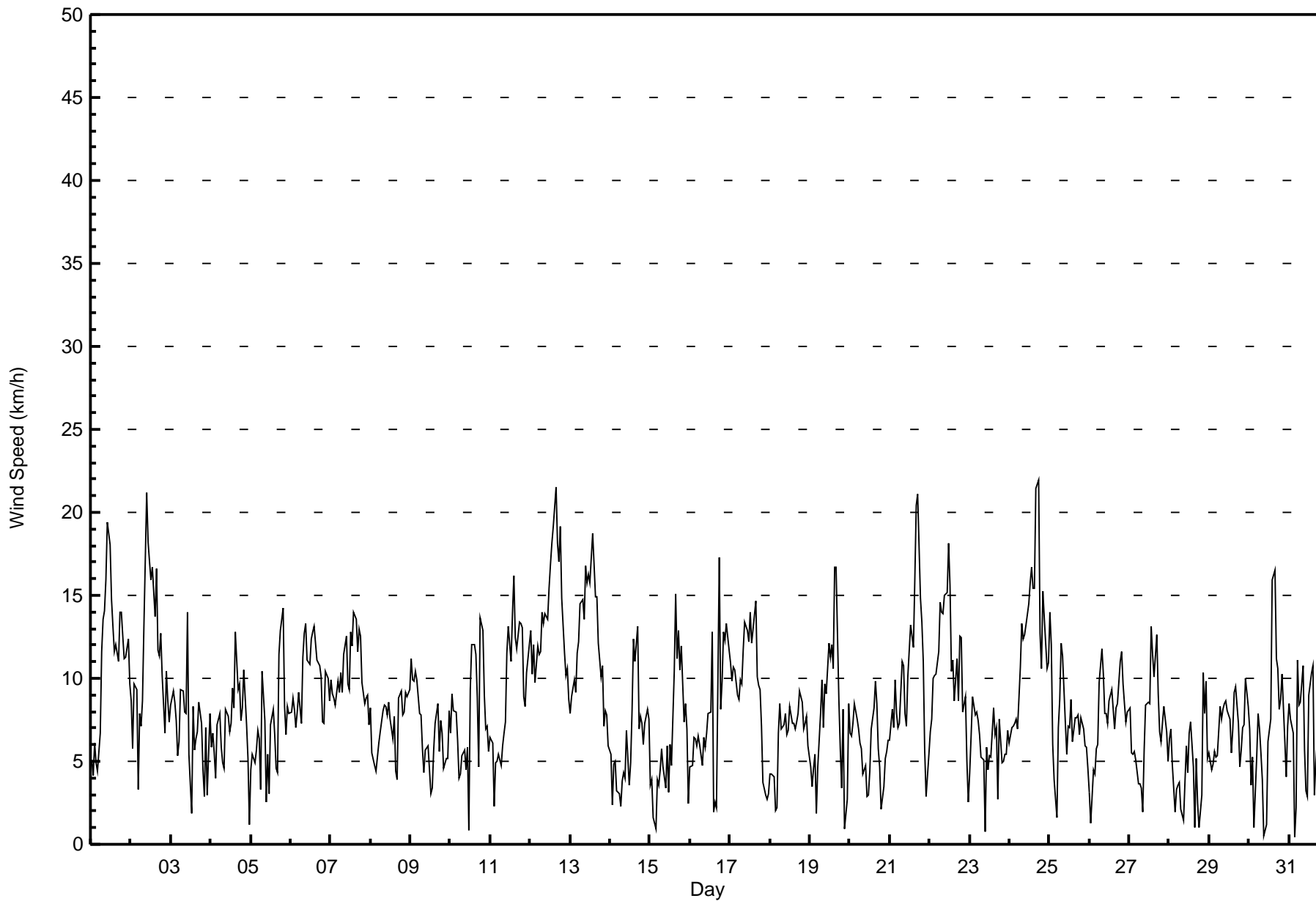
Wind Speed (WS) - km/h
Mildred Lake - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 13 km/h on Jul 24 17:00 Minimum Value: 0 km/h on Jul 26 01:00 Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 2 Q ₃ = 3 P ₉₀ = 4 P ₉₉ = 6																	Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Jul	1	2	2	1	2	2	3	3	3	4	5	4	4	4	5	4	4	4	4	3	3	2	2	2	5
2-Jul	2	2	1	2	2	2	2	2	4	5	5	5	4	4	4	7	5	4	3	3	2	2	2	2	7
3-Jul	1	2	3	2	1	2	2	2	2	2	8	3	3	3	2	1	1	2	3	1	1	2	3	2	8
4-Jul	3	2	2	2	3	2	3	2	2	3	3	2	3	4	3	5	4	5	3	3	2	2	2	1	5
5-Jul	2	1	1	1	1	1	1	4	4	1	2	1	4	3	2	2	2	6	3	2	3	3	2	2	6
6-Jul	3	2	4	2	2	2	2	4	3	3	4	3	4	3	4	4	3	4	3	2	1	2	2	2	4
7-Jul	2	2	2	1	2	2	2	2	3	3	3	4	3	3	4	4	4	4	4	3	1	1	1	1	4
8-Jul	1	2	1	1	1	1	2	2	2	3	4	3	3	3	3	3	3	3	2	2	2	2	2	2	4
9-Jul	2	2	2	2	2	2	2	2	2	2	2	2	1	2	3	3	2	2	2	2	1	1	1	1	3
10-Jul	2	2	2	1	1	1	1	1	1	1	2	2	5	3	3	3	3	2	5	4	3	3	2	2	5
11-Jul	1	2	1	1	1	1	1	2	2	3	3	5	4	4	3	3	3	4	4	3	2	1	2	2	5
12-Jul	2	2	2	2	2	2	3	3	3	3	4	4	5	4	5	5	5	6	5	4	2	2	2	2	6
13-Jul	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5	5	4	4	2	2	1	1	1	1	5
14-Jul	1	1	1	2	1	1	1	1	2	2	3	3	3	5	4	4	5	2	1	1	1	1	1	1	5
15-Jul	1	1	1	1	1	1	1	2	1	2	2	2	3	2	8	4	3	4	3	3	2	2	2	2	8
16-Jul	1	2	2	2	2	2	2	2	2	2	3	3	3	9	2	1	3	8	2	2	2	2	2	2	9
17-Jul	1	1	2	1	1	1	2	2	2	4	4	5	5	4	4	4	3	3	2	2	1	0	1	1	5
18-Jul	1	1	1	1	2	2	2	2	1	2	2	2	2	3	3	2	3	3	3	2	2	1	2	2	3
19-Jul	1	1	2	3	2	3	3	3	2	2	3	4	4	4	4	6	5	4	2	1	5	3	1	2	6
20-Jul	1	1	1	3	1	1	1	1	1	2	1	2	2	2	2	3	3	3	2	2	2	2	2	2	3
21-Jul	3	4	3	3	3	3	3	4	4	4	3	4	6	5	4	6	5	6	4	3	3	2	1	2	6
22-Jul	1	3	2	2	2	3	3	3	3	3	5	4	5	3	3	4	3	3	5	4	2	2	3	1	5
23-Jul	1	2	2	2	2	1	2	2	2	2	2	2	2	2	6	2	3	1	2	2	2	2	2	2	6
24-Jul	2	2	2	2	2	3	3	5	5	5	5	5	6	6	6	7	13	8	7	4	5	4	4	4	13
25-Jul	5	4	3	1	1	2	3	3	3	3	3	3	3	3	3	3	3	2	2	2	1	1	1	1	5
26-Jul	0	2	2	2	2	3	4	2	2	2	2	4	3	4	3	3	3	3	3	2	2	2	1	2	4
27-Jul	2	2	1	1	1	1	1	1	1	1	3	2	3	4	3	3	3	3	1	1	1	1	1	2	4
28-Jul	2	2	2	1	2	2	1	1	1	2	2	2	2	2	2	2	3	2	2	4	4	3	3	2	4
29-Jul	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	4	3	3	2	3	1	2	2	2	4
30-Jul	5	1	3	2	3	4	3	2	1	2	2	3	2	3	5	4	3	3	2	2	2	2	1	2	5
31-Jul	2	2	2	2	3	3	3	3	2	3	4	3	4	3	4	2	4	3	4	2	4	3	3	3	4
																	5 4 4 3 3 4 4 5 5 5 8 5 6 9 8 7 13 8 7 4 5 4 4 4 4								
																	Diurnal Maximum								



Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	174	23.39	23.39
6 - 11	419	56.32	79.70
12 - 19	145	19.49	99.19
20 - 28	6	0.81	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

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

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	22	23	7	9	5	9	7	2	10	9	19	10	15	7	6	14	174
6 - 11	100	51	15	4	7	5	16	23	23	29	39	14	8	29	20	36	419
12 - 19	42	20	3	3	1	0	0	20	13	2	2	11	2	8	3	15	145
20 - 28	0	2	0	0	0	0	0	1	0	0	0	0	0	0	2	1	6
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	164	96	25	16	13	14	23	46	46	40	60	35	25	44	31	66	744

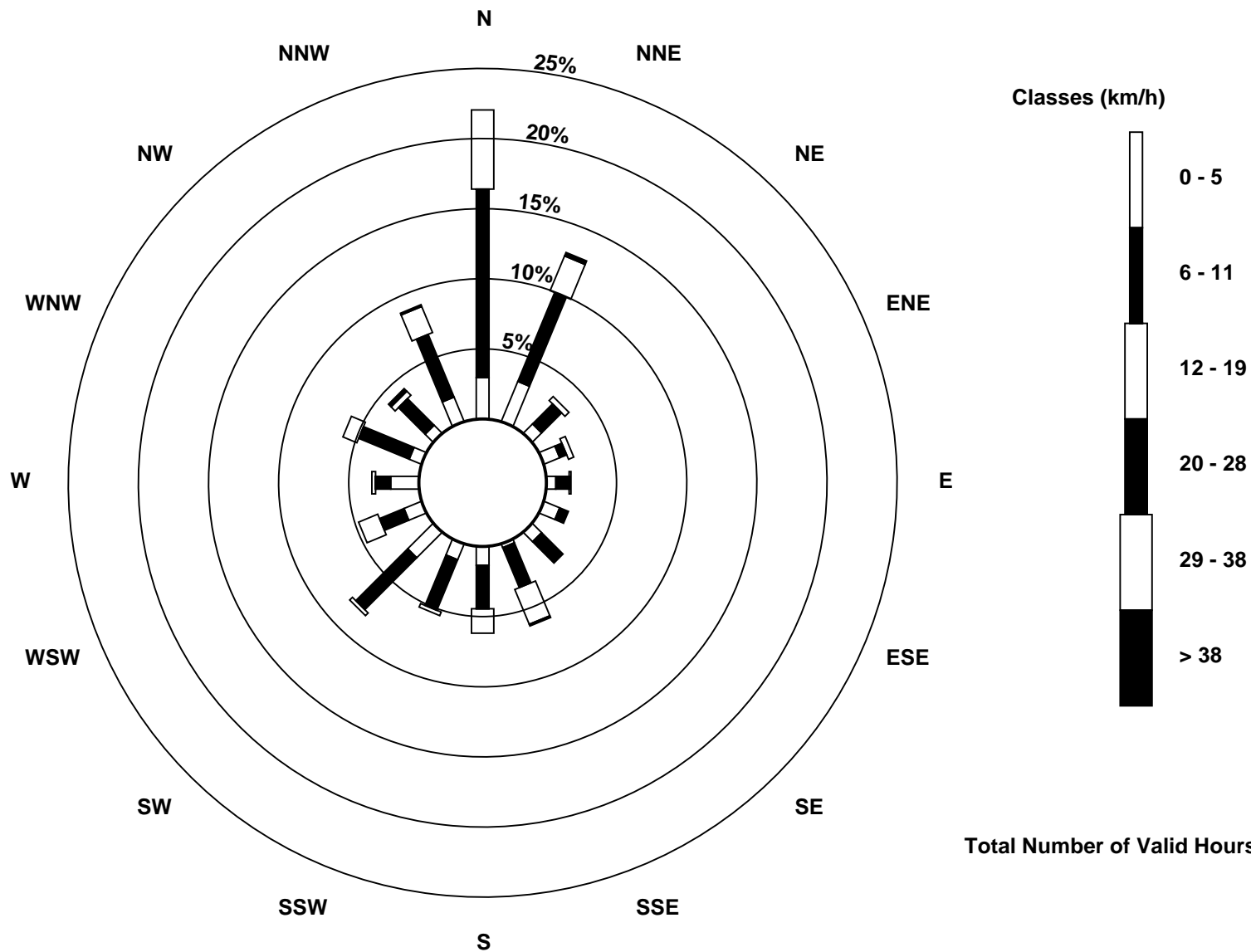
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

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





Wood Buffalo Environmental Association
Summary of Hour Averages

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

Direction of Maximum Speed: 308 deg on Jul 24 18:00 Direction of Maximum Daily Speed Average: 359.2 deg on Jul 12	Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0
Direction of Minimum Speed: 65 deg on Jul 31 04:00 Direction of Minimum Daily Speed Average: 1.3 deg on Jul 30	Percent Operational Time: 100.0
Monthly Average Direction: 296.0 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-Jul	212	171	160	184	136	146	161	160	161	169	168	162	167	164	184	166	154	153	161	178	188	167	163	148	165.3
2-Jul	159	125	141	159	112	153	153	125	154	158	165	168	180	180	179	194	179	141	147	156	133	120	145	129	158.1
3-Jul	129	149	149	152	119	140	159	171	173	145	184	242	334	94	96	83	104	144	114	102	130	128	188	311	142.3
4-Jul	298	312	282	261	289	292	279	270	249	274	287	274	256	286	266	248	258	296	218	217	194	170	136	41	261.5
5-Jul	25	5	3	8	355	346	290	356	17	38	92	79	357	357	47	58	58	355	338	337	326	290	306	312	354.3
6-Jul	298	305	332	326	344	0	14	7	19	25	38	23	17	45	62	63	59	74	45	356	356	359	354	10	17.7
7-Jul	9	3	2	5	5	353	355	2	346	349	2	5	359	8	18	19	29	32	11	15	5	6	3	5	6.8
8-Jul	5	9	6	1	3	357	8	13	14	7	3	32	29	356	7	27	66	30	18	19	26	13	27	11	15.0
9-Jul	9	9	10	8	13	17	19	28	9	351	335	324	341	66	28	47	34	79	82	83	57	47	27	5	22.9
10-Jul	12	7	8	9	14	17	32	18	26	36	6	130	103	87	79	82	75	184	254	293	301	328	345	3	20.1
11-Jul	1	9	336	342	355	359	353	352	3	12	357	350	316	344	342	351	1	9	8	9	9	4	358	357	355.9
12-Jul	356	358	0	354	0	6	10	6	357	3	4	11	8	354	349	346	351	8	357	6	360	351	352	0	359.2
13-Jul	353	350	352	351	345	341	353	2	12	3	18	23	21	22	24	50	47	32	15	7	2	360	11	41	12.2
14-Jul	16	35	16	2	11	7	32	11	12	19	358	18	336	337	334	344	19	11	349	336	341	349	354	6	357.8
15-Jul	342	320	286	248	224	222	216	205	219	274	319	269	213	214	330	345	326	327	340	340	344	328	340	356	314.2
16-Jul	276	270	264	250	238	229	243	234	302	313	327	319	315	328	303	102	285	4	347	339	342	337	344	345	318.0
17-Jul	343	351	349	349	352	359	3	0	351	8	3	351	354	11	357	356	29	27	20	16	33	24	55	205	1.8
18-Jul	198	212	215	147	180	185	194	168	171	173	182	171	206	216	218	228	225	221	219	221	223	209	212	221	203.4
19-Jul	225	249	187	126	108	181	196	198	196	209	228	233	230	232	251	312	302	283	226	266	313	68	333	16	245.6
20-Jul	34	31	25	6	357	8	6	7	8	26	57	72	353	357	345	336	344	354	341	4	224	208	219	226	357.9
21-Jul	256	283	255	247	234	225	240	254	285	285	257	278	287	280	271	352	21	16	22	26	30	40	93	144	310.8
22-Jul	138	186	197	186	184	176	168	172	171	170	173	168	196	222	205	232	320	308	290	334	350	350	6	292	198.7
23-Jul	260	278	290	293	323	338	340	15	348	171	215	278	345	239	304	8	299	87	217	235	272	269	262	219	290.9
24-Jul	215	183	168	175	187	222	216	243	247	248	251	251	251	251	248	312	308	291	286	292	295	291	257		258.9
25-Jul	288	307	340	352	356	313	299	313	327	339	341	325	335	342	28	40	356	31	60	43	42	29	18	13	345.6
26-Jul	26	111	13	32	116	139	153	165	175	172	177	204	196	223	222	217	227	213	171	162	165	154	157	177	176.9
27-Jul	184	186	186	204	207	215	214	215	309	3	15	352	349	5	15	37	4	25	23	41	15	8	20	12	9.4
28-Jul	3	1	357	313	2	246	244	15	310	194	195	212	194	202	229	220	123	103	336	240	273	217	203	236	234.5
29-Jul	232	254	264	294	247	226	209	218	209	208	216	229	205	186	219	201	208	221	221	189	162	145	156	153	207.1
30-Jul	357	79	157	264	306	240	232	223	221	104	130	201	209	158	175	4	32	40	37	16	14	9	42	27	22.1
31-Jul	26	39	30	65	34	358	12	345	2	344	332	287	291	298	294	280	327	7	301	292	297	301	294	307	328.7

338.7 339.2 339.2 330.6 341.0 319.6 278.6 315.8 329.7 338.8 305.5 292.7 296.8 321.1 325.2 354.1 0.4 9.8 351.7 347.7 337.9 348.8 347.2 346.3
 Diurnal Average

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



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

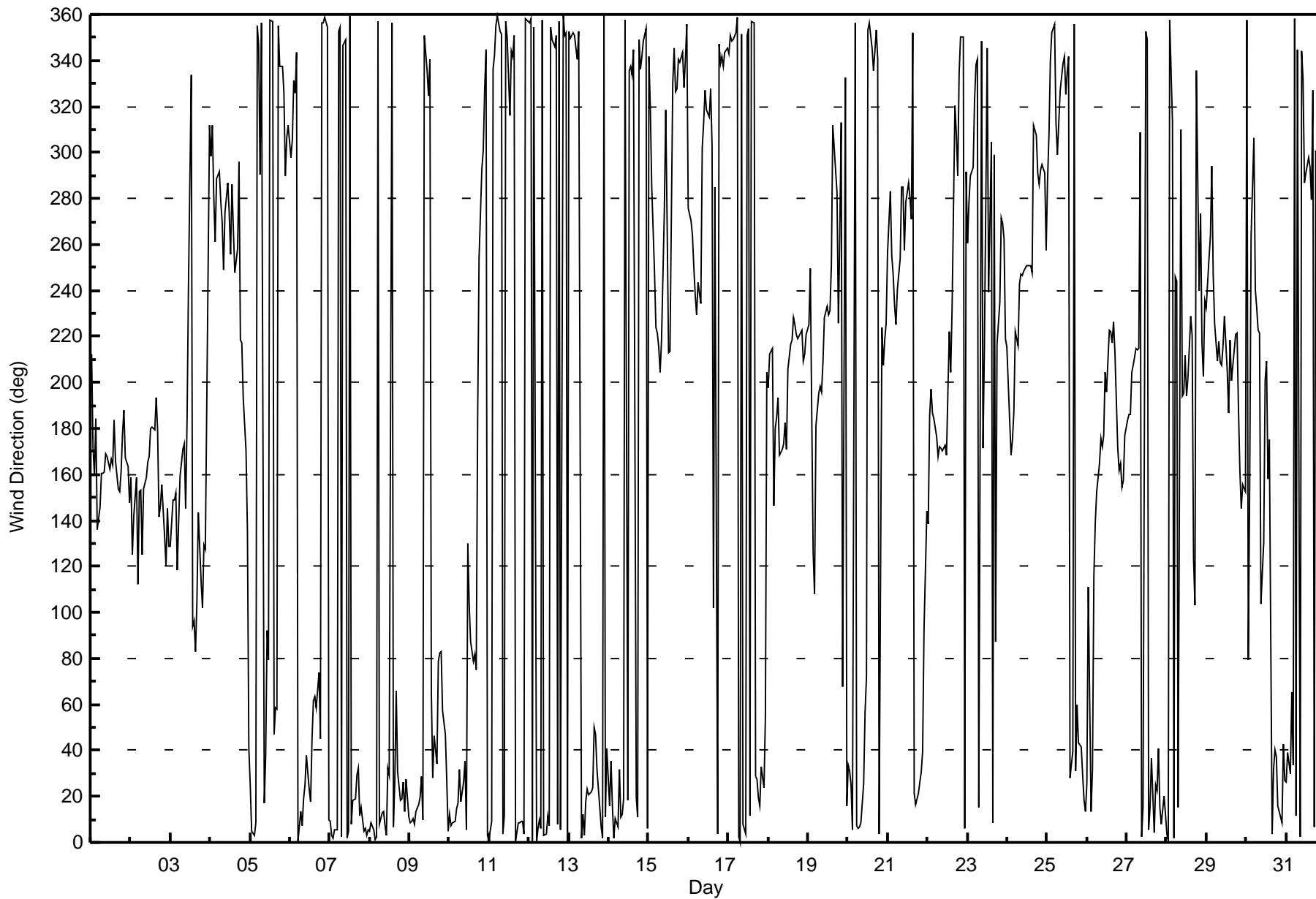
Wind Direction (WD) - deg
Mildred Lake - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 102 deg on Jul 23 10:00 Minimum Value: 7 deg on Jul 14 21:00 Percentiles: P ₁ = 8 P ₁₀ = 12 Q ₁ = 17 Median = 23 Q ₃ = 32 P ₉₀ = 51 P ₉₉ = 91		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-Jul	17	19	18	21	39	18	17	15	18	19	19	20	23	21	31	26	30	25	18	20	13	12	12	21	39	
2-Jul	14	16	16	14	53	23	27	28	23	19	20	19	20	20	19	27	20	23	20	25	17	10	17	13	53	
3-Jul	15	14	18	19	35	24	19	19	31	31	29	68	79	23	36	15	25	25	14	18	47	17	73	18	79	
4-Jul	35	18	27	32	25	20	23	25	28	31	22	30	35	27	28	26	37	26	33	25	15	14	32	68	68	
5-Jul	40	11	11	10	13	15	49	32	34	77	23	52	34	38	36	59	55	44	11	10	20	27	15	23	77	
6-Jul	22	20	32	25	14	13	15	17	19	22	37	24	25	21	23	24	27	32	25	15	11	13	13	17	37	
7-Jul	13	11	12	12	12	14	15	22	17	18	23	43	19	21	21	26	22	21	25	20	13	11	12	16	43	
8-Jul	11	15	14	16	16	17	22	21	22	23	44	36	39	56	35	62	64	27	18	16	17	14	18	18	64	
9-Jul	15	13	13	12	15	16	16	21	40	29	21	34	64	72	55	51	19	41	19	15	16	11	16	12	72	
10-Jul	14	12	11	11	14	21	15	23	24	40	37	99	46	25	21	29	31	51	30	19	18	23	14	14	99	
11-Jul	10	16	52	11	12	14	24	34	27	34	23	29	21	25	11	20	19	20	17	14	14	12	12	12	52	
12-Jul	12	13	12	12	13	14	15	15	21	19	22	23	22	20	18	16	17	20	17	14	14	12	12	14	23	
13-Jul	11	9	10	10	8	8	14	15	19	20	24	24	26	21	23	25	26	21	17	13	11	11	12	19	26	
14-Jul	12	43	21	13	16	34	48	25	34	57	33	71	72	61	33	33	19	18	14	8	7	9	8	11	72	
15-Jul	38	22	43	77	22	32	24	24	38	66	46	79	51	72	61	20	23	20	16	13	16	10	18	65	79	
16-Jul	25	29	22	18	20	20	27	29	26	36	41	32	33	31	83	65	71	16	16	12	9	8	10	8	83	
17-Jul	9	9	8	8	9	11	12	16	21	25	26	34	25	32	23	20	31	24	21	22	11	13	56	16	56	
18-Jul	20	11	16	54	57	22	18	27	22	22	30	34	29	38	35	32	29	25	21	24	23	15	16	24	57	
19-Jul	26	31	64	26	78	60	20	15	30	23	30	29	30	30	39	23	19	44	27	43	44	91	34	18	91	
20-Jul	18	17	18	13	12	14	14	14	25	23	56	56	67	18	27	20	24	38	39	83	39	23	33	31	83	
21-Jul	34	33	28	29	34	29	30	29	24	30	37	30	29	33	30	39	19	18	20	18	18	17	30	14	39	
22-Jul	12	27	14	17	18	18	14	18	17	19	17	16	21	25	18	40	29	32	23	34	13	10	46	56	56	
23-Jul	30	20	17	18	17	12	14	36	45	102	35	68	56	47	60	35	39	75	23	28	29	31	34	28	102	
24-Jul	24	14	18	14	25	29	23	28	29	27	31	28	27	27	28	28	40	20	32	25	19	20	28	29	40	
25-Jul	23	25	21	34	88	18	22	19	20	29	56	35	41	34	56	48	38	29	28	15	15	19	15	10	88	
26-Jul	20	69	21	30	18	25	23	17	20	26	31	37	32	35	32	45	33	30	19	11	11	16	20	19	69	
27-Jul	14	13	12	12	16	21	21	32	64	24	28	24	33	25	21	27	25	24	17	17	14	13	16	17	64	
28-Jul	17	11	47	60	38	43	37	78	79	38	30	50	27	34	50	97	58	59	87	76	30	31	17	29	97	
29-Jul	28	40	40	46	25	25	19	21	22	25	27	30	37	68	50	35	29	33	28	34	16	28	14	33	68	
30-Jul	58	42	43	91	48	29	33	39	45	94	94	55	40	44	27	27	31	24	25	18	17	15	24	18	94	
31-Jul	20	18	21	85	81	15	20	23	11	76	78	66	30	20	21	80	53	18	17	19	20	21	19	22	85	
		58	69	64	91	88	60	49	78	79	102	94	99	79	72	83	97	71	75	87	83	47	91	73	68	
		Diurnal Maximum																								



Wood Buffalo Environmental Association
Hourly Averages

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





Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	July 14, 2016	Last Calibration	June 15, 2016
Station Name	Mildred Lake	Station Number	AMS 2
Reason:	Routine		
Start Time (MST)	9:40	End Time (MST)	12:45
Gas Cert Reference	SA1301009	Station temp.	22 Deg C
Cal Gas Concentration	47.2 ppm	Cal Gas Exp Date	12/12/2016
Calibrator Make/Model	API T700	Serial Number	1185
ZAG Make/Model	API 701	Serial Number	825
DACS make/model	Campbell Scientific CR3000	DACS serial No.	8346

Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 1000 ppb		PMT voltage	-653	-653
Analyzer IP address	192.168.1.43		Lamp voltage	797	798
Calculated slope	1.002521	1.000180	Chamber temp	45.0	45.0
Calculated intercept	0.019427	0.771076	Pressure	680.5	697.6
Analyzer Background	19.3	18.7	Flow	0.484	0.495
Analyzer Coefficient	0.912	0.897	Intensity	91	90

Analyzer make TEI 43i Analyzer serial # JC1404901075

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.1	----
as found span	5000	82.7	780.7	787.3	0.992
calibrator zero	5000	0.0	0.0	-0.1	----
high point	5000	82.7	780.7	780.3	1.001
second point	5000	41.5	391.8	390.2	1.004
third point	5000	20.8	196.4	195.1	1.006
as left zero	5000	0.0	0.0	-0.2	----
as left span	5000	82.7	780.7	781.6	0.999
Average Correction Factor					1.004

Corrected As found 787.4 Previous response 778.7 % change -1.1%

Notes:

Inlet filter changed after as founds. Adjusted span.

Calibration Performed By:

Evan Magill



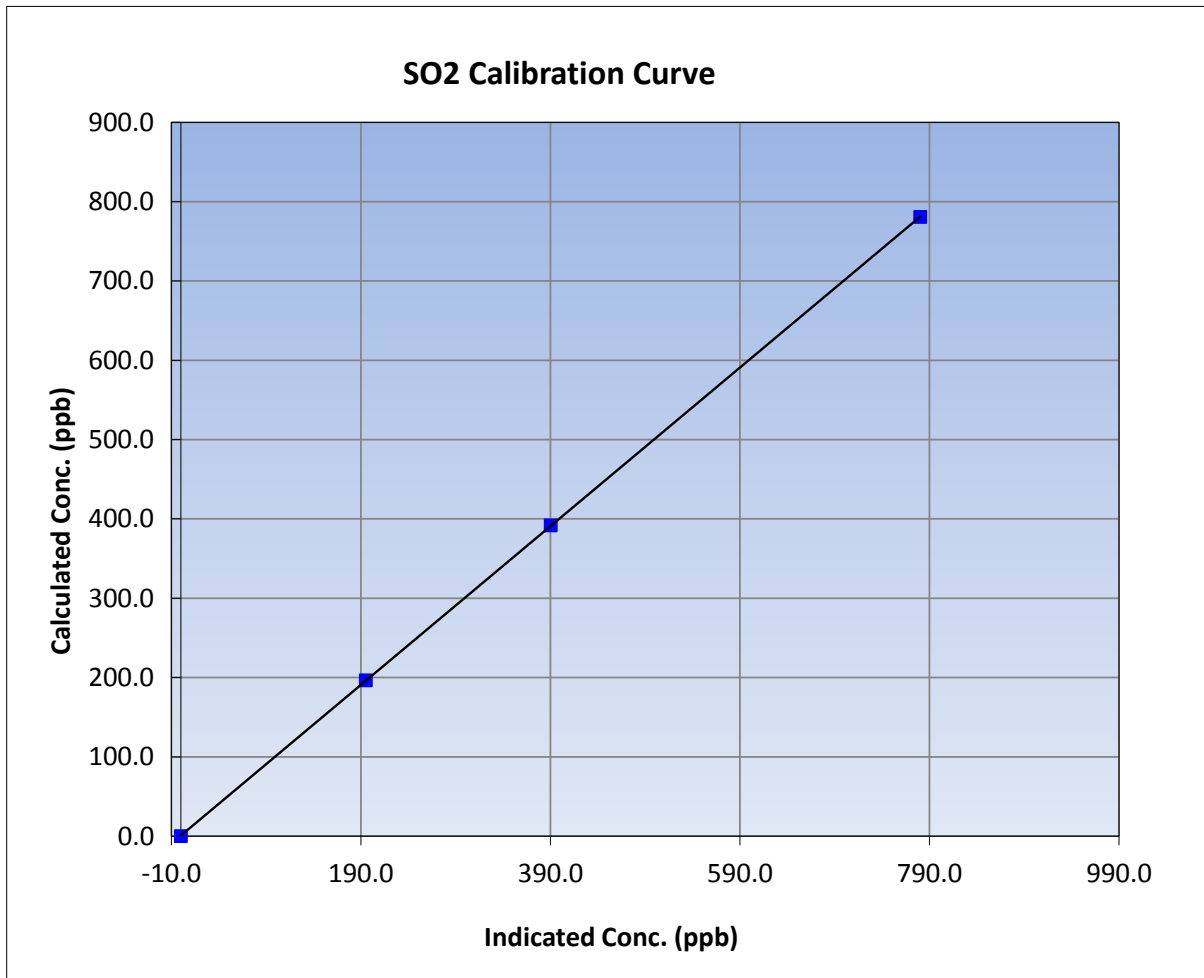
Wood Buffalo Environmental Association SO2 Calibration Report

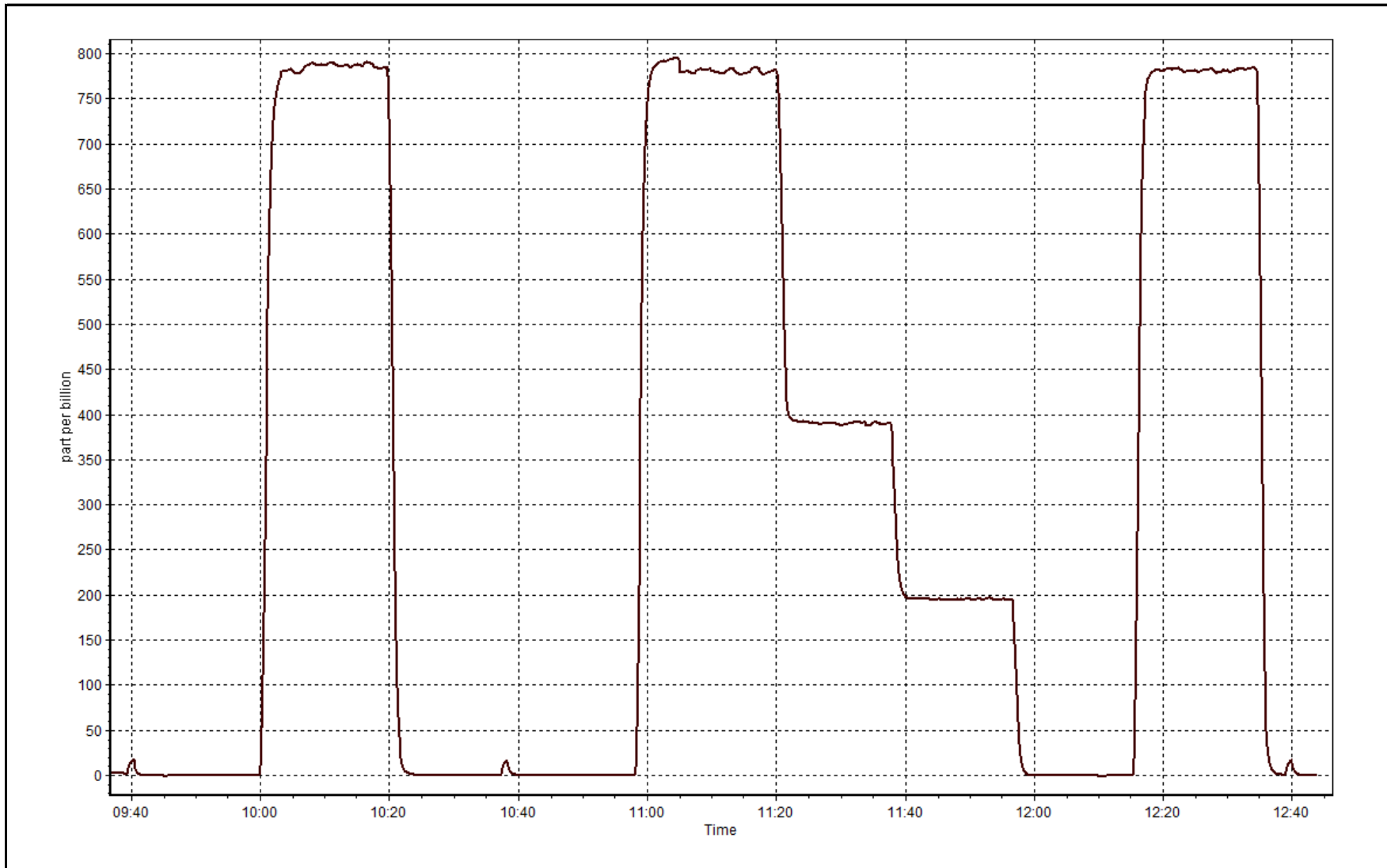
Station Information

Calibration Date	July 14, 2016	Previous Calibration	June 15, 2016
Station Name	Mildred Lake	Station Number	AMS 2
Start Time (MST)	9:40	End Time (MST)	12:45
Analyzer make	TEI 43i	Analyzer serial #	JC1404901075

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999996
780.7	780.3	1.0006		
391.8	390.2	1.0040	Slope	1.000180
196.4	195.1	1.0064		
			Intercept	0.771076







Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	July 13, 2016	Last Calibration	June 15, 2016
Station Name	Mildred Lake	Station Number	AMS 2
Reason:	Routine		
Start Time (MST)	10:45	End Time (MST)	13:30
Gas Cert Reference	ALM028262	Station temp.	22 Deg C
Cal Gas Concentration	5.04 ppm	Cal Gas Exp Date	09/09/2017
Calibrator Make/Model	API T700	Serial Number	1185
ZAG air Make/Model	API 701	Serial Number	825
DACS make/model	Campbell Scientific CR3000	Serial Number	8346
SO2 gas concentration	47.2 ppm	SO2 gas cert/exp	SA1301009 12-Dec-16

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-601	-601
Analyzer IP address	192.168.1.42		Lamp voltage	782	784
Calculated slope	0.991626	0.989441	Chamber temp	45	45
Calculated intercept	-0.119807	0.246217	Pressure	539.9	545.4
Analyzer Background	15.9	15.6	Flow	1.029	1.040
Analyzer Coefficient	0.969	0.956	Intensity	87	87
			Converter temp.	324	326

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

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.1	----
as found span	4000	64.1	80.8	82.0	0.985
SO2 scrubber check	5000	21.2	200.1	1.2	----
calibrator zero	5000	0.0	0.0	-0.1	----
high point	4000	64.1	80.8	81.5	0.991
second point	4000	32.2	40.6	40.7	0.998
third point	4000	16.1	20.3	20.1	1.010
as left zero	5000	0.0	0.0	0.0	----
as left span	4000	64.1	80.8	81.4	0.992
Average Correction Factor					1.000

Corrected As found	82.0	Previous response	81.6	% change	-0.6%
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Notes:

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

Calibration Performed By: Evan Magill



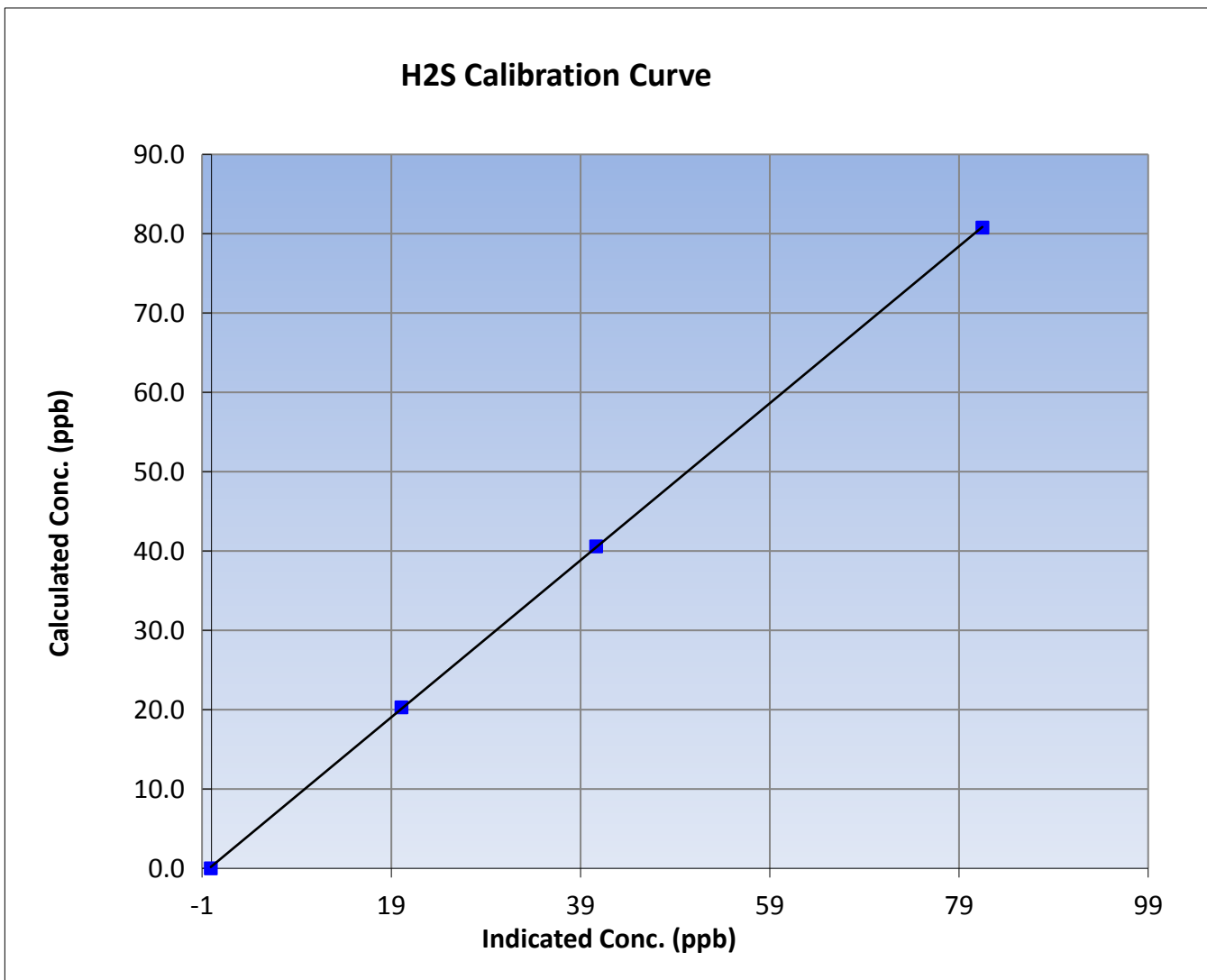
Wood Buffalo Environmental Association H2S Calibration Report

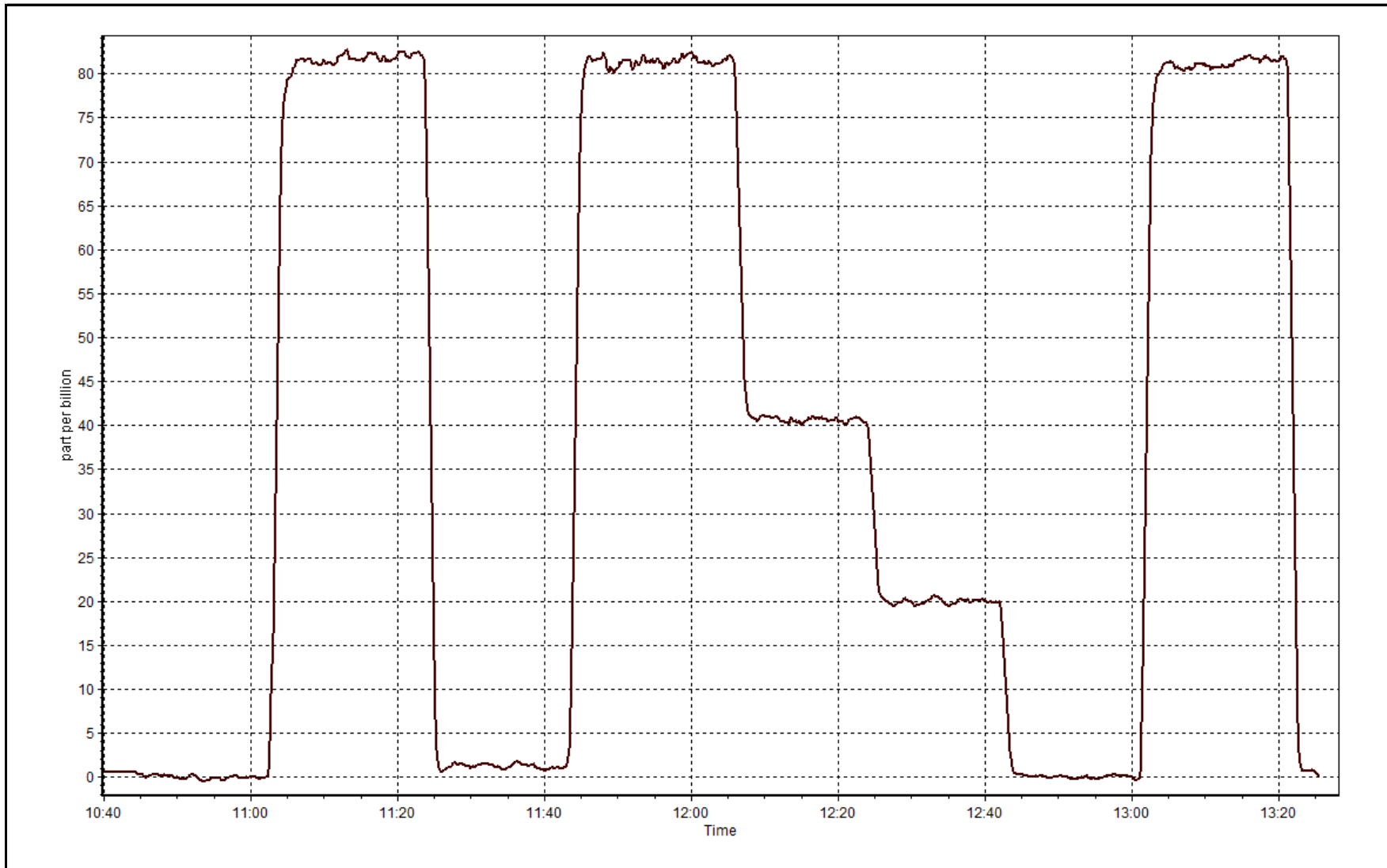
Station Information

Calibration Date	July 13, 2016	Previous Calibration	June 15, 2016
Station Name	Mildred Lake	Station Number	AMS 2
Start Time (MST)	10:45	End Time (MST)	13:30
Analyzer make	TEI 450i	Analyzer serial #	815129107

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999978
80.8	81.5	0.9914		
40.6	40.7	0.9978	Slope	0.989441
20.3	20.1	1.0103		
			Intercept	0.246217







Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	July-14-16	Last Calibration	June-15-16
Station Name	Mildred Lake	Station Number	AMS 2
Reason:	Routine		
Start Time (MST)	9:40	End Time (MST)	12:45
Gas Cert Reference	SA1301009	Cal Gas Expiry Date	12/12/2016
CH4 Cal Gas Conc.	510 ppm	CH4 Equiv Conc.	1087.5 ppm
C3H8 Cal Gas Conc.	210 ppm	Station temp.	22 Deg C
Calibrator Make/Model	API T700	Serial Number	1185
ZAG make/model	Teledyne API 701	Serial Number	825
DACS make/model	Campbell Scientific CR3000	Serial Number	8346

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 50 ppm		Sample Pressure	8.2	8.2
Analyzer IP address	192.168.1.51		Air or Bypass Press	39.9	39.9
Calculated slope	1.007215	1.006183	Fuel Pressure	25.7	25.7
Calculated intercept	-0.002118	-0.066987	Analyzer Coeff	4.604	4.682
			Analyzer BKG	2.33	2.37

Analyzer make Thermo 51i-LT Analyzer serial # 1300156231

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	-0.06	----
as found span	5000	82.7	17.99	18.00	0.999
calibrator zero	5000	0.0	0.00	0.04	----
high point	5000	82.7	17.99	17.93	1.003
second point	5000	41.5	9.03	9.05	0.997
third point	5000	20.8	4.52	4.59	0.986
as left zero	5000	0.0	0.00	0.10	----
as left span	5000	82.7	17.99	17.83	1.009
Average Correction Factor					0.995

Corrected As found 18.06 Previous response 17.86 % change -1.1%

Notes:

Inlet filter changed after as founds. Installed zero air generator pressure sensor after as founds. Did not adjust zero but used new value. Adjusted span.

Calibration Performed By:

Evan Magill



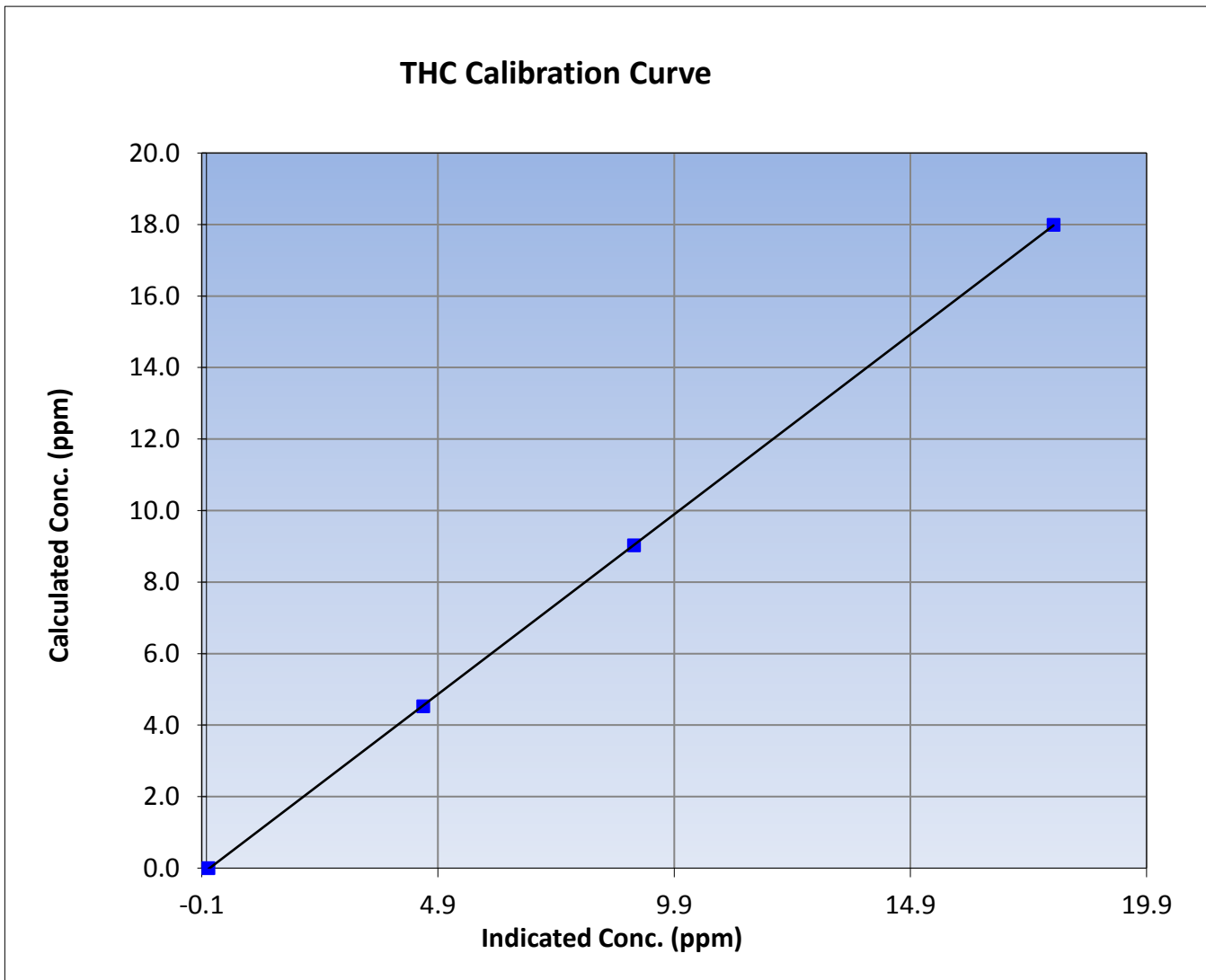
Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	July 14, 2016	Previous Calibration	June 15, 2016
Station Name	Mildred Lake	Station Number	AMS 2
Start Time (MST)	9:40	End Time (MST)	12:45
Analyzer make	Thermo 51i-LT	Analyzer serial #	1300156231

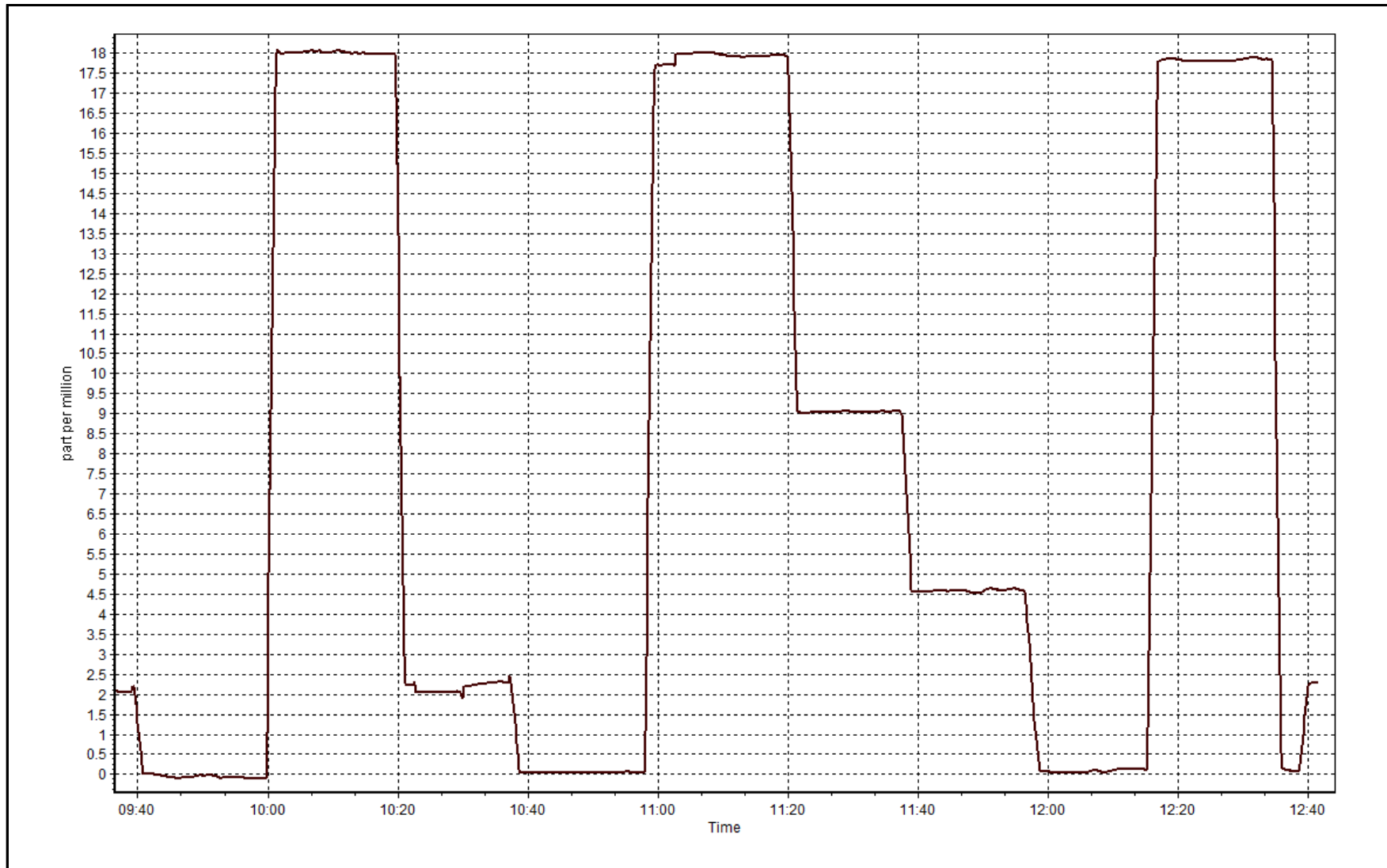
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.04	----	Correlation Coefficient	0.999990
17.99	17.93	1.0032		
9.03	9.05	0.9974	Slope	1.006183
4.52	4.59	0.9856		
			Intercept	-0.066987



THC Calibration Plot

Date: July 14, 2016





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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

AMS 3 LOWER CAMP METEOROLOGY JULY 2016

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

August 29, 2016



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

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
Temperature 20 m (C) Average	744	0	0	100.00	30.1	-	23.9	-
Temperature 45 m (C) Average	744	0	0	100.00	29.6	-	23.8	-
Temperature 100 m (C) Average	744	0	0	100.00	28.7	-	23.7	-
Temperature 167 m (C) Average	744	0	0	100.00	28	-	23.3	-
Relative Humidity 20 m (%) Average	744	0	0	100.00	99	-	92.0	-
Relative Humidity 45 m (%) Average	744	0	0	100.00	99	-	90.0	-
Relative Humidity 100 m (%) Average	744	0	0	100.00	99	-	89.0	-
Relative Humidity 167 m (%) Average	744	0	0	100.00	97	-	88.0	-
Wind Speed 20 m (km/h) Average	744	0	0	100.00	20	-	14.0	-
Wind Speed 45 m (km/h) Average	744	0	0	100.00	29	-	19.0	-
Wind Speed 100 m (km/h) Average	744	0	0	100.00	39	-	23.0	-
Wind Speed 167 m (km/h) Average	740	0	4	99.46	45	-	27.0	-
Wind Direction 20 m (deg) Average	744	0	0	100.00	-	-	-	-
Wind Direction 45 m (deg) Average	744	0	0	100.00	-	-	-	-
Wind Direction 100 m (deg) Average	744	0	0	100.00	-	-	-	-
Wind Direction 167 m (deg) Average	740	0	4	99.46	-	-	-	-
Vertical Wind Speed 20 m (km/h) Average	744	0	0	100.00	0.8	-	0.2	-
Vertical Wind Speed 45 m (km/h) Average	744	0	0	100.00	1.1	-	0.6	-
Vertical Wind Speed 100 m (km/h) Average	744	0	0	100.00	2.7	-	1.2	-
Vertical Wind Speed 167 m (km/h) Average	740	0	4	99.46	5.7	-	1.4	-

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

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

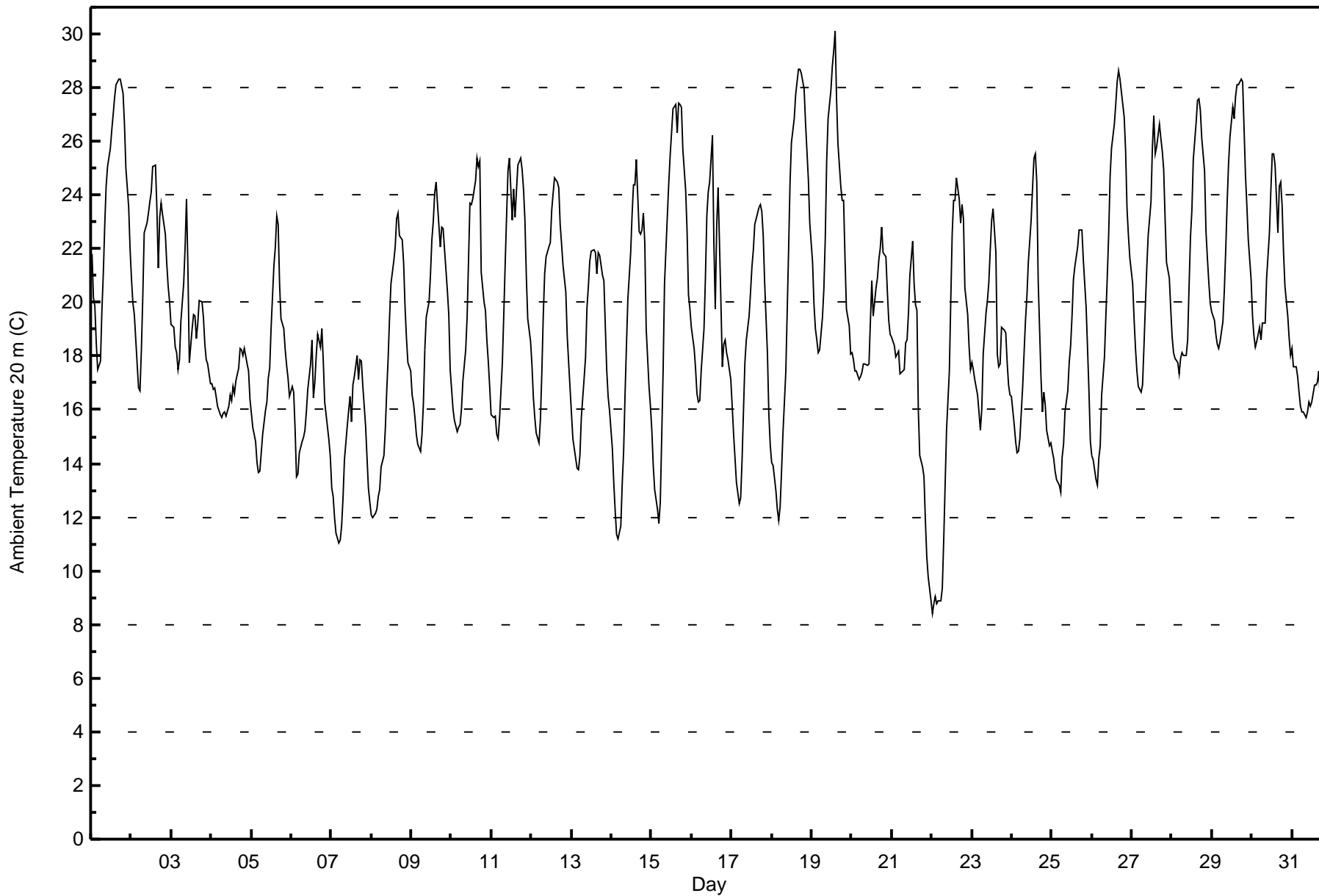
MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
Temperature 20 m (C) Average	744	19.41	4.2	-	8.4	14.2	16.4	18.8	22.6	25.4	30.1
Temperature 45 m (C) Average	744	19.32	4.1	-	8.6	14.4	16.5	18.9	22.4	25	29.6
Temperature 100 m (C) Average	744	19.04	3.9	-	8.2	14.4	16.2	18.7	21.8	24.4	28.7
Temperature 167 m (C) Average	744	18.85	3.8	-	7.9	14.3	16.2	18.6	21.7	24	28
Relative Humidity 20 m (%) Average	744	67.3	19	-	22	40	52	70	83	92	99
Relative Humidity 45 m (%) Average	744	66.1	18	-	21	40	51	69	81	90	99
Relative Humidity 100 m (%) Average	744	64.7	18	-	20	39	50	67	79	88	99
Relative Humidity 167 m (%) Average	744	63.6	18	-	21	39	49	65	77	88	97
Wind Speed 20 m (km/h) Average	744	6.3	4	-	0	2	3	5	8	12	20
Wind Speed 45 m (km/h) Average	744	8.7	5	-	0	3	5	8	11	16	29
Wind Speed 100 m (km/h) Average	744	12.8	7	-	0	4	7	12	17	22	39
Wind Speed 167 m (km/h) Average	740	15.3	8	-	1	6	9	15	20	26	45
Wind Direction 20 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-
Wind Direction 45 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-
Wind Direction 100 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-
Wind Direction 167 m (deg) Average	740	-	-	-	-	-	-	-	-	-	-
Vertical Wind Speed 20 m (km/h) Average	744	-0.12	0.3	-	-1.1	-0.5	-0.3	-0.1	0.1	0.3	0.8
Vertical Wind Speed 45 m (km/h) Average	744	-0.1	0.5	-	-1.6	-0.6	-0.4	-0.1	0.2	0.6	1.1
Vertical Wind Speed 100 m (km/h) Average	744	0.2	0.6	-	-1.3	-0.4	-0.2	0.1	0.5	0.8	2.7
Vertical Wind Speed 167 m (km/h) Average	740	0.46	0.8	-	-1.5	-0.3	0	0.3	0.8	1.4	5.7

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

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
Wind Speed. Wind Direction, Vertical Wind Speed 167 m	31 Jul 2016 09:00	31 Jul 2016 11:00	3	Intermittent unstable operation
Wind Speed. Wind Direction, Vertical Wind Speed 167 m	31 Jul 2016 13:00	31 Jul 2016 13:00	1	Intermittent unstable operation





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	9	1.21	1.21
10 - 20	432	58.06	59.27
> 20	303	40.73	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Ambient Temperature 45 m (AT45m) - C

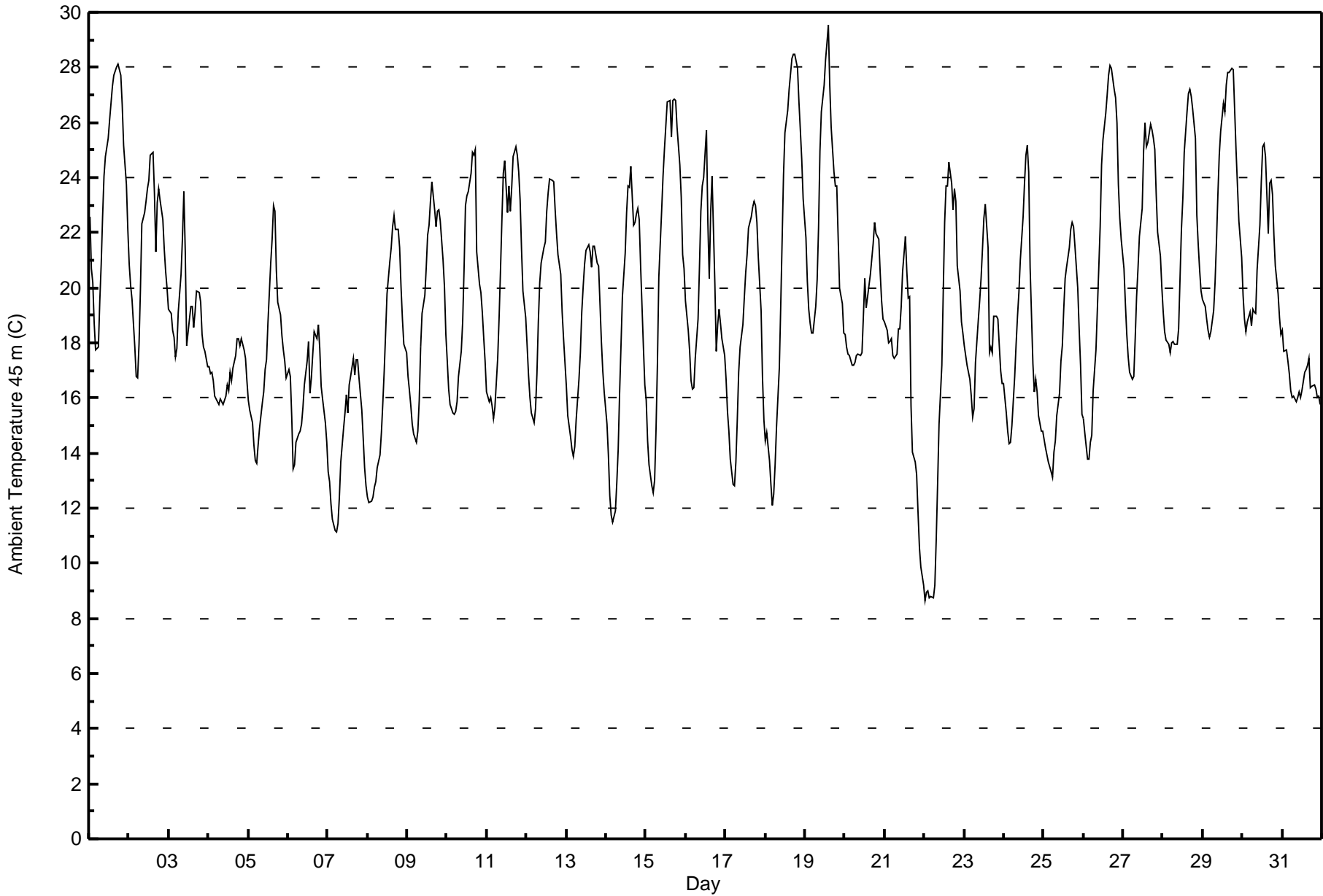
Lower Camp Met Tower - July 2016

Maximum Value: 29.6 C on Jul 19 15:00		Maximum Daily Average: 23.8 C on Jul 1		Hours in Service: 744																																												
Minimum Value: 8.6 C on Jul 22 01:00		Minimum Daily Average: 14.5 C on Jul 7		Hours of Data: 744																																												
Maximum Diurnal Average: 22.9 C at hour 16		Minimum Diurnal Average: 15.1 C at hour 5		Hours of Missing Data: 0																																												
Monthly Average: 19.32 C		Percentiles: P ₁ = 9.2 P ₁₀ = 14.4 Q ₁ = 16.5 Median = 18.9 Q ₃ = 22.4 P ₉₀ = 25.0 P ₉₉ = 28.0		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-Jul	22.6	20.7	20.2	18.7	17.7	17.8	19.5	20.9	22.6	24.1	24.8	25.4	26.1	26.7	27.3	27.7	28.0	28.1	27.9	27.7	26.6	25.2	23.8	22.1	23.8	28.1																						
2-Jul	20.8	20.1	19.6	17.9	16.8	16.7	18.0	20.0	22.3	22.7	23.1	23.6	23.9	24.8	24.9	23.4	21.3	23.1	23.6	23.2	22.5	21.4	20.6	20.0	21.4	24.9																						
3-Jul	19.2	19.1	18.5	18.2	17.5	17.8	19.1	20.5	21.8	23.5	21.3	17.9	18.9	19.3	19.3	18.5	19.1	19.9	19.8	19.5	18.3	17.9	17.7	17.1	19.2	23.5																						
4-Jul	17.1	16.9	16.9	16.6	16.1	15.8	15.8	15.9	15.8	15.8	16.1	16.5	16.3	16.9	16.6	17.1	17.5	18.2	18.1	17.9	18.2	17.8	17.4	16.6	16.8	18.2																						
5-Jul	15.9	15.6	15.1	14.3	13.7	13.6	14.3	14.9	15.8	16.2	17.0	17.4	18.7	20.9	21.7	23.0	22.8	20.6	19.5	19.0	18.2	17.7	17.3	16.7	17.5	23.0																						
6-Jul	17.0	16.8	15.3	13.4	13.6	14.4	14.7	14.8	15.1	15.6	16.5	17.3	18.1	16.2	16.7	17.6	18.4	18.2	18.7	17.8	16.4	16.0	15.1	14.4	16.2	18.7																						
7-Jul	13.3	13.0	12.1	11.6	11.2	11.2	11.4	12.4	13.7	14.9	15.5	16.1	15.5	16.5	16.8	17.4	16.8	17.4	17.4	16.7	15.5	14.5	13.5	12.8	14.5	17.4																						
8-Jul	12.4	12.2	12.3	12.4	12.7	12.9	13.5	13.9	14.7	15.8	17.0	18.4	19.8	20.9	21.5	22.2	22.6	22.1	22.1	21.5	20.1	18.8	17.9	17.6	17.3	22.6																						
9-Jul	16.8	16.3	15.7	15.1	14.7	14.4	14.8	15.9	17.8	19.1	19.7	20.8	21.9	22.3	23.1	23.9	22.8	22.2	22.8	22.8	22.4	21.0	20.0	18.3	19.4	23.9																						
10-Jul	17.3	16.3	15.8	15.4	15.4	15.5	15.9	16.8	17.7	18.8	20.7	23.0	23.3	23.5	24.2	24.9	24.8	25.0	21.3	20.1	19.8	19.1	18.2	17.3	19.6	25.0																						
11-Jul	16.2	15.8	16.0	15.7	15.2	15.7	17.5	18.9	20.6	22.5	24.1	24.6	22.7	23.7	22.8	23.6	24.7	25.1	24.8	24.2	23.2	21.4	19.9	18.9	20.8	25.1																						
12-Jul	17.9	16.8	16.0	15.5	15.1	15.6	16.9	18.8	20.2	20.9	21.5	21.7	22.8	23.4	23.9	23.9	23.9	22.8	22.0	21.2	20.5	19.1	18.2	17.3	19.8	23.9																						
13-Jul	16.4	15.3	14.6	14.1	13.9	14.2	15.2	16.7	17.6	19.1	20.1	20.8	21.4	21.6	21.3	20.8	21.5	21.5	20.9	20.8	19.4	18.0	17.0	16.2	18.3	21.6																						
14-Jul	15.0	13.9	12.5	11.7	11.5	11.9	12.9	14.2	16.2	17.9	19.7	21.3	22.7	23.7	23.6	24.4	22.3	22.4	22.7	22.9	22.5	20.8	17.8	16.5	18.4	24.4																						
15-Jul	15.9	14.5	13.6	12.8	12.6	13.0	14.9	17.3	20.4	22.8	24.1	25.0	25.9	26.8	26.8	25.5	26.8	26.8	26.8	25.8	24.4	23.3	21.2	20.7	21.1	26.8																						
16-Jul	19.5	18.4	17.7	16.6	16.3	16.4	17.4	18.8	20.7	22.8	23.7	24.0	25.8	22.4	20.3	22.7	24.0	20.1	17.7	18.7	19.2	18.7	18.2	17.5	19.9	25.8																						
17-Jul	16.7	15.5	14.8	13.8	12.9	12.8	13.7	15.2	16.9	17.9	18.7	19.6	20.5	21.2	22.2	22.6	22.9	23.1	23.0	22.4	21.1	19.2	16.7	15.2	18.3	23.1																						
18-Jul	14.5	14.7	13.7	12.8	12.1	12.5	13.6	14.9	17.1	19.3	21.7	24.1	25.6	26.5	27.2	27.7	28.3	28.5	28.5	28.0	26.7	25.7	24.7	23.2	21.3	28.5																						
19-Jul	21.8	20.2	19.2	18.7	18.4	18.3	19.3	20.3	22.2	25.0	26.4	27.3	28.3	28.9	29.6	27.4	25.8	24.2	23.7	23.7	21.8	20.0	19.4	18.3	22.8	29.6																						
20-Jul	18.3	17.8	17.6	17.6	17.2	17.2	17.3	17.5	17.6	17.6	17.6	19.0	20.4	19.3	20.1	20.5	21.0	21.6	22.4	22.0	21.8	20.6	19.5	18.9	19.2	22.4																						
21-Jul	18.8	18.4	18.0	18.0	18.2	17.5	17.4	17.6	18.5	18.5	19.3	20.6	21.8	20.6	19.6	19.7	15.7	14.0	13.7	13.2	11.8	10.6	9.9	9.2	16.7	21.8																						
22-Jul	8.6	8.9	9.0	8.8	8.8	8.8	9.2	10.9	12.9	15.0	17.2	19.8	22.4	23.7	23.7	24.5	23.8	22.8	23.6	23.1	20.8	19.9	18.8	18.4	16.8	24.5																						
23-Jul	17.9	17.5	17.2	16.7	16.1	15.3	15.6	17.3	18.8	19.5	20.3	21.4	22.5	23.1	21.5	17.7	17.8	17.6	18.9	18.9	18.9	17.9	17.0	16.5	18.4	23.1																						
24-Jul	16.5	15.5	14.8	14.4	14.4	15.0	16.8	17.9	19.0	19.8	21.0	22.6	23.8	24.8	25.2	24.2	20.7	17.3	16.2	16.7	16.2	15.3	14.8	14.8	18.2	25.2																						
25-Jul	14.5	14.2	13.9	13.7	13.3	13.1	14.0	14.4	15.4	16.2	17.3	17.9	19.2	20.4	20.7	21.4	22.1	22.4	22.2	21.5	20.0	18.5	17.2	15.4	17.5	22.4																						
26-Jul	15.3	14.7	13.8	13.8	14.4	14.7	16.3	17.7	19.2	20.7	22.2	24.5	25.4	26.4	27.0	27.7	28.0	28.0	27.2	26.9	26.0	23.7	22.5	21.8	21.6	28.0																						
27-Jul	20.7	19.4	18.3	17.5	16.9	16.7	16.8	18.2	19.7	20.7	21.8	22.9	24.9	26.0	25.1	25.3	25.9	25.7	25.4	25.0	23.4	22.0	21.2	20.0	21.7	26.0																						
28-Jul	19.1	18.4	18.1	18.0	17.7	18.0	18.1	18.0	17.9	18.5	20.3	22.1	23.2	24.9	26.4	27.0	27.2	27.0	26.5	25.4	22.6	21.6	20.7	19.9	21.5	27.2																						
29-Jul	19.6	19.3	18.9	18.5	18.2	18.4	19.1	20.2	21.6	23.3	24.8	25.7	26.7	26.4	27.3	27.8	27.8	28.0	27.9	26.4	25.0	23.7	22.4	21.1	23.3	28.0																						
30-Jul	19.7	18.9	18.4	18.7	19.1	18.6	19.2	19.1	19.1	20.7	22.3	23.8	25.1	25.2	24.7	22.0	23.8	23.9	23.4	21.9	20.8	19.8	18.9	18.3	21.1	25.2																						
31-Jul	18.5	17.7	17.7	17.3	16.9	16.3	16.0	16.1	15.9	16.0	16.2	16.0	16.3	16.9	17.1	17.2	17.5	16.4	16.4	16.5	16.3	16.0	16.1	15.8	16.6	18.5																						
																								17.2	16.5	16.0	15.4	15.1	15.2	15.9	17.0	18.2	19.4	20.4	21.3	22.3	22.7	22.9	22.9	22.8	22.4	22.1	21.7	20.7	19.5	18.5	17.6	Diurnal Average
																								22.6	20.7	20.2	18.7	19.1	18.6	19.5	20.9	22.6	25.0	26.4	27.3	28.3	28.9	29.6	27.8	28.3	28.5	28.5	28.0	26.7	25.7	24.7	23.2	Diurnal Maximum



Wood Buffalo Environmental Association
Hourly Averages

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





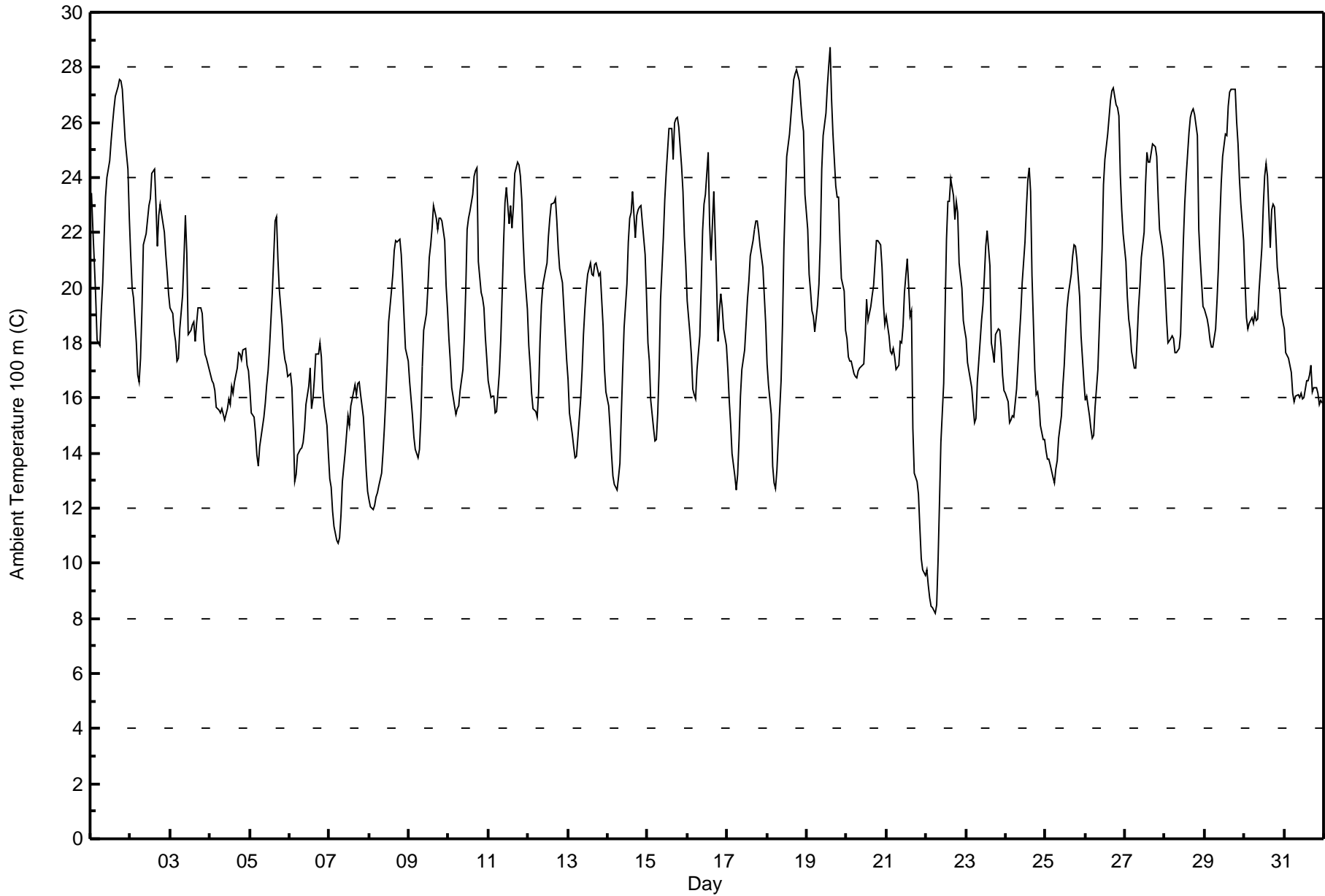
**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	9	1.21	1.21
10 - 20	433	58.20	59.41
> 20	302	40.59	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	9	1.21	1.21
10 - 20	450	60.48	61.69
> 20	285	38.31	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



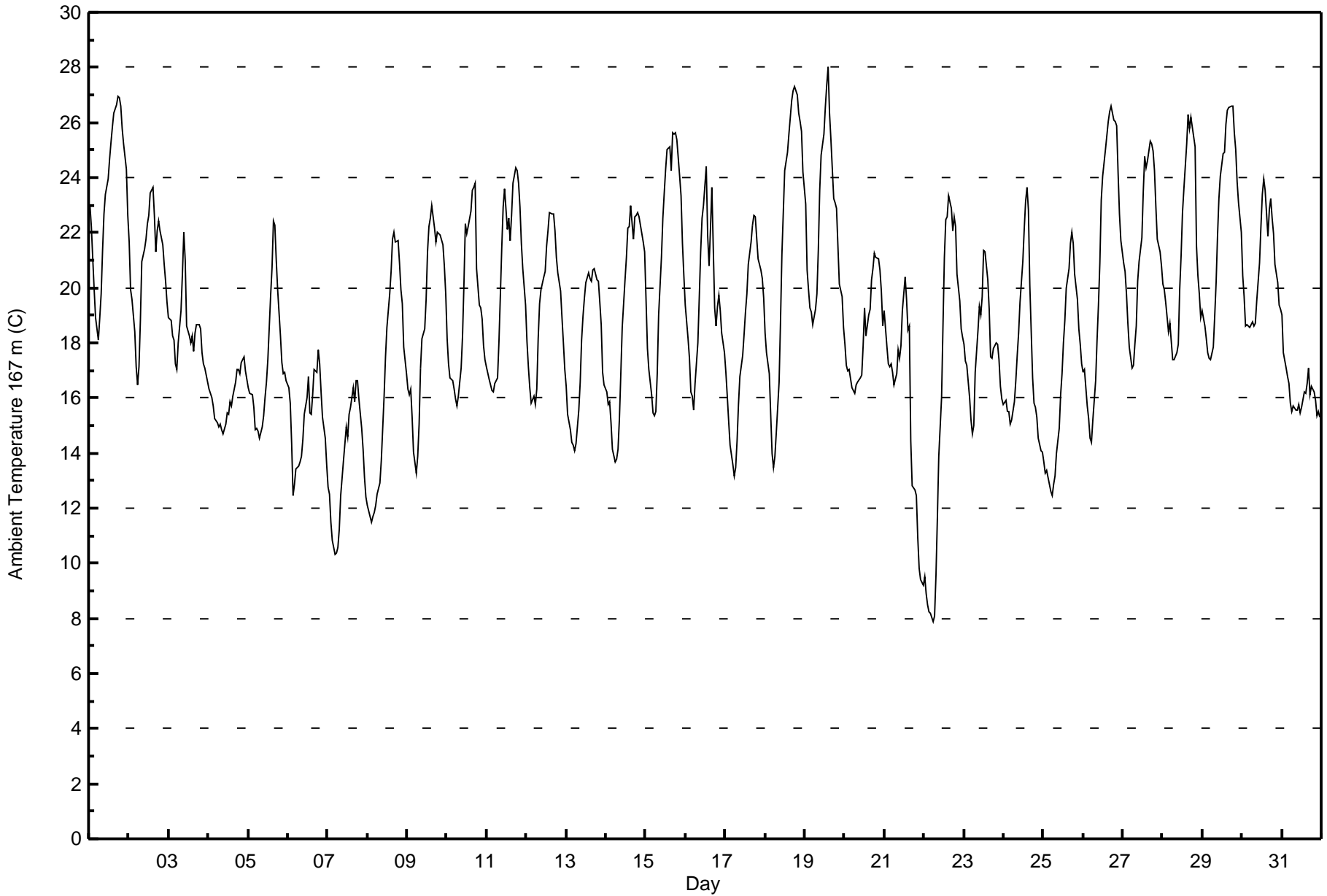
Wood Buffalo Environmental Association

Summary of Hour Averages

Ambient Temperature 167 m (AT167m) - C

Lower Camp Met Tower - July 2016

Maximum Value: 28.0 C on Jul 19 15:00																				Maximum Daily Average: 23.3 C on Jul 1					Hours in Service: 744				
Minimum Value: 7.9 C on Jul 22 06:00																				Minimum Daily Average: 13.6 C on Jul 7					Hours of Data: 744				
Maximum Diurnal Average: 22.0 C at hour 16																				Minimum Diurnal Average: 15.1 C at hour 6					Hours of Missing Data: 0				
Monthly Average: 18.85 C																				Percentiles: P ₁ = 9.4 P ₁₀ = 14.3 Q ₁ = 16.2 Median = 18.6 Q ₃ = 21.7 P ₉₀ = 24.0 P ₉₉ = 26.9					Hours of Calibration: 0				
																									Percent Operational Time: 100.0				
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Jul	23.0	22.2	21.0	19.9	18.9	18.1	18.9	19.8	21.3	22.7	23.4	24.0	24.6	25.3	25.8	26.3	26.7	26.9	26.9	26.6	25.8	25.2	24.3	22.6	23.3	26.9			
2-Jul	21.7	19.9	19.6	18.4	17.1	16.5	17.1	18.8	20.9	21.4	21.8	22.3	22.6	23.5	23.7	22.6	21.3	22.1	22.4	22.1	21.5	20.8	20.2	19.5	20.7	23.7			
3-Jul	18.9	18.8	18.2	18.1	17.3	17.1	18.0	19.2	20.5	22.0	21.0	18.6	18.3	18.0	18.3	17.7	18.4	18.7	18.7	18.5	17.7	17.2	17.1	16.6	18.4	22.0			
4-Jul	16.3	16.2	16.0	15.7	15.2	15.1	14.9	15.1	14.9	14.7	15.0	15.5	15.4	15.8	15.7	16.1	16.6	17.0	17.0	16.9	17.3	17.5	17.0	16.7	16.0	17.5			
5-Jul	16.4	16.2	16.1	15.7	14.9	14.9	14.8	14.5	15.0	15.3	16.0	16.6	17.4	19.7	20.7	22.4	22.3	21.0	19.9	18.3	17.3	16.9	16.9	16.6	17.3	22.4			
6-Jul	16.4	15.8	14.3	12.5	12.9	13.4	13.5	13.7	13.9	14.5	15.4	16.0	16.8	15.4	15.4	16.1	17.1	16.9	17.8	17.2	16.2	15.3	14.5	13.6	15.2	17.8			
7-Jul	12.8	12.5	11.5	10.8	10.3	10.4	10.6	11.2	12.5	13.7	14.3	14.9	14.6	15.4	15.7	16.4	15.9	16.6	16.6	16.0	14.9	14.1	13.1	12.4	13.6	16.6			
8-Jul	12.1	11.9	11.5	11.7	11.9	12.1	12.5	12.9	13.7	14.9	16.1	17.5	18.6	19.8	20.6	21.8	22.0	21.7	21.7	20.9	19.9	19.4	17.9	16.9	16.7	22.0			
9-Jul	16.3	16.1	16.3	15.3	14.1	13.3	13.9	15.0	17.1	18.1	18.5	19.6	21.3	22.2	22.5	23.0	22.2	21.7	22.0	21.9	21.9	21.6	20.8	19.8	18.9	23.0			
10-Jul	18.2	17.2	16.7	16.6	16.3	16.0	15.7	16.1	17.1	18.3	20.2	22.3	21.9	22.2	22.8	23.5	23.6	23.8	20.7	19.4	19.3	18.9	17.9	17.4	19.3	23.8			
11-Jul	17.1	16.7	16.5	16.3	16.2	16.5	16.7	18.0	19.7	21.4	22.9	23.6	22.1	22.5	21.7	22.6	23.8	24.4	24.2	23.8	23.0	21.6	20.7	19.3	20.5	24.4			
12-Jul	18.1	17.2	16.4	15.8	16.1	15.8	16.3	18.1	19.4	19.9	20.4	20.6	21.5	22.1	22.7	22.7	22.7	22.1	21.1	20.5	19.9	18.9	18.0	17.0	19.3	22.7			
13-Jul	16.4	15.4	14.8	14.4	14.3	14.1	14.3	15.6	16.6	18.1	19.0	19.6	20.2	20.5	20.3	20.2	20.6	20.7	20.3	20.3	19.5	18.7	16.9	16.5	17.8	20.7			
14-Jul	16.2	15.8	15.8	15.1	14.1	13.7	13.8	14.1	15.2	16.9	18.6	20.3	21.1	22.2	22.2	23.0	21.8	22.6	22.6	22.7	22.6	22.3	21.7	21.3	19.0	23.0			
15-Jul	19.6	17.8	17.1	16.1	15.4	15.4	15.5	16.9	19.0	21.1	22.5	23.4	24.3	25.0	25.1	24.3	25.6	25.6	25.6	25.4	24.0	23.4	21.6	20.5	21.3	25.6			
16-Jul	19.4	18.2	17.5	16.2	16.1	15.5	16.5	18.0	19.6	21.3	22.5	23.0	24.4	21.9	20.8	22.1	23.7	19.3	18.6	19.3	19.7	19.2	18.4	17.7	19.5	24.4			
17-Jul	16.9	16.1	15.2	14.3	13.6	13.2	13.5	14.4	15.8	16.8	17.5	18.3	19.1	19.8	20.9	21.6	22.3	22.6	22.6	21.8	21.1	20.7	20.3	19.6	18.3	22.6			
18-Jul	18.3	17.7	16.9	15.4	14.0	13.5	13.9	14.8	16.6	18.8	21.2	22.7	24.2	24.9	25.6	26.2	26.8	27.1	27.3	27.0	26.3	26.0	25.7	24.2	21.5	27.3			
19-Jul	23.0	20.6	19.9	19.3	19.1	18.7	19.2	19.8	21.3	23.5	24.8	25.6	26.5	27.3	28.0	26.3	25.4	23.2	23.1	22.9	21.5	20.2	19.7	18.6	22.4	28.0			
20-Jul	18.0	17.2	17.0	17.0	16.4	16.3	16.1	16.5	16.6	16.8	16.8	17.9	19.3	18.3	19.0	19.2	20.3	20.7	21.2	21.1	21.0	20.7	19.9	18.6	18.4	21.2			
21-Jul	19.2	17.9	17.2	17.1	17.2	16.9	16.5	16.9	17.7	17.4	17.9	19.2	20.4	19.6	18.5	18.6	14.4	12.8	12.7	12.4	10.9	9.8	9.4	9.2	15.8	20.4			
22-Jul	9.5	8.9	8.5	8.2	8.2	7.9	8.1	9.6	11.6	13.9	16.0	18.6	21.1	22.5	22.6	23.4	22.9	22.1	22.6	22.2	20.5	19.5	18.5	18.2	16.0	23.4			
23-Jul	18.0	17.4	17.2	16.0	15.2	14.7	15.0	16.9	18.5	19.3	19.0	19.7	21.4	21.3	20.3	19.2	17.5	17.4	17.8	18.0	17.9	17.4	16.4	16.0	17.8	21.4			
24-Jul	15.8	15.9	15.5	15.5	15.0	15.2	15.9	16.6	17.6	18.4	19.5	20.9	22.1	23.1	23.6	22.8	20.1	16.7	15.8	15.7	15.3	14.6	14.1	14.1	17.5	23.6			
25-Jul	13.7	13.3	13.4	13.1	12.6	12.4	12.9	13.2	14.0	14.9	16.1	16.9	18.0	18.8	20.0	20.7	21.6	22.0	21.6	20.5	19.6	18.5	18.0	17.3	16.8	22.0			
26-Jul	16.9	17.0	15.7	15.3	14.6	14.4	15.2	16.6	18.1	19.4	20.9	23.2	24.0	25.0	25.5	26.0	26.4	26.6	26.1	26.1	25.9	24.2	22.7	21.7	21.1	26.6			
27-Jul	20.9	20.6	19.8	18.7	17.9	17.1	17.2	17.9	18.6	20.2	21.0	21.8	23.5	24.8	24.4	24.6	25.3	25.2	25.0	24.3	22.9	21.8	21.3	20.8	21.5	25.3			
28-Jul	20.1	20.0	19.5	18.4	18.7	18.0	17.4	17.4	17.6	17.9	19.9	21.1	22.7	23.6	25.2	26.3	25.8	26.2	25.8	25.1	21.5	20.5	19.8	18.9	21.1	26.3			
29-Jul	19.2	18.6	18.1	17.6	17.5	17.4	17.9	19.0	20.2	21.9	23.2	24.0	24.9	24.9	26.0	26.4	26.5	26.6	26.6	25.6	25.0	23.8	23.1	22.0	22.3	26.6			
30-Jul	20.4	19.7	18.6	18.7	18.6	18.7	18.8	18.6	18.7	19.5	20.9	22.2	23.4	23.9	23.6	21.8	22.8	23.2	22.6	22.0	20.9	20.2	19.4	19.2	20.7	23.9			
31-Jul	19.0	17.6	17.1	16.8	16.5	15.8	15.5	15.7	15.6	15.6	15.7	15.5	15.7	16.2	16.2	16.5	17.1	16.1	16.4	16.2	15.9	15.4	15.5	15.3	16.2	19.0			
																				17.7 17.0 16.4 15.8 15.4 15.1 15.4 16.2 17.3 18.3 19.3 20.2 21.0 21.5 21.7 22.0 21.9 21.6 21.4 21.0 20.2 19.5 18.7 18.0					Diurnal Average				
																				23.0 22.2 21.0 19.9 19.1 18.7 19.2 19.8 21.3 23.5 24.8 25.6 26.5 27.3 28.0 26.4 26.8 27.1 27.3 27.0 26.3 26.0 25.7 24.2					Diurnal Maximum				





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	11	1.48	1.48
10 - 20	456	61.29	62.77
> 20	277	37.23	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) - %

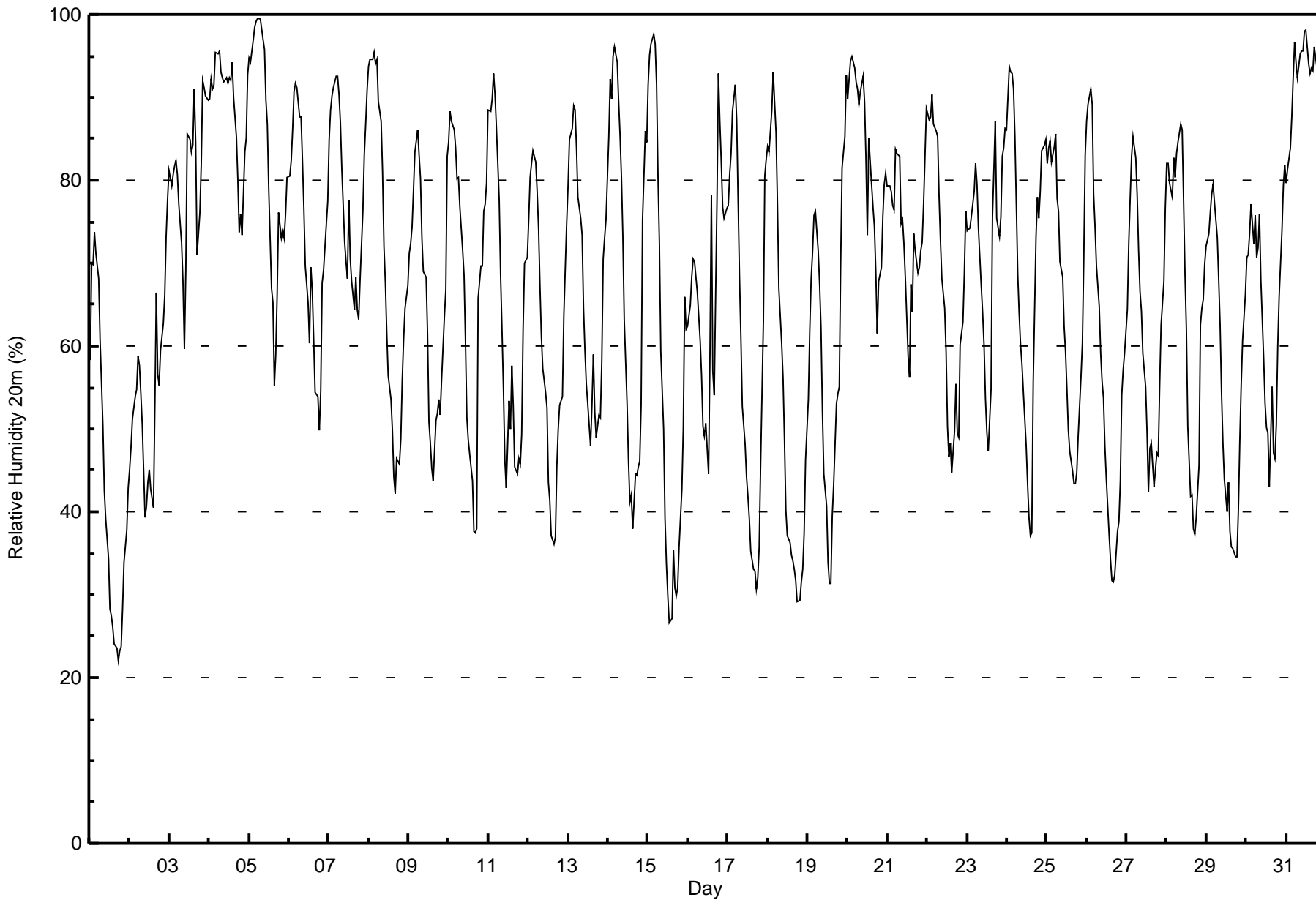
Lower Camp Met Tower - July 2016

Maximum Value: 99 % on Jul 5 07:00																		Maximum Daily Average: 92.3 % on Jul 31																		Hours in Service: 744	
Minimum Value: 22 % on Jul 1 18:00																		Minimum Daily Average: 43.1 % on Jul 1																		Hours of Data: 744	
Maximum Diurnal Average: 84.8 % at hour 4																		Minimum Diurnal Average: 51.6 % at hour 16																		Hours of Missing Data: 0	
Monthly Average: 67.3 %																		Percentiles: P ₁ = 27 P ₁₀ = 40 Q ₁ = 52 Median = 70 Q ₃ = 83 P ₉₀ = 92 P ₉₉ = 98																		Hours of Calibration: 0	
																																				Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24													
1-Jul	58	70	70	74	71	68	61	56	50	43	39	34	28	28	26	24	24	22	23	24	28	34	38	43	43.1	74											
2-Jul	45	48	51	54	55	59	58	54	51	39	41	43	45	43	40	53	66	57	55	60	63	66	73	78	54.0	78											
3-Jul	81	79	81	82	82	81	77	72	68	60	69	86	85	83	84	91	85	71	76	82	92	91	90	90	80.7	92											
4-Jul	90	92	91	92	95	95	96	93	92	92	92	92	92	94	90	85	80	74	76	73	83	85	93	93	88.8	96											
5-Jul	95	94	97	98	99	99	99	99	97	96	90	87	79	67	65	55	59	66	76	73	74	73	76	80	83.2	99											
6-Jul	80	82	86	91	92	91	88	88	82	77	70	65	60	69	67	61	54	54	50	55	68	69	75	77	72.9	92											
7-Jul	85	88	90	91	92	93	90	87	81	73	70	68	78	71	68	64	68	64	63	68	76	83	87	91	78.8	93											
8-Jul	94	95	95	95	94	95	90	87	81	72	68	62	56	54	50	44	42	46	46	49	56	61	65	67	69.2	95											
9-Jul	71	72	74	79	83	86	83	80	73	69	68	61	51	48	45	44	51	52	53	52	56	64	67	83	65.3	86											
10-Jul	85	88	87	86	84	80	80	77	72	68	60	51	49	47	44	38	37	38	66	70	70	76	77	80	67.1	88											
11-Jul	89	88	90	93	90	87	78	68	62	55	46	43	53	50	58	53	45	45	46	46	49	62	70	71	64.0	93											
12-Jul	75	80	82	83	82	79	74	67	61	57	54	53	43	41	37	36	37	45	50	53	54	64	69	75	60.6	83											
13-Jul	79	85	86	89	88	84	78	75	73	65	59	55	53	48	53	59	52	49	52	51	58	71	73	75	67.2	89											
14-Jul	85	92	90	95	96	94	89	85	80	73	63	53	46	41	42	38	45	44	45	46	53	75	86	85	68.5	96											
15-Jul	91	95	97	98	96	92	81	72	59	50	39	34	30	27	27	35	31	30	31	36	43	50	66	62	57.1	98											
16-Jul	62	65	68	71	70	68	66	61	56	50	49	51	45	59	78	57	54	78	93	87	82	77	75	77	66.7	93											
17-Jul	77	81	83	88	92	87	78	69	61	53	48	44	42	39	35	33	33	31	32	36	45	63	80	82	58.8	92											
18-Jul	84	83	88	93	89	86	77	67	60	56	49	40	37	36	35	34	33	32	29	29	32	33	38	46	53.6	93											
19-Jul	54	62	68	71	76	76	72	67	62	52	45	41	34	31	31	39	43	53	54	55	70	81	85	93	59.0	93											
20-Jul	90	92	94	95	93	92	91	89	91	92	89	83	73	85	79	77	74	69	61	68	69	76	79	81	82.7	95											
21-Jul	79	79	79	77	76	84	83	83	75	75	72	68	59	56	67	64	73	71	69	70	72	72	77	89	73.8	89											
22-Jul	88	87	88	90	87	86	85	78	73	68	65	59	50	47	48	45	50	55	49	49	60	63	69	76	67.3	90											
23-Jul	74	74	74	77	79	82	80	74	67	64	60	54	50	47	55	76	81	87	75	73	76	83	84	86	72.1	87											
24-Jul	86	94	93	93	91	85	69	64	60	58	54	48	43	39	37	38	56	73	78	75	79	84	84	85	69.4	94											
25-Jul	82	84	85	82	84	86	78	76	70	68	62	59	55	50	47	45	43	43	45	49	56	60	71	83	65.2	86											
26-Jul	87	89	91	89	78	74	70	65	59	56	54	48	44	37	34	32	32	32	38	39	44	54	57	59	56.7	91											
27-Jul	64	72	78	83	85	83	78	72	67	64	59	55	50	42	48	48	43	45	47	47	55	62	68	77	62.2	85											
28-Jul	82	82	80	78	83	80	83	85	87	86	78	69	62	50	42	42	38	37	39	46	63	65	66	70	66.3	87											
29-Jul	72	74	76	78	80	77	73	68	63	54	48	44	40	44	38	36	36	35	35	40	48	55	61	66	55.8	80											
30-Jul	71	71	74	77	72	76	71	72	76	68	58	53	50	50	43	55	47	46	51	60	66	74	79	82	64.2	82											
31-Jul	80	81	84	88	92	97	94	92	95	96	96	98	98	94	93	94	93	96	95	92	92	92	92	93	92.3	98											
	78.6	81.3	82.9	84.8	84.8	83.9	79.6	75.6	71.1	66.1	61.8	58.1	54.2	52.1	52.0	51.6	52.0	53.2	54.7	56.6	62.0	68.3	72.9	77.2	Diurnal Average												
	95	95	97	98	99	99	99	99	97	96	96	98	98	94	94	94	93	96	95	92	92	92	92	93	Diurnal Maximum												



Wood Buffalo Environmental Association
Hourly Averages

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





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	72	9.68	9.68
40 - 60	193	25.94	35.62
60 - 80	249	33.47	69.09
80 - 100	230	30.91	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) - %

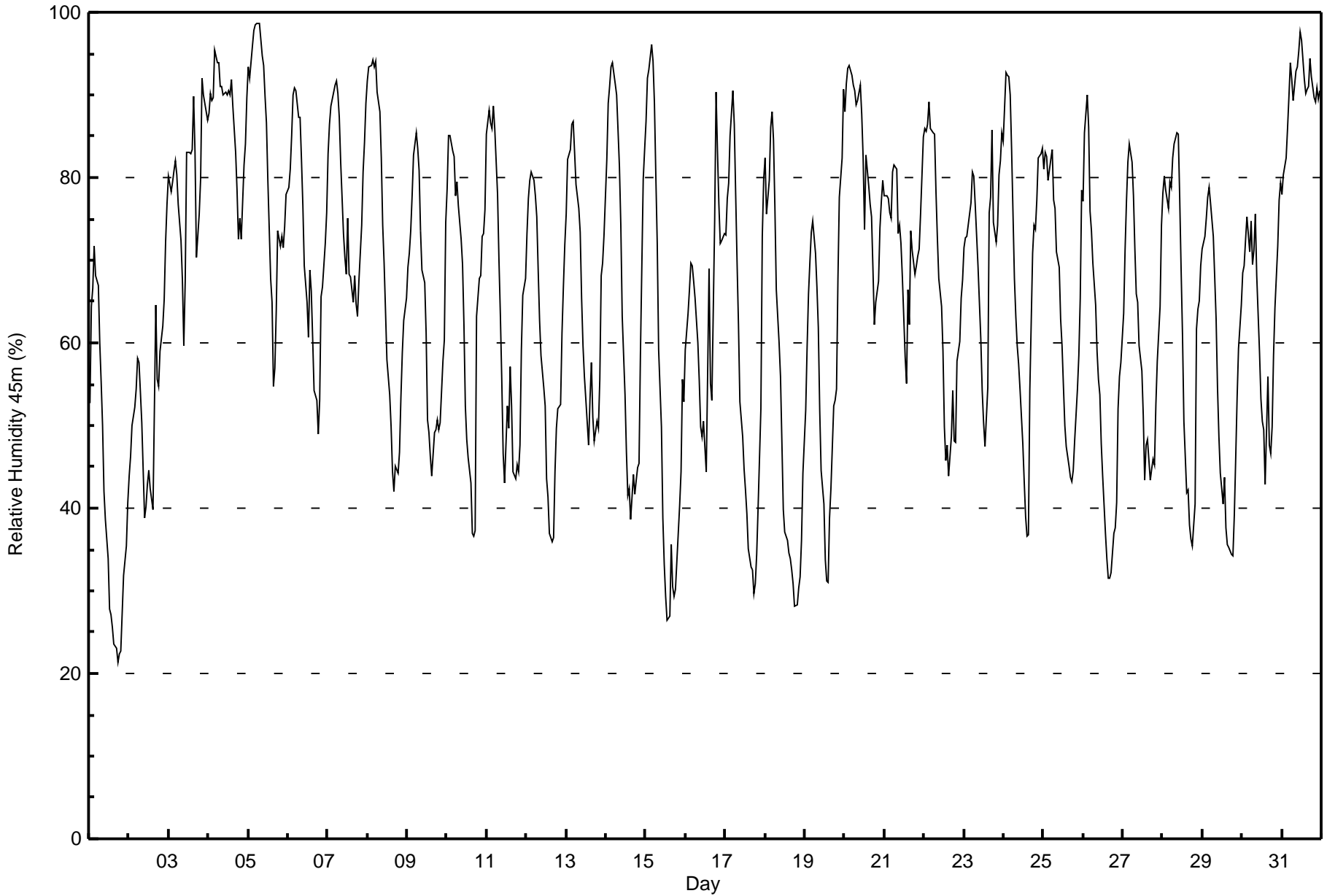
Lower Camp Met Tower - July 2016

Maximum Value: 99 % on Jul 5 07:00 Maximum Daily Average: 90.3 % on Jul 31																		Hours in Service: 744 Hours of Data: 744																																																	
Minimum Value: 21 % on Jul 1 18:00 Minimum Daily Average: 41.6 % on Jul 1 Maximum Diurnal Average: 83.4 % at hour 5 Minimum Diurnal Average: 51.1 % at hour 16 Monthly Average: 66.1 % Percentiles: P ₁ = 27 P ₁₀ = 40 Q ₁ = 51 Median = 69 Q ₃ = 81 P ₉₀ = 90 P ₉₉ = 96																		Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																																																	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																																									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																																											
1-Jul	53	64	67	72	68	67	60	55	50	42	39	34	28	27	26	24	23	21	22	23	27	32	35	41	41.6	72																																									
2-Jul	44	46	50	52	54	58	58	54	50	39	40	43	45	42	40	52	65	56	55	59	62	65	72	77	53.3	77																																									
3-Jul	80	78	79	81	82	80	77	72	68	60	67	83	83	83	90	83	70	76	80	92	90	89	87	79.8	92																																										
4-Jul	88	90	89	90	95	94	94	91	91	90	90	90	91	90	92	89	83	78	72	75	72	82	84	90	87.1	95																																									
5-Jul	93	92	96	98	98	99	99	99	95	94	90	87	80	68	65	55	57	64	74	72	73	71	74	78	82.0	99																																									
6-Jul	79	81	85	90	91	91	87	87	82	77	69	65	61	69	66	61	54	53	49	53	66	67	72	76	72.1	91																																									
7-Jul	83	87	89	89	91	92	90	87	82	73	70	68	75	68	68	65	68	65	63	67	74	81	84	89	77.9	92																																									
8-Jul	92	93	94	94	93	94	90	88	82	74	70	64	58	54	50	44	42	45	44	47	53	59	63	65	68.9	94																																									
9-Jul	69	71	74	78	83	85	84	81	74	69	67	61	51	49	46	44	49	49	51	50	50	58	60	75	63.6	85																																									
10-Jul	79	85	85	83	82	78	80	77	72	70	62	52	48	46	43	37	37	37	63	68	68	73	73	76	65.6	85																																									
11-Jul	85	88	87	86	89	86	78	70	63	56	47	43	52	50	57	52	44	44	45	44	48	59	66	68	62.8	89																																									
12-Jul	73	77	80	81	80	78	75	69	63	58	55	52	43	41	37	36	36	44	50	52	52	61	67	72	59.7	81																																									
13-Jul	76	82	83	86	87	83	79	76	73	65	60	56	53	48	53	58	51	48	51	50	56	68	70	73	66.0	87																																									
14-Jul	82	89	91	93	94	91	90	86	81	74	63	54	47	42	42	39	44	42	43	45	45	59	80	83	66.6	94																																									
15-Jul	87	92	93	96	94	89	80	72	59	50	39	33	29	26	27	36	31	29	30	34	40	44	56	53	55.0	96																																									
16-Jul	59	64	66	70	69	68	65	60	55	50	49	51	44	56	69	55	53	75	90	83	77	72	72	73	64.4	90																																									
17-Jul	73	77	79	85	90	86	78	70	62	53	49	45	42	39	35	33	33	30	31	34	40	52	73	80	57.1	90																																									
18-Jul	82	76	80	86	88	85	76	66	60	56	48	40	37	36	35	34	33	31	28	28	30	32	36	44	51.9	88																																									
19-Jul	52	60	66	70	73	75	71	67	62	52	45	41	34	31	31	39	42	52	53	54	68	78	82	91	57.8	91																																									
20-Jul	88	91	93	94	92	91	91	89	89	91	88	82	74	83	79	77	75	69	62	65	67	74	77	80	81.7	94																																									
21-Jul	78	78	78	76	75	81	82	81	73	74	72	68	58	55	66	62	74	71	68	69	70	71	76	85	72.6	85																																									
22-Jul	86	86	87	89	86	85	85	78	73	68	64	59	50	46	48	44	49	54	48	48	58	60	65	68	66.0	89																																									
23-Jul	71	73	73	76	77	81	80	77	69	65	61	54	50	47	55	76	78	86	75	72	74	80	82	85	71.5	86																																									
24-Jul	84	93	92	92	90	83	68	63	60	58	54	48	43	39	37	37	54	71	74	74	77	82	83	84	68.4	93																																									
25-Jul	81	83	83	80	82	83	77	76	71	69	63	60	55	50	47	45	44	43	45	48	54	59	65	78	64.2	83																																									
26-Jul	77	85	90	86	76	74	70	65	59	56	54	48	44	37	34	32	32	32	37	38	41	52	56	58	55.4	90																																									
27-Jul	64	71	77	82	84	82	78	71	66	65	60	57	51	43	48	48	43	45	46	45	53	58	64	74	61.4	84																																									
28-Jul	78	80	78	76	80	79	82	84	85	85	78	69	61	51	42	42	38	36	35	40	62	64	65	69	65.0	85																																									
29-Jul	71	73	75	78	79	77	73	68	63	55	49	44	40	44	38	36	35	34	34	39	46	53	59	65	55.3	79																																									
30-Jul	69	69	72	75	71	75	69	71	76	68	59	53	51	50	43	56	48	47	50	59	64	72	77	79	63.4	79																																									
31-Jul	78	80	82	86	90	94	92	89	93	93	95	98	97	92	90	91	91	94	92	90	89	91	89	90	90.3	98																																									
																		75.9		79.2		81.1		82.9		83.4		82.7		79.3		75.5		71.1		66.0		61.7		58.1		54.0		51.7		51.3		51.1		51.2		52.2		53.5		55.0		59.7		65.1		69.9		74.4		Diurnal Average	
																		93		93		96		98		98		99		99		99		95		94		95		98		97		92		92		91		91		94		92		90		92		91		89		91		Diurnal Maximum	



Wood Buffalo Environmental Association
Hourly Averages

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





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	75	10.08	10.08
40 - 60	206	27.69	37.77
60 - 80	262	35.22	72.98
80 - 100	201	27.02	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



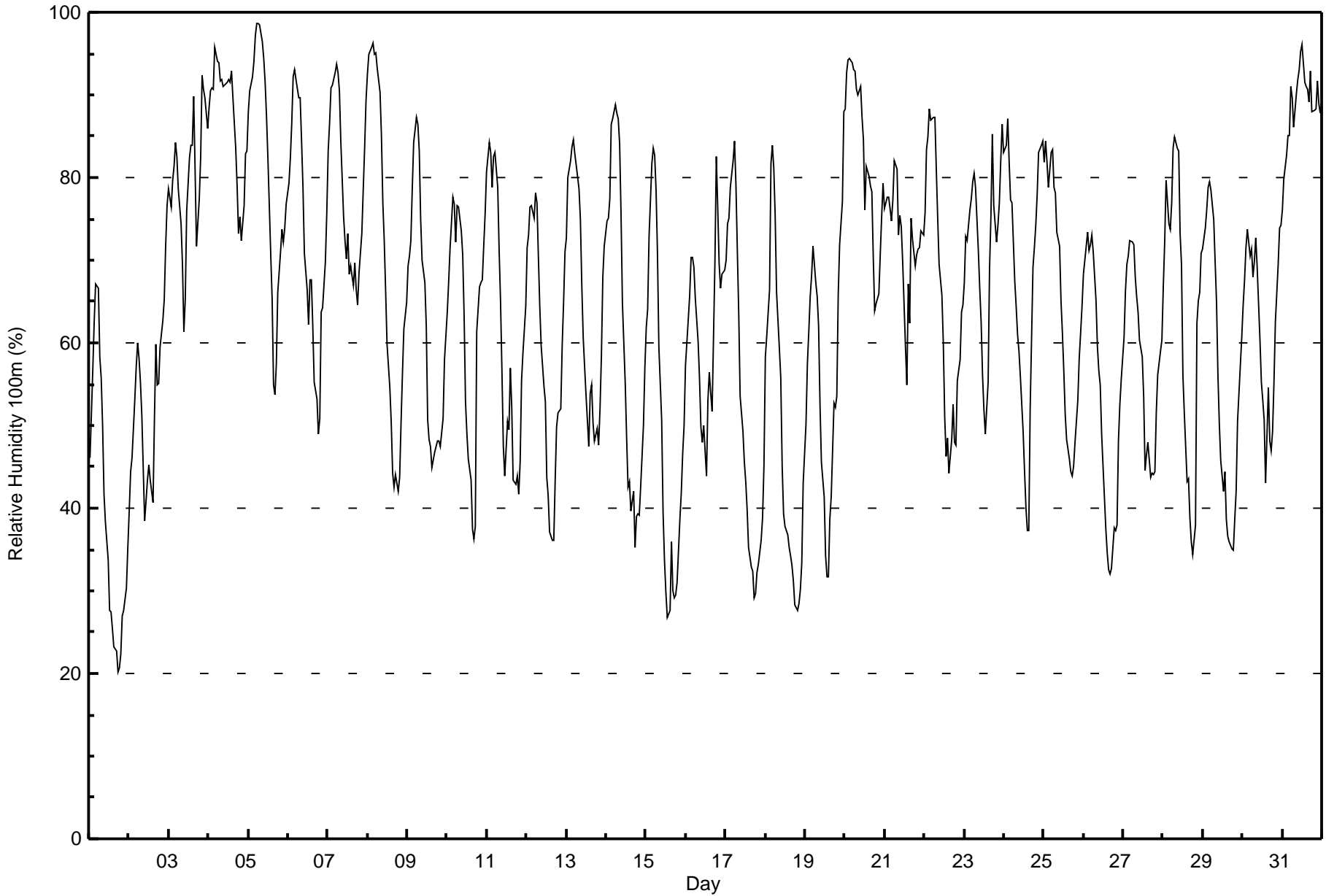
Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity 100m (RH100m) - %

Lower Camp Met Tower - July 2016

Maximum Value: 99 % on Jul 5 07:00 Maximum Daily Average: 88.8 % on Jul 31																		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 20 % on Jul 1 18:00 Minimum Daily Average: 39.1 % on Jul 1 Maximum Diurnal Average: 81.4 % at hour 6 Minimum Diurnal Average: 50.7 % at hour 17 Monthly Average: 64.7 % Percentiles: P ₁ = 27 P ₁₀ = 39 Q ₁ = 50 Median = 67 Q ₃ = 79 P ₉₀ = 88 P ₉₉ = 96																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	46	51	57	62	67	67	58	56	50	42	38	34	28	27	25	23	23	20	21	22	27	28	30	35	39.1	67
2-Jul	40	44	46	53	57	60	58	55	51	39	41	43	45	43	41	51	60	55	55	59	63	65	72	77	53.1	77
3-Jul	79	76	80	81	84	83	79	74	69	61	65	76	82	84	84	90	81	72	77	83	92	91	90	86	80.0	92
4-Jul	88	91	91	91	96	94	94	92	92	91	91	92	92	93	90	84	79	73	75	72	77	83	83	83	87.2	96
5-Jul	88	91	92	94	97	99	99	99	96	94	92	87	82	71	65	55	54	57	66	71	74	72	74	77	81.1	99
6-Jul	79	82	87	92	93	92	90	90	84	79	71	66	62	68	68	62	55	53	49	51	64	64	70	76	72.8	93
7-Jul	83	87	91	91	93	94	93	90	84	75	72	70	73	68	69	67	70	66	65	69	73	78	84	89	79.0	94
8-Jul	93	95	96	96	95	95	93	90	85	77	72	66	60	55	50	44	42	44	42	44	50	56	62	65	69.5	96
9-Jul	69	70	72	79	84	87	86	83	75	70	67	62	51	48	47	45	47	47	48	48	47	51	58	61	62.7	87
10-Jul	64	67	71	78	77	72	77	76	74	71	63	53	49	46	43	37	36	38	61	67	67	68	72	76	62.6	78
11-Jul	81	84	83	79	83	83	79	71	65	57	47	44	50	49	57	52	43	43	44	42	46	55	59	64	60.8	84
12-Jul	72	73	76	77	75	78	77	70	64	60	55	53	44	42	37	36	36	43	50	52	52	60	65	71	59.0	78
13-Jul	73	80	82	84	85	83	81	79	75	67	61	57	54	47	54	55	50	48	50	48	52	58	68	72	65.0	85
14-Jul	75	75	77	87	87	89	88	87	84	76	65	55	49	43	43	40	42	35	39	39	39	43	50	57	60.9	89
15-Jul	62	64	73	82	84	83	78	71	60	51	39	34	30	27	28	36	30	29	30	31	39	42	47	50	49.9	84
16-Jul	57	63	66	70	70	69	65	60	56	50	48	50	44	53	56	54	52	70	83	76	70	67	68	69	61.9	83
17-Jul	70	74	75	79	82	84	79	71	64	54	49	46	43	40	35	33	32	29	30	32	33	36	39	45	52.3	84
18-Jul	58	61	67	82	84	81	75	66	59	56	45	39	38	37	35	34	33	31	28	28	28	30	33	43	48.9	84
19-Jul	50	57	61	66	68	72	67	66	62	53	46	41	34	32	32	39	41	53	52	54	66	72	77	88	56.1	88
20-Jul	88	93	94	94	94	93	93	91	90	91	87	85	76	81	80	79	78	71	64	65	66	71	75	79	82.4	94
21-Jul	76	78	78	76	75	77	82	81	73	75	74	70	60	55	67	62	75	73	69	71	71	71	74	73	72.3	82
22-Jul	76	83	85	88	87	87	87	81	75	69	66	60	51	46	48	44	48	52	48	48	55	58	64	65	65.6	88
23-Jul	67	73	72	76	77	79	80	79	71	67	63	56	52	49	55	69	75	85	77	72	74	77	82	87	71.5	87
24-Jul	83	84	87	82	77	77	68	64	61	59	56	49	44	40	37	37	52	69	72	74	78	83	84	84	66.8	87
25-Jul	82	84	82	79	83	83	79	78	73	72	65	61	57	51	48	46	44	44	45	48	53	58	61	64	64.2	84
26-Jul	68	70	73	71	72	73	71	65	59	57	55	49	45	37	35	32	32	33	38	37	38	48	53	56	52.8	73
27-Jul	61	66	70	70	72	72	72	68	66	64	60	58	54	45	46	48	44	44	44	44	52	56	59	60	58.1	72
28-Jul	67	72	80	74	74	77	84	85	84	83	73	69	56	51	43	44	39	36	34	38	62	65	66	71	63.6	85
29-Jul	71	74	76	79	79	79	75	70	65	56	50	46	42	44	39	37	36	35	35	39	42	50	54	61	55.5	79
30-Jul	65	68	72	74	70	71	68	70	73	69	60	55	53	51	43	55	48	47	49	55	63	70	74	74	62.3	74
31-Jul	76	80	83	85	85	91	90	86	90	92	93	95	96	91	91	91	89	93	88	88	88	92	89	88	88.8	96
																		71.2 74.6 77.2 79.7 80.9 81.4 79.5 76.3 71.9 66.9 62.3 58.8 54.7 52.1 51.5 51.2 50.7 51.5 52.4 53.8 58.0 61.7 65.6 69.2						Diurnal Average		
																		93 95 96 96 97 99 99 99 99 96 94 93 95 96 92 93 91 89 93 88 88 92 92 90 89						Diurnal Maximum		





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	84	11.29	11.29
40 - 60	207	27.82	39.11
60 - 80	285	38.31	77.42
80 - 100	168	22.58	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity 167m (RH167m) - %

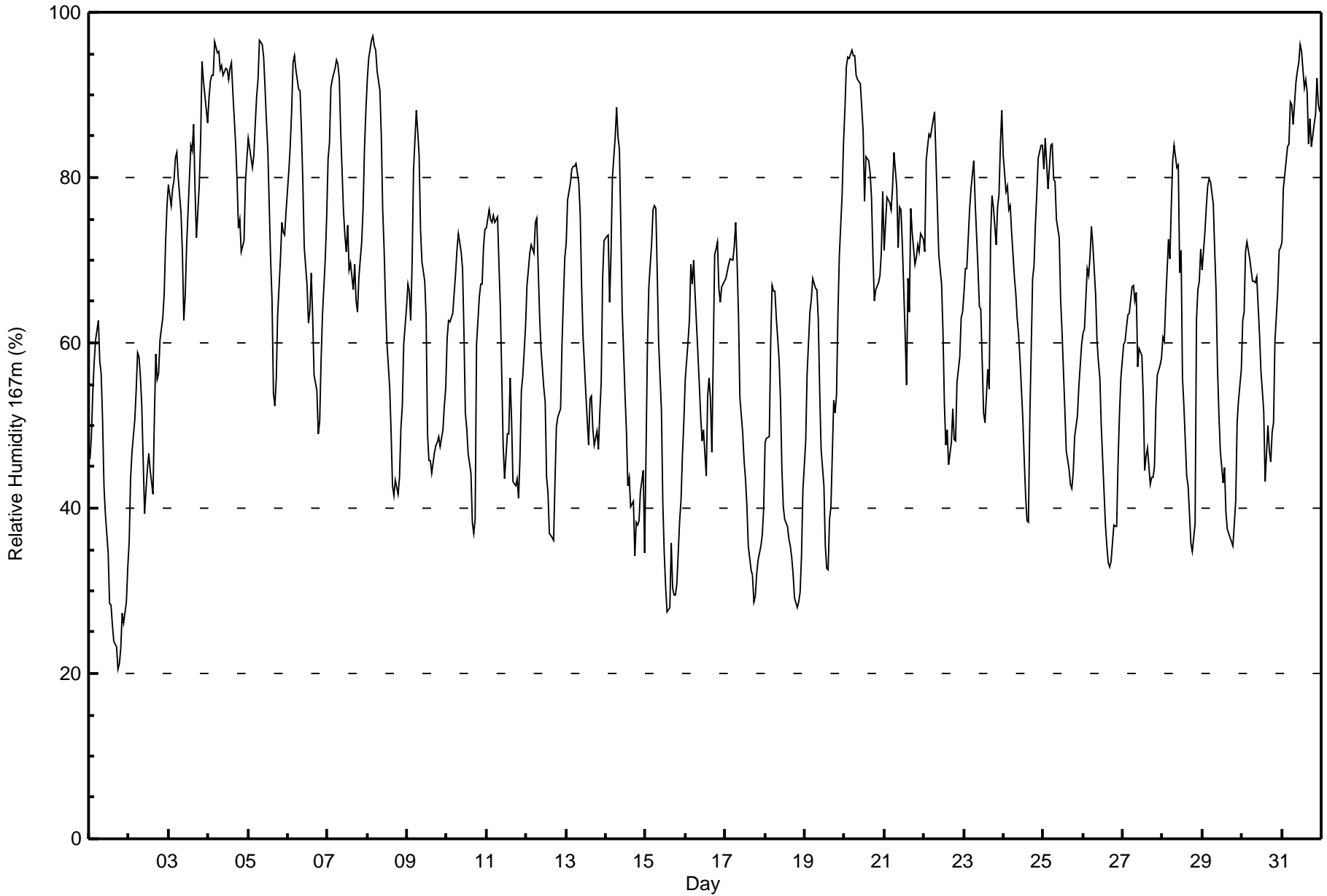
Lower Camp Met Tower - July 2016

Maximum Value: 97 % on Jul 8 04:00																		Maximum Daily Average: 87.7 % on Jul 31						Hours in Service: 744		Hours of Data: 744																	
Minimum Value: 21 % on Jul 1 18:00																		Minimum Daily Average: 38.3 % on Jul 1						Hours of Missing Data: 0		Hours of Calibration: 0																	
Maximum Diurnal Average: 79.0 % at hour 6																		Minimum Diurnal Average: 50.1 % at hour 17						Percent Operational Time: 100.0																			
Monthly Average: 63.6 %																		Percentiles: P ₁ = 27 P ₁₀ = 39 Q ₁ = 49 Median = 65 Q ₃ = 77 P ₉₀ = 88 P ₉₉ = 96																									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																			
1-Jul	46	49	54	58	60	63	58	56	51	43	39	35	29	28	26	24	23	21	21	23	27	26	29	33	38.3	63																	
2-Jul	36	44	47	51	54	59	58	56	52	39	42	45	47	45	42	51	59	56	56	60	63	66	72	77	53.1	77																	
3-Jul	79	77	79	80	82	83	80	76	71	63	66	72	80	84	83	86	79	73	79	84	94	92	90	87	79.9	94																	
4-Jul	90	92	92	92	96	95	95	93	93	92	93	92	93	94	90	84	80	74	75	71	72	79	82	87	87.7	96																	
5-Jul	85	84	81	83	87	90	92	97	96	95	91	87	83	70	65	54	52	56	63	70	75	73	73	76	78.2	97																	
6-Jul	81	84	88	94	95	93	91	91	86	79	72	67	62	64	68	63	56	54	49	50	58	63	70	75	73.0	95																	
7-Jul	82	84	91	92	93	94	94	92	86	76	73	71	74	69	70	67	70	65	64	68	72	76	84	88	78.9	94																	
8-Jul	92	94	97	97	96	95	93	91	85	76	71	65	60	55	49	43	42	43	42	44	50	52	60	64	69.0	97																	
9-Jul	67	66	63	70	81	88	86	83	74	70	68	63	49	46	46	44	47	48	48	49	47	49	52	55	60.7	88																	
10-Jul	61	63	63	64	66	68	71	73	71	69	61	52	50	47	44	38	37	39	60	66	67	67	72	74	60.0	74																	
11-Jul	74	76	75	75	75	75	75	70	64	56	48	44	49	49	56	51	43	43	44	41	46	54	56	62	58.3	76																	
12-Jul	67	69	71	72	71	75	75	69	63	59	55	53	44	42	37	36	36	43	50	51	52	60	65	70	57.7	75																	
13-Jul	72	77	79	81	81	81	82	79	76	67	61	57	54	48	53	54	50	48	49	47	52	55	68	72	64.3	82																	
14-Jul	73	73	65	71	80	85	88	85	83	74	64	54	49	43	44	40	41	34	38	38	38	42	45	35	57.6	88																	
15-Jul	47	60	67	72	76	77	76	69	60	52	40	35	30	27	28	36	30	30	30	31	38	41	46	50	47.8	77																	
16-Jul	56	60	63	70	67	70	66	59	55	51	48	50	44	54	56	53	47	71	71	72	67	65	67	67	60.3	72																	
17-Jul	68	69	69	70	70	72	75	70	63	53	49	46	44	40	35	33	32	29	29	32	34	35	37	40	49.7	75																	
18-Jul	48	48	49	60	67	66	66	63	58	53	45	40	39	38	36	35	34	32	29	28	29	30	34	42	44.6	67																	
19-Jul	48	56	60	64	65	68	67	67	63	54	47	43	35	33	33	39	40	53	52	54	63	70	78	84	55.6	84																	
20-Jul	88	93	95	94	95	95	95	92	92	91	89	86	77	83	82	81	77	70	65	66	67	68	71	78	83.0	95																	
21-Jul	71	78	77	77	76	79	83	79	72	76	76	72	61	55	68	64	76	73	69	70	72	71	73	73	72.5	83																	
22-Jul	71	82	84	85	85	87	88	82	76	71	67	61	53	48	49	45	48	52	48	48	55	58	63	64	65.5	88																	
23-Jul	66	69	69	76	79	80	82	77	69	64	64	58	52	50	57	54	73	78	76	72	76	78	84	88	70.5	88																	
24-Jul	83	78	79	76	77	73	68	66	63	61	58	51	46	41	38	38	51	68	69	74	78	82	84	84	66.2	84																	
25-Jul	81	85	82	79	84	84	80	80	75	73	65	61	57	52	47	45	43	42	44	49	51	55	57	60	63.7	85																	
26-Jul	61	62	69	68	71	74	72	66	60	58	56	50	46	38	35	33	33	34	38	38	38	46	51	56	52.1	74																	
27-Jul	60	60	62	63	64	67	67	65	66	57	59	58	54	45	46	47	43	44	44	45	52	56	57	58	55.8	67																	
28-Jul	61	60	65	72	70	76	82	84	81	82	68	71	56	52	44	43	39	36	35	38	63	66	67	71	61.8	84																	
29-Jul	69	73	76	79	80	79	77	71	66	57	51	47	43	45	40	37	37	36	35	38	41	50	53	57	55.8	80																	
30-Jul	63	64	71	72	70	69	68	67	67	68	61	57	54	52	43	50	47	46	49	50	60	66	71	72	60.7	72																	
31-Jul	72	79	82	84	84	89	89	87	92	93	94	96	95	91	92	90	84	87	84	86	88	92	89	88	87.7	96																	
																		68.3	71.2	73.0	75.5	77.3	79.0	78.6	75.9	71.9	66.8	62.6	59.3	55.0	52.4	51.8	50.5	50.1	51.0	51.8	53.5	57.6	60.7	64.5	67.2	Diurnal Average	
																		92	94	97	97	96	95	95	97	96	95	94	96	95	93	94	90	84	87	84	86	94	92	90	88	Diurnal Maximum	



Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	82	11.02	11.02
40 - 60	224	30.11	41.13
60 - 80	292	39.25	80.38
80 - 100	146	19.62	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 - July 2016

Maximum Speed: 20 km/h on Jul 24 14:00	Maximum Daily Speed Average: 9.6 km/h on Jul 24	Hours in Service: 744
Minimum Speed Value: 0 km/h on Jul 31 02:00	Minimum Daily Speed Average: 1.0 km/h on Jul 30	Hours of Data: 744
Maximum Diurnal Speed Average: 3.7 km/h at hour 17	Minimum Diurnal Speed Average: 0.1 km/h at hour 6	Hours of Missing Data: 0
Monthly Average Velocity: 1.3 km/h 296.2 deg	Percentiles: P ₁ = 1 P ₁₀ = 2 Q ₁ = 3 Median = 5 Q ₃ = 8 P ₉₀ = 12 P ₉₉ = 18	Percent Operational Time: 100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	S3	ESE2	SE5	ESE3	E3	ESE4	SSE10	SSE10	SSE10	SSE16	SSE17	SSE15	SSE13	S10	SSE11	SSE11	SSE11	SE12	SSE14	S13	S14	SSE12	SSE10	SSE9		
2-Jul	SSE9	SSE5	SSE6	E4	E4	E3	ESE3	SE5	SSE12	SSE19	S15	S15	S15	S15	S14	SSW15	SSW7	SE12	SSE13	SSE9	S6	SSE9	SSE7	SSE7		
3-Jul	S2	S5	E3	ESE4	ESE5	ESE5	SSE7	SSE8	SSE9	SE8	S14	SW8	ENE2	E4	E3	ENE2	SE4	SSE6	ESE3	E2	SE4	SE7	S6	NW6		
4-Jul	NW4	NNW2	W5	WNW7	W8	WNW7	WNW4	W7	W6	W11	W7WSW10	WSW12	WSW13	WSW14	WSW17	WSW10	W7	SW8	SW7	SSW7	SSE9	SSE5	NNW3	WSW6.5		
5-Jul	NNE2	NNW3	NNW2	NW3	NW4	NW4	N2	N7	NNW3	WSW1	S1	SSE2	NNE1	NE3	SSE6	SE4	SSE5	NNW6	N6	NNW3	WNW7	WNW7	NNW5	N3		
6-Jul	WNW6	WNW8	NW8	NW7	NNW5	N5	NNE4	N7	NNE10	NNE10	NE7	NNE7	NNE7	NNE7	ENE9	ENE7	ENE6	E7	NE6	N6	NNW4	NNW6	NNW7	N5		
7-Jul	NNW6	N5	NW3	NW5	NNW4	NW4	NNW6	NNW5	NNW6	N8	N5	N7	N7	N8	NNE8	NNE8	NNE8	NNW6	N8	NNE5	N5	N4	NNW4	NNW3		
8-Jul	NNW3	NW3	NW2	NW3	NNW2	NW4	NNW5	N4	NNW6	N6	N6	N7	NNW6	NNE5	N5	N5	N4	N5	N6	N5	NNE5	NNE5	NW4	NNW4		
9-Jul	NNW4	N7	N7	N6	N6	N4	N4	N2	NNW1	NW2	N2	NE2	NNE2	N3	N6	NNE5	NNE5	SE4	NE4	ENE4	NE3	NNE1	N3	N4		
10-Jul	N2	N4	N4	NNW3	NNE1	NE1	N2	N3	NNW4	NNW3	NNW4	NNW3	E5	ENE6	ENE8	ENE7	ESE5	SSE5	W18	W13	N3	NNW4	NW4	NW3		
11-Jul	NNW2	W2	NW1	N3	NW2	WNW2	ESE1	NNW3	NNW4	NNW4	N5	N7	NW9	NNW10	NNW8	N7	NNW7	N9	N10	N10	N6	NNW4	N5	N7		
12-Jul	N6	NNW5	N5	NNW5	NNW5	N6	NNW6	N7	N8	N10	N8	N10	N13	N13	N14	NNW14	NNW12	N12	N15	N10	NNW9	NNW6	NNW6	NNW4		
13-Jul	NNW5	NNW4	NNW5	NNW5	N6	NNW6	NNW8	NNW8	N9	N11	N11	N12	N12	N13	N14	NNE8	NE9	NNE11	N7	N7	N4	N3	N3	NNE3		
14-Jul	N2	NNE2	NE1	NNW1	N1	N1	NW1	N1	N1	NNE3	NNE5	N4	NW2	N5	NNW7	NNW7	N11	NNW3	NNW7	NW4	N3	N3	NNW2	WNW3		
15-Jul	NW1	N1	NNW0	ESE1	SE2	SE5	SE6	SE5	SW2	W4	WSW7	WSW7	W4	NW6	N11	NNW7	NNW9	NNW6	NNW6	NNW5	N4	NNW1	NNW3	NNW3		
16-Jul	W5	WNW2	SW2	SSE3	SSE3	SSE5	SSW4	W5	W6	WNW4	N3	NNE4	NNE3	NNW8	SSE3	SW2	WSW4	N11	W2	NW3	NNW7	NNW8	NNW7	NNW5		
17-Jul	NNW6	NNW5	NNW4	NNW3	NNW2	NNW3	NNW4	NNW6	NNW6	N10	N9	N8	NNW9	N8	N9	N9	N8	N7	N6	NNE4	NNE2	N1	NNW0	SSE1		
18-Jul	S1	SSE2	NNE1	NE2	ESE2	ESE3	SE5	SE8	SE8	SE8	SSE9	SE5	SE1	SSW4	WNW5	WNW7	W8	WSW9	WSW13	SW14	SW9	SSW8	SSW9	SW5		
19-Jul	S3	SE7	SE8	SE6	SE4	SSE6	SSE9	SSE11	SSE7	SW4	W9	W12	W12	WSW13	W13	NW12	NW17	W12	WSW7	WNW3	NW9	SSE2	NW3	NNW3		
20-Jul	N3	NE2	NNW2	NNW5	NNW5	NNW4	N4	NNW4	N3	WNW3	NW4	WNW2	W3	NNW4	N4	NNW6	NNE6	NNE4	WNW2	ESE1	SW5	SSW2	SSE3	SW2		
21-Jul	WSW7	SW4	WSW5	SW5	S6	SSE3	WSW7	W13	W12	W12	W11	WSW16	W16	W17	W18	NW13	N17	N16	N11	N12	NNE10	NNE4	SSE0	SE4		
22-Jul	SE5	SE5	SSE8	SSE7	SSE8	SSE11	SSE8	SSE8	SSE13	S15	S12	SSE18	S16	SW12	SSW11	SW15	WNW8	NW4	W10	NW10	NNW5	NW6	NNW2	WSW1		
23-Jul	SW4	W8	W8	NW4	NNW4	NW3	NNW3	N3	N3	NNE4	W5	W6	NE4	W5	WNW9	NNW5	WNW7	SSE2	SW10	WSW5	WSW7	WSW2	SSW5	S6		
24-Jul	S6	SSE10	SSE12	SE13	SE13	SSE8	SW14	WSW16	WSW16	WSW15	WSW16	W17	W18	W20	W19	W20	NW19	NW16	NNW14	W12	WNW11	W10	NNW6	W12		
25-Jul	W14	WNW9	NW5	WNW5	W4	NNW5	WNW11	NNW11	NNW9	NNW3	N2	NNW1	SE3	NNW3	NNE7	N5	N4	N4	NNE4	NE4	N4	NNW4	NNE3	NNW2		
26-Jul	N3	NNW4	NNW5	NNW3	SSE4	SE4	SE5	SSE10	SSE9	SSE7	SSW9	S11	SSW7	W6	W7	WNW7	SW5	S12	S11	SSE9	SSE10	SSE7	SSE9	S4.6		
27-Jul	SSE7	SSE6	SE5	SE5	SE5	SE5	SE6	SE4	E2	N4	NNW5	N6	NNW4	N10	N9	N8	N8	N7	N5	NE5	N4	N3	NNW2	N1		
28-Jul	N3	NNW2	NW3	N3	N3	SW2	SW5	SE3	ENE0	SE4	SSE6	SSE3	SSE8	SSE6	S3	ENE3	SSE5	NW2	NW3	WSW2	W13	S9	SSW8	SSW5		
29-Jul	SW8	SSW4	WSW2	WSW3	SW5	SSW6	SW6	SW4	SSW3	SSW4	SW2	W7	WSW4	SSE11	SSW7	SSW8	SSW11	WSW9	S2	S11	SE9	SSE9	SSE8	E2		
30-Jul	N3	E3	SSE5	SSW3	W8	SSE4	S6	SSE6	SE2	SE5	SSE4	ESE5	SE4	SSE10	SSE16	N10	NNE7	N7	NNE4	N6	N6	NNW4	N2	NNW4		
31-Jul	NNE4	WNW0	NNW2	WNW2	NNE1	NNW8	NNW4	NW6	NNW5	WNW4	WNW5	WSW5	WNW9	NW7	WSW11	W10	NW5	NNW5	NW5	WNW5	WNW7	NNW3	NW4	NW7		

WNW1.5	NNW0.7	NNW0.6	NW0.7	NNW0.2	ESE0.1	SSW0.8	WSW1.1	W0.9	WSW0.7	WSW1.4	W2.2	W1.9	NNW2.5	NNW2.6	NW3.5	NNW3.7	NNW3.1	NW2.6	NW2.0	NNW2.1	NNW0.5	W0.7	NNW1.2	Diurnal Average
W14	SSE10	SSE12	SE13	SSE13	SSE11	SW14	WSW16	WSW16	SSE19	SSE17	SSE18	W18	W20	W19	W20	NW19	NW16	W18	SW14	S14	SSE12	SSE10	W12	Diurnal Maximum

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



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

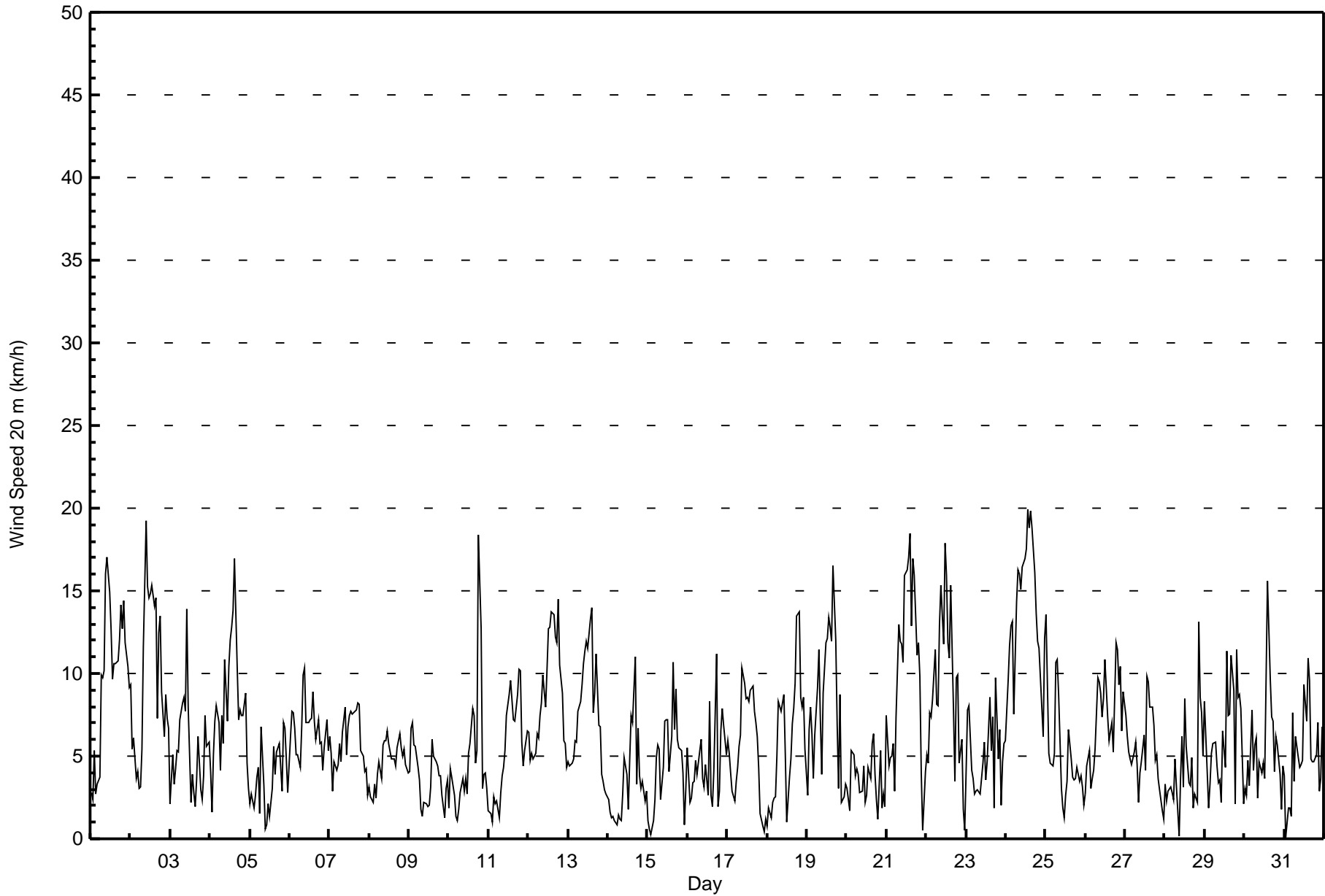
Wind Speed 20 m (WS20m) - km/h
Lower Camp Met Tower - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 13 km/h on Jul 24 17:00 Minimum Value: 1 km/h on Jul 18 01:00 Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 3 Q ₃ = 4 P ₉₀ = 5 P ₉₉ = 7																	Hours in Service: 744 Hours of Data: 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-Jul	1	1	2	1	1	2	3	3	4	6	7	6	6	4	6	5	5	5	5	4	4	3	3	2	7
2-Jul	3	2	3	2	2	2	2	3	6	7	6	5	5	6	5	6	5	5	5	4	3	3	2	3	7
3-Jul	2	3	2	1	2	2	3	4	3	3	7	6	2	3	2	2	4	2	2	1	3	3	3	3	7
4-Jul	2	1	3	3	3	3	2	3	4	4	3	4	4	5	5	5	5	5	3	3	3	3	3	1	5
5-Jul	1	1	1	1	1	2	1	4	3	1	1	1	2	2	3	2	2	4	2	2	3	3	2	2	4
6-Jul	3	3	3	3	2	2	2	4	4	4	3	3	4	4	5	4	4	4	4	3	1	2	3	3	5
7-Jul	2	2	2	2	2	2	2	3	3	3	3	4	5	4	4	5	4	4	4	3	2	2	2	1	5
8-Jul	1	1	1	1	2	1	2	2	3	2	3	3	3	3	3	2	2	2	3	2	2	3	2	2	3
9-Jul	2	3	2	3	3	2	2	1	1	1	1	1	1	2	3	2	2	5	2	1	2	1	1	2	5
10-Jul	1	2	2	1	1	1	1	1	2	1	2	2	4	3	4	4	3	2	9	7	2	2	2	1	9
11-Jul	1	1	1	1	1	1	1	2	2	2	3	4	5	4	4	3	3	4	4	5	2	1	1	2	5
12-Jul	3	2	2	2	2	3	4	3	4	4	4	5	5	5	6	5	6	5	6	4	4	2	2	2	6
13-Jul	1	2	2	2	2	2	3	3	4	4	5	5	5	6	6	6	4	5	3	3	2	1	1	1	6
14-Jul	2	1	1	1	1	1	1	1	1	2	3	2	3	3	4	4	5	1	2	2	1	1	1	1	5
15-Jul	1	1	1	1	1	2	2	2	2	3	4	3	4	3	7	4	3	4	3	3	2	1	1	1	7
16-Jul	2	2	1	2	2	2	3	4	3	3	2	2	2	6	2	2	2	7	1	1	2	2	2	2	7
17-Jul	2	2	1	1	1	1	2	2	3	4	4	4	4	4	5	4	4	3	3	2	1	1	1	1	5
18-Jul	1	1	1	1	1	1	3	3	2	3	3	3	2	3	3	4	4	4	4	3	3	3	3	3	4
19-Jul	3	3	3	3	3	3	4	3	3	4	4	5	5	5	5	7	7	6	4	2	7	1	1	1	7
20-Jul	2	1	1	3	2	2	2	2	1	1	2	2	2	2	2	3	3	2	2	1	2	2	2	2	3
21-Jul	3	3	4	4	3	3	5	5	4	4	5	6	6	8	7	6	6	6	5	5	4	3	1	1	8
22-Jul	1	2	3	3	3	4	4	4	5	5	4	6	5	5	4	6	5	3	5	5	2	2	2	1	6
23-Jul	3	4	4	3	1	1	1	2	2	2	3	3	2	4	5	3	4	2	5	4	2	2	2	2	5
24-Jul	2	3	3	4	4	3	5	5	6	6	6	7	7	7	9	13	11	7	5	5	5	4	6	13	
25-Jul	5	4	2	1	2	2	5	5	4	2	2	2	2	3	3	3	2	3	2	2	1	1	1	1	5
26-Jul	1	1	1	2	3	2	3	4	3	3	4	5	4	5	3	4	3	3	4	3	2	2	3	4	5
27-Jul	2	2	2	1	1	2	2	2	1	2	2	3	3	4	3	3	3	3	2	3	1	1	2	1	4
28-Jul	1	1	1	2	2	3	3	2	1	1	3	2	3	3	2	2	3	2	1	5	5	3	3	2	5
29-Jul	3	2	2	2	2	2	2	2	2	2	2	4	4	5	5	4	5	5	4	3	3	3	3	1	5
30-Jul	3	2	3	4	4	2	4	3	3	3	2	2	2	5	6	6	4	4	3	3	2	2	1	1	6
31-Jul	3	1	1	2	2	4	3	2	2	2	3	3	5	4	5	4	3	2	2	3	4	2	3	4	5
Diurnal Maximum																									



Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	382	51.34	51.34
6 - 11	276	37.10	88.44
12 - 19	84	11.29	99.73
20 - 28	2	0.27	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

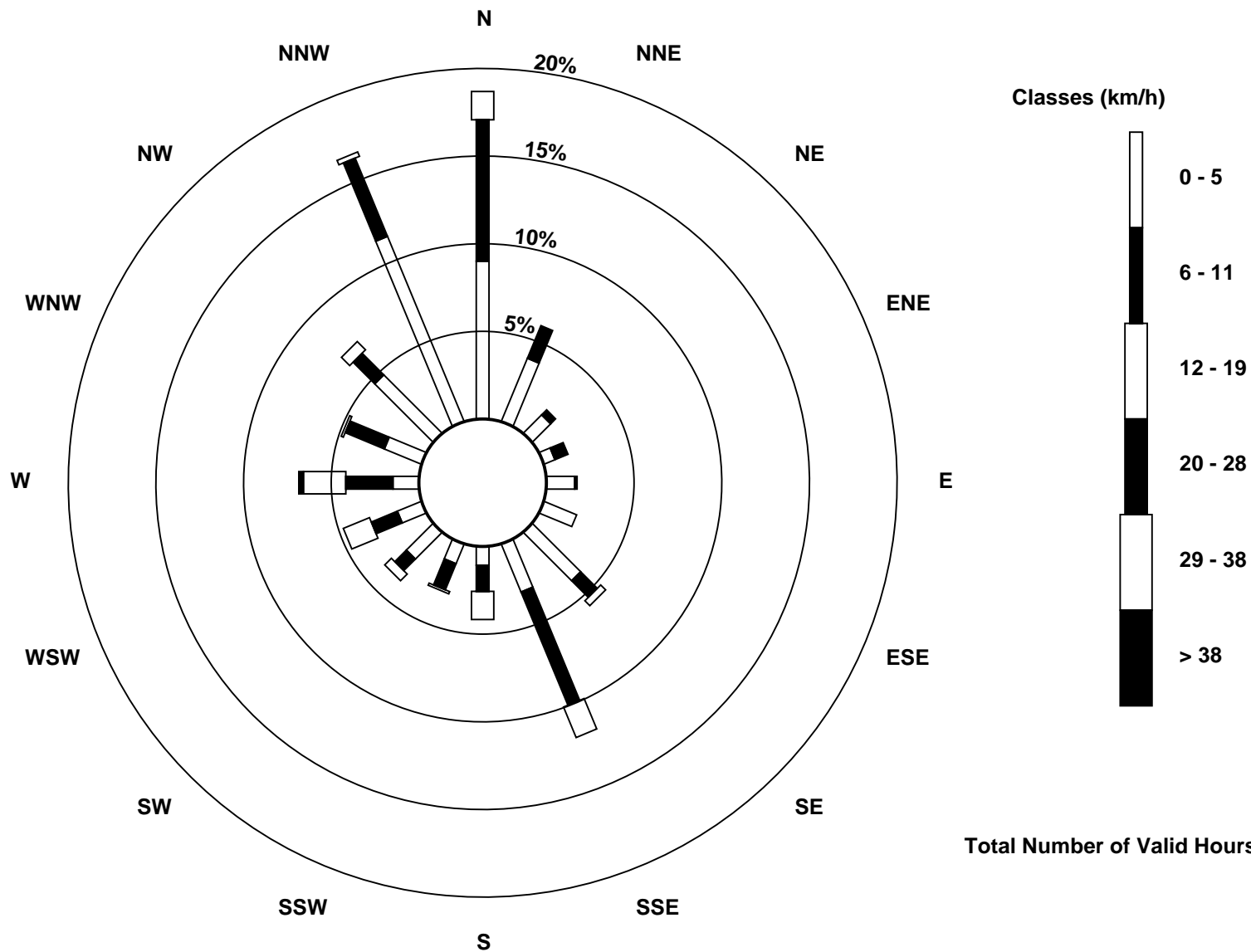
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

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





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed 45 m (WS45m) - km/h

Lower Camp Met Tower - July 2016

Maximum Speed: 29 km/h on Jul 24 16:00	Maximum Daily Speed Average: 13.9 km/h on Jul 24	Hours in Service: 744
Minimum Speed Value: 0 km/h on Jul 28 09:00	Minimum Daily Speed Average: 1.3 km/h on Jul 30	Hours of Data: 744
Maximum Diurnal Speed Average: 5.1 km/h at hour 17	Minimum Diurnal Speed Average: 0.3 km/h at hour 6	Hours of Missing Data: 0
Monthly Average Velocity: 2.1 km/h 301.9 deg	Percentiles: P ₁ = 1 P ₁₀ = 3 Q ₁ = 5 Median = 8 Q ₃ = 11 P ₉₀ = 16 P ₉₉ = 25	Percent Operational Time: 100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Jul	S6	SE4	SE8	SE5	E4	ESE6	SE12	SE12	SE13	SE20	SE22	SE18	SSE15	SSE12	SE13	SE14	SE13	SE15	SE18	S14	S17	SSE14	SSE13	SE11	SE12.1	SE22	
2-Jul	SE12	SSE8	SSE9	E5	E5	E3	ESE4	SE7	SE15	SSE23	S18	SSE17	SSE17	S18	S16	SSW18	S10	SE16	SE17	SSE11	SSE7	SE11	SE10	SE10	SSE11.0	SSE23	
3-Jul	SE4	SE7	E4	ESE5	ESE7	ESE7	SE8	SE10	SSE10	SE10	S17	SW12	NE2	E6	E5	ENE3	SE4	SSE7	ESE4	ENE4	SE5	SE10	S7	WNW9	SE4.9	S17	
4-Jul	WNW7	NW2	W8	W11	WSW12	W11	W6	W11	WSW9	WSW16	W11	WSW14	WSW17	WSW19	WSW20	SW22	WSW15	W10	SSW11	SSW10	S10	SSE11	SE7	N4	WSW9.5	SW22	
5-Jul	NNE4	N3	NNW2	NNW3	NW5	NW6	NNW2	NNW9	NNW5	W1	SSE1	SE3	N2	NNE4	SSE6	SE4	SE6	NNW9	NNW9	NNW5	WNW10	W10	NW7	NNW5	NNW2.9	W10	
6-Jul	W10	W12	WNW11	NW10	NNW8	NNW8	NNE6	N10	N14	NNE15	NNE10	NNE10	NNE10	NNE10	NE14	ENE10	ENE9	E10	NNE9	N9	NNW8	NNW9	NNW12	N8	N7.5	NNE15	
7-Jul	NNW10	NNW9	NW5	NNW7	NNW7	NNW7	NW8	NW6	NNW9	N11	NNW7	N9	N11	NNW11	N11	N11	NNE11	N12	N12	NNE8	NNW8	N7	NNW7	NNW4	N8.4	N12	
8-Jul	NNW5	NNW4	NW3	NW5	NNW4	NW5	NNW6	NNW5	NNW7	NNW8	N8	N8	NNW7	N6	N6	N6	N6	N8	N9	N8	NNE9	NNE9	NNW6	NNW7	N6.2	N9	
9-Jul	NNW8	N10	N9	N8	N8	N6	N5	N2	NW2	WNW3	NNW3	NNE2	N3	NNW4	N7	NNE6	NNE7	ESE6	NE7	ENE7	NE5	NE3	N4	N7	N4.7	N10	
10-Jul	N4	N7	N6	NNW4	NNE2	NE2	N3	N4	NNW5	NW4	NNW4	NW3	E8	ENE9	ENE11	NE10	E7	SSE6	WSW27	W19	NNW5	NNW6	NW7	WNW4	NNW2.7	WSW27	
11-Jul	NW2	W1	WNW2	NNW5	NW3	NW3	ENE1	NNW4	NNW5	NNW5	N7	N10	NW12	NNW15	NNW12	NNW10	NNW10	N13	N15	N15	N9	NNW8	NNW10	NNW11	NNW7.6	N15	
12-Jul	N10	NNW9	NNW9	NNW8	NNW9	NNW9	NNW9	N10	NNW12	NNW14	N11	N15	N17	N18	NNW19	NNW19	NNW18	N17	NNW21	N15	NNW14	NNW11	NNW10	NNW8	NNW12.8	NNW21	
13-Jul	NNW9	NNW8	NNW8	NNW9	NNW9	NNW9	NNW12	NNW12	N14	N15	N16	N17	N15	N19	N19	NNE12	NNE12	NNE16	N10	N10	N7	N7	N6	N4	N11.2	N19	
14-Jul	N4	NNE3	N1	NW2	WNW0	NW1	NNW2	N2	N2	N3	NNE6	N5	NW3	NNW6	NW10	NW10	N16	N5	NW10	NW6	NNW5	NNW6	N5	NW3	NNW4.5	N16	
15-Jul	W2	NW1	WNW0	SW0	SE4	SE8	SE7	SE6	SW3	W6	WSW9	WSW9	WSW9	WSW5	WSW9	NNW15	NNW8	NW13	NNW9	NNW9	NNW10	NNW7	NNW4	WNW4	NW3.4	NNW15	
16-Jul	W8	W4	SW4	S4	SSE3	S5	SSW6	W8	W9	W5	NNW4	N5	N3	NNW12	SSE3	SW2	WSW5	NNW17	WNW2	NW5	NW11	NW13	NNW11	NNW9	WNW4.1	NNW17	
17-Jul	NNW10	NNW10	NNW8	NNW6	N4	NNW5	NNW7	NNW8	NNW9	NNW14	N13	NNW11	NNW11	NNW11	NNW12	NNW13	N11	N10	NNW9	NNE7	NNE4	NNW1	NW1	SSE1	NNW7.9	NNW14	
18-Jul	SSW2	SE4	ESE2	E2	ESE3	ESE4	SE7	SE10	SE9	SE10	SE10	SE6	ESE1	S4	W6	WNW9	W10	WSW13	SW18	SW17	SSW12	SSW12	SSW12	SSW8	SSW5.1	SW18	
19-Jul	S5	ESE8	SE11	SE8	SE6	SE8	SE11	SE13	SE8	SW5	WSW11	W16	W17	WSW18	WSW18	WNW17	WNW22	W17	WSW11	WNW4	WNW13	SE3	WNW2	NNW6	WSW5.1	WNW22	
20-Jul	N5	NNE4	N3	NNW9	NNW8	NNW6	N6	NNW6	N4	WNW4	NW6	WNW2	W3	NW7	NNW5	NNW8	N8	N5	WNW3	E1	SW8	SSW3	S4	SSW3	NNW3.3	NNW9	
21-Jul	SW11	SW7	WSW8	SW7	SSE6	S4	SW10	WSW19	W17	W16	WSW15	WSW24	WSW23	W24	WSW27	NW18	N24	N23	N16	N17	NNE15	NNE6	ESE1	SE5	W7.9	WSW27	
22-Jul	SE6	SE6	SSE9	SSE9	SSE10	SSE13	SE11	SE10	SSE15	SSE17	SSE14	SSE21	S18	SW15	S13	SW19	W11	WNW5	W14	WNW14	NNW8	NW10	NNW4	WSW2	S6.3	SSE21	
23-Jul	SW7	WSW13	W13	WNW7	NW6	NNW4	NNW4	N4	N3	NNE4	WSW6	W7	NNE4	W6	WNW12	NNW7	WNW11	SE2	SW12	SW7	SW9	SW4	SSW7	S6	W4.6	WSW13	
24-Jul	SSE7	SSE12	SE15	SE17	SE17	SSE9	SSW19	SW21	WSW23	WSW21	WSW23	WSW24	WSW25	WSW28	WSW28	WSW29	WNW26	WNW23	WNW19	W17	W17	W14	W9	WSW18	WSW13.9	WSW29	
25-Jul	W19	W13	WNW7	WNW6	W6	WNW8	WNW14	WNW15	NW11	NNW4	NNW3	N2	ESE3	NNW5	NNE9	N7	N5	N5	NNE5	NE7	N5	NNW4	NNE5	N2	NW5.2	W19	
26-Jul	N2	NNW5	NNW8	N4	SE6	ESE7	ESE8	SE12	SE12	SE10	SE8	SSW10	SSE13	S9	W8	W8	W9	SW6	SSE13	SSE13	SSE11	SE14	SE10	SSE12	SSE5.5	SE14	
27-Jul	SSE10	SE8	SE7	SE6	SE6	SE6	SE7	SE5	E2	N5	NNW6	NNW8	NNW5	N13	N13	N11	NNW11	N10	N7	NE9	N7	NNW7	NNW3	N3	NNE3.3	N13	
28-Jul	N6	NNW5	NNW5	NNW5	NNW4	SW4	SW7	SE3	ENE0	ESE4	SSE7	SE3	SSE8	SSE6	S4	NE4	SSE6	NW3	NW4	WSW3	WSW20	S9	S8	S6	SSW1.7	WSW20	
29-Jul	SW11	SSW5	WSW3	WSW5	SSW7	SSW7	SSW7	SSW5	SSW4	SSW4	WSW3	W8	WSW5	SSE13	SSW8	SSW9	SSW13	WSW11	S2	S12	SE11	SE12	SSE10	ESE4	SSW5.9	SSW13	
30-Jul	N5	E3	SSE6	SSW5	W11	SSE5	S7	SSE7	SE2	ESE5	SE4	ESE5	ESE4	SE12	SSE17	N13	NNE11	N10	NNE7	N9	NNW9	NNW7	N3	NNW7	ENE1.3	SSE17	
31-Jul	N6	NNE0	NNW2	WNW2	N2	NNW12	NNW6	NW10	NNW9	NW7	WNW7	WSW6	W14	WNW11	SW15	WSW15	WNW7	NNW7	WNW7	WNW7	WNW8	W11	NW4	WNW6	WNW11	WNW6.4	WSW15

WNW2.3 NW1.1WNW1.0 NW1.3NNW0.4 N0.3 SW0.8WSW1.4WNW1.4 W1.0 W1.7 W3.0 W2.6WNW3.4NNW3.6 NW4.9NNW5.1NNW4.7 NW3.8 NW3.1 NW3.3 NW1.2 NW1.2 NW2.0	Diurnal Average
W19 W13 SE15 SE17 SE17 SSE13 SSW19 SW21WSW23 SSE23WSW23WSW24WSW25WSW28WSW28WSW29WNW26 N23 WSW27 W19WSW20 W14 SSE13WSW18	Diurnal Maximum

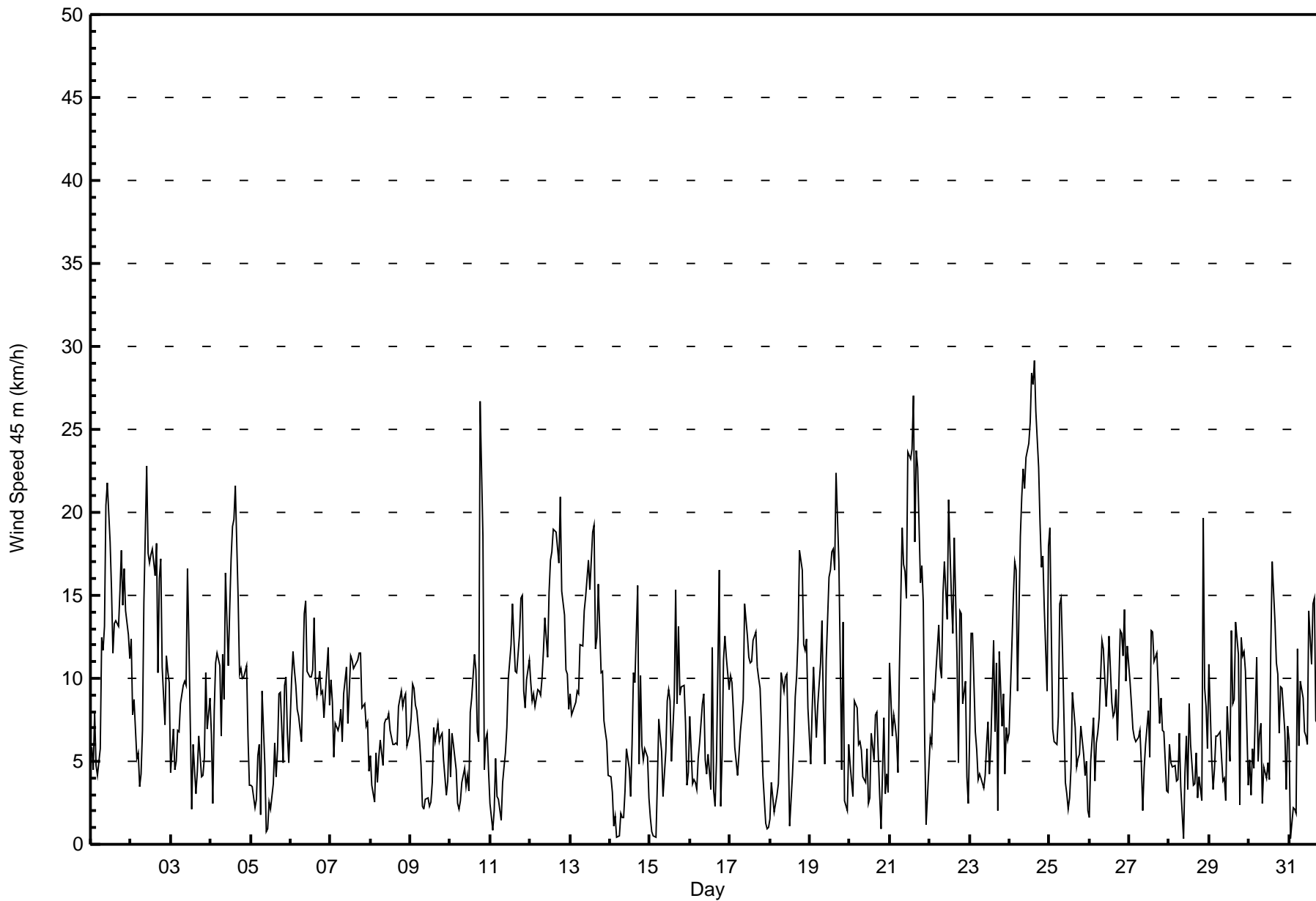
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

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

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 15 km/h on Jul 24 17:00 Minimum Value: 1 km/h on Jul 14 05:00 Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 3 Q ₃ = 4 P ₉₀ = 5 P ₉₉ = 9																	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-Jul	2	2	2	2	2	2	4	4	5	7	7	6	6	4	6	6	6	6	6	3	3	3	3	3	7
2-Jul	3	3	4	3	2	2	2	4	6	7	6	5	5	5	5	6	7	7	6	4	3	3	3	3	7
3-Jul	3	3	2	2	2	2	3	4	3	3	8	7	2	4	2	2	4	2	3	1	3	3	4	3	8
4-Jul	2	2	4	2	3	4	3	3	4	4	4	3	3	4	4	5	5	5	3	3	3	3	4	2	5
5-Jul	2	1	1	1	1	1	1	5	4	2	1	1	3	3	3	2	3	6	2	3	3	3	3	3	6
6-Jul	4	3	4	2	2	3	2	4	5	5	4	4	5	5	7	4	5	5	4	3	2	3	3	4	7
7-Jul	3	2	2	2	3	2	2	3	4	4	3	5	5	4	5	6	4	4	4	3	2	2	2	1	6
8-Jul	2	2	2	1	2	2	2	2	2	3	3	3	3	2	3	2	2	2	3	3	2	3	2	2	3
9-Jul	2	3	3	3	3	3	2	1	1	1	1	1	1	2	3	3	3	5	2	2	2	2	2	2	5
10-Jul	2	2	2	2	1	1	1	1	1	1	1	2	6	4	4	4	4	2	11	8	2	2	2	2	11
11-Jul	1	1	1	1	2	1	1	2	2	2	3	4	5	5	4	4	3	4	5	5	2	2	2	2	5
12-Jul	4	2	2	2	3	3	4	3	4	4	5	5	5	6	6	5	6	6	7	4	4	2	2	2	7
13-Jul	2	2	2	2	2	3	3	3	5	5	5	5	6	6	7	8	5	6	3	3	2	1	2	2	8
14-Jul	2	1	1	1	1	1	1	1	1	2	3	2	3	4	4	4	6	2	3	2	1	1	1	1	6
15-Jul	1	1	1	1	1	2	2	2	2	3	4	4	4	3	9	5	3	4	3	4	3	2	3	1	9
16-Jul	2	2	2	2	2	2	5	5	3	4	3	2	2	9	2	2	2	10	1	2	3	2	3	2	10
17-Jul	2	2	2	2	1	2	2	2	3	5	5	4	4	5	5	5	4	3	3	2	2	1	1	1	5
18-Jul	1	1	1	1	1	2	3	4	2	3	4	3	2	3	4	4	4	5	4	3	4	4	4	3	5
19-Jul	3	2	3	3	4	4	4	3	4	4	4	5	5	5	5	7	7	5	4	3	9	2	2	2	9
20-Jul	2	2	2	3	3	3	2	2	2	1	2	2	2	3	3	3	3	3	2	1	3	3	2	3	3
21-Jul	3	4	5	7	3	3	6	6	4	4	4	5	6	8	6	7	7	7	5	5	4	4	1	1	8
22-Jul	1	2	3	3	4	4	4	4	5	5	4	6	5	5	4	6	5	4	5	5	2	2	3	2	6
23-Jul	3	5	4	4	2	1	2	2	1	2	3	2	4	5	4	5	2	6	4	2	3	3	2	6	
24-Jul	2	3	3	3	4	4	5	4	5	5	5	6	6	7	7	10	15	13	8	5	5	5	6	15	
25-Jul	5	5	3	2	2	3	5	5	5	2	3	2	2	4	3	4	2	3	2	2	1	2	1	5	
26-Jul	1	2	1	3	3	3	4	4	3	3	4	6	5	5	3	4	3	3	3	3	2	2	4	4	6
27-Jul	3	2	2	1	2	2	1	2	1	2	2	3	3	5	4	3	4	3	2	3	1	2	3	2	5
28-Jul	2	2	2	2	3	4	3	3	1	2	3	2	3	3	2	2	3	2	2	6	5	3	3	3	6
29-Jul	2	2	3	2	2	2	3	2	3	3	3	5	4	6	5	5	6	6	4	3	3	3	3	2	6
30-Jul	5	2	3	5	5	2	4	3	3	3	2	3	2	6	5	7	4	5	3	3	3	2	2	2	7
31-Jul	4	1	1	2	3	5	4	2	3	3	4	3	5	4	5	3	3	3	3	3	4	3	3	4	5
Diurnal Maximum																									





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	223	29.97	29.97
6 - 11	344	46.24	76.21
12 - 19	150	20.16	96.37
20 - 28	26	3.49	99.87
29 - 38	1	0.13	100.00
> 38	0	0.00	100.00

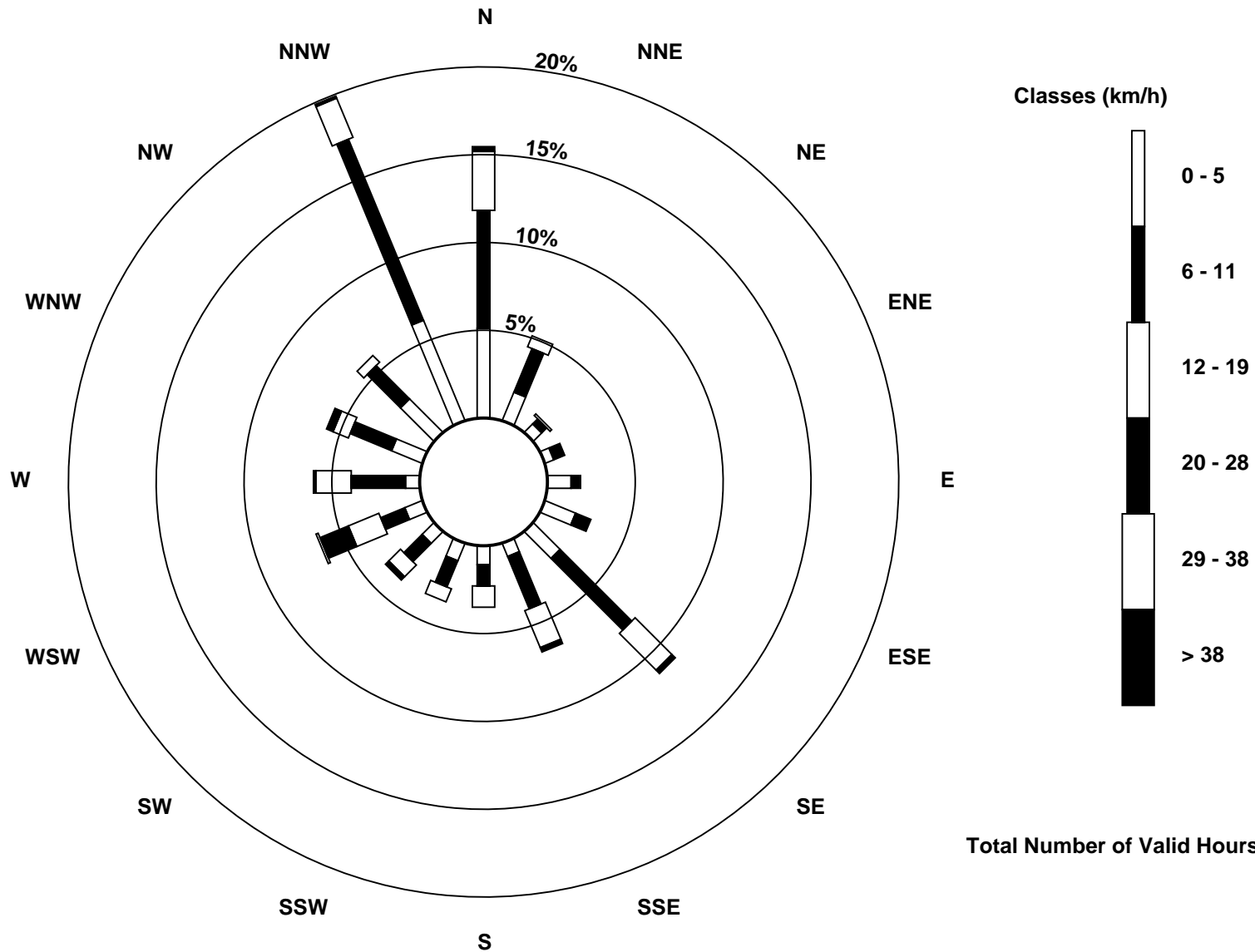
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

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





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed 100 m (WS100m) - km/h

Lower Camp Met Tower - July 2016

Maximum Speed: 39 km/h on Jul 24 17:00		Maximum Daily Speed Average: 20.1 km/h on Jul 12		Hours in Service: 744																						
Minimum Speed Value: 0 km/h on Jul 15 04:00		Minimum Daily Speed Average: 2.4 km/h on Jul 28		Hours of Data: 744																						
Maximum Diurnal Speed Average: 7.1 km/h at hour 18		Minimum Diurnal Speed Average: 0.9 km/h at hour 10		Hours of Missing Data: 0																						
Monthly Average Velocity: 3.0 km/h 312.1 deg		Percentiles: P ₁ = 1 P ₁₀ = 4 Q ₁ = 7 Median = 12 O ₃ = 17 P ₉₀ = 22 P ₉₉ = 31		Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	SSW16	S12	SSE14	SSE14	SE10	SE11	SE19	SE17	SE21	SE31	SE31	SE25	SE20	SSE15	SE18	SE19	SE19	SE23	SE27	S17	S22	SSE20	SSE21	SSE20	SSE18.6	SE31
2-Jul	SSE19	SE15	SE19	SE12	SE8	SE7	SE8	SE12	SE21	SSE31	SSE20	SSE21	SSE21	S19	S18	SSW22	S15	SE26	SE25	SE16	SE12	SE21	SE20	SE18	SSE16.9	SSE31
3-Jul	SE16	SE20	SE11	SSE11	SE12	SE11	SE12	SE13	SE12	SE13	S20	SW20	WNW2	E10	E8	E6	E7	SSE7	ESE6	E7	SE9	SE15	S10WNW15	SE8.6	SW20	
4-Jul	W11	WNW7	W11	W15WSW14	W16	W11	W16WSW12WSW20	W15WSW16WSW20WSW22WSW24	SW27WSW20	W14	SW14	SW15	SSW12	S12	SSE10	ENE1								WSW13.1	SW27	
5-Jul	NNE5	NNE5	N5	N5	N8	NNW7	W5	NNW12	N7	NNE2	E2	ESE4	N4	N5	SSE5	E2	SE4	NNW17	NNW19	NNW11	NNW12	W15WNW12	WNW10	NNW5.3	NNW19	
6-Jul	WNW16	W16WNW14	NW13	NNW10	N11	NNE8	N14	NNE20	NNE19	NNE14	NNE15	NNE15	NNE17	ENE20	ENE14	ENE14	E15	NNE13	N15	N10	N15	NNW20	N15	N11.2	NNE20	
7-Jul	N15	N14	N8	N12	N14	NNW11	NNW12	NNW7	NNW12	N15	NNW9	N12	N17	NNW15	NNE15	NNE16	NNE15	NNE16	N18	NNE13	N15	N16	N13	N9	N13.1	N18
8-Jul	N10	NNE7	NNE3	N7	NNE8	NNW6	N8	N7	NNW8	N9	N9	N9	NNW8	N7	N8	N6	N8	N12	N15	NNE14	NE19	NE20	NNE10	N11	N9.2	NE20
9-Jul	N12	N14	NNE15	N12	N13	N10	N7	N3	N3	NW3	NW4	N3	N3	N3	N8	NNE8	NNE11	E9	NE11	ENE11	ENE11	ENE14	ENE5	NNE5	NNE6.9	NNE15
10-Jul	NNE7	N11	N11	N9	NNE7	E2	NNE4	NNE4	N5	N4	NNW4	NNW3	E12	ENE13	ENE16	NE14	E10	SE7WSW33	W26	WNW9	NW11	NW10	NNW6	N3.9	WSW33	
11-Jul	N7	N6	NW4	NNW8	NNW10	NNW8	N2	NNW5	NNW6	NNW7	N10	N13	NW19	NNW20	NNW19	NNW14	NNW16	N19	N24	N25	N18	N17	NNW19	NNW22	NNW12.7	N25
12-Jul	NNW18	NNW17	NNW18	N15	N21	N16	N14	N13	N15	N17	N17	N21	N24	N24	NNW25	NNW26	NNW27	N26	N31	N24	N23	NNW21	NNW20	N15	N20.1	N31
13-Jul	NNW16	NNW15	NNW17	NNW18	NNW17	NNW16	NNW16	NNW16	N20	N22	N23	N24	N23	NNE28	N27	NNE21	NE19	NNE22	N16	N18	N15	N13	N11	NE8	N17.5	NNE28
14-Jul	NNE8	NE5	N5	NNW8	NNW5	NNW6	NNW3	N3	NNW2	N4	N7	N6	NW4	NNW8	NW13	NW12	N24	N10	NNW14	NNW11	NW12	NNW12	NNW16	NNW13	NNW8.4	N24
15-Jul	NNW7	NNW5	NW1	SW0	SW4	SW5	SSW3	SSW4	WSW5	W8WSW10WSW10	WSW9	W6	NW12	NNW20	NNW12	NW17	NW13	NNW17	NNW16	NW14	NNW13	WNW7		NNW7.0	NNW20	
16-Jul	W12	WSW9WSW10	SW10	WSW9	SW7WSW12WSW13	W13	W7	NW6	NNW7	NNW4	NNW17	WSW3	WSW2	WSW5	NNW27	NNW7	NNW16	NNW23	NNW23	NNW23	NNW23	NNW23	NNW20	NNW8.8	NNW27	
17-Jul	NNW20	NNW19	NNW17	NNW13	NNW12	N9	N8	NNW10	NNW11	N19	N17	NNW14	NNW14	NNW15	NNW17	N17	N15	N15	N14	NNE13	NE11	NE6	ENE3	SE3	N12.1	NNW20
18-Jul	SSE7	SSE3	SSE6	SE5	SSE5	SSE8	SSE12	SE13	SE8	SE12	SSE10	SE9	S1	SSW5	W8	W10WSW11WSW14	SW19	SW23	SW24	SW29	SW31	SW23		SSW9.5	SW31	
19-Jul	SSW17	S6	SSE7	SSE8	SSE8	SSE11	SSE9	SSE11	SSE7	SW7WSW13	W21WSW21WSW19WSW21	NNW25	NNW33	W20WSW12	W7WNW19	ENE3	W3	N10						WSW8.3	WNW33	
20-Jul	NE11	NNE9	N8	N14	NNW13	N11	N10	N9	N7	NW3	NW6	NNW3	WNW2	NNW9	NNW7	NNW10	N9	N7	W3	SW1	SW10	SW12	SSW10	SW11	NNW4.8	N14
21-Jul	WSW18	WSW13	WSW14	SW12	SSW7	SW6WSW13WSW25	W24WSW20WSW17WSW25WSW26	W29WSW30	NW24	N34	N33	N24	N23	NNE19	NNE11	ENE4	SE9							WNW10.1	N34	
22-Jul	SE14	SSE10	SSE12	SSE12	SSE16	SSE19	SE18	SE15	SSE19	SSE20	SSE18	SSE26	S19	SW18	S14	SW23	W16	WNW9	W20WNW20	NNW17	NNW18	NNW8	W4	S7.7	SSE26	
23-Jul	WSW12	WSW19	W20	W13	NW9	NNW7	NW7	N4	N3	NNE4	W6	W8	NE4	W7WNW16	N10	W14	E2	SW13	SW10	SW13	WSW10	SW12	SW12	W7.1	W20	
24-Jul	SSW7	SSE11	SSE16	SSE16	S13	SSW12	SW27	SW24	WSW24	WSW23	WSW25	WSW27	WSW29	WSW31	WSW32	WSW32	NNW39	NNW35	NNW28	W22	W25	W22	W15WSW24	WSW19.1	WNW39	
25-Jul	W27	W20	NW12	WNW11	W8WNW12	WNW19	WNW20	NW15	NNW5	NNW5	N3	ENE3	NNW7	NNE11	N10	N6	N7	NNE8	NE11	NE12	NE7	ENE5	SE5	NNW6.4	W27	
26-Jul	SE6	SE7	ENE2	ESE6	SE17	SE13	SE14	SE19	SE14	SE12	SE10	SSW11	SSE14	SSW10	W9	W10	W11	SW7	SSE13	SSE14	S16	SSE19	SSE18	SSE17	SSE9.4	SSE19
27-Jul	SSE18	SSE11	SSE9	S6	S5	SSW4	S3	SSW2	WSW1	NNW5	NNW7	NNW9	NNW7	N16	N18	N16	N15	N14	NNE10	NE14	NNE13	N11	NNE7	N8	N4.5	SSE18
28-Jul	N12	NNW10	NNW7	NW5	NW6	WSW10	WSW10	SSE1	WNW1	S3	SE4	ESE2	SE5	SE5	SSE3	NNE3	SE6	N4	NNW4	WSW3	WSW24	SSW11	SSW13	SW9	WSW2.4	WSW24
29-Jul	SW16	SW9	WSW8	WSW6	SW10	SW11	SSW8	SSW6	SSW5	SSW4	SW4	W10	WSW6	SSE15	SSW9	SSW10	SSW15	WSW12	SSW3	S17	SSE13	SSE15	SE20	SE15	SSW8.2	SE20
30-Jul	N9	ESE5	SSE8	WSW10	W18	SW7	SSW11	S9	SW1	ESE4	SE4	ESE5	SE5	SE15	SSE20	N19	NNE16	NNE15	NNE10	N16	N17	N12	NNE8	NNE13	NE2.6	SSE20
31-Jul	NNE13	NNE5	NNE4	NNE3	NNE5	N20	N12	NNW16	NNW17	NNW10	WNW8	W6	W20	NNW18	WSW17	WSW18	WNW11	N10	WNW11	W15	W19	WNW8	W13	WNW19	NNW9.3	W20
WNW3.1 NW2.1WNW1.8 NW2.4 NW1.9WNW1.6WSW1.8 W1.9 NW1.8WNW0.9 W1.6 W3.1MNW3.4WNW4.3WNW4.3 NW6.2NNW7.1 N7.1NNW5.3NNW5.0 NW5.0NNW2.8 NW2.2 NW2.5																								Diurnal Average		
W27 SE20 W20NNW18 N21 N20 SW27WSW25WSW24 SE31 SE31 WSW27WSW29WSW31WSW32WSW32WNW39WNW35WSW33 W26 W25 SW29 SW31WSW24																								Diurnal Maximum		

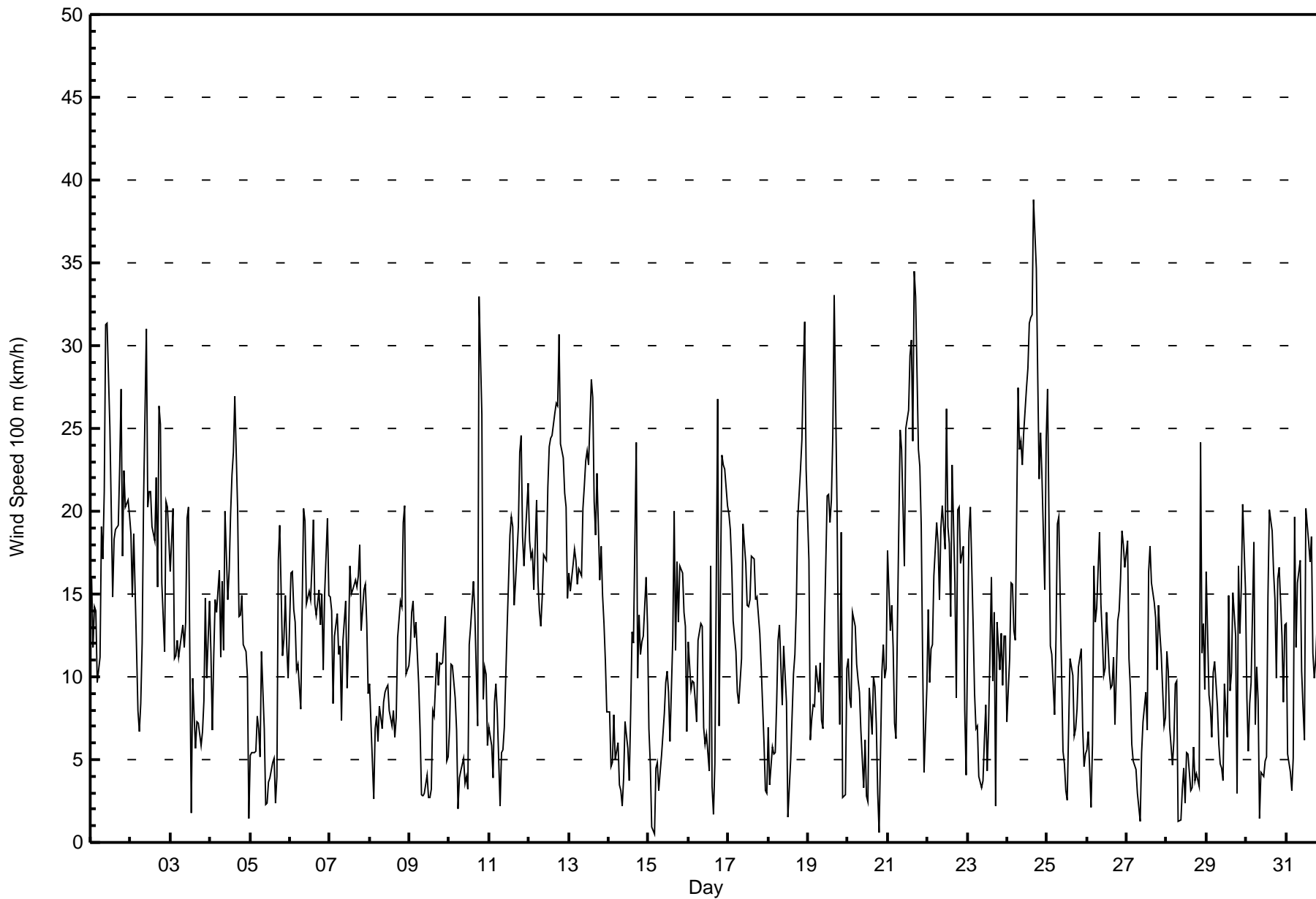
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

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

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	116	15.59	15.59
6 - 11	232	31.18	46.77
12 - 19	272	36.56	83.33
20 - 28	106	14.25	97.58
29 - 38	17	2.28	99.87
> 38	1	0.13	100.00

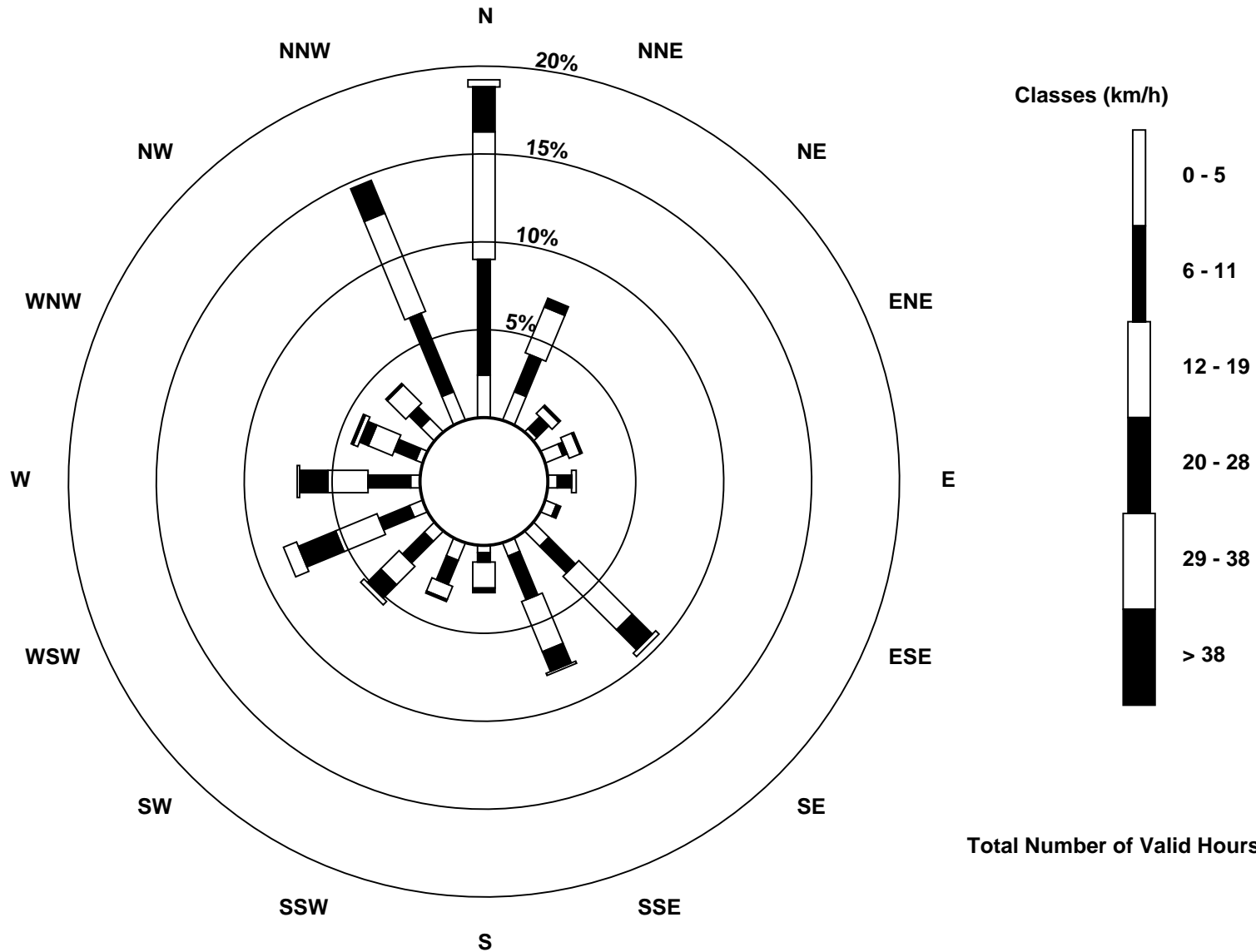
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

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





Maximum Speed: 45 km/h on Jul 24 17:00	Maximum Daily Speed Average: 24.6 km/h on Jul 24	Hours in Service: 744
Minimum Speed Value: 1 km/h on Jul 5 00:00	Minimum Daily Speed Average: 3.1 km/h on Jul 10	Hours of Data: 740
Maximum Diurnal Speed Average: 8.2 km/h at hour 18	Minimum Diurnal Speed Average: 1.5 km/h at hour 10	Hours of Missing Data: 4
Monthly Average Velocity: 3.8 km/h 312.0 deg	Percentiles: P ₁ = 2 P ₁₀ = 6 Q ₁ = 9 Median = 15 O ₃ = 20 P ₉₀ = 26 P ₉₉ = 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-Jul	SW20	S15	SSE15	SSE14	SSE17	SSE17	SSE20	SSE17	SE22	SE33	SE32	SE26	SSE21	SSE16	SE19	SE20	SE20	SE24	SE29	S20	S28	SSE25	S26	SSE25	SSE20.7	SE33
2-Jul	S25	SSE17	SSE18	SSE19	SSE17	SSE14	SE12	SE15	SE21	SSE31	S23	SSE23	SSE23	S21	S20	SSW24	S20	SE28	SE27	SE17	SE16	SE24	SSE23	SSE21	SSE20.0	SSE31
3-Jul	SSE18	SE22	SSE19	SSE17	SSE19	SSE16	SE11	SSE12	SE11	SE14	S24	SW24	WSW5	E13	ESE9	ESE8	SSE10	SSE7	E6	E7	SE8	SSE14	SSW11	W16	SSE10.4	SW24
4-Jul	W13WNW11	W13	W15WSW16	W18	W14	W17WSW13	W23	W15	W18	W21WSW25WSW28WSW33WSW24	W15	SW14	SW19	SSW17	S11	S11	SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1	WSW15.5	WSW33
5-Jul	N5	NNE11	NNE10	NE8	NNE9	NNW9	WNW7	NNW13	N10	NNE5	ENE5	ENE3	NNW5	N6	S4	NNE2	SE2	NNW19	NNW24	NNW17	WNW13	WNW15	WNW16	NW16	NNW7.5	NNW24
6-Jul	WNW17	W17WNW15	NW14	N11	NNE10	NE9	N16	NNE21	NNE19	NE15	NNE16	NNE15	NNE22	ENE21	ENE15	ENE15	ENE16	NE13	N16	NNE15	N17	N21	NNE22	NNE12.7	NNE22	
7-Jul	N21	N19	N13	N17	N18	N15	N13	NNW9	NNW13	N16	N10	N12	N17	N16	NNE16	N17	NNE16	NNE17	NNE18	NNE14	N20	N23	N19	N16	N15.7	N23
8-Jul	N15	NNE14	NNE6	N8	NNE9	N8	N9	N7	N8	N9	N9	N10	N9	N7	N7	N6	NNW8	N13	NNE15	NNE17	NE26	NE31	NE19	NNE13	NNE11.0	NE31
9-Jul	NNE12	NNE13	NE14	NE15	NNE14	N10	NNE8	N4	NNE3	NNW3	NW5	NW3	N2	N2	N7	NNE8	NE13	ENE11	NE13	ENE12	ENE13	E15	ESE11	E8	NE7.7	E15
10-Jul	NE8	NNE8	ENE7	NE7	E8	ESE8	ESE5	ENE3	N4	NNE3	N4	NNW2	E13	ENE14	ENE16	NE14	E11	SE7	W33	W30WNW14	NW14	NNW15	NNW11	NNE3.1	W33	
11-Jul	N16	N12	NNE5	N8	N15	N13	NNW7	NNW7	NNW6	NNW8	NNW10	N13	NW19	NNW21	NNW22	NNW16	NNW18	N21	N26	N27	N24	N25	N26	N27	N15.9	N27
12-Jul	N24	N23	N24	N22	N29	N24	N18	N15	N15	N18	N18	N23	N25	N26	NNW27	NNW28	NNW30	N30	N34	N27	N28	NNW26	N26	N20	N23.9	N34
13-Jul	N19	N21	N23	N25	N24	N20	NNW18	NNW18	N22	N23	N24	N25	N24	NNE29	N28	NE24	NE21	NNE24	N17	NNE21	NNE20	NNE20	NNE20	NE16	N21.1	NNE29
14-Jul	NE15	ENE12	SE7	S3	WSW5	WNW7	WNW5	NW6	NNW4	NNW5	NNW8	N6	NW5	NNW9	NW13	NW13	N27	N12	NNW13	NNW13	NNW13	NNW16	NNW19	N18	NNW8.3	N27
15-Jul	N9	NW8	WNW7	W7	W9	W10	WSW8	SW10	WSW8	W9WSW11	WSW11	WSW9	W7	NW14	NNW22	NW13	NW18	NW15	NNW20	NNW19	NW20	NW18	NNW10	WNW9.9	NNW22	
16-Jul	W12	W15	W15WSW18WSW19WSW16WSW17	W15	W14	W8	NW7	NW9	NW7	NNW18	W7	NW2	NW6	NNW33	NNW17	NNW24	NNW31	NNW29	NNW29	NNW26	NNW26	NNW26	NNW26	NW12.9	NNW33	
17-Jul	NNW26	NNW26	N23	N21	N18	N17	N12	NNW11	NNW12	N20	N18	NNW15	NNW14	NNW16	NNW19	N18	N15	N16	N14	NNE14	NE11	ENE8	ENE7	ESE7	N14.6	NNW26
18-Jul	SSE9	S12	S14	S10	S9	S10	S11	S9	S6	SSE8	S8	SE7	SW2	SSW6	W8	W12WSW13WSW16	SW20	SW26	SW30	SW35	SW36	SW36	SSW12.6	SW36		
19-Jul	SW34	SW19	SSW14	SSW11	SSW6	S9	SSW10	S9	S6	SW9WSW14	W23WSW23WSW22WSW23WNW29WNW39WNW24	W9	WSW7	WNW22	NE6	WNW3	NNE14	WSW12.2	WNW39	WNW39	WNW39	WNW39	WNW39	WSW12.2	WNW39	
20-Jul	NE19	NNE15	NNE13	N17	N15	N13	N11	N10	N8	N4	NNW6	N4	NW3	NNW9	NNW7	NNW11	NNW9	NNW8	WNW4	WSW4	WSW10	SW18	SW25	SW22	NNW5.6	SW25
21-Jul	W25WSW19WSW21WSW19	SW10	SW9WSW17WSW33	W30	W23WSW19WSW28	W29	W35WSW35	NW27	N35	N35	N25	NNE23	NNE22	NNE18	NE9	ESE10	WNW13.1	N35	WNW13.1	N35	WNW13.1	N35	WNW13.1	N35	WNW13.1	N35
22-Jul	SE15	SSE13	S17	S16	SSE18	SSE20	SSE18	SSE16	SSE16	SSE22	SSE21	SSE26	S21	SW21	SSW17	SW26	W19WNW13	W25	NW23	NNW21	NNW20	N11	WNW5	SSW8.9	SSE26	
23-Jul	WSW13	W21WNW21WNW17	NW13	NNW12	NNW10	NNE4	N3	N3	W6	W9	NE2	W8WNW16	NNE12	NNW16	NE5	SW14	SW13	WSW14	WSW11	WSW15	WSW15	WSW15	WSW15	W8.4	WNW21	
24-Jul	SW12	SSW10	SSW12	SSW14	SSW15	SW23	SW23	SW27	WSW28	WSW26	WSW26	WSW31	WSW33	WSW36	WSW36	WSW37	WNW45	WNW44	WNW36	W26	W28	W27	W21	WSW32	WSW24.6	WNW45
25-Jul	W34	W26WNW17WNW16	W9WNW15WNW22WNW21	NW16	NW6	NW5	N3	N2	NW8	NNE10	N11	N7	N7	NNE8	NE11	NE18	ENE16	ESE10	SE13	NNW6.7	W34	W34	W34	W34	NNW6.7	W34
26-Jul	SE17	SSE18	SE9	SE12	SE20	SE16	SE16	SSE17	SSE12	SE11	SE9	SSW13	S14	SSW11	W10	W11	W12	SW8	S14	S17	S21	SSE24	SSE22	SSE17	SSE12.1	SSE24
27-Jul	SSE16	S12	SSW10	SW11	SW10	WSW9	WSW7	WSW7	W5	NNW7	N9	NNW9	NNW7	N17	N18	N16	N15	N13	NNE11	NE16	NE16	NNE16	NE11	ENE7	N4.4	N18
28-Jul	NNE6	NNE7	N6	WNW4	WNW10	WSW12	W14	WNW4	NW6	SSW4	SE2	SSE1	SSE5	SSE3	SSE2	N3	SE4	N5	N5	W3WSW29	SSW14	SW19	SW16	WSW4.2	WSW29	
29-Jul	WSW17	WSW13	W14	W7WSW11	SW12	SW10	SSW7	SSW5	SSW5	WSW4	WSW11	SW7	SSE14	SSW10	SSW11	SSW17	WSW14	SW4	S16	S15	SSE19	SSE21	SE20	SSW9.3	SSE21	
30-Jul	N8	ESE9	S11	WSW18	W23	SW15	SW16	SSW9	WSW7	SSE2	S3	ESE4	SE5	SE13	SSE22	N23	NNE17	NNE15	NE10	NNE19	NNE25	NNE24	NE18	NE22	NNE3.2	NNE25
31-Jul	NE23	NE16	NE9	NNE8	NNE9	N24	N15	N18	UO	UO	UO	W7	UO	NNW21	WSW19	W20	WNW15	NNE11	NW13	W14	WNW19	WNW12	WNW18	WNW23	NNW10.2	N24

NNW3.5	NW2.5	NNW2.2	NNW3.0	NW2.7	NNW3.0	W3.2	W3.5	NNW2.9	W1.5	W2.2	W4.0	NNW3.9	NNW5.4	NNW5.4	NW7.2	NNW7.9	N8.2	NNW6.4	NNW6.0	NNW6.1	NNW4.2	NW3.0	NW3.1	Diurnal Average
SW34	NNW26	N24	N25	N29	N24	SW32	WSW33	W30	SE33	SE32	WSW31	WSW33	WSW36	WSW36	WSW37	WNW45	WNW44	WNW36	W30	NNW31	SW35	SW36	SW36	Diurnal Maximum

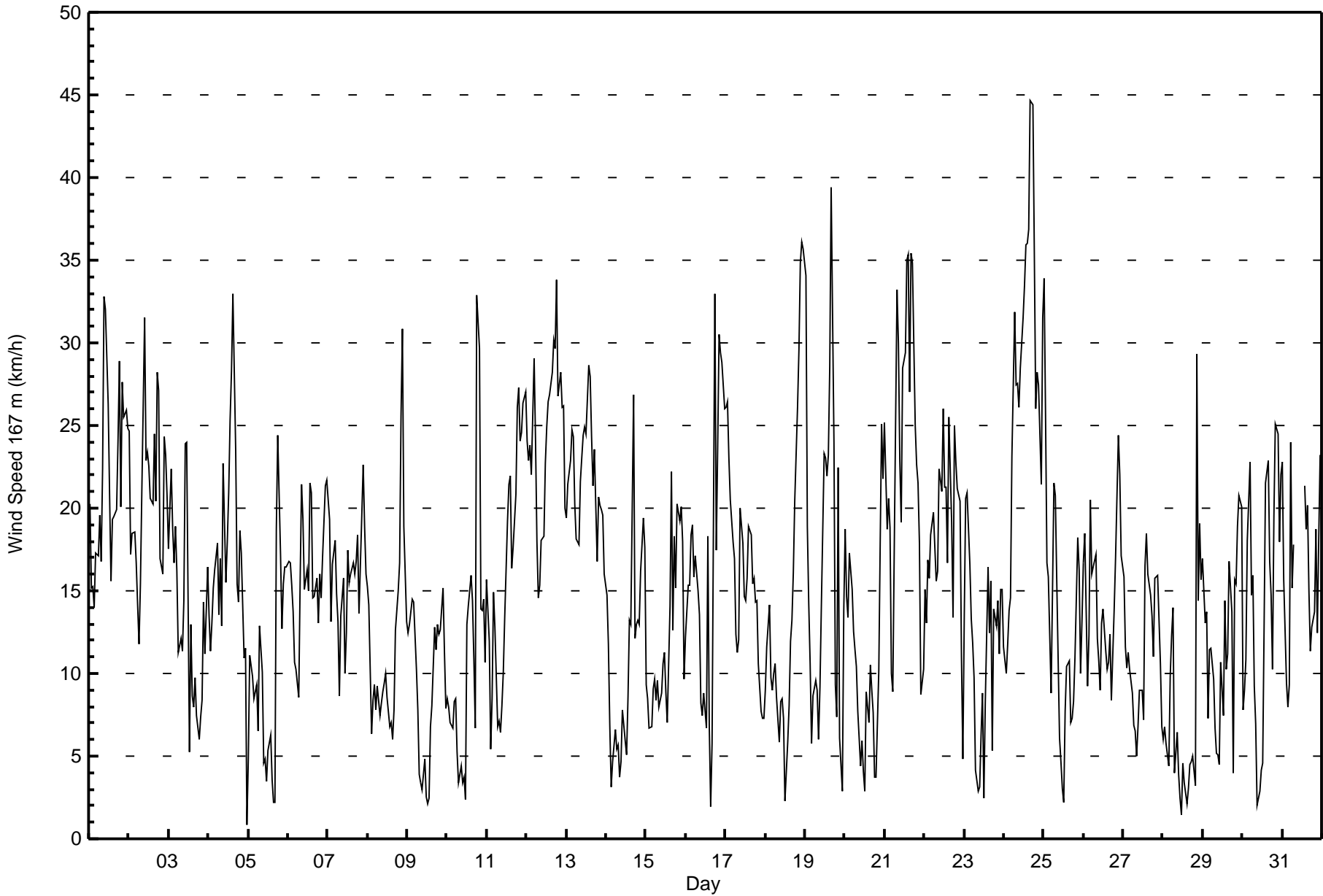
UO - Unstable Operation
 All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

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

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 19 km/h on Jul 24 17:00 Minimum Value: 1 km/h on Jul 14 08:00 Percentiles: P ₁ = 1 P ₁₀ = 2 O ₁ = 2 Median = 3 O ₃ = 4 P ₉₀ = 5 P ₉₉ = 11																		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-Jul	3	2	2	2	2	4	4	3	4	6	5	6	7	5	6	6	5	5	4	4	3	3	5	4	7		
2-Jul	3	3	2	3	3	4	3	5	6	6	7	6	6	5	5	6	8	4	4	3	3	2	3	3	8		
3-Jul	2	3	3	2	2	2	2	3	2	4	10	7	7	7	3	2	3	2	3	3	3	4	4	3	10		
4-Jul	2	2	3	1	4	3	2	2	3	3	3	2	3	2	4	5	4	7	3	2	2	2	4	1	7		
5-Jul	3	2	1	1	1	2	2	6	5	4	2	2	4	3	3	2	2	11	2	8	3	2	4	4	11		
6-Jul	3	2	4	3	1	3	2	4	3	3	4	4	5	5	7	5	5	6	4	2	1	3	3	4	7		
7-Jul	5	2	4	4	4	2	2	3	3	3	3	5	5	3	4	6	4	3	3	3	2	2	3	2	6		
8-Jul	3	3	2	3	3	1	2	2	2	2	2	2	2	2	3	2	2	2	3	3	2	2	8	4	8		
9-Jul	1	2	1	1	2	3	2	2	2	1	2	2	1	2	4	3	3	4	2	2	1	1	2	3	4		
10-Jul	2	2	1	1	1	1	2	1	2	1	2	2	8	3	4	3	4	2	12	6	4	2	3	3	12		
11-Jul	2	2	3	3	1	1	2	2	2	3	3	5	5	5	3	3	3	4	4	4	2	2	2	2	5		
12-Jul	3	3	3	2	2	5	3	2	3	3	3	4	4	5	5	4	5	5	5	4	3	2	2	3	5		
13-Jul	2	1	1	2	1	2	2	3	3	3	4	4	5	5	7	9	4	4	3	3	2	3	4	2	9		
14-Jul	4	2	1	1	1	1	1	1	1	2	2	2	3	3	4	4	5	2	2	1	1	2	1	2	5		
15-Jul	2	1	1	1	2	1	1	2	2	3	4	3	3	3	12	7	4	4	3	5	4	4	4	3	12		
16-Jul	3	3	2	2	3	4	5	3	3	4	3	3	3	12	3	2	3	14	4	4	2	2	2	2	14		
17-Jul	2	1	2	1	1	2	3	2	3	4	4	4	5	4	4	4	3	4	3	2	1	1	1	1	5		
18-Jul	3	2	2	1	1	2	2	2	1	3	2	3	3	3	4	3	4	4	3	3	2	2	1	2	4		
19-Jul	4	4	3	3	3	3	3	3	3	6	4	4	4	4	4	7	7	7	4	2	10	4	4	5	10		
20-Jul	3	2	1	3	4	2	2	2	2	2	1	1	3	2	3	2	2	2	2	2	1	4	5	4	5		
21-Jul	4	3	5	8	5	4	6	9	4	3	3	4	7	8	7	5	6	5	4	3	4	5	2	2	9		
22-Jul	2	3	3	3	6	4	3	4	4	6	5	5	5	6	4	6	5	6	6	4	2	2	5	4	6		
23-Jul	3	2	2	3	2	1	3	2	2	2	3	3	2	5	8	4	5	4	6	3	2	2	2	2	8		
24-Jul	3	2	2	3	4	4	3	4	4	3	4	3	4	5	5	10	19	18	12	3	4	4	6	6	19		
25-Jul	4	5	5	5	4	3	5	4	4	2	3	2	2	4	4	3	3	3	2	3	2	4	3	3	5		
26-Jul	2	2	4	4	1	3	3	3	2	3	3	7	4	3	3	4	2	3	3	1	2	3	5	3	7		
27-Jul	2	3	1	1	1	2	1	1	2	1	1	2	3	4	2	3	3	2	2	2	2	2	2	3	4		
28-Jul	2	1	1	2	1	3	3	2	1	1	2	2	1	2	2	2	3	3	1	6	3	4	4	2	6		
29-Jul	2	4	4	3	2	2	2	3	3	3	3	5	4	5	5	5	5	6	3	3	2	2	2	2	6		
30-Jul	6	3	4	9	9	2	5	5	2	3	2	2	3	6	5	10	5	4	4	5	3	3	3	2	10		
31-Jul	5	3	3	4	6	4	5	2	UO	UO	UO	4	UO	2	3	2	4	3	5	3	5	4	5	4	6		
																		Diurnal Maximum									
UO - Unstable Operation																											





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	69	9.32	9.32
6 - 11	192	25.95	35.27
12 - 19	278	37.57	72.84
20 - 28	158	21.35	94.19
29 - 38	40	5.41	99.59
> 38	3	0.41	100.00

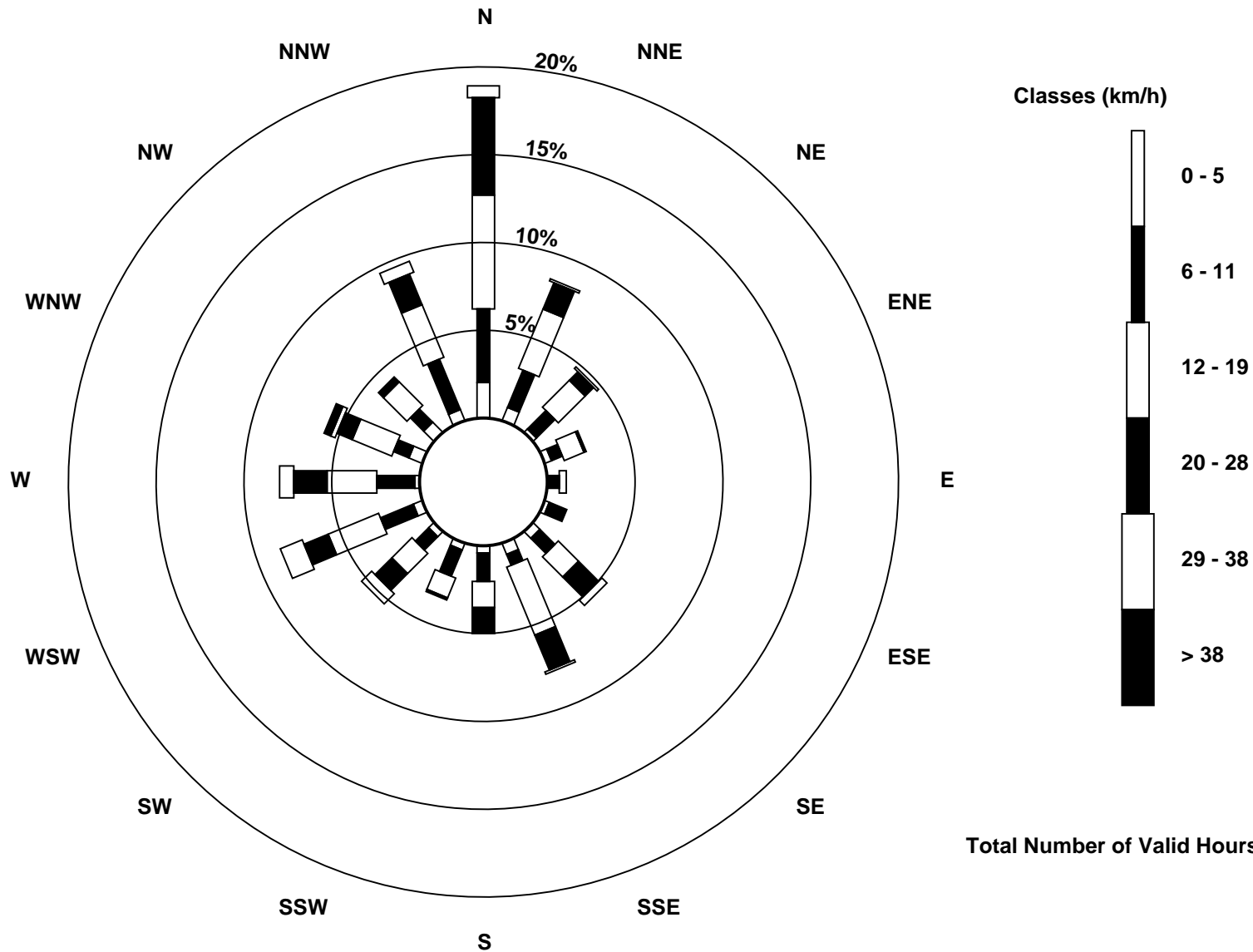
Total Number of Valid Hours: 740

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

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





Wood Buffalo Environmental Association
Summary of Hour Averages

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

Direction of Maximum Speed: 260 deg on Jul 24 14:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 254.3 deg on Jul 24	Hours of Data: 744
Direction of Minimum Speed: 300 deg on Jul 31 02:00	Direction of Minimum Daily Speed Average: 1.0 deg on Jul 30
Direction of Minimum Speed: 300 deg on Jul 31 02:00	Hours of Missing Data: 0
Monthly Average Direction: 315.0 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-Jul	178	121	144	112	84	113	153	159	152	151	154	158	158	180	157	147	152	145	155	179	183	167	157	154	156.5
2-Jul	153	168	164	82	83	79	109	146	149	163	181	178	175	182	183	208	198	145	147	160	174	149	149	151	164.4
3-Jul	181	171	89	116	112	123	157	160	160	135	188	228	58	94	92	77	137	160	114	81	137	137	191	311	149.9
4-Jul	305	336	279	284	260	286	292	281	262	263	279	256	256	258	248	239	256	280	220	217	201	157	149	348	254.3
5-Jul	13	339	335	322	319	318	11	353	327	237	186	155	26	39	164	143	153	343	353	341	291	294	332	352	332.4
6-Jul	294	286	313	317	327	353	22	356	13	25	35	26	30	29	59	77	64	93	37	359	345	344	347	351	9.9
7-Jul	346	350	312	326	330	323	327	326	335	359	350	0	3	354	14	12	16	16	9	19	349	349	339	331	353.2
8-Jul	328	316	315	319	341	314	346	350	348	353	355	358	344	23	3	1	0	355	1	11	16	15	325	348	352.1
9-Jul	339	358	7	356	358	353	354	360	329	310	358	38	20	358	353	19	21	132	44	60	39	13	358	0	7.9
10-Jul	357	7	3	339	27	37	355	3	344	332	328	329	100	72	75	58	111	160	266	274	358	332	309	306	342.7
11-Jul	336	281	321	352	308	301	103	341	340	337	356	1	321	344	343	349	344	2	357	359	358	346	354	352	347.3
12-Jul	1	340	350	348	344	349	346	356	355	354	358	356	3	359	349	343	335	3	352	356	347	337	336	336	351.0
13-Jul	344	340	339	345	352	345	343	338	355	358	3	357	2	11	2	27	35	19	355	2	352	357	2	12	0.1
14-Jul	349	28	50	335	8	350	317	2	360	23	32	5	326	356	332	328	356	347	323	322	1	354	341	296	347.5
15-Jul	314	5	343	117	129	135	127	138	232	266	252	255	255	260	316	349	347	330	340	340	337	354	336	293	308.5
16-Jul	278	291	232	166	160	163	204	272	275	285	354	13	15	344	161	224	246	349	273	312	329	327	332	334	306.8
17-Jul	331	341	346	346	336	336	332	339	339	357	1	351	344	353	350	354	0	359	349	20	15	1	334	148	350.3
18-Jul	188	151	25	36	102	112	139	146	144	142	150	134	128	193	290	290	266	249	238	232	218	210	210	214	202.6
19-Jul	180	124	144	141	125	151	150	156	154	225	267	277	276	257	261	313	311	275	256	301	305	151	309	343	250.6
20-Jul	356	40	332	342	328	335	354	340	3	296	309	299	269	332	355	347	14	18	295	118	225	194	161	218	333.8
21-Jul	240	225	244	220	170	153	241	260	277	271	261	257	263	278	259	320	6	11	3	4	22	27	162	139	287.5
22-Jul	134	144	157	161	168	166	148	153	161	173	169	165	181	228	194	229	283	307	278	306	337	324	327	237	188.9
23-Jul	228	263	281	320	330	321	330	353	6	33	263	274	42	266	301	343	294	149	225	243	238	242	206	183	275.5
24-Jul	171	157	149	144	146	149	221	239	252	256	256	263	261	260	263	259	310	310	298	278	282	280	287	269	254.3
25-Jul	280	289	311	302	270	310	299	302	316	346	3	347	128	332	23	9	358	11	18	40	360	331	19	347	323.1
26-Jul	353	341	333	334	153	136	127	151	155	158	148	209	172	195	267	273	286	232	176	172	165	150	158	166	176.8
27-Jul	162	152	144	142	137	138	134	138	92	2	340	349	341	0	357	357	351	359	1	37	8	349	342	358	28.6
28-Jul	357	332	309	352	356	232	236	137	74	130	158	150	158	168	177	65	162	319	324	251	265	188	197	194	198.7
29-Jul	236	204	251	253	215	201	216	218	207	194	225	272	248	161	211	206	213	255	183	183	146	148	160	82	202.2
30-Jul	353	91	155	206	278	154	177	166	138	130	150	119	136	152	166	4	25	11	20	354	352	345	11	332	106.3
31-Jul	18	300	339	287	20	347	346	319	327	302	297	241	290	304	240	271	311	341	305	299	295	344	316	312	303.8

291.1 294.6 291.0 324.2 296.2 110.1 211.2 242.8 273.8 253.2 250.4 269.4 269.8 290.2 283.4 314.0 330.7 344.3 308.6 308.7 297.1 283.9 271.4 298.1
 Diurnal Average

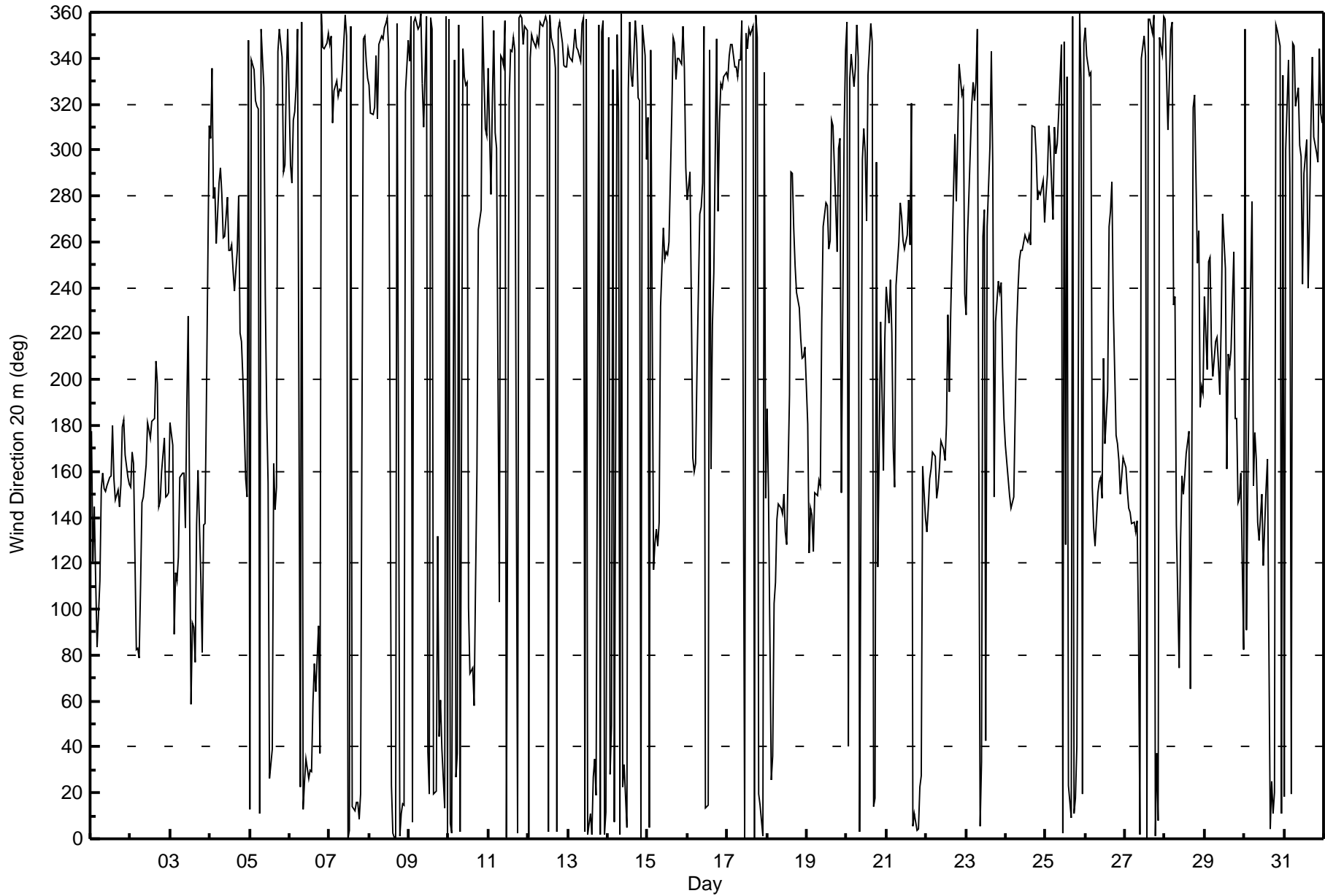
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

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

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 104 deg on Jul 28 09:00 Minimum Value: 9 deg on Jul 14 22:00 Percentiles: P ₁ = 12 P ₁₀ = 17 Q ₁ = 22 Median = 29 Q ₃ = 45 P ₉₀ = 64 P ₉₉ = 94																								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-Jul	41	42	21	29	32	34	17	21	26	21	19	26	31	31	35	30	26	23	21	14	11	16	14	12	42
2-Jul	14	21	54	62	28	67	50	31	26	20	18	23	23	20	19	21	45	20	22	22	17	18	18	20	67
3-Jul	64	27	54	22	21	22	18	21	22	27	31	52	84	61	54	68	60	24	47	29	55	22	52	27	84
4-Jul	31	62	39	20	23	26	32	21	33	22	25	21	22	19	17	15	33	28	17	15	13	14	67	38	67
5-Jul	71	24	35	21	23	22	75	23	53	88	75	50	90	62	34	49	29	61	20	74	21	26	38	48	90
6-Jul	25	22	18	21	19	27	31	27	30	29	43	43	42	37	42	42	51	34	41	22	18	19	18	29	51
7-Jul	21	21	40	30	36	23	24	34	24	31	35	40	34	27	37	45	32	30	30	36	19	22	22	33	45
8-Jul	30	22	48	29	48	19	29	36	25	27	36	32	33	40	41	34	36	28	22	23	27	32	31	29	48
9-Jul	21	19	19	22	29	34	36	49	80	41	37	57	53	42	39	45	39	63	31	24	38	83	36	21	83
10-Jul	60	15	31	32	64	86	40	35	31	39	39	62	69	40	39	41	54	27	50	24	44	22	29	20	86
11-Jul	29	42	84	18	69	31	77	54	38	41	38	30	29	25	23	28	24	26	22	18	17	14	15	16	84
12-Jul	25	18	19	23	20	25	27	23	23	23	29	25	26	25	24	24	22	22	21	22	21	16	17	19	29
13-Jul	17	17	17	20	18	22	24	24	27	25	26	26	26	27	24	45	36	26	26	25	19	13	36	38	45
14-Jul	52	56	31	56	55	78	72	86	70	52	36	46	96	56	32	37	22	31	14	15	15	9	28	24	96
15-Jul	63	93	96	78	22	18	15	16	63	47	36	34	35	53	63	22	31	24	21	20	17	25	80	37	96
16-Jul	22	67	48	40	47	34	69	68	34	68	52	28	57	47	60	62	30	28	34	23	14	13	17	16	69
17-Jul	14	16	17	27	55	26	26	27	32	27	31	33	35	37	35	30	35	31	24	32	55	75	86	45	86
18-Jul	75	33	50	36	19	39	24	19	19	20	19	55	97	62	63	33	28	26	16	10	13	12	12	23	97
19-Jul	65	27	16	25	67	35	20	13	20	57	31	24	27	22	22	37	21	38	22	42	37	80	59	25	80
20-Jul	39	39	63	23	22	34	35	31	44	38	20	55	57	26	54	32	32	38	48	77	40	51	50	85	85
21-Jul	16	38	65	47	37	79	52	23	20	19	24	20	22	29	18	42	24	26	29	24	26	49	87	13	87
22-Jul	13	20	20	18	19	16	26	28	18	14	21	14	18	24	17	22	47	70	24	39	20	17	75	93	93
23-Jul	34	33	25	43	26	29	30	56	53	55	64	44	65	54	47	33	43	68	18	35	16	69	27	23	69
24-Jul	17	14	14	15	13	30	10	16	18	19	20	21	19	21	20	36	24	26	23	23	26	39	28	28	39
25-Jul	21	23	25	23	32	24	20	25	32	67	88	95	67	77	32	44	43	56	45	32	25	27	35	57	95
26-Jul	28	12	10	41	39	41	37	23	19	19	54	47	28	56	37	39	32	52	17	12	16	12	27	18	56
27-Jul	15	19	18	14	16	18	13	24	44	30	30	28	68	26	18	23	26	22	23	32	26	49	73	100	100
28-Jul	54	45	33	43	58	93	25	32	104	24	24	43	17	28	48	62	29	69	48	76	21	20	17	28	104
29-Jul	15	36	73	48	17	16	20	28	50	56	84	72	62	28	42	35	21	28	88	12	15	17	16	49	88
30-Jul	83	72	38	61	32	51	53	37	65	32	44	48	55	40	23	59	46	33	48	19	20	22	53	18	83
31-Jul	55	99	52	70	92	30	66	14	24	40	46	45	32	30	26	20	47	28	25	29	31	38	53	32	99
83 99 96 78 92 93 77 86 104 88 88 95 97 77 63 68 60 70 88 77 55 83 87 100																									
Diurnal Maximum																									





Wood Buffalo Environmental Association
Summary of Hour Averages

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

Direction of Maximum Speed: 249 deg on Jul 24 16:00 Direction of Maximum Daily Speed Average: 247.0 deg on Jul 24	Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0
Direction of Minimum Speed: 72 deg on Jul 28 09:00 Direction of Minimum Daily Speed Average: 1.3 deg on Jul 30	Percent Operational Time: 100.0
Monthly Average Direction: 316.2 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-Jul	189	133	139	127	99	112	140	146	140	139	142	145	148	166	144	138	141	133	143	170	173	159	150	145	146.2
2-Jul	140	151	148	92	92	83	107	134	139	151	171	167	164	173	173	199	188	135	135	148	162	135	133	136	152.5
3-Jul	137	145	100	123	111	117	144	145	147	127	178	225	40	87	84	67	126	152	103	77	126	127	187	298	139.2
4-Jul	284	320	267	270	251	274	276	268	252	253	268	248	247	248	239	231	249	270	212	209	190	153	137	359	245.6
5-Jul	13	349	348	334	326	319	348	346	331	279	160	144	5	20	153	133	143	334	340	337	282	280	314	333	327.9
6-Jul	281	275	303	311	327	345	16	351	11	22	30	21	26	26	54	67	57	82	31	357	340	340	340	350	4.3
7-Jul	343	345	322	331	339	326	326	321	330	351	341	358	359	345	11	6	14	11	4	16	348	349	341	342	350.2
8-Jul	336	331	318	324	347	316	338	345	341	347	349	354	338	9	354	351	351	352	358	11	19	22	335	347	350.3
9-Jul	336	352	3	351	354	352	353	351	322	302	339	17	8	347	350	16	20	112	38	58	48	48	4	354	6.0
10-Jul	354	1	358	346	13	35	353	356	341	323	328	324	84	67	66	51	95	150	255	263	338	337	316	301	342.0
11-Jul	319	272	295	335	315	315	76	335	332	328	353	355	311	335	333	340	337	356	354	353	356	345	343	341	340.9
12-Jul	349	335	342	344	345	344	344	352	347	348	351	349	358	351	343	336	327	359	346	349	342	334	335	336	344.8
13-Jul	338	339	337	342	347	340	336	331	349	352	359	350	357	9	357	23	30	13	353	2	351	352	349	8	354.8
14-Jul	350	15	350	319	290	313	339	8	349	7	16	1	319	348	324	321	354	356	320	318	343	340	350	311	341.1
15-Jul	275	326	290	214	144	137	125	130	228	267	249	250	251	255	311	340	338	322	330	333	334	337	339	286	304.5
16-Jul	265	268	235	172	162	170	211	261	265	279	343	3	5	335	157	223	243	342	288	318	325	322	327	333	302.1
17-Jul	331	337	343	348	349	338	332	333	333	348	355	344	339	345	341	346	354	355	346	15	27	334	313	168	345.3
18-Jul	194	142	104	84	118	122	132	137	137	135	140	127	123	184	281	282	259	242	230	224	210	202	202	205	194.0
19-Jul	187	117	132	133	130	144	143	146	143	220	258	267	264	249	252	302	300	265	246	286	294	146	294	348	243.8
20-Jul	7	32	351	340	327	337	353	341	357	295	306	302	281	325	348	337	7	6	289	97	218	200	171	213	331.1
21-Jul	236	229	238	221	168	170	236	251	266	260	252	249	255	268	250	317	3	8	359	360	19	24	105	146	279.6
22-Jul	132	142	149	153	156	155	136	139	150	163	157	155	172	219	184	221	276	297	267	298	336	323	333	253	183.0
23-Jul	228	253	266	300	325	330	331	349	353	26	258	267	26	263	293	341	282	132	217	235	233	233	207	179	268.2
24-Jul	166	147	141	138	139	147	213	232	244	248	248	254	253	251	253	249	301	300	286	267	271	269	275	258	247.0
25-Jul	269	277	301	300	262	295	289	293	307	334	341	351	103	327	15	3	356	2	15	36	11	342	22	355	317.0
26-Jul	1	346	340	350	132	123	120	139	142	142	135	201	162	190	261	266	276	231	166	165	162	138	140	154	162.5
27-Jul	149	142	137	136	134	135	129	128	81	354	335	342	338	355	352	353	348	356	359	34	7	340	347	2	20.7
28-Jul	351	340	328	344	348	230	235	130	72	123	147	134	147	154	169	47	148	326	319	245	255	180	189	191	204.8
29-Jul	228	204	258	243	211	196	209	212	208	192	237	264	243	150	203	201	204	246	185	174	139	140	147	114	195.4
30-Jul	352	96	149	209	269	154	178	157	125	120	137	109	122	144	156	358	24	9	16	351	347	346	11	335	57.8
31-Jul	5	21	343	294	3	343	343	319	327	306	290	237	275	293	234	257	294	341	296	282	281	325	300	298	296.5

291.2 305.3 301.6 321.5 328.3 351.5 226.3 257.2 288.1 275.6 260.4 268.7 272.5 289.0 283.3 309.7 326.9 341.6 310.1 316.5 304.5 325.3 307.4 305.4
 Diurnal Average

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



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

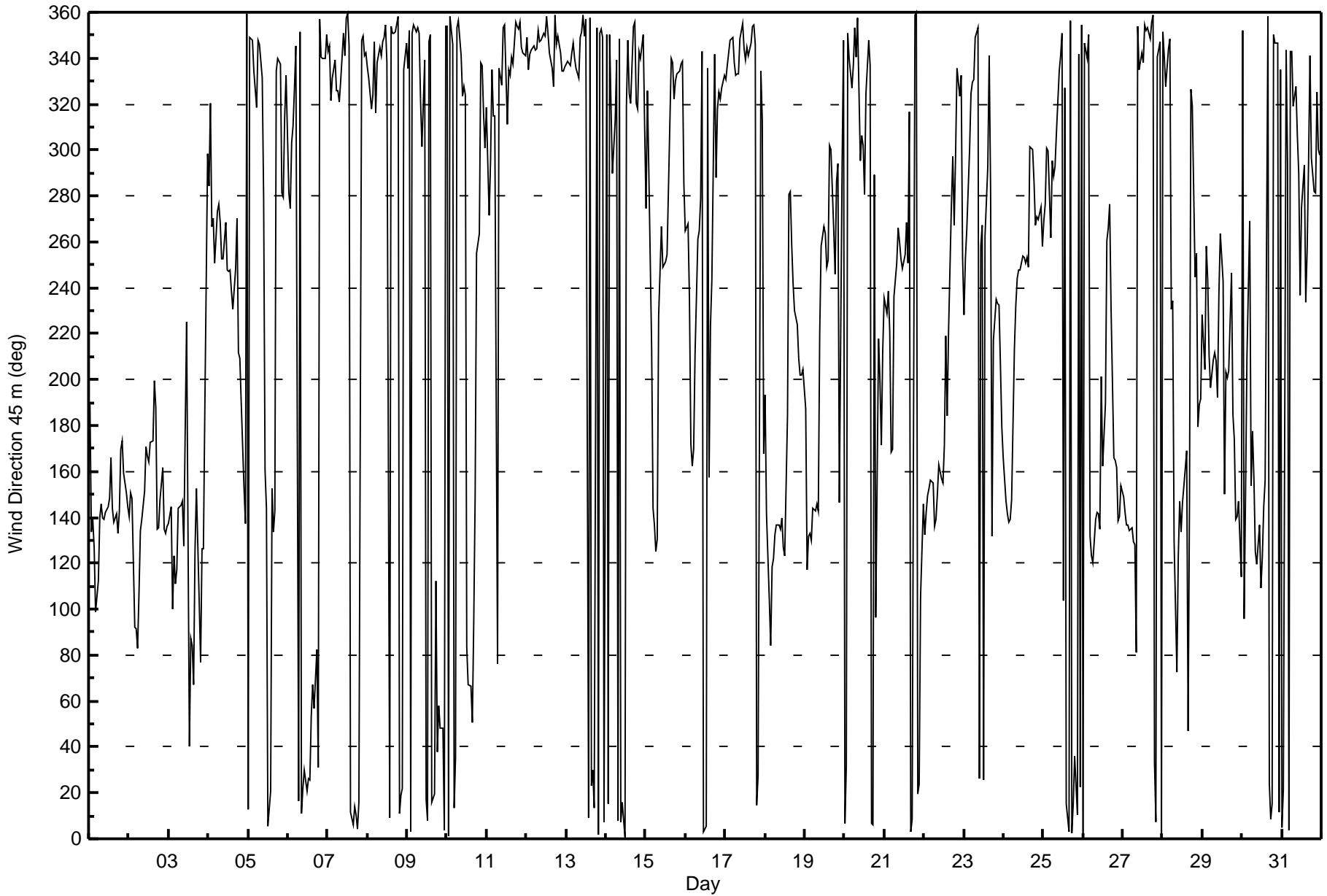
Wind Direction 45 m (WD45m) - deg
Lower Camp Met Tower - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 101 deg on Jul 31 05:00 Minimum Value: 6 deg on Jul 14 22:00 Percentiles: P ₁ = 8 P ₁₀ = 12 Q ₁ = 15 Median = 22 Q ₃ = 37 P ₉₀ = 57 P ₉₉ = 92		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-Jul	20	21	11	22	28	17	13	18	20	16	14	22	27	29	28	24	21	18	17	10	7	12	15	11	29	
2-Jul	11	16	25	54	21	61	53	29	21	18	14	22	20	16	15	20	40	17	17	18	14	13	13	13	61	
3-Jul	40	23	51	21	15	18	14	19	19	20	31	48	81	47	38	57	49	23	38	20	51	17	52	18	81	
4-Jul	24	70	21	12	18	15	23	12	22	13	14	16	14	11	10	10	28	19	17	15	12	12	32	37	70	
5-Jul	38	19	30	22	15	15	69	22	40	92	79	43	95	57	34	47	27	58	15	60	17	15	37	32	95	
6-Jul	17	14	14	17	12	19	21	21	23	19	30	31	32	23	30	34	38	22	26	18	11	14	12	21	38	
7-Jul	16	14	24	23	25	13	16	26	17	27	28	34	24	19	30	37	23	24	26	26	14	14	15	19	37	
8-Jul	20	21	57	20	37	15	24	26	19	22	26	24	29	30	33	24	24	19	19	15	14	17	28	20	57	
9-Jul	11	15	14	16	21	22	27	41	59	34	27	50	41	30	34	43	31	51	20	14	12	48	47	9	59	
10-Jul	19	10	17	17	26	45	37	23	19	29	28	49	65	27	29	30	48	26	47	15	32	18	24	12	65	
11-Jul	20	73	62	8	36	31	73	55	30	36	31	26	27	18	15	20	17	20	16	15	13	10	10	11	73	
12-Jul	19	10	12	13	12	14	18	18	16	17	22	17	19	19	18	20	15	17	15	16	14	10	10	10	22	
13-Jul	9	10	10	12	13	13	16	20	19	19	18	20	22	18	38	28	19	20	20	15	8	23	29	38		
14-Jul	43	36	54	48	92	87	65	66	48	40	28	37	82	48	28	27	17	29	10	9	8	6	10	28	92	
15-Jul	40	91	76	86	12	12	12	14	58	39	29	26	29	48	53	16	27	18	14	13	11	15	50	27	91	
16-Jul	16	66	36	41	62	32	62	46	23	57	48	26	46	46	53	61	25	25	41	17	9	8	11	10	66	
17-Jul	9	9	9	16	12	18	14	19	25	20	23	26	31	31	29	24	25	28	19	26	13	38	55	68	68	
18-Jul	33	15	25	34	15	32	19	15	13	15	13	45	92	64	52	24	22	17	11	8	13	12	13	17	92	
19-Jul	50	23	11	19	32	24	15	9	19	63	24	15	17	17	14	34	17	35	11	35	34	74	72	15	74	
20-Jul	31	27	52	14	14	26	26	26	33	39	14	53	67	19	41	26	23	25	41	77	41	53	39	85	85	
21-Jul	10	31	54	40	35	53	49	15	14	11	16	11	16	25	11	41	18	18	20	17	16	30	94	13	94	
22-Jul	9	18	16	16	16	14	20	25	15	12	20	12	16	23	15	20	44	65	16	38	12	13	83	60	83	
23-Jul	19	17	14	33	19	21	19	39	35	44	58	36	60	57	43	27	43	68	19	22	11	42	22	20	68	
24-Jul	14	10	9	9	8	30	9	13	10	11	12	13	12	11	12	11	34	20	23	16	15	15	30	20	34	
25-Jul	13	18	21	20	28	23	15	17	30	66	75	98	66	74	24	31	35	46	40	19	21	27	20	74	98	
26-Jul	57	13	7	60	20	28	27	16	14	15	53	51	24	53	31	31	22	51	13	8	12	8	21	12	60	
27-Jul	13	13	12	10	10	12	10	18	48	24	21	21	52	18	14	17	19	15	16	19	24	15	76	63	76	
28-Jul	38	32	23	32	80	66	20	33	98	23	23	43	12	28	50	59	29	62	29	84	13	19	15	26	98	
29-Jul	11	34	71	37	16	15	19	27	49	50	76	55	59	26	41	32	20	21	79	7	11	13	11	36	79	
30-Jul	81	63	35	51	26	48	46	36	76	36	48	48	53	35	19	56	30	24	38	14	15	15	43	13	81	
31-Jul	49	88	49	69	101	22	50	8	13	38	44	52	25	19	22	12	45	20	18	22	18	36	43	24	101	
		81	91	76	86	101	87	73	66	98	92	79	98	95	74	53	61	49	68	79	84	51	74	94	85	
		Diurnal Maximum																								



Wood Buffalo Environmental Association
Hourly Averages

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





Wood Buffalo Environmental Association
Summary of Hour Averages

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

Direction of Maximum Speed: 300 deg on Jul 24 17:00		Hours in Service:	744
Direction of Maximum Daily Speed Average: 349.5 deg on Jul 12		Hours of Data:	744
Direction of Minimum Speed: 229 deg on Jul 15 04:00		Hours of Missing Data:	0
Direction of Minimum Daily Speed Average: 2.4 deg on Jul 28		Percent Operational Time:	100.0
Monthly Average Direction: 306.9 deg			

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Jul	213	173	147	147	141	142	143	144	138	138	141	140	145	156	138	137	137	133	142	170	174	163	159	150	148.7
2-Jul	154	142	140	140	146	145	134	132	136	148	168	161	162	174	171	198	176	134	134	138	142	134	143	141	150.4
3-Jul	136	137	140	148	142	142	140	142	138	129	173	220	293	90	98	90	134	156	103	85	131	135	191	286	144.9
4-Jul	268	302	261	261	249	266	260	262	246	252	266	251	249	247	240	234	250	269	217	217	197	170	147	68	245.2
5-Jul	16	27	357	353	355	342	261	345	358	15	95	117	349	356	155	85	134	336	327	334	286	274	291	302	329.7
6-Jul	282	274	300	311	342	3	25	359	15	25	32	26	31	31	57	66	60	80	31	7	357	353	348	6	10.7
7-Jul	358	360	356	357	358	342	342	333	336	353	346	358	5	348	14	12	19	14	10	19	2	1	354	360	359.7
8-Jul	1	16	12	352	12	348	354	357	347	357	355	1	347	0	355	354	352	360	10	22	34	38	23	6	7.8
9-Jul	354	360	14	6	0	0	2	357	352	312	322	352	1	2	353	24	29	87	47	74	63	73	70	12	22.2
10-Jul	22	359	4	1	16	84	20	12	357	355	337	337	85	68	69	54	90	146	254	261	292	325	325	338	354.4
11-Jul	351	350	323	327	336	336	1	337	332	335	354	357	306	335	332	339	337	360	1	1	6	0	347	344	345.3
12-Jul	347	343	347	349	355	360	354	356	350	350	355	354	0	352	344	336	329	4	350	357	349	340	344	350	349.5
13-Jul	342	341	340	343	342	336	341	337	354	356	2	354	360	13	3	32	35	19	4	9	5	351	3	41	359.4
14-Jul	21	43	358	334	334	340	333	359	333	0	1	355	320	345	324	323	358	3	333	332	323	330	337	348	343.2
15-Jul	339	310	308	229	215	215	200	197	240	260	252	249	255	267	315	338	331	318	325	330	345	321	329	299	305.8
16-Jul	260	255	255	235	241	222	237	256	260	267	320	336	339	339	252	249	252	343	343	328	332	330	333	336	303.8
17-Jul	336	341	342	343	345	354	354	338	335	350	356	347	344	346	344	351	360	358	356	21	41	56	72	142	352.1
18-Jul	161	159	161	142	149	151	147	145	138	138	148	130	186	192	273	275	254	238	228	224	217	217	219	214	201.0
19-Jul	213	189	162	154	153	155	163	156	149	232	250	260	258	248	248	299	297	274	245	262	288	70	274	6	249.8
20-Jul	36	14	6	355	344	354	359	358	9	320	323	336	303	330	346	334	359	353	280	230	228	214	208	223	336.5
21-Jul	251	247	249	234	200	217	239	250	263	257	251	247	256	266	250	325	7	10	3	7	21	31	73	132	285.4
22-Jul	140	158	165	157	151	150	140	145	150	163	156	155	178	218	189	223	280	284	267	302	342	329	348	269	185.4
23-Jul	244	253	265	271	311	327	323	6	8	20	260	270	34	261	296	4	279	86	217	227	236	244	229	219	266.4
24-Jul	195	163	154	158	171	200	219	232	243	245	250	249	248	251	245	300	297	284	264	267	267	269	255	249.2	
25-Jul	264	271	304	298	263	285	287	293	310	328	333	8	59	328	13	4	2	6	23	46	45	43	71	130	317.6
26-Jul	140	146	77	110	128	136	135	141	143	137	132	203	166	194	261	269	269	234	166	166	170	152	149	154	159.3
27-Jul	150	157	164	182	191	199	185	202	257	329	339	341	346	354	357	2	357	5	17	38	29	3	14	2	10.7
28-Jul	354	348	346	310	319	238	246	167	300	169	132	117	145	137	154	27	139	355	339	254	253	194	205	215	245.0
29-Jul	235	223	257	255	230	219	212	211	209	199	233	259	239	149	199	207	206	243	203	178	160	152	144	143	198.8
30-Jul	6	106	155	244	271	219	209	174	218	117	138	117	130	142	157	359	29	19	30	7	3	9	31	22	36.1
31-Jul	19	28	24	19	19	350	358	338	343	330	302	266	273	289	240	256	284	9	291	268	275	297	281	291	305.0

293.3 304.4 300.9 304.7 315.9 291.5 245.3 267.5 305.6 290.9 278.3 273.4 283.9 302.0 296.6 319.6 332.3 351.3 326.9 330.1 321.7 334.9 305.3 308.3
 Diurnal Average

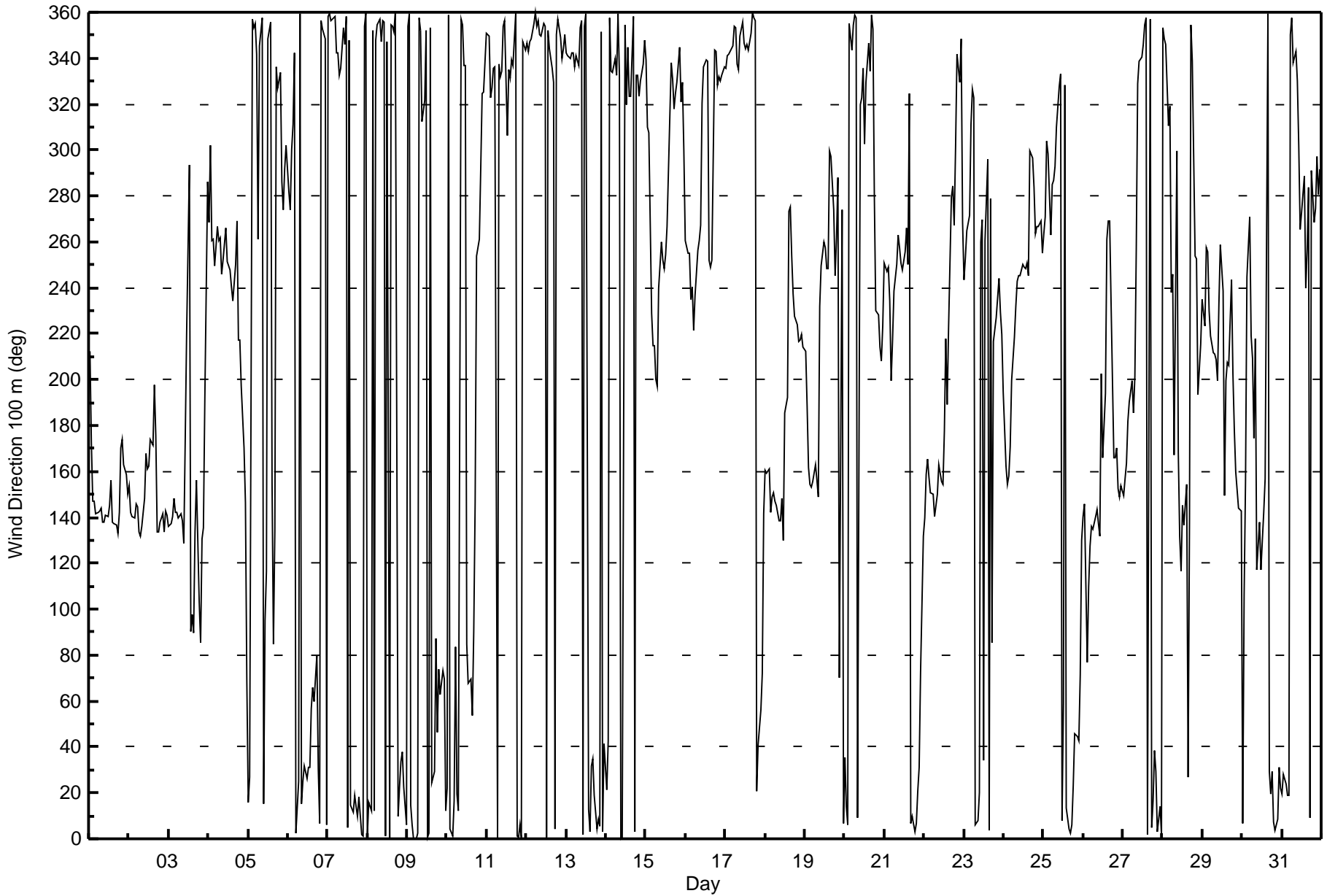
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

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

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 99 deg on Jul 20 20:00 Minimum Value: 2 deg on Jul 14 22:00 Percentiles: P ₁ = 3 P ₁₀ = 7 Q ₁ = 9 Median = 14 Q ₃ = 25 P ₉₀ = 42 P ₉₉ = 84																		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-Jul	8	13	11	7	9	10	6	9	9	7	7	16	23	26	19	16	12	10	12	10	6	7	9	12	26
2-Jul	9	7	5	16	18	30	19	13	14	14	14	21	20	16	13	18	24	7	10	12	11	6	5	4	30
3-Jul	4	4	15	10	9	11	9	9	11	11	31	35	82	31	24	28	34	24	27	14	34	10	48	13	82
4-Jul	14	18	16	8	11	8	10	7	13	9	8	12	10	7	7	21	13	13	10	11	8	20	61	61	
5-Jul	34	21	15	10	10	15	42	24	27	67	56	28	89	62	41	80	47	61	6	35	13	9	29	14	89
6-Jul	11	10	11	13	8	20	12	12	14	12	22	21	25	12	22	26	24	15	17	10	8	9	10	12	26
7-Jul	11	8	13	13	11	12	10	20	11	20	21	32	14	9	22	25	15	15	16	15	7	7	8	10	32
8-Jul	10	17	37	19	16	13	17	21	14	14	17	12	20	21	17	16	14	12	8	6	8	27	17	37	
9-Jul	7	7	5	7	7	13	15	36	67	33	22	43	41	28	20	38	24	38	14	9	6	17	27	36	67
10-Jul	17	11	10	7	11	42	22	17	17	26	27	49	63	17	21	19	39	23	46	7	27	13	7	10	63
11-Jul	9	11	34	6	6	8	48	24	24	23	20	22	21	11	9	13	13	17	9	7	6	8	3	3	48
12-Jul	7	5	5	5	5	9	10	10	9	12	15	11	12	14	12	16	10	10	9	9	8	4	5	6	16
13-Jul	3	5	4	5	5	6	8	10	12	11	10	11	12	14	12	23	20	9	14	12	9	7	10	22	23
14-Jul	12	19	9	9	16	13	32	23	39	31	17	23	72	36	23	19	10	13	8	6	6	2	2	4	72
15-Jul	19	11	76	82	17	10	25	27	23	22	17	17	27	39	43	10	22	14	11	9	7	7	6	10	82
16-Jul	11	53	16	27	29	36	33	16	16	43	43	23	52	33	71	78	30	20	18	7	4	3	6	3	78
17-Jul	4	3	3	6	4	9	12	13	17	15	15	21	22	23	19	18	18	19	14	22	8	8	27	31	31
18-Jul	27	20	15	10	11	15	8	7	7	8	12	23	94	59	41	20	19	14	8	4	3	3	5	8	94
19-Jul	12	34	19	19	15	16	25	12	25	80	20	10	11	12	10	27	12	33	8	22	34	67	84	22	84
20-Jul	17	8	12	7	9	11	13	16	14	42	20	59	77	9	25	20	13	20	47	99	7	10	16	36	99
21-Jul	7	10	13	27	30	29	20	10	9	7	11	9	13	23	8	43	9	8	10	9	10	20	30	12	43
22-Jul	5	13	13	14	11	9	8	14	9	10	15	9	16	16	14	13	40	41	11	39	8	6	21	84	84
23-Jul	7	6	8	20	17	13	12	34	46	35	51	32	54	61	40	37	40	68	18	10	3	10	8	9	68
24-Jul	20	12	10	12	13	21	4	10	7	8	8	8	8	8	8	7	30	15	19	12	8	9	24	13	30
25-Jul	7	12	15	11	24	12	11	11	24	36	63	72	71	56	17	17	20	29	30	11	10	28	26	28	72
26-Jul	15	18	54	32	6	8	9	6	6	8	21	68	22	51	23	26	15	48	11	7	7	9	8	8	68
27-Jul	5	8	11	14	17	19	29	41	86	11	16	16	33	9	7	8	16	9	9	10	17	12	15	12	86
28-Jul	6	7	10	34	41	21	11	82	88	35	47	49	12	52	61	59	26	51	31	83	7	21	14	19	88
29-Jul	6	24	27	14	11	10	13	18	36	42	67	55	52	21	39	27	17	24	70	7	11	14	4	12	70
30-Jul	48	27	39	39	19	29	28	38	80	75	53	40	32	18	14	56	19	13	25	13	12	8	26	15	80
31-Jul	24	28	31	61	53	10	21	6	8	44	42	50	20	11	14	7	40	13	20	10	10	34	16	15	61
Diurnal Maximum																									





Maximum Value: 0.8 km/h on Jul 26 20:00 Maximum Daily Average: 0.2 km/h on Jul 1																								Hours in Service: 744 Hours of Data: 744		
Minimum Value: -1.1 km/h on Jul 13 15:00 Minimum Daily Average: -0.5 km/h on Jul 12 Maximum Diurnal Average: -0.1 km/h at hour 7 Minimum Diurnal Average: -0.3 km/h at hour 18 Monthly Average: -0.12 km/h Percentiles: $P_1 = -0.8$ $P_{10} = -0.5$ $Q_1 = -0.3$ Median = -0.1 $Q_3 = 0.1$ $P_{90} = 0.3$ $P_{99} = 0.6$																								Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0		
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	0.2	0.0	0.2	0.0	0.0	-0.2	0.2	0.3	0.2	0.3	0.2	0.5	0.3	0.4	0.2	0.3	0.2	0.0	0.4	0.6	0.5	0.4	0.4	0.1	0.2	0.6
2-Jul	0.3	0.2	0.2	-0.3	-0.4	-0.2	-0.2	0.3	0.0	0.4	0.6	0.6	0.5	0.5	0.4	0.3	0.2	0.2	0.1	0.3	0.2	0.1	-0.1	0.1	0.2	0.6
3-Jul	0.1	0.2	-0.2	-0.2	-0.5	-0.3	0.2	0.1	0.0	0.0	0.2	0.0	-0.1	-0.2	0.0	-0.2	0.1	0.2	-0.1	-0.2	-0.1	-0.3	0.1	-0.2	-0.1	0.2
4-Jul	-0.1	-0.1	-0.1	-0.3	0.0	-0.4	-0.1	-0.4	-0.2	-0.3	-0.2	-0.1	-0.1	-0.2	0.0	0.0	-0.3	-0.2	0.2	0.3	0.4	0.1	-0.2	-0.1	-0.1	0.4
5-Jul	-0.1	-0.1	0.0	-0.2	-0.3	-0.2	0.0	-0.6	-0.1	-0.1	0.2	0.1	0.1	0.0	0.4	0.2	0.3	0.0	-0.2	0.1	-0.4	-0.3	-0.4	-0.2	-0.1	0.4
6-Jul	-0.3	-0.4	-0.4	-0.3	-0.1	-0.2	-0.2	-0.2	-0.6	-0.7	-0.6	-0.2	-0.6	-0.4	-0.6	-0.4	-0.2	-0.3	-0.3	-0.4	-0.2	-0.3	-0.2	-0.3	-0.4	-0.1
7-Jul	-0.4	-0.3	-0.1	-0.3	-0.2	-0.2	-0.2	-0.2	-0.4	-0.5	-0.1	-0.4	-0.4	-0.4	-0.6	-0.4	-0.6	-0.4	-0.4	-0.3	-0.2	-0.2	-0.3	-0.2	-0.3	-0.1
8-Jul	-0.2	-0.2	-0.2	-0.2	-0.1	-0.2	-0.1	-0.1	-0.5	-0.4	-0.2	-0.4	-0.4	-0.1	0.0	-0.2	-0.2	-0.4	-0.3	-0.2	-0.2	-0.3	-0.4	-0.3	-0.2	0.0
9-Jul	-0.2	-0.3	-0.5	-0.3	-0.3	-0.3	-0.2	-0.1	0.0	-0.2	0.0	0.0	0.2	-0.2	-0.7	-0.5	-0.3	0.0	-0.2	-0.3	-0.1	0.0	-0.2	-0.1	-0.2	0.2
10-Jul	-0.1	-0.2	-0.2	-0.1	0.0	0.0	-0.1	0.0	-0.3	-0.1	-0.1	0.1	-0.3	-0.2	-0.5	-0.5	0.0	0.1	-0.7	-0.5	-0.2	-0.2	-0.2	-0.1	-0.2	0.1
11-Jul	0.0	0.0	0.0	-0.1	-0.1	-0.1	0.0	-0.2	-0.1	-0.1	-0.2	-0.5	-0.5	-0.3	-0.2	-0.4	-0.3	-0.4	-0.5	-0.4	-0.3	-0.2	-0.2	-0.2	-0.2	0.0
12-Jul	-0.2	-0.3	-0.2	-0.3	-0.3	-0.4	-0.3	-0.5	-0.5	-0.6	-0.2	-0.5	-0.9	-1.0	-0.8	-0.7	-0.5	-0.8	-0.7	-0.6	-0.3	-0.3	-0.3	-0.2	-0.5	-0.2
13-Jul	-0.2	-0.3	-0.3	-0.2	-0.4	-0.2	-0.3	-0.3	-0.3	-0.5	-0.7	-0.6	-0.7	-0.9	-1.1	-0.6	-0.8	-0.9	-0.4	-0.4	-0.2	-0.1	-0.2	-0.2	-0.4	-0.1
14-Jul	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.2	0.1	-0.1	-0.2	0.0	0.1	-0.3	-0.2	-0.6	-0.3	-0.5	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1	0.2
15-Jul	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.5	-0.2	-0.1	0.1	0.3	-0.2	-0.6	-0.6	-0.5	-0.3	-0.2	-0.4	-0.2	0.0	0.0	-0.1	0.5
16-Jul	-0.2	-0.2	0.0	0.2	0.2	0.2	0.2	0.1	-0.1	0.2	-0.2	-0.5	0.1	-0.3	0.1	0.3	0.0	-0.5	0.0	-0.1	-0.3	-0.4	-0.3	-0.3	-0.1	0.3
17-Jul	-0.4	-0.2	-0.1	-0.1	-0.1	-0.2	-0.2	-0.2	-0.3	-0.6	-0.7	-0.8	-0.5	-0.6	-0.3	-0.5	-0.5	-0.5	-0.3	-0.2	0.0	0.0	0.1	0.1	-0.3	0.1
18-Jul	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.2	0.4	0.2	0.2	0.1	0.4	0.1	-0.2	-0.1	-0.2	-0.2	-0.2	0.2	0.3	0.5	0.4	0.1	0.5
19-Jul	0.4	0.1	0.2	0.2	0.2	0.1	0.1	0.2	0.0	0.0	-0.2	-0.2	-0.1	-0.3	-0.3	-0.4	-0.6	-0.5	-0.1	-0.1	-0.3	0.0	-0.2	-0.2	-0.1	0.4
20-Jul	-0.2	-0.1	-0.1	-0.3	-0.1	-0.2	-0.3	-0.1	-0.2	-0.1	-0.3	0.1	0.2	-0.2	-0.1	-0.2	-0.3	-0.3	-0.3	0.0	0.1	0.1	0.2	0.0	-0.1	0.2
21-Jul	0.0	0.2	-0.1	0.2	0.2	0.2	0.0	-0.3	-0.5	-0.5	-0.3	-0.4	-0.5	-0.6	-0.5	-0.8	-1.0	-1.0	-0.5	-0.8	-0.7	-0.2	0.0	0.0	-0.3	0.2
22-Jul	-0.1	0.2	0.1	0.3	0.5	0.3	0.2	0.3	0.3	0.6	0.4	0.4	0.6	0.1	0.4	-0.1	-0.2	-0.2	-0.4	-0.4	-0.2	-0.4	-0.1	0.1	0.1	0.6
23-Jul	0.1	-0.2	-0.3	-0.1	-0.2	-0.2	-0.1	-0.1	0.0	-0.4	-0.1	0.0	0.0	0.0	-0.2	-0.5	-0.4	0.3	0.1	-0.1	0.0	0.0	0.2	0.4	-0.1	0.4
24-Jul	0.4	0.3	0.1	-0.1	0.0	0.2	0.0	-0.2	-0.3	-0.3	-0.3	-0.6	-0.4	-0.5	-0.4	-0.5	-0.8	-0.6	-0.7	-0.6	-0.3	-0.5	-0.2	-0.3	-0.3	0.4
25-Jul	-0.6	-0.5	-0.3	-0.3	-0.3	-0.4	-0.5	-0.4	-0.4	-0.2	-0.2	-0.1	0.0	0.1	-0.3	-0.1	-0.1	-0.2	-0.2	-0.4	-0.3	-0.3	-0.2	0.0	-0.3	0.1
26-Jul	0.0	-0.3	-0.5	-0.2	0.0	-0.1	-0.1	0.2	0.3	0.3	0.0	0.3	0.4	0.1	-0.1	-0.1	0.0	-0.1	0.6	0.8	0.6	0.0	0.0	0.2	0.1	0.8
27-Jul	0.1	-0.1	0.1	0.3	0.2	0.1	0.1	0.3	0.2	-0.3	-0.3	-0.5	-0.1	-0.8	-0.7	-0.5	-0.4	-0.4	-0.2	-0.4	-0.2	-0.1	0.0	0.0	-0.2	0.3
28-Jul	-0.1	-0.1	-0.2	-0.1	-0.2	0.0	0.0	-0.1	0.0	0.0	0.5	0.5	0.1	0.5	0.1	-0.1	0.3	-0.1	-0.1	0.1	-0.4	0.4	0.4	0.3	0.1	0.5
29-Jul	0.0	0.0	0.0	-0.1	0.1	0.3	0.1	0.3	0.5	0.4	0.3	-0.1	0.3	0.4	0.0	0.1	0.2	-0.3	0.1	0.7	0.1	0.0	0.2	0.0	0.2	0.7
30-Jul	-0.3	-0.2	0.1	0.1	-0.3	0.2	0.2	0.2	0.1	0.3	0.0	0.0	0.4	0.4	0.6	-0.6	-0.4	-0.3	-0.2	-0.3	-0.2	-0.2	-0.1	-0.4	0.0	0.6
31-Jul	-0.2	-0.1	-0.1	-0.1	-0.2	-0.3	-0.1	-0.2	-0.1	-0.1	-0.2	0.1	-0.4	-0.1	0.0	-0.3	-0.2	-0.3	-0.2	-0.1	-0.2	-0.3	-0.2	-0.2	-0.2	0.1
																								Diurnal Average		
																								Diurnal Maximum		



Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

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

Lower Camp Met Tower - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 4.6 km/h on Jul 24 17:00 Minimum Value: 0.1 km/h on Jul 14 05:00 Percentiles: P ₁ = 0.2 P ₁₀ = 0.5 Q ₁ = 0.9 Median = 1.3 Q ₃ = 2.0 P ₉₀ = 2.5 P ₉₉ = 3.8																							Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0		
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Jul	0.7	0.4	0.7	0.6	0.5	0.9	2.0	2.0	2.5	3.7	3.6	3.2	2.7	2.1	2.5	2.5	2.4	2.6	3.0	1.6	1.7	1.4	1.3	1.1	3.7
2-Jul	1.7	1.2	1.2	1.1	0.9	1.0	1.1	1.5	2.6	3.5	2.3	2.4	2.4	2.3	2.1	2.1	1.6	2.9	2.9	1.7	1.0	1.6	1.6	1.5	3.5
3-Jul	1.0	1.4	1.0	0.8	0.9	1.1	1.5	1.7	1.6	1.9	2.0	2.0	1.3	1.7	1.2	0.9	1.0	1.2	1.0	0.5	1.2	1.7	1.6	1.2	2.0
4-Jul	1.0	0.4	1.1	1.4	1.5	1.6	1.0	1.6	1.4	2.2	1.6	1.8	2.1	2.4	2.2	2.3	2.2	1.8	1.2	1.2	1.2	1.0	1.2	0.5	2.4
5-Jul	0.6	0.3	0.2	0.3	0.7	1.0	0.7	1.5	1.2	0.6	0.7	0.6	1.4	1.6	1.4	1.4	1.3	1.7	1.2	1.2	1.2	1.3	0.9	0.7	1.7
6-Jul	1.3	1.6	1.5	1.3	1.1	1.3	1.2	1.8	2.7	3.0	2.2	2.4	2.4	2.1	3.1	2.5	2.3	2.1	2.0	1.4	0.7	1.1	1.5	1.4	3.1
7-Jul	1.2	1.0	0.7	1.1	1.3	1.0	1.4	1.3	1.7	2.1	1.6	2.1	2.2	2.2	2.5	2.3	2.3	2.3	1.6	1.0	0.9	0.8	0.5	2.5	
8-Jul	0.6	0.4	0.4	0.5	0.7	0.8	1.3	1.2	1.5	1.6	1.9	1.9	1.8	1.7	1.6	1.7	1.3	1.3	1.5	1.3	1.3	1.4	0.9	0.9	1.9
9-Jul	0.8	1.4	1.5	1.4	1.5	1.1	1.1	0.8	1.3	0.8	0.6	1.1	1.0	1.1	1.8	1.7	1.1	1.2	0.9	0.9	0.4	0.3	0.4	0.5	1.8
10-Jul	0.3	0.6	0.8	0.4	0.4	0.4	0.5	0.8	1.1	1.1	1.5	1.5	2.4	2.0	2.5	2.4	1.8	1.1	3.9	2.6	0.7	0.6	0.6	0.3	3.9
11-Jul	0.1	0.2	0.3	0.2	0.2	0.5	0.8	1.2	1.3	1.4	1.8	2.1	2.3	2.4	2.1	1.9	1.8	2.3	2.5	2.3	1.2	0.6	0.8	1.3	2.5
12-Jul	1.3	0.9	1.1	0.9	1.1	1.4	1.6	1.7	2.0	2.3	2.2	2.5	3.1	3.1	3.2	3.3	2.9	3.0	3.4	2.5	2.1	1.1	1.1	0.8	3.4
13-Jul	0.7	0.7	0.8	1.0	1.1	1.4	2.0	2.1	2.4	2.7	2.9	3.1	2.8	3.6	3.4	2.9	2.5	3.0	1.7	1.6	0.8	0.5	0.5	0.6	3.6
14-Jul	0.4	0.2	0.2	0.1	0.1	0.2	0.5	0.8	0.8	1.3	1.7	1.7	1.8	2.2	2.1	2.2	2.7	0.6	1.1	0.6	0.3	0.2	0.2	0.2	2.7
15-Jul	0.2	0.1	0.1	0.2	0.3	0.8	0.9	1.1	1.3	1.6	1.8	1.9	1.9	1.7	2.6	2.6	1.8	2.0	1.3	1.1	1.1	0.5	0.4	0.4	2.6
16-Jul	0.8	0.9	0.7	1.0	0.9	1.0	1.7	1.8	1.6	1.5	1.0	1.2	1.3	2.1	0.9	0.9	1.1	2.8	0.5	0.4	1.1	1.3	1.3	0.9	2.8
17-Jul	0.9	0.9	0.7	0.6	0.3	0.5	1.1	1.4	1.8	2.6	2.3	2.3	2.4	2.5	2.5	2.5	2.1	1.9	1.4	1.1	0.3	0.2	0.2	0.1	2.6
18-Jul	0.2	0.2	0.2	0.3	0.3	0.5	1.2	1.9	1.8	2.0	1.8	1.7	1.6	1.5	1.8	1.8	1.8	1.7	1.9	1.6	1.3	1.5	1.5	1.4	2.0
19-Jul	1.2	1.0	1.1	0.9	0.7	1.3	1.6	1.9	1.6	1.5	2.1	2.7	2.8	2.5	2.6	3.0	3.7	2.6	1.6	0.8	2.3	0.7	0.4	0.6	3.7
20-Jul	0.8	0.7	0.5	1.1	1.1	1.0	1.2	1.1	0.9	0.6	0.8	1.0	1.5	1.0	1.4	1.6	1.9	1.2	1.0	0.4	0.7	0.5	0.9	0.9	1.9
21-Jul	1.1	1.2	1.5	1.5	1.2	0.9	1.4	2.6	2.4	2.2	2.2	3.1	3.2	3.4	3.5	3.7	4.2	4.2	2.9	2.9	2.4	1.4	0.5	0.4	4.2
22-Jul	0.7	0.8	1.4	1.3	1.6	2.0	2.2	2.0	2.4	2.1	2.1	2.7	2.1	1.9	1.6	2.0	1.9	1.2	2.1	2.4	0.9	1.0	0.5	0.3	2.7
23-Jul	0.9	1.8	1.8	1.2	0.7	0.4	0.8	1.2	1.4	1.5	1.9	2.0	1.8	1.8	2.4	1.5	1.7	0.9	1.4	0.9	0.9	0.5	0.9	0.9	2.4
24-Jul	0.8	1.3	2.1	2.4	2.2	1.5	2.0	2.3	2.9	2.9	3.2	3.5	3.6	3.8	3.8	3.7	4.6	3.9	3.0	2.3	2.5	2.1	1.6	2.5	4.6
25-Jul	2.8	2.1	0.9	0.6	0.7	0.9	2.3	2.5	2.1	1.3	1.7	1.4	1.5	1.9	2.1	1.8	1.4	1.2	1.2	1.2	0.7	0.5	0.5	0.4	2.8
26-Jul	0.3	0.4	0.5	0.4	1.0	1.3	1.7	2.3	2.1	1.9	1.9	1.7	2.2	2.0	1.7	1.9	1.9	1.6	1.5	1.3	1.1	1.5	1.7	1.3	2.3
27-Jul	1.2	1.2	0.8	0.7	0.6	0.7	0.9	1.2	0.9	1.2	1.4	1.8	1.9	2.4	1.9	2.0	2.0	1.6	1.1	1.4	0.7	0.6	0.4	0.4	2.4
28-Jul	0.4	0.5	0.5	0.5	0.6	0.7	1.0	0.7	0.3	0.8	1.4	1.3	1.6	1.6	1.6	1.7	1.5	0.8	0.3	0.7	2.7	1.3	1.3	1.1	2.7
29-Jul	1.2	0.9	0.8	0.6	0.8	1.0	1.1	1.2	1.4	1.5	1.7	2.2	2.0	2.4	1.9	1.5	1.8	1.9	1.1	1.4	1.1	1.3	1.0	0.6	2.4
30-Jul	1.2	0.4	0.8	1.2	1.6	0.8	1.1	1.4	0.8	1.6	1.6	1.7	1.8	2.2	2.6	3.0	2.7	2.2	1.4	1.2	1.2	0.7	0.5	0.7	3.0
31-Jul	1.2	0.4	0.3	0.6	0.6	1.8	1.1	1.1	1.2	1.0	1.0	1.0	2.2	1.8	1.8	1.8	1.5	1.1	1.0	1.3	1.8	0.9	1.1	1.7	2.2
Diurnal Maximum																									



Maximum Value: 1.1 km/h on Jul 26 20:00		Maximum Daily Average: 0.6 km/h on Jul 1		Hours in Service: 744																							
Minimum Value: -1.6 km/h on Jul 24 17:00		Minimum Daily Average: -0.7 km/h on Jul 12		Hours of Data: 744																							
Maximum Diurnal Average: 0.0 km/h at hour 7		Minimum Diurnal Average: -0.3 km/h at hour 17		Hours of Missing Data: 0																							
Monthly Average: -0.10 km/h		Percentiles: $P_1 = -1.1$ $P_{10} = -0.6$ $Q_1 = -0.4$ Median = -0.1 $Q_3 = 0.2$ $P_{90} = 0.6$ $P_{99} = 1.0$		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-Jul	0.2	0.2	0.7	0.2	0.2	0.1	0.6	0.7	0.7	0.9	1.0	0.8	0.8	0.4	0.6	0.9	0.8	0.5	1.0	0.6	0.2	0.9	0.8	0.6	0.6	1.0	
2-Jul	0.6	0.6	0.6	-0.1	-0.2	-0.1	0.0	0.5	0.6	1.1	0.6	0.7	0.6	0.6	0.7	0.2	0.2	0.9	0.7	0.6	0.2	0.6	0.3	0.5	0.5	1.1	
3-Jul	0.2	0.5	0.0	-0.1	-0.3	0.0	0.5	0.4	0.3	0.3	0.3	0.2	-0.1	0.0	0.1	-0.1	0.2	0.4	0.0	-0.1	-0.1	0.1	0.2	-0.5	0.1	0.5	
4-Jul	-0.3	-0.2	-0.4	-0.5	0.0	-0.5	-0.3	-0.3	-0.5	-0.2	-0.1	-0.5	0.0	-0.1	0.0	0.4	0.3	-0.6	-0.3	0.1	0.2	0.2	0.8	0.4	-0.2	-0.1	0.8
5-Jul	-0.2	-0.2	0.0	-0.1	-0.3	-0.3	0.0	-0.7	-0.2	-0.1	0.3	0.1	0.3	-0.1	0.6	0.5	0.5	-0.2	-0.3	-0.2	-0.6	-0.4	-0.6	-0.3	-0.1	0.6	
6-Jul	-0.6	-0.6	-0.7	-0.7	-0.3	-0.3	-0.2	-0.2	-0.6	-0.7	-0.5	-0.1	-0.3	-0.2	-0.4	-0.1	0.0	0.0	-0.3	-0.6	-0.5	-0.4	-0.5	-0.3	-0.4	0.0	
7-Jul	-0.5	-0.4	-0.2	-0.3	-0.1	-0.4	-0.4	-0.2	-0.4	-0.5	-0.3	-0.5	-0.6	-0.6	-0.4	-0.4	-0.5	-0.5	-0.2	-0.3	-0.3	-0.3	-0.4	-0.2	-0.4	-0.1	
8-Jul	-0.3	-0.2	-0.2	-0.2	0.0	-0.2	-0.2	-0.1	-0.5	-0.6	-0.4	-0.5	-0.4	0.1	0.2	-0.3	-0.3	-0.5	-0.3	-0.3	-0.1	-0.1	-0.5	-0.4	-0.3	0.2	
9-Jul	-0.5	-0.5	-0.6	-0.3	-0.3	-0.3	-0.1	-0.1	0.0	-0.1	0.0	0.2	0.4	-0.1	-0.5	-0.4	-0.3	0.3	-0.2	-0.2	0.0	0.0	-0.2	-0.2	-0.2	0.4	
10-Jul	-0.1	-0.3	-0.3	-0.2	0.0	0.0	-0.1	0.0	-0.3	-0.2	-0.1	0.1	-0.1	0.1	-0.4	-0.3	0.0	0.2	-1.0	-0.7	-0.2	-0.3	-0.4	-0.2	-0.2	0.2	
11-Jul	-0.1	0.0	-0.1	-0.3	-0.1	-0.2	0.1	-0.2	-0.1	-0.1	0.0	-0.6	-0.7	-0.8	-0.6	-0.6	-0.4	-0.6	-0.6	-0.7	-0.4	-0.4	-0.4	-0.5	-0.3	0.1	
12-Jul	-0.4	-0.4	-0.4	-0.4	-0.4	-0.5	-0.3	-0.7	-0.6	-0.8	-0.3	-0.9	-0.8	-1.1	-1.2	-1.1	-0.9	-0.9	-0.9	-0.6	-0.6	-0.6	-0.5	-0.4	-0.7	-0.3	
13-Jul	-0.4	-0.4	-0.5	-0.4	-0.4	-0.5	-0.9	-0.7	-0.7	-0.7	-0.7	-1.0	-0.8	-0.8	-0.9	-0.5	-0.6	-0.6	-0.6	-0.5	-0.4	-0.3	-0.2	-0.3	-0.2	-0.6	-0.2
14-Jul	-0.2	0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.2	0.3	0.1	0.0	0.2	0.2	-0.6	-0.5	-0.7	-0.3	-0.7	-0.3	-0.2	-0.2	-0.1	-0.1	-0.1	0.3	
15-Jul	0.0	0.0	0.0	0.0	0.3	0.5	0.4	0.2	0.1	0.6	-0.3	0.0	0.1	0.4	-0.6	-0.9	-0.6	-1.0	-0.6	-0.5	-0.5	-0.5	-0.2	-0.1	-0.1	0.6	
16-Jul	-0.4	-0.2	-0.2	0.1	0.2	0.3	0.5	0.1	-0.1	0.2	-0.1	-0.4	0.1	-0.6	0.2	0.3	0.0	-0.7	-0.1	-0.3	-0.6	-0.7	-0.6	-0.5	-0.1	0.5	
17-Jul	-0.6	-0.5	-0.3	-0.2	-0.1	-0.4	-0.4	-0.1	-0.3	-0.9	-0.8	-0.8	-0.6	-0.8	-0.4	-0.8	-0.5	-0.6	-0.5	-0.2	0.0	0.1	0.0	0.1	-0.4	0.1	
18-Jul	0.0	0.2	0.1	0.2	0.3	0.3	0.3	0.5	0.6	0.7	0.6	0.5	0.1	0.7	0.1	-0.3	-0.2	-0.1	0.0	0.0	0.1	0.2	0.3	0.5	0.2	0.7	
19-Jul	0.7	0.5	0.7	0.7	0.6	0.3	0.7	0.6	0.4	0.0	0.0	-0.6	-0.3	-0.4	-0.4	-0.5	-1.4	-0.5	0.0	-0.2	-0.8	0.1	-0.1	-0.3	0.0	0.7	
20-Jul	-0.1	-0.1	-0.1	-0.4	-0.3	0.0	-0.2	-0.3	-0.1	-0.2	-0.4	0.1	0.2	-0.4	-0.1	-0.3	-0.1	-0.2	-0.4	0.0	0.2	0.2	0.4	0.0	-0.1	0.4	
21-Jul	0.1	0.3	0.0	0.2	0.4	0.4	0.1	-0.4	-0.9	-0.6	-0.2	-0.2	-0.5	-1.1	-0.7	-1.2	-1.1	-1.1	-0.6	-0.7	-0.7	-0.3	0.0	0.2	-0.4	0.4	
22-Jul	0.1	0.3	0.3	0.5	0.7	0.7	0.6	0.5	0.9	0.6	0.6	1.0	0.7	0.1	0.2	0.0	-0.4	-0.2	-0.7	-0.7	-0.3	-0.6	-0.2	0.0	0.2	1.0	
23-Jul	0.3	0.0	-0.2	-0.3	-0.4	-0.3	-0.1	0.1	0.2	-0.2	0.1	0.1	-0.1	0.1	-0.3	-0.6	-0.7	0.3	0.2	0.0	0.0	0.1	0.2	0.4	0.0	0.4	
24-Jul	0.5	1.1	0.7	0.6	0.9	0.7	-0.2	0.0	-0.1	-0.3	-0.5	-0.8	-0.6	-0.7	-0.8	-0.4	-1.6	-1.6	-1.1	-0.8	-0.8	-0.6	-0.5	-0.5	-0.3	1.1	
25-Jul	-0.9	-0.7	-0.6	-0.5	-0.4	-0.5	-0.9	-0.8	-0.8	-0.3	-0.1	-0.1	0.3	0.1	-0.2	-0.2	-0.1	-0.1	-0.2	-0.2	-0.2	-0.3	-0.1	0.0	-0.3	0.3	
26-Jul	0.1	-0.3	-0.7	-0.2	0.2	0.0	0.1	0.6	0.5	0.8	0.4	0.4	0.8	0.2	-0.2	-0.4	-0.1	-0.2	0.7	1.1	1.0	0.6	0.1	0.7	0.3	1.1	
27-Jul	0.4	0.0	0.4	0.6	0.7	0.5	0.6	0.4	0.3	-0.2	-0.5	-0.4	0.0	-0.7	-0.8	-0.5	-0.7	-0.4	-0.3	-0.3	-0.3	-0.3	-0.1	-0.1	-0.1	0.7	
28-Jul	-0.2	-0.1	-0.3	-0.3	-0.2	0.0	0.3	0.1	0.0	0.2	0.8	0.9	0.5	0.7	0.2	0.2	0.4	-0.1	-0.3	0.1	-0.4	0.5	0.5	0.5	0.2	0.9	
29-Jul	0.2	0.2	-0.1	-0.1	0.2	0.4	0.2	0.4	0.5	0.4	0.5	-0.2	0.4	0.8	0.3	0.1	0.4	-0.4	0.2	0.6	0.7	0.6	0.6	0.1	0.3	0.8	
30-Jul	-0.4	0.0	0.3	0.3	-0.6	0.5	0.5	0.4	0.3	0.6	0.1	0.6	0.8	0.6	0.9	-0.9	-0.2	0.0	-0.3	-0.4	-0.4	-0.3	-0.1	-0.6	0.1	0.9	
31-Jul	-0.3	-0.1	-0.1	-0.2	-0.2	-0.4	-0.2	-0.4	-0.4	-0.3	-0.4	0.2	-0.6	-0.3	0.1	-0.3	-0.2	-0.3	-0.4	-0.3	-0.3	-0.3	-0.4	-0.6	-0.3	0.2	
																								Diurnal Average			
																								Diurnal Maximum			



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

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

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 5.0 km/h on Jul 24 17:00 Minimum Value: 0.1 km/h on Jul 14 22:00 Percentiles: P ₁ = 0.2 P ₁₀ = 0.6 Q ₁ = 1.0 Median = 1.5 Q ₃ = 2.1 P ₉₀ = 2.6 P ₉₉ = 3.7		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																							
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Jul	0.9	0.6	0.9	0.8	0.7	1.1	2.2	2.1	2.6	3.7	3.6	3.2	2.9	2.4	2.6	2.5	2.5	2.7	3.1	1.9	2.0	1.5	1.5	1.2	3.7
2-Jul	1.8	1.4	1.5	1.2	1.1	1.1	1.2	1.6	2.7	3.7	2.8	2.7	2.6	2.7	2.5	2.3	1.7	2.9	2.8	1.8	1.3	1.8	1.6	1.6	3.7
3-Jul	1.2	1.7	1.2	1.1	0.9	1.2	1.6	1.7	1.5	1.9	2.4	2.0	1.4	1.7	1.3	0.9	1.1	1.3	1.0	0.4	1.3	1.7	1.7	1.4	2.4
4-Jul	1.3	0.6	1.2	1.4	1.5	1.7	1.3	1.6	1.3	2.2	1.8	1.8	2.0	2.2	2.1	2.4	2.2	2.0	1.3	1.5	1.3	1.0	1.3	0.5	2.4
5-Jul	0.5	0.4	0.2	0.2	0.6	1.0	0.7	1.5	1.2	0.6	0.8	0.7	1.7	1.7	1.4	1.6	1.3	1.8	1.4	1.4	1.3	1.4	1.0	0.9	1.8
6-Jul	1.4	1.7	1.4	1.3	1.1	1.4	1.2	1.9	2.8	2.8	2.2	2.6	2.5	2.3	3.1	2.6	2.4	2.3	2.0	1.5	0.8	1.4	1.7	1.5	3.1
7-Jul	1.4	1.2	0.9	1.3	1.5	1.2	1.5	1.5	1.9	2.2	1.7	2.2	2.2	2.2	2.3	2.7	2.4	2.5	2.4	1.7	1.3	1.1	1.0	0.6	2.7
8-Jul	0.7	0.5	0.4	0.7	0.9	0.7	1.3	1.4	1.4	1.6	1.9	1.9	2.0	1.8	1.8	1.6	1.3	1.3	1.6	1.4	1.4	1.6	1.1	1.0	2.0
9-Jul	0.9	1.5	1.5	1.4	1.6	1.3	1.2	0.9	1.4	0.9	0.7	1.2	1.3	1.2	1.9	1.8	1.3	1.4	1.0	0.8	0.4	0.5	0.5	0.5	1.9
10-Jul	0.3	0.6	0.9	0.5	0.5	0.4	0.5	0.9	1.1	1.1	1.6	1.8	2.5	2.1	2.6	2.4	2.0	1.1	3.7	2.6	1.0	0.7	0.7	0.3	3.7
11-Jul	0.2	0.2	0.3	0.3	0.3	0.6	0.8	1.3	1.5	1.6	2.0	2.2	2.3	2.6	2.3	2.1	1.9	2.3	2.7	2.4	1.4	0.7	1.0	1.5	2.7
12-Jul	1.4	1.1	1.3	1.0	1.4	1.6	1.7	1.7	2.1	2.4	2.3	2.6	3.2	3.1	3.2	3.4	3.3	3.2	3.5	2.6	2.3	1.4	1.4	0.9	3.5
13-Jul	0.8	0.8	1.0	1.1	1.3	1.6	2.1	2.2	2.6	2.7	3.1	3.1	3.0	3.8	3.6	3.0	2.7	3.1	1.8	1.8	0.9	0.6	0.7	0.8	3.8
14-Jul	0.4	0.3	0.2	0.2	0.1	0.3	0.5	0.8	1.0	1.4	1.7	1.8	2.1	2.5	2.2	2.3	2.9	0.7	1.0	0.7	0.2	0.1	0.2	0.2	2.9
15-Jul	0.2	0.2	0.2	0.3	0.4	1.0	0.9	1.0	1.5	1.8	2.0	2.0	2.3	1.9	2.8	2.7	1.9	2.1	1.5	1.3	1.2	0.6	0.5	0.6	2.8
16-Jul	1.0	1.2	1.0	1.2	1.2	1.4	2.1	2.1	1.9	1.7	1.2	1.1	1.4	2.4	1.0	1.0	1.0	3.0	0.5	0.5	1.3	1.3	1.5	1.2	3.0
17-Jul	1.0	1.1	0.8	0.8	0.4	0.6	1.0	1.6	2.0	2.7	2.6	2.5	2.6	2.6	2.7	2.6	2.2	1.9	1.6	1.2	0.4	0.2	0.2	0.2	2.7
18-Jul	0.3	0.3	0.3	0.4	0.3	0.7	1.3	2.0	1.7	1.9	1.7	1.9	1.8	1.8	2.0	2.0	2.0	1.7	1.8	1.8	1.5	1.7	1.9	1.7	2.0
19-Jul	1.6	1.3	1.0	0.9	0.9	1.4	1.5	1.6	1.6	1.7	2.4	3.0	3.0	2.7	2.5	3.3	3.8	2.6	1.3	1.0	2.5	0.7	0.5	0.8	3.8
20-Jul	1.1	0.8	0.6	1.2	1.3	1.3	1.3	1.2	1.0	0.6	0.7	1.1	1.6	1.1	1.6	1.8	2.0	1.4	1.1	0.5	0.7	0.7	1.2	1.2	2.0
21-Jul	1.1	1.3	1.6	1.7	1.5	1.1	1.4	2.7	2.5	2.1	2.4	2.6	3.2	3.3	3.0	3.8	4.3	4.3	3.2	3.0	2.4	1.4	0.6	0.5	4.3
22-Jul	0.7	1.1	1.5	1.5	1.9	2.2	2.3	2.3	2.5	2.4	2.4	2.9	2.7	2.1	2.0	2.3	2.0	1.4	2.3	2.7	1.0	1.1	0.7	0.3	2.9
23-Jul	1.0	1.8	2.1	1.5	0.8	0.4	0.9	1.2	1.6	1.6	2.0	2.4	2.0	2.2	2.7	1.6	1.7	0.9	1.6	1.2	0.9	0.7	1.1	1.1	2.7
24-Jul	1.1	1.2	2.0	2.2	2.1	1.6	2.3	2.5	2.6	2.6	2.9	3.3	3.3	3.4	3.6	3.5	5.0	4.2	3.1	2.4	2.7	2.4	1.9	2.6	5.0
25-Jul	3.1	2.4	1.1	0.8	0.8	1.1	2.2	2.6	2.2	1.5	2.0	1.5	1.7	2.3	2.2	1.8	1.6	1.4	1.4	1.3	0.9	0.7	0.5	0.5	3.1
26-Jul	0.4	0.5	0.6	0.5	1.1	1.4	1.9	2.4	2.2	2.0	1.9	1.7	2.3	2.2	2.0	2.1	2.1	1.7	1.5	1.4	1.1	1.4	1.9	1.4	2.4
27-Jul	1.5	1.3	1.0	0.8	0.7	0.8	0.8	1.1	0.9	1.2	1.4	1.8	2.1	2.5	1.9	2.1	2.0	1.7	1.2	1.5	0.7	0.7	0.5	0.5	2.5
28-Jul	0.4	0.6	0.5	0.5	0.5	0.9	1.2	0.7	0.3	0.8	1.4	1.4	1.5	1.8	1.8	1.8	1.5	1.0	0.4	0.7	2.6	1.4	1.4	1.3	2.6
29-Jul	1.3	1.0	1.1	0.8	0.8	1.1	1.3	1.2	1.5	1.7	1.9	2.4	2.2	2.5	2.1	1.7	2.0	1.9	1.2	1.5	1.1	1.3	1.1	0.8	2.5
30-Jul	1.2	0.5	1.0	1.5	1.9	0.9	1.2	1.4	0.9	1.7	1.7	2.0	2.0	2.3	2.8	3.0	2.7	2.3	1.5	1.2	1.4	0.9	0.6	0.8	3.0
31-Jul	1.3	0.6	0.4	0.7	0.7	1.9	1.2	1.1	1.3	1.0	1.1	1.1	2.3	2.0	1.7	1.8	1.6	1.2	1.1	1.6	2.0	1.1	1.4	1.8	2.3
	3.1	2.4	2.1	2.2	2.1	2.2	2.3	2.7	2.8	3.7	3.6	3.3	3.3	3.8	3.6	3.8	5.0	4.3	3.7	3.0	2.7	2.4	1.9	2.6	
	Diurnal Maximum																								



Maximum Value: 2.7 km/h on Jul 16 07:00		Maximum Daily Average: 1.2 km/h on Jul 1		Hours in Service: 744																						
Minimum Value: -1.3 km/h on Jul 24 18:00		Minimum Daily Average: -0.3 km/h on Jul 12		Hours of Data: 744																						
Maximum Diurnal Average: 0.4 km/h at hour 7		Minimum Diurnal Average: 0.0 km/h at hour 17		Hours of Missing Data: 0																						
Monthly Average: 0.20 km/h		Percentiles: P ₁ = -1.0 P ₁₀ = -0.4 Q ₁ = -0.2 Median = 0.1 Q ₃ = 0.5 P ₉₀ = 0.8 P ₉₉ = 2.2		Hours of Calibration: 0																						
				Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	0.6	0.2	1.2	0.8	0.5	0.4	1.4	1.5	2.1	2.5	2.2	2.1	1.4	1.1	1.7	1.5	1.3	1.2	1.6	0.6	-0.2	1.0	1.3	0.8	1.2	2.5
2-Jul	1.4	1.8	2.3	0.6	-0.1	0.4	0.0	0.3	1.6	2.3	0.4	1.4	0.5	0.6	0.4	0.5	0.3	1.8	1.7	1.5	-0.2	0.9	1.8	1.4	1.0	2.3
3-Jul	1.7	2.4	0.7	-0.9	-0.5	-0.3	0.6	1.0	0.5	0.1	0.8	1.5	0.4	0.5	0.5	0.0	0.1	0.1	0.0	0.0	0.2	0.6	0.6	-0.2	0.4	2.4
4-Jul	0.5	-0.4	0.2	0.2	1.1	0.4	0.8	0.4	0.8	0.6	0.1	0.7	0.7	0.9	1.5	1.2	0.4	0.0	0.4	0.4	0.3	0.6	0.5	0.1	0.5	1.5
5-Jul	-0.2	-0.2	-0.1	-0.2	-0.4	-0.2	-0.1	-0.1	0.3	0.1	0.4	0.3	0.3	-0.1	0.4	0.8	0.2	-0.2	-0.3	0.0	-0.5	0.3	-0.8	-0.7	0.0	0.8
6-Jul	-0.3	-0.2	-0.5	-0.5	-0.3	0.1	0.3	0.5	-0.2	-0.5	0.0	0.2	0.5	0.1	0.1	0.6	-0.3	0.1	0.7	0.0	0.0	0.1	-0.2	0.5	0.0	0.7
7-Jul	0.0	-0.1	0.5	0.5	0.4	-0.1	-0.3	0.5	-0.2	-0.2	-0.6	-0.3	-0.6	-0.6	0.1	0.3	0.2	0.2	0.6	0.6	0.1	0.2	0.0	0.1	0.1	0.6
8-Jul	0.0	0.0	-0.1	0.1	0.6	0.0	0.1	-0.1	-0.3	-0.7	-0.3	-1.0	-0.1	0.3	0.3	-0.3	-0.4	0.1	0.2	0.3	0.3	0.5	0.2	-0.2	0.0	0.6
9-Jul	-0.1	-0.3	-0.3	0.1	0.2	0.0	0.1	-0.1	-0.1	0.4	-0.2	0.5	0.7	-0.2	-0.4	-0.2	0.1	-0.1	-0.2	0.0	0.1	0.3	0.0	-0.2	0.0	0.7
10-Jul	-0.2	-0.3	-0.4	-0.1	-0.2	0.0	0.0	-0.1	-0.4	0.1	-0.2	-0.2	0.2	0.3	0.1	-0.5	0.0	0.1	0.5	0.6	0.1	-0.4	-0.4	-0.1	-0.1	0.6
11-Jul	-0.1	-0.1	-0.2	-0.3	-0.2	-0.3	0.2	-0.2	0.1	0.4	0.7	-0.7	0.0	-0.7	-0.6	-0.5	-0.5	0.0	0.2	0.2	0.2	0.0	-0.1	-0.1	-0.1	0.7
12-Jul	-0.1	-0.1	0.0	-0.2	0.1	0.2	0.0	-0.2	-0.5	-0.6	-0.2	-0.3	-0.2	-0.3	-1.2	-1.0	-1.0	0.2	-0.2	0.2	-0.2	-0.2	-0.2	-0.1	-0.3	0.2
13-Jul	0.0	-0.2	-0.1	-0.2	-0.3	-0.3	-0.9	-0.4	-0.2	-0.1	0.1	-0.2	-0.3	0.3	-0.4	-0.1	0.0	0.0	-0.1	0.1	0.0	-0.3	-0.2	-0.3	-0.2	0.3
14-Jul	0.1	0.2	0.2	0.0	-0.1	0.0	-0.1	-0.1	0.2	0.2	-0.4	-0.2	0.8	0.6	-0.2	-0.7	0.0	-0.3	-0.2	-0.1	-0.3	-0.4	-0.3	0.0	0.0	0.8
15-Jul	0.0	-0.1	0.0	0.0	0.1	-0.1	-0.2	0.0	0.0	0.4	-0.3	0.4	0.7	0.2	-0.4	-0.5	-0.1	-0.9	-0.4	-0.3	-0.2	-0.6	-0.4	-0.2	-0.1	0.7
16-Jul	-0.2	0.0	-0.6	-0.2	-0.7	-0.2	2.7	1.6	0.6	0.6	-0.2	-0.4	0.1	-0.5	0.1	0.1	-0.6	0.0	-0.3	-0.2	-0.5	-0.5	-0.1	0.0	2.7	
17-Jul	-0.3	-0.3	0.0	-0.2	-0.1	-0.3	0.0	-0.1	0.4	-0.4	-0.5	-0.4	0.0	-1.0	-0.5	-0.7	-0.1	0.0	-0.3	0.1	0.1	0.1	0.1	0.1	-0.2	0.4
18-Jul	0.3	0.2	0.2	0.3	0.3	0.6	0.9	0.6	0.2	0.5	0.3	0.4	0.8	1.3	0.1	0.0	0.4	0.4	0.6	1.0	0.7	1.2	1.9	2.2	0.6	2.2
19-Jul	1.7	-0.2	0.4	0.7	0.4	0.5	0.3	0.3	0.1	0.4	0.7	-0.3	0.1	0.4	0.0	-0.2	-0.7	0.1	0.7	0.3	-0.2	0.3	-0.1	0.2	0.2	1.7
20-Jul	0.2	0.1	0.0	0.0	0.0	0.4	0.5	0.4	0.4	0.1	-0.2	0.3	1.0	-0.4	0.1	0.2	-0.2	-0.3	-0.6	0.0	0.8	1.2	0.8	0.6	0.2	1.2
21-Jul	0.7	1.1	1.3	0.8	-0.1	0.4	0.9	0.7	-0.4	0.1	0.6	0.7	0.1	-0.2	0.5	0.1	0.2	-0.3	0.4	-0.1	-0.2	0.0	0.1	0.1	0.3	1.3
22-Jul	0.5	0.2	0.4	0.7	1.8	2.4	1.8	1.2	1.7	0.4	0.7	1.4	0.0	0.7	-0.1	0.9	-0.2	0.1	-0.4	-0.5	0.0	-0.3	0.0	0.1	0.6	2.4
23-Jul	1.3	1.6	0.9	0.7	-0.5	-0.3	-0.2	0.3	0.4	0.3	0.3	-0.1	-0.4	0.2	0.2	-0.1	-0.2	0.0	0.7	0.5	0.7	0.6	1.0	0.7	0.4	1.6
24-Jul	0.1	0.7	0.3	0.1	-0.2	0.7	0.9	0.9	0.7	0.2	0.2	0.2	0.0	0.2	0.2	0.6	-1.2	-1.3	-0.6	0.2	0.3	0.5	0.3	0.6	0.2	0.9
25-Jul	0.0	-0.2	-0.4	-0.6	0.1	-0.2	-0.6	-0.8	-0.8	-0.1	0.2	-0.1	0.4	0.4	-0.6	-0.5	-0.1	-0.2	-0.2	0.3	0.2	-0.1	0.0	0.1	-0.1	0.4
26-Jul	0.3	0.2	0.1	0.1	0.7	0.9	0.8	1.4	0.7	0.8	0.0	0.5	1.2	0.2	0.0	-0.6	-0.3	-0.1	0.2	0.3	0.7	1.3	1.2	0.8	0.5	1.4
27-Jul	0.8	0.0	0.1	0.0	0.1	-0.1	0.1	0.0	0.0	-0.3	-0.5	-0.1	0.6	-0.8	-0.3	-0.3	-0.5	-0.1	0.0	0.0	-0.1	-0.2	-0.2	-0.1	-0.1	0.8
28-Jul	-0.1	0.0	-0.1	-0.2	0.0	0.4	1.1	0.0	0.0	0.1	0.1	1.5	-0.1	0.0	-0.3	0.1	0.1	0.2	-0.1	0.1	1.1	0.5	0.7	0.8	0.3	1.5
29-Jul	1.0	0.2	0.4	0.3	0.6	0.8	0.4	0.9	0.6	0.5	1.3	0.2	0.6	0.8	0.5	-0.1	0.3	0.3	0.4	-0.2	0.5	0.8	1.4	1.1	0.6	1.4
30-Jul	0.3	0.0	0.0	-0.2	-1.0	0.3	0.6	0.4	0.3	0.5	-0.5	0.8	0.6	0.7	0.6	-0.2	0.8	0.2	-0.1	-0.2	0.0	0.0	-0.2	-0.4	0.2	0.8
31-Jul	-0.1	0.1	0.0	-0.1	-0.1	0.1	0.0	-0.2	0.0	-0.2	-0.2	0.5	0.3	-0.2	0.8	0.4	0.6	-0.1	0.1	0.8	0.6	0.0	0.6	-0.3	0.1	0.8
																								Diurnal Average		
																								Diurnal Maximum		



Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

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

Lower Camp Met Tower - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 4.3 km/h on Jul 24 18:00 Minimum Value: 0.2 km/h on Jul 14 22:00 Percentiles: P ₁ = 0.3 P ₁₀ = 0.6 Q ₁ = 1.0 Median = 1.5 Q ₃ = 2.2 P ₉₀ = 2.8 P ₉₉ = 3.6																								Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Jul	1.0	1.0	1.1	1.5	1.0	1.2	1.5	2.1	2.6	2.8	3.6	3.4	3.5	3.0	3.2	3.1	3.1	2.7	2.4	2.3	1.7	1.9	1.7	1.8	3.6
2-Jul	1.8	1.6	1.3	1.8	1.5	1.8	1.4	1.8	2.9	3.9	3.5	3.3	3.2	3.4	3.0	2.9	1.8	2.6	2.6	2.1	1.9	1.7	1.4	1.2	3.9
3-Jul	0.9	1.2	2.2	1.7	1.3	1.6	1.4	1.6	1.7	2.0	2.2	1.8	1.8	2.1	1.2	1.0	1.5	1.6	1.0	0.3	1.4	1.5	1.4	1.2	2.2
4-Jul	1.3	1.0	1.4	1.3	1.7	1.5	1.3	1.4	1.4	1.8	1.5	1.7	1.8	2.0	1.9	2.5	2.4	2.3	1.3	1.5	1.2	1.0	1.6	0.5	2.5
5-Jul	0.6	0.8	0.3	0.3	0.6	0.7	0.8	1.4	1.3	0.7	1.1	0.7	1.7	1.9	1.5	2.0	1.5	1.6	1.3	1.7	1.5	1.4	1.4	1.4	2.0
6-Jul	1.2	1.4	1.2	0.9	0.7	1.4	1.5	1.8	2.6	2.4	2.7	2.6	2.9	2.3	3.4	3.2	3.0	2.2	2.5	1.3	0.6	1.2	1.1	1.7	3.4
7-Jul	1.3	1.4	1.4	1.9	1.8	1.3	1.2	1.9	2.2	2.3	1.8	2.1	1.8	2.2	2.3	2.7	2.6	2.5	2.4	1.9	1.3	1.4	1.0	1.1	2.7
8-Jul	1.1	1.2	0.7	1.0	1.1	1.1	1.5	1.4	1.7	2.0	2.1	1.9	2.4	1.9	1.8	1.9	1.6	1.7	1.4	1.3	1.1	1.6	1.8	1.6	2.4
9-Jul	0.7	0.7	0.6	1.0	1.4	1.5	1.4	0.9	1.3	1.0	0.8	1.3	1.5	1.3	1.8	2.1	1.1	1.5	1.1	1.0	0.5	0.5	0.8	0.6	2.1
10-Jul	0.7	0.7	0.7	0.7	0.6	0.5	0.6	1.0	1.0	1.3	1.6	2.1	2.6	2.4	3.2	2.8	2.4	1.5	2.3	1.7	1.7	1.2	0.9	0.6	3.2
11-Jul	0.5	0.4	0.4	0.3	0.4	0.9	0.8	1.3	1.8	2.3	2.4	2.5	2.1	2.4	2.2	2.2	1.8	2.3	2.3	1.6	1.3	0.6	0.5	0.7	2.5
12-Jul	0.8	0.7	0.8	0.7	1.2	1.5	1.8	1.8	2.2	2.3	2.3	2.3	2.9	2.9	3.3	3.2	3.1	2.8	3.0	2.2	2.0	0.9	1.0	1.0	3.3
13-Jul	0.4	0.6	0.6	1.0	1.0	1.1	1.8	2.3	2.2	2.5	2.6	2.9	2.4	3.4	2.9	2.5	3.0	2.9	1.8	1.4	0.6	0.7	1.1	1.3	3.4
14-Jul	1.0	0.4	0.4	0.6	0.3	0.3	0.4	0.7	0.8	1.1	1.1	1.7	2.8	2.8	3.0	2.8	2.0	0.6	0.6	0.3	0.3	0.2	0.2	0.2	3.0
15-Jul	0.3	0.2	0.2	0.3	0.5	0.4	0.8	1.0	1.7	2.7	2.5	2.9	3.2	2.7	3.2	3.0	2.1	2.1	1.5	1.3	0.8	0.9	0.6	0.8	3.2
16-Jul	1.1	1.7	1.2	1.6	2.3	2.2	2.8	2.1	2.0	2.0	1.3	1.0	1.7	2.4	1.2	1.0	1.0	2.8	0.7	0.7	1.2	0.9	1.0	0.8	2.8
17-Jul	0.6	0.5	0.5	0.9	0.4	1.0	1.3	1.9	2.7	2.8	2.7	3.1	3.1	3.0	3.3	2.6	2.3	1.9	1.5	1.1	0.3	0.3	0.3	0.4	3.3
18-Jul	0.6	0.6	0.5	0.4	0.4	1.0	1.4	1.3	0.9	1.0	1.1	1.6	2.8	2.2	2.7	2.4	2.6	2.3	2.4	1.5	1.1	1.1	1.4	2.5	2.8
19-Jul	2.6	1.6	1.5	1.6	1.1	1.2	1.3	1.4	1.3	2.3	3.0	2.8	3.3	3.4	3.2	3.5	3.5	2.8	1.2	1.1	2.2	0.9	0.7	1.1	3.5
20-Jul	1.4	0.8	0.9	1.1	1.3	1.5	1.6	1.6	1.3	0.9	0.8	1.4	2.1	0.9	1.8	2.1	1.4	1.2	1.2	0.8	0.7	1.4	1.9	1.9	2.1
21-Jul	1.2	1.6	2.0	2.2	2.0	1.5	1.8	2.6	2.4	1.9	2.6	2.7	3.2	2.8	2.9	3.6	3.9	3.5	2.8	2.6	2.5	1.6	1.2	0.6	3.9
22-Jul	0.6	1.4	1.7	1.7	2.0	1.9	1.9	2.5	2.7	2.6	2.5	3.1	3.0	2.6	2.1	2.8	1.9	1.7	2.2	2.4	0.9	1.0	0.4	0.6	3.1
23-Jul	1.3	1.7	1.4	1.5	1.4	0.7	0.5	1.5	2.0	1.9	2.1	2.7	2.0	2.6	2.9	1.2	1.7	0.8	1.5	1.3	0.7	0.8	1.1	1.3	2.9
24-Jul	1.2	1.1	1.3	1.6	1.8	1.9	2.1	2.9	3.0	2.7	3.3	3.4	3.2	3.6	3.4	3.3	4.2	4.3	3.3	2.4	2.4	2.5	2.3	2.5	4.3
25-Jul	2.6	2.8	1.6	1.2	1.1	1.2	2.1	2.0	2.2	2.1	2.4	2.0	1.8	2.3	1.8	2.1	1.6	1.4	1.6	1.4	1.1	1.2	0.6	0.9	2.8
26-Jul	0.9	1.1	0.8	0.8	1.2	1.3	1.8	1.7	1.6	1.6	1.7	2.6	2.8	2.6	2.5	2.8	2.4	2.2	1.7	1.4	1.2	1.8	1.9	2.0	2.8
27-Jul	1.5	1.2	0.9	0.8	0.7	0.8	0.7	0.6	0.7	0.7	1.4	2.0	2.6	2.2	1.1	1.4	2.1	1.2	1.1	1.4	0.8	1.1	0.9	0.9	2.6
28-Jul	0.5	0.3	0.3	0.6	0.7	1.0	1.1	0.6	0.4	0.6	1.0	1.9	0.6	1.3	1.9	2.1	1.8	1.7	0.7	0.8	2.5	1.8	1.5	1.6	2.5
29-Jul	0.9	1.4	1.6	1.0	0.9	1.3	1.7	1.7	1.7	2.0	2.4	2.8	2.8	2.6	2.8	2.5	3.0	2.5	1.4	1.2	1.2	1.4	1.2	1.0	3.0
30-Jul	2.0	0.8	1.2	1.7	1.8	1.2	1.5	1.2	0.9	1.6	1.5	2.5	2.3	2.6	2.6	2.7	2.8	2.3	1.6	1.0	1.4	1.0	1.2	1.0	2.8
31-Jul	1.5	1.2	0.9	1.4	0.5	1.5	1.1	0.6	0.7	0.8	1.0	1.3	2.0	1.6	1.9	1.5	1.6	1.0	1.2	1.2	1.6	1.6	1.9	2.0	2.0
	2.6	2.8	2.2	2.2	2.3	2.2	2.8	2.9	3.0	3.9	3.6	3.4	3.5	3.6	3.4	3.6	4.2	4.3	3.3	2.6	2.5	2.5	2.3	2.5	
	Diurnal Maximum																								



Maximum Value: 5.7 km/h on Jul 19 01:00 Maximum Daily Average: 1.4 km/h on Jul 1																								Hours in Service:	744	
Minimum Value: -1.5 km/h on Jul 8 12:00 Minimum Daily Average: -0.1 km/h on Jul 12																								Hours of Data:	740	
Maximum Diurnal Average: 0.8 km/h at hour 23 Minimum Diurnal Average: 0.1 km/h at hour 17																								Hours of Missing Data:	4	
Monthly Average: 0.46 km/h Percentiles: P ₁ = -1.0 P ₁₀ = -0.3 Q ₁ = 0.0 Median = 0.3 Q ₃ = 0.8 P ₉₀ = 1.4 P ₉₉ = 3.1																								Hours of Calibration:	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-Jul	2.3	0.8	0.8	0.6	1.1	0.9	1.2	1.5	2.5	2.9	2.3	2.4	1.7	1.8	2.2	1.2	1.4	1.2	1.6	0.6	-0.5	1.0	1.1	0.8	1.4	2.9
2-Jul	1.1	2.1	2.2	1.6	0.3	1.0	0.6	0.5	1.9	2.4	0.1	1.8	0.5	0.8	0.2	1.5	0.4	2.6	2.1	1.9	0.2	1.6	2.6	1.8	1.3	2.6
3-Jul	2.2	2.7	1.2	-1.2	-0.4	-0.3	0.3	1.1	0.3	-0.1	1.8	2.2	1.1	1.1	1.3	0.4	0.2	0.0	0.1	0.4	0.3	0.9	0.6	0.5	0.7	2.7
4-Jul	1.2	-0.3	0.8	0.9	1.4	0.9	1.7	1.1	1.3	1.0	0.7	1.0	0.9	1.4	2.2	2.2	0.7	0.1	1.2	1.5	1.6	0.7	0.5	0.2	1.0	2.2
5-Jul	0.0	0.3	0.1	0.4	-0.2	0.0	0.2	0.1	0.3	0.1	0.2	0.4	0.4	-0.2	0.6	0.3	0.0	0.2	-0.3	0.4	-0.2	0.8	-0.4	-0.8	0.1	0.8
6-Jul	0.1	0.5	-0.3	-0.5	-0.3	-0.1	0.4	0.9	-0.1	-0.5	0.1	0.6	0.5	0.4	0.4	0.9	-0.6	0.3	1.3	0.2	0.1	0.3	0.0	0.8	0.2	1.3
7-Jul	0.3	0.1	1.0	0.8	1.0	0.1	0.0	0.4	-0.3	-0.1	-0.4	-0.1	-0.9	-0.7	0.4	0.2	0.4	0.5	1.0	0.6	0.5	0.8	0.3	0.4	0.3	1.0
8-Jul	0.4	0.5	0.1	0.1	0.8	0.0	0.0	0.2	-0.2	-0.8	-0.5	-1.5	-0.5	0.1	-0.2	-0.4	-0.4	0.3	0.3	0.7	0.7	1.4	1.3	0.0	0.1	1.4
9-Jul	0.0	-0.2	0.2	0.3	0.0	-0.1	-0.1	0.0	0.1	0.2	-0.2	0.3	0.2	-0.5	-0.4	0.0	0.7	-0.2	0.0	0.3	0.3	0.8	0.9	0.2	0.1	0.9
10-Jul	0.1	-0.1	0.0	0.1	0.2	0.5	0.5	0.1	-0.2	-0.1	-0.2	-0.3	0.6	0.7	0.6	-0.6	0.2	0.0	1.1	1.3	1.0	-0.2	-0.4	0.0	0.2	1.3
11-Jul	0.1	0.2	0.0	-0.1	0.1	0.0	0.2	-0.3	0.0	0.4	0.9	-1.0	0.2	-0.6	-0.6	-0.3	-0.3	0.0	0.4	0.3	0.2	0.3	-0.1	0.0	0.0	0.9
12-Jul	0.0	0.0	0.0	-0.1	0.4	0.2	0.2	-0.1	-0.6	-0.6	-0.1	-0.2	-0.1	-0.2	-1.1	-0.9	-0.9	0.4	-0.1	0.4	0.3	0.2	0.1	0.0	-0.1	0.4
13-Jul	0.0	-0.1	0.0	0.0	0.1	0.2	-0.3	0.0	-0.2	0.1	0.4	0.2	-0.4	0.8	-0.3	-0.1	0.3	0.2	0.3	0.4	0.4	-0.1	-0.2	0.0	0.1	0.8
14-Jul	0.3	0.6	0.5	0.3	0.2	0.0	-0.1	0.0	0.2	-0.1	-0.9	-0.6	0.8	0.8	0.1	-0.8	0.3	-0.3	-0.1	0.1	-0.2	-0.3	-0.1	0.2	0.0	0.8
15-Jul	0.2	-0.1	-0.1	0.1	0.3	0.1	0.0	0.1	-0.1	0.2	0.0	0.6	0.4	0.1	-0.1	0.0	0.0	-0.9	-0.3	-0.1	-0.1	-0.4	-0.5	-0.2	0.0	0.6
16-Jul	-0.2	-0.1	-0.5	-0.2	-1.0	-0.2	4.0	2.7	1.0	0.9	-0.3	-0.3	0.1	-0.2	0.1	-0.1	-0.1	-0.1	0.1	-0.1	0.0	-0.2	-0.2	0.1	0.2	4.0
17-Jul	-0.2	-0.2	0.2	0.1	0.1	-0.1	0.2	-0.2	0.9	-0.2	-0.5	-0.4	0.3	-1.0	-0.3	-0.9	0.1	0.1	-0.1	0.4	0.2	0.1	0.2	0.5	0.0	0.9
18-Jul	0.6	0.1	0.2	0.3	0.4	0.5	0.6	0.3	0.1	0.3	0.1	0.2	0.8	1.8	0.2	-0.2	0.7	1.0	1.5	1.6	1.9	2.5	3.2	4.6	1.0	4.6
19-Jul	5.7	1.5	0.9	0.6	0.3	0.5	0.6	0.2	0.0	0.6	0.8	0.1	0.4	1.1	0.3	0.1	-0.5	0.5	0.7	0.7	0.6	0.2	0.1	0.6	0.7	5.7
20-Jul	0.7	0.5	0.4	0.1	0.3	0.6	0.4	0.6	0.4	0.3	0.0	0.1	1.0	-0.2	0.2	0.4	-0.5	-0.2	-0.7	0.2	1.1	3.5	4.6	3.2	0.7	4.6
21-Jul	1.1	1.6	2.4	2.0	0.2	0.8	1.5	1.4	0.0	0.7	1.3	1.2	1.0	0.5	1.3	1.1	0.2	-0.1	0.7	-0.1	0.3	0.8	0.3	0.2	0.8	2.4
22-Jul	0.6	0.4	0.6	0.7	2.4	2.3	1.8	1.3	1.3	0.6	0.9	1.0	0.5	1.7	1.0	1.7	0.2	0.3	0.1	-0.1	0.1	-0.3	0.2	0.3	0.8	2.4
23-Jul	1.5	1.8	0.6	1.2	-0.2	-0.2	-0.1	0.1	0.1	0.0	0.5	0.2	-0.5	0.4	0.6	0.1	0.4	0.1	1.5	1.5	1.3	0.7	1.4	1.3	0.6	1.8
24-Jul	0.7	0.9	0.7	0.5	0.5	3.4	2.4	1.8	1.2	0.6	0.8	0.8	0.6	0.9	1.1	1.4	-0.9	-1.5	-1.5	1.0	1.1	1.3	1.0	1.2	0.8	3.4
25-Jul	0.5	0.2	-0.1	-0.4	0.5	0.3	0.1	-0.6	-0.7	-0.1	0.1	0.0	0.5	1.1	-0.7	-0.9	-0.3	-0.3	-0.1	0.8	0.9	0.2	0.5	1.0	0.1	1.1
26-Jul	1.4	1.2	0.4	0.9	1.5	1.4	1.2	1.3	0.5	0.4	-0.5	1.0	1.4	0.8	-0.1	-0.7	-0.4	0.0	0.2	0.3	0.6	1.5	1.0	0.4	0.7	1.5
27-Jul	0.3	0.4	0.7	0.6	0.8	0.5	0.4	0.2	-0.3	0.0	-0.4	0.1	0.3	-1.3	-0.3	-0.4	-0.7	0.0	0.2	0.0	0.3	-0.1	0.1	0.2	0.1	0.8
28-Jul	0.1	0.2	0.1	0.2	0.1	0.8	1.7	0.0	0.0	0.2	0.1	1.1	-0.2	-0.1	-0.3	-0.1	0.1	0.3	0.2	0.5	1.9	1.6	2.7	2.6	0.6	2.7
29-Jul	1.3	0.8	0.8	0.2	0.7	1.4	0.9	1.1	0.9	0.7	1.8	0.7	1.0	0.5	1.1	0.4	0.8	1.0	1.0	0.9	0.4	0.8	1.2	1.3	0.9	1.8
30-Jul	0.7	0.6	0.5	0.5	-0.6	1.3	1.7	0.9	0.7	0.4	-0.7	0.6	-0.2	0.6	0.2	0.2	1.0	0.1	0.2	0.1	0.4	0.4	-0.2	0.0	0.4	1.7
31-Jul	0.1	0.6	0.2	0.1	-0.1	0.2	0.0	0.1	UO	UO	UO	0.5	UO	0.5	1.3	0.2	0.9	-0.3	0.4	1.2	1.3	0.7	1.4	0.7	0.5	1.4
																								Diurnal Average		
																								Diurnal Maximum		
UO - Unstable Operation																										



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

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

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 8.1 km/h on Jul 24 18:00 Minimum Value: 0.2 km/h on Jul 14 22:00 Percentiles: P ₁ = 0.3 P ₁₀ = 0.6 Q ₁ = 1.0 Median = 1.5 Q ₃ = 2.3 P ₉₀ = 3.0 P ₉₉ = 4.0																								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-Jul	0.8	1.1	1.1	1.6	1.1	1.2	1.8	2.3	2.9	3.2	4.0	3.7	3.7	3.2	3.9	3.9	4.0	3.1	2.7	2.1	1.0	1.3	1.1	1.7	4.0	
2-Jul	1.0	1.7	1.8	1.9	1.7	2.2	1.7	2.2	3.1	4.2	3.1	3.7	3.2	3.0	2.4	2.8	1.6	2.7	2.6	2.0	2.3	1.7	1.7	1.4	4.2	
3-Jul	1.3	1.5	2.4	1.6	1.4	1.5	1.3	1.6	1.8	2.2	4.5	2.9	2.3	2.0	1.2	1.1	1.3	1.2	0.9	0.4	1.6	1.4	1.4	1.3	4.5	
4-Jul	1.2	1.1	1.4	1.1	1.6	1.2	1.3	1.4	1.2	1.4	1.5	1.6	1.3	1.7	1.5	2.2	2.4	1.9	1.2	1.2	0.8	0.7	1.6	0.6	2.4	
5-Jul	0.7	0.9	0.4	0.3	0.4	0.6	0.8	1.1	1.6	0.6	0.9	0.8	1.9	1.9	1.6	2.0	1.4	1.7	1.1	1.7	1.9	1.6	1.8	1.5	2.0	
6-Jul	1.3	1.4	1.2	0.9	1.0	1.6	1.3	1.7	2.6	2.7	3.0	3.0	3.2	1.8	3.1	3.7	3.4	2.2	2.9	1.5	0.9	1.1	1.1	1.3	3.7	
7-Jul	1.2	1.5	1.7	2.0	2.0	1.5	1.4	1.9	2.0	2.7	2.2	2.4	1.9	2.4	2.4	2.7	2.9	2.6	2.8	1.9	1.0	0.7	1.2	0.8	2.9	
8-Jul	1.1	0.8	1.1	1.2	1.2	1.2	1.4	1.6	1.5	2.0	2.2	1.9	2.8	1.8	1.5	1.9	1.8	2.2	1.7	1.3	0.6	0.7	1.9	2.0	2.8	
9-Jul	1.0	0.5	0.5	1.0	1.1	1.3	1.1	0.7	1.3	0.9	1.1	1.5	1.1	1.0	2.2	2.2	1.4	1.9	1.1	1.0	0.5	0.6	1.0	1.0	2.2	
10-Jul	1.0	0.9	0.5	0.4	0.5	0.6	0.7	0.8	0.6	0.7	1.4	1.6	3.1	2.7	3.6	3.2	2.7	1.7	2.3	1.5	2.0	1.5	0.9	1.1	3.6	
11-Jul	0.6	0.5	0.5	0.5	0.3	0.5	0.7	1.3	1.7	2.1	2.7	3.1	2.3	2.1	1.7	2.1	1.9	2.7	2.4	1.9	1.4	0.7	0.8	0.6	3.1	
12-Jul	1.0	1.1	0.9	0.9	1.2	1.3	1.5	1.9	2.2	2.7	2.4	2.6	3.1	3.3	3.1	3.0	2.6	2.8	2.9	2.3	1.8	0.6	1.2	1.4	3.3	
13-Jul	0.6	0.6	0.5	0.9	0.8	1.0	1.7	2.1	2.1	2.5	3.2	3.2	2.7	3.8	3.1	2.4	3.2	3.0	1.9	1.3	0.6	0.8	1.3	1.2	3.8	
14-Jul	0.7	0.5	0.4	0.3	0.3	0.3	0.3	0.4	0.7	0.8	1.3	1.4	3.6	2.8	3.3	3.1	2.0	0.7	0.7	0.3	0.3	0.2	0.3	0.2	3.6	
15-Jul	0.3	0.3	0.2	0.2	0.3	0.5	0.7	1.1	1.7	2.5	2.9	3.1	3.1	2.8	3.3	2.9	2.5	2.1	1.5	1.4	0.6	0.8	0.7	1.0	3.3	
16-Jul	0.9	1.6	1.0	1.7	2.1	2.4	2.5	2.1	1.9	2.4	1.5	1.3	2.1	3.6	1.5	0.8	1.3	4.8	0.6	0.6	1.1	0.8	0.8	0.8	4.8	
17-Jul	0.8	0.4	0.6	0.6	0.5	0.9	1.7	1.8	2.7	3.0	3.1	3.7	3.6	3.5	3.7	3.0	2.8	2.2	1.6	0.9	0.3	0.2	0.2	0.4	3.7	
18-Jul	0.7	0.6	0.6	0.4	0.5	0.7	0.7	0.8	0.6	0.8	0.9	1.4	2.9	2.2	3.0	2.5	2.8	2.7	2.8	1.1	0.8	0.5	0.6	1.0	3.0	
19-Jul	1.3	2.2	1.2	1.1	0.9	0.9	1.3	1.1	1.0	2.4	3.1	2.7	3.2	3.6	3.2	3.6	3.2	2.7	1.1	1.2	1.9	1.0	0.6	1.1	3.6	
20-Jul	1.3	0.7	0.8	1.0	1.4	1.6	1.6	1.8	1.3	1.0	0.8	1.4	2.2	0.6	1.6	2.2	1.8	1.4	1.2	1.0	0.8	1.1	1.6	1.8	2.2	
21-Jul	1.2	1.6	1.7	2.0	2.2	2.0	1.8	1.9	1.8	1.8	2.4	2.4	3.0	2.5	2.2	3.6	4.0	3.4	3.0	2.8	2.4	1.1	1.4	0.6	4.0	
22-Jul	0.7	1.2	1.2	1.4	2.3	1.9	2.0	2.7	2.3	1.9	2.3	3.1	2.4	2.6	1.8	2.7	2.1	1.9	2.1	2.1	1.1	1.1	0.4	0.7	3.1	
23-Jul	1.6	1.7	0.9	1.4	1.3	0.8	0.4	1.1	1.9	1.9	2.3	2.7	1.7	3.0	3.3	1.0	2.1	0.7	1.5	1.2	0.5	1.1	0.9	0.8	3.3	
24-Jul	1.2	0.9	0.8	1.3	1.7	1.7	1.9	2.9	2.8	2.4	2.8	2.9	3.0	3.1	2.9	2.9	3.9	8.1	7.6	2.2	2.4	2.5	2.3	2.3	8.1	
25-Jul	2.2	2.4	1.8	1.5	1.5	1.6	2.2	1.9	2.3	2.1	3.0	2.1	1.8	3.1	1.9	2.4	1.5	1.7	1.8	1.3	0.5	1.4	0.9	1.2	3.1	
26-Jul	1.2	1.3	1.4	1.2	1.0	1.2	1.9	1.8	1.8	1.7	1.8	2.8	2.7	2.7	2.5	2.9	2.3	2.2	1.3	0.6	0.6	1.2	1.6	1.5	2.9	
27-Jul	1.4	0.9	0.9	0.8	0.9	0.8	0.5	0.5	0.8	0.6	1.3	2.0	2.7	2.3	1.2	1.6	2.5	1.7	1.2	1.2	0.5	1.2	1.2	1.1	2.7	
28-Jul	0.6	0.4	0.3	0.7	0.7	0.8	1.0	0.7	0.5	0.4	0.6	1.7	0.6	1.2	2.0	2.3	1.6	1.6	0.9	1.5	2.0	1.8	1.2	1.3	2.3	
29-Jul	0.7	1.3	1.5	1.0	0.9	1.0	1.8	1.7	1.5	1.9	2.4	2.9	2.9	2.6	3.4	2.7	3.3	2.8	1.6	0.9	0.7	1.3	1.5	1.3	3.4	
30-Jul	2.4	0.8	1.0	1.8	1.3	1.5	1.4	1.2	0.8	1.5	1.3	2.7	2.2	2.9	2.0	2.6	2.7	2.4	1.6	0.9	1.5	0.9	1.0	0.6	2.9	
31-Jul	1.3	1.4	1.2	1.7	0.7	1.3	1.5	0.7	UO	UO	UO	1.6	UO	1.5	2.1	1.4	1.5	0.9	1.1	1.5	1.6	1.7	2.0	2.4	2.4	
	2.4	2.4	2.4	2.0	2.3	2.4	2.5	2.9	3.1	4.2	4.5	3.7	3.7	3.8	3.9	3.9	4.0	8.1	7.6	2.8	2.4	2.5	2.3	2.4		
Diurnal Maximum																										
UO - Unstable Operation																										



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

AMS 4 BUFFALO VIEWPOINT JULY 2016

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

August 29, 2016



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

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	703	34	41	99.06	113	0	11	0
H2S (ppb) Average	702	34	42	98.92	7	0	1	0
THC (ppm) Average	704	33	40	99.06	3.5	-	2.6	-
Temperature (C) Average	744	0	0	100.00	30.3	-	22.9	-
Relative Humidity (%) Average	744	0	0	100.00	99	-	94	-
Wind Speed 10 m (km/h) Average	744	0	0	100.00	31	-	18	-
Wind Direction 10 m (deg) Average	744	0	0	100.00	-	-	-	-

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

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

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	703	1.6	7	-	0	0	0	0	0	2	113
H2S (ppb) Average	702	0.3	0	-	0	0	0	0	0	1	7
THC (ppm) Average	704	2.34	0.2	-	2	2.1	2.2	2.3	2.4	2.7	3.5
Temperature 2 m (C) Average	744	19.08	4.6	-	5.6	13.7	15.7	18.2	22.8	25.7	30.3
Relative Humidity (%) Average	744	68	20	-	22	41	52	71	85	94	99
Wind Speed 10 m (km/h) Average	744	9.8	5	-	1	5	7	9	12	16	31
Wind Direction 10 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-

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

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
SO2, THC, H2S	24 Jul 2016 08:00	24 Jul 2016 11:00	4	Station Power Failure
SO2, THC	25 Jul 2016 15:00	25 Jul 2016 15:00	1	Maintenance - investigate low daily spans
SO2, THC	26 Jul 2016 10:00	26 Jul 2016 10:00	1	Maintenance - repairs to calibration system
SO2, THC	26 Jul 2016 13:00	26 Jul 2016 13:00	1	Maintenance - repairs to calibration system
H2S	26 Jul 2016 10:00	26 Jul 2016 13:00	4	Maintenance - repairs to calibration system



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

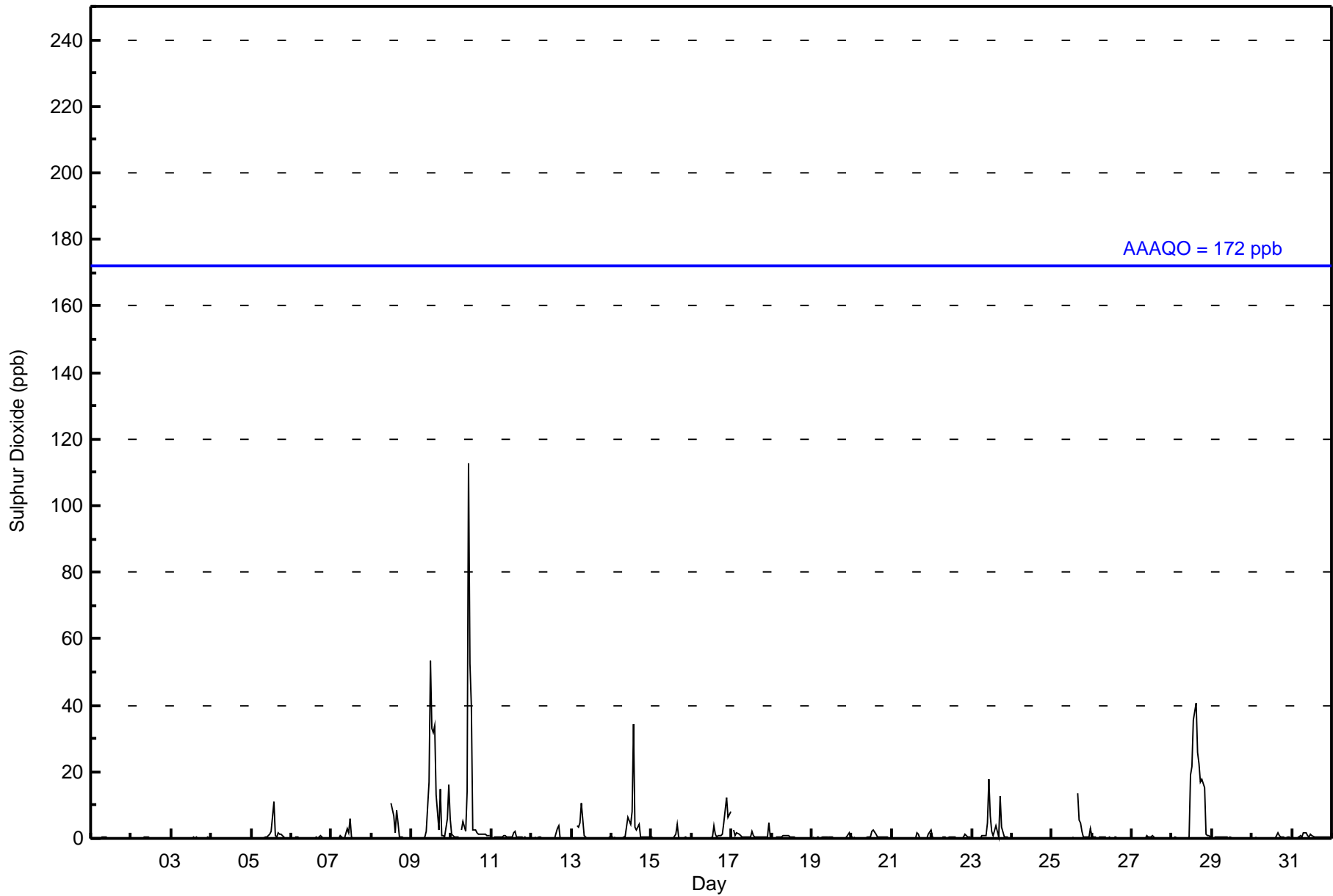
Buffalo Viewpoint - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																
Maximum Value: 113 ppb on Jul 10 11:00										Maximum Daily Average: 10.8 ppb on Jul 10										Hours of Data: 703						
Minimum Value: 0 ppb on Jul 4 23:00										Minimum Daily Average: 0.1 ppb on Jul 4										Hours of Missing Data: 41						
Maximum Diurnal Average: 5.6 ppb at hour 11										Minimum Diurnal Average: 0.2 ppb at hour 1										Hours of Calibration: 34						
Monthly Average: 1.6 ppb										Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 0 P ₉₀ = 2 P ₉₉ = 34										Percent Operational Time: 99.1						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	0	0	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
2-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
3-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
4-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
5-Jul	Z	0	0	0	0	0	0	0	1	1	1	1	2	11	1	0	2	1	1	0	0	0	0	0	1.0	11
6-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0.2	1
7-Jul	0	0	Z	0	0	1	1	0	0	3	2	6	0	0	0	0	0	0	0	0	0	0	0	0	0.6	6
8-Jul	0	0	0	Z	0	0	0	0	0	C	C	C	11	7	2	8	4	1	0	0	0	0	0	0	1.7	11
9-Jul	0	0	0	0	Z	0	0	0	0	2	17	53	33	32	34	13	3	15	1	1	1	6	16	6	10.1	53
10-Jul	1	1	0	0	0	Z	3	5	2	14	113	53	40	2	3	2	1	1	1	1	1	1	1	1	10.8	113
11-Jul	Z	0	0	0	0	0	0	1	1	0	0	0	2	2	1	1	0	0	0	0	0	0	0	0	0.5	2
12-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	3	4	0	0	0	0	0	0	0	0	0.4	4
13-Jul	0	1	Z	4	3	5	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.1	10
14-Jul	0	0	0	Z	0	0	0	0	1	3	6	4	8	34	3	4	0	0	0	0	0	0	0	0	3.0	34
15-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	4	0	0	0	0	0	0	0	0	0.4	4
16-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	4	1	0	1	1	1	5	9	12	6	8	2.2	12	
17-Jul	Z	3	1	2	1	1	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	4	1	0.9	4	
18-Jul	0	Z	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
19-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0.3	2	
20-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	2	2	1	0	0	0	0	0	0	0	0	0	0.5	2
21-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	1	3	0.4	3	
22-Jul	0	0	0	0	0	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0.3	1	
23-Jul	Z	0	0	0	0	0	1	1	5	18	7	2	1	4	2	0	13	3	0	0	0	0	0	2.6	18	
24-Jul	0	Z	0	0	0	0	0	PF	PF	PF	PF	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
25-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	1	M	14	6	5	2	1	0	0	0	3	1.5	14	
26-Jul	1	0	0	Z	1	0	0	0	0	M	0	0	M	0	0	0	0	0	0	0	0	0	0	0.3	1	
27-Jul	0	0	0	0	Z	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0.2	1	
28-Jul	0	0	0	0	0	Z	0	0	0	0	19	21	36	41	26	22	17	18	15	1	1	1	1	9.5	41	
29-Jul	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	
30-Jul	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0.3	2	
31-Jul	0	0	Z	0	0	1	0	2	2	1	0	1	1	0	0	0	1	0	0	0	0	0	0	0.6	2	
0.2 0.3 0.2 0.4 0.4 0.4 0.6 0.5 0.4 1.2 5.6 5.0 4.2 4.4 3.2 2.7 1.7 1.9 1.0 0.9 0.5 0.8 1.1 0.8																								Diurnal Average		
1 3 1 4 3 5 10 5 2 14 113 53 40 36 41 26 22 17 18 15 9 12 16 8																								Diurnal Maximum		
Z - zerospan C - Calibration M - Maintenance 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 (SO₂) - ppb
Buffalo Viewpoint - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	675	96.02	96.02
11 - 20	15	2.13	98.15
21 - 60	12	1.71	99.86
61 - 110	0	0.00	99.86
111 - 172	1	0.14	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 703

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

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

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	146	55	10	4	4	6	62	66	33	35	26	57	34	51	34	52	675
11 - 20	4	2	0	2	0	0	0	1	0	0	2	0	2	0	1	1	15
21 - 60	2	1	0	0	1	0	0	0	1	1	1	0	1	2	1	1	12
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	153	58	10	6	5	6	62	67	34	36	29	57	37	53	36	54	703

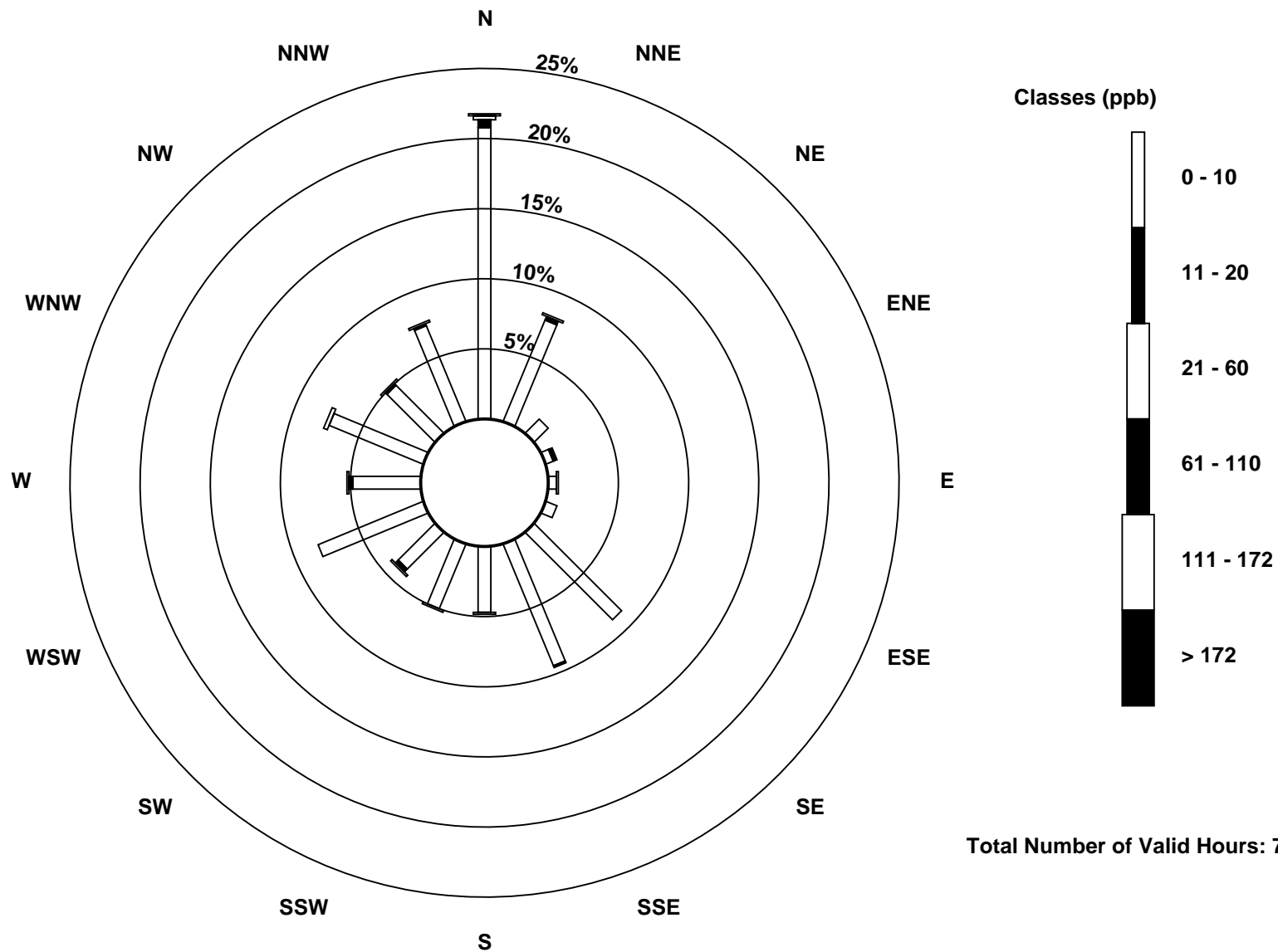
Total Number of Valid Hours: 703

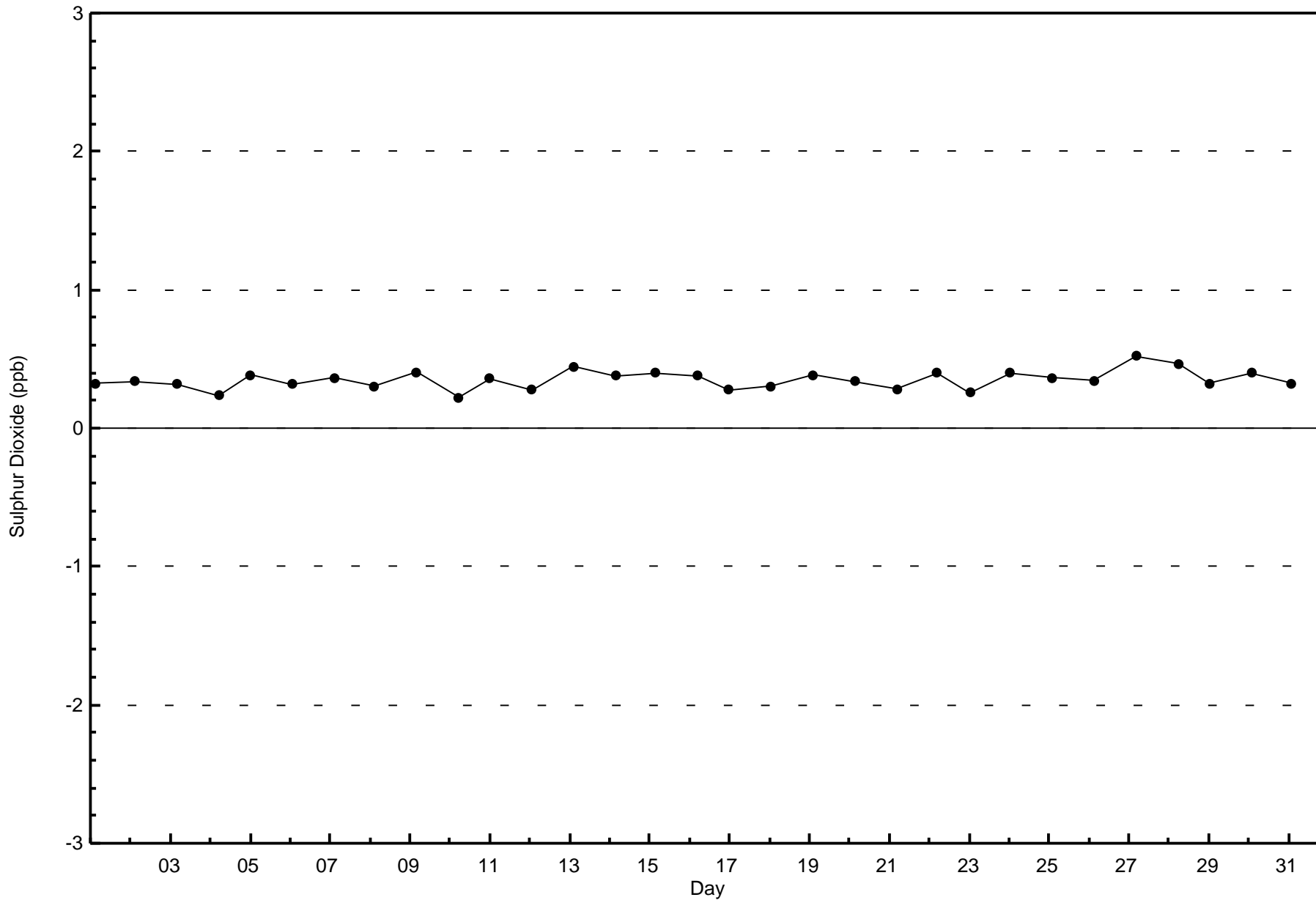
Total Number of Hours: 744

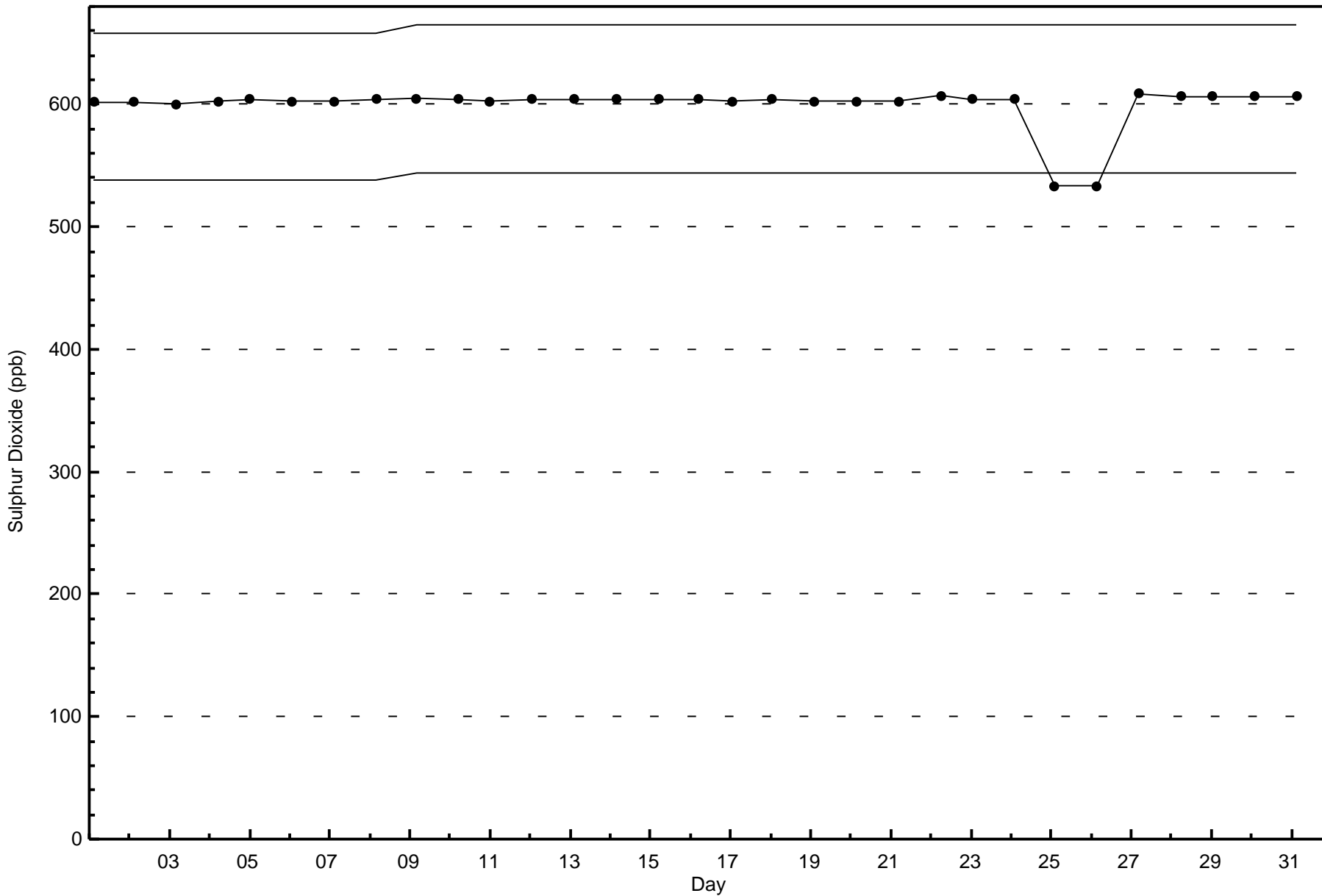


Wood Buffalo Environmental Association
Wind Rose Jul 2016

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

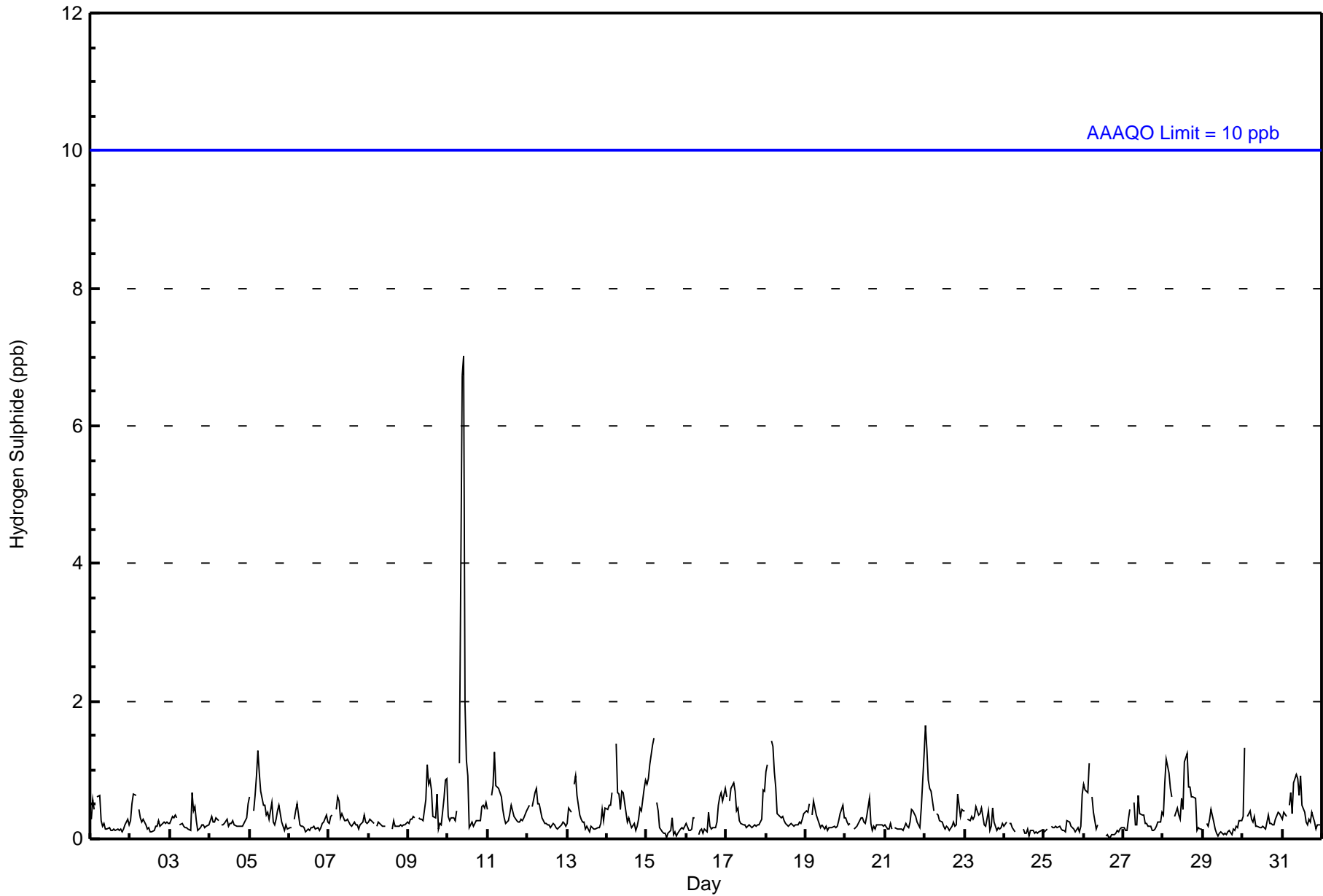








Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																
Maximum Value: 7 ppb on Jul 10 10:00										Maximum Daily Average: 1.1 ppb on Jul 10										Hours of Data: 702						
Minimum Value: 0 ppb on Jul 26 16:00										Minimum Daily Average: 0.1 ppb on Jul 24										Hours of Missing Data: 42						
Maximum Diurnal Average: 0.6 ppb at hour 5										Minimum Diurnal Average: 0.2 ppb at hour 19										Hours of Calibration: 34						
Monthly Average: 0.3 ppb										Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 1										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-Jul	0	1	0	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
2-Jul	0	1	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
3-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.3	1
4-Jul	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2	1
5-Jul	1	Z	0	1	1	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.5	1
6-Jul	0	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
7-Jul	0	0	0	Z	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
8-Jul	0	0	0	0	Z	0	0	0	0	0	0	C	C	C	0	0	0	0	0	0	0	0	0	0	0.2	0
9-Jul	0	0	0	0	0	Z	0	0	0	0	1	1	1	1	1	0	0	1	0	0	0	1	1	1	0.5	1
10-Jul	0	0	0	0	0	0	Z	1	7	7	2	1	1	0	0	0	0	0	0	0	0	0	0	1	1.1	7
11-Jul	0	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
12-Jul	0	0	Z	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
13-Jul	0	0	0	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
14-Jul	0	0	0	1	Z	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0.5	1
15-Jul	1	1	1	1	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
16-Jul	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0.3	1
17-Jul	1	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.4	1
18-Jul	1	1	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1
19-Jul	0	0	1	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
20-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.2	1
21-Jul	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
22-Jul	2	1	1	1	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.4	2
23-Jul	0	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
24-Jul	0	0	Z	0	0	0	0	PF	PF	PF	PF	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
25-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2	1
26-Jul	1	1	1	1	Z	1	0	0	0	M	M	M	M	0	0	0	0	0	0	0	0	0	0	0	0.3	1
27-Jul	0	0	0	0	0	Z	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
28-Jul	0	1	1	1	1	1	Z	0	0	0	0	1	0	1	1	1	1	1	1	1	1	0	0	0	0.6	1
29-Jul	0	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
30-Jul	0	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
31-Jul	0	0	0	Z	0	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
0.4 0.5 0.4 0.5 0.6 0.6 0.4 0.4 0.5 0.5 0.3 0.3 0.2 0.3 0.3 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.3 0.3 0.4																								Diurnal Average		
2 1 1 1 1 1 1 1 7 7 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1																								Diurnal Maximum		
Z - zerospan C - Calibration M - Maintenance PF - Power Failure																										
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb 24-hr 3 ppb																										





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	700	99.72	99.72
3 - 4	0	0.00	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: 702

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

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

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	149	57	10	6	6	7	59	68	33	37	28	54	39	52	36	59	700
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	151	57	10	6	6	7	59	68	33	37	28	54	39	52	36	59	702

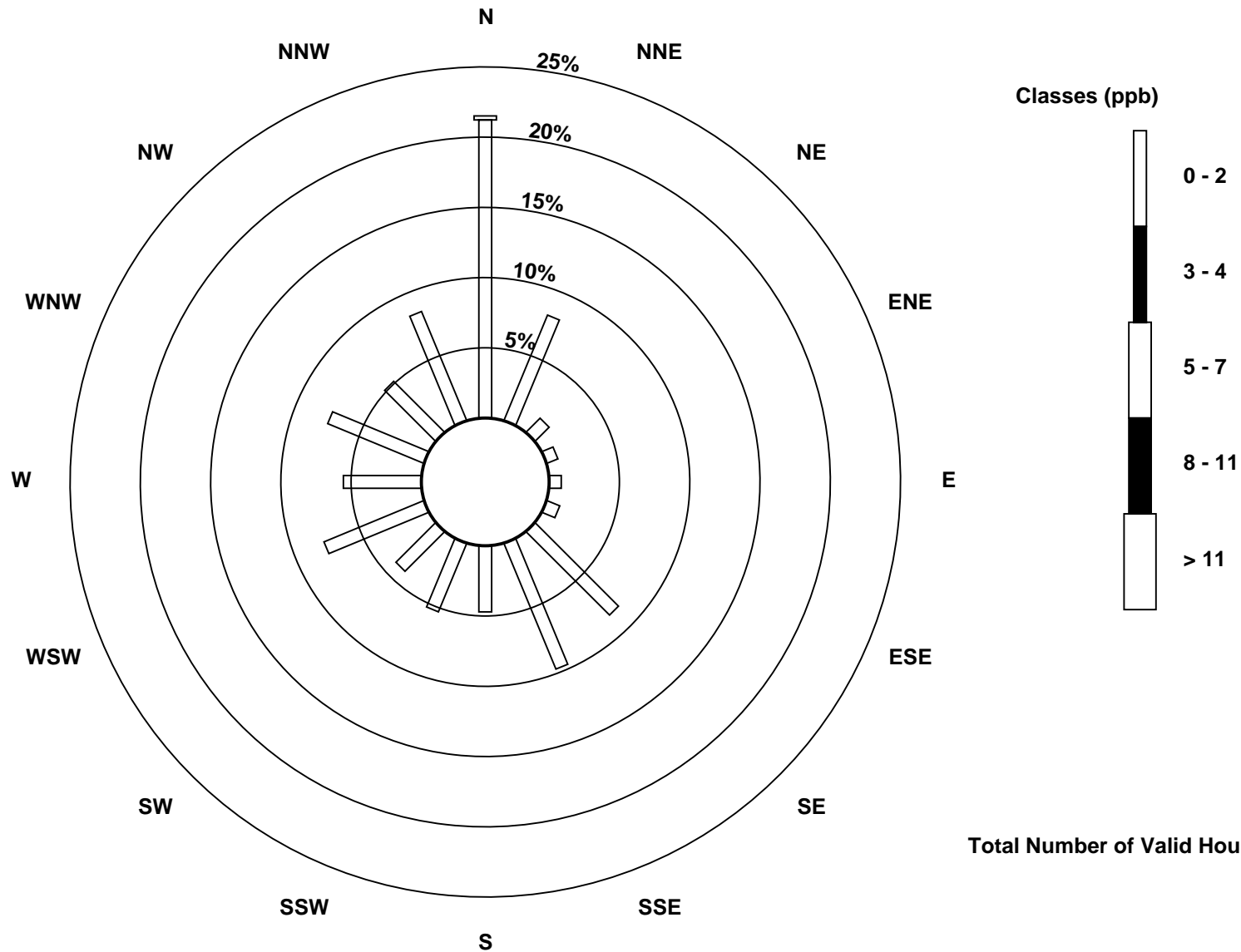
Total Number of Valid Hours: 702

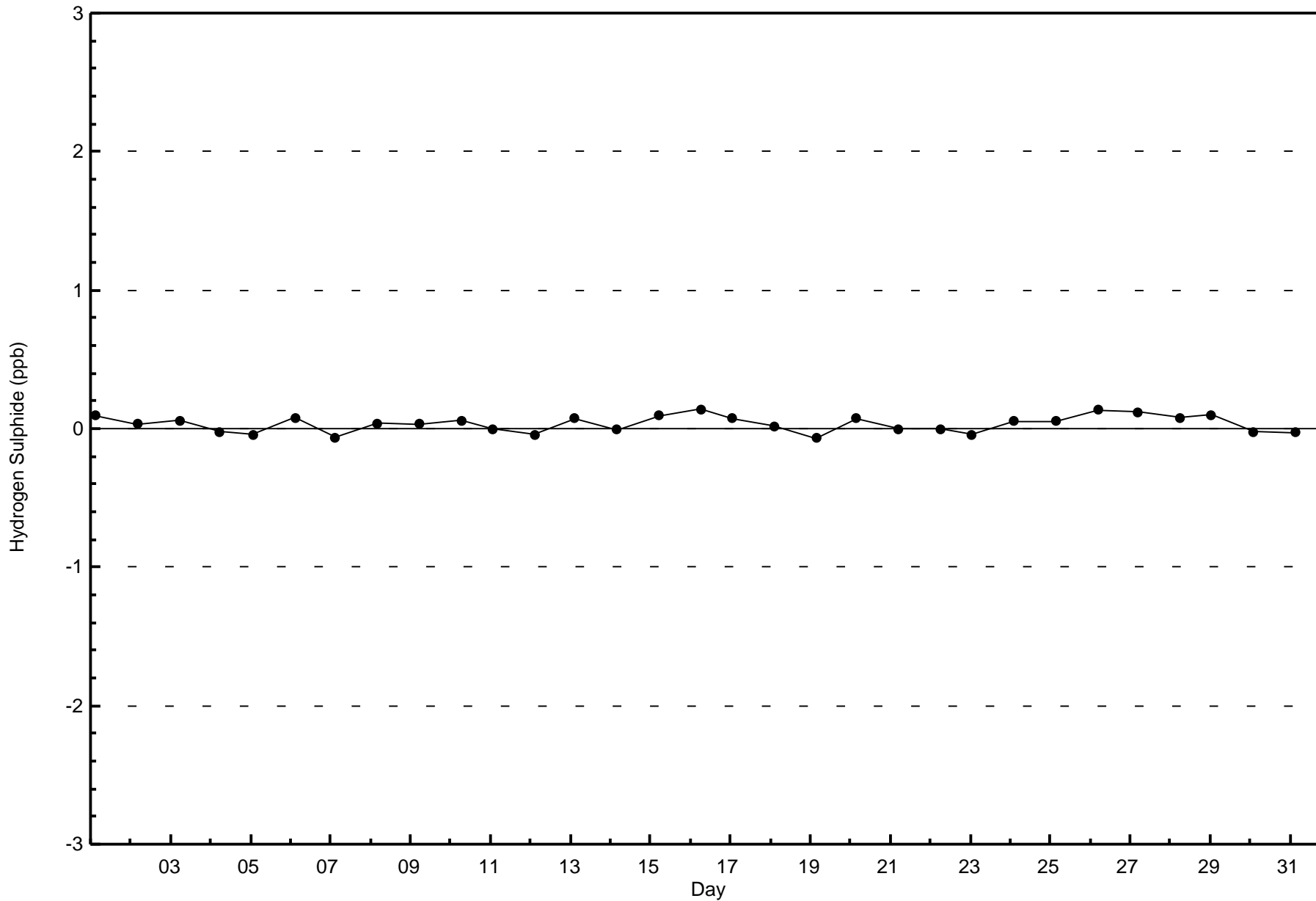
Total Number of Hours: 744

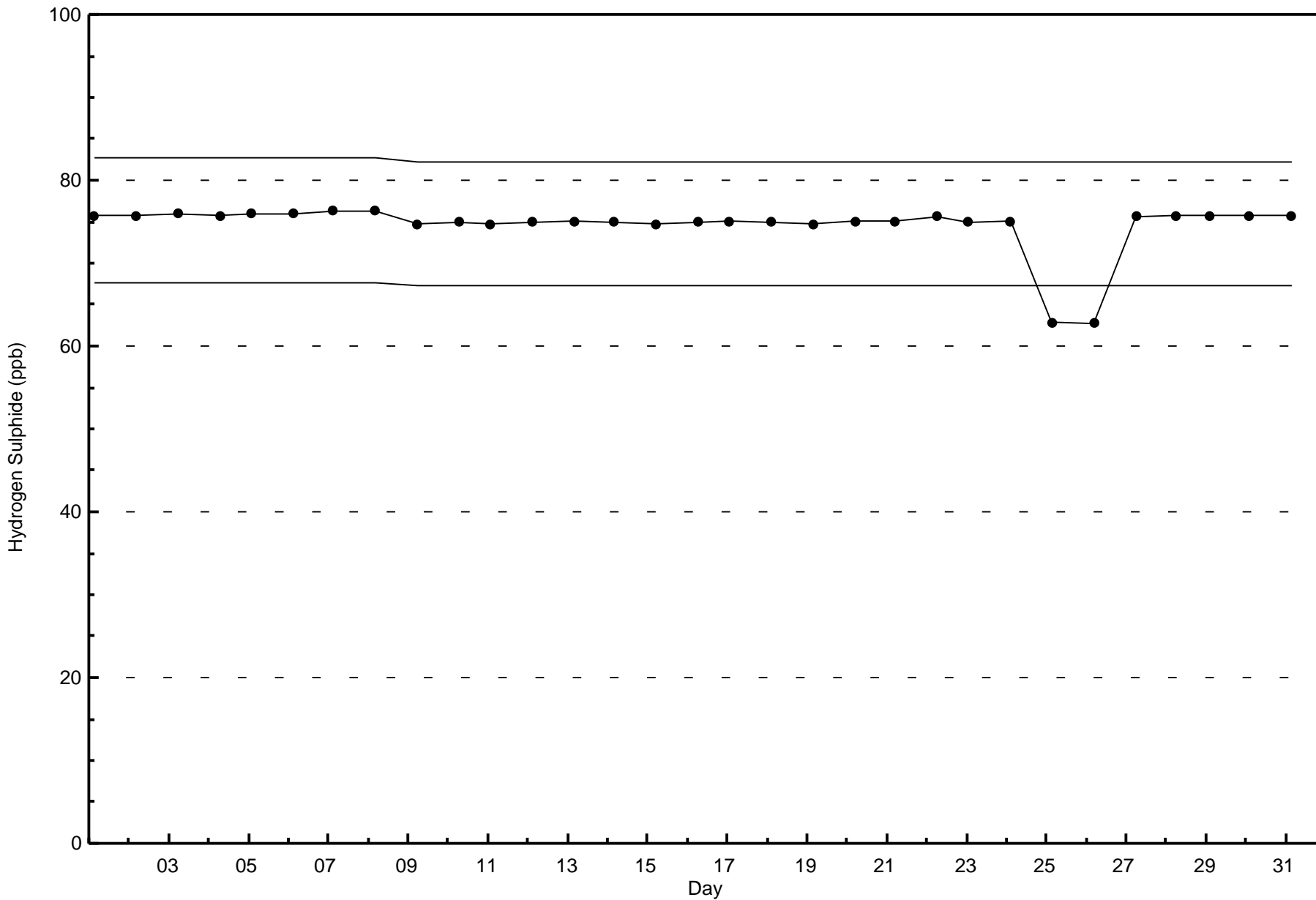


Wood Buffalo Environmental Association
Wind Rose Jul 2016

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









Wood Buffalo Environmental Association

Summary of Hour Averages

Total Hydrocarbons (THC) - ppm

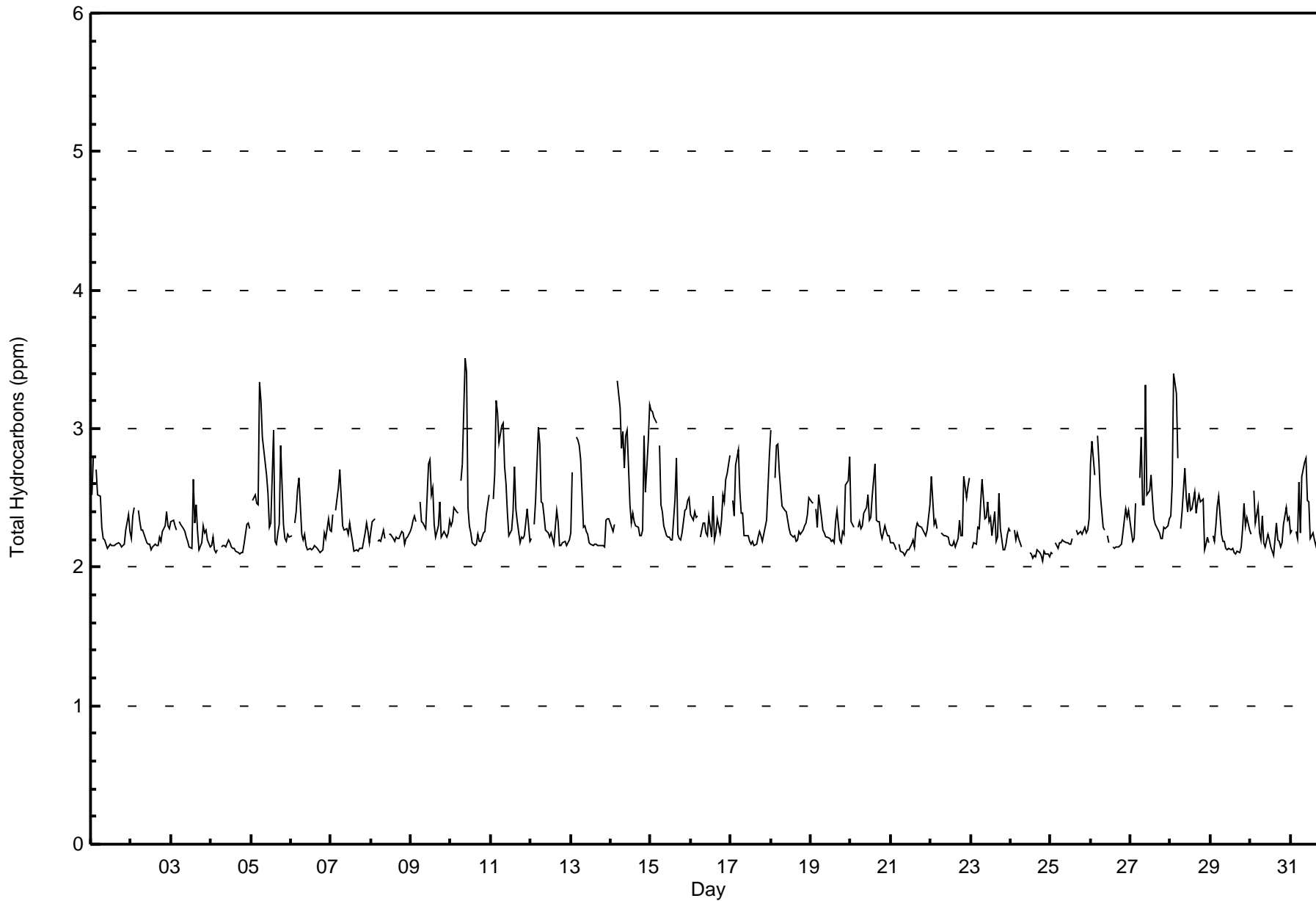
Buffalo Viewpoint - July 2016

Maximum Value: 3.5 ppm on Jul 10 09:00		Maximum Daily Average: 2.6 ppm on Jul 14		Hours in Service: 744																							
Minimum Value: 2.0 ppm on Jul 24 20:00		Minimum Daily Average: 2.1 ppm on Jul 24		Hours of Data: 704																							
Maximum Diurnal Average: 2.6 ppm at hour 6		Minimum Diurnal Average: 2.2 ppm at hour 18		Hours of Missing Data: 40																							
Monthly Average: 2.34 ppm		Percentiles: P ₁ = 2.1 P ₁₀ = 2.1 Q ₁ = 2.2 Median = 2.3 Q ₃ = 2.4 P ₉₀ = 2.7 P ₉₉ = 3.2		Hours of Calibration: 33																							
				Percent Operational Time: 99.1																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Jul	2.5	2.8	Z	2.7	2.5	2.5	2.3	2.2	2.2	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.2	2.2	2.3	2.4	2.3	2.3	2.8	
2-Jul	2.2	2.4	2.4	Z	2.4	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.4	2.3	2.3	2.2	2.4	
3-Jul	2.3	2.3	2.3	2.3	Z	2.3	2.3	2.3	2.2	2.2	2.1	2.1	2.1	2.6	2.3	2.4	2.3	2.1	2.2	2.3	2.2	2.3	2.2	2.2	2.3	2.6	
4-Jul	2.2	2.2	2.1	2.1	2.1	Z	2.1	2.2	2.2	2.1	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.3	2.3	2.3	2.2	2.3	
5-Jul	Z	2.5	2.5	2.5	2.4	3.3	3.2	2.9	2.8	2.7	2.5	2.3	2.3	3.0	2.2	2.2	2.2	2.3	2.9	2.3	2.2	2.2	2.2	2.2	2.5	3.3	
6-Jul	2.2	Z	2.3	2.4	2.6	2.6	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.3	2.3	2.2	2.6	
7-Jul	2.3	2.4	Z	2.4	2.6	2.7	2.5	2.3	2.3	2.3	2.2	2.3	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.3	2.3	2.2	2.3	2.7	
8-Jul	2.3	2.3	2.3	Z	2.2	2.2	2.2	2.3	2.2	C	C	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.2	2.2	2.2	2.3	2.2	2.3	
9-Jul	2.3	2.3	2.4	2.3	Z	2.5	2.3	2.3	2.3	2.3	2.7	2.8	2.5	2.6	2.3	2.2	2.3	2.5	2.2	2.2	2.3	2.2	2.2	2.3	2.4	2.8	
10-Jul	2.3	2.3	2.4	2.4	2.4	Z	2.6	2.8	3.5	3.4	2.4	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.4	2.4	2.5	2.4	3.5	
11-Jul	Z	2.5	2.7	3.2	3.1	2.9	3.0	3.0	2.7	2.6	2.4	2.2	2.3	2.4	2.7	2.4	2.3	2.2	2.2	2.2	2.2	2.3	2.4	2.2	2.5	3.2	
12-Jul	2.2	Z	2.3	2.5	3.0	2.9	2.5	2.5	2.4	2.3	2.2	2.2	2.2	2.2	2.2	2.4	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	3.0	
13-Jul	2.2	2.7	Z	2.9	2.9	2.9	2.8	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.4	2.9	
14-Jul	2.3	2.3	2.3	Z	3.3	3.2	2.9	3.0	2.7	2.9	3.0	2.5	2.3	2.4	2.3	2.3	2.3	2.2	2.2	2.3	2.9	2.5	2.9	3.2	2.6	3.3	
15-Jul	3.1	3.1	3.1	3.0	Z	2.9	2.5	2.4	2.3	2.2	2.2	2.2	2.2	2.2	2.5	2.8	2.2	2.2	2.2	2.3	2.4	2.4	2.5	2.5	2.5	3.1	
16-Jul	2.4	2.3	2.4	2.4	2.4	Z	2.2	2.3	2.3	2.2	2.2	2.4	2.2	2.5	2.2	2.2	2.4	2.2	2.3	2.5	2.5	2.6	2.7	2.8	2.4	2.8	
17-Jul	Z	2.5	2.4	2.7	2.9	2.5	2.4	2.4	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.3	2.6	2.8	2.4	2.9	
18-Jul	3.0	Z	2.6	2.9	2.9	2.7	2.6	2.4	2.4	2.4	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.3	2.3	2.4	2.5	2.4	3.0	
19-Jul	2.5	2.5	Z	2.4	2.3	2.5	2.4	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.4	2.2	2.2	2.3	2.2	2.6	2.6	2.8	2.3	2.8	
20-Jul	2.3	2.3	2.3	Z	2.3	2.3	2.3	2.3	2.4	2.4	2.5	2.3	2.4	2.5	2.8	2.3	2.3	2.3	2.2	2.2	2.3	2.3	2.2	2.2	2.3	2.8	
21-Jul	2.2	2.2	2.2	2.1	Z	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.1	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.3	2.4	2.2	2.4	
22-Jul	2.7	2.5	2.3	2.3	2.3	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.7	2.5	2.6	2.6	2.3	2.7
23-Jul	Z	2.1	2.2	2.2	2.3	2.3	2.5	2.6	2.3	2.4	2.5	2.3	2.4	2.2	2.4	2.2	2.2	2.5	2.3	2.1	2.1	2.2	2.2	2.3	2.3	2.6	
24-Jul	2.3	Z	2.3	2.2	2.2	2.2	2.1	PF	PF	PF	PF	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.1	2.1	2.3	
25-Jul	2.1	2.1	Z	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	Z	2.3	2.2	2.2	2.2	2.3	2.2	2.3	2.3	2.3	2.2	2.3	
26-Jul	2.7	2.9	2.7	Z	2.9	2.8	2.5	2.3	2.3	M	2.2	2.2	M	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.3	2.4	2.4	2.4	2.4	2.9	
27-Jul	2.3	2.2	2.2	2.5	Z	2.6	2.9	2.5	2.5	3.3	2.5	2.6	2.7	2.5	2.3	2.3	2.3	2.2	2.2	2.2	2.3	2.3	2.3	2.4	2.4	3.3	
28-Jul	2.4	2.6	3.4	3.3	2.8	Z	2.3	2.4	2.7	2.5	2.4	2.5	2.4	2.4	2.5	2.4	2.5	2.5	2.5	2.5	2.1	2.2	2.2	2.2	2.5	3.4	
29-Jul	Z	2.2	2.2	2.3	2.4	2.5	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	2.3	2.5	2.3	2.4	2.3	2.2	2.5
30-Jul	2.2	Z	2.5	2.3	2.4	2.2	2.2	2.4	2.2	2.1	2.2	2.2	2.1	2.1	2.1	2.3	2.2	2.2	2.1	2.2	2.3	2.4	2.3	2.4	2.3	2.5	
31-Jul	2.2	2.3	Z	2.3	2.2	2.6	2.2	2.7	2.8	2.8	2.5	2.5	2.2	2.3	2.2	2.2	2.2	2.2	2.3	2.2	2.1	2.1	2.1	2.1	2.3	2.8	
	2.4	2.4	2.4	2.5	2.5	2.6	2.4	2.4	2.4	2.4	2.3	2.3	2.2	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.4	2.4	2.4	Diurnal Average	
	3.1	3.1	3.4	3.3	3.3	3.3	3.2	3.0	3.5	3.4	3.0	2.8	2.7	3.0	2.8	2.8	2.5	2.5	2.9	2.5	2.9	2.6	2.9	3.2	3.2	Diurnal Maximum	
Z - zerospan		C - Calibration			M - Maintenance			PF - Power Failure																			



Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	1	0.14	0.14
2.1 - 3.0	688	97.73	97.87
3.1 - 10.0	15	2.13	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
Buffalo Viewpoint - July 2016**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
2.1 - 3.0	152	58	10	6	5	6	62	67	34	34	29	54	35	52	31	53	688
3.1 - 10.0	2	0	0	0	0	0	0	0	0	2	0	2	2	1	5	1	15
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	154	58	10	6	5	6	62	67	34	36	29	57	37	53	36	54	704

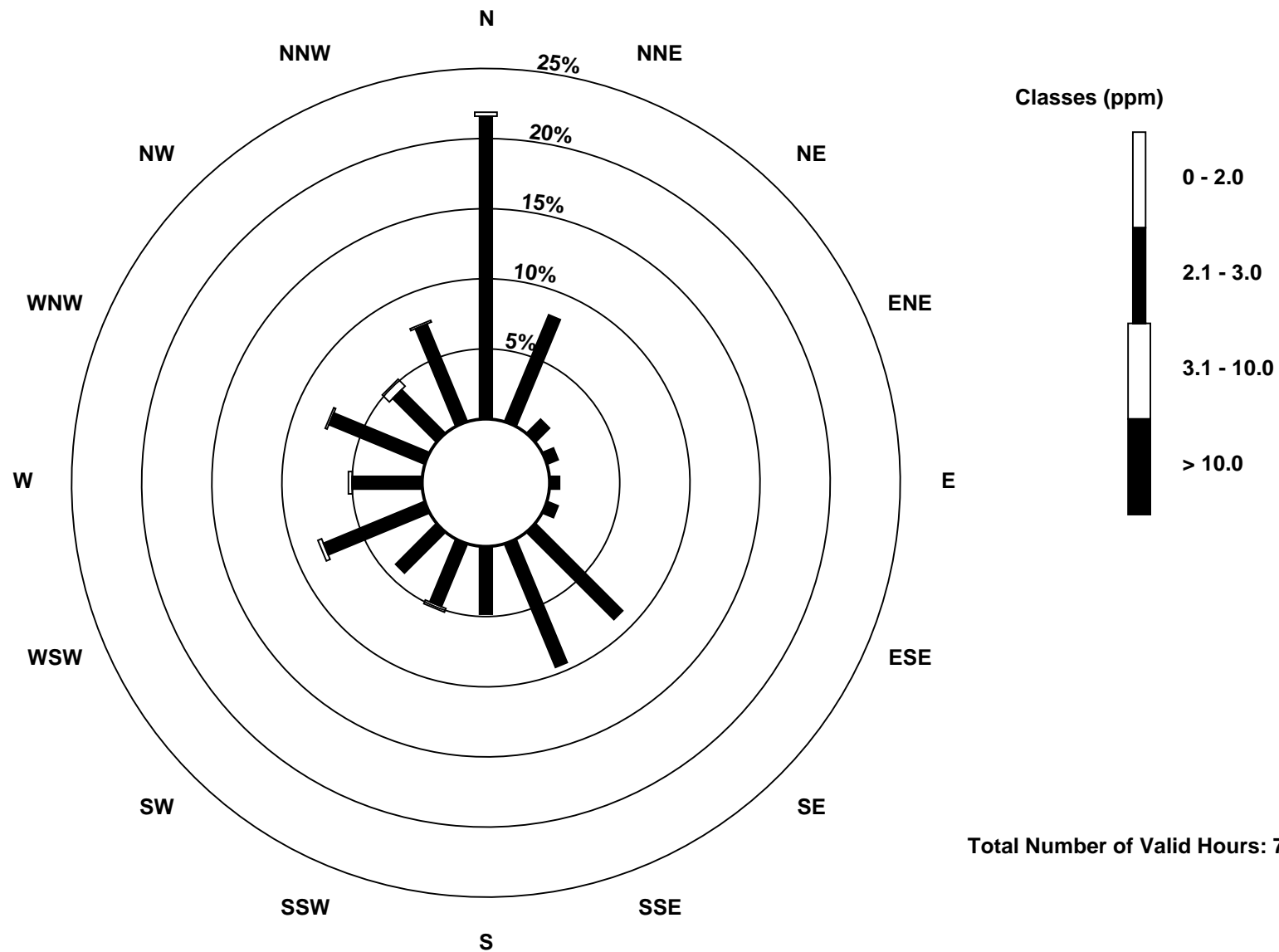
Total Number of Valid Hours: 704

Total Number of Hours: 744

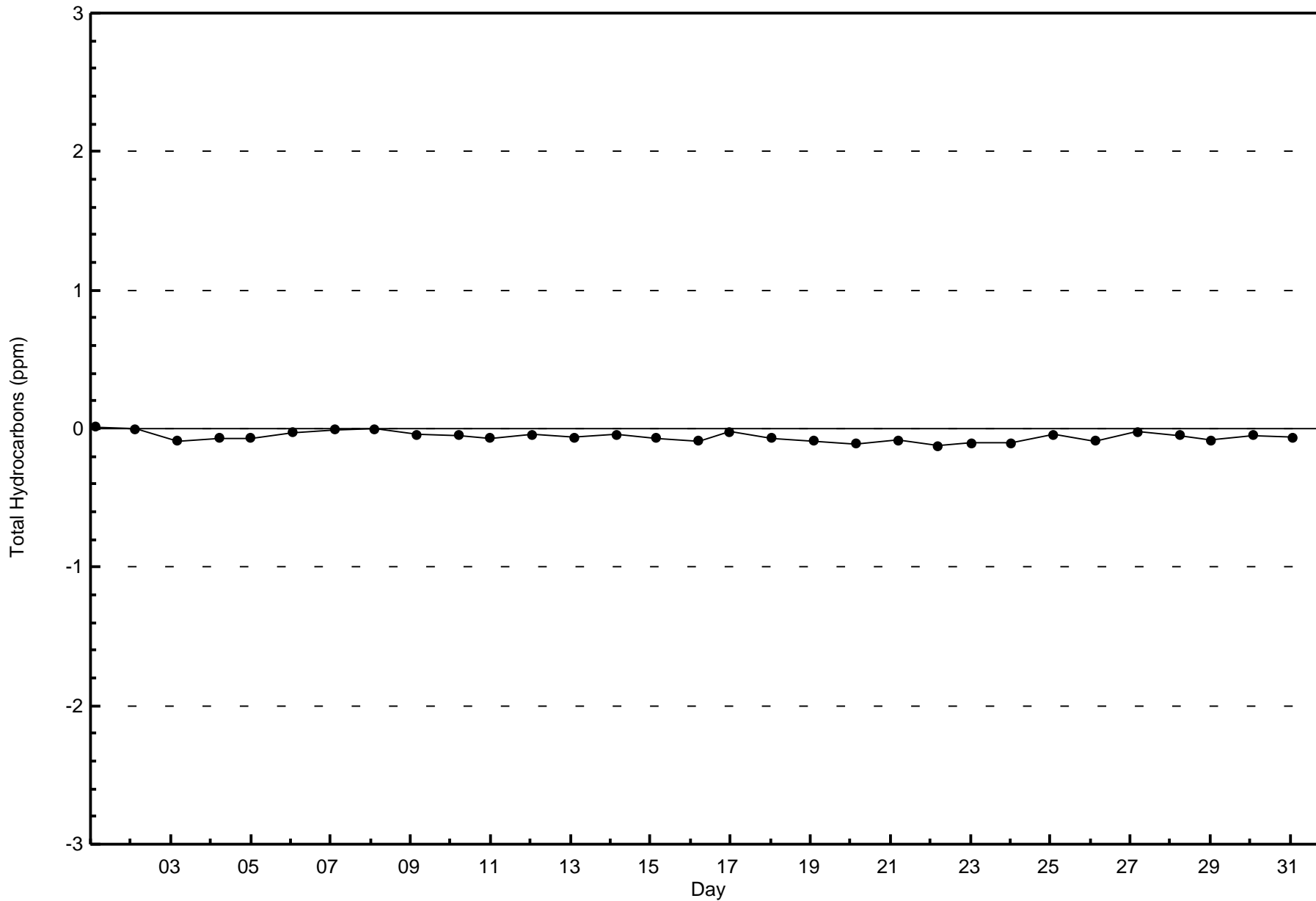


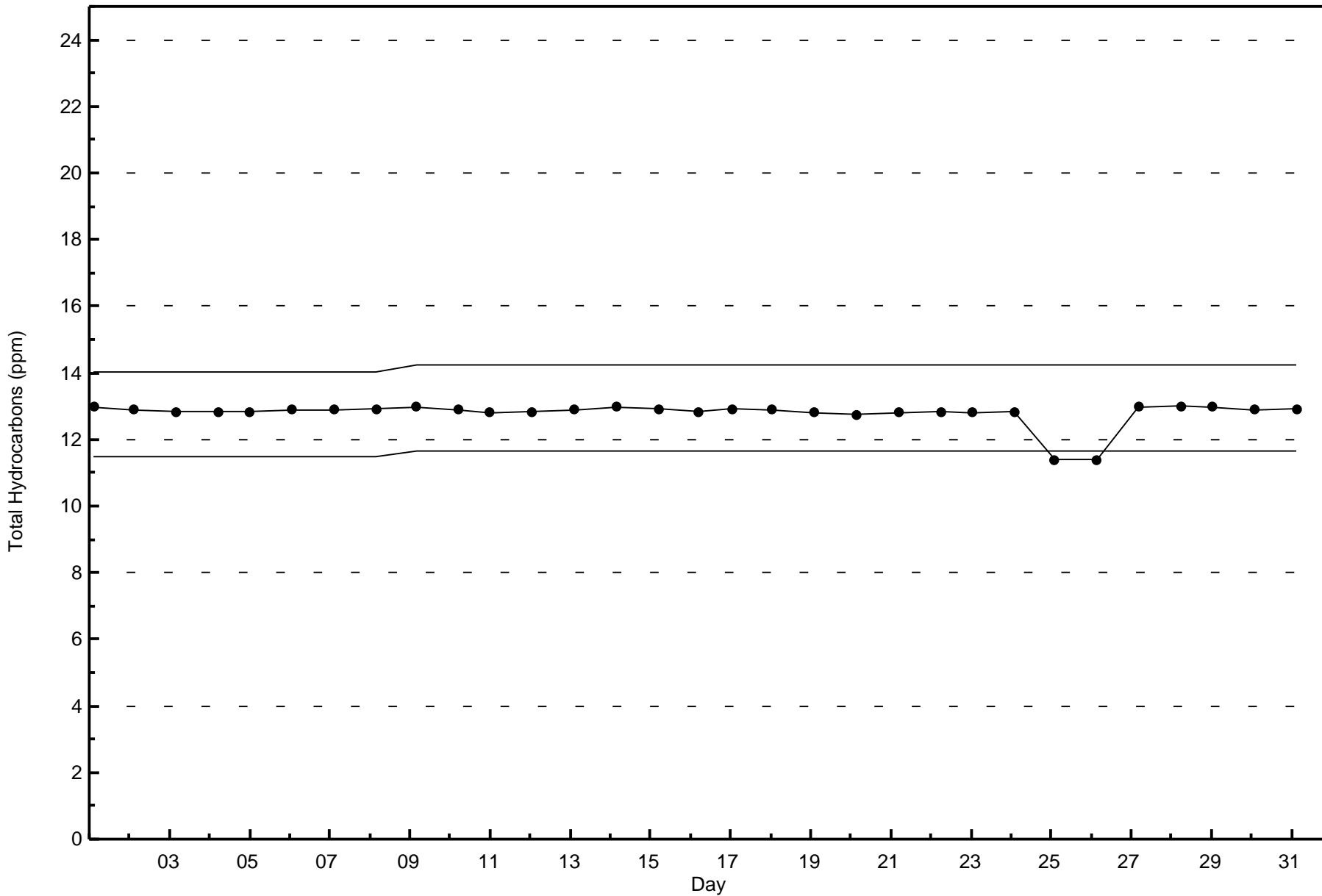
Wood Buffalo Environmental Association
Wind Rose Jul 2016

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



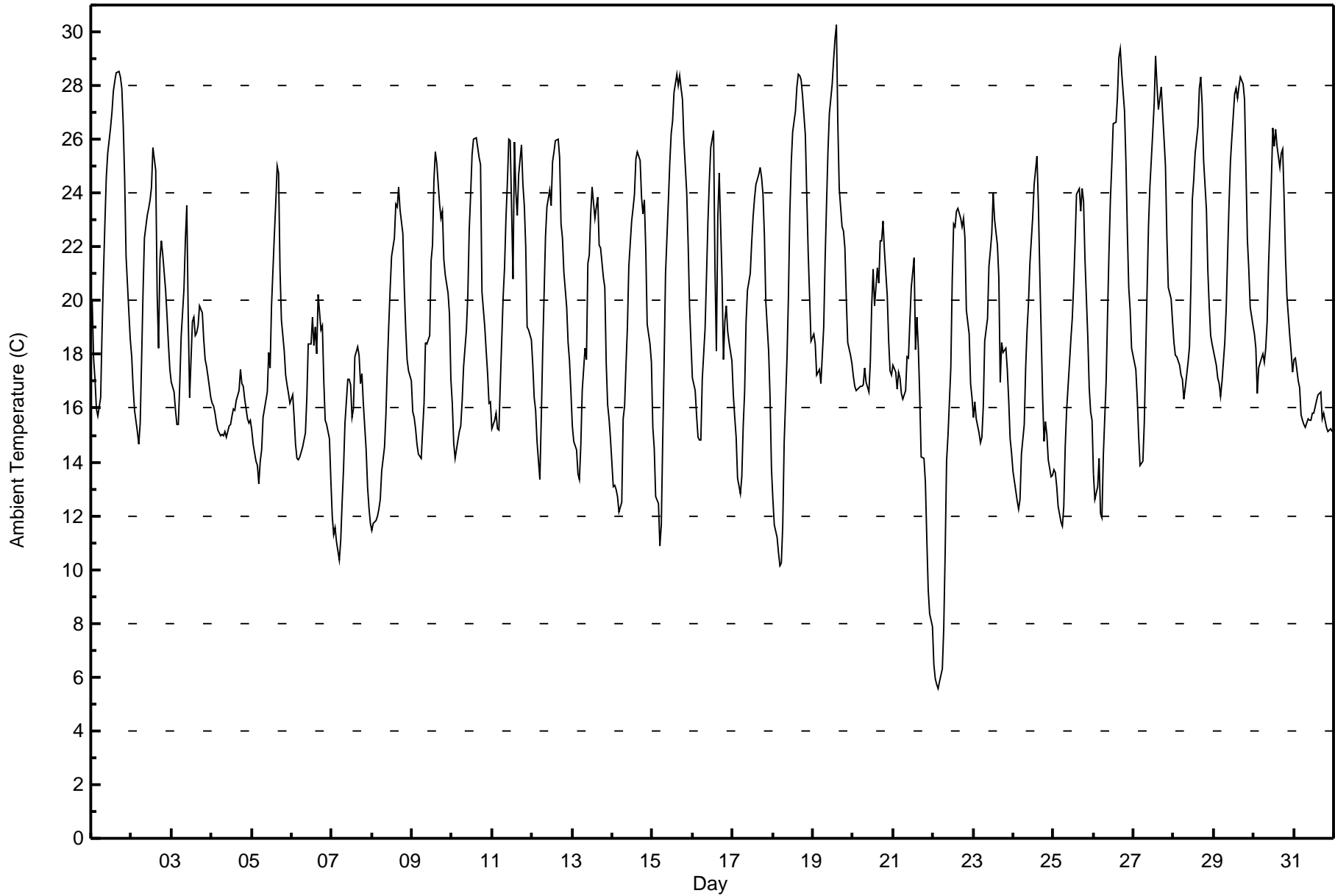
Total Number of Valid Hours: 704







Maximum Value: 30.3 C on Jul 19 15:00 Maximum Daily Average: 22.9 C on Jul 1																						Hours in Service: 744 Hours of Data: 744				
Minimum Value: 5.6 C on Jul 22 04:00 Minimum Daily Average: 14.5 C on Jul 7 Maximum Diurnal Average: 23.8 C at hour 15 Minimum Diurnal Average: 14.0 C at hour 5 Monthly Average: 19.08 C Percentiles: P ₁ = 7.9 P ₁₀ = 13.7 Q ₁ = 15.7 Median = 18.2 Q ₃ = 22.8 P ₉₀ = 25.7 P ₉₉ = 28.1																						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-Jul	20.0	17.8	17.1	16.0	15.7	16.4	18.9	21.0	22.9	24.6	25.5	26.5	27.0	27.8	28.2	28.5	28.5	28.3	27.9	26.5	24.6	21.7	19.5	18.5	22.9	28.5
2-Jul	17.9	16.8	15.9	15.1	14.7	15.4	17.8	20.3	22.3	23.2	23.5	23.8	24.2	25.7	24.9	20.3	18.2	21.5	22.2	21.7	20.4	19.4	18.4	17.5	20.0	25.7
3-Jul	17.0	16.6	15.9	15.4	15.4	16.9	18.7	20.4	22.3	23.5	19.5	16.4	19.2	19.4	18.7	18.8	19.1	19.8	19.5	18.6	17.8	17.5	17.2	16.4	18.3	23.5
4-Jul	16.2	16.1	15.8	15.5	15.2	15.0	15.0	15.0	15.2	14.9	15.3	15.4	15.7	16.0	15.9	16.3	16.7	17.5	16.9	16.8	16.4	15.6	15.4	15.5	15.8	17.5
5-Jul	15.2	14.6	14.0	13.9	13.2	14.1	14.5	15.7	16.3	16.6	18.1	17.5	19.8	22.4	23.6	25.0	24.8	21.2	19.3	18.1	17.2	16.9	16.6	16.2	17.7	25.0
6-Jul	16.5	15.7	14.7	14.1	14.1	14.2	14.6	14.8	15.1	16.4	18.4	18.4	19.4	18.4	19.0	18.0	20.2	18.9	19.1	17.0	15.6	15.4	14.9	13.4	16.5	20.2
7-Jul	12.0	11.3	11.5	11.0	10.3	11.1	12.5	13.8	15.5	17.1	17.1	16.9	15.7	16.0	17.9	18.3	18.0	16.9	17.3	16.2	14.5	13.1	12.3	11.7	14.5	18.3
8-Jul	11.5	11.7	11.8	12.0	12.3	12.6	13.7	14.6	15.8	17.6	19.1	20.4	21.7	22.3	23.6	23.5	24.2	23.4	22.5	20.5	19.0	17.8	17.4	17.0	17.7	24.2
9-Jul	15.9	15.7	15.3	14.7	14.3	14.2	15.2	16.2	18.4	18.4	18.7	21.5	22.0	24.5	25.5	25.1	23.6	23.1	23.3	21.5	21.0	20.3	19.5	17.1	19.4	25.5
10-Jul	16.2	14.7	14.1	14.8	15.1	15.4	16.3	17.6	18.9	20.2	22.7	24.0	25.4	26.0	26.1	25.7	25.4	25.1	20.3	19.0	18.1	17.3	16.2	16.3	19.6	26.1
11-Jul	15.3	15.5	15.8	15.2	15.2	16.9	20.1	21.2	23.1	24.4	26.0	26.0	20.8	25.9	24.1	23.2	24.7	25.8	24.3	23.5	22.0	19.0	18.9	18.6	21.1	26.0
12-Jul	17.6	16.4	15.9	14.8	13.3	15.6	18.1	20.3	22.4	23.5	24.1	23.5	25.2	25.6	26.0	26.0	25.3	22.9	22.3	21.0	19.7	18.4	17.8	16.6	20.5	26.0
13-Jul	15.4	14.7	14.4	13.5	13.3	14.6	16.7	18.2	17.8	21.4	21.7	23.2	24.2	23.1	23.5	23.8	22.1	21.9	20.8	20.5	17.7	16.1	15.6	14.9	18.7	24.2
14-Jul	13.1	13.1	13.0	12.7	12.1	12.5	15.6	16.1	17.6	19.0	21.3	23.0	23.4	24.0	25.3	25.5	25.2	23.8	23.2	23.8	21.9	19.1	18.4	17.7	19.2	25.5
15-Jul	15.3	14.5	12.7	12.5	10.9	11.7	14.8	17.7	21.0	23.7	25.1	26.2	26.7	27.7	28.4	28.0	28.4	27.9	27.5	25.9	24.0	22.1	19.8	18.4	21.3	28.4
16-Jul	17.1	16.7	15.7	14.9	14.8	14.8	17.1	19.0	20.9	22.9	24.4	25.7	26.3	21.2	18.1	23.1	24.7	20.9	17.8	19.2	19.8	18.8	18.5	17.8	19.6	26.3
17-Jul	16.5	15.7	14.9	13.4	12.8	13.4	15.3	16.6	19.2	20.4	21.0	22.1	23.1	23.8	24.4	24.7	25.0	24.6	24.0	22.4	20.0	18.1	16.5	13.7	19.2	25.0
18-Jul	12.6	11.6	11.2	10.6	10.1	10.2	11.7	14.7	17.8	20.1	23.2	25.1	26.3	27.0	27.9	28.4	28.4	28.2	27.6	26.2	23.9	21.8	20.2	18.5	20.1	28.4
19-Jul	18.8	18.4	17.2	17.4	17.4	16.9	19.0	21.6	23.6	25.5	27.0	28.1	29.0	29.7	30.3	26.6	24.2	22.7	22.6	22.0	20.0	18.4	18.0	17.6	22.2	30.3
20-Jul	17.2	16.8	16.7	16.7	16.8	16.8	16.9	17.5	17.0	16.6	17.7	19.9	21.2	19.8	21.2	20.7	22.2	22.2	22.9	21.8	20.2	18.5	17.4	17.2	18.8	22.9
21-Jul	17.6	17.3	16.7	17.4	17.1	16.5	16.3	16.6	17.9	17.9	19.3	20.5	21.6	18.2	19.4	18.2	16.4	14.2	14.1	13.3	11.1	9.2	8.4	7.9	16.0	21.6
22-Jul	6.5	5.9	5.7	5.6	5.9	6.3	7.8	10.6	14.0	15.0	17.5	20.7	22.9	22.7	23.4	23.4	23.1	22.8	23.1	22.3	19.6	18.8	16.9	16.4	15.7	23.4
23-Jul	15.7	16.3	15.6	15.1	14.7	14.9	16.1	18.5	19.3	21.3	21.9	22.5	24.0	23.0	22.1	20.8	17.0	18.4	18.1	18.2	17.5	16.3	14.9	14.4	18.2	24.0
24-Jul	13.7	12.9	12.5	12.3	12.6	14.3	15.4	17.5	18.9	19.9	21.4	23.1	24.3	24.8	25.4	23.6	21.0	16.4	14.8	15.5	15.0	14.1	13.5	13.5	17.4	25.4
25-Jul	13.7	13.6	13.1	12.3	11.8	11.6	12.4	14.5	15.9	17.6	18.5	19.4	20.6	22.2	23.9	24.2	23.3	24.2	23.7	21.6	18.6	16.7	15.9	15.6	17.7	24.2
26-Jul	13.6	12.6	13.1	14.2	12.1	11.9	14.3	17.0	19.5	21.8	23.8	25.1	26.6	26.6	27.6	29.1	29.4	28.5	27.1	25.2	22.6	20.5	19.7	18.2	20.8	29.4
27-Jul	17.7	17.4	16.4	15.0	13.9	14.1	15.5	18.0	20.5	22.8	24.3	26.3	27.3	29.1	28.0	27.1	27.9	27.0	26.0	25.0	22.4	20.5	20.1	19.2	21.7	29.1
28-Jul	18.4	17.9	17.9	17.6	17.3	17.1	16.3	16.7	17.7	18.3	20.6	23.7	24.5	25.5	26.5	27.9	28.3	27.3	25.2	23.4	21.1	19.8	18.7	18.4	21.1	28.3
29-Jul	18.1	17.6	17.1	16.9	16.5	17.0	18.4	19.7	21.7	23.6	25.2	26.1	27.7	27.9	27.5	27.9	28.3	28.1	27.5	24.9	22.3	21.2	19.8	19.1	22.5	28.3
30-Jul	18.7	18.2	16.6	17.5	17.9	18.0	17.7	18.2	19.2	21.3	24.5	26.4	25.8	26.4	25.8	24.9	25.5	25.6	23.8	21.6	20.2	18.7	18.1	17.4	21.2	26.4
31-Jul	17.8	17.9	17.0	16.8	15.8	15.6	15.4	15.3	15.6	15.5	15.5	15.8	15.8	16.3	16.5	16.5	16.6	15.6	15.8	15.3	15.1	15.2	15.2	15.1	16.0	17.9
																								Diurnal Average		
																								Diurnal Maximum		





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	10	1.34	1.34
10 - 20	448	60.22	61.56
> 20	286	38.44	100.00

Total Number of Valid Hours: 744

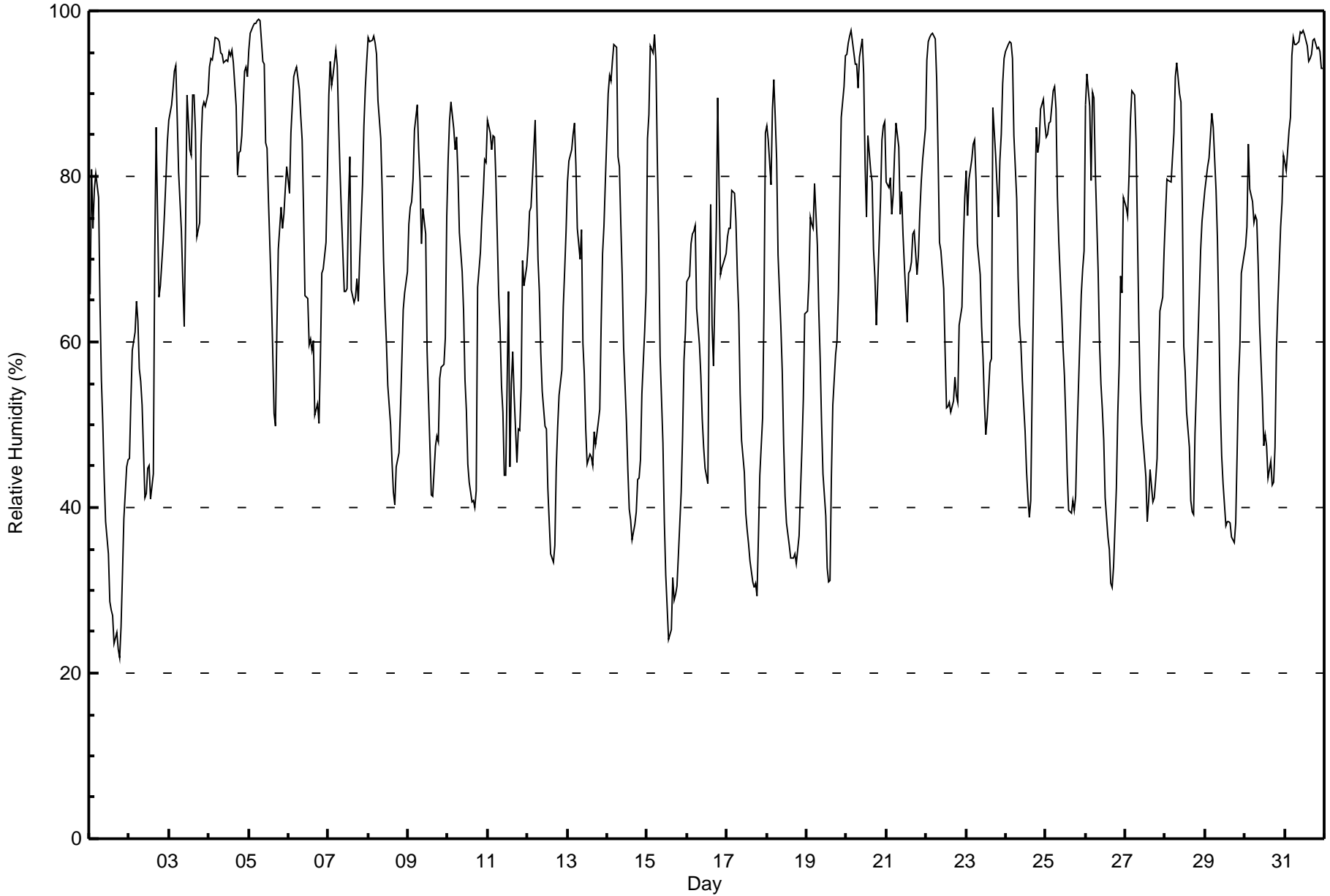
Total Number of Hours: 744



Wood Buffalo Environmental Association
Summary of Hour Averages

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

Maximum Value: 99 % on Jul 5 07:00														Maximum Daily Average: 93.7 % on Jul 31														Hours in Service: 744	
Minimum Value: 22 % on Jul 1 19:00														Minimum Daily Average: 46.1 % on Jul 1														Hours of Data: 744	
Maximum Diurnal Average: 87.6 % at hour 5														Minimum Diurnal Average: 51.0 % at hour 15														Hours of Missing Data: 0	
Monthly Average: 68.0 %														Percentiles: P ₁ = 27 P ₁₀ = 41 Q ₁ = 52 Median = 71 Q ₃ = 85 P ₉₀ = 94 P ₉₉ = 97														Hours of Calibration: 0	
																												Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Jul	66	81	74	79	80	77	65	55	50	44	38	34	29	28	27	24	25	23	22	26	32	39	45	46	46.1	81			
2-Jul	46	53	59	61	65	63	57	55	52	41	42	45	45	41	44	70	86	75	65	67	72	76	80	84	60.2	86			
3-Jul	87	89	91	93	93	87	81	73	67	62	75	90	83	83	90	90	85	73	74	84	88	89	88	90	83.5	93			
4-Jul	93	94	94	95	97	97	96	95	95	94	94	94	95	95	95	94	88	80	83	83	85	93	93	92	92.2	97			
5-Jul	95	97	98	98	98	99	99	99	99	94	94	84	83	77	66	59	51	50	62	71	76	74	75	78	81	81.7	99		
6-Jul	78	85	89	92	93	93	90	87	84	76	66	65	60	60	59	60	51	53	50	58	68	69	72	80	72.5	93			
7-Jul	90	94	91	92	95	93	86	80	75	66	66	66	77	82	66	65	65	68	65	70	79	86	91	94	79.3	95			
8-Jul	97	96	96	97	96	95	89	85	78	70	64	60	55	50	46	42	40	45	47	52	58	64	66	68	69.0	97			
9-Jul	74	76	77	80	86	89	83	79	72	76	73	59	53	47	41	41	48	49	48	56	57	57	60	75	64.9	89			
10-Jul	82	87	89	86	83	85	80	73	68	64	55	52	45	43	41	41	40	42	67	71	75	78	82	82	67.1	89			
11-Jul	87	85	83	85	85	80	66	62	55	52	44	44	66	45	55	59	54	45	49	49	54	70	67	69	62.9	87			
12-Jul	72	76	76	80	87	78	70	66	59	54	50	50	42	38	34	33	35	45	50	54	57	64	69	73	58.8	87			
13-Jul	79	82	83	85	86	81	74	70	74	60	56	49	45	46	46	45	49	48	50	52	62	71	74	80	64.5	86			
14-Jul	90	92	92	94	96	96	82	81	74	68	59	50	45	40	38	36	38	39	43	44	46	54	61	66	63.5	96			
15-Jul	85	87	96	95	97	94	82	72	58	48	38	32	28	24	25	32	29	29	30	34	42	49	58	61	55.2	97			
16-Jul	67	68	72	73	73	74	64	60	56	51	47	45	43	65	77	62	57	74	90	79	68	69	70	71	65.5	90			
17-Jul	73	74	74	78	78	75	68	64	54	48	44	39	37	36	33	31	30	31	29	36	44	51	64	85	53.2	85			
18-Jul	86	84	79	88	92	87	82	71	62	56	48	41	38	35	34	34	34	34	33	37	42	47	53	63	56.7	92			
19-Jul	64	67	75	74	74	79	72	64	58	50	44	39	33	31	31	44	52	58	60	66	77	87	91	95	61.9	95			
20-Jul	95	96	97	98	95	93	93	91	94	97	92	81	75	85	81	79	71	68	62	67	77	84	86	87	85.2	98			
21-Jul	79	79	80	75	78	83	87	83	75	78	73	69	62	68	69	70	73	73	68	71	76	79	82	86	75.7	87			
22-Jul	94	96	97	97	97	97	92	83	72	71	67	59	52	52	53	51	53	56	54	53	62	64	72	77	71.7	97			
23-Jul	81	75	80	82	84	84	80	72	68	62	58	53	49	51	57	58	88	85	82	75	82	85	91	94	74.0	94			
24-Jul	95	96	96	96	94	85	77	68	62	60	55	49	44	41	39	41	54	77	86	83	84	88	89	86	72.8	96			
25-Jul	85	85	86	87	90	91	88	78	72	64	59	56	50	44	40	39	41	40	41	49	60	66	69	71	64.6	91			
26-Jul	89	92	88	79	90	90	81	69	60	55	52	48	41	37	35	31	30	33	42	51	57	68	66	77	60.9	92			
27-Jul	76	75	80	87	90	90	84	73	62	54	50	46	44	38	41	45	41	41	43	46	56	64	65	71	61.0	90			
28-Jul	75	80	80	79	82	85	92	94	90	89	77	60	56	52	47	41	40	39	49	60	65	71	75	76	68.9	94			
29-Jul	78	81	82	85	88	86	78	72	63	53	46	43	38	38	38	38	36	36	38	46	55	60	68	71	59.1	88			
30-Jul	72	74	84	78	77	74	75	75	69	62	53	47	49	47	44	46	43	43	47	59	65	74	77	83	63.2	84			
31-Jul	82	81	86	87	95	97	96	96	96	98	97	98	97	96	94	94	95	96	97	95	96	95	93	93	93.7	98			
		81.0	83.2	84.6	85.7	87.6	86.3	81.0	75.6	70.0	65.0	60.2	56.3	53.4	51.8	51.0	51.2	52.3	53.5	56.1	59.6	65.0	70.5	74.1	78.3	Diurnal Average			
		97	97	98	98	98	99	99	99	96	98	97	98	97	96	95	94	95	96	97	95	96	95	93	95	Diurnal Maximum			





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed (WS) - km/h

Buffalo Viewpoint - July 2016

Maximum Speed: 31 km/h on Jul 12 19:00	Maximum Daily Speed Average: 18.0 km/h on Jul 12	Hours in Service: 744
Minimum Speed Value: 1 km/h on Jul 30 01:00	Minimum Daily Speed Average: 2.9 km/h on Jul 28	Hours of Data: 744
Maximum Diurnal Speed Average: 6.4 km/h at hour 18	Minimum Diurnal Speed Average: 1.1 km/h at hour 7	Hours of Missing Data: 0
Monthly Average Velocity: 3.1 km/h 325.4 deg	Percentiles: P ₁ = 2 P ₁₀ = 5 Q ₁ = 7 Median = 9 Q ₃ = 12 P ₉₀ = 16 P ₉₉ = 25	Percent Operational Time: 100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	S6	SE7	SSE6	SE6	SE7	SSE7	SE9	SE9	SE12	SE16	SE17	SE16	SE13	SE12	SSE11	SE11	SE11	SE12	SSE11	S11	SSE10	SE8	SE7	SSE8	SE9.9	SE17
2-Jul	SSE7	SSE7	SE7	SE7	SE7	SE8	SE8	SE10	SE13	SE18	SSE17	SSE12	SSE14	SSE13	SSE12	SSE15	SE9	SE7	SSE8	SE7	SE5	SE8	SE10	SE8	SSE9.7	SE18
3-Jul	SE9	SE8	SSE8	SSE7	SSE7	SSE7	SSE7	SE8	SE7	ESE9	SSE14	SSW8	SSE3	ESE8	E4	ESE4	SE7	ESE9	SE5	SSE4	SSE4	SSE6	WSW6	W9	SSE5.7	SSE14
4-Jul	W7	W7	WSW7	SW7	WSW9	WSW10	WSW6	WSW9	SW7	WSW12	WSW9	WSW11	SW8	WSW12	SW11	SW12	WSW11	WSW10	SSW7	SSW8	SSE7	SE6	SE5	S3	SW7.2	SW12
5-Jul	NNW3	N6	N5	NNW3	N6	NNW7	W7	NNW10	N11	N3	NE4	ENE5	N7	N7	N5	N7	NNW4	N14	NW16	WSW10	W8	WSW8	NNW10	NNW11	NNW5.7	NW16
6-Jul	W11	W13	WSW11	WSW15	NW12	NNW13	N13	N16	N20	N18	NNE14	N15	NNE12	NNE18	NE18	NE12	NNE11	NE10	NNE12	N12	N12	N18	N19	N13	N11.4	N20
7-Jul	N12	NNW11	N14	N13	N13	NNW10	NNW12	N12	N14	NNW13	N10	NNW9	N15	N12	N16	N13	NNE15	N15	N16	N15	N14	N14	N13	N11	N12.8	N16
8-Jul	N11	N8	N8	N8	NNE8	NNE7	NNE8	NNE10	N10	N9	N8	N9	N9	N7	NNW8	N4	N7	NNE7	N12	N13	NNE13	NNE12	NNE12	NNE10	N8.9	N13
9-Jul	N11	N12	NNE12	N12	NNE11	N10	N8	N4	N5	WSW2	W5	NW4	WSW5	N7	N7	NNE5	NNE11	ENE12	NNE13	NE8	NE7	NE8	ENE7	N7	NNE7.0	NNE13
10-Jul	N8	N9	N8	NNE8	NNE7	NE5	NNE3	N5	N6	N5	N6	NNW5	NNE8	NNE16	NE11	NNE11	ENE6	S6	WSW20	W13	W8	WSW7	NW12	WSW7	NNW5.0	WSW20
11-Jul	NNW7	N7	NNW4	NW9	NW8	N7	N5	NNW6	N6	N8	N11	NNW16	WSW14	NW14	NW18	NW14	NW11	N18	N20	N20	N14	N12	NNW18	NNW19	NNW11.2	N20
12-Jul	NNW18	NNW15	N14	NNE6	NNW9	NNW9	N13	N12	N13	N16	N15	N21	NNW22	N23	N22	NNW22	NNW21	N25	N31	N24	N21	N23	N24	N18	NNW18.0	N31
13-Jul	NNW14	NNW14	NNW13	NW13	NW13	NW12	NNW14	N19	N18	N18	N22	N22	N19	N24	N25	NNE20	NNE18	NNE19	N16	N15	N11	N11	NNE11	NNE6	N15.2	N25
14-Jul	N7	N4	NNE4	NNW3	SSW3	WSW3	NW4	WSW4	NW5	NW5	N6	N6	NW6	W7	WSW13	WSW10	N18	NNE14	N12	NNW8	NW6	NW8	WSW8	NW5	NNW5.9	N18
15-Jul	WSW3	WSW4	SSW4	SW4	SSE7	SE6	SSE4	SSE4	WSW6	WSW7	WSW7	WSW7	W8	WSW8	NW11	NNW19	WSW12	WSW13	WSW12	NW13	NW14	WSW9	W9	WSW6	WSW5.8	NNW19
16-Jul	WSW8	WSW8	WSW7	SW6	SW5	SW7	WSW9	WSW10	WSW10	W9	WSW9	NW9	W9	NNW19	W11	SSW2	WSW3	N21	NNW11	NNW19	NNW25	NNW20	NNW20	NNW17	NW8.6	NNW25
17-Jul	NW17	NNW19	NNW18	NNW11	NNW11	NNW10	N11	N12	N14	N15	NNW16	N16	N15	N15	N16	N17	N12	NNE11	N12	N10	NNE6	ENE3	SE4	SSE6	N11.2	NNW19
18-Jul	SE8	SSE8	SSE8	S7	S8	SSE9	SSE7	SSE5	SE5	SE5	SE6	SSW4	SSE6	S4	SW6	SW8	SW9	SSW9	SSW9	SSW9	SSW8	S7	S7	SSE9	S6.2	SSW9
19-Jul	S8	SSE8	SE9	SE5	S4	SE7	SSE7	S6	SSW6	SSW9	SW11	WSW14	WSW14	WSW12	WSW14	NW23	NNW20	WSW13	SW5	SSW5	WSW9	ESE3	WSW4	N7	SW5.4	NW23
20-Jul	NNE10	N9	N8	N10	N14	N10	N11	N6	NNE5	WSW3	NW1	NNE5	N4	NNW6	NNW7	WSW9	WSW9	WSW6	W5	WSW5	SSW6	S8	S7	SSW9	NNW3.6	N14
21-Jul	SW11	WSW11	W6	SW10	S6	SSW3	SW9	WSW18	WSW16	WSW12	WSW12	WSW18	W15	WSW16	WSW18	W17	N29	N30	N20	N19	NNE16	NNE10	E5	SE6	WSW6.4	N30
22-Jul	SE7	SSE7	SSE8	SE9	SSE10	SSE11	SSE13	SSE13	SSE13	SE13	SSE13	SSE15	S13	SSW12	S10	SSW11	NNW10	WSW6	W9	WSW9	NNW14	NW13	NW8	SW4	S5.3	SSE15
23-Jul	SSW7	WSW10	W8	W8	NNW9	NNW8	NNW9	NNW6	NNW3	N6	NW6	NNW7	NW6	SSW6	NW10	N9	NNW7	W2	SSW9	SSW7	SW6	SSW6	SSW7	S7	W4.3	NW10
24-Jul	SSE8	SSE8	SE9	SSE9	SE9	S8	S9	SW14	WSW16	WSW16	WSW18	WSW17	WSW19	WSW19	SW18	SW15	NNW26	NNW26	W14	WSW10	WSW15	WSW12	WSW11	WSW16	WSW11.0	NNW26
25-Jul	W15	W16	W12	WSW8	SSW5	W7	WSW8	NNW14	NNW12	NW12	NNW10	NNW9	NNW9	NW10	NNW9	NNE9	NNE8	NNE7	NNE8	NNE10	NNE9	NNE9	NE5	E3	NNW5.7	W16
26-Jul	S3	S4	ENE2	E4	SSE4	SSE5	SSE7	SE9	SE8	SE7	SSE5	S10	S10	SSW8	W5	NNW8	NNW7	SSE5	ESE9	SE7	SE8	SE8	SSE8	SE9	SSE4.7	S10
27-Jul	SSE8	SSE7	SSE7	SSE8	SSE7	SSE7	SSE5	S4	NNW5	NNW6	N12	N11	N10	N11	N19	N15	N13	N13	N11	NNE10	NNE10	NNE10	NNE8	NNW4	N4.7	N19
28-Jul	N7	NNW4	NW4	W4	NNW3	SSW5	SW2	SSE2	NNW5	SSE5	S4	N3	SW7	SSW6	S6	NNW3	E2	SSE4	SW5	SW8	WSW13	S7	SSE7	SSW6	SW2.9	WSW13
29-Jul	SSW7	SW4	WSW6	SW3	S6	SSE5	S6	SSW7	SSW7	SSW7	SSW6	SW6	S7	S9	S7	S8	SSW11	SSW7	SSW6	S6	SE7	SSE8	SE9	SE7	S6.0	SSW11
30-Jul	E1	ESE4	S7	WSW7	W4	SSW6	S6	SSE5	SW2	WSW3	NNW6	N7	SE5	SE10	SSE15	N17	NNE15	NNE13	NNE11	N12	N14	N11	NNE8	N9	NNE2.9	N17
31-Jul	NNE9	NNE9	N8	NE4	NNE8	NNW17	N11	NNW12	NNW12	NW5	NW5	SW8	W12	W12	WSW10	SW7	WSW7	N11	WSW9	W8	W12	W10	W11	W12	NW6.4	NNW17

NW2.0 NW2.2 NW1.9	NNW1.7	NNW1.1	NW1.2	NNW1.1	NW1.8	NW2.8	NW2.2	NW2.1	NW3.4	NNW3.5	NW4.0	NW4.4	NNW5.1	NNW6.3	N6.4	NNW5.3	NNW4.8	NNW4.8	NNW3.4	NNW3.0	NW2.1						Diurnal Average		
NNW18	NNW19	NNW18	NNW15	N14	NNW17	NNW14	N19	N20	N18	N22	N22	NNW22	N24	N25	NW23	N29	N30	N31	N24	NNW25	N23	NNW24	NNW19						Diurnal Maximum

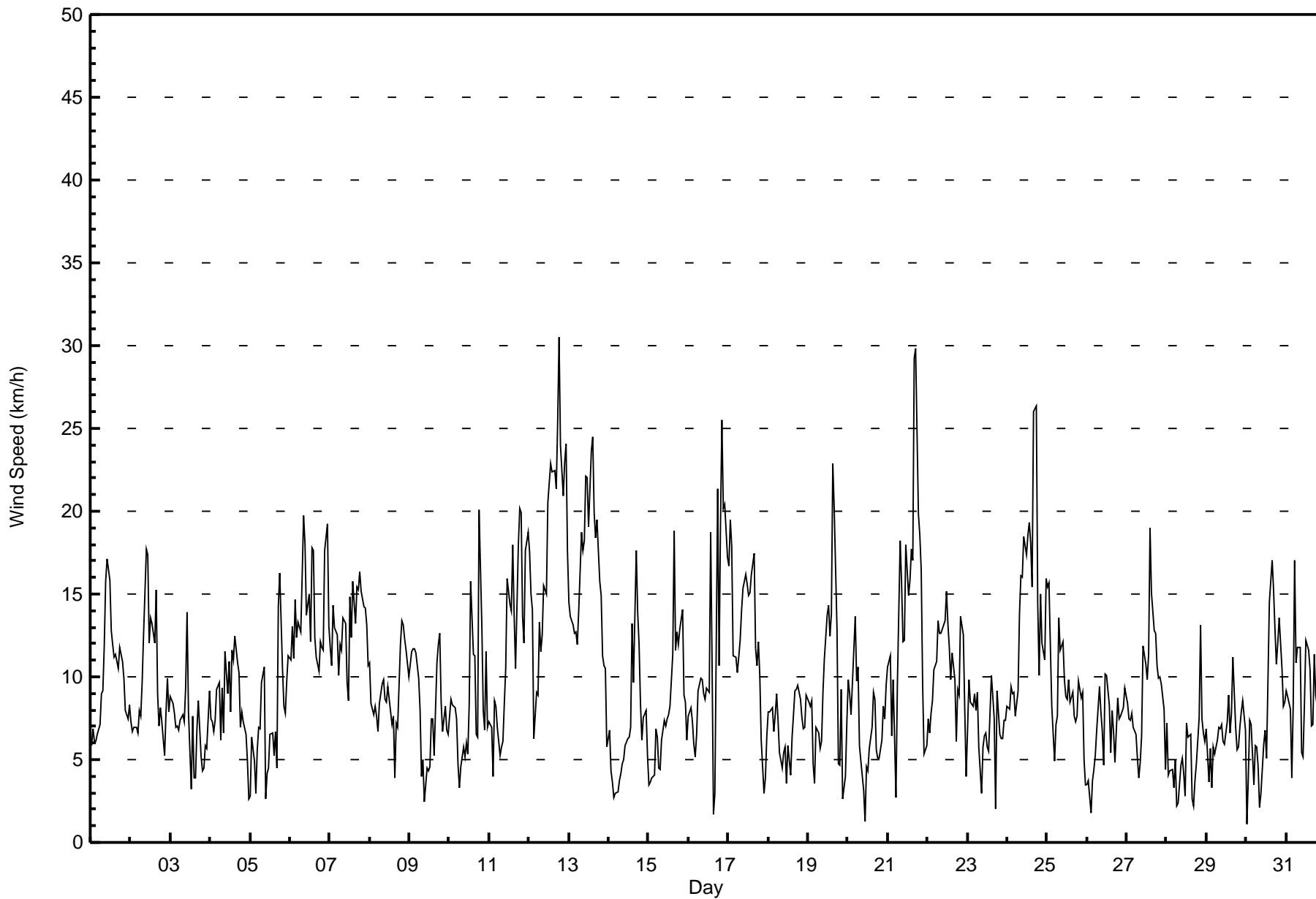
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

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

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	120	16.13	16.13
6 - 11	394	52.96	69.09
12 - 19	198	26.61	95.70
20 - 28	29	3.90	99.60
29 - 38	3	0.40	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
Buffalo Viewpoint - July 2016**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	12	5	4	3	6	3	8	16	7	8	9	7	6	9	8	9	120
6 - 11	62	36	5	2	0	4	47	45	28	30	18	29	21	33	14	20	394
12 - 19	67	17	2	1	0	0	10	13	1	1	4	24	12	8	14	24	198
20 - 28	16	1	0	0	0	0	0	0	0	0	0	1	0	3	1	7	29
29 - 38	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	160	59	11	6	6	7	65	74	36	39	31	61	39	53	37	60	744

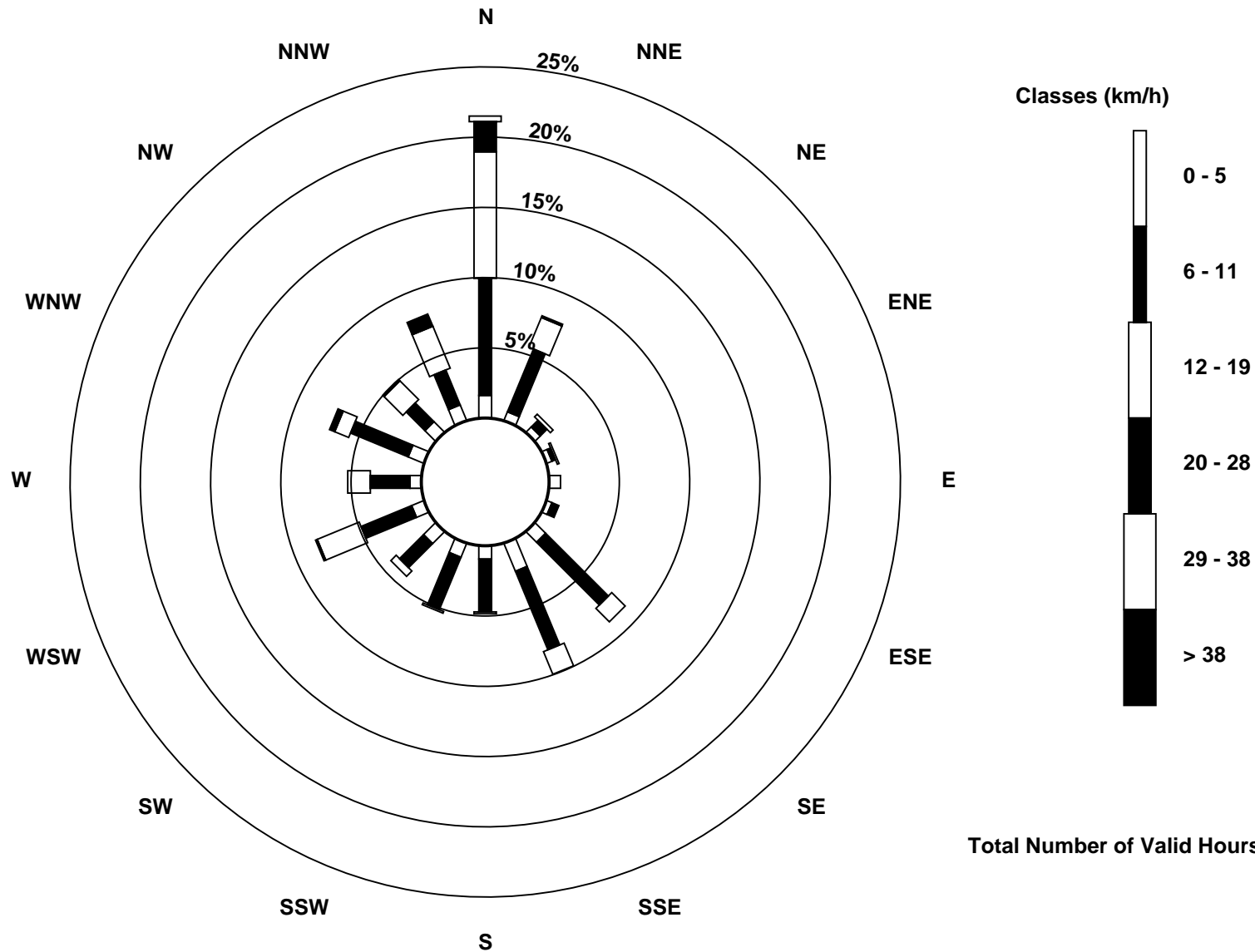
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

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



Total Number of Valid Hours: 744



Wood Buffalo Environmental Association
Summary of Hour Averages

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

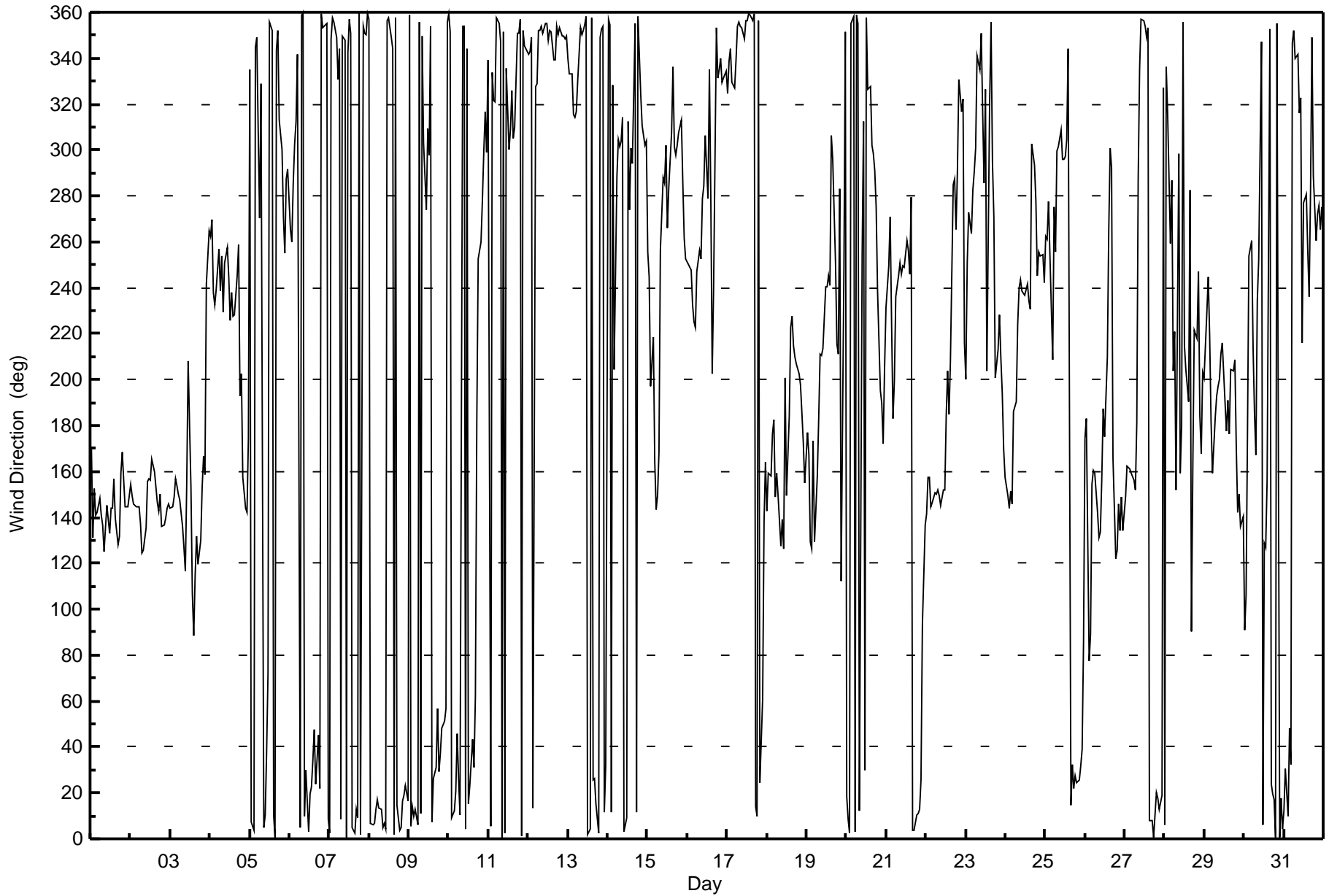
Direction of Maximum Speed: 350 deg on Jul 12 19:00 Direction of Maximum Daily Speed Average: 348.7 deg on Jul 12																							Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0		
Direction of Minimum Speed: 91 deg on Jul 30 01:00											Direction of Minimum Daily Speed Average: 2.9 deg on Jul 28												Percent Operational Time: 100.0		
Monthly Average Direction: 298.1 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-Jul	170	131	153	141	142	149	141	136	125	136	145	133	144	144	157	140	128	132	159	169	156	144	145	150	143.6
2-Jul	154	149	146	145	144	145	137	125	126	136	155	157	156	166	160	153	146	143	150	136	136	140	144	146	146.6
3-Jul	144	144	149	157	154	150	148	136	127	117	155	208	153	107	88	115	132	119	130	153	167	159	241	265	147.7
4-Jul	263	270	238	233	239	257	239	254	229	251	257	245	226	238	227	228	245	258	193	203	158	144	142	175	233.6
5-Jul	335	8	4	345	349	308	270	329	5	10	38	72	356	352	10	1	343	352	313	300	271	255	287	292	328.8
6-Jul	266	260	285	303	312	342	5	359	360	10	30	3	20	23	34	48	24	45	22	360	353	354	355	9	358.9
7-Jul	3	348	358	356	349	331	344	9	350	348	1	342	357	351	5	3	13	9	360	2	354	351	350	359	356.2
8-Jul	357	7	6	7	13	17	14	13	5	7	4	356	358	349	344	2	357	15	4	5	16	19	23	17	7.2
9-Jul	359	5	14	10	13	6	356	11	350	303	274	309	298	354	7	26	31	57	29	37	48	51	57	356	14.0
10-Jul	359	352	9	12	21	46	26	11	354	354	4	344	15	23	43	31	62	182	253	260	278	300	317	299	348.3
11-Jul	339	5	334	322	321	358	355	347	1	351	2	336	300	309	326	305	310	351	351	357	1	352	346	343	339.3
12-Jul	342	343	349	14	328	329	352	352	354	351	355	355	348	352	351	339	339	354	350	353	350	349	349	349	348.7
13-Jul	340	333	333	316	314	317	330	353	350	352	354	358	2	4	358	26	26	15	2	349	353	354	12	32	354.1
14-Jul	357	355	12	328	205	289	305	302	304	314	3	9	312	274	301	294	355	12	358	341	324	311	302	304	329.2
15-Jul	255	245	197	218	164	143	149	168	256	288	286	302	266	284	308	336	301	298	302	307	313	286	262	252	285.8
16-Jul	251	249	248	233	225	223	247	256	253	279	284	306	279	335	279	202	241	353	332	335	340	329	331	334	305.2
17-Jul	325	339	344	329	327	339	354	356	354	353	348	357	356	359	359	357	359	14	10	357	24	61	139	164	352.3
18-Jul	143	159	158	176	182	149	159	150	128	139	127	201	149	184	223	227	215	210	207	203	198	186	173	155	176.9
19-Jul	177	167	129	126	173	130	158	183	211	211	214	241	240	245	241	306	296	251	215	211	283	112	249	352	234.7
20-Jul	18	8	2	355	358	3	359	355	12	254	312	30	357	327	328	302	298	291	275	239	195	190	172	205	332.6
21-Jul	231	250	271	225	183	200	236	245	251	246	250	249	260	257	246	279	4	4	11	11	13	26	93	137	287.4
22-Jul	142	157	158	144	147	151	150	152	149	145	152	152	184	204	185	208	285	288	265	291	331	317	322	216	180.6
23-Jul	200	251	273	263	283	291	301	341	335	351	316	286	326	204	321	356	295	271	201	213	228	209	194	170	270.7
24-Jul	158	150	144	152	146	186	190	224	240	243	239	237	239	242	234	230	303	293	278	246	255	254	255	242	239.8
25-Jul	262	261	278	254	209	275	256	300	302	308	296	296	297	304	344	15	32	22	28	24	26	32	39	86	312.5
26-Jul	175	183	78	89	154	160	159	142	131	134	156	187	175	210	266	301	293	166	122	126	146	134	149	134	157.6
27-Jul	149	162	162	161	160	156	152	181	288	335	357	356	354	349	353	8	8	1	10	20	17	13	19	327	10.0
28-Jul	6	336	316	259	287	204	221	152	298	159	180	355	215	205	191	283	90	163	221	218	247	184	168	203	220.1
29-Jul	200	229	244	219	182	159	184	193	197	200	211	216	190	177	191	176	204	204	208	170	142	150	136	141	186.4
30-Jul	91	106	177	254	260	213	186	167	234	252	347	6	129	127	156	353	24	19	17	1	355	1	18	4	15.3
31-Jul	12	31	10	48	32	347	352	340	342	316	323	216	277	281	256	236	282	349	289	261	272	276	265	275	309.3
310.8 310.6 324.7 295.6 301.3 305.7 302.5 318.3 326.1 318.5 317.5 308.3 297.1 310.7 314.5 329.3 340.2 352.2 337.1 335.0 332.6 341.5 336.2 312.9 Diurnal Average																									
All monthly, daily, and diurnal averages have been calculated using vector methods																									



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

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

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 98 deg on Jul 30 01:00 Minimum Value: 8 deg on Jul 11 04:00 Percentiles: P ₁ = 10 P ₁₀ = 14 Q ₁ = 17 Median = 20 Q ₃ = 30 P ₉₀ = 43 P ₉₉ = 78																								Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Jul	13	11	16	14	15	17	20	24	22	23	24	27	32	30	33	31	35	25	24	22	20	15	13	17	35
2-Jul	18	15	16	15	17	19	21	22	23	25	25	28	25	29	28	22	23	26	23	17	27	14	17	16	29
3-Jul	17	17	17	14	18	21	24	27	30	24	27	38	68	39	46	30	24	21	31	19	20	19	45	17	68
4-Jul	19	17	19	19	18	15	19	14	20	18	21	18	23	19	19	17	29	26	20	22	18	20	26	70	70
5-Jul	63	20	18	35	15	16	26	34	21	62	35	26	32	41	46	37	77	32	13	45	23	17	15	17	77
6-Jul	22	15	28	14	14	24	16	17	17	19	21	23	22	21	22	24	25	26	20	17	14	17	17	15	28
7-Jul	16	14	17	16	14	21	20	18	19	23	23	32	19	17	20	24	20	18	17	16	15	14	14	15	32
8-Jul	14	13	14	13	17	18	18	18	22	24	27	25	30	38	34	64	38	27	17	16	14	15	14	15	64
9-Jul	14	14	13	14	13	15	15	29	36	54	26	52	38	30	36	67	38	27	17	18	22	11	19	23	67
10-Jul	15	12	11	15	16	19	25	23	18	28	28	44	37	19	31	24	48	46	17	16	18	18	12	31	48
11-Jul	23	14	35	8	12	15	28	28	30	21	21	24	18	27	15	16	28	17	16	17	15	14	12	14	35
12-Jul	14	15	19	26	11	22	15	18	18	17	19	18	18	18	20	20	18	18	17	18	16	15	17	14	26
13-Jul	15	16	18	11	11	13	17	17	18	18	17	20	22	19	20	21	21	18	17	15	13	14	18	37	37
14-Jul	14	19	35	38	48	53	31	26	30	42	42	45	49	36	20	25	30	17	17	9	14	11	35	53	
15-Jul	22	25	20	38	14	11	21	35	35	32	40	47	42	36	43	17	20	19	17	18	12	18	11	17	47
16-Jul	14	16	20	23	23	21	19	17	18	23	24	20	24	38	40	76	50	67	16	17	15	15	16	16	76
17-Jul	12	18	16	17	14	19	16	17	17	19	20	21	22	22	22	19	26	21	16	16	11	50	41	10	50
18-Jul	10	8	13	9	13	13	16	30	39	32	35	69	56	67	51	38	25	19	17	15	13	12	15	10	69
19-Jul	12	14	9	36	68	23	23	39	37	23	25	25	24	27	25	26	19	30	39	32	31	72	40	30	72
20-Jul	14	13	14	16	17	15	15	19	20	47	95	36	64	25	34	19	25	30	34	33	12	11	11	20	95
21-Jul	17	24	33	22	34	73	35	15	15	17	20	17	29	29	19	42	19	19	18	18	16	21	39	31	73
22-Jul	9	19	17	14	18	20	21	21	23	23	22	24	26	24	22	17	34	32	21	43	17	11	32	52	52
23-Jul	27	16	15	16	16	18	15	32	72	36	37	46	47	60	79	43	34	80	17	14	12	28	18	16	80
24-Jul	11	11	14	13	11	30	20	20	20	20	21	21	23	19	21	19	30	17	33	19	14	20	17	17	33
25-Jul	19	16	19	19	21	29	27	17	21	23	30	27	36	35	37	34	31	29	24	16	14	12	61	67	67
26-Jul	23	20	80	47	19	17	23	22	28	31	68	29	35	28	50	35	38	52	21	15	13	13	15	10	80
27-Jul	13	12	13	14	15	18	16	29	39	27	18	19	25	31	17	19	28	21	17	17	14	10	11	20	39
28-Jul	16	39	35	49	54	29	77	72	30	31	46	78	35	40	43	84	88	57	17	20	16	34	21	20	88
29-Jul	15	57	29	51	20	16	20	24	25	30	44	43	43	47	51	32	29	27	22	32	13	19	18	23	57
30-Jul	98	53	30	38	72	38	42	29	64	64	46	38	67	42	25	70	21	24	18	18	17	15	19	13	98
31-Jul	21	18	19	43	34	16	21	18	16	64	79	18	23	23	20	25	39	16	21	23	17	18	16	20	79
Diurnal Maximum																									





Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	July 8, 2016	Last Calibration	June 15, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Reason:	Routine		
Start Time (MST)	9:00	End Time (MST)	11:10
Gas Cert Reference	LL107929	Station temp.	21 Deg C
Cal Gas Concentration	49.7 ppm	Cal Gas Exp Date	08-Sep-18
Calibrator Make/Model	Sabio 4010	Serial Number	11551008
ZAG Make/Model	API 701	Serial Number	4297
DACS make/model	Campbell Scientific CR3000	DACS serial No.	2635

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-593	-593
Analyzer IP address	192.168.1.43		Lamp voltage	838	828
Calculated slope	1.002095	0.991687	Chamber temp	45.0	45.0
Calculated intercept	0.110708	-0.363215	Pressure	684.9	702.4
Analyzer Background	10.9	10.8	Flow	0.486	0.501
Analyzer Coefficient	0.819	0.819	Intensity	85	85

Analyzer make TEI 43i Analyzer serial # JC1327300932

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.3	----
as found span	5000	60.4	600.4	605.2	0.992
calibrator zero	5000	0.0	0.0	0.3	----
high point	5000	60.4	600.4	605.2	0.992
second point	5000	30.2	300.2	304.8	0.985
third point	5000	15.1	150.1	150.7	0.996
as left zero	5000	0.0	0.0	0.4	----
as left span	5000	60.4	600.4	610.5	0.983
Average Correction Factor					0.991

Corrected As found 604.9 Previous response 599.0 % change -1.0%

Notes:

Sample inlet filter replaced after as founds. No adjustments made.

Calibration Performed By: Asad Hidayat



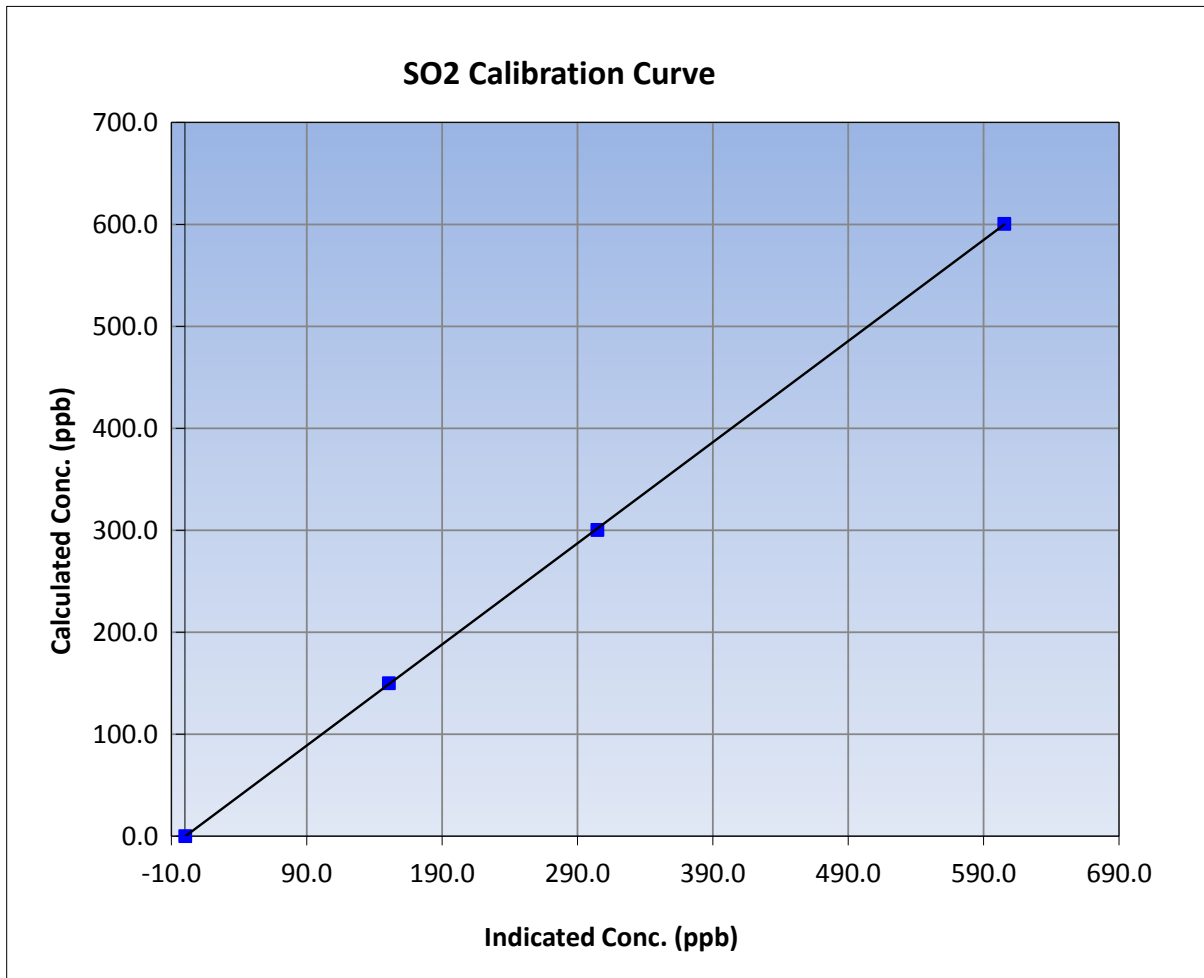
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	July 8, 2016	Previous Calibration	June 15, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Start Time (MST)	9:00	End Time (MST)	11:10
Analyzer make	TEI 43i	Analyzer serial #	JC1327300932

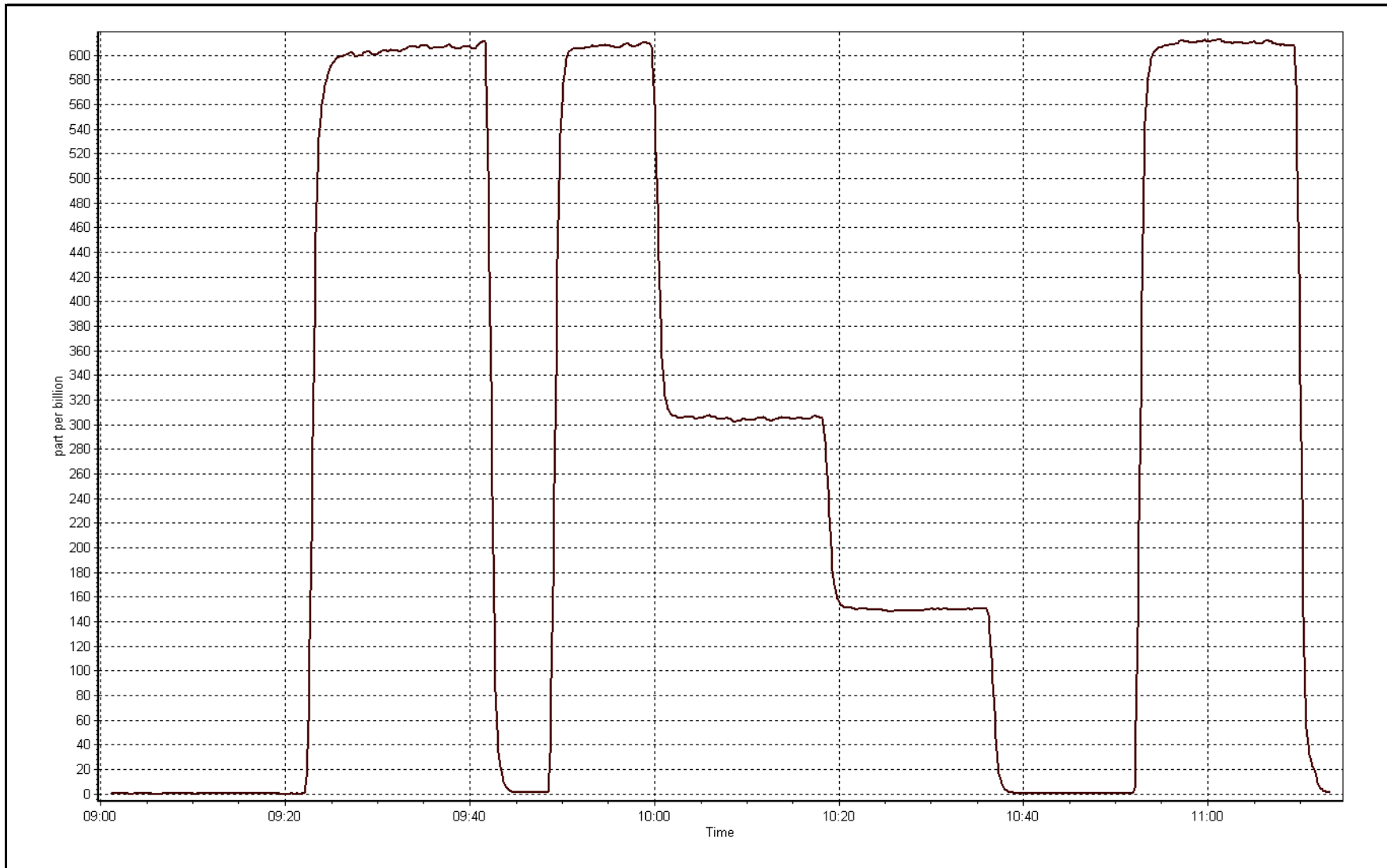
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	----	Correlation Coefficient	0.999978
600.4	605.2	0.9921		
300.2	304.8	0.9850	Slope	0.991687
150.1	150.7	0.9962		
			Intercept	-0.363215



SO2 Calibration Plot

Date: July 8, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	July 8, 2016	Last Calibration	June 24, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Reason:	Routine		
Start Time (MST)	11:10	End Time (MST)	13:35
Gas Cert Reference	LL101590	Station temp.	22 Deg C
Cal Gas Concentration	9.75 ppm	Cal Gas Exp Date	2/22/2016
Calibrator Make/Model	Sabio 4010	Serial Number	11551008
ZAG air Make/Model	API 701	Serial Number	4297
DACS make/model	Campbell Scientific CR3000	Serial Number	2635
SO2 gas concentration	49.7 ppm	SO2 gas cert/exp	LL107929 08-Spet-2018

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-616	-616
Analyzer IP address	192.168.1.42		Lamp voltage	876	874
Calculated slope	0.994467	0.993153	Chamber temp	45	45
Calculated intercept	-0.103126	0.063089	Pressure	545.7	540.9
Analyzer Background	14.2	14	Flow	1.037	1.036
Analyzer Coefficient	0.862	0.845	Intensity	94	94
			Converter temp.	332	329

Analyzer make/model	TEI 450i	Analyzer serial #	1336160094
Converter make/model	na	Converter serial #	na

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	6000	0.0	0.0	-0.1	----
as found span	6000	46.2	75.1	76.3	0.984
SO2 scrubber check	5000	15.1	150.1	1.5	----
calibrator zero	6000	0.0	0.0	-0.1	----
high point	6000	46.2	75.1	75.5	0.995
second point	6000	25.8	41.9	42.3	0.992
third point	6000	15.4	25.0	25.1	0.995
as left zero	5000	0.0	0.0	0.2	----
as left span	6000	46.1	74.9	75.9	0.987
Average Correction Factor					0.994

Corrected As found	76.4	Previous response	75.6	% change	-1.1%
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Notes:

Sample inlet filter replaced after as founds. Scrubber check done after 3rd point. Adjusted span.

Calibration Performed By: Asad Hidayat



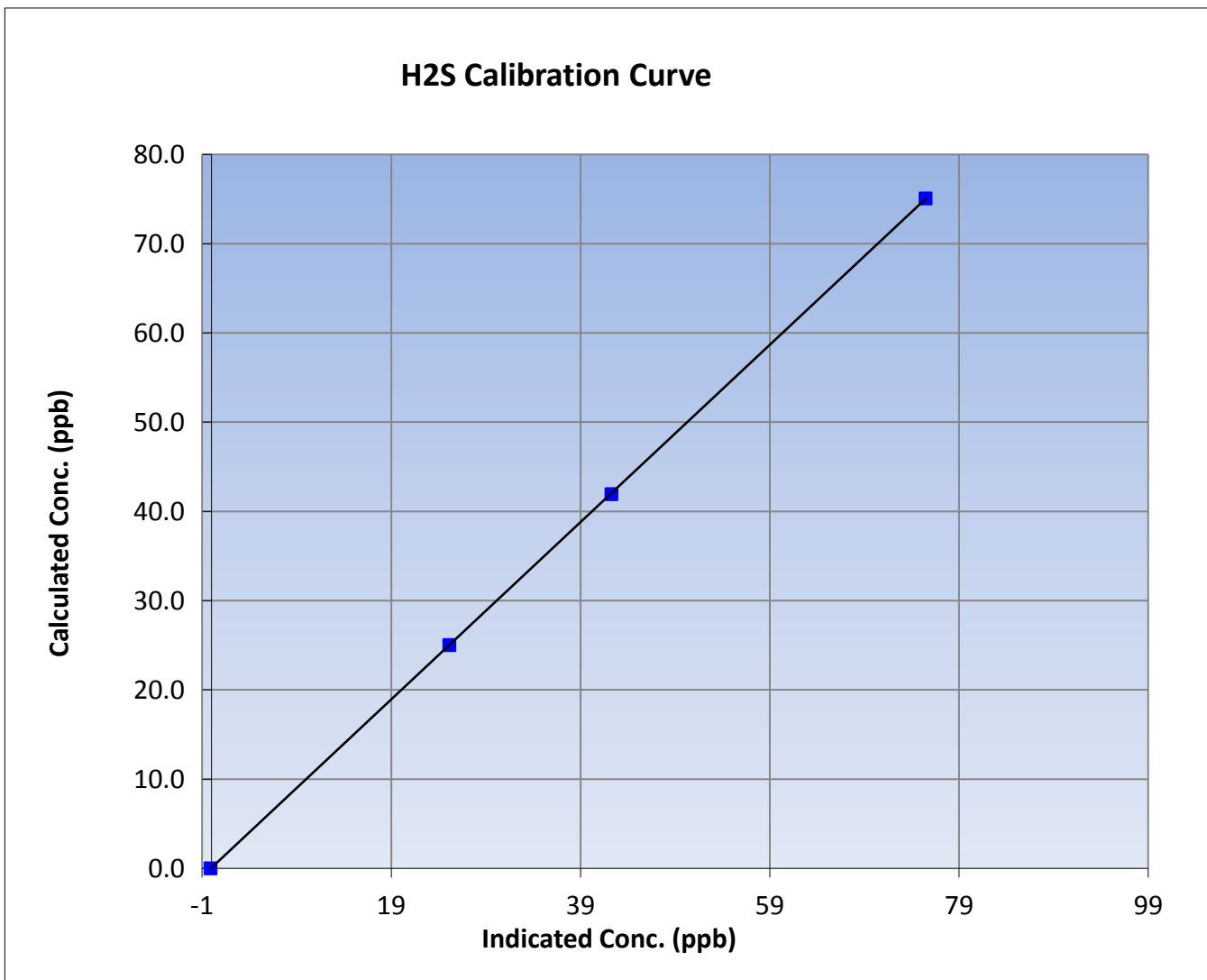
Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	July 8, 2016	Previous Calibration	June 24, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Start Time (MST)	11:10	End Time (MST)	13:35
Analyzer make	TEI 450i	Analyzer serial #	1336160094

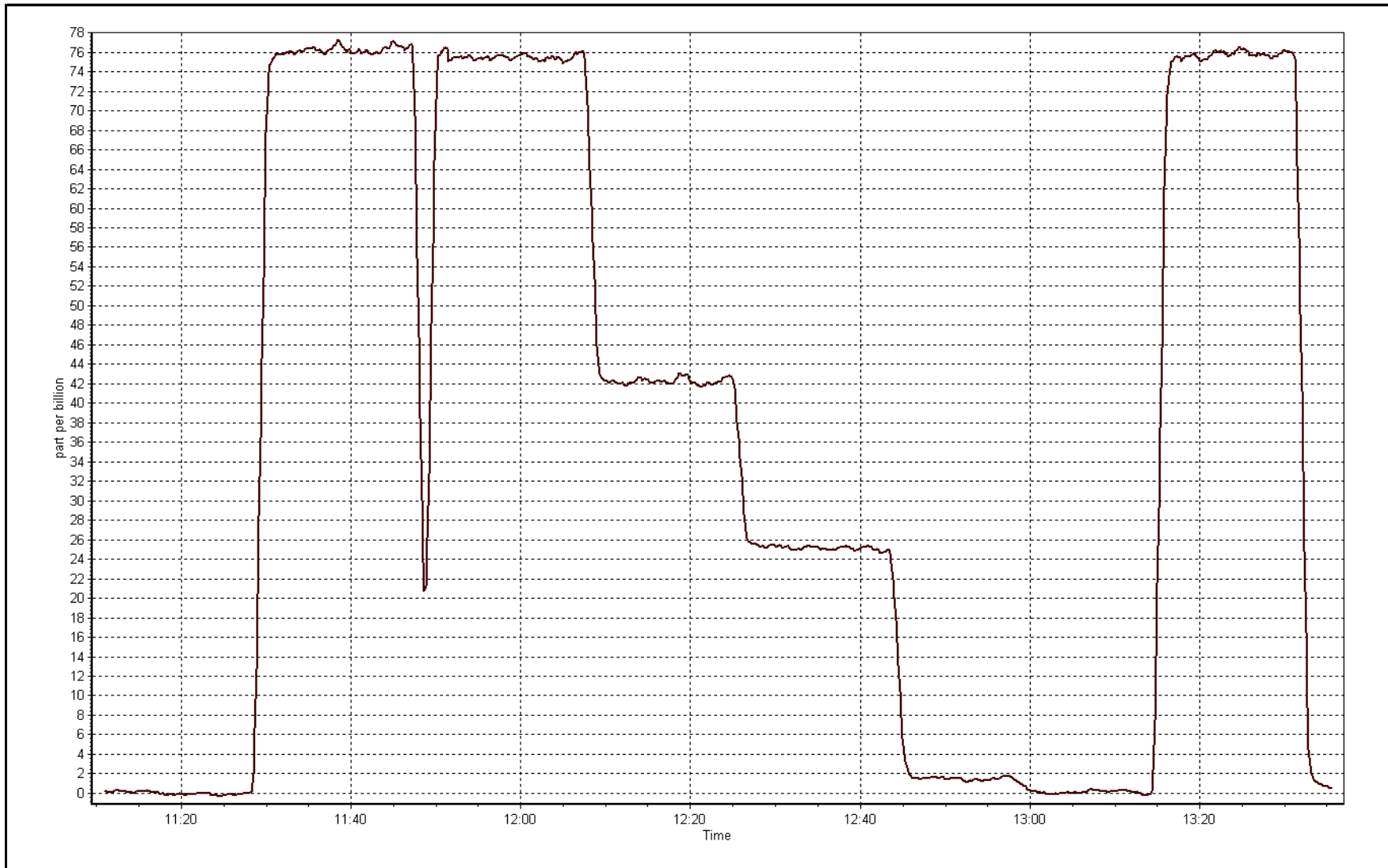
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999993
75.1	75.5	0.9949		
41.9	42.3	0.9918	Slope	0.993153
25.0	25.1	0.9954		
			Intercept	0.063089



H2S Calibration Plot

Date: July 8, 2016





Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	July-08-16	Last Calibration	June-15-16
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Reason:	Routine		
Start Time (MST)	9:00	End Time (MST)	11:10
Gas Cert Reference	LL107929	Cal Gas Expiry Date	08-Sep-18
CH4 Cal Gas Conc.	514 ppm	CH4 Equiv Conc.	1061.3 ppm
C3H8 Cal Gas Conc.	199 ppm	Station temp.	21 Deg C
Calibrator Make/Model	Sabio 4010	Serial Number	11551008
ZAG make/model	Teledyne API 701	Serial Number	4297
DACS make/model	Campbell Scientific CR3000	Serial Number	2635

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 50 ppm		Sample Pressure	8.5	8.5
Analyzer IP address	192.168.1.51		Air or Bypass Press	30.4	30.4
Calculated slope	1.002244	0.992513	Fuel Pressure	19.9	19.9
Calculated intercept	-0.043951	0.005972	Analyzer Coeff	4.2	4.2
			Analyzer BKG	0.890	0.890

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

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	0.00	----
as found span	5000	60.4	12.82	12.91	0.993
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	60.4	12.82	12.91	0.993
second point	5000	30.2	6.41	6.46	0.992
third point	5000	15.1	3.20	3.21	0.998
as left zero	5000	0.0	0.00	0.48	----
as left span	5000	60.4	12.82	12.99	0.987
Average Correction Factor					0.995

Corrected As found	12.91	Previous response	12.84	% change	-0.6%
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Notes:

Sample inlet filter changed after as founds. No adjustments made.

Calibration Performed By:

Asad Hidayat



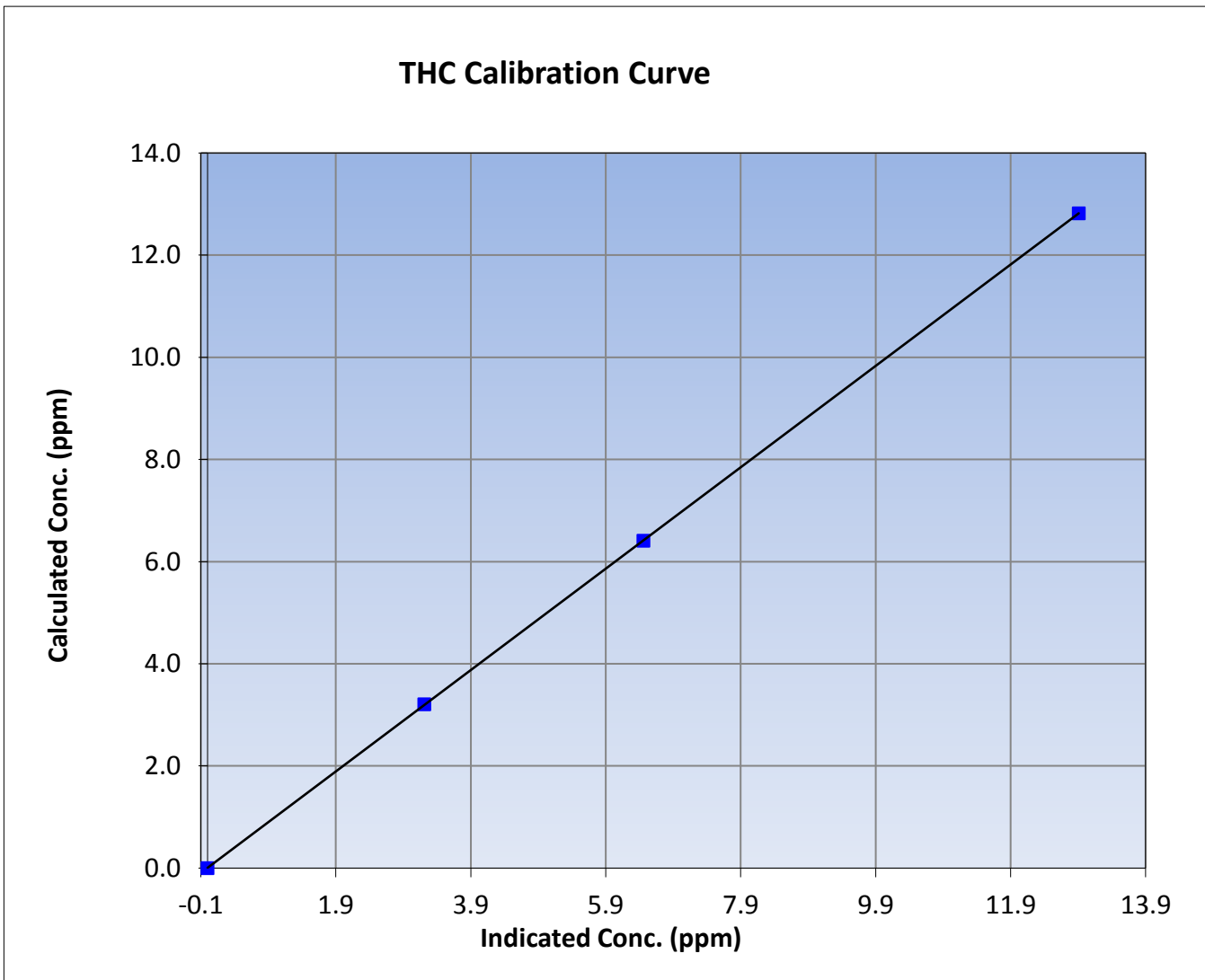
Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	July 8, 2016	Previous Calibration	June 15, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Start Time (MST)	9:00	End Time (MST)	11:10
Analyzer make	TEI 51i-LT	Analyzer serial #	1201650671

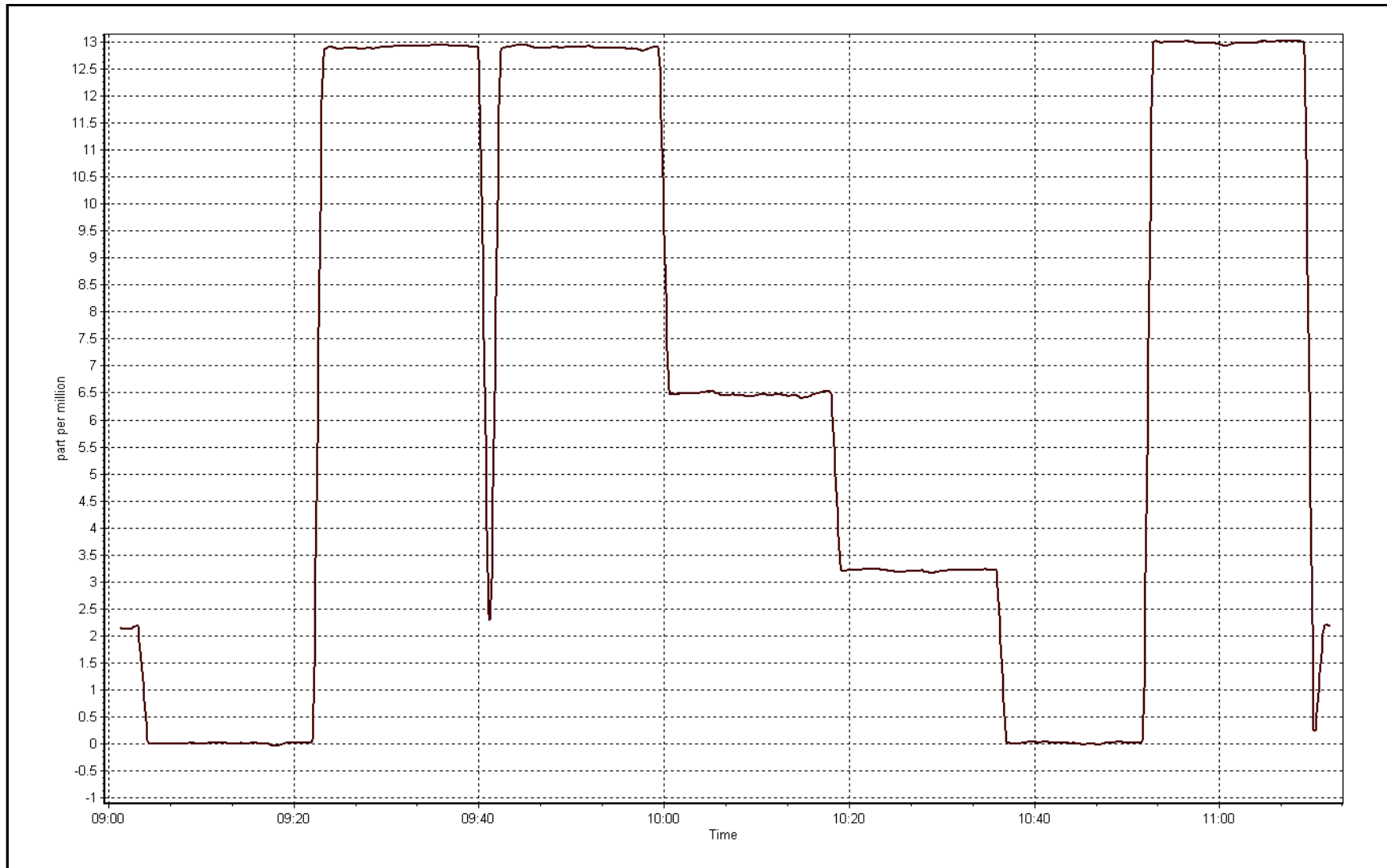
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999997
12.82	12.91	0.9930		
6.41	6.46	0.9923	Slope	0.992513
3.20	3.21	0.9984		
			Intercept	0.005972



THC Calibration Plot

Date: July 8, 2016





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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY MONITORING PROGRAM MONTHLY REPORT

**AMS 5
MANNIX
JULY 2016**

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

August 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - MANNIX (AMS 5)

JULY 2016

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	705	34	39	99.33	150	0	16	0
H2S (ppb) Average	703	35	41	99.19	12	2	2	0
THC (ppm) Average	703	34	41	99.06	6.2	-	2.7	-
Temperature 2 m (C) Average	744	0	0	100.00	30.3	-	22.7	-
Temperature 20 m (C) Average	744	0	0	100.00	29.1	-	23.4	-
Temperature 45 m (C) Average	744	0	0	100.00	28.6	-	23.2	-
Temperature 75 m (C) Average	744	0	0	100.00	28.2	-	23.1	-
Temperature 90 m (C) Average	744	0	0	100.00	28	-	23.1	-
Relative Humidity 2 m (%) Average	744	0	0	100.00	98	-	94	-
Relative Humidity 20 m (%) Average	744	0	0	100.00	97	-	91	-
Relative Humidity 45 m (%) Average	744	0	0	100.00	98	-	90	-
Relative Humidity 75 m (%) Average	744	0	0	100.00	98	-	90	-
Relative Humidity 90 m (%) Average	744	0	0	100.00	99	-	90	-
Wind Speed 20 m (km/h) Average	744	0	0	100.00	27	-	16	-
Wind Speed 45 m (km/h) Average	744	0	0	100.00	34	-	22	-
Wind Speed 75 m (km/h) Average	744	0	0	100.00	37	-	25	-
Wind Speed 90 m (km/h) Average	742	0	2	99.73	38	-	26	-
Wind Direction 20 m (deg) Average	744	0	0	100.00	-	-	-	-
Wind Direction 45 m (deg) Average	744	0	0	100.00	-	-	-	-
Wind Direction 75 m (deg) Average	744	0	0	100.00	-	-	-	-
Wind Direction 90 m (deg) Average	742	0	2	99.73	-	-	-	-
Vertical Wind Speed 20 m (km/h) Average	744	0	0	100.00	1.4	-	0.5	-
Vertical Wind Speed 45 m (km/h) Average	744	0	0	100.00	2	-	1.2	-
Vertical Wind Speed 75 m (km/h) Average	744	0	0	100.00	1.4	-	0.5	-
Vertical Wind Speed 90 m (km/h) Average	742	0	2	99.73	3.8	-	1.9	-

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

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

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	705	4	11	-	0	0	0	0	3	10	150
H2S (ppb) Average	703	1	1	-	0	0	0	0	1	2	12
THC (ppm) Average	703	2.3	0.3	-	2	2.1	2.1	2.2	2.4	2.6	6.2
Temperature 2 m (C) Average	744	18.76	4.4	-	5.2	13.7	15.6	18.1	22.2	25	30.3
Temperature 20 m (C) Average	744	18.95	4	-	6.6	14.3	16.2	18.5	21.9	24.2	29.1
Temperature 45 m (C) Average	744	18.82	3.9	-	6.6	14.3	16.2	18.4	21.7	24	28.6
Temperature 75 m (C) Average	744	18.69	3.8	-	6.8	14.2	16.1	18.4	21.3	23.8	28.2
Temperature 90 m (C) Average	744	18.64	3.8	-	6.9	14.2	16.1	18.4	21.3	23.7	28
Relative Humidity 2 m (%) Average	744	68.8	19	-	23	43	53	71	85	94	98
Relative Humidity 20 m (%) Average	744	64.7	18	-	19	40	50	67	79	90	97
Relative Humidity 45 m (%) Average	744	64.2	18	-	19	40	50	66	78	89	98
Relative Humidity 75 m (%) Average	744	63.7	18	-	20	40	50	65	77	88	98
Relative Humidity 90 m (%) Average	744	63.6	18	-	20	40	50	65	77	88	99
Wind Speed 20 m (km/h) Average	744	9	4	-	1	4	6	8	12	15	27
Wind Speed 45 m (km/h) Average	744	13	6	-	0	5	9	13	17	21	34
Wind Speed 75 m (km/h) Average	744	14.9	7	-	0	6	9	14	20	25	37
Wind Speed 90 m (km/h) Average	742	15.8	8	-	0	6	10	15	21	26	38
Wind Direction 20 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-
Wind Direction 45 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-
Wind Direction 75 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-
Wind Direction 90 m (deg) Average	742	-	-	-	-	-	-	-	-	-	-
Vertical Wind Speed 20 m (km/h) Average	744	0.11	0.3	-	-0.8	-0.3	-0.1	0	0.3	0.5	1.4
Vertical Wind Speed 45 m (km/h) Average	744	0.07	0.6	-	-2	-0.6	-0.3	0	0.4	1	2
Vertical Wind Speed 75 m (km/h) Average	744	0.17	0.3	-	-1.2	-0.2	0	0.1	0.4	0.6	1.4
Vertical Wind Speed 90 m (km/h) Average	742	0.81	0.7	-	-1	0	0.2	0.7	1.3	1.9	3.8

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

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
SO2	11 Jul 2016 13:00	11 Jul 2016 16:00	4	Calibration system maintenance
SO2	15 Jul 2016 10:00	15 Jul 2016 10:00	1	Maintenance - station wiring/data logger upgrade
H2S	11 Jul 2016 13:00	11 Jul 2016 17:00	5	Calibration system maintenance
H2S	15 Jul 2016 10:00	15 Jul 2016 10:00	1	Maintenance - station wiring/data logger upgrade
THC	11 Jul 2016 13:00	11 Jul 2016 16:00	4	Calibration system maintenance
THC	15 Jul 2016 09:00	15 Jul 2016 11:00	3	Maintenance - station wiring and zero air gen maintenance
Wind Speed, Wind Direction, Vertical Wind Speed 90 m	31 Jul 2016 11:00	31 Jul 2016 12:00	2	Intermittent unstable operation



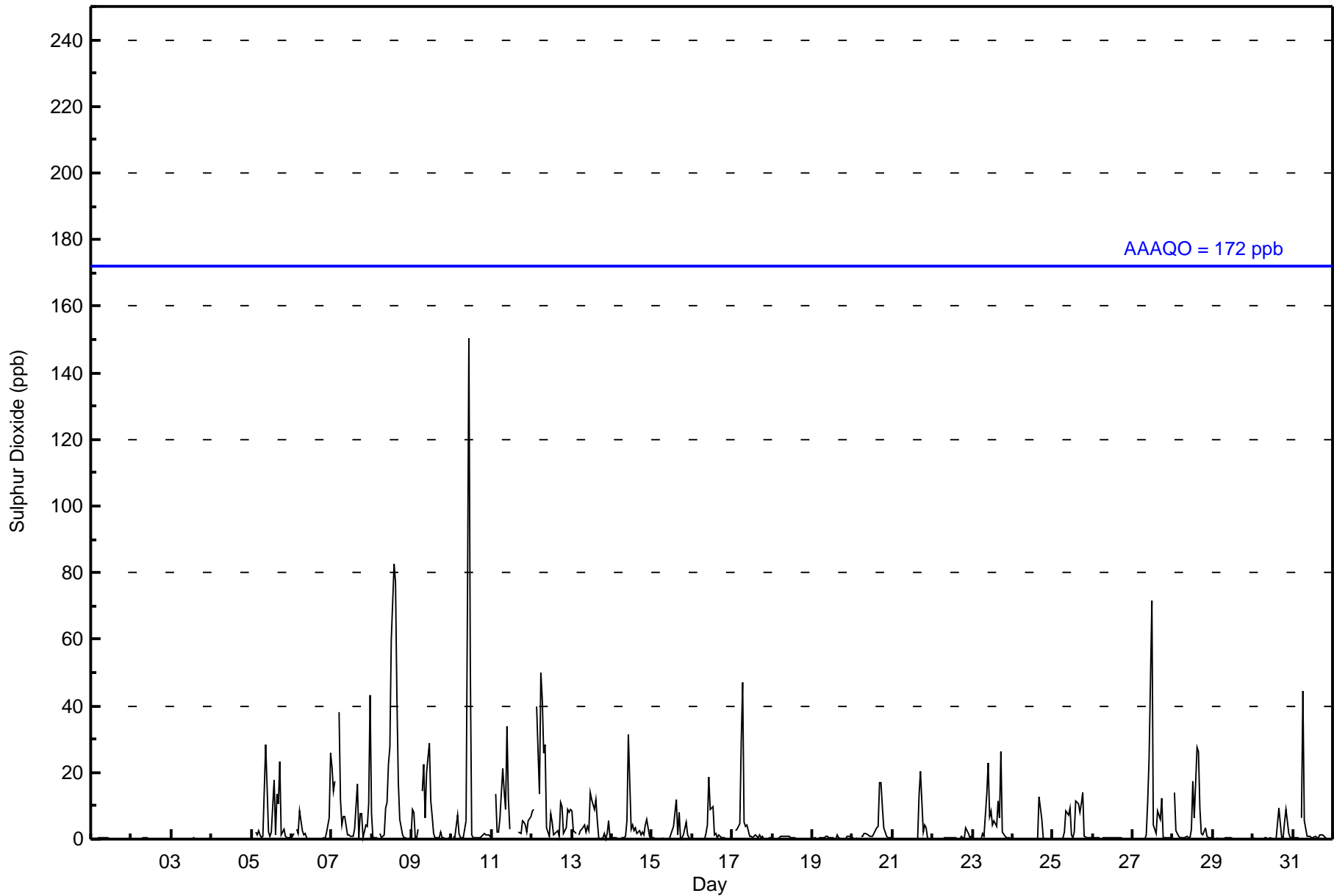
Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

Mannix - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																
Maximum Value: 150 ppb on Jul 10 11:00										Maximum Daily Average: 16.0 ppb on Jul 8										Hours of Data: 705						
Minimum Value: 0 ppb on Jul 3 05:00										Minimum Daily Average: 0.1 ppb on Jul 4										Hours of Missing Data: 39						
Maximum Diurnal Average: 10.5 ppb at hour 11										Minimum Diurnal Average: 1.1 ppb at hour 22										Hours of Calibration: 34						
Monthly Average: 4.0 ppb										Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 3 P ₉₀ = 10 P ₉₉ = 49										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-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
2-Jul	0	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-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
4-Jul	Z	0	0	0	0	0	0	0	0	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
5-Jul	0	Z	2	1	3	1	1	1	28	16	2	1	2	18	1	14	11	23	1	3	1	0	0	0	5.7	28
6-Jul	1	2	Z	3	2	8	2	1	2	0	0	0	0	0	0	0	0	0	0	1	0	2	6	26	2.5	26
7-Jul	22	14	17	Z	38	12	4	7	7	1	1	1	1	1	3	16	0	7	8	0	4	4	10	43	9.7	43
8-Jul	7	1	0	0	Z	2	0	1	9	11	22	28	60	82	77	42	17	6	1	0	0	0	0	0	16.0	82
9-Jul	9	8	0	0	3	Z	14	22	6	20	29	11	7	2	1	0	0	2	0	0	0	0	0	0	6.0	29
10-Jul	Z	1	0	7	2	0	0	0	6	72	150	53	1	0	0	0	0	0	1	2	1	1	1	1	13.1	150
11-Jul	2	Z	13	2	2	7	21	14	9	34	12	3	M	M	M	M	2	2	6	5	4	2	5	7	8.0	34
12-Jul	9	9	Z	40	14	50	42	26	28	3	1	7	5	1	2	3	1	11	10	2	3	9	8	9	12.7	50
13-Jul	8	2	2	Z	1	3	3	4	2	4	3	14	12	9	12	5	0	0	2	0	2	5	0	0	4.1	14
14-Jul	0	0	0	0	Z	0	0	1	1	5	31	3	4	3	3	1	2	1	2	1	4	6	1	1	3.2	31
15-Jul	0	0	0	0	0	Z	0	0	0	0	M	0	1	3	4	12	1	8	0	1	1	5	1	0	1.8	12
16-Jul	Z	0	0	0	0	0	0	0	2	4	19	9	10	1	2	1	1	1	1	1	0	0	0	0	2.2	19
17-Jul	0	Z	3	3	5	29	47	5	4	4	1	1	1	1	1	1	1	1	1	1	0	0	0	1	4.7	47
18-Jul	0	0	Z	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
19-Jul	0	0	0	Z	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	1	1	1	0.4	1
20-Jul	0	0	0	0	Z	1	1	2	2	1	1	1	1	2	3	4	17	17	10	3	1	1	0	0	3.0	17
21-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	13	20	2	4	3	0	0	0	2.0	20
22-Jul	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	3	2	1	1	0.5	3
23-Jul	0	Z	0	0	0	0	2	1	13	23	7	8	4	6	4	11	6	26	2	1	1	0	0	0	5.1	26
24-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	13	6	0	0	0	0	0	0	0.9	13
25-Jul	0	0	0	Z	0	0	0	2	9	7	9	1	0	2	12	10	8	10	14	1	0	0	0	0	3.9	14
26-Jul	0	1	1	1	0	Z	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.4	1
27-Jul	0	0	0	0	0	Z	0	0	1	11	24	71	4	3	2	8	6	12	1	0	0	0	0	0	6.3	71
28-Jul	Z	14	3	1	1	1	0	0	1	0	1	3	17	6	28	26	9	2	1	3	1	0	0	0	5.1	28
29-Jul	0	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
30-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	9	5	1	0	5	9	2	0	1	1.5	9
31-Jul	0	0	0	0	Z	6	45	5	1	1	1	1	1	1	0	0	1	1	1	0	0	0	0	0	2.9	45
2.4 2.1 1.7 2.3 2.8 4.9 6.0 3.1 4.4 7.7 10.5 7.3 4.5 4.8 5.5 5.3 4.0 4.9 2.1 1.2 1.4 1.1 1.4 3.0																								Diurnal Average		
22 14 17 40 38 50 47 26 28 72 150 71 60 82 77 42 17 26 14 5 9 9 10 43																								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
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Mannix - July 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	635	90.07	90.07
11 - 20	36	5.11	95.18
21 - 60	29	4.11	99.29
61 - 110	4	0.57	99.86
111 - 172	1	0.14	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 705

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

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

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	43	56	25	14	9	12	76	62	22	26	34	66	59	32	30	69	635
11 - 20	8	5	2	1	0	2	1	0	0	0	0	0	4	3	4	6	36
21 - 60	12	4	1	2	0	0	0	1	0	0	1	2	0	0	1	5	29
61 - 110	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
111 - 172	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	65	68	28	17	9	14	77	63	22	26	35	68	63	35	35	80	705

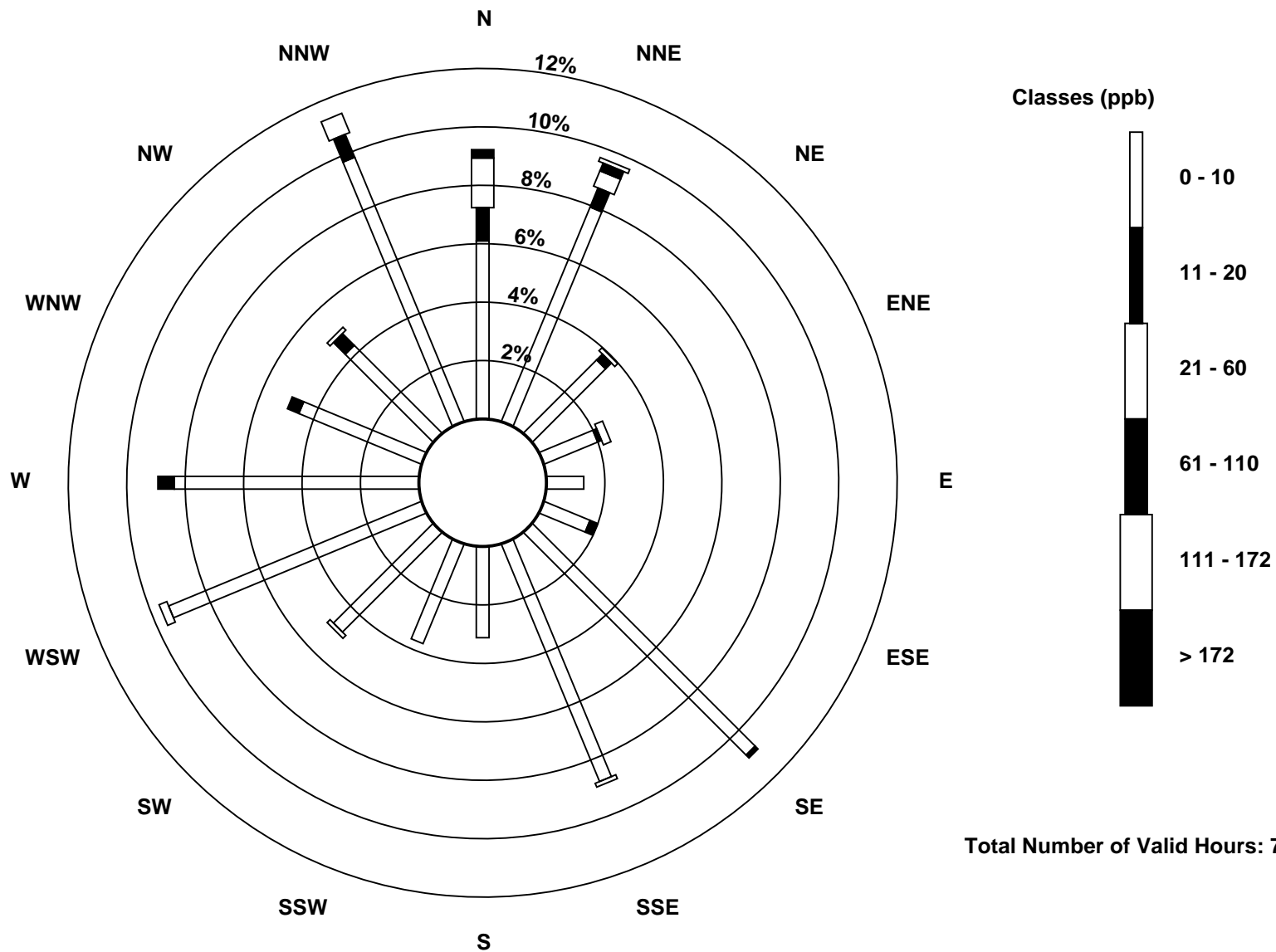
Total Number of Valid Hours: 705

Total Number of Hours: 744

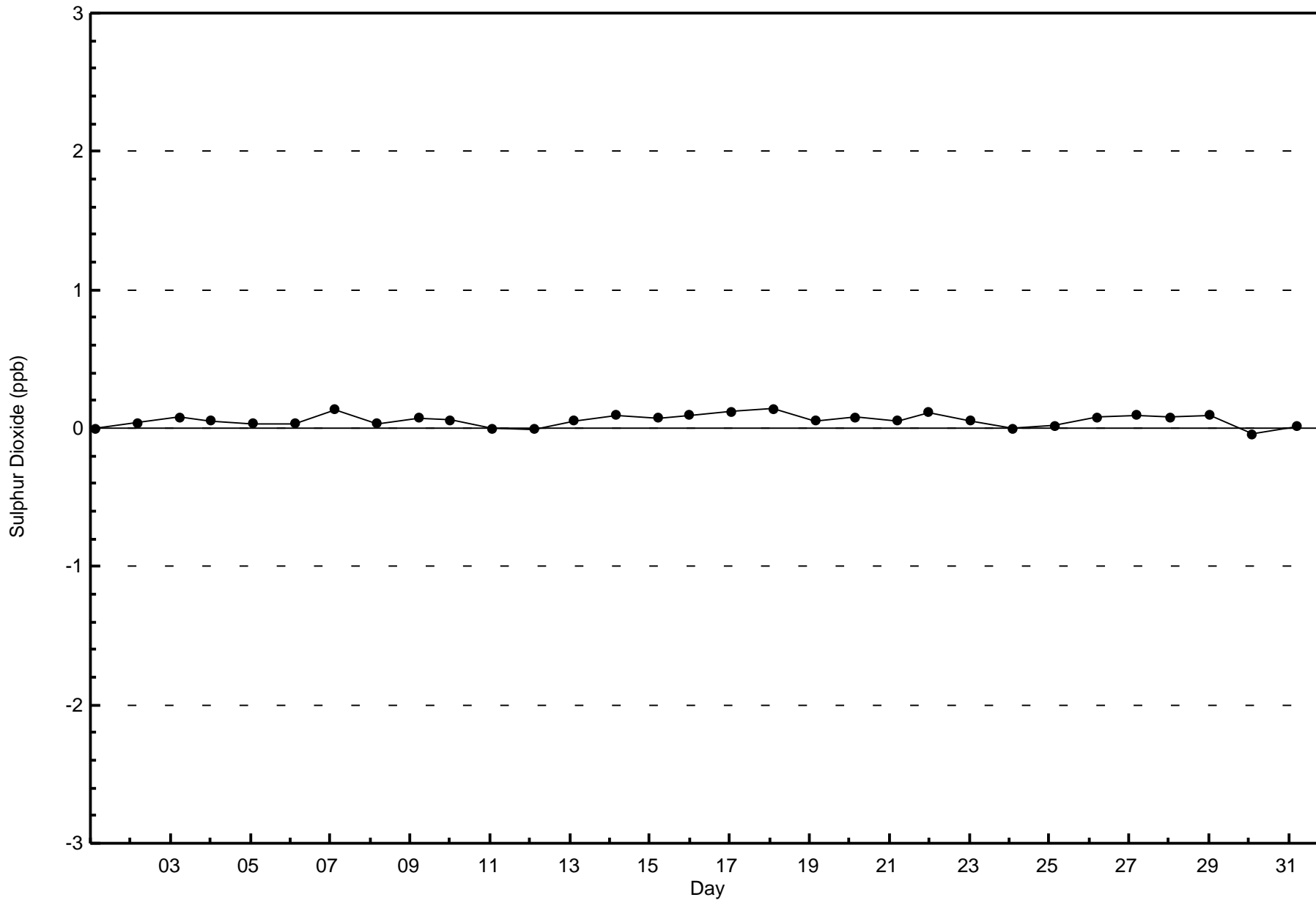


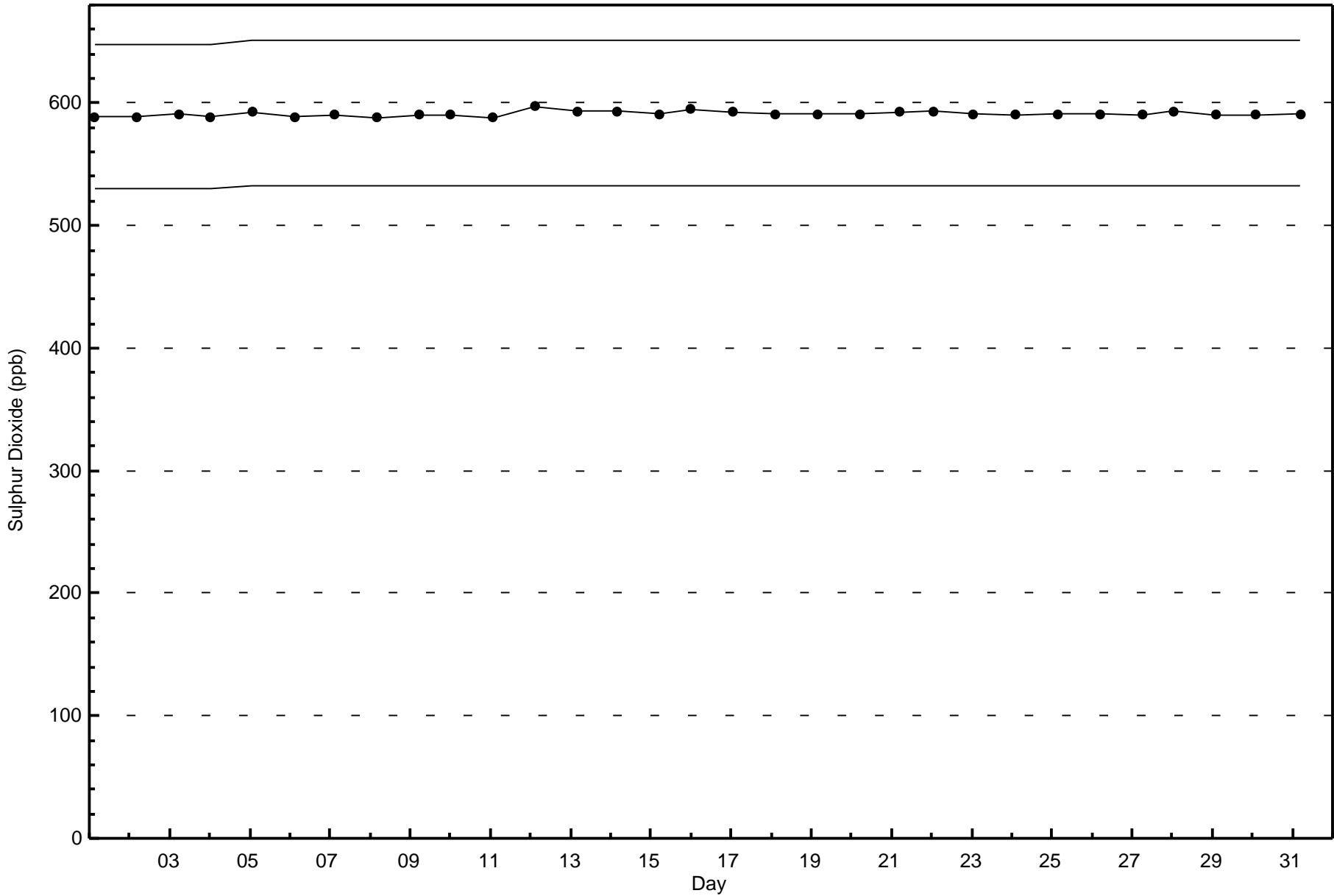
Wood Buffalo Environmental Association
Wind Rose Jul 2016

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



Total Number of Valid Hours: 705





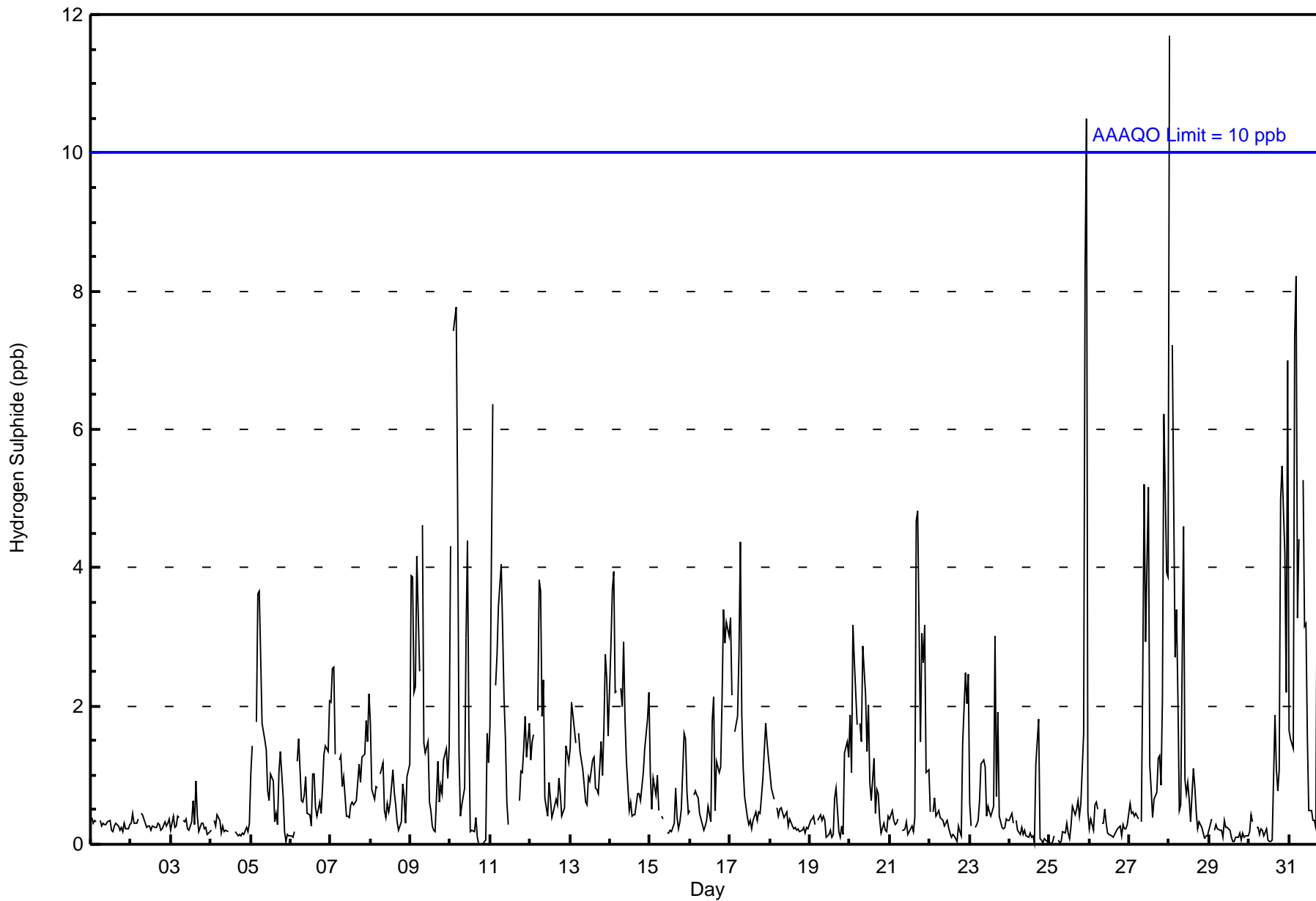


Number of Exceedences (AAAQO):	1-hr: 2	24-hr: 0	Hours in Service:	744
Maximum Value: 12 ppb on Jul 28 01:00	Maximum Daily Average: 2.2 ppb on Jul 31		Hours of Data:	703
Minimum Value: 0 ppb on Jul 10 18:00	Minimum Daily Average: 0.2 ppb on Jul 29		Hours of Missing Data:	41
Maximum Diurnal Average: 1.7 ppb at hour 5	Minimum Diurnal Average: 0.4 ppb at hour 13		Hours of Calibration:	35
Monthly Average: 1.0 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 1 P ₉₀ = 2 P ₉₉ = 7		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-Jul	0	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	
2-Jul	0	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	
3-Jul	0	0	0	0	0	0	Z	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0.3	1	
4-Jul	0	Z	0	0	0	0	0	0	0	0	0	C	C	C	C	0	0	0	0	0	0	0	0	0	0.2	0	
5-Jul	1	1	Z	2	4	4	3	2	2	1	1	1	1	1	0	0	0	1	1	1	1	0	0	0	1.2	4	
6-Jul	0	0	0	Z	1	2	1	1	1	1	0	0	1	1	1	1	0	1	0	1	1	1	1	2	0.8	2	
7-Jul	2	3	3	1	Z	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	2	1	1.2	3	
8-Jul	2	1	1	1	1	Z	1	1	0	0	1	0	1	1	1	1	0	0	0	1	1	0	1	1	0.7	2	
9-Jul	4	4	2	2	4	3	Z	5	1	1	1	1	0	0	0	0	1	1	1	1	1	1	1	1	1.6	5	
10-Jul	4	Z	7	8	5	1	0	1	1	3	4	2	0	0	0	0	0	0	0	0	0	0	0	2	1	1.8	8
11-Jul	2	6	Z	2	3	3	4	3	2	2	1	0	M	M	M	M	M	1	1	1	1	1	2	1	2	2.1	6
12-Jul	1	1	2	Z	2	4	4	2	2	1	0	1	1	0	0	1	1	1	1	0	1	1	1	1	1	1.3	4
13-Jul	1	2	2	1	Z	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3	2	2	1.3	3	
14-Jul	3	4	4	2	2	Z	2	2	3	2	1	0	1	0	0	0	1	1	1	1	1	1	2	2	1.6	4	
15-Jul	1	1	1	1	1	0	Z	0	0	M	0	0	0	0	0	1	0	0	0	0	2	2	1	0	0.6	2	
16-Jul	0	Z	1	1	1	1	0	0	0	0	0	1	0	2	2	0	1	1	1	2	3	3	3	3	1.2	3	
17-Jul	3	2	Z	2	2	3	4	2	1	1	0	0	0	0	0	0	0	0	0	1	1	2	1	1	1.3	4	
18-Jul	1	1	1	Z	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
19-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	1	0.4	1	
20-Jul	2	1	3	3	2	Z	2	1	3	2	1	2	1	1	1	0	1	1	0	0	0	0	0	0	1.2	3	
21-Jul	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	5	5	1	3	3	3	1	1	1.1	5	
22-Jul	0	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	2	0.6	2	
23-Jul	1	0	Z	0	0	0	1	1	1	1	0	1	0	0	1	3	1	2	0	0	0	0	0	0	0.7	3	
24-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0.3	2	
25-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1	2	8	10	0	1.1	10	
26-Jul	0	0	0	1	1	1	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
27-Jul	1	0	0	0	0	0	Z	0	2	5	3	5	1	1	0	1	1	1	1	1	2	6	4	4	1.8	6	
28-Jul	12	Z	7	3	3	2	0	1	5	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	1.7	12	
29-Jul	0	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-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	2	1	1	1	1	5	5	4	2	7	1.4	7
31-Jul	2	2	1	7	8	3	4	Z	5	3	3	2	0	0	0	0	0	4	3	0	0	0	0	0	2.2	8	

1.5	1.3	1.5	1.5	1.7	1.2	1.3	0.9	1.2	1.0	0.8	0.7	0.4	0.5	0.5	0.6	0.7	0.8	0.6	0.8	1.0	1.5	1.4	1.2	Diurnal Average
12	6	7	8	8	4	4	5	5	5	4	5	1	2	2	3	5	5	3	5	5	8	10	7	Diurnal Maximum

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





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Hydrogen Sulphide (H₂S) - ppb
Mannix - July 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	633	90.04	90.04
3 - 4	49	6.97	97.01
5 - 7	16	2.28	99.29
8 - 11	4	0.57	99.86
> 11	1	0.14	100.00

Total Number of Valid Hours: 703

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

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

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	42	51	27	17	7	14	76	65	23	27	30	66	60	33	28	67	633
3 - 4	12	15	0	0	1	0	0	0	0	0	0	2	3	1	5	10	49
5 - 7	7	4	1	0	0	0	0	0	0	0	0	0	1	0	2	1	16
8 - 11	2	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	4
> 11	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Totals	63	71	29	17	9	14	76	65	23	27	30	68	64	34	35	78	703

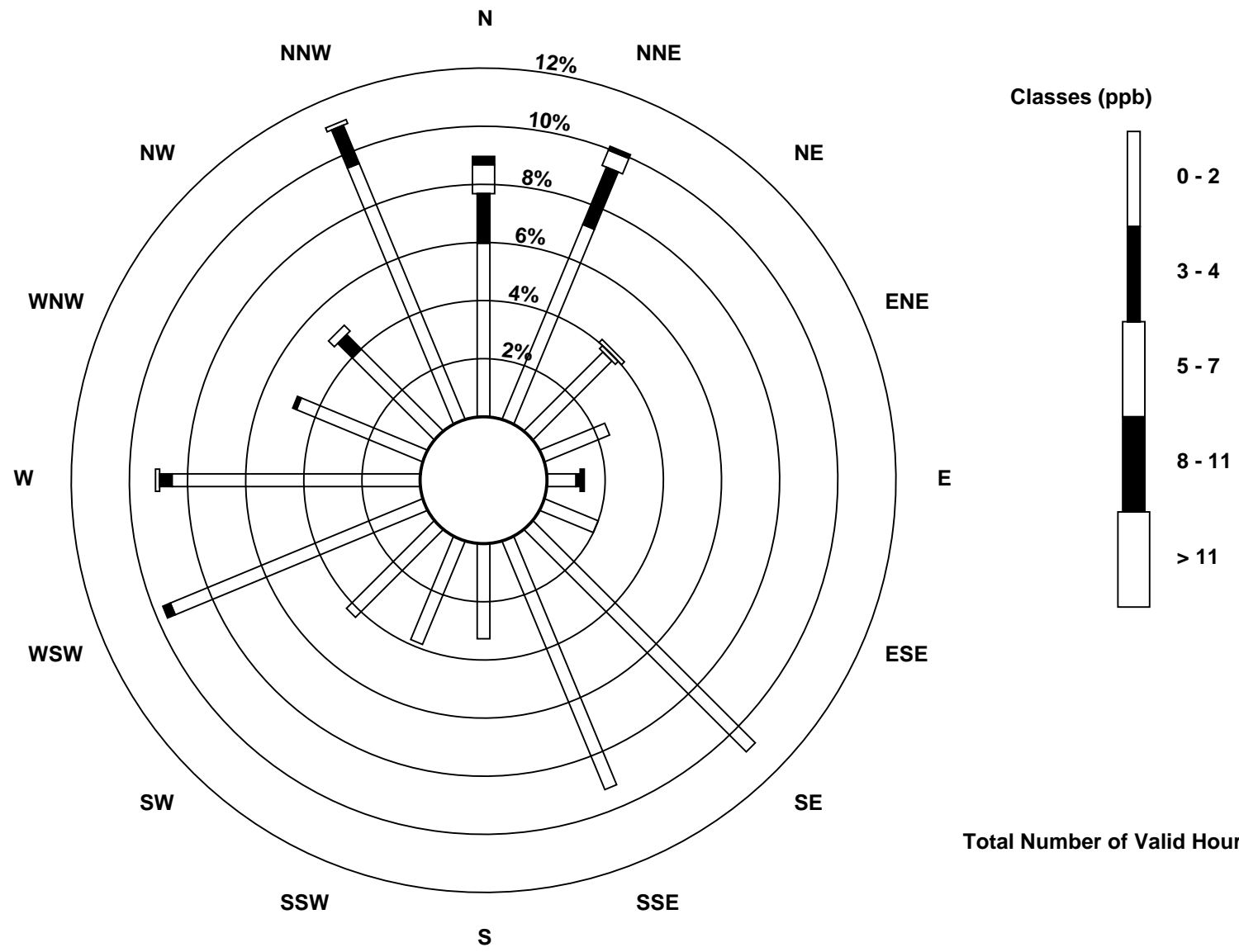
Total Number of Valid Hours: 703

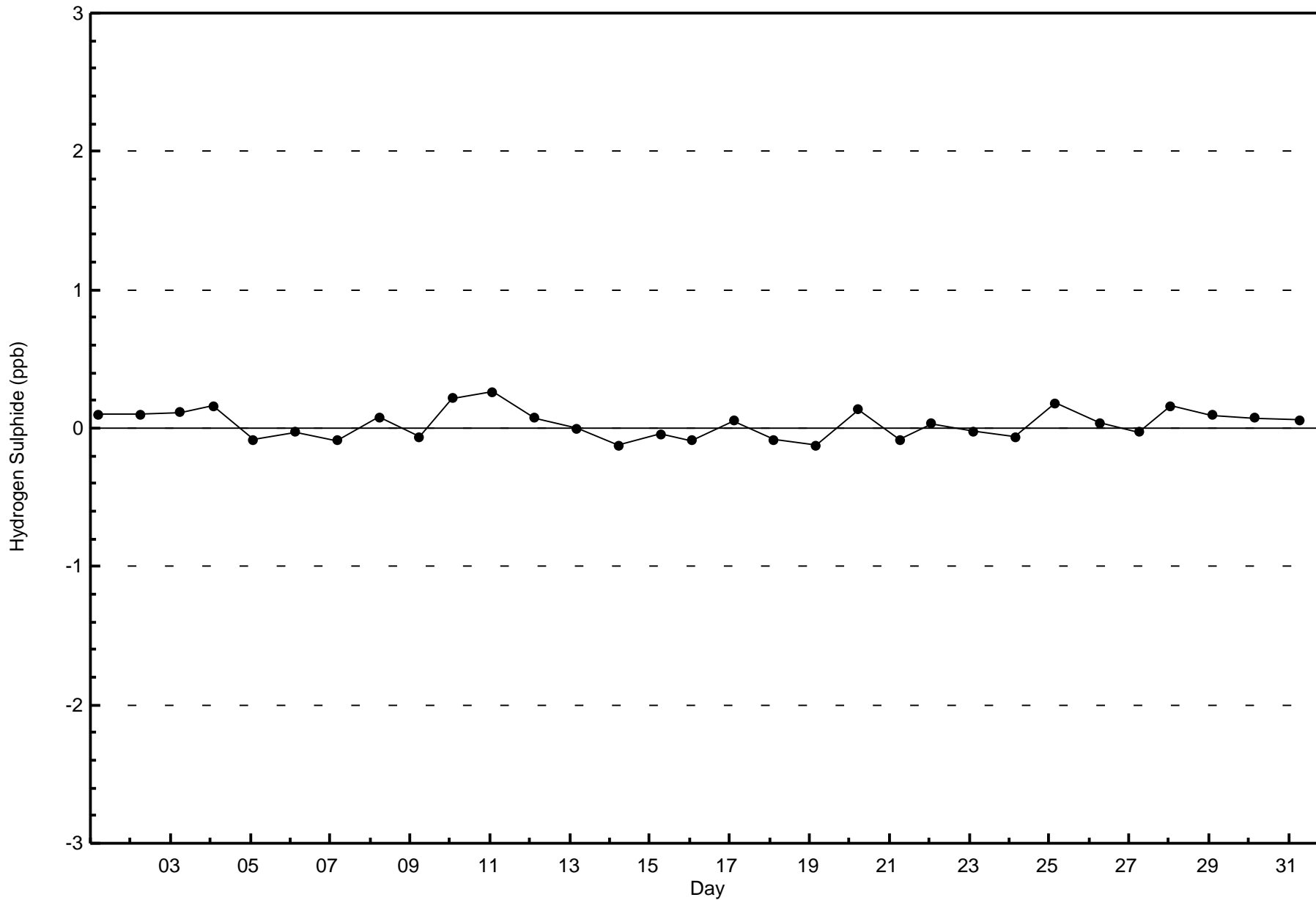
Total Number of Hours: 744

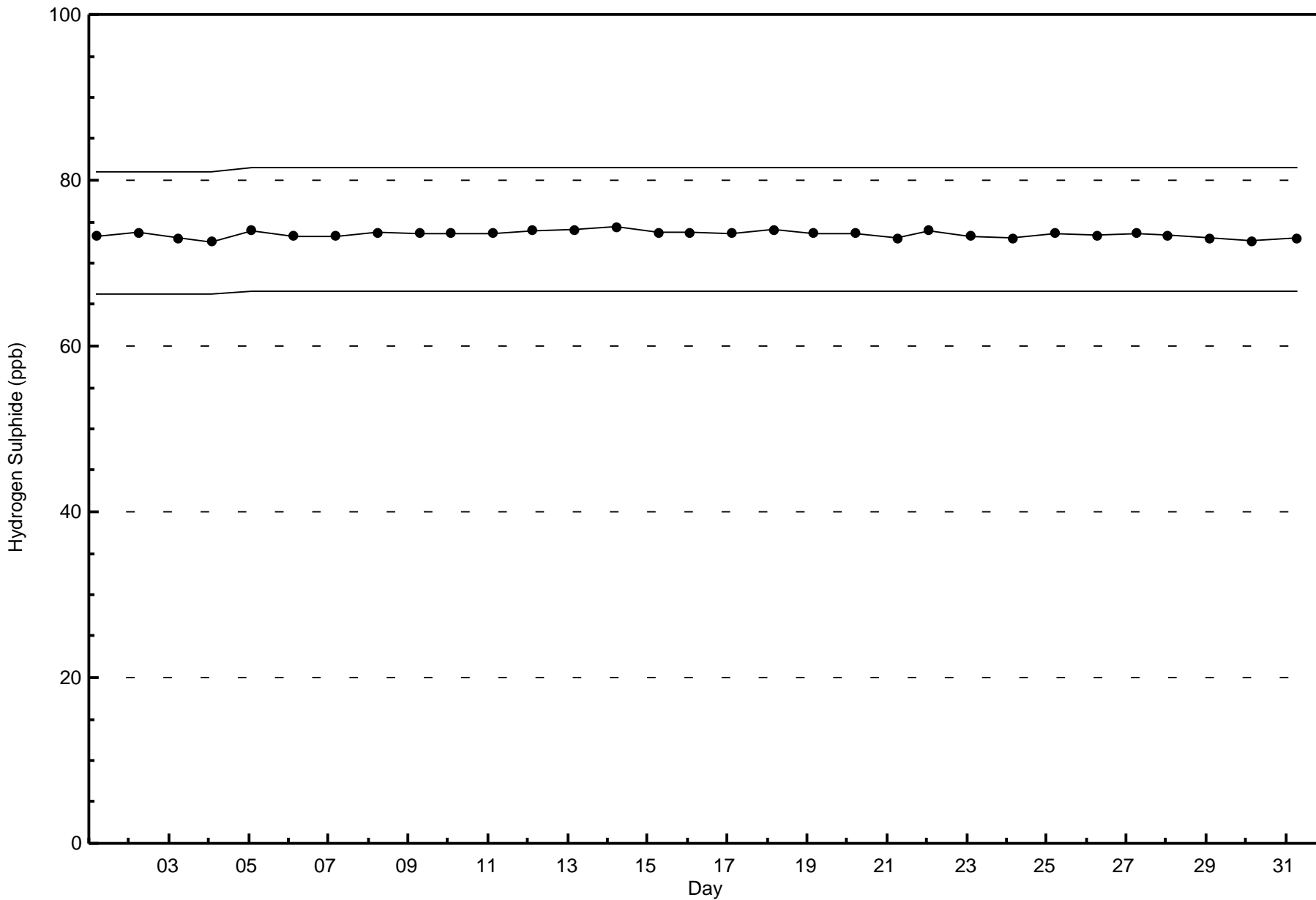


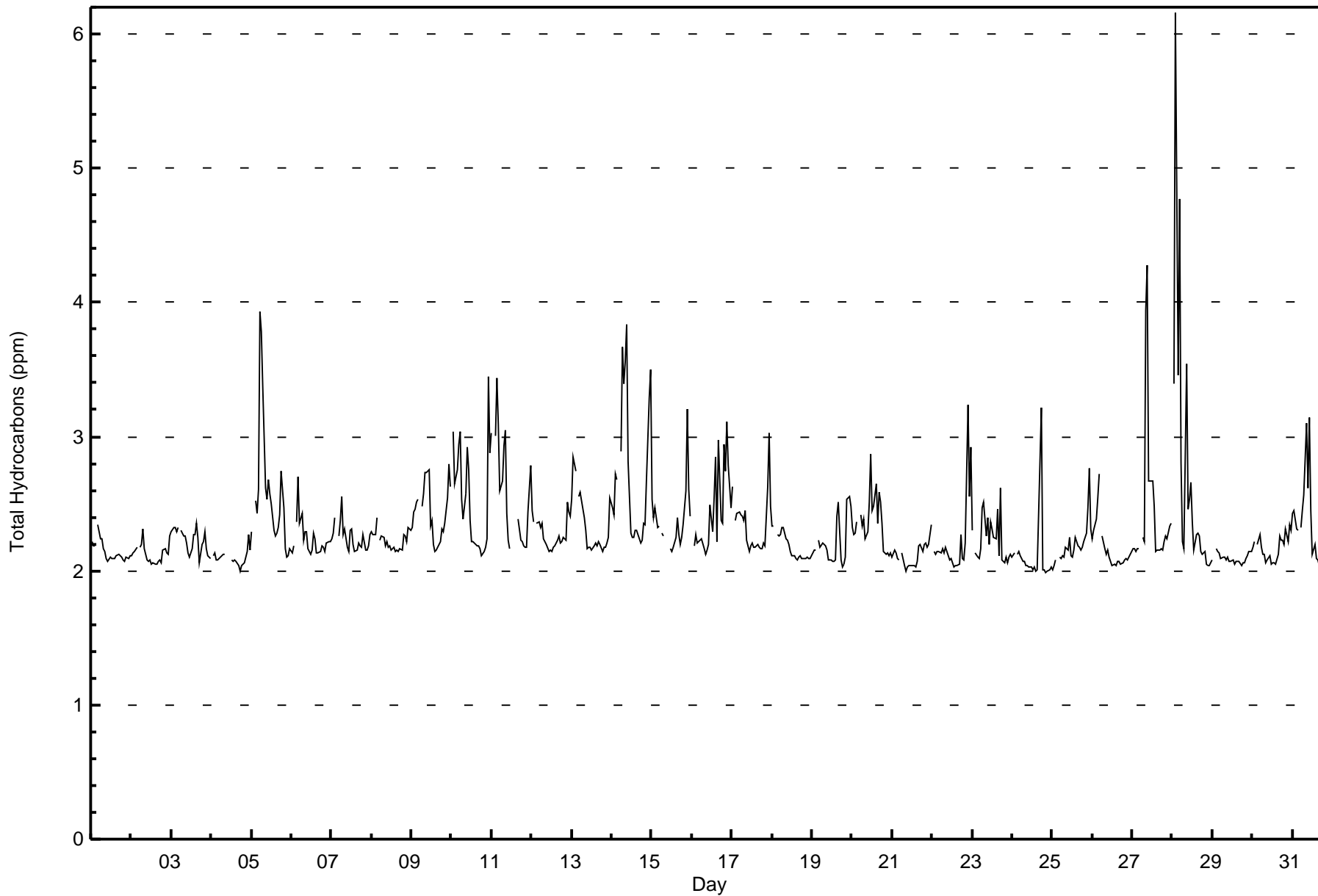
Wood Buffalo Environmental Association
Wind Rose Jul 2016

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











Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Mannix - July 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	45	6.40	6.40
2.1 - 3.0	632	89.90	96.30
3.1 - 10.0	26	3.70	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 703

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Total Hydrocarbons (THC) - ppm
Mannix - July 2016

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	0	0	0	0	0	0	0	4	4	3	4	19	11	0	0	0	45
2.1 - 3.0	64	68	28	16	9	14	77	59	18	23	31	46	48	28	25	78	632
3.1 - 10.0	1	0	0	1	0	0	0	0	0	0	0	2	4	6	10	2	26
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	65	68	28	17	9	14	77	63	22	26	35	67	63	34	35	80	703

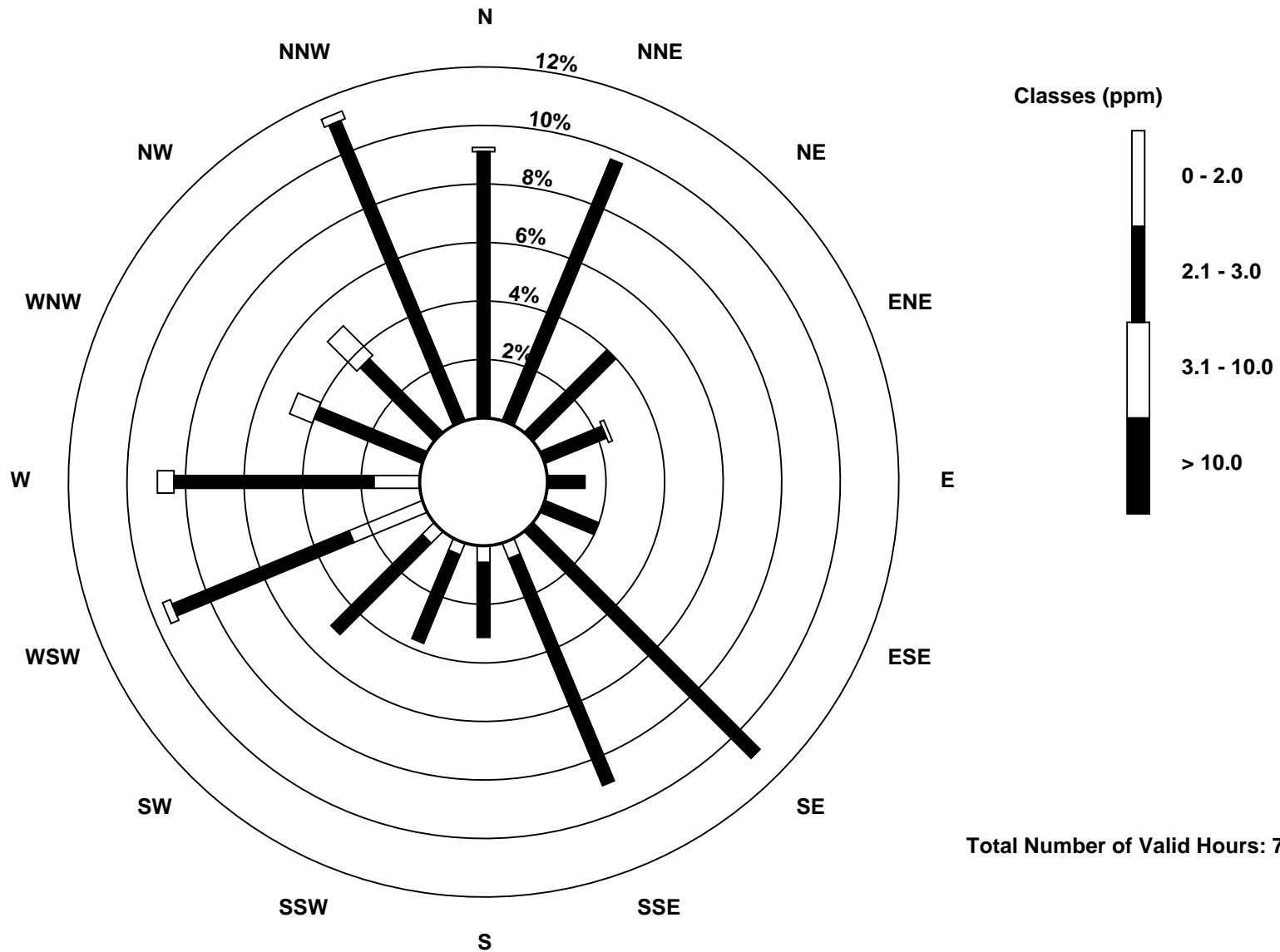
Total Number of Valid Hours: 703

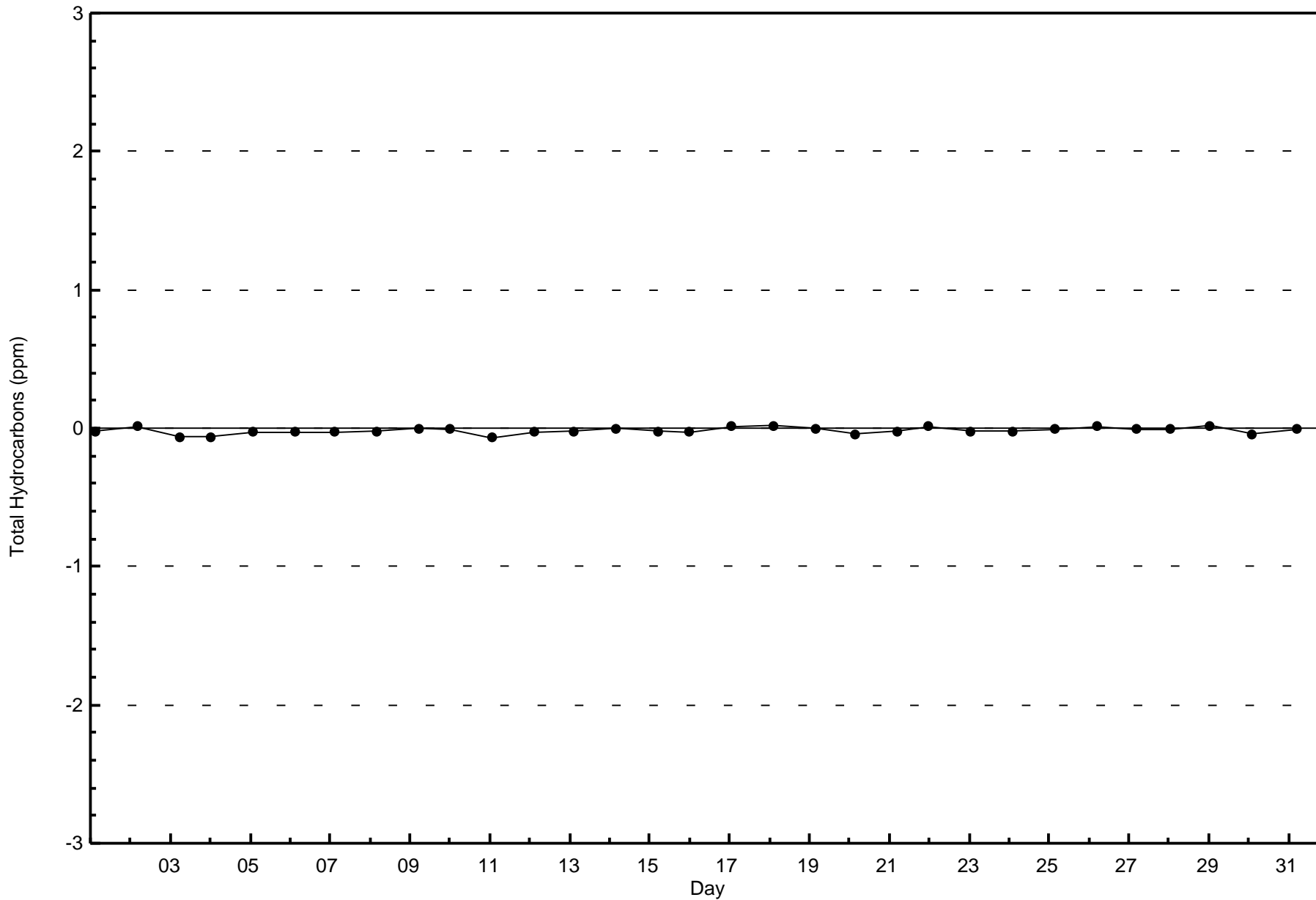
Total Number of Hours: 744

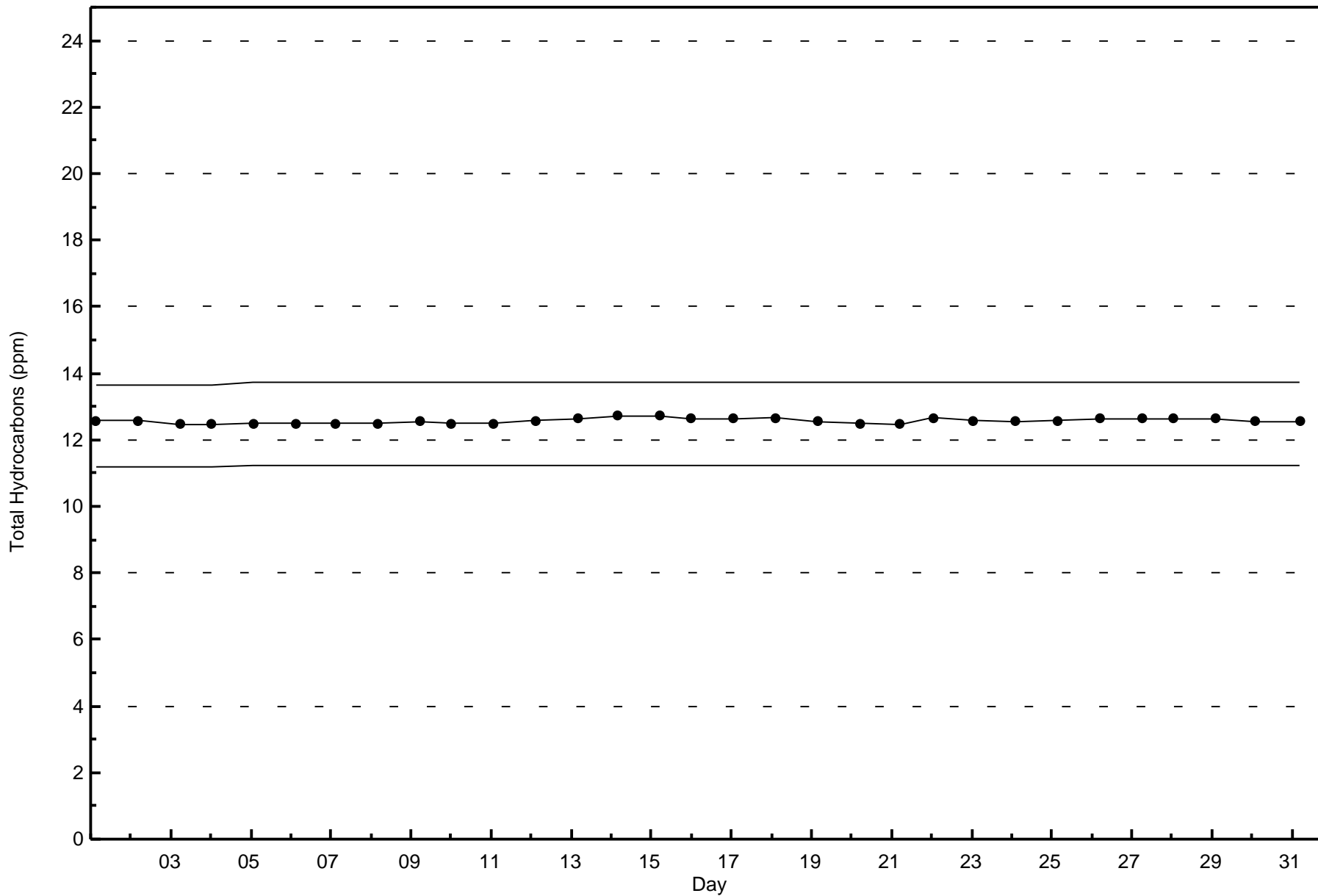


Wood Buffalo Environmental Association
Wind Rose Jul 2016

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

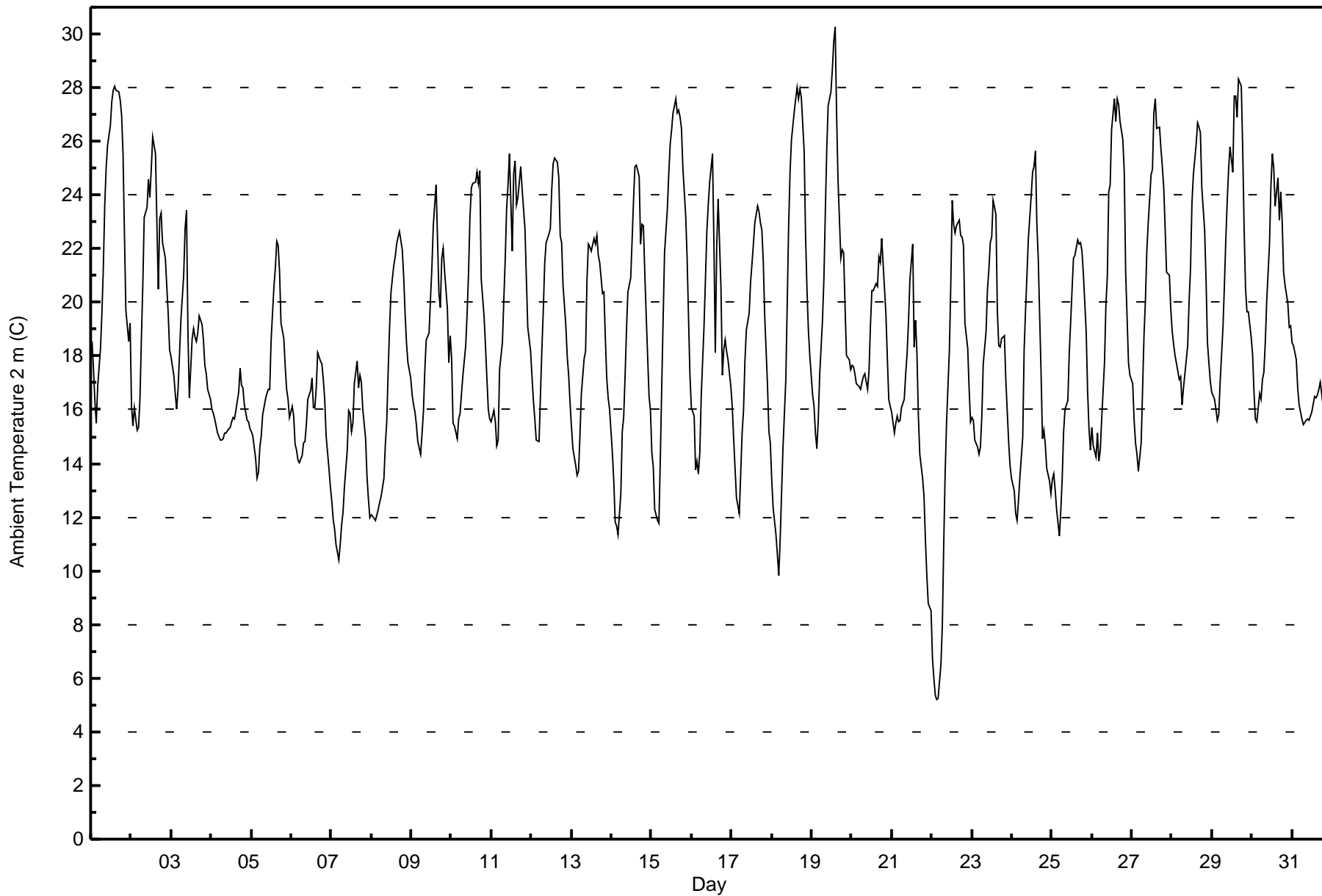








Maximum Value: 30.3 C on Jul 19 15:00																				Maximum Daily Average: 22.7 C on Jul 1					Hours in Service: 744																			
Minimum Value: 5.2 C on Jul 22 04:00																				Minimum Daily Average: 14.1 C on Jul 7					Hours of Data: 744																			
Maximum Diurnal Average: 23.2 C at hour 15																				Minimum Diurnal Average: 13.9 C at hour 5					Hours of Missing Data: 0																			
Monthly Average: 18.76 C																				Percentiles: P₁ = 8.5 P₁₀ = 13.7 Q₁ = 15.6 Median = 18.1 Q₃ = 22.2 P₉₀ = 25.0 P₉₉ = 28.0					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-Jul	18.5	17.6	16.3	15.5	16.9	18.3	19.6	21.3	23.6	25.0	25.9	26.6	27.5	27.9	28.0	27.9	27.8	27.5	26.9	25.5	22.5	19.7	18.6	19.2	22.7	28.0																		
2-Jul	16.1	15.4	16.1	15.2	15.3	16.4	18.6	20.6	23.2	23.5	24.6	23.9	25.0	26.2	25.5	22.9	20.5	23.1	23.3	22.2	21.6	20.6	19.6	18.2	20.7	26.2																		
3-Jul	18.0	17.3	16.6	16.0	16.8	18.0	19.3	21.0	22.8	23.4	18.9	16.5	18.6	19.0	18.7	18.6	18.9	19.5	19.2	18.6	17.7	17.3	16.7	16.4	18.5	23.4																		
4-Jul	16.0	15.9	15.6	15.4	15.2	14.9	14.9	14.9	15.1	15.1	15.3	15.3	15.5	15.7	15.7	16.0	16.6	17.5	16.9	16.8	16.2	15.6	15.5	15.3	15.7	17.5																		
5-Jul	15.2	15.0	14.2	13.5	13.6	14.6	15.1	15.8	16.4	16.6	16.8	16.7	18.6	20.6	21.3	22.3	22.1	21.1	19.2	18.6	17.6	16.8	16.4	15.7	17.2	22.3																		
6-Jul	16.1	15.8	14.7	14.5	14.2	14.0	14.3	14.8	14.8	15.4	16.4	16.7	17.2	16.1	16.1	16.8	18.1	17.8	17.7	17.1	16.4	15.0	13.8	13.1	15.7	18.1																		
7-Jul	12.6	12.0	11.6	11.0	10.4	11.0	11.7	12.2	13.1	14.5	16.0	15.9	15.2	15.5	17.0	17.8	16.8	17.3	17.0	16.0	14.9	13.5	12.7	12.0	14.1	17.8																		
8-Jul	12.1	12.0	11.9	12.1	12.3	12.6	12.8	13.5	14.7	15.5	17.4	19.1	20.4	21.4	21.7	22.2	22.4	22.6	22.0	21.0	19.6	18.5	17.8	17.2	17.2	22.6																		
9-Jul	16.5	16.2	15.9	15.5	14.8	14.3	15.1	15.9	17.5	18.6	18.9	20.1	21.3	22.9	23.6	24.4	20.4	19.8	21.6	22.0	21.2	19.8	17.8	18.8	18.9	24.4																		
10-Jul	17.9	15.5	15.4	14.9	15.7	15.9	16.6	17.3	18.4	19.6	21.1	23.2	24.3	24.4	24.5	24.8	24.4	24.9	20.8	19.5	18.4	17.2	16.0	15.6	19.4	24.9																		
11-Jul	15.6	16.0	15.6	14.7	14.9	17.5	18.5	20.1	21.6	23.5	24.4	25.5	21.9	24.8	25.3	23.6	23.9	25.0	24.2	23.5	22.8	20.9	19.1	18.2	20.9	25.5																		
12-Jul	17.2	16.3	15.7	14.9	14.8	16.6	18.2	19.7	21.4	22.2	22.6	22.7	24.2	25.2	25.4	25.2	24.6	22.5	22.2	20.6	19.1	18.0	17.3	16.2	20.1	25.4																		
13-Jul	15.3	14.6	13.9	13.5	13.7	15.0	16.6	17.9	18.2	20.8	22.2	22.1	21.9	22.4	22.2	22.5	21.7	21.5	20.3	20.4	18.7	17.2	16.5	16.1	18.5	22.5																		
14-Jul	14.4	13.3	11.8	11.7	11.3	12.9	15.2	15.7	17.2	19.0	20.4	20.9	22.3	23.8	25.1	25.1	24.7	22.2	22.9	22.8	21.1	19.5	16.5	16.0	18.6	25.1																		
15-Jul	14.4	13.8	12.3	11.9	11.8	14.2	16.9	19.4	21.9	23.5	24.8	25.9	26.4	27.1	27.6	27.0	27.1	26.9	26.5	25.0	23.2	21.7	19.5	17.3	21.1	27.6																		
16-Jul	16.1	15.7	13.8	14.1	13.6	14.4	16.5	19.1	20.9	22.6	23.7	24.5	25.5	22.2	18.1	22.1	23.8	20.6	17.3	18.2	18.6	18.2	17.8	16.8	18.9	25.5																		
17-Jul	16.1	14.9	13.8	12.7	12.1	13.6	15.1	16.0	17.8	19.0	19.6	20.8	21.4	22.2	23.0	23.6	23.4	23.0	22.7	21.6	19.5	16.9	15.2	14.8	18.3	23.6																		
18-Jul	13.4	12.3	11.3	10.6	9.8	11.2	13.0	14.6	17.2	19.9	22.8	24.8	26.1	27.1	27.6	28.0	27.6	28.0	27.7	25.6	22.5	20.5	19.0	18.0	19.9	28.0																		
19-Jul	16.6	16.1	15.1	14.5	15.6	17.3	19.3	20.9	23.3	25.6	27.3	27.8	28.7	29.7	30.3	27.0	24.6	21.7	22.0	21.9	19.9	18.0	17.9	17.5	21.6	30.3																		
20-Jul	17.6	17.6	17.3	17.0	16.9	16.8	17.0	17.2	17.3	16.7	17.4	19.1	20.4	20.4	20.7	20.6	21.7	21.5	22.4	21.4	19.5	17.9	16.4	16.1	18.6	22.4																		
21-Jul	15.9	15.1	15.5	15.8	15.6	15.6	16.1	16.4	17.3	18.1	19.3	20.9	22.2	18.3	19.3	18.1	15.8	14.4	13.4	12.8	11.1	9.8	8.8	8.5	15.6	22.2																		
22-Jul	6.7	6.0	5.4	5.2	5.3	6.5	8.0	11.0	13.6	15.5	18.2	20.7	23.8	22.9	22.6	22.8	23.0	22.5	22.4	22.1	19.2	18.3	16.8	15.6	15.6	23.8																		
23-Jul	15.7	15.6	14.9	14.6	14.3	14.6	15.8	17.7	18.9	20.5	21.2	22.2	22.4	23.8	23.3	19.7	18.4	18.4	18.7	18.8	17.1	16.0	14.8	13.9	18.0	23.8																		
24-Jul	13.4	13.0	12.2	11.9	12.6	13.5	14.9	18.2	19.7	21.0	22.4	23.9	24.9	25.1	25.6	23.0	21.6	17.4	14.9	15.2	14.7	13.8	13.3	12.9	17.5	25.6																		
25-Jul	13.4	13.6	13.0	12.3	11.3	12.2	13.4	15.2	16.0	16.3	18.1	19.3	20.5	21.7	21.7	22.3	22.2	22.2	21.9	21.1	18.9	16.7	15.3	14.5	17.2	22.3																		
26-Jul	15.3	14.7	14.3	15.1	14.1	14.5	15.6	17.8	19.9	20.9	24.1	24.4	26.4	27.6	26.7	27.6	27.4	26.7	26.1	24.9	21.1	19.4	17.8	17.3	20.8	27.6																		
27-Jul	17.0	15.6	14.8	14.3	13.7	14.8	16.8	18.8	20.1	21.9	23.0	24.7	24.9	27.1	27.6	26.5	26.5	25.7	25.1	24.3	22.8	21.1	21.0	19.8	21.2	27.6																		
28-Jul	18.9	18.4	18.0	17.4	17.1	17.2	16.2	16.8	17.9	18.4	20.1	21.3	23.7	24.8	25.9	26.7	26.5	26.3	24.3	22.7	20.9	18.5	17.8	17.1	20.5	26.7																		
29-Jul	16.7	16.4	16.0	15.6	15.8	17.0	19.0	20.6	22.4	23.8	25.0	25.8	24.8	27.7	27.7	26.9	28.3	28.1	25.7	22.7	20.6	19.7	19.7	18.7	21.9	28.3																		
30-Jul	18.1	16.7	15.7	15.6	16.6	16.4	17.2	17.4	18.5	20.0	22.2	24.3	25.5	25.0	23.6	24.7	23.1	24.1	23.0	21.1	20.7	20.0	19.1	19.1	20.3	25.5																		
31-Jul	18.5	18.4	17.9	16.8	16.2	15.9	15.7	15.5	15.6	15.6	15.6	15.7	15.9	16.5	16.5	16.6	16.8	17.0	16.6	15.7	15.2	15.1	14.9	14.9	16.2	18.5																		
																				15.7	15.1	14.4	14.0	13.9	14.8	15.9	17.2	18.6	19.8	20.8	21.7	22.5	23.1	23.2	23.0	22.6	22.2	21.5	20.6	19.1	17.8	16.7	16.1	Diurnal Average
																				18.9	18.4	18.0	17.4	17.1	18.3	19.6	21.3	23.6	25.6	27.3	27.8	28.7	29.7	30.3	28.0	28.3	28.1	27.7	25.6	23.2	21.7	21.0	19.8	Diurnal Maximum





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	11	1.48	1.48
10 - 20	459	61.69	63.17
> 20	274	36.83	100.00

Total Number of Valid Hours: 744

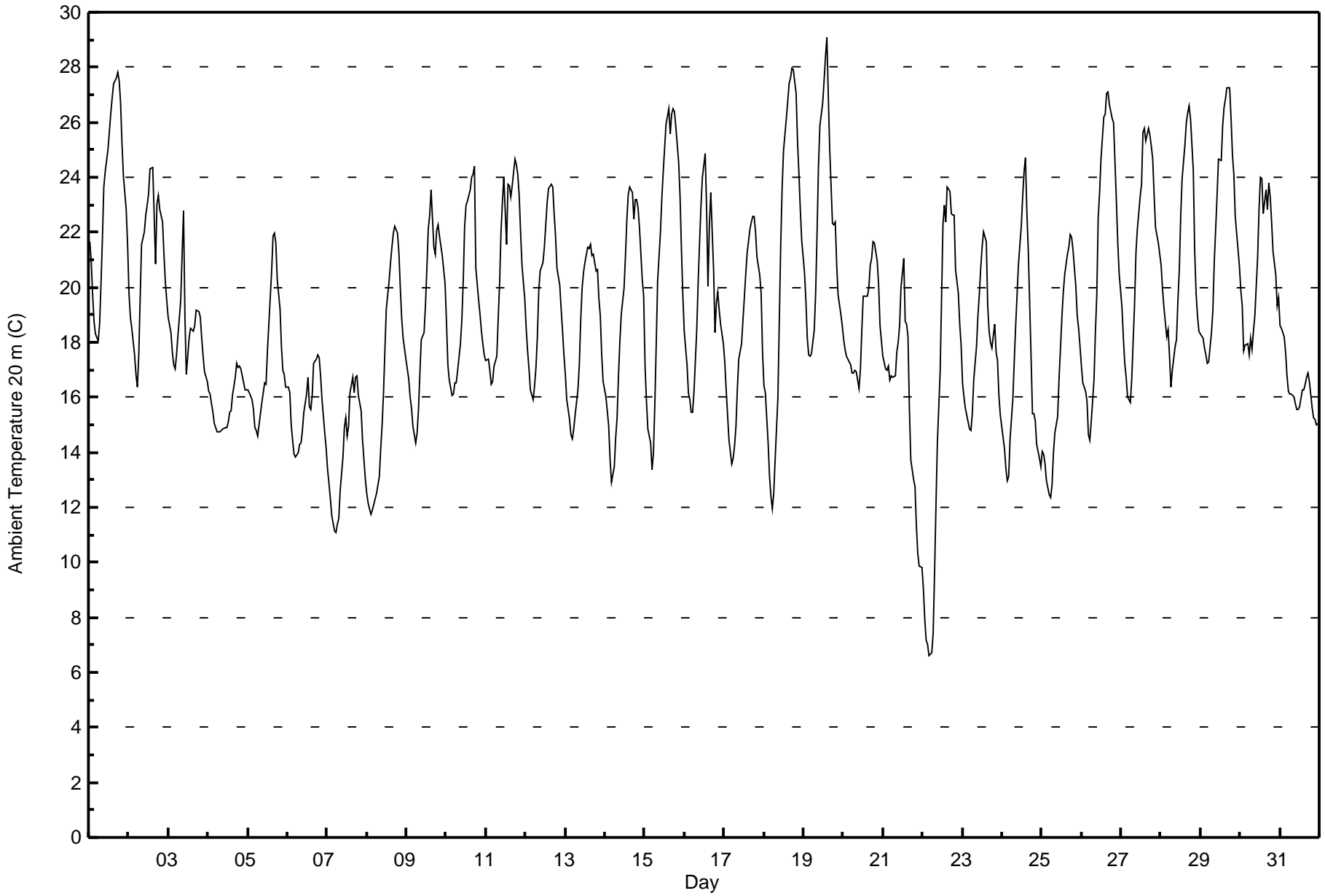
Total Number of Hours: 744



Summary of Hour Averages

Mannix - July 2016

Maximum Value: 29.1 C on Jul 19 15:00 Maximum Daily Average: 23.4 C on Jul 1																							Hours in Service:	744			
Minimum Value: 6.6 C on Jul 22 05:00 Minimum Daily Average: 14.0 C on Jul 7																							Hours of Data:	744			
Maximum Diurnal Average: 22.4 C at hour 16 Minimum Diurnal Average: 15.0 C at hour 5																							Hours of Missing Data:	0			
Monthly Average: 18.95 C Percentiles: P ₁ = 9.6 P ₁₀ = 14.3 Q ₁ = 16.2 Median = 18.5 Q ₃ = 21.9 P ₉₀ = 24.2 P ₉₉ = 27.6																							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-Jul	21.7	20.9	19.7	18.8	18.3	18.0	18.7	20.1	21.8	23.6	24.2	25.0	25.7	26.4	26.9	27.4	27.6	27.8	27.5	26.7	25.2	24.1	22.8	21.6	23.4	27.8	
2-Jul	19.8	18.9	18.5	17.5	16.8	16.4	17.6	19.6	21.6	22.0	22.6	23.0	23.4	24.3	24.4	22.6	20.8	23.0	23.3	22.9	22.4	21.2	20.2	19.5	20.9	24.4	
3-Jul	18.9	18.3	17.6	17.2	17.0	17.5	18.3	19.5	21.2	22.8	19.0	16.8	18.1	18.5	18.5	18.4	18.6	19.2	19.1	18.9	18.2	17.5	16.9	16.6	18.5	22.8	
4-Jul	16.2	16.1	15.8	15.5	15.1	14.8	14.7	14.7	14.8	14.8	14.9	14.9	15.1	15.5	15.5	16.1	16.7	17.2	17.1	17.2	17.0	16.5	16.3	16.3	15.8	17.2	
5-Jul	16.3	16.2	15.9	15.6	14.9	14.8	14.6	14.6	15.0	15.8	16.2	16.5	16.5	17.7	19.6	20.6	21.9	22.0	21.6	20.3	19.2	17.9	17.0	16.8	16.4	17.5	22.0
6-Jul	16.3	16.2	15.0	14.5	14.0	13.8	14.0	14.3	14.3	14.8	15.4	16.1	16.7	15.7	15.6	16.1	17.3	17.4	17.6	17.5	16.8	15.9	14.7	14.2	15.6	17.6	
7-Jul	13.3	12.9	12.3	11.7	11.1	11.1	11.4	11.6	12.6	13.9	14.9	15.2	14.6	15.0	16.2	16.7	16.2	16.7	16.8	16.0	15.5	14.5	13.7	13.0	14.0	16.8	
8-Jul	12.5	12.2	11.8	11.9	12.1	12.3	12.5	13.1	14.2	15.0	16.2	17.8	19.2	20.2	20.9	21.5	22.0	22.2	21.9	21.3	20.0	18.9	18.1	17.4	16.9	22.2	
9-Jul	17.0	16.7	16.0	15.6	15.0	14.4	14.7	15.5	16.9	18.1	18.4	19.4	20.7	22.1	22.6	23.6	21.5	21.2	22.1	22.3	21.9	21.1	20.6	20.1	19.1	23.6	
10-Jul	18.8	17.2	16.6	16.1	16.1	16.5	16.5	17.0	18.0	18.8	20.2	22.2	23.0	23.1	23.6	24.0	24.1	24.4	20.7	19.5	19.0	18.4	18.0	17.5	19.6	24.4	
11-Jul	17.4	17.4	17.0	16.5	16.6	17.1	17.5	18.9	20.2	22.0	23.1	24.0	21.6	23.8	23.7	23.3	23.7	24.7	24.5	24.1	23.3	22.0	20.8	19.6	20.9	24.7	
12-Jul	18.5	17.7	17.1	16.3	15.9	16.4	17.1	18.2	19.9	20.6	20.9	21.5	22.3	23.1	23.6	23.8	23.7	22.7	21.9	20.7	20.1	19.2	18.4	17.5	19.9	23.8	
13-Jul	16.8	15.9	15.2	14.6	14.5	14.8	15.4	16.3	17.2	18.8	20.0	20.5	20.9	21.5	21.4	21.5	21.1	21.2	20.6	20.6	19.6	19.0	17.6	16.6	18.4	21.5	
14-Jul	16.0	15.5	14.9	13.7	12.9	13.5	14.5	15.2	16.8	18.0	19.0	20.0	21.1	22.5	23.4	23.7	23.4	22.5	23.2	23.2	22.9	22.2	20.3	19.7	19.1	23.7	
15-Jul	17.1	15.9	14.9	14.4	13.4	14.0	15.8	18.0	20.3	22.0	23.2	24.2	25.1	25.9	26.5	25.6	26.3	26.5	26.4	25.8	24.6	23.4	21.4	19.7	21.3	26.5	
16-Jul	18.4	17.2	16.2	15.9	15.4	15.5	16.2	18.5	20.2	21.7	23.0	24.0	24.9	22.9	20.0	22.3	23.5	20.6	18.4	19.4	19.8	19.2	18.7	18.0	19.6	24.9	
17-Jul	17.3	16.3	15.3	14.4	13.6	13.8	14.3	14.9	16.3	17.4	17.9	18.8	19.6	20.5	21.3	22.1	22.4	22.6	22.6	22.0	21.1	20.4	19.8	17.7	18.4	22.6	
18-Jul	16.4	16.2	14.3	13.1	12.4	12.0	12.5	13.8	16.0	18.8	21.6	23.6	24.9	26.1	26.8	27.4	27.6	28.0	27.9	27.1	25.3	24.1	22.8	21.7	20.9	28.0	
19-Jul	20.6	19.5	18.1	17.5	17.5	17.6	18.5	19.8	22.0	24.4	25.9	26.7	27.5	28.4	29.1	27.0	25.0	22.3	22.3	22.4	20.9	19.7	19.0	18.6	22.1	29.1	
20-Jul	18.1	17.8	17.5	17.4	17.2	16.9	16.9	17.0	16.9	16.3	17.0	18.4	19.7	19.7	19.7	20.0	20.8	21.1	21.7	21.6	21.0	20.1	18.6	18.1	18.7	21.7	
21-Jul	17.5	17.0	17.0	17.1	16.6	16.8	16.7	16.8	17.6	18.0	18.6	20.0	21.0	18.7	18.7	18.2	15.6	13.7	13.0	12.8	11.3	10.3	9.8	9.8	15.9	21.0	
22-Jul	9.1	7.9	7.2	7.0	6.6	6.7	7.4	9.6	12.0	14.3	16.9	19.6	22.2	23.0	22.4	23.6	23.5	22.7	22.6	22.6	20.6	19.8	18.7	17.9	16.0	23.6	
23-Jul	16.5	16.0	15.6	15.1	14.8	14.8	15.4	16.6	17.8	19.0	19.7	20.7	21.5	22.0	21.7	19.3	18.4	18.0	17.8	18.6	17.7	17.4	16.1	15.4	17.7	22.0	
24-Jul	15.0	14.1	13.4	13.0	13.1	14.5	16.0	17.3	18.6	19.7	20.8	22.2	23.3	24.2	24.7	22.7	21.3	17.5	15.4	15.4	15.1	14.3	13.8	13.5	17.5	24.7	
25-Jul	14.0	13.9	13.6	13.0	12.5	12.4	12.8	14.0	14.7	15.3	16.7	17.7	18.8	19.8	20.5	21.2	21.5	21.9	21.8	21.4	20.0	19.0	18.5	17.8	17.2	21.9	
26-Jul	17.1	16.5	16.2	15.9	14.7	14.5	15.1	16.6	18.4	19.7	22.5	23.4	24.7	26.2	26.3	27.0	27.1	26.6	26.1	26.0	24.5	23.1	21.6	20.5	21.3	27.1	
27-Jul	19.3	18.2	17.3	16.7	16.0	15.8	16.7	18.1	19.4	21.3	22.1	23.3	23.7	25.6	25.8	25.3	25.8	25.5	25.1	24.7	23.3	22.2	21.6	21.2	21.4	25.8	
28-Jul	20.8	19.9	19.3	18.2	18.5	17.5	16.4	17.0	17.9	18.1	19.5	20.6	22.6	24.0	25.2	26.0	26.3	26.6	26.1	24.3	21.3	19.8	18.9	18.4	21.0	26.6	
29-Jul	18.3	18.1	17.8	17.6	17.2	17.3	18.3	19.2	20.9	22.1	23.3	24.7	24.6	25.9	26.6	26.8	27.3	27.3	26.1	24.8	24.1	22.6	22.0	20.8	22.2	27.3	
30-Jul	19.9	19.3	17.7	17.9	18.0	17.5	18.1	17.7	18.4	19.0	21.1	22.8	24.0	23.9	22.7	23.5	22.9	23.8	23.3	22.4	21.3	20.4	19.3	19.6	20.6	24.0	
31-Jul	18.6	18.5	18.2	17.6	16.8	16.2	16.1	16.1	16.0	15.8	15.6	15.6	15.7	16.3	16.3	16.5	16.7	16.9	16.6	15.6	15.3	15.2	15.0	15.0	16.3	18.6	
																							Diurnal Average				
																							Diurnal Maximum				





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	10	1.34	1.34
10 - 20	453	60.89	62.23
> 20	281	37.77	100.00

Total Number of Valid Hours: 744

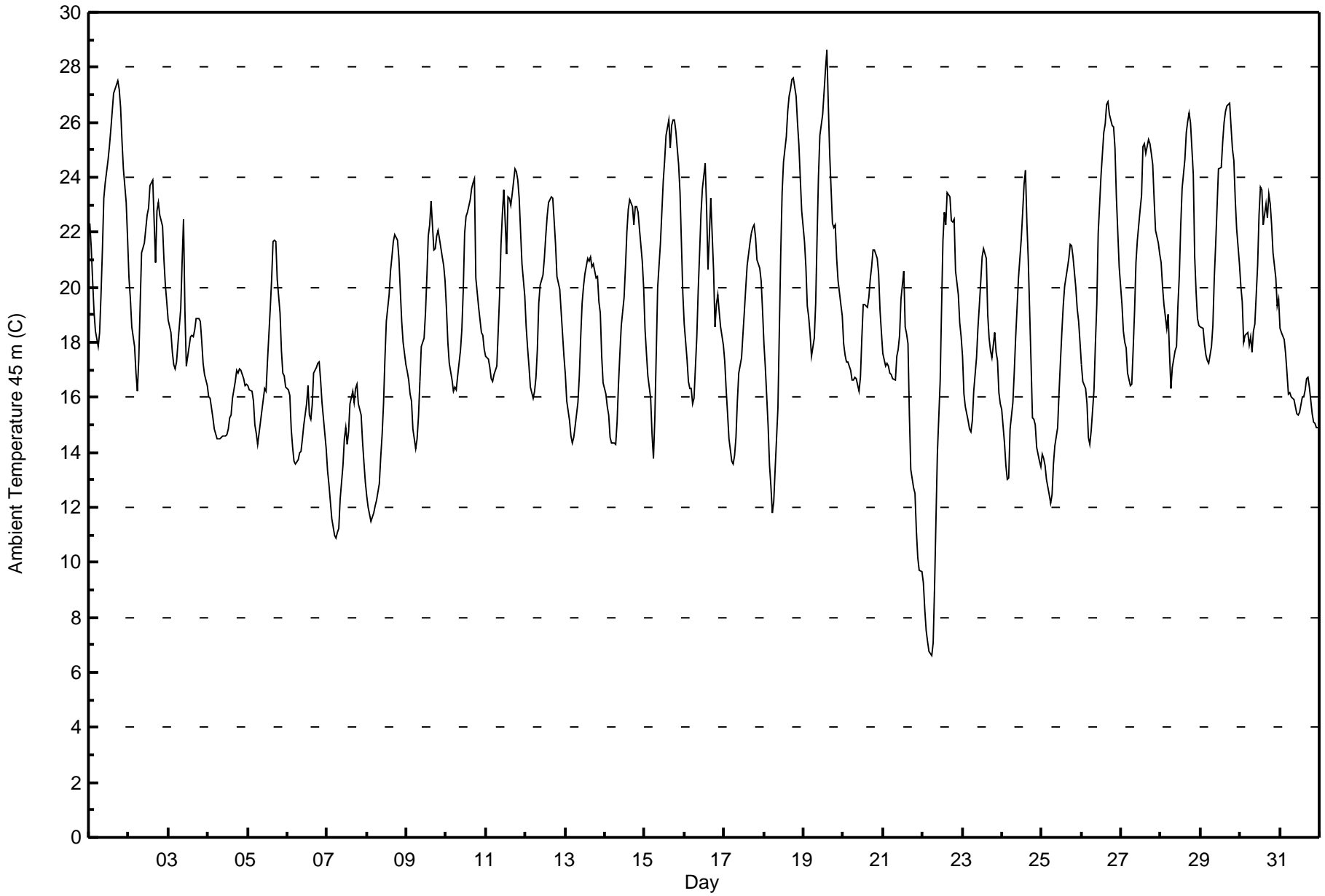
Total Number of Hours: 744



Summary of Hour Averages

Mannix - July 2016

Maximum Value: 28.6 C on Jul 19 15:00		Maximum Daily Average: 23.2 C on Jul 1		Hours in Service: 744																							
Minimum Value: 6.6 C on Jul 22 06:00		Minimum Daily Average: 13.8 C on Jul 7		Hours of Data: 744																							
Maximum Diurnal Average: 22.1 C at hour 16		Minimum Diurnal Average: 14.9 C at hour 6		Hours of Missing Data: 0																							
Monthly Average: 18.82 C		Percentiles: P ₁ = 9.2 P ₁₀ = 14.3 Q ₁ = 16.2 Median = 18.4 Q ₃ = 21.7 P ₉₀ = 24.0 P ₉₉ = 27.1		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-Jul	22.3	21.5	20.3	19.1	18.4	17.9	18.3	19.7	21.4	23.2	23.8	24.6	25.1	25.7	26.4	27.1	27.3	27.5	27.2	26.5	25.3	24.3	23.1	21.8	23.2	27.5	
2-Jul	20.3	19.6	18.6	17.8	16.9	16.2	17.4	19.4	21.3	21.6	22.1	22.6	22.9	23.7	23.9	22.4	20.9	22.8	23.1	22.7	22.2	21.0	20.1	19.5	20.8	23.9	
3-Jul	18.8	18.3	17.6	17.2	17.0	17.3	17.9	19.2	20.9	22.5	19.1	17.1	17.9	18.2	18.3	18.2	18.4	18.9	18.9	18.8	18.0	17.2	16.8	16.4	18.3	22.5	
4-Jul	16.0	16.0	15.6	15.3	14.8	14.5	14.5	14.5	14.5	14.6	14.6	14.6	14.8	15.2	15.3	16.0	16.6	17.0	16.9	17.1	17.0	16.7	16.4	16.5	15.6	17.1	
5-Jul	16.4	16.3	16.2	15.9	15.0	14.7	14.3	14.7	15.5	15.9	16.3	16.2	17.3	19.2	20.3	21.6	21.7	21.7	20.3	19.1	17.7	16.9	16.8	16.4	17.3	21.7	
6-Jul	16.3	16.0	14.9	14.2	13.7	13.6	13.7	14.0	14.0	14.5	15.0	15.8	16.4	15.3	15.2	15.7	16.9	17.1	17.3	17.3	16.6	15.8	14.7	14.1	15.3	17.3	
7-Jul	13.3	12.8	12.2	11.6	11.0	10.9	11.1	11.3	12.3	13.5	14.5	14.9	14.3	14.7	15.8	16.2	15.8	16.3	16.5	15.7	15.3	14.4	13.6	12.9	13.8	16.5	
8-Jul	12.4	12.0	11.5	11.7	11.8	12.1	12.3	12.8	13.8	14.6	15.8	17.4	18.7	19.7	20.6	21.1	21.7	21.9	21.7	21.1	19.9	18.8	18.0	17.2	16.6	21.9	
9-Jul	16.9	16.6	16.1	15.9	14.8	14.1	14.5	15.3	16.6	17.8	18.1	19.1	20.4	21.9	22.3	23.1	21.4	21.4	21.9	22.1	21.7	21.1	20.8	20.2	18.9	23.1	
10-Jul	19.2	18.0	17.2	16.6	16.2	16.4	16.3	16.8	17.7	18.5	19.9	22.0	22.6	22.7	23.2	23.6	23.8	23.9	20.4	19.3	18.8	18.3	18.3	17.7	19.5	23.9	
11-Jul	17.5	17.4	17.1	16.7	16.6	16.8	17.2	18.4	19.7	21.6	22.7	23.5	21.2	23.3	23.2	23.0	23.4	24.3	24.2	23.9	23.2	22.0	20.9	19.7	20.7	24.3	
12-Jul	18.6	17.8	17.1	16.3	16.0	16.2	16.7	17.7	19.4	20.1	20.4	21.1	21.9	22.6	23.1	23.3	23.2	22.4	21.6	20.4	19.9	19.1	18.3	17.5	19.6	23.3	
13-Jul	16.8	15.9	15.2	14.6	14.3	14.5	14.9	15.8	16.8	18.2	19.4	20.0	20.5	21.0	21.0	21.1	20.8	20.9	20.3	20.4	19.5	19.0	17.5	16.5	18.1	21.1	
14-Jul	16.1	15.7	15.3	14.5	14.3	14.3	14.3	15.1	16.5	17.6	18.6	19.6	20.8	22.0	22.8	23.2	23.0	22.3	23.0	22.9	22.7	22.1	20.9	20.0	19.1	23.2	
15-Jul	18.5	17.6	16.8	16.0	14.6	13.8	15.3	17.6	20.0	21.6	22.7	23.8	24.6	25.5	26.1	25.1	25.9	26.1	26.1	25.7	24.4	23.4	21.6	19.8	21.4	26.1	
16-Jul	18.7	17.4	16.6	16.3	16.3	15.8	16.0	18.2	19.9	21.3	22.7	23.6	24.5	22.9	20.6	21.9	23.2	20.6	18.6	19.4	19.8	19.1	18.6	17.9	19.6	24.5	
17-Jul	17.3	16.3	15.4	14.5	13.7	13.6	13.9	14.6	15.9	16.9	17.4	18.3	19.1	20.0	20.8	21.6	22.0	22.2	22.3	21.8	21.0	20.7	20.3	19.2	18.3	22.3	
18-Jul	17.9	17.1	14.9	13.5	12.8	11.8	12.2	13.4	15.6	18.4	21.2	23.5	24.6	25.5	26.4	26.9	27.2	27.6	27.6	27.0	26.0	25.1	23.9	22.8	21.0	27.6	
19-Jul	21.7	20.7	19.3	18.9	18.3	17.5	18.1	19.4	21.8	24.0	25.5	26.3	27.1	27.9	28.6	26.7	24.9	22.3	22.2	22.3	21.1	20.2	19.4	19.0	22.2	28.6	
20-Jul	18.0	17.6	17.3	17.3	17.0	16.6	16.6	16.7	16.7	16.2	16.7	18.1	19.4	19.4	19.3	19.6	20.3	20.7	21.3	21.3	21.0	20.5	19.2	18.3	18.6	21.3	
21-Jul	17.6	17.1	17.2	17.1	16.9	16.8	16.7	16.6	17.5	17.7	18.3	19.6	20.6	18.6	18.3	18.0	15.3	13.3	12.7	12.5	11.1	10.1	9.7	9.7	15.8	20.6	
22-Jul	9.3	8.3	7.5	7.1	6.7	6.6	7.1	9.1	11.5	13.9	16.6	19.2	21.7	22.7	22.3	23.5	23.3	22.4	22.4	22.5	20.6	19.7	18.7	18.2	15.9	23.5	
23-Jul	17.5	16.1	15.7	15.2	14.8	14.7	15.2	16.2	17.5	18.5	19.3	20.2	21.1	21.4	21.0	19.0	18.2	17.7	17.4	18.3	17.7	17.3	16.2	15.8	17.6	21.4	
24-Jul	15.6	14.3	13.5	13.0	13.1	14.9	15.8	16.9	18.2	19.3	20.3	21.7	22.7	23.7	24.3	22.4	21.0	17.2	15.3	15.2	15.0	14.2	13.7	13.5	17.3	24.3	
25-Jul	14.0	13.8	13.5	13.0	12.4	12.2	12.5	13.6	14.2	14.9	16.2	17.3	18.3	19.3	20.0	20.7	21.1	21.6	21.5	21.1	20.0	19.2	18.7	18.0	17.0	21.6	
26-Jul	17.2	16.6	16.3	15.8	14.6	14.3	14.8	16.3	18.0	19.4	22.0	23.0	24.1	25.6	26.0	26.7	26.8	26.3	25.9	25.8	25.1	23.3	22.0	20.7	21.1	26.8	
27-Jul	19.4	18.4	18.0	17.8	16.9	16.4	16.5	17.8	19.1	20.9	21.7	22.8	23.3	25.1	25.2	24.9	25.4	25.2	24.9	24.4	23.2	22.1	21.6	21.2	21.3	25.4	
28-Jul	20.9	20.0	19.4	18.5	19.0	17.6	16.3	17.1	17.7	17.9	19.3	20.4	22.2	23.6	24.7	25.6	26.0	26.3	26.0	24.1	21.1	19.8	18.9	18.6	20.9	26.3	
29-Jul	18.6	18.5	17.9	17.6	17.3	17.2	17.9	18.6	20.3	21.5	22.9	24.3	24.4	25.3	26.0	26.4	26.6	26.7	25.8	25.0	24.6	23.2	22.1	20.9	22.1	26.7	
30-Jul	20.1	19.5	18.0	18.3	18.3	17.9	18.2	17.6	18.4	18.6	20.8	22.6	23.6	23.5	22.3	23.0	22.5	23.4	23.0	22.3	21.2	20.3	19.3	19.6	20.5	23.6	
31-Jul	18.5	18.4	18.1	17.6	16.9	16.1	16.2	16.0	15.9	15.6	15.4	15.4	15.5	16.0	16.0	16.3	16.7	16.7	16.4	15.4	15.1	15.0	14.9	14.9	16.2	18.5	
		17.5	16.8	16.1	15.6	15.2	14.9	15.2	16.1	17.4	18.4	19.3	20.3	21.0	21.7	21.9	22.1	22.0	21.8	21.4	21.0	20.2	19.4	18.6	17.9	Diurnal Average	
		22.3	21.5	20.3	19.1	19.0	17.9	18.3	19.7	21.8	24.0	25.5	26.3	27.1	27.9	28.6	27.1	27.3	27.6	27.6	27.0	26.0	25.1	23.9	22.8	Diurnal Maximum	





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

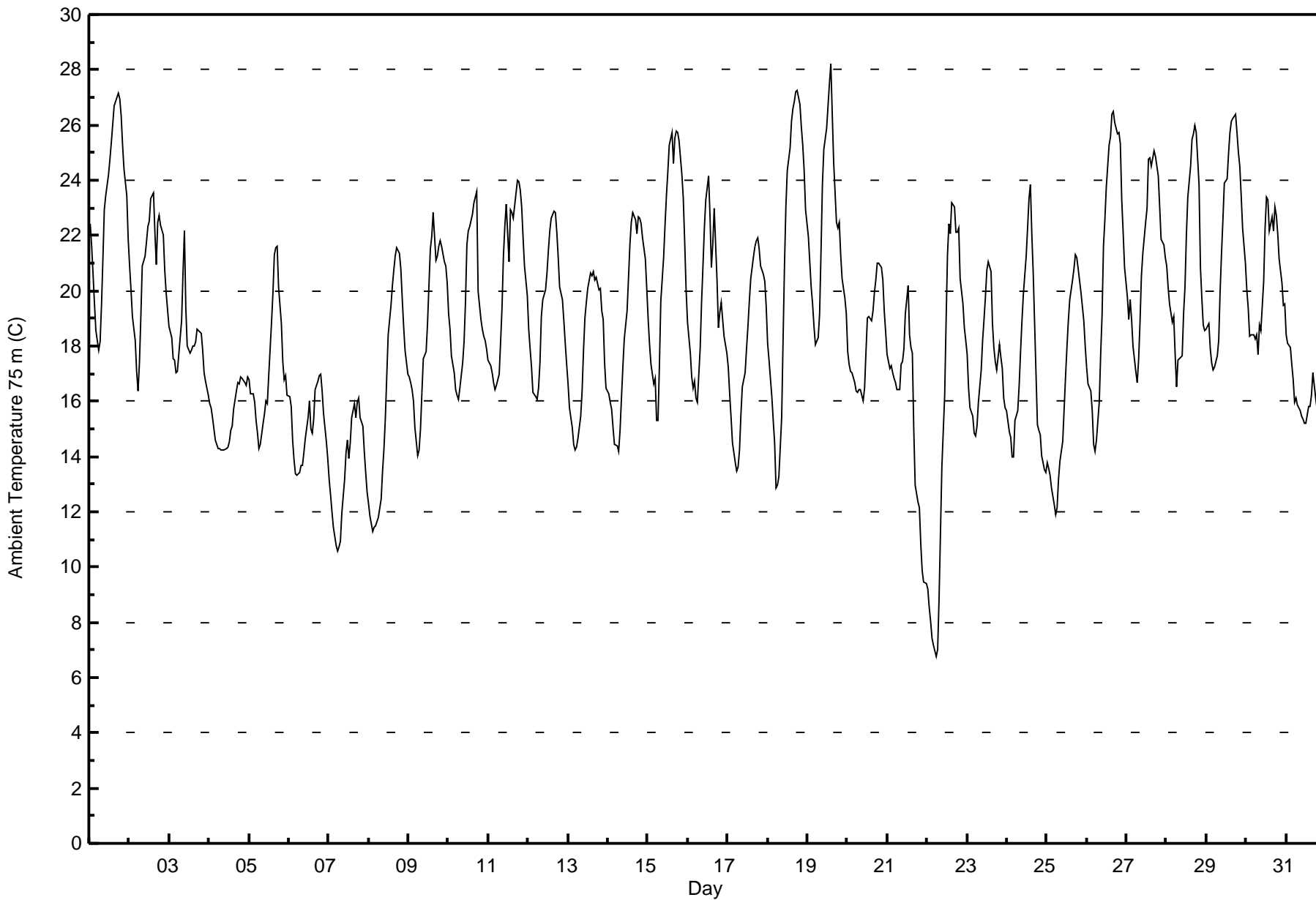
Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	10	1.34	1.34
10 - 20	456	61.29	62.63
> 20	278	37.37	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Value: 28.2 C on Jul 19 15:00 Maximum Daily Average: 23.1 C on Jul 1																				Hours in Service: 744 Hours of Data: 744						
Minimum Value: 6.8 C on Jul 22 06:00 Minimum Daily Average: 13.5 C on Jul 7 Maximum Diurnal Average: 21.8 C at hour 16 Minimum Diurnal Average: 15.0 C at hour 6 Monthly Average: 18.69 C Percentiles: P ₁ = 9.2 P ₁₀ = 14.2 Q ₁ = 16.1 Median = 18.4 Q ₃ = 21.3 P ₉₀ = 23.8 P ₉₉ = 26.9																				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-Jul	22.4	21.6	20.6	19.5	18.6	17.9	18.2	19.5	21.2	22.9	23.4	24.2	24.8	25.4	26.1	26.7	27.0	27.2	27.0	26.3	25.3	24.4	23.4	21.9	23.1	27.2
2-Jul	20.9	20.0	19.0	18.2	17.1	16.4	17.4	19.0	20.9	21.3	21.8	22.3	22.5	23.3	23.6	22.1	20.9	22.5	22.7	22.4	22.0	20.8	19.9	19.3	20.7	23.6
3-Jul	18.7	18.3	17.6	17.5	17.0	17.1	17.7	18.9	20.6	22.2	19.4	18.0	17.7	17.9	18.0	18.0	18.2	18.6	18.5	18.5	17.9	17.0	16.7	16.2	18.2	22.2
4-Jul	15.9	15.8	15.4	15.0	14.6	14.3	14.3	14.2	14.2	14.2	14.3	14.3	14.5	14.9	15.1	15.7	16.4	16.7	16.7	16.9	16.8	16.7	16.6	16.9	15.4	16.9
5-Jul	16.8	16.3	16.3	16.0	15.3	14.8	14.3	14.5	15.2	15.6	16.0	15.9	16.9	18.9	19.9	21.3	21.5	21.6	20.1	18.8	17.4	16.8	16.9	16.2	17.2	21.6
6-Jul	16.2	15.8	14.6	13.9	13.4	13.3	13.4	13.7	13.7	14.1	14.6	15.4	16.0	15.0	14.9	15.4	16.4	16.7	16.9	17.0	16.4	15.6	14.5	13.9	15.0	17.0
7-Jul	13.2	12.6	12.0	11.4	10.8	10.6	10.7	10.9	12.0	13.2	14.2	14.6	14.0	14.5	15.4	15.9	15.4	15.9	16.1	15.4	15.1	14.2	13.4	12.7	13.5	16.1
8-Jul	12.3	11.9	11.3	11.4	11.5	11.7	11.8	12.5	13.5	14.3	15.4	16.9	18.4	19.5	20.2	20.7	21.2	21.6	21.3	20.8	19.7	18.7	17.8	17.0	16.3	21.6
9-Jul	16.9	16.7	16.4	16.0	15.1	14.0	14.2	15.0	16.3	17.6	17.8	18.8	20.2	21.5	21.9	22.8	21.1	21.2	21.6	21.8	21.6	21.1	20.9	20.3	18.8	22.8
10-Jul	19.2	18.6	17.6	17.0	16.4	16.2	16.1	16.5	17.4	18.2	19.6	21.6	22.1	22.3	22.8	23.2	23.4	23.6	20.0	19.0	18.6	18.4	18.2	17.9	19.3	23.6
11-Jul	17.5	17.3	17.0	16.7	16.4	16.6	17.0	18.2	19.4	21.2	22.3	23.1	21.0	23.0	22.8	22.6	23.1	24.0	23.9	23.6	23.0	21.9	20.9	19.8	20.5	24.0
12-Jul	18.6	17.9	17.2	16.3	16.2	16.1	16.5	17.4	19.1	19.7	20.0	20.6	21.5	22.2	22.6	22.9	22.8	22.1	21.2	20.1	19.7	18.9	18.1	17.3	19.4	22.9
13-Jul	16.7	15.7	15.1	14.4	14.2	14.3	14.6	15.4	16.4	17.8	19.0	19.6	20.1	20.6	20.5	20.7	20.4	20.5	20.0	20.1	19.3	19.0	17.4	16.5	17.9	20.7
14-Jul	16.3	16.0	15.7	15.0	14.4	14.4	14.2	15.0	16.1	17.2	18.2	19.3	20.4	21.7	22.5	22.8	22.6	22.1	22.7	22.6	22.4	21.9	21.2	20.1	18.9	22.8
15-Jul	19.0	18.1	17.3	16.6	16.8	15.3	15.3	17.3	19.6	21.2	22.4	23.4	24.3	25.3	25.7	24.6	25.5	25.8	25.7	25.4	24.2	23.4	21.7	20.1	21.4	25.8
16-Jul	18.9	17.8	16.9	16.5	16.7	16.1	16.0	17.9	19.6	20.9	22.3	23.3	24.1	22.7	20.8	21.7	23.0	20.4	18.7	19.2	19.6	19.0	18.4	17.8	19.5	24.1
17-Jul	17.2	16.2	15.4	14.5	13.8	13.5	13.6	14.3	15.5	16.5	17.0	17.9	18.7	19.6	20.5	21.3	21.6	21.8	21.9	21.5	20.9	20.6	20.4	19.4	18.1	21.9
18-Jul	18.1	17.5	16.2	15.3	14.5	12.9	12.9	13.3	15.4	18.2	20.9	23.0	24.3	25.2	26.2	26.6	26.9	27.2	27.3	26.7	26.0	25.3	24.4	23.0	21.1	27.3
19-Jul	21.9	21.0	20.2	19.5	18.7	18.1	18.3	19.2	21.4	23.9	25.1	25.9	26.7	27.5	28.2	26.4	24.6	22.5	22.3	22.5	21.3	20.4	19.7	19.2	22.3	28.2
20-Jul	17.8	17.4	17.1	17.0	16.7	16.4	16.3	16.4	16.4	16.0	16.5	17.8	19.0	19.1	18.9	19.3	19.9	20.4	21.0	21.0	20.8	20.4	19.3	18.5	18.3	21.0
21-Jul	17.7	17.2	17.3	17.0	16.8	16.7	16.4	16.4	17.3	17.4	17.9	19.2	20.2	18.4	18.0	17.7	15.0	13.0	12.4	12.2	10.8	9.9	9.5	9.4	15.6	20.2
22-Jul	9.2	8.6	8.0	7.4	7.2	6.8	7.0	8.9	11.3	13.6	16.2	18.9	21.3	22.4	22.1	23.2	23.0	22.1	22.1	22.3	20.4	19.5	18.7	18.2	15.8	23.2
23-Jul	17.7	16.5	15.8	15.4	14.8	14.7	15.1	16.0	17.1	18.2	18.9	19.8	20.7	21.0	20.7	18.8	17.9	17.4	17.2	18.0	17.6	17.2	16.1	15.8	17.4	21.0
24-Jul	15.6	14.9	14.7	14.0	14.0	15.3	15.6	16.6	17.8	18.9	19.9	21.3	22.3	23.3	23.8	22.1	20.6	17.0	15.1	15.0	14.8	14.0	13.5	13.4	17.2	23.8
25-Jul	13.8	13.6	13.3	12.9	12.3	11.9	12.2	13.2	13.8	14.6	15.7	16.9	17.9	18.9	19.7	20.4	20.8	21.3	21.2	20.8	20.0	19.4	18.9	18.0	16.7	21.3
26-Jul	17.3	16.6	16.4	15.6	14.5	14.2	14.6	16.0	17.7	19.1	21.6	22.6	23.7	25.3	25.6	26.4	26.5	26.1	25.7	25.7	25.3	23.3	22.1	20.8	20.9	26.5
27-Jul	19.8	19.0	19.7	19.0	18.0	17.1	16.7	17.5	18.8	20.6	21.4	22.5	23.0	24.8	24.8	24.5	25.0	24.9	24.5	24.1	23.0	21.9	21.7	21.2	21.4	25.0
28-Jul	20.9	20.2	19.5	18.9	19.1	17.7	16.5	17.5	17.6	17.7	19.2	20.1	22.0	23.4	24.5	25.5	25.7	26.0	25.7	23.8	20.8	19.7	18.8	18.6	20.8	26.0
29-Jul	18.6	18.8	17.9	17.4	17.2	17.2	17.7	18.2	20.0	21.3	22.6	23.9	24.1	24.9	25.7	26.1	26.2	26.4	25.7	25.0	24.5	23.4	22.3	21.0	21.9	26.4
30-Jul	20.1	19.4	18.4	18.4	18.4	18.2	18.4	17.7	18.8	18.5	20.4	22.3	23.4	23.3	22.2	22.7	22.2	23.1	22.7	22.1	21.1	20.3	19.5	19.5	20.5	23.4
31-Jul	18.4	18.1	18.0	17.4	16.8	16.0	16.1	15.9	15.7	15.4	15.3	15.2	15.2	15.8	15.8	16.2	17.0	16.6	16.1	15.3	15.1	14.9	14.7	14.8	16.1	18.4
																								Diurnal Average		
																								Diurnal Maximum		





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	11	1.48	1.48
10 - 20	461	61.96	63.44
> 20	272	36.56	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



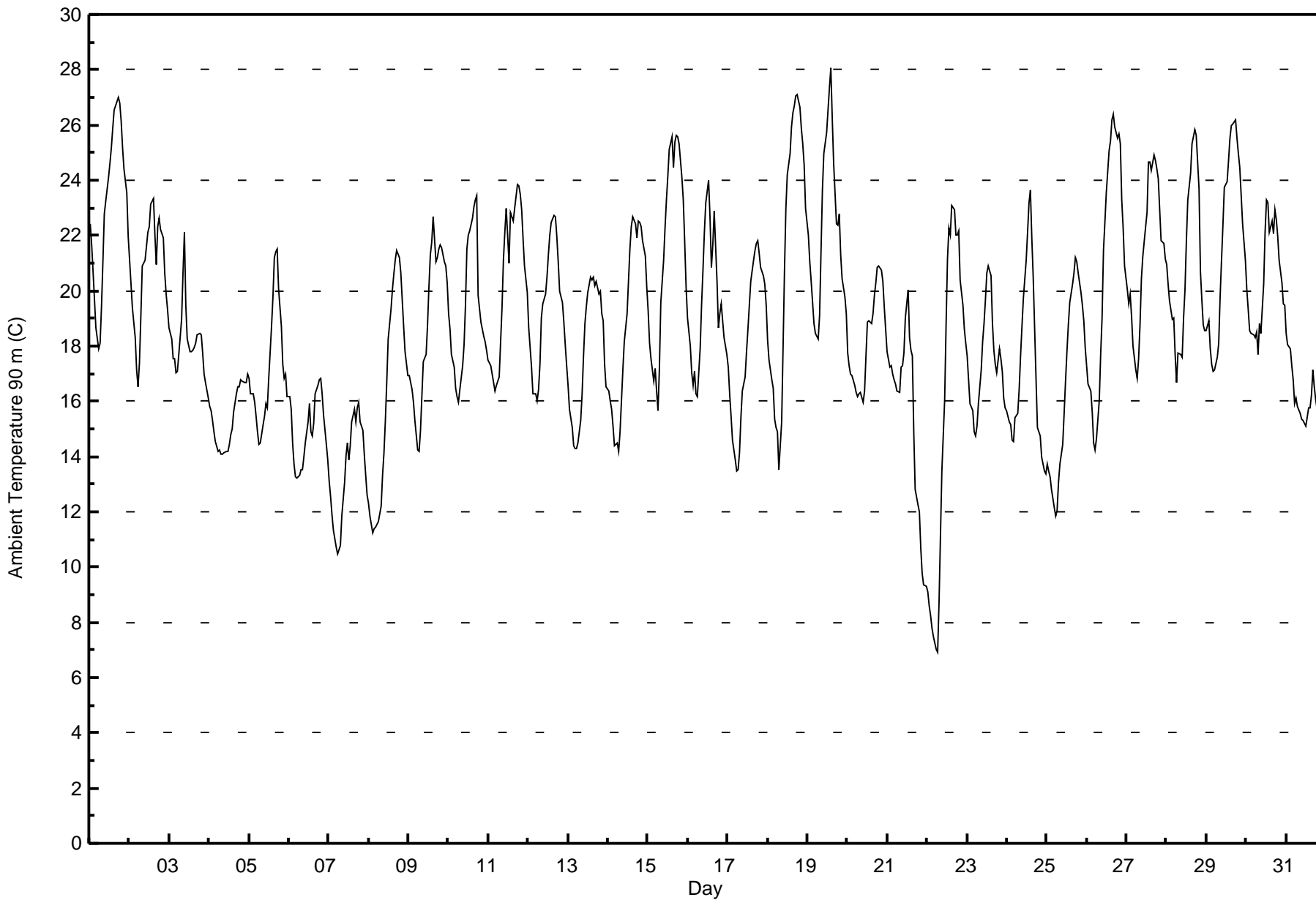
Wood Buffalo Environmental Association

Summary of Hour Averages

Ambient Temperature 90 m (AT90m) - C

Mannix - July 2016

Maximum Value: 28.0 C on Jul 19 15:00		Maximum Daily Average: 23.1 C on Jul 1		Hours in Service: 744																							
Minimum Value: 6.9 C on Jul 22 07:00		Minimum Daily Average: 13.4 C on Jul 7		Hours of Data: 744																							
Maximum Diurnal Average: 21.6 C at hour 16		Minimum Diurnal Average: 15.1 C at hour 6		Hours of Missing Data: 0																							
Monthly Average: 18.64 C		Percentiles: P ₁ = 9.1 P ₁₀ = 14.2 Q ₁ = 16.1 Median = 18.4 Q ₃ = 21.3 P ₉₀ = 23.7 P ₉₉ = 26.7		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-Jul	22.4	21.7	20.7	19.7	18.7	17.9	18.1	19.4	21.1	22.8	23.2	24.1	24.6	25.2	25.9	26.5	26.9	27.0	26.8	26.1	25.2	24.4	23.5	22.0	23.1	27.0	
2-Jul	21.1	20.2	19.4	18.3	17.1	16.5	17.4	19.1	20.9	21.1	21.6	22.1	22.3	23.1	23.4	22.0	21.0	22.3	22.6	22.2	21.9	20.7	19.9	19.3	20.7	23.4	
3-Jul	18.6	18.3	17.5	17.5	17.0	17.1	17.7	19.0	20.7	22.1	19.5	18.2	17.8	17.8	17.9	18.1	18.4	18.5	18.4	17.8	17.0	16.7	16.1	18.1	22.1	22.1	
4-Jul	15.8	15.7	15.3	14.9	14.5	14.2	14.3	14.1	14.1	14.1	14.2	14.2	14.4	14.8	15.0	15.6	16.3	16.5	16.5	16.8	16.7	16.7	17.0	17.0	15.4	17.0	
5-Jul	16.9	16.3	16.3	15.9	15.4	14.9	14.4	14.5	15.1	15.5	15.9	15.8	16.8	18.7	19.8	21.2	21.4	21.5	20.1	18.7	17.4	16.8	17.0	16.2	17.2	21.5	
6-Jul	16.2	15.7	14.5	13.7	13.2	13.2	13.3	13.5	13.5	14.0	14.5	15.3	15.9	14.9	14.7	15.2	16.3	16.6	16.8	16.8	16.3	15.5	14.5	13.9	14.9	16.8	
7-Jul	13.1	12.6	11.9	11.4	10.7	10.5	10.6	10.8	11.8	13.1	14.0	14.5	13.9	14.4	15.3	15.7	15.3	15.8	15.9	15.2	15.0	14.1	13.3	12.6	13.4	15.9	
8-Jul	12.3	11.8	11.2	11.4	11.4	11.5	11.6	12.2	13.3	14.1	15.3	16.7	18.3	19.3	20.0	20.6	21.1	21.5	21.2	20.6	19.7	18.7	17.8	16.9	16.2	21.5	
9-Jul	16.9	16.7	16.4	15.9	15.3	14.2	14.2	14.9	16.2	17.4	17.7	18.8	20.1	21.3	21.8	22.7	21.0	21.2	21.5	21.7	21.5	21.1	20.9	20.3	18.7	22.7	
10-Jul	19.2	18.6	17.7	17.2	16.5	16.2	16.0	16.4	17.3	18.1	19.5	21.5	22.0	22.1	22.6	23.0	23.3	23.4	19.8	18.9	18.6	18.3	18.2	17.9	19.3	23.4	
11-Jul	17.5	17.3	17.0	16.7	16.4	16.6	16.9	18.2	19.4	21.1	22.1	23.0	21.0	22.8	22.7	22.5	23.0	23.8	23.8	23.5	22.9	21.9	20.9	19.9	20.4	23.8	
12-Jul	18.7	18.0	17.2	16.3	16.2	16.0	16.4	17.3	19.0	19.5	19.9	20.5	21.3	22.0	22.5	22.7	22.7	22.0	21.1	20.0	19.6	18.9	18.1	17.3	19.3	22.7	
13-Jul	16.6	15.7	15.0	14.4	14.3	14.3	14.5	15.3	16.3	17.7	18.8	19.4	20.0	20.5	20.4	20.5	20.2	20.3	19.9	20.0	19.2	18.9	17.4	16.5	17.8	20.5	
14-Jul	16.4	16.0	15.7	15.1	14.4	14.5	14.2	14.9	16.0	17.1	18.1	19.2	20.3	21.5	22.3	22.7	22.4	21.9	22.5	22.5	22.3	21.8	21.2	20.2	18.9	22.7	
15-Jul	19.3	18.1	17.5	16.7	17.2	16.4	15.7	17.2	19.6	21.1	22.2	23.3	24.1	25.1	25.6	24.5	25.4	25.6	25.6	25.3	24.1	23.3	21.8	20.2	21.5	25.6	
16-Jul	19.0	18.0	17.0	16.6	17.1	16.2	16.2	17.9	19.4	20.8	22.1	23.2	24.0	22.7	20.8	21.7	22.9	20.3	18.7	19.1	19.5	18.9	18.3	17.7	19.5	24.0	
17-Jul	17.2	16.3	15.5	14.6	13.9	13.5	13.5	14.2	15.4	16.4	16.9	17.8	18.6	19.5	20.3	21.1	21.4	21.7	21.8	21.4	20.8	20.5	20.3	19.5	18.0	21.8	
18-Jul	18.2	17.5	16.8	16.5	15.3	15.1	14.9	13.5	15.3	17.9	20.7	23.0	24.2	25.0	25.9	26.4	26.7	27.1	27.1	26.6	25.9	25.3	24.5	23.0	21.4	27.1	
19-Jul	22.0	21.1	20.3	19.6	18.8	18.5	18.3	19.1	21.4	23.7	25.0	25.7	26.5	27.4	28.0	26.3	24.6	22.4	22.4	22.8	21.3	20.5	19.8	19.2	22.3	28.0	
20-Jul	17.7	17.3	17.0	17.0	16.6	16.3	16.2	16.3	16.3	15.9	16.4	17.7	18.9	18.9	18.8	19.2	19.8	20.3	20.9	20.9	20.7	20.3	19.4	18.6	18.2	20.9	
21-Jul	17.8	17.3	17.3	17.0	16.8	16.6	16.4	16.3	17.3	17.3	17.8	19.0	20.0	18.3	17.8	17.6	14.9	12.8	12.2	12.0	10.7	9.8	9.4	9.3	15.5	20.0	
22-Jul	9.1	8.6	8.3	7.8	7.5	7.0	6.9	8.7	11.1	13.5	16.1	18.7	21.2	22.3	22.0	23.1	22.9	22.0	22.0	22.2	20.4	19.5	18.6	18.1	15.7	23.1	
23-Jul	17.6	16.8	15.9	15.7	14.9	14.8	15.1	15.9	17.1	18.1	18.8	19.7	20.6	20.9	20.6	18.8	17.9	17.3	17.0	17.9	17.5	17.1	16.1	15.8	17.4	20.9	
24-Jul	15.7	15.3	15.1	14.6	14.5	15.4	15.6	16.4	17.7	18.7	19.7	21.1	22.1	23.2	23.7	21.9	20.5	16.8	15.1	14.9	14.7	14.0	13.5	13.4	17.2	23.7	
25-Jul	13.7	13.5	13.3	12.8	12.2	11.8	12.0	13.0	13.7	14.4	15.6	16.7	17.8	18.8	19.6	20.2	20.6	21.2	21.1	20.6	19.9	19.5	18.9	17.9	16.6	21.2	
26-Jul	17.3	16.6	16.4	15.6	14.5	14.2	14.6	16.0	17.7	19.0	21.4	22.5	23.5	25.1	25.4	26.2	26.4	25.9	25.5	25.7	25.3	23.3	22.3	20.9	20.9	26.4	
27-Jul	20.0	19.5	19.9	19.1	18.0	17.1	16.8	17.5	18.8	20.5	21.3	22.3	22.8	24.6	24.6	24.3	24.9	24.7	24.4	24.0	22.9	21.8	21.7	21.2	21.4	24.9	
28-Jul	20.9	20.2	19.7	19.0	19.0	17.7	16.7	17.7	17.7	17.6	19.0	20.0	21.8	23.3	24.3	25.3	25.6	25.9	25.6	23.7	20.7	19.7	18.7	18.6	20.8	25.9	
29-Jul	18.6	18.9	17.9	17.3	17.1	17.1	17.6	18.1	19.8	21.1	22.4	23.7	24.0	24.7	25.5	26.0	26.0	26.2	25.5	24.9	24.4	23.5	22.4	21.1	21.8	26.2	
30-Jul	20.0	19.3	18.6	18.5	18.4	18.3	18.5	17.7	18.8	18.5	20.2	22.1	23.3	23.2	22.1	22.5	22.1	22.9	22.6	22.0	21.1	20.3	19.5	19.5	20.4	23.3	
31-Jul	18.4	18.0	17.9	17.3	16.8	15.9	16.1	15.8	15.6	15.4	15.3	15.2	15.1	15.8	15.7	16.2	17.1	16.5	16.1	15.3	15.2	14.8	14.7	14.8	16.0	18.4	
		17.6	17.0	16.5	15.9	15.5	15.1	15.2	15.8	17.0	18.0	18.9	19.8	20.6	21.2	21.5	21.6	21.6	21.4	21.0	20.7	20.0	19.3	18.6	17.9	Diurnal Average	
		22.4	21.7	20.7	19.7	19.0	18.5	18.5	19.4	21.4	23.7	25.0	25.7	26.5	27.4	28.0	26.5	26.9	27.1	27.1	26.6	25.9	25.3	24.5	23.0	Diurnal Maximum	





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	11	1.48	1.48
10 - 20	465	62.50	63.98
> 20	268	36.02	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



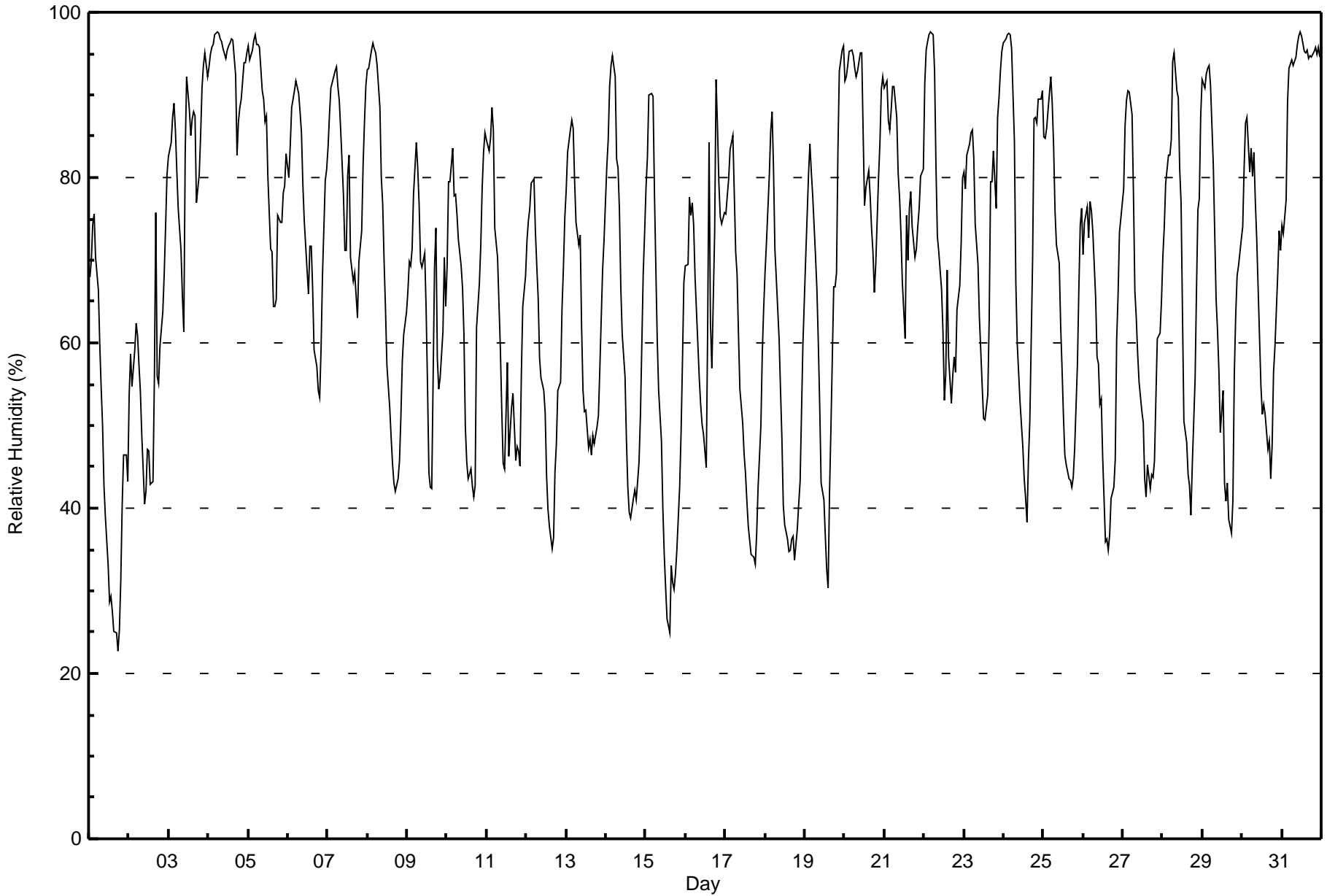
Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

Mannix - July 2016

Maximum Value: 98 % on Jul 22 05:00 Maximum Daily Average: 94.1 % on Jul 4																		Hours in Service: 744 Hours of Data: 744																																																	
Minimum Value: 23 % on Jul 1 18:00 Minimum Daily Average: 45.6 % on Jul 1 Maximum Diurnal Average: 86.7 % at hour 5 Minimum Diurnal Average: 53.2 % at hour 16 Monthly Average: 68.8 % Percentiles: P ₁ = 29 P ₁₀ = 43 Q ₁ = 53 Median = 71 Q ₃ = 85 P ₉₀ = 94 P ₉₉ = 97																		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-Jul	68	70	74	76	70	66	60	55	50	43	39	33	29	29	27	25	25	23	25	31	40	46	46	43	45.6	76																																									
2-Jul	54	59	55	59	62	61	57	54	49	41	42	47	47	43	43	56	76	56	55	60	64	68	74	80	56.7	80																																									
3-Jul	83	84	87	89	86	81	76	71	66	61	83	92	88	85	87	88	87	77	80	85	91	94	95	92	83.7	95																																									
4-Jul	93	95	96	96	97	98	98	97	96	96	94	95	96	96	97	97	92	83	87	89	89	94	94	95	94.1	98																																									
5-Jul	96	94	95	97	97	96	96	96	91	90	87	88	80	71	71	64	64	65	75	75	75	78	79	83	83.5	97																																									
6-Jul	80	84	88	90	91	92	90	88	85	79	75	69	66	72	72	66	59	57	54	53	59	68	80	81	74.9	92																																									
7-Jul	84	88	91	92	93	93	91	89	86	78	71	71	80	83	70	67	68	66	63	70	74	81	87	91	80.3	93																																									
8-Jul	93	93	95	96	96	95	94	89	80	77	70	64	57	52	49	45	43	42	44	46	51	58	61	64	68.9	96																																									
9-Jul	66	70	69	71	78	84	81	77	70	69	71	64	55	44	42	42	69	74	58	54	56	61	70	64	65.1	84																																									
10-Jul	69	79	79	84	78	78	76	73	69	67	61	50	46	43	45	43	41	43	62	67	72	79	83	85	65.4	85																																									
11-Jul	84	83	85	89	86	74	70	65	59	52	45	45	58	46	49	52	54	46	47	47	45	56	64	68	61.3	89																																									
12-Jul	72	75	76	79	80	74	69	65	58	56	54	52	44	40	38	35	36	44	48	54	55	64	69	75	58.9	80																																									
13-Jul	78	83	86	87	86	80	75	72	73	62	54	52	52	47	48	46	49	48	50	51	57	63	69	72	64.1	87																																									
14-Jul	81	85	91	93	95	92	82	81	76	67	61	56	48	42	39	39	41	42	41	43	46	51	68	73	64.0	95																																									
15-Jul	79	83	90	90	90	78	69	60	54	48	40	34	30	27	25	33	31	30	32	35	43	49	58	67	53.2	90																																									
16-Jul	69	70	78	75	77	74	68	60	56	52	50	49	45	62	84	62	57	73	92	86	79	75	74	76	68.5	92																																									
17-Jul	76	78	80	83	85	78	71	68	61	54	50	47	44	41	38	34	34	34	33	37	43	50	59	64	56.0	85																																									
18-Jul	69	72	80	86	88	81	71	68	61	54	48	40	38	36	35	35	36	37	34	37	41	43	52	60	54.2	88																																									
19-Jul	70	75	80	84	81	78	71	66	60	52	43	41	37	33	30	42	50	67	67	68	83	93	96	96	65.1	96																																									
20-Jul	92	92	94	95	95	95	93	92	93	95	95	85	77	79	81	78	74	71	66	70	80	84	91	92	85.8	95																																									
21-Jul	91	92	87	86	88	91	91	87	80	78	73	67	61	75	70	76	78	74	70	71	74	76	80	81	79.1	92																																									
22-Jul	91	95	96	97	98	97	93	81	73	71	66	61	53	56	69	58	53	56	58	56	64	67	72	80	73.5	98																																									
23-Jul	81	79	83	84	85	86	82	74	70	63	59	55	51	51	54	63	79	79	83	76	87	90	93	95	75.1	95																																									
24-Jul	96	97	97	97	97	96	84	68	60	56	53	47	44	41	38	46	51	70	87	87	87	90	90	91	73.7	97																																									
25-Jul	85	85	86	88	92	89	84	76	72	70	62	57	51	47	45	43	43	43	44	47	57	66	74	76	66.0	92																																									
26-Jul	71	75	76	73	77	76	73	65	58	57	52	53	46	36	36	35	37	41	43	46	60	66	73	75	58.4	77																																									
27-Jul	79	86	89	91	90	88	78	66	63	59	55	52	50	44	41	45	42	44	44	46	53	61	61	65	62.2	91																																									
28-Jul	71	74	79	83	83	85	94	95	90	90	81	77	63	50	48	44	43	39	45	56	66	76	77	87	70.7	95																																									
29-Jul	92	91	93	93	93	91	82	73	65	61	57	49	54	43	41	43	39	37	41	56	63	68	69	72	65.3	93																																									
30-Jul	74	81	87	87	81	84	80	83	77	73	61	55	51	53	51	47	48	44	48	56	59	68	73	71	66.4	87																																									
31-Jul	74	73	77	89	93	94	94	94	95	96	97	98	97	95	95	95	94	95	95	95	96	95	96	95	92.4	98																																									
																		79.4		81.9		84.6		86.4		86.7		84.6		80.5		75.8		70.8		66.6		62.9		59.5		56.1		53.6		53.5		53.2		54.7		54.8		57.1		59.7		64.8		70.3		75.1		77.8		Diurnal Average	
																		96		97		97		97		98		98		98		97		96		96		96		97		98		97		96		97		97		94		95		95		95		96		95		96		Diurnal Maximum	





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity (RH) - %
Mannix - July 2016

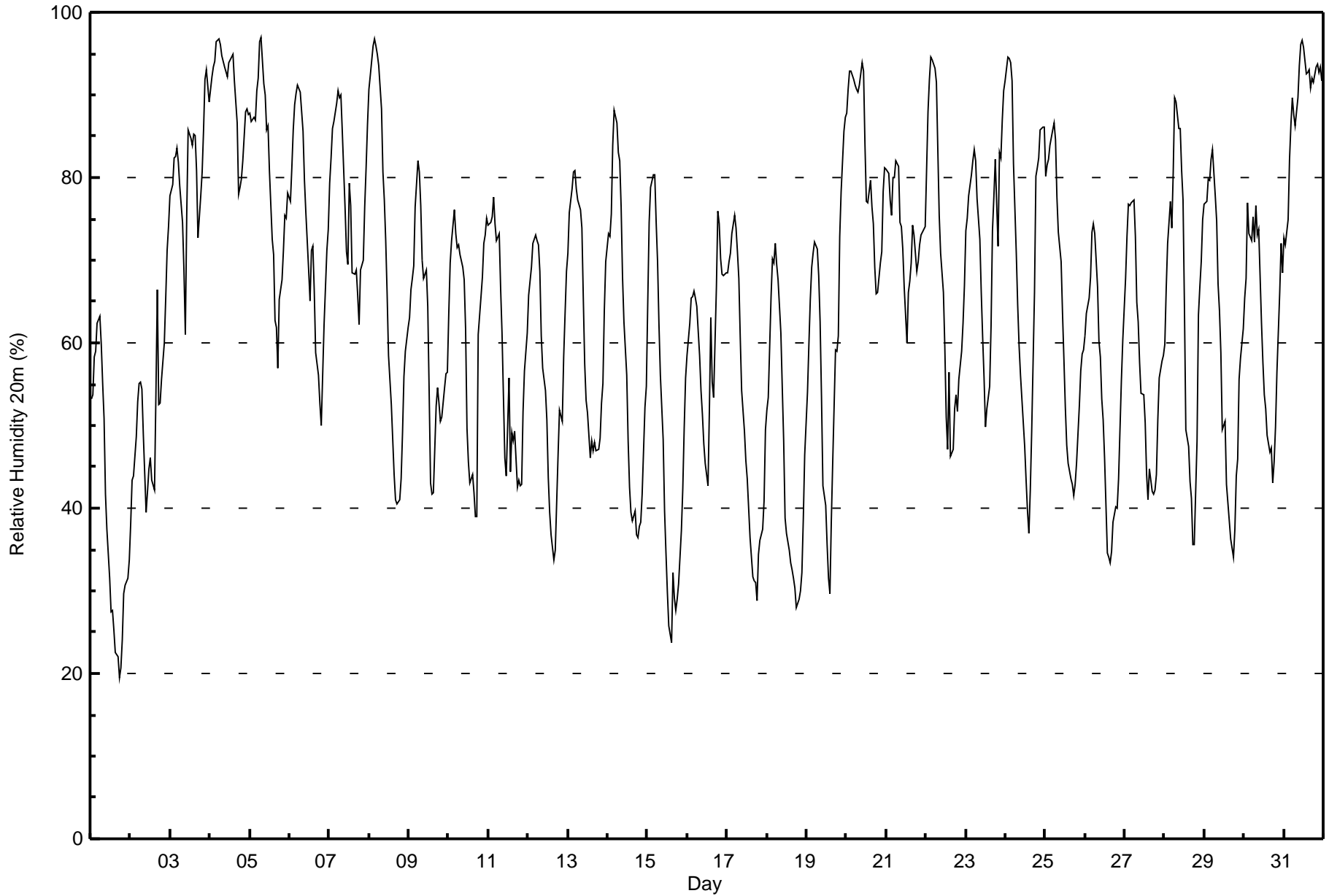
Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	51	6.85	6.85
40 - 60	203	27.28	34.14
60 - 80	244	32.80	66.94
80 - 100	246	33.06	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Value: 97 % on Jul 5 08:00														Maximum Daily Average: 90.5 % on Jul 4														Hours in Service: 744											
Minimum Value: 19 % on Jul 1 18:00														Minimum Daily Average: 39.2 % on Jul 1														Hours of Data: 744											
Maximum Diurnal Average: 80.1 % at hour 6														Minimum Diurnal Average: 50.8 % at hour 16														Hours of Missing Data: 0											
Monthly Average: 64.7 %														Percentiles: P ₁ = 26 P ₁₀ = 40 Q ₁ = 50 Median = 67 Q ₃ = 79 P ₉₀ = 90 P ₉₉ = 96														Hours of Calibration: 0											
																												Percent Operational Time: 100.0											
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24															
1-Jul	53	54	58	59	62	63	60	55	51	42	37	32	27	28	25	23	22	19	21	24	30	31	32	34	39.2	63													
2-Jul	38	43	44	49	53	55	55	54	49	39	42	45	46	43	42	54	66	53	53	56	60	65	71	74	52.1	74													
3-Jul	78	79	82	83	84	82	79	75	69	61	76	86	85	84	85	85	81	73	78	81	86	92	93	89	80.9	93													
4-Jul	91	92	93	94	96	97	96	95	94	93	92	94	94	95	95	92	87	78	79	80	82	88	88	88	90.5	97													
5-Jul	88	87	87	87	91	92	96	97	91	90	86	86	81	73	71	63	62	57	65	68	71	75	75	78	79.8	97													
6-Jul	77	81	86	89	90	91	90	88	86	80	76	69	65	71	72	66	59	56	53	50	56	62	71	74	73.2	91													
7-Jul	79	82	86	87	89	90	90	90	86	76	71	69	79	77	69	68	69	66	62	69	70	76	81	86	77.9	90													
8-Jul	91	92	96	97	96	95	94	88	81	77	72	66	59	53	48	44	41	40	41	44	49	56	59	62	68.3	97													
9-Jul	63	66	68	69	76	82	81	77	70	68	69	64	54	43	42	42	52	55	53	51	51	55	56	56	60.9	82													
10-Jul	64	70	72	76	73	72	72	71	69	68	62	50	46	43	44	42	39	39	61	66	68	72	73	75	61.9	76													
11-Jul	74	75	75	78	74	72	73	67	61	54	46	44	56	44	49	48	49	43	43	43	43	52	57	61	57.5	78													
12-Jul	66	67	69	72	73	72	72	69	61	57	54	51	44	39	37	34	35	41	46	52	50	58	64	69	56.3	73													
13-Jul	71	76	79	81	81	79	77	76	74	65	57	53	52	46	48	47	48	47	47	49	53	55	64	70	62.2	81													
14-Jul	73	73	76	84	88	87	83	82	76	68	63	56	48	42	40	38	40	37	37	38	38	42	52	55	58.9	88													
15-Jul	65	75	79	80	80	75	70	62	56	48	40	35	30	26	24	32	29	28	29	31	37	42	50	56	49.1	80													
16-Jul	58	62	65	66	66	65	64	59	54	51	48	45	43	52	63	55	53	67	76	74	70	68	68	69	61.0	76													
17-Jul	68	70	71	73	75	74	71	68	61	54	49	46	44	40	36	32	31	31	29	34	36	38	41	50	50.9	75													
18-Jul	52	53	66	70	70	72	69	68	61	55	48	39	37	35	33	33	32	30	28	29	30	32	39	46	46.9	72													
19-Jul	54	60	65	69	71	72	71	68	62	53	43	40	36	32	30	38	46	59	59	61	73	78	86	87	58.9	87													
20-Jul	88	91	93	93	92	91	91	90	91	94	93	84	77	77	80	77	74	69	66	66	70	71	78	81	82.4	94													
21-Jul	81	80	77	75	80	80	82	81	75	74	71	67	60	66	68	70	74	73	69	70	72	73	73	74	73.6	82													
22-Jul	81	88	92	95	94	93	91	83	75	71	66	60	51	47	57	46	47	52	54	52	56	59	62	67	68.3	95													
23-Jul	74	75	78	80	82	83	82	77	73	66	61	56	50	52	55	62	74	78	82	72	83	82	87	90	73.0	90													
24-Jul	92	94	94	94	92	82	71	65	60	56	53	48	43	40	37	42	49	66	80	81	82	86	86	86	70.0	94													
25-Jul	80	82	82	84	86	87	85	78	73	70	64	58	52	48	45	44	43	42	43	45	52	57	59	59	63.1	87													
26-Jul	61	64	65	68	73	74	73	67	60	58	53	51	46	35	34	33	35	38	40	40	44	50	55	60	53.3	74													
27-Jul	68	73	77	77	77	77	73	65	62	58	54	54	50	44	41	45	42	42	42	44	51	56	58	58	57.8	77													
28-Jul	60	67	72	77	74	81	90	89	86	86	81	77	64	49	48	43	41	36	36	48	63	67	70	75	65.8	90													
29-Jul	77	77	80	80	82	83	78	75	67	64	59	49	51	43	41	38	36	34	38	44	46	56	58	62	59.0	83													
30-Jul	65	68	77	73	72	75	72	77	73	74	62	58	54	52	49	47	47	43	46	50	56	66	72	68	62.4	77													
31-Jul	73	72	75	82	86	90	88	86	90	94	96	97	96	92	93	93	91	92	91	93	94	93	93	92	89.2	97													
														71.0	73.8	76.8	78.7	80.0	80.1	78.7	75.5	70.9	66.6	62.7	58.9	55.4	51.9	51.5	50.8	51.4	51.0	53.1	54.9	58.8	63.0	66.8	69.4	Diurnal Average	
														92	94	96	97	96	97	96	97	94	94	96	97	96	95	95	93	91	92	91	93	94	93	93	92	Diurnal Maximum	





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

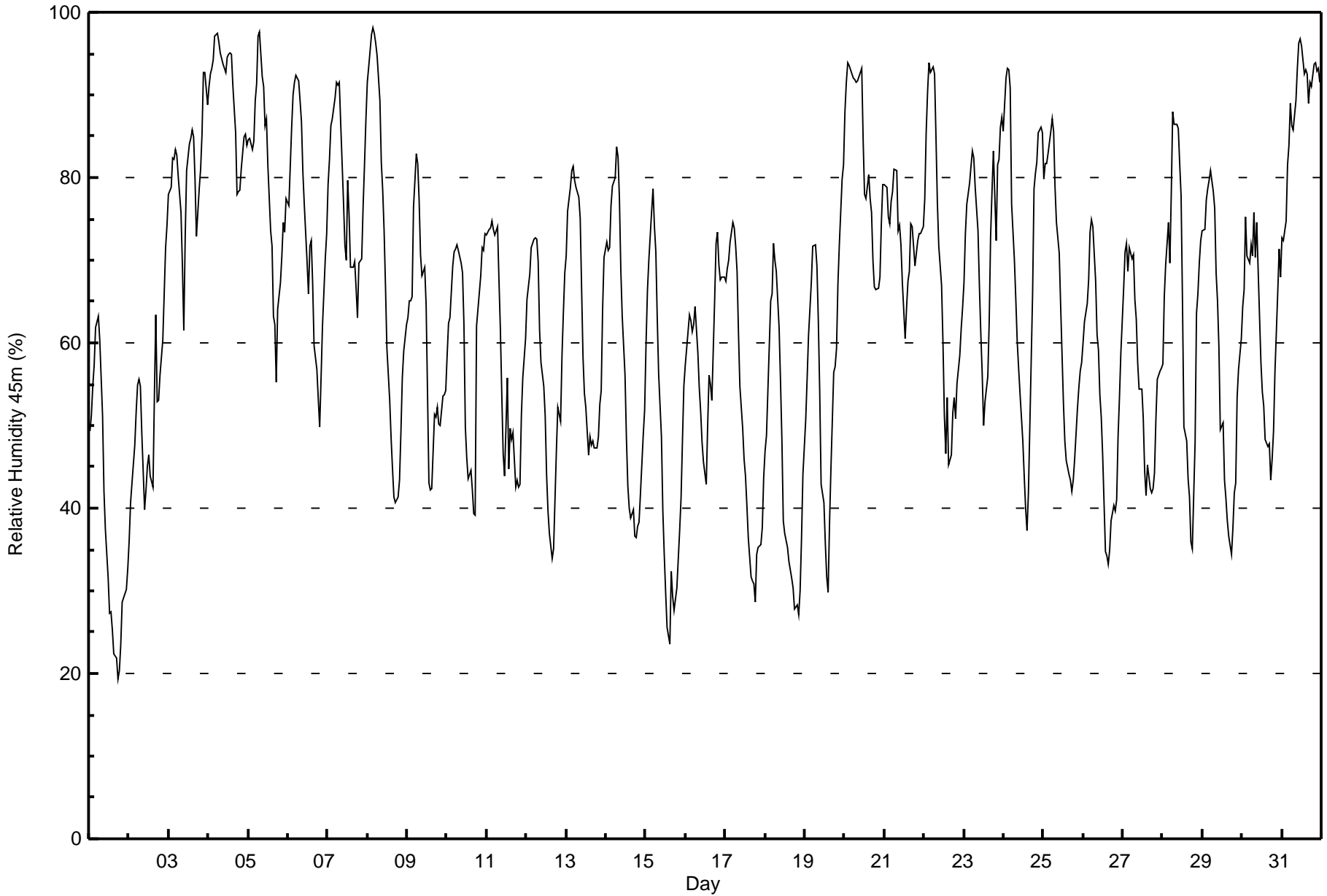
Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	1	0.13	0.13
20 - 40	76	10.22	10.35
40 - 60	219	29.44	39.79
60 - 80	277	37.23	77.02
80 - 100	171	22.98	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Value: 98 % on Jul 8 04:00 Maximum Daily Average: 90.2 % on Jul 4																		Hours in Service: 744 Hours of Data: 744																																																	
Minimum Value: 19 % on Jul 1 18:00 Minimum Daily Average: 38.5 % on Jul 1 Maximum Diurnal Average: 79.3 % at hour 6 Minimum Diurnal Average: 50.9 % at hour 18 Monthly Average: 64.2 % Percentiles: P ₁ = 26 P ₁₀ = 40 Q ₁ = 50 Median = 66 Q ₃ = 78 P ₉₀ = 89 P ₉₉ = 97																		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-Jul	49	51	55	57	62	63	60	56	51	42	38	32	27	27	25	22	22	19	20	24	29	29	30	33	38.5	63																																									
2-Jul	36	41	43	48	52	55	56	55	49	40	42	45	47	44	43	54	63	53	53	56	60	66	72	74	51.9	74																																									
3-Jul	78	79	82	82	83	83	80	76	69	62	73	81	84	85	86	85	80	73	79	81	85	93	93	89	80.8	93																																									
4-Jul	91	93	93	94	97	97	96	95	94	94	93	95	95	95	91	86	78	78	78	81	85	85	84	84	90.2	97																																									
5-Jul	85	85	83	84	89	91	97	98	92	91	86	87	82	73	72	63	62	55	64	67	71	75	73	78	79.3	98																																									
6-Jul	77	81	86	90	92	92	92	89	87	81	77	70	66	72	72	67	60	57	53	50	56	62	70	73	73.8	92																																									
7-Jul	79	82	86	87	90	91	91	91	87	77	72	70	80	75	69	69	70	67	63	70	70	76	81	87	78.4	91																																									
8-Jul	91	93	97	98	97	96	95	89	82	78	74	67	59	53	48	45	41	41	41	43	49	56	59	62	69.0	98																																									
9-Jul	63	65	65	66	77	83	82	77	71	68	69	65	54	43	42	42	51	51	52	50	50	54	54	54	60.3	83																																									
10-Jul	58	62	63	69	71	71	72	71	70	68	62	50	46	44	45	42	39	39	62	66	68	71	71	73	60.6	73																																									
11-Jul	73	74	74	75	74	73	74	68	62	54	47	44	56	45	50	48	49	43	43	43	43	51	56	61	57.4	75																																									
12-Jul	65	67	68	72	73	73	73	70	62	58	55	51	44	40	37	34	35	41	47	52	51	58	64	69	56.5	73																																									
13-Jul	71	76	79	81	81	80	79	78	75	67	58	54	52	46	49	48	48	47	47	49	52	54	64	70	62.7	81																																									
14-Jul	72	71	71	77	79	80	84	82	77	69	63	56	48	43	40	39	40	37	36	38	38	42	49	52	57.6	84																																									
15-Jul	60	66	70	76	79	74	71	63	56	49	40	34	30	26	24	32	29	28	29	30	37	41	48	55	47.8	79																																									
16-Jul	57	61	63	63	61	62	64	59	55	52	48	46	43	50	56	55	53	65	72	73	69	68	68	68	59.7	73																																									
17-Jul	68	69	70	72	75	74	72	69	61	55	50	46	44	40	36	32	31	31	29	34	35	36	38	44	50.4	75																																									
18-Jul	47	49	60	65	66	72	70	69	62	55	48	38	37	35	34	33	32	30	28	28	27	30	36	44	45.6	72																																									
19-Jul	51	56	61	64	67	72	72	69	63	54	43	41	36	32	30	38	45	56	57	59	67	72	80	82	56.9	82																																									
20-Jul	88	91	94	93	93	92	92	92	92	93	93	85	78	77	80	77	76	70	67	66	67	68	74	79	82.4	94																																									
21-Jul	79	79	75	74	77	78	81	81	74	74	72	67	61	64	67	69	74	74	69	71	72	73	73	74	73.1	81																																									
22-Jul	78	85	90	94	93	93	93	85	77	72	67	60	51	47	53	45	46	52	53	51	55	58	62	64	67.7	94																																									
23-Jul	67	73	77	79	81	83	82	79	73	67	61	56	50	53	56	62	73	78	83	72	81	82	86	87	72.7	87																																									
24-Jul	86	92	93	93	91	77	70	65	60	57	54	48	44	40	37	42	50	66	79	81	82	85	86	85	69.3	93																																									
25-Jul	80	82	82	83	86	87	86	79	75	71	65	59	53	48	46	44	43	42	43	46	52	55	57	58	63.3	87																																									
26-Jul	60	63	65	68	73	75	74	68	61	59	54	51	46	35	34	33	35	39	40	40	41	49	53	59	53.1	75																																									
27-Jul	67	71	72	69	71	70	71	65	63	58	54	54	51	44	42	45	42	42	42	44	51	56	57	57	56.6	72																																									
28-Jul	57	66	70	75	70	78	88	87	86	86	82	78	65	50	48	44	41	36	35	48	64	66	70	72	65.0	88																																									
29-Jul	74	74	77	79	80	81	78	76	68	65	60	50	50	43	41	38	37	34	38	42	43	53	57	61	58.3	81																																									
30-Jul	64	66	75	70	70	72	71	76	70	75	63	58	54	52	48	47	48	43	46	49	56	66	71	68	61.7	76																																									
31-Jul	73	72	75	82	84	89	86	86	89	93	96	97	96	92	93	93	89	92	91	94	94	93	93	92	88.9	97																																									
																		69.1		72.1		74.7		76.7		78.4		79.3		79.0		76.2		71.4		67.1		63.1		59.1		55.7		52.1		51.6		51.0		51.3		50.9		53.0		54.7		58.0		62.0		65.5		68.0		Diurnal Average	
																		91		93		97		98		97		97		98		94		94		96		97		96		95		95		93		89		92		91		94		94		93		93		92		Diurnal Maximum			





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

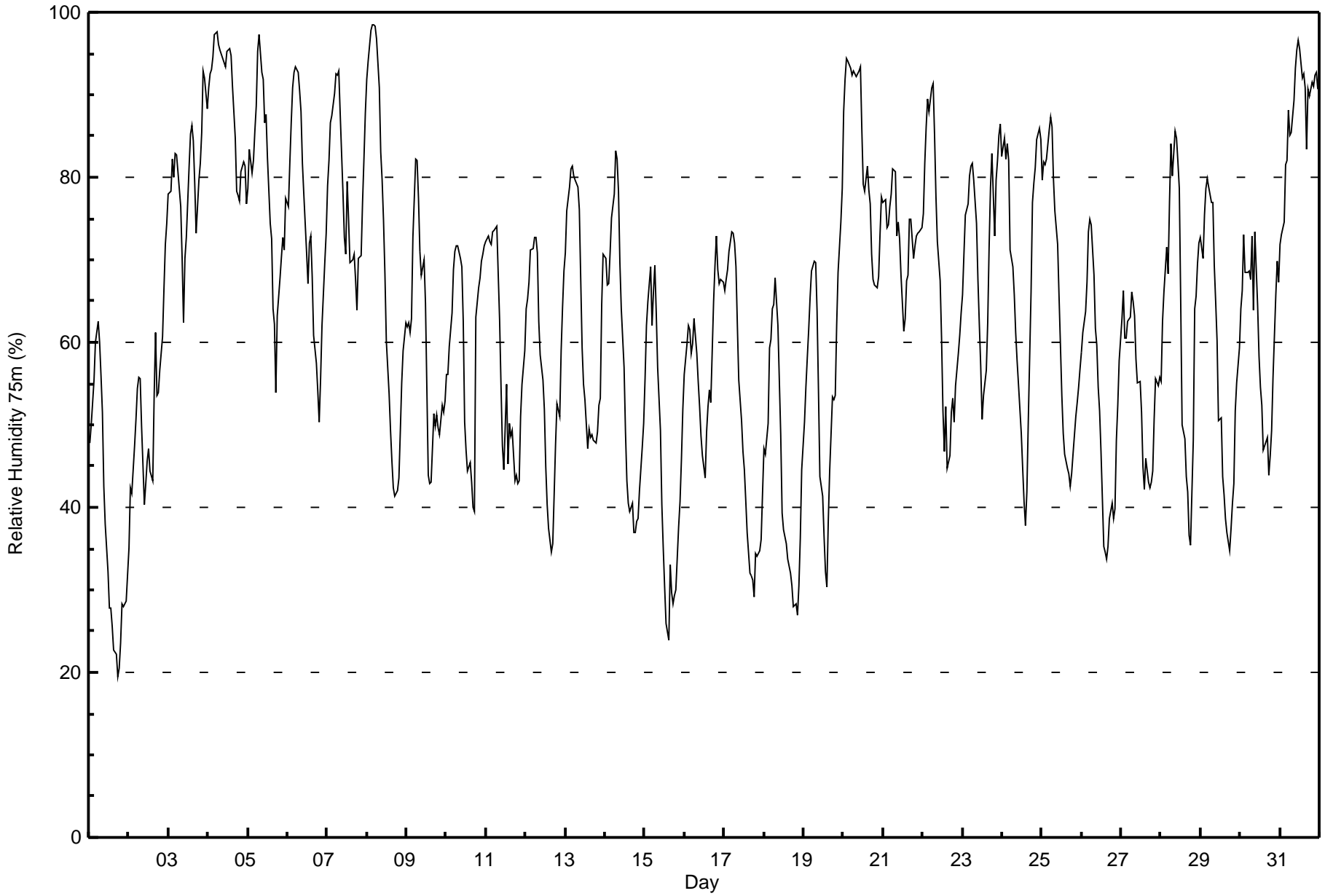
Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	1	0.13	0.13
20 - 40	77	10.35	10.48
40 - 60	223	29.97	40.46
60 - 80	286	38.44	78.90
80 - 100	157	21.10	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Value: 98 % on Jul 8 04:00																		Maximum Daily Average: 89.6 % on Jul 4																		Hours in Service: 744												
Minimum Value: 20 % on Jul 1 18:00																		Minimum Daily Average: 38.1 % on Jul 1																		Hours of Data: 744												
Maximum Diurnal Average: 78.3 % at hour 7																		Minimum Diurnal Average: 51.1 % at hour 18																		Hours of Missing Data: 0												
Monthly Average: 63.7 %																		Percentiles: P ₁ = 26 P ₁₀ = 40 Q ₁ = 50 Median = 65 Q ₃ = 77 P ₉₀ = 88 P ₉₉ = 97																		Hours of Calibration: 0												
																																				Percent Operational Time: 100.0												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Jul	48	50	53	55	60	62	60	56	52	43	38	32	28	28	26	23	22	20	21	24	28	28	29	32	38.1	62																						
2-Jul	35	42	42	47	51	54	56	56	50	40	43	46	47	44	43	54	61	54	54	57	61	66	72	74	52.0	74																						
3-Jul	78	78	82	80	83	83	81	76	70	62	70	73	81	85	86	84	79	73	80	82	85	93	92	88	80.3	93																						
4-Jul	91	93	93	95	97	98	96	95	95	94	93	95	95	96	95	91	85	78	78	77	81	82	81	77	89.6	98																						
5-Jul	79	83	81	82	86	89	95	97	93	92	87	88	82	74	72	64	62	54	63	68	70	73	71	77	78.4	97																						
6-Jul	76	82	87	91	93	93	93	90	88	82	78	71	67	72	73	68	61	58	54	50	56	62	70	73	74.5	93																						
7-Jul	79	82	87	87	90	92	92	93	88	78	73	71	79	75	70	70	71	68	64	70	71	77	82	88	79.0	93																						
8-Jul	92	94	98	98	98	98	97	91	83	80	75	68	60	54	49	46	42	41	42	44	49	55	59	62	69.8	98																						
9-Jul	62	62	61	63	73	82	82	77	71	68	70	65	54	44	43	43	51	50	51	50	49	52	51	53	59.5	82																						
10-Jul	56	56	59	64	69	71	72	72	70	69	63	50	47	44	45	43	40	40	63	67	68	70	71	72	60.0	72																						
11-Jul	72	73	72	72	73	74	74	68	63	55	47	45	55	45	50	49	49	43	44	43	43	51	55	59	57.3	74																						
12-Jul	64	65	67	71	71	73	73	71	62	58	55	52	45	40	38	35	36	42	48	53	51	59	64	69	56.7	73																						
13-Jul	71	76	79	81	81	80	80	79	76	68	59	55	53	47	49	49	49	48	48	49	52	53	65	71	63.2	81																						
14-Jul	70	67	67	71	75	78	83	82	78	70	64	57	49	43	41	39	41	37	37	38	39	42	47	50	56.9	83																						
15-Jul	56	62	65	69	62	66	69	64	57	49	40	35	30	26	24	33	30	28	29	30	38	41	46	52	45.9	69																						
16-Jul	56	60	62	61	59	60	63	59	55	52	49	46	44	49	52	54	53	65	69	73	69	67	68	67	58.8	73																						
17-Jul	66	68	69	71	73	73	72	69	62	55	50	47	45	41	37	32	32	31	29	34	34	35	36	42	50.2	73																						
18-Jul	47	46	50	59	60	64	65	68	62	56	49	39	37	36	34	33	32	31	28	28	27	31	36	45	44.3	68																						
19-Jul	50	55	58	62	65	69	70	70	64	54	44	41	36	32	30	38	44	53	53	54	62	68	75	79	55.3	79																						
20-Jul	88	92	94	94	93	92	93	93	92	93	93	86	79	78	81	79	77	71	68	67	67	68	73	78	82.8	94																						
21-Jul	77	77	74	74	76	78	81	81	73	75	73	68	61	63	67	68	75	75	70	72	73	73	73	74	73.0	81																						
22-Jul	76	82	86	90	88	91	91	85	78	72	68	60	52	47	52	45	46	52	53	50	55	59	61	64	66.7	91																						
23-Jul	66	71	75	77	80	81	82	80	74	68	62	57	51	54	57	62	72	79	83	73	80	82	85	86	72.3	86																						
24-Jul	82	85	82	84	82	71	69	66	61	58	55	49	45	41	38	42	50	66	77	79	81	85	86	85	67.4	86																						
25-Jul	80	82	82	82	86	87	86	80	76	72	66	60	54	49	46	45	44	43	44	46	51	53	55	57	63.5	87																						
26-Jul	59	61	64	67	73	75	74	68	62	60	54	52	47	35	35	34	35	39	40	39	40	48	52	58	52.9	75																						
27-Jul	63	66	61	61	63	63	66	65	63	58	55	55	52	45	42	46	43	42	43	44	51	56	55	56	54.7	66																						
28-Jul	55	62	66	72	68	77	84	80	86	85	82	79	65	50	48	44	42	37	35	48	64	66	70	72	64.0	86																						
29-Jul	73	70	75	79	80	79	77	77	69	65	60	50	51	44	42	39	37	35	38	41	43	52	55	59	57.8	80																						
30-Jul	64	66	73	69	68	69	68	73	64	73	64	58	55	52	47	48	48	44	46	49	56	66	70	67	60.7	73																						
31-Jul	72	73	75	81	82	88	85	85	89	93	96	97	96	92	93	91	83	91	90	92	91	92	93	91	87.9	97																						
																								67.8	70.4	72.2	74.5	76.1	77.8	78.3	76.3	71.8	67.6	63.7	59.6	56.2	52.5	51.8	51.2	51.4	51.1	53.0	54.5	57.5	61.4	64.4	66.9	Diurnal Average
																								92	94	98	98	98	98	97	97	95	94	96	97	96	96	95	91	85	91	90	92	91	93	93	91	Diurnal Maximum





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

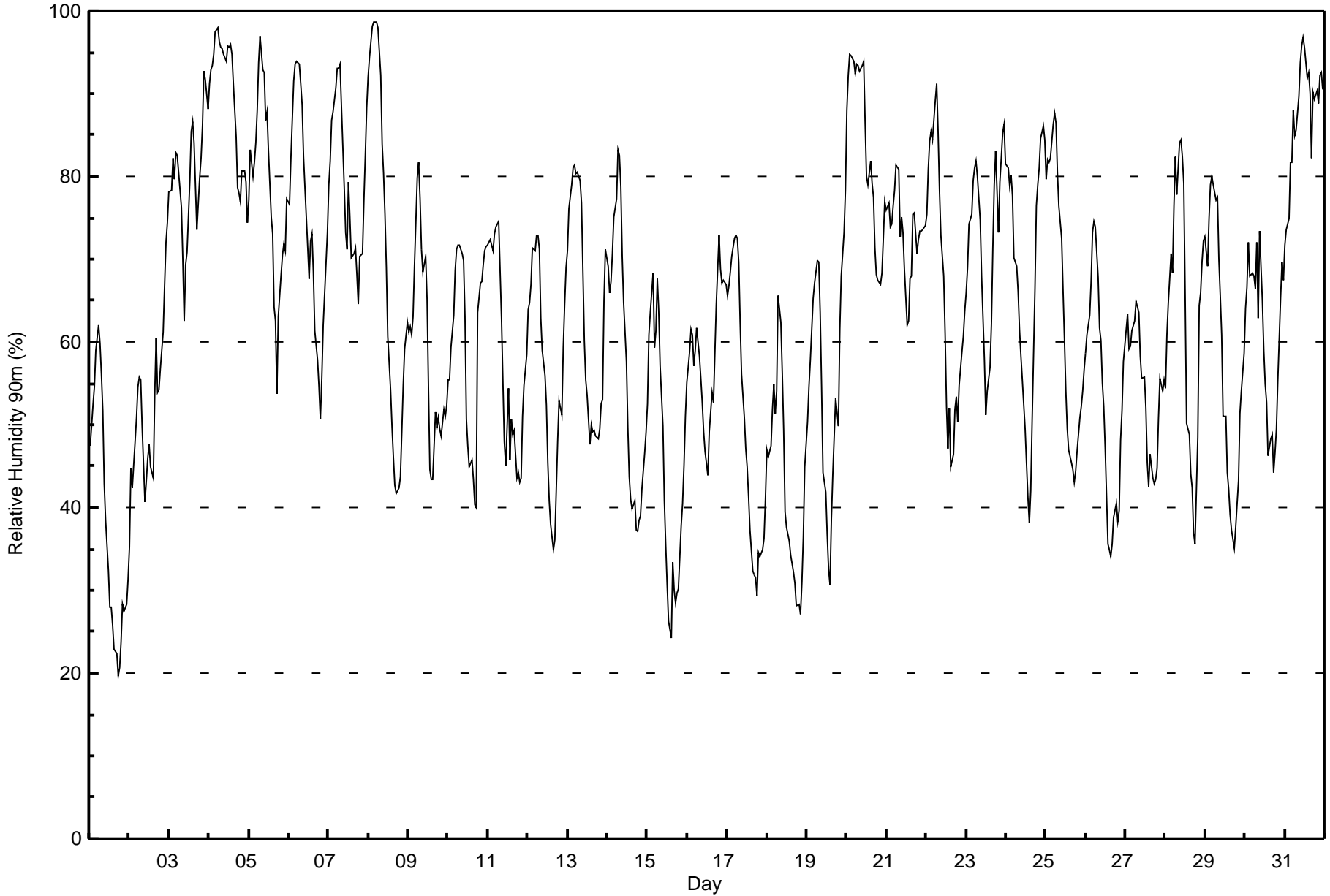
Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	1	0.13	0.13
20 - 40	73	9.81	9.95
40 - 60	232	31.18	41.13
60 - 80	287	38.58	79.70
80 - 100	151	20.30	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Value: 99 % on Jul 8 05:00																		Maximum Daily Average: 89.6 % on Jul 4						Hours in Service: 744																									
Minimum Value: 20 % on Jul 1 18:00																		Minimum Daily Average: 38.0 % on Jul 1						Hours of Data: 744																									
Maximum Diurnal Average: 77.9 % at hour 7																		Minimum Diurnal Average: 51.4 % at hour 18						Hours of Missing Data: 0																									
Monthly Average: 63.6 %																		Percentiles: P ₁ = 26 P ₁₀ = 40 Q ₁ = 50 Median = 65 Q ₃ = 77 P ₉₀ = 88 P ₉₉ = 97						Hours of Calibration: 0																									
																		Percent Operational Time: 100.0																															
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Jul	48	50	52	55	59	62	60	56	52	43	38	32	28	28	26	23	22	20	21	24	28	28	28	31	38.0	62																							
2-Jul	35	45	42	48	51	55	56	56	50	41	43	46	48	45	44	54	60	54	54	57	61	67	72	74	52.3	74																							
3-Jul	78	78	82	80	83	83	80	76	70	63	69	71	79	85	87	84	79	74	80	82	86	93	92	88	80.1	93																							
4-Jul	91	93	93	95	98	98	96	96	95	95	94	96	96	96	95	91	85	79	78	77	81	81	79	74	89.6	98																							
5-Jul	77	83	80	82	84	88	94	97	93	92	87	88	83	75	73	64	63	54	63	68	71	72	71	77	78.3	97																							
6-Jul	77	82	87	92	94	94	93	91	89	82	79	71	68	72	73	68	61	58	55	51	56	62	69	73	74.9	94																							
7-Jul	79	82	87	88	91	93	93	94	89	79	73	71	79	75	70	71	71	68	65	70	71	77	83	88	79.4	94																							
8-Jul	92	94	98	99	99	99	98	92	84	80	76	69	61	54	50	46	43	42	42	44	49	55	59	62	70.3	99																							
9-Jul	61	62	61	63	69	80	82	77	71	69	70	65	54	45	43	43	51	50	51	50	49	52	51	52	59.2	82																							
10-Jul	55	55	59	63	69	71	72	72	71	70	63	51	47	45	46	43	40	40	64	67	67	69	71	72	60.1	72																							
11-Jul	72	72	72	71	73	74	75	69	63	55	48	45	54	46	51	49	49	44	44	43	44	51	55	58	57.3	75																							
12-Jul	64	65	67	71	71	73	73	71	63	59	56	52	45	41	38	35	36	42	48	53	51	59	65	69	57.0	73																							
13-Jul	71	76	79	81	81	80	80	79	77	68	60	55	53	48	50	49	49	49	48	50	52	53	65	71	63.6	81																							
14-Jul	69	66	67	71	75	77	83	83	79	70	65	58	50	44	41	40	41	37	37	39	39	42	47	49	57.0	83																							
15-Jul	53	61	64	68	59	61	68	64	57	50	41	35	31	26	24	33	30	29	30	30	38	40	45	51	45.3	68																							
16-Jul	55	59	61	61	57	59	62	58	56	53	49	47	44	49	51	54	53	65	69	73	69	67	68	67	58.5	73																							
17-Jul	66	67	69	70	73	73	73	70	62	56	51	47	45	41	37	32	32	32	29	35	34	35	36	41	50.2	73																							
18-Jul	47	46	47	52	55	51	54	66	62	56	49	39	38	36	34	33	32	31	28	28	27	31	36	45	42.8	66																							
19-Jul	50	55	58	61	65	67	70	70	64	55	44	42	37	33	31	39	44	53	52	50	62	68	73	78	54.9	78																							
20-Jul	88	92	95	95	94	92	94	93	93	93	94	87	80	79	82	79	77	71	68	67	67	68	73	77	83.3	95																							
21-Jul	76	77	74	74	76	78	81	81	73	75	73	69	62	63	68	68	75	76	71	72	73	73	73	74	73.2	81																							
22-Jul	75	81	84	85	84	89	91	85	78	73	68	61	52	47	52	45	46	52	53	50	55	59	61	64	66.3	91																							
23-Jul	66	69	74	75	80	81	82	80	75	68	63	58	51	54	57	62	71	79	83	73	79	82	85	86	72.3	86																							
24-Jul	82	81	79	80	78	70	69	66	62	58	55	49	45	41	38	42	51	66	76	79	81	85	86	84	66.8	86																							
25-Jul	80	82	82	82	86	88	87	80	76	72	66	60	54	49	47	45	45	43	44	47	51	52	54	57	63.8	88																							
26-Jul	59	61	63	67	73	75	74	68	62	60	55	52	47	36	35	34	36	39	41	38	40	48	52	58	53.0	75																							
27-Jul	61	63	59	60	61	63	65	64	63	58	56	56	52	45	42	46	44	43	43	45	51	56	54	55	54.5	65																							
28-Jul	54	61	65	71	68	76	82	78	84	84	82	79	65	50	49	44	42	37	36	48	64	66	70	72	63.7	84																							
29-Jul	73	69	75	79	80	79	77	77	70	66	61	51	51	44	42	39	37	35	38	40	43	51	54	59	58.0	80																							
30-Jul	64	67	72	68	68	68	66	72	63	73	65	59	55	53	46	48	49	44	47	49	55	65	70	68	60.6	73																							
31-Jul	72	74	75	82	82	88	85	86	90	94	96	97	96	92	93	90	82	90	89	90	89	92	92	90	87.7	97																							
																								67.4	69.9	71.7	73.8	75.4	76.9	77.9	76.3	72.1	68.1	64.2	60.0	56.5	52.8	52.1	51.5	51.6	51.4	53.1	54.5	57.5	61.3	64.1	66.7	Diurnal Average	
																								92	94	98	99	99	99	98	97	95	95	96	97	96	96	95	91	85	90	89	90	89	93	92	90	Diurnal Maximum	





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	1	0.13	0.13
20 - 40	72	9.68	9.81
40 - 60	238	31.99	41.80
60 - 80	286	38.44	80.24
80 - 100	147	19.76	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Speed: 27 km/h on Jul 24 17:00	Maximum Daily Speed Average: 13.8 km/h on Jul 12	Hours in Service: 744
Minimum Speed Value: 1 km/h on Jul 14 09:00	Minimum Daily Speed Average: 2.2 km/h on Jul 10	Hours of Data: 744
Maximum Diurnal Speed Average: 4.5 km/h at hour 18	Minimum Diurnal Speed Average: 0.5 km/h at hour 3	Hours of Missing Data: 0
Monthly Average Velocity: 1.9 km/h 295.6 deg	Percentiles: P ₁ = 1 P ₁₀ = 4 Q ₁ = 6 Median = 8 Q ₃ = 12 P ₉₀ = 15 P ₉₉ = 22	Percent Operational Time: 100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	S6	SSE8	SSE9	SE9	SE9	SE8	SE10	SE9	SSE11	SE17	SSE20	SE16	SSE12	SSE11	SSE11	SE10	SE12	SE13	SSE13	SSE14	SSE14	SE11	SE11	SE12	SSE11.2	SSE20
2-Jul	SSE10	SSE9	SE9	SE9	SE10	SE8	SE7	SE9	SE15	SSE19	SSE16	SSE16	SSE16	SSE16	SSE16	S15	SSE7	SE14	SE13	SE10	SE10	SE12	SE11	SE8	SSE11.5	SSE19
3-Jul	SE8	SE8	SE8	SE7	SE9	SE9	SE8	SE10	SE9	SE6	S13WSW12	SSE4	E9	E5	E7	SSE4	SSE4	ESE4	ESE4	SSE5	SE7	SSW6	W11	SE5.4	S13	
4-Jul	WSW7	WSW6	SW7	WSW9	SW9WSW10	WSW10	WSW11	SW9WSW14	WSW12	WSW12	WSW12	WSW13	SW13	SW13	SW13	WSW13	W10	SW8	SSW7	S6	SSE7	SSE4	WNW1	WSW8.5	WSW14	
5-Jul	NNW3	NNE7	N6	N5	NN3	NW4	W8	NN8	N8	NNE3	NE3	E3	NW4	NNE6	SE4	ESE6	ESE3	NNW7	NNW8	W7	W15WSW12	W11	W9	NW3.5	W15	
6-Jul	W13	W8	W11	W13	NW9	NNW7	ENE5	NNW7	N14	NNE16	NNE12	NE11	ENE8	NNE14	NE15	NE12	ENE13	NE13	NE10	NNE10	N11	N9	NNW11	N12	N7.4	NNE16
7-Jul	N13	N9	NNW8	NNW11	NNW9	NNW6	NNW6	NNW7	NNW5	NW8	NNW7	NW6	NNE6	NW8	N10	NNE9	NNE14	NNE12	NNE13	NNE12	N12	N10	N10	N9	N8.5	NNE14
8-Jul	NNE10	NNE6	NNE6	NNE5	NNE6	N5	NNE6	NE7	NNE6	NE4	N3	NNE5	N4	N4	NNE4	ENE6	ENE8	NE5	NE7	NNE11	NNE12	NNE13	NNE10	NNE9	NNE6.5	NNE13
9-Jul	NNE7	NNE8	NNE11	NNE10	N6	NNW5	N5	NNE3	NNE3	W2	WSW6	W4	WSW3	NE3	ENE7	NE5	ENE7	N9	NE6	NE8	NE7	NE7	ENE5	ENE8	NNE4.6	NNE11
10-Jul	NNE6	N7	NNE7	N5	NE5	ESE3	SE4	SE2	NNE3	NNE4	N3	NE4	ENE12	ENE15	ENE14	NE13	E11	SSW6	WSW23	WSW15	W10	WNW7	WNW4	WNW6	NNE2.2	WSW23
11-Jul	NW4	N4	NNW3	NW4	NNW7	N5	NNE5	NNW4	NW5	NNE7	NNE10	NNW8	NNW17	NNW13	NW14	NW12	NW10	N14	N12	N14	NNE18	N14	NNW14	NNW13	NNW8.6	NNE18
12-Jul	NNW14	NNW13	NNW13	NNW12	NNW13	N13	N11	N9	NNW7	NNW11	NNW12	N13	NNW17	NNW17	NNW17	NNW18	NW18	NNW18	NNW21	NNW16	NNW15	NNW13	NNW14	NNW13	NNW13.8	NNW21
13-Jul	NNW10	NNW9	NNW10	NNW11	NNW11	NNW11	NNW12	NNW11	NNW12	NNW12	N16	N17	N15	N17	NNE21	NNE18	NNE18	NNE17	N12	N10	N13	N11	N12	NE8	N12.2	NNE21
14-Jul	NNE6	NNE5	E1	WSW3	WSW4	SW1	W4	ENE2	N1	NW3	NW6	NW4	WNW6	W8	NW8	WNW9	NNW13	N9	N7	NNW7	NNW5	NNW2	WNW4	WNW2	NW3.8	NNW13
15-Jul	WSW4	W6	W5	WSW4	SW6	S2	S3	SW4	WSW5	W9	WNW7	W6	W6	WNW4	W7	NNW17	WNW10	W13	WNW11	WNW10	NNW10	WNW8	WNW7	W5	W6.1	NNW17
16-Jul	WSW9	WSW9	SW7	WSW10	SW9	SW7	SW7	W12	W12	W11	W10	WNW9	W11	NW14	WNW8	SE1	WSW4	NNW17	NNW7	NW10	NW13	NW12	NW13	NNW13	WNW7.7	NNW17
17-Jul	NNW13	NNW11	NNW12	NNW8	NNW6	N7	N8	NNW9	NW9	NNW10	NW12	NNW11	NW11	NNW10	NNW11	NW12	NNW11	N8	N9	NE8	NE7	NE6	ENE3	SW5	NNW8.0	NNW13
18-Jul	SSW6	SSE6	SSE5	SE6	SSE8	SE7	SE8	SE7	SE7	SE6	SE6	SE7	ESE5	S5	S2	SW7	SW10	SSW7	SW11	SSW10	SSW10	SSW10	SSW9	S8	S6.1	SW11
19-Jul	S8	SSE7	SSE8	SSE6	SE6	SSE7	SSE7	SE7	SE5	SSE3	WSW13	WSW16	WSW16	WSW15	WSW14	WNW20	WNW20	W21	W8	WSW5	WSW9	NNE3	WSW5	NW4	WSW6.2	W21
20-Jul	NNE9	NNE9	NNE7	NNW5	NW9	NNW8	NNW6	NNW4	NNW5	NNW4	WSW5	NW3	N2	WNW7	NW6	WNW11	WNW8	WNW5	W6	WSW7	SW7	SSW7	SSW7	SW7	NW3.8	WNW11
21-Jul	WSW8	WSW8	SW6	SW8	S7	SSW5	SW6	WSW16	W13	WSW12	WSW11	WSW19	WSW19	WSW21	WSW19	W18	N23	N21	N16	NNE15	NNE16	NNE11	NE5	E5	WNW6.4	N23
22-Jul	SE6	S7	SSE9	SSE8	SSE9	SSE10	SSE11	SSE11	SE12	SSE12	SE10	SE15	S13	SSW14	SSW8	SW14	W13	W10	WSW9	W10	NNW10	NW8	NNW6	WSW4	S5.6	SE15
23-Jul	SW8	WSW11	WSW9	W12	W9	W8	W8	NNE5	NW2	WSW5	WNW7	WNW8	WSW6	SW7	SW5	N4	W9	ENE3	SSW9	SSW6	S4	WSW8	SSW4	SSE6	WSW5.0	W12
24-Jul	SSE6	SE7	SSE9	SSE9	SSE7	SSW8	SSW10	SW13	WSW17	WSW16	WSW20	SW22	WSW23	WSW23	WSW24	SW19	WNW27	WNW26	W21	WSW14	W17	W17	W16	WSW13	WSW13.1	WNW27
25-Jul	W16	W21	W14	W10	WSW5	W11	W14	W16	WNW13	WNW11	WNW7	W8	W12	WNW9	NW6	NNW5	N6	N4	NE8	NE9	NNE7	NNE6	E3	SE8	WNW6.4	W21
26-Jul	SE10	SE8	SE5	ESE7	ESE8	SE7	SE8	SE9	SE10	ESE7	S8	SSW9	SSE9	SSW9	WSW9	WSW3	SE7	SE11	SE10	SE10	SSE9	SE9	SSE9	SE6	SSE6.9	SE11
27-Jul	SE7	SSE6	SSE8	SSE8	SSE6	S4	SSW3	WSW4	W6	NW4	NNW6	N6	WNW10	NW8	NNW13	N12	N8	N10	NNE11	NE9	NNE9	N9	NNE8	NNE4	N3.0	NNW13
28-Jul	NE5	NW3	W2	WSW7	WSW4	WSW8	WSW7	NW1	NNW1	SSW3	ESE3	ESE3	SE5	ESE5	SSE3	SW1	ENE5	ENE4	WNW2	SW9	WSW11	S9	S8	SSW7	SSW2.3	WSW11
29-Jul	SW6	SSW4	SW2	SW4	SSW7	S6	S6	S6	S4	SSE7	SE7	SSE5	SE8	SSE12	SSE8	S8	SSW11	S7	SE11	SSE9	SSE9	SSE8	SE10	SE9	S6.5	SSE12
30-Jul	SE2	SE5	S6	SW4	SE5	SSE7	SSW9	SSE4	WSW3	SE8	E5	SSE3	SE7	SSE12	SSE15	N7	NNE15	NNE13	NNE10	N10	NNE13	N15	NNE12	NNE12	ENE2.7	NNE15
31-Jul	NE7	NE9	NNE7	N4	N12	N11	N12	NNW11	NW9	W4	WNW5	SW11	W14	W13	W17	W14	W8	NNW5	W8	W12	W15	W13	WSW10	W16	WNW7.2	W17
WNW1.2WNW1.0 W0.5 W1.5WSW0.7WSW1.0 SW1.3 W1.4 W1.8WSW1.3 W2.4WSW2.7WSW3.5 W3.4NNW2.9 NW3.5NNW4.1NNW4.5NNW3.1 NW2.4NNW3.2NNW2.2 NW1.6WNW1.6																								Diurnal Average		
W16 W21 W14 W13NNW13 N13 W14 W16WSW17 SSE19WSW20 SW22WSW23WSW23WSW24WNW20WNW27WNW26WSW23NNW16 NNE18 W17 W16 W16																								Diurnal Maximum		

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



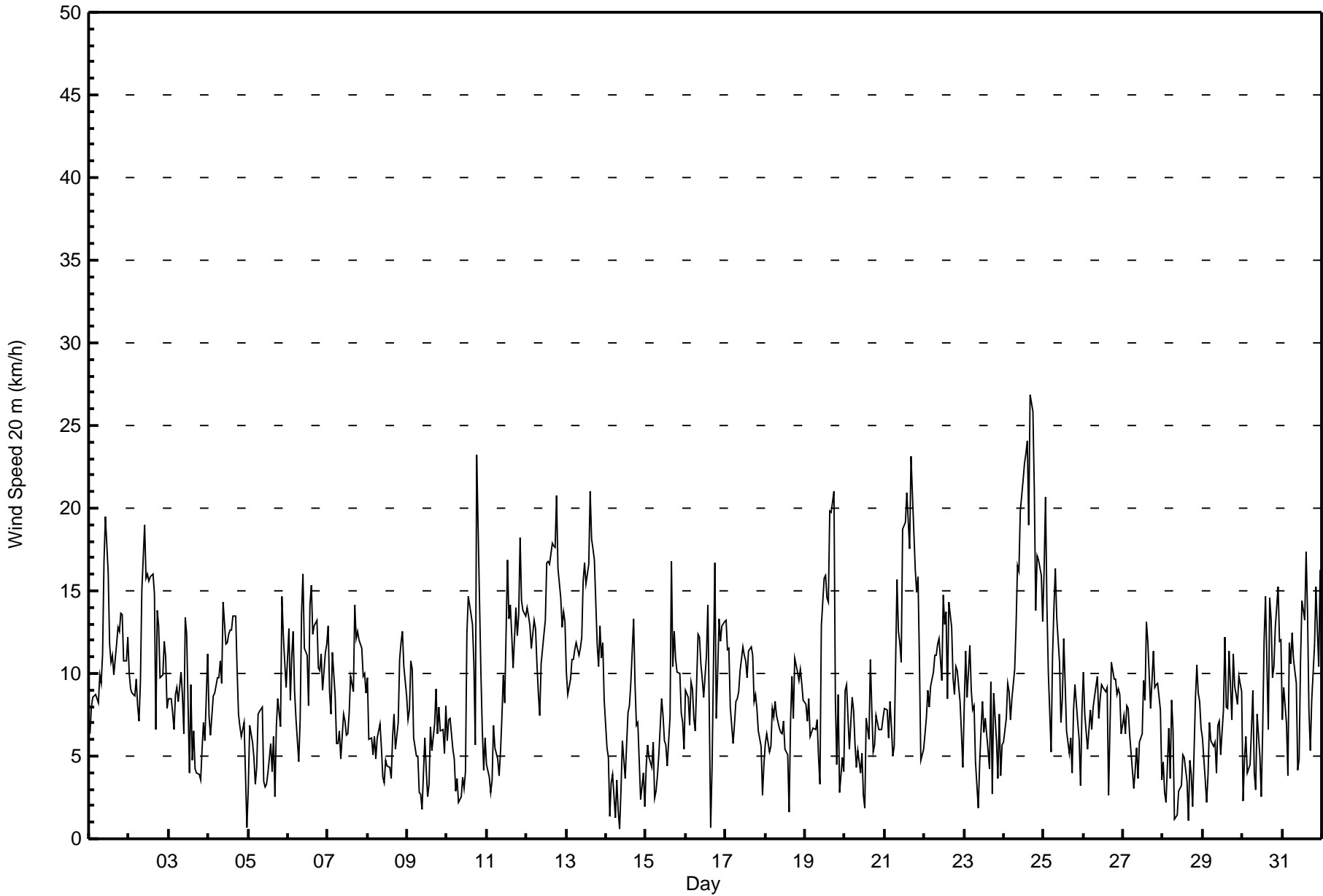
Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Speed 20 m (WS20m) - km/h

Mannix - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 15 km/h on Jul 24 17:00																	Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 1 km/h on Jul 15 04:00																									
Percentiles: P ₁ = 1 P ₁₀ = 2 Q ₁ = 2 Median = 3 Q ₃ = 4 P ₉₀ = 5 P ₉₉ = 8																									
Day	Hourly Period Ending At (MST)																							Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		24
1-Jul	2	1	2	2	3	2	3	4	4	7	7	6	5	6	5	5	5	5	5	5	4	3	3	3	7
2-Jul	2	2	3	2	3	3	3	4	7	7	7	6	6	6	6	6	5	5	5	4	3	4	4	3	7
3-Jul	2	2	2	2	3	3	3	3	3	4	7	3	5	4	2	2	2	2	2	2	3	3	3	3	7
4-Jul	1	1	2	2	2	2	2	3	3	4	3	3	4	3	4	6	6	4	3	2	2	2	3	1	6
5-Jul	1	2	1	2	1	2	2	4	5	3	2	2	3	3	3	3	2	7	5	4	3	2	3	2	7
6-Jul	2	3	4	4	4	3	3	5	5	4	5	4	3	6	5	3	4	5	3	3	3	3	4	5	6
7-Jul	4	3	3	4	3	3	3	3	3	4	3	3	5	3	4	5	5	4	4	4	4	3	4	3	5
8-Jul	3	2	2	2	2	2	2	3	3	2	2	3	3	3	3	3	3	3	2	3	3	3	2	2	3
9-Jul	2	2	2	2	2	2	2	2	1	2	2	2	2	3	3	5	4	3	2	2	2	1	1	2	5
10-Jul	2	2	1	2	2	2	2	1	2	2	2	2	5	4	4	4	4	3	6	4	2	2	2	2	6
11-Jul	2	2	1	1	2	2	2	2	3	3	3	4	6	5	6	5	4	5	5	6	5	5	5	4	6
12-Jul	5	4	4	4	4	4	5	4	4	4	5	6	6	7	7	7	7	6	7	6	5	4	5	4	7
13-Jul	4	3	3	4	4	4	5	4	5	5	6	5	6	6	7	7	5	5	4	5	3	3	4	2	7
14-Jul	2	1	1	2	1	1	1	1	2	2	2	3	3	4	4	4	6	4	3	3	2	2	2	1	6
15-Jul	2	1	1	1	1	1	2	2	2	3	3	4	4	3	5	7	4	4	5	3	5	2	2	2	7
16-Jul	3	2	2	2	2	2	2	2	2	3	3	4	4	6	7	2	2	11	3	4	5	4	4	5	11
17-Jul	5	4	4	3	2	3	4	4	5	5	5	5	5	5	5	5	5	5	4	3	2	1	1	2	5
18-Jul	1	1	2	2	2	2	3	3	3	2	2	2	3	4	3	4	4	5	4	4	2	2	2	2	5
19-Jul	2	1	2	3	3	3	3	3	2	4	4	5	5	5	6	9	7	8	3	2	7	3	2	2	9
20-Jul	3	3	3	3	4	3	3	2	2	2	1	2	2	3	3	3	3	3	2	2	1	2	2	2	4
21-Jul	2	2	3	3	2	2	3	5	3	3	3	5	5	6	4	8	9	8	6	5	4	4	3	2	9
22-Jul	2	2	2	2	3	3	3	4	4	4	4	6	6	7	5	6	3	3	2	4	4	3	4	3	7
23-Jul	2	2	2	2	2	2	2	2	2	3	3	3	3	4	6	6	5	3	4	3	2	3	2	1	6
24-Jul	2	2	3	3	3	3	4	6	5	5	6	7	7	7	7	11	15	9	8	3	3	3	4	3	15
25-Jul	5	3	4	3	2	3	3	5	5	4	4	4	5	4	3	3	3	3	3	2	2	1	2	2	5
26-Jul	3	2	2	2	3	3	3	3	3	3	5	4	5	4	4	2	4	4	4	3	2	2	2	2	5
27-Jul	2	2	2	2	2	1	2	2	2	3	3	3	3	5	6	4	4	3	3	3	3	3	2	2	6
28-Jul	1	1	1	4	3	2	3	1	2	2	2	2	2	2	2	2	3	2	2	5	4	3	3	2	5
29-Jul	1	2	1	1	2	2	3	3	2	3	3	3	4	5	4	5	5	4	4	3	2	3	3	3	5
30-Jul	4	3	3	2	3	3	5	2	2	3	2	2	3	5	5	8	5	4	3	3	4	4	3	3	8
31-Jul	2	3	2	2	6	4	4	4	4	2	3	3	4	3	5	4	3	2	4	3	3	4	3	3	6
Diurnal Maximum																									
5 4 4 4 6 4 5 6 7 7 7 7 7 7 7 11 15 11 8 6 7 5 5 5																									





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	159	21.37	21.37
6 - 11	393	52.82	74.19
12 - 19	173	23.25	97.45
20 - 28	19	2.55	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 20 m (WS20m) - km/h
Mannix - July 2016

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	14	14	9	7	6	9	9	11	7	5	8	18	6	8	14	14	159
6 - 11	30	35	16	6	3	5	62	40	15	22	21	28	31	22	16	41	393
12 - 19	21	21	4	4	0	0	11	14	3	1	5	23	26	3	8	29	173
20 - 28	2	1	0	0	0	0	0	1	0	0	1	6	3	4	0	1	19
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	67	71	29	17	9	14	82	66	25	28	35	75	66	37	38	85	744

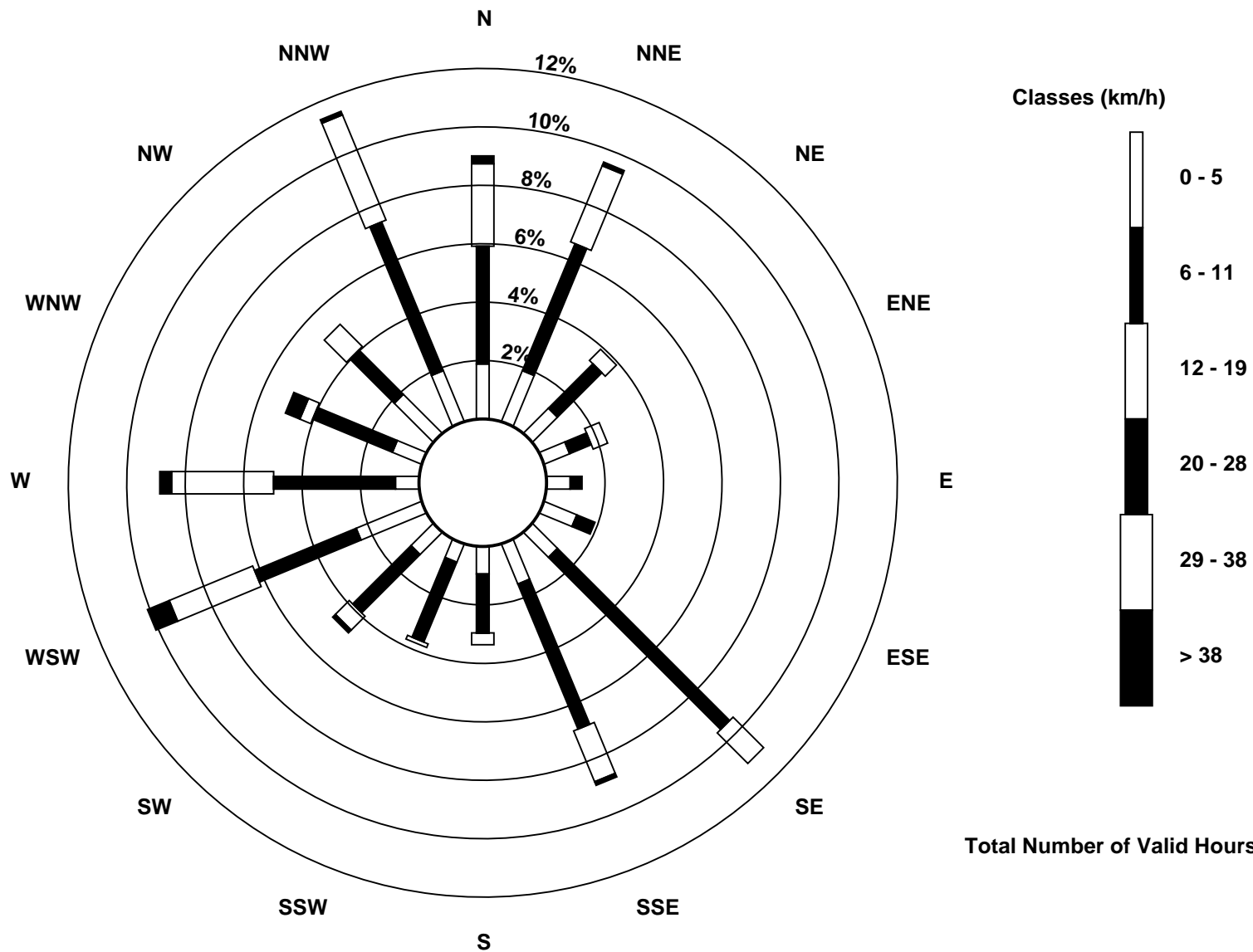
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

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





Maximum Speed: 34 km/h on Jul 24 17:00	Maximum Daily Speed Average: 21.4 km/h on Jul 12	Hours in Service: 744
Minimum Speed Value: 0 km/h on Jul 16 16:00	Minimum Daily Speed Average: 3.0 km/h on Jul 30	Hours of Data: 744
Maximum Diurnal Speed Average: 6.8 km/h at hour 18	Minimum Diurnal Speed Average: 0.9 km/h at hour 3	Hours of Missing Data: 0
Monthly Average Velocity: 2.7 km/h 294.4 deg	Percentiles: P ₁ = 2 P ₁₀ = 5 Q ₁ = 9 Median = 13 Q ₃ = 17 P ₉₀ = 21 P ₉₉ = 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-Jul	S14	SSE15	SE15	SE15	SE13	SE12	SE13	SE12	SE15	SE22	SSE26	SE21	SSE17	SSE16	SSE15	ESE12	SE15	SE17	SSE18	SSE21	SSE22	SE18	SE19	SE20	SE16.5	SSE26
2-Jul	SSE18	SSE18	SE15	SE14	SE15	SE12	SE9	ESE11	SE20	SE26	SSE24	SSE22	SSE23	SSE23	SSE23	SSE24	SSE13	SE18	SE17	SE13	SE14	SE17	SE17	SE12	SE17.0	SE26
3-Jul	SE13	SE13	SE12	SE12	SE14	SE13	SE11	SE13	SE10	SE8	S27	SW19	SSE5	ENE11	E5	E8	SSE7	SSE5	E4	ESE4	SSE9	SE10	SSW10	W14	SE8.0	S27
4-Jul	WSW10	WSW9	SW11	SW12	SW13	WSW12	WSW13	SW12	WSW17	WSW13	WSW14	WSW15	SW17	SW18	SW20	WSW17	WSW12	SSW11	SSW12	S12	SSE13	SSE9	SW3	SW11.5	SW20	
5-Jul	NW5	N10	N9	N8	NNW7	NW9	W9	NW12	NNW12	N5	NNE4	E4	NW6	N7	ESE5	E6	ESE2	NW12	NW15	W10	W18	WSW16	W15	W13	NW5.8	W18
6-Jul	W17	W13	W14	W17	NW14	NNW11	ENE6	NNW11	N20	NNE21	NNE15	NE13	NE10	NNE19	NE19	NE14	NE15	NE15	NE12	N14	N16	N14	NNW17	N19	N10.5	NNE21
7-Jul	N20	N15	NNW14	NNW18	NNW15	NNW10	NNW10	NNW10	NNW8	NW13	NNW11	NW9	N9	NW13	N14	N11	NNE18	NNE15	N16	NNE16	N17	N16	N16	N14	N13.0	N20
8-Jul	N15	NNE10	NNE8	NNE7	NNE8	N6	NNE8	NNE9	NNE7	NNE5	NNW5	NNE6	N6	N6	N4	NE7	ENE9	NNE7	NE8	NNE15	NNE18	NNE18	NNE15	NNE12	NNE8.8	NNE18
9-Jul	N10	NNE11	NNE16	NNE14	N10	NNW8	N6	N3	NNE3	W2	WSW7	W5	W3	NE4	NE8	NE6	NE9	N14	NNE9	NE10	NE10	NE9	ENE8	ENE10	NNE6.5	NNE16
10-Jul	NE8	N11	NNE10	NNE8	NE7	E4	SE5	ESE2	N3	N4	N4	NNE4	NE14	ENE17	NE16	NE15	ENE12	S8	WSW27	WSW17	W12	WNNW12	NW7	WNNW10	N3.1	WSW27
11-Jul	NNW10	N7	NNW5	NW8	NNW12	NNW8	N6	NW6	WNN8	N9	NNE11	NNW12	WNNW23	WNNW19	NW22	NW19	WNNW16	NNW21	N18	N21	N27	N23	NNW23	NNW25	NNW13.7	N27
12-Jul	NNW24	NNW23	NNW22	NNW20	NNW22	N19	N16	NNW12	NNW11	NNW17	NNW19	NNW19	NNW23	NNW24	NNW24	NNW25	NW26	NNW26	NNW30	NNW26	NNW24	NNW21	NNW23	NNW21	NNW21.4	NNW30
13-Jul	NNW18	NNW16	NNW17	NNW19	NNW19	NNW18	NNW19	NW17	NW18	NNW18	N22	N22	N22	N23	N28	NNE22	NNE23	N23	N17	N15	N19	N18	N18	NNE13	N18.2	N28
14-Jul	NNE10	NE5	E3	SSW1	WSW4	W2	WNN4	ENE1	WNN1	WNN5	NW8	NW5	WNN7	WNN9	NW12	WNNW13	NNW20	N14	NNW10	NNW11	NNW7	NNW4	NW9	NNW6	NW5.8	NNW20
15-Jul	NNW2	NW5	WNN8	WNN7	WSW9	SSW4	S4	SW5	WSW6	W10	WNNW10	WSW7	W7	W5	W10	NW24	WNNW14	W16	WNNW15	WNNW16	NW16	WNNW13	WNNW13	W9	WNN8.7	NW24
16-Jul	WSW13	WSW13	WSW11	WSW14	WSW14	SW13	SW10	WSW14	W13	W12	W11	WNNW13	W13	NW21	WNNW14	SSW0	WSW5	NNW26	NNW12	NW17	NW22	NW20	NW21	NNW23	WNN11.8	NNW26
17-Jul	NW22	NNW21	NNW20	NNW15	NNW12	N12	N12	NNW13	NW14	NNW16	NW18	NW16	NW15	NW14	NNW16	NW18	NNW16	NNW13	NNW13	NNE10	NNE10	NE7	SE3	NNW12.8	NW22	
18-Jul	SSE8	SSE12	SSE12	SE11	SE15	SE12	SE13	SE10	SE9	SE9	SE8	ESE8	ESE6	S8	SSW3	SW10	SW13	SSW12	SW15	SSW17	S19	SSW21	SSW21	SSW19	S10.4	SSW21
19-Jul	SSW18	S14	S15	S13	SSE11	SSE11	SSE9	SE9	ESE6	SSE4	WSW15	SW18	SW19	WSW17	WSW17	WNNW27	WNNW28	W27	W11	SW6	WSW12	N6	SSW5	NW5	SW8.9	WNNW28
20-Jul	NNE14	NNE14	N11	NNW9	NW14	NNW13	NNW10	NNW7	NNW8	NNW7	WSW6	NW4	NNW2	WNNW10	NW9	WNNW14	WNNW11	WNNW8	WSW7	WSW9	SW9	SSW13	SSW15	SW15	WNN5.7	SSW15
21-Jul	SW13	WSW13	WSW12	SW14	S11	SSW9	SW8	WSW19	WSW16	WSW14	WSW12	WSW22	WSW23	WSW25	WSW23	W22	N33	N30	N24	N20	N22	NNE15	NE7	E7	W8.6	N33
22-Jul	SE11	SSE15	SSE19	SSE15	SSE17	SSE17	SE15	SE16	SE16	SSE17	SE13	SE20	S22	SSW25	S16	SSW22	WSW17	W13	WSW11	W14	NNW18	NW15	NNW12	WSW4	S8.7	SSW25
23-Jul	SW14	WSW17	WSW13	W15	W13	WNNW12	WNNW10	N6	NNW3	WSW5	W8	W11	WSW7	SSW10	SW7	N7	W12	NE3	S15	SSW10	SSW6	SW12	SW7	S8	WSW7.3	WSW17
24-Jul	S9	SE12	SSE16	SSE12	SSW17	SSW19	SSW19	SSW21	SW20	SW24	SW28	SW29	SW29	SW30	SW25	WNNW34	WNNW33	W28	WSW17	WSW21	WSW21	WSW20	WSW18	NNW17.4	WNNW34	
25-Jul	WSW21	WSW24	W21	W15	WSW7	W15	W16	W20	W17	W13	WNNW9	W10	W14	WNNW12	NW9	NNW7	NNW8	N6	NNE9	NE11	NNE10	NE9	E6	SE12	WNN8.0	WSW24
26-Jul	SE16	SE12	ESE8	E8	ESE9	ESE8	SE11	SE12	SE12	ESE8	S13	SSW14	SSE14	S14	WSW11	WSW4	SE8	SE14	SE13	SE15	SSE17	SE16	SSE17	SSE12	SSE10.2	SSE17
27-Jul	SE14	SSE13	SSE16	SSE15	S10	SSW9	SSW5	WSW5	W6	NW6	NNW9	N8	WNNW13	NW13	NNW20	NNW16	N11	N14	NNE14	NNE13	NNE13	N14	NNE11	NE4	N3.5	NNW20
28-Jul	NE7	NW5	WNNW3	WSW9	W7	WSW12	WSW10	WNNW4	NW2	SSW4	ESE3	ESE3	SE6	ESE5	SSE4	SSE1	ENE5	NE5	WNNW2	SW12	SW14	S16	S17	SSW12	SSW3.5	S17
29-Jul	SW10	SW7	WSW5	WSW6	SSW11	SSW11	S10	S8	S6	SE8	SE8	SSE7	SE10	SSE17	SSE11	S13	SSW19	S11	SE16	SSE17	SSE15	SSE17	SE16	SE14	S10.1	SSW19
30-Jul	ESE4	SE7	S13	SW9	SSE7	S12	SSW17	SSE6	SW5	SE9	E5	SSE4	SE8	SSE17	SSE21	NNW10	NNE18	NNE17	NNE13	N16	N19	N23	NNE18	N18	ENE3.0	N23
31-Jul	NE10	NE12	NNE10	N6	N18	NNW18	N20	NNW19	NW17	W6	WNNW8	SW14	W18	W17	W20	W19	W11	NNW8	W10	W14	W18	W18	WSW15	W21	WNN10.2	W21

WNNW1.5	WNNW1.3	W0.9	W2.1	WNNW1.3	WSW2.0	SW1.7	W2.1	W2.6	W1.8	WSW3.1	WSW3.6	WSW4.5	W4.6	WNNW4.2	WNNW5.2	NW6.0	NNW6.8	NW4.5	NW3.5	WNNW4.5	NNW3.2	NW2.2	WNNW2.3	Diurnal Average
NNW24	WSW24	NNW22	NNW20	NNW22	N19	NNW20	W20	WSW21	SE26	S27	SW28	SW29	SW29	SW30	WNNW27	WNNW34	WNNW33	NNW30	NNW26	N27	N23	NNW23	NNW25	Diurnal Maximum

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



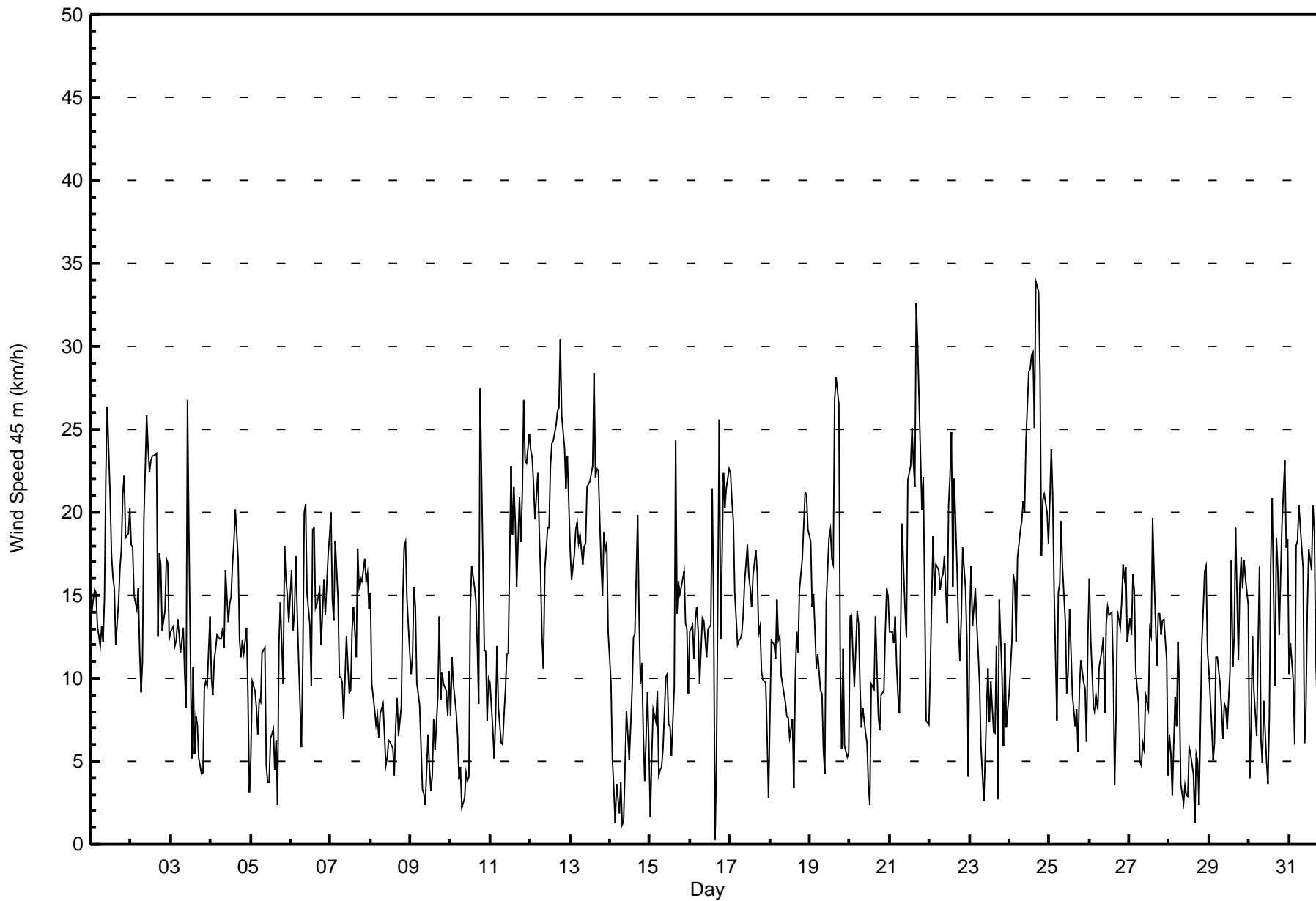
Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Speed 45 m (WS45m) - km/h

Mannix - July 2016

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





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	81	10.89	10.89
6 - 11	226	30.38	41.26
12 - 19	330	44.35	85.62
20 - 28	99	13.31	98.92
29 - 38	8	1.08	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

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

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	5	5	5	2	6	8	2	6	1	7	3	7	5	7	7	5	81
6 - 11	24	22	17	5	5	8	21	11	10	9	11	17	16	13	11	26	226
12 - 19	30	23	10	2	0	1	50	32	15	14	19	36	27	15	21	35	330
20 - 28	14	3	0	0	0	0	6	10	2	4	5	11	7	3	8	26	99
29 - 38	2	0	0	0	0	0	0	0	0	0	3	0	0	2	0	1	8
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	75	53	32	9	11	17	79	59	28	34	41	71	55	40	47	93	744

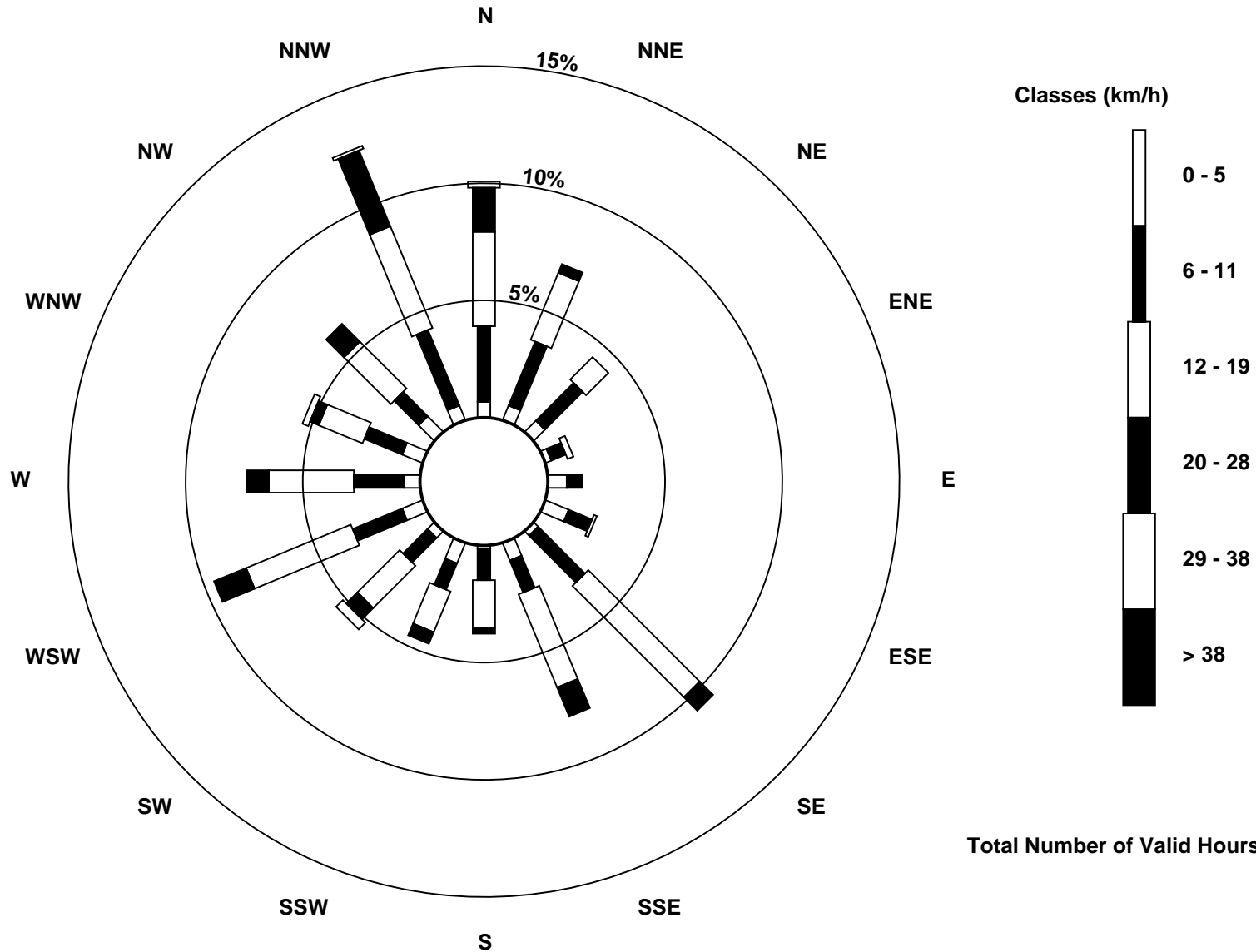
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

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





Maximum Speed: 37 km/h on Jul 21 17:00	Maximum Daily Speed Average: 24.4 km/h on Jul 12	Hours in Service: 744
Minimum Speed Value: 0 km/h on Jul 16 16:00	Minimum Daily Speed Average: 3.0 km/h on Jul 30	Hours of Data: 744
Maximum Diurnal Speed Average: 7.8 km/h at hour 18	Minimum Diurnal Speed Average: 1.3 km/h at hour 3	Hours of Missing Data: 0
Monthly Average Velocity: 3.1 km/h 302.5 deg	Percentiles: P ₁ = 2 P ₁₀ = 6 Q ₁ = 9 Median = 14 O ₃ = 20 P ₉₀ = 25 P ₉₉ = 32	Percent Operational Time: 100.0

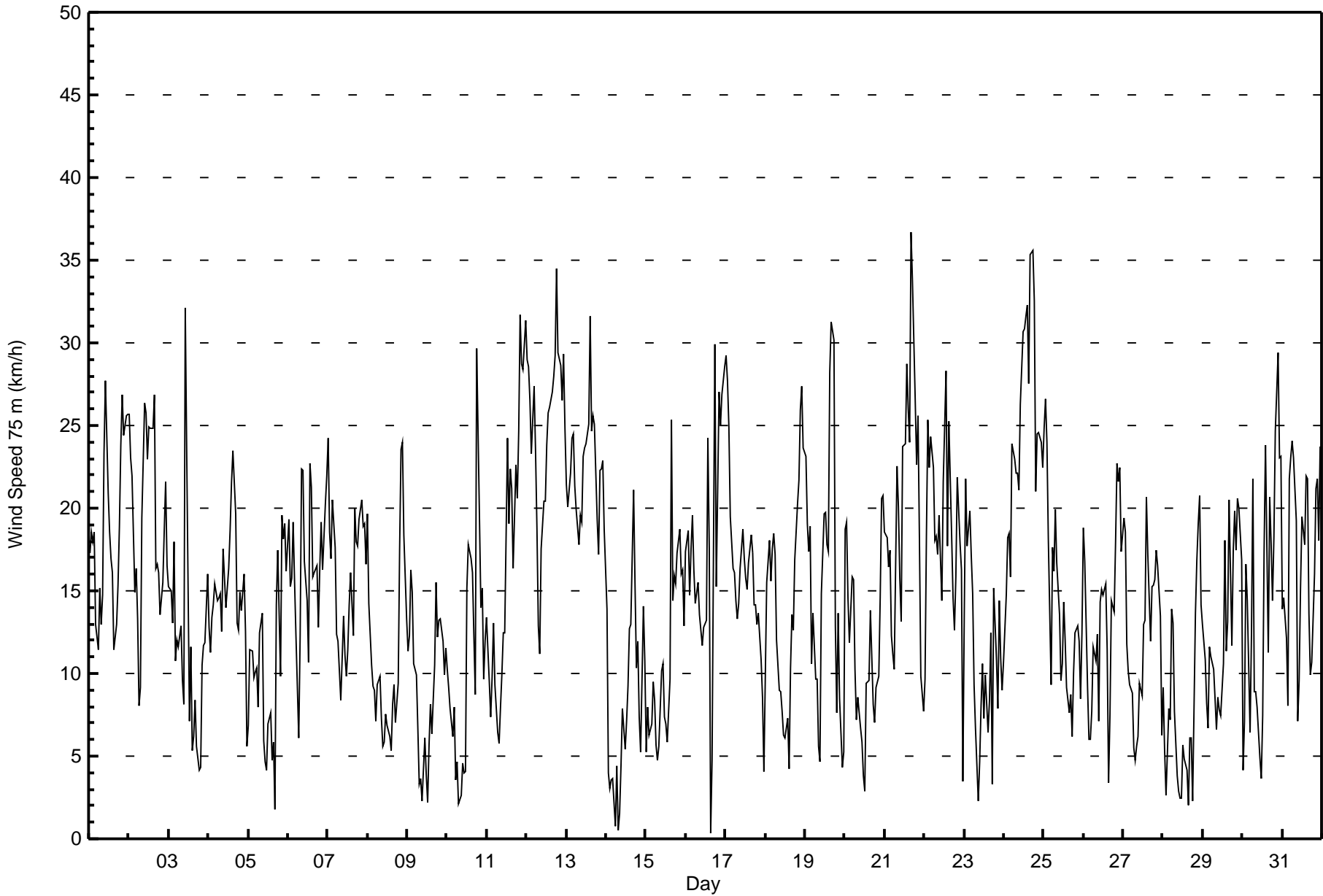
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	S17	SSE19	SE18	SE19	SE13	SE11	SE15	SE13	SE15	SE23	SSE28	SE21	SSE19	SSE17	SSE16	ESE11	SE13	SE15	SSE19	SSE24	SSE27	SE24	SE26	SE26	SE18.2	SSE28
2-Jul	SSE26	SSE23	SE22	SE15	SE16	SE13	SE8	ESE9	SE19	SE26	SSE26	SSE23	SSE25	SSE25	SSE25	SSE27	SSE16	SE17	SE16	SE14	SE16	SE19	SE22	SE17	SE18.9	SSE27
3-Jul	SE15	SE15	SE13	SE18	SE11	SE12	SE12	SE13	SE10	SE8	S32	SW24	S7	ENE12	E5	E6	SSE8	SSE6	ENE4	ESE4	SSE11	SE12	SSW12	W16	SSE8.8	S32
4-Jul	W13	WSW11	WSW13	WSW14	WSW15	WSW14	WSW15	WSW15	SW13	WSW18	WSW14	WSW15	WSW16	SW19	SW22	SW23	WSW20	WSW13	SSW13	SSW15	S14	SSE16	SSE13	SW6	SW13.3	SW23
5-Jul	NW7	N11	N11	N10	N10	NNW10	W8	NW12	N14	N6	NE5	ENE4	NW7	N8	ESE5	E6	ESE2	NNW14	NNW17	W10	W20	WSW18	W19	W16	NW7.1	W20
6-Jul	W19	W15	W16	NNW19	NW16	N12	ENE6	NNW12	N22	NNE22	NNE17	NE14	NE11	NNE23	NE21	NE16	NE16	NE17	NE13	N16	NNE19	N16	NNW20	N22	N12.1	NNE23
7-Jul	N24	N19	N17	N21	N18	NNW12	NNW12	NNW10	NNW8	NNW13	NNW11	NNW10	N11	NW14	N16	N12	NNE20	NNE18	NNE18	NNE19	N21	N19	N19	N17	N15.2	N24
8-Jul	N20	NNE14	NNE11	NNE9	NNE9	N7	NNE9	NNE10	NNE7	NNE6	NNW6	NNE8	N7	N6	NNE5	NE8	ENE9	NNE7	NE9	NNE18	NNE24	NNE24	NNE18	NNE13	NNE10.7	NNE24
9-Jul	NNE11	NNE12	NE16	NE15	N11	N10	N7	N3	NNE4	WNW2	WSW6	W4	W2	NE6	NE8	NE6	NE11	N16	NNE12	NE13	NE13	NE12	ENE10	ENE11	NNE7.7	NE16
10-Jul	NE10	NNE9	NE8	NE6	ENE8	ESE4	SE5	ESE2	N3	NNE5	N4	NNE4	ENE15	ENE18	NE17	NE16	ENE12	S9	WSW30	WSW19	W14	WNW15	NW10	NW12	NNE3.2	WSW30
11-Jul	NNW13	N10	N7	NNW10	NNW13	N9	N6	NNW6	NW8	N10	NNE12	NNW12	NNW24	NNW19	NW22	NW21	NW16	NNW23	N21	N25	N32	N29	NNW28	NNW31	NNW15.8	N32
12-Jul	N29	N29	N27	N23	N27	N23	N19	N13	NNW11	NNW18	NNW20	N20	NNW24	NNW26	NNW26	NNW27	NW28	NNW29	NNW34	NNW29	NNW29	NNW27	NNW29	NNW25	NNW24.4	NNW34
13-Jul	NNW21	NNW20	NNW22	NNW24	NNW25	NNW21	NNW20	NNW18	NNW20	NNW19	N23	N24	N24	N25	N32	NNE25	NNE26	NNE25	N19	N17	N22	N22	N23	NE19	N21.2	N32
14-Jul	NNE14	ENE4	ESE3	ESE4	S4	WNW1	NW4	N0	WNW2	WNW4	NW8	NW5	WNW7	WNW9	NW13	WNW13	NNW21	N15	NNW10	NNW12	NNW7	NNW5	NNW14	NNW11	NNW6.2	NNW21
15-Jul	N5	NW8	NNW6	NW7	W10	WSW8	SW6	SW5	WSW6	W10	WNW11	W7	W7	W6	W10	NNW25	NW14	W16	WNW15	WNW17	NNW19	WNW16	NNW16	W13	WNW9.7	NNW25
16-Jul	W17	W19	WSW15	WSW18	WSW20	WSW16	WSW14	WSW15	W14	W13	W12	WNW13	W13	NW24	WNW18	NNW0	W5	NNW30	NNW15	NW21	NW27	NW25	NNW27	NNW29	WNW14.4	NNW30
17-Jul	NNW29	NNW28	NNW25	NNW20	N16	N16	N14	NNW13	NNW14	NNW16	NNW19	NW17	NW16	NNW15	NNW17	NW18	NNW17	N14	N14	NNE13	NNE14	NE11	ENE9	E4	NNW14.8	NNW29
18-Jul	SE10	SSE16	SSE18	SE16	SE18	SSE19	SSE17	SE12	SE9	SE9	SE8	ESE6	ESE6	S7	SSW4	SSW10	SW14	SSW13	SW17	SSW20	SSW22	SSW26	SSW27	SSW24	S12.5	SSW27
19-Jul	SSW23	SSW19	SSW17	SSW19	S11	S14	SSE10	SE10	SE6	S5	WSW15	WSW20	SW20	WSW18	WSW17	WNW28	NNW31	W30	W13	WSW8	W14	N8	S4	NW5	SW10.9	WNW31
20-Jul	NNE19	NNE19	N15	NNW12	NW16	NNW16	NNW10	NNW7	NNW9	NNW7	W6	NNW4	NNW3	WNW9	NW10	WNW14	WNW11	NW8	WSW7	WSW9	WSW10	SSW15	SSW21	SW21	NW6.2	SW21
21-Jul	WSW19	WSW18	WSW16	SW17	SSW12	SW11	SW10	WSW23	WSW20	WSW16	WSW13	WSW24	WSW24	WSW29	WSW26	W24	N37	N34	N27	N23	N26	NNE18	NE10	ENE8	W10.3	N37
22-Jul	SE10	SSE18	SSE25	SSE22	SSE24	SSE22	SE18	SSE18	SE17	SSE20	SE14	SE22	S25	SSW28	S18	SSW25	WSW18	W15	WSW13	W16	NNW22	NW18	NNW16	WNW3	S10.2	SSW28
23-Jul	WSW14	WSW22	W18	W20	W17	WNW15	NNW9	N7	NNW2	W5	W8	W11	W7	SSW10	SW6	N8	W12	NE3	SSW15	SSW11	SW8	SW14	SW11	SSW9	WSW8.4	WSW22
24-Jul	SSW11	SSE15	SSE18	SSE18	S16	SSW24	SSW23	SSW22	SSW22	SW21	SW26	SW31	SW31	SW32	WSW32	SW28	WNW35	NNW36	W33	WSW21	WSW24	W25	W24	WSW22	SW20.4	WNW36
25-Jul	WSW25	WSW27	W24	W18	W9	W18	W16	W20	WNW17	WNW14	WNW10	W11	W14	WNW12	NN9	NNW8	NNW9	N6	NE10	NE12	NE13	ENE12	ESE8	SE12	NNW8.4	WSW27
26-Jul	SE19	SE17	ESE9	ESE6	ESE6	ESE8	SE12	SE11	SE12	SE7	S14	SSW15	SSE15	SSW15	WSW11	WSW3	SE8	SE14	SE14	SE18	SSE23	SE22	SSE22	SSE17	SSE11.6	SSE23
27-Jul	SSE19	SSE19	S12	S10	SSW9	WSW9	WSW6	WSW5	W6	NW6	NNW9	N9	NW13	NW13	NNW21	N17	N12	N15	NNE15	NNE16	NNE17	NNE16	NE13	ENE6	N4.4	NNW21
28-Jul	ENE9	NNW5	NNW3	W8	W7	WSW14	WSW13	WNW8	NW4	SSW3	ESE2	ESE2	SE6	ESE5	SSE4	SE2	ENE6	NE6	NNW2	SW14	SW17	S19	S21	SW14	SW3.7	S21
29-Jul	SW13	SW11	WSW8	WSW7	SW12	SSW11	SSW10	S9	S7	SSE9	SE8	SSE7	SE11	SSE18	SSE11	S13	SSW20	S12	SE17	SSE20	SSE17	SSE21	SE20	SE17	S10.7	SSE21
30-Jul	E4	SE7	SSW17	WSW14	S6	S12	SSW22	SSE9	SW9	SE8	E5	SSE4	ESE7	SE17	SSE24	N11	NNE21	NNE18	NNE14	N18	N25	N29	NNE23	N23	NE3.0	N29
31-Jul	NE14	NE15	NE12	NNE8	N22	N23	N24	NNW23	NW19	WNW7	WNW10	WSW15	W20	W18	W22	W22	WNW14	NNW10	W11	W16	W21	W22	W18	W24	NW11.8	N24

NNW1.9	WNW1.5	W1.3	W2.6	NNW2.1	W2.8	WSW2.1	W2.4	NNW2.9	NNW1.8	W2.8	WSW3.6	WSW4.4	W4.5	NNW4.3	NW5.4	NNW6.6	NNW7.8	NNW5.3	NW4.1	NNW5.5	NNW3.9	NNW2.5	NW2.9	Diurnal Average
NNW29	N29	N27	NNW24	N27	SSW24	N24	NNW23	N22	SE26	S32	SW31	SW31	SW32	WSW32	WNW28	N37	WNW36	NNW34	NNW29	N32	N29	NNW29	NNW31	Diurnal Maximum

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



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





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	61	8.20	8.20
6 - 11	198	26.61	34.81
12 - 19	297	39.92	74.73
20 - 28	159	21.37	96.10
29 - 38	29	3.90	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 75 m (WS75m) - km/h
Mannix - July 2016**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	5	4	2	3	4	10	2	2	3	2	1	2	4	6	4	7	61
6 - 11	23	13	14	10	2	10	20	8	8	8	9	13	17	10	12	21	198
12 - 19	28	24	19	5	0	0	40	26	11	13	11	33	30	16	15	26	297
20 - 28	27	11	1	0	0	0	11	21	2	14	8	15	12	3	6	28	159
29 - 38	8	0	0	0	0	0	0	0	1	0	3	3	2	3	0	9	29
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	91	52	36	18	6	20	73	57	25	37	32	66	65	38	37	91	744

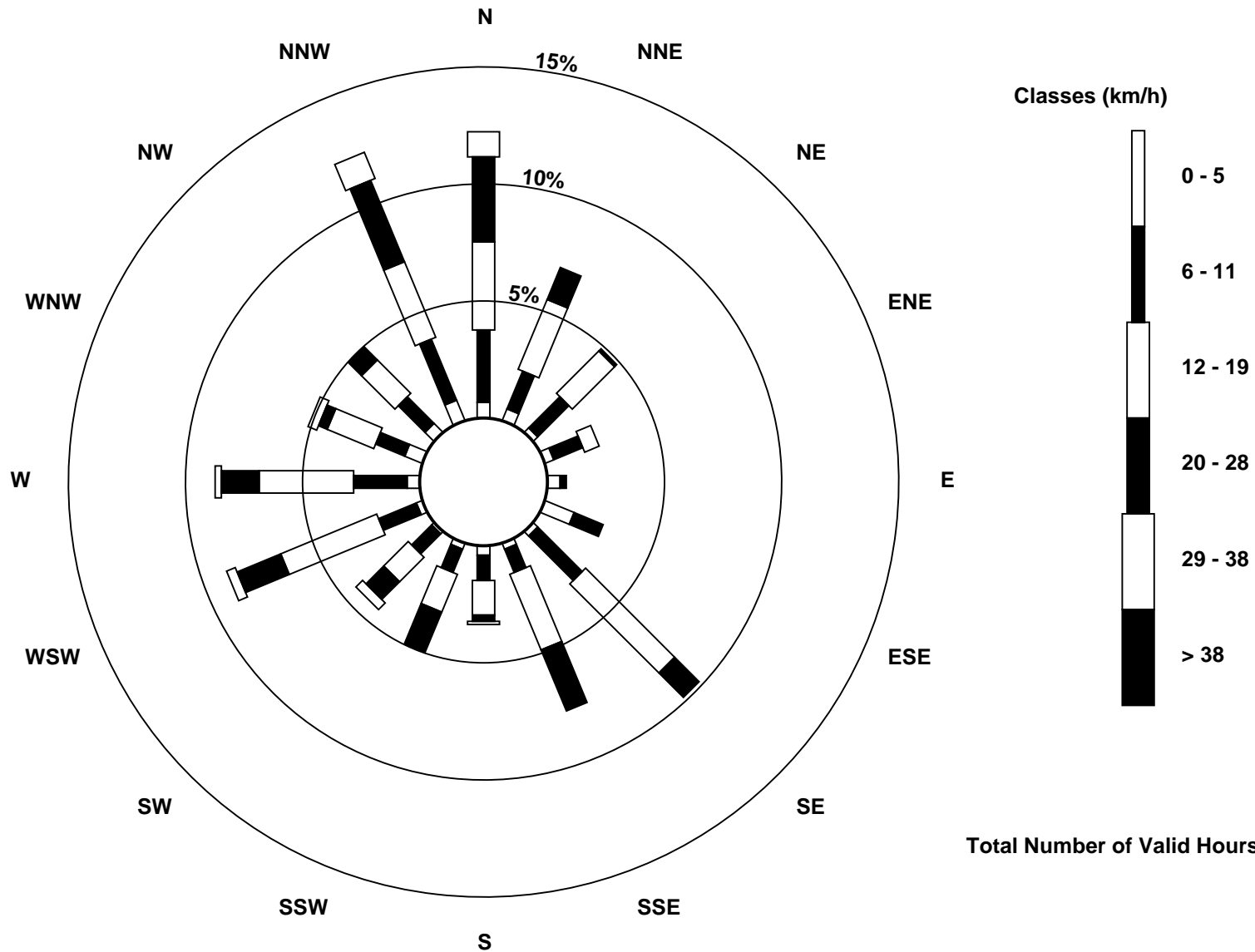
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

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





Maximum Speed: 38 km/h on Jul 21 17:00	Maximum Daily Speed Average: 25.4 km/h on Jul 12	Hours in Service: 744
Minimum Speed Value: 0 km/h on Jul 16 16:00	Minimum Daily Speed Average: 2.7 km/h on Jul 30	Hours of Data: 742
Maximum Diurnal Speed Average: 7.8 km/h at hour 18	Minimum Diurnal Speed Average: 1.5 km/h at hour 3	Hours of Missing Data: 2
Monthly Average Velocity: 3.0 km/h 304.0 deg	Percentiles: P ₁ = 2 P ₁₀ = 6 Q ₁ = 10 Median = 15 Q ₃ = 21 P ₉₀ = 26 P ₉₉ = 33	Percent Operational Time: 99.7

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	S19	SSE20	SE19	SE21	SE17	SE13	SE17	SE14	SE16	SE26	SSE29	SE23	SSE20	SSE18	SSE17	SE13	SE16	SE19	SSE20	SSE25	SSE29	SE27	SE29	SE29	SE20.2	SE29
2-Jul	SSE29	SSE25	SE25	SE18	SE18	SE15	SE11	ESE12	SE21	SE29	SSE27	SSE24	SSE26	SSE26	SSE26	SSE29	SSE19	SE20	SE19	SE16	SE18	SE22	SE25	SE20	SE21.1	SSE29
3-Jul	SE18	SE18	SE17	SE21	ESE13	SE15	SE14	SE14	SE11	SE10	S33	SW25	SSE10	E13	E6	ESE8	S9	SSE6	E5	ESE6	SSE11	SSE14	SSW13	W17	SSE10.3	S33
4-Jul	W14	W12WSW14	WSW15	WSW17	WSW15	WSW15	WSW16	WSW13	WSW18	W14WSW15	WSW17	WSW19	SW23	SW25	WSW21	W13	SW13	SSW16	S15	SSE18	SSE14	SSW14	SW5	SW14.0	SW25	
5-Jul	NNW7	N12	N12	N10	N11	NNW11	WNW7	NW13	N15	NNE6	NE5	ENE5	NW7	N7	ESE5	E6	SE2	NNW15	NNW18	WNW10	W20	W19	NNW20	NNW17	NW7.4	W20
6-Jul	W20	W16	W17	WNW19	NW16	N12	ENE6	NNW12	N23	NNE23	NNE17	NE15	ENE11	NNE24	NE22	NE17	NE17	NE17	NE13	N17	NNE20	N17	N21	N23	N12.6	NNE24
7-Jul	N26	N20	N18	N21	N19	NNW13	NNW12	NNW11	NNW9	NNW14	NNW11	NNW10	N12	NNW14	N17	N12	NNE20	NNE19	NNE18	NNE20	N22	N20	N20	N17	N15.9	N26
8-Jul	NNE21	NNE16	NNE11	NNE10	NNE9	N7	NNE10	NNE10	NNE7	NNE6	N6	NNE8	N7	N6	NNE6	NE8	ENE10	NE7	NE10	NNE18	NNE26	NNE27	NE20	NE14	NNE11.3	NNE27
9-Jul	NNE12	NNE12	NE16	NE15	NNE10	N10	N7	N3	NNE4	NW2	WSW6	WNW4	W2	NE6	NE8	ENE7	NE11	NNE16	NE14	NE14	NE15	ENE13	E12	ENE13	NE8.1	NE16
10-Jul	ENE12	NE9	ENE7	ENE5	E9	ESE5	SE6	ESE2	N2	NNE4	N4	NNE4	ENE16	ENE18	NE17	NE17	ENE14	S9	WSW30	WSW20	W15	WNW16	NW10	NW13	NNE3.0	WSW30
11-Jul	N15	N11	N8	NNW10	NNW13	N10	N6	NNW5	NW8	N10	NNE12	NNW13	WNW24	NW19	NNW22	NNW22	NW16	N23	N22	N26	N33	N31	N30	N33	NNW16.4	N33
12-Jul	N31	N30	N28	N24	N29	N25	N20	N13	N11	NNW18	NNW21	N21	NNW24	NNW26	NNW27	NNW27	NW28	NNW30	NNW36	NNW31	NNW30	NNW29	NNW32	N27	NNW25.4	NNW36
13-Jul	NNW23	NNW22	NNW24	NNW26	NNW27	NNW23	NNW21	NNW18	NNW20	NNW19	N24	N24	N24	N26	N32	NNE25	NNE27	NNE26	N20	N18	N23	N24	N25	NE21	N22.4	N32
14-Jul	NE15	E5	ESE6	SE6	S4	WSW1	NW5	W1	WNW2	WNW4	NW8	NW5	WNW7	WNW9	NW13	NW13	NNW21	N16	N10	NNW12	NNW8	NNW6	NNW16	NNW13	NNW6.1	NNW21
15-Jul	N7	NNW8	NNW7	NW7	W7	WSW10	WSW8	SW5	WSW6	W10	WNW11	W7	W7	W6	W10	NNW26	NW14	WNW16	WNW15	WNW17	NNW19	WNW17	WNW16	WNW13	WNW9.9	NNW26
16-Jul	W19	W20	W16	WSW20	W22	WSW19	WSW18	W17	W13	W12	W12	NW13	W13	NW25	WNW19	WNW0	W5	NNW30	NNW16	NW22	NNW29	NW27	NNW29	NNW31	WNW15.5	NNW31
17-Jul	NNW32	NNW31	N27	N21	N18	N18	N15	NNW13	NNW14	NNW16	NNW19	NNW17	NW16	NNW15	NNW17	NW18	NNW18	N14	N15	NNE14	NNE14	NE11	ENE9	E7	N15.4	NNW32
18-Jul	SE12	SSE17	SSE19	SSE14	SSE18	SSE18	SSE20	SSE14	SSE9	SSE9	SE9	SE8	ESE7	S8	SSW5	SW11	SW14	SSW13	SW17	SSW21	SSW23	SSW29	SSW30	SSW26	S13.6	SSW30
19-Jul	SSW26	SSW22	SSW20	SW22	S12	S13	S10	SE11	SE6	S5	WSW15	WSW20	WSW20	WSW18	WSW18	WNW28	WNW32	W30	W13	WSW9	W12	N9	S4	NNW6	WSW11.8	WNW32
20-Jul	NNE21	NNE21	NNE16	NNW13	NNW16	NNW17	NNW10	NNW7	NNW8	NNW6	W6	NNW4	NNW3	WNW9	NW9	WNW13	WNW11	NW8	W7	WSW9	WSW10	SSW15	SSW24	SW24	NW6.4	SSW24
21-Jul	WSW21	WSW21	WSW18	SW19	SSW13	SW13	WSW11	WSW24	W22	WSW16	WSW13	WSW24	WSW24	WSW30	WSW27	W25	N38	N35	N27	N23	NNE26	NNE19	NE11	E10	WNW11.1	N38
22-Jul	ESE11	SSE19	SSE29	SSE27	SSE29	SSE26	SSE20	SSE20	SSE18	SSE21	SE16	SE24	S26	SSW30	SSW19	SSW27	W19	W15	W13	W17	NNW23	NW19	NNW17	WNW3	S11.4	SSW30
23-Jul	WSW13	W23	W20	W22	WNW19	WNW15	NW9	NNE7	W2	W5	W8	WNW11	W7	SSW10	SW6	N8	W12	NE3	SSW16	SSW12	SW9	SW15	SW13	SW10	WSW8.8	W23
24-Jul	SSW12	S15	S17	S18	SSW17	SSW27	SSW25	SW23	WSW23	SW22	SW27	SW31	SW31	SW32	WSW33	SW28	WNW36	WNW36	WNW34	WSW22	W26	W26	W25	WSW24	WSW21.8	WNW36
25-Jul	W26	W28	W25	W19	W10	W18	W16	W20	WNW16	WNW13	NW10	W11	W14	WNW12	NW9	NNW8	NNW9	N6	NE10	NE13	NE13	ENE13	ESE12	SE15	WNW8.2	W28
26-Jul	SE21	SE20	SE14	ESE10	ESE11	SE12	SE14	SE13	SE9	S15	SSW16	SSE15	SSW16	WSW12	WSW4	SE8	SE16	SE15	SE20	SSE25	SSE25	SSE26	SSE20	SSE13.5	SSE26	
27-Jul	SSE23	SSE20	S10	SSW9	SW9	WSW9	W6	WSW5	WNW6	NW6	NNW9	N9	NW13	NW13	NNW21	N17	N12	N15	NNE16	NNE16	NNE19	NNE18	NE15	ENE8	N4.7	SSE23
28-Jul	ENE10	NNW4	NNW2	W7	W7	WSW14	WSW15	WNW9	NW5	SW2	SE3	SE3	SSE6	ESE5	SSE5	SE3	ENE7	NE6	NNW2	SW14	WSW18	S20	S22	SW15	SW4.1	S22
29-Jul	SW14	WSW12	WSW10	W7	SW12	SW11	SSW11	S9	S7	SSE9	SE9	SSE8	SE12	SSE19	SSE12	S14	SSW21	S12	SSE19	S21	SSE19	SSE23	SE23	SE20	S11.3	SE23
30-Jul	ESE6	SE9	SSW19	WSW17	SSW7	SSW13	SSW23	S10	SW10	SE8	E5	SSE4	SE8	SSE18	SSE26	N12	NNE21	NNE18	NNE15	N19	N27	N32	NNE24	NNE24	NE2.7	N32
31-Jul	NE15	NE15	NE13	NNE9	N22	N25	N25	NNW25	NW20	WNW6	UO	UO	W20	W18	W22	WNW23	WNW14	NNW10	WNW11	W16	W22	W23	W19	W25	NNW12.8	N25

NNW1.9	WNW1.6	W1.5	W2.8	NW2.0	W2.9	WSW2.4	W2.4	NNW2.8	W1.6	WSW2.6	WSW3.2	WSW4.3	W4.6	NNW4.4	NW5.4	NNW6.6	NNW7.8	NNW5.4	NW4.3	NNW5.8	NNW3.9	NNW2.4	NW2.9	Diurnal Average	
NNW32	NNW31	SSE29	SSE27	N29	SSW27	N25	NNW25	N23	SE29	S33	SW31	SW31	SW32	WSW33	SSE29	N38	WNW36	NNW36	NNW31	N33	N32	NNW32	N33	Diurnal Maximum	

UO - Unstable Operation
 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

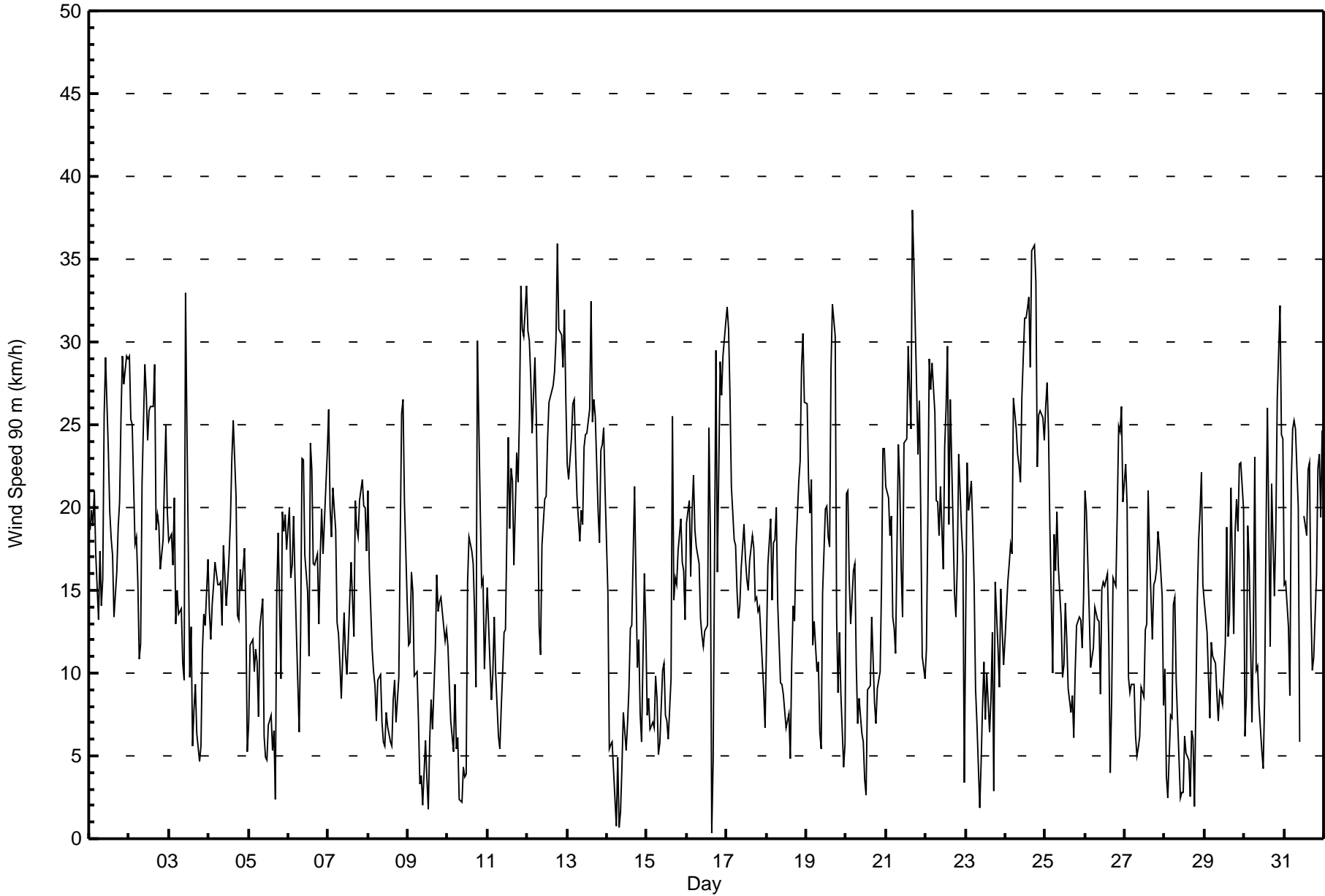
Mannix - July 2016

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



Wood Buffalo Environmental Association
Hourly Averages

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





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	53	7.14	7.14
6 - 11	178	23.99	31.13
12 - 19	280	37.74	68.87
20 - 28	184	24.80	93.67
29 - 38	47	6.33	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 742

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

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

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	3	3	2	2	3	5	3	2	3	1	3	3	5	5	4	6	53
6 - 11	20	13	11	9	5	8	15	8	8	5	6	10	15	13	11	21	178
12 - 19	26	19	20	7	2	3	30	22	10	14	11	27	29	17	13	30	280
20 - 28	34	17	3	0	0	0	16	25	4	12	9	14	21	4	5	20	184
29 - 38	11	0	0	0	0	0	3	6	1	3	3	3	1	4	0	12	47
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	94	52	36	18	10	16	67	63	26	35	32	57	71	43	33	89	742

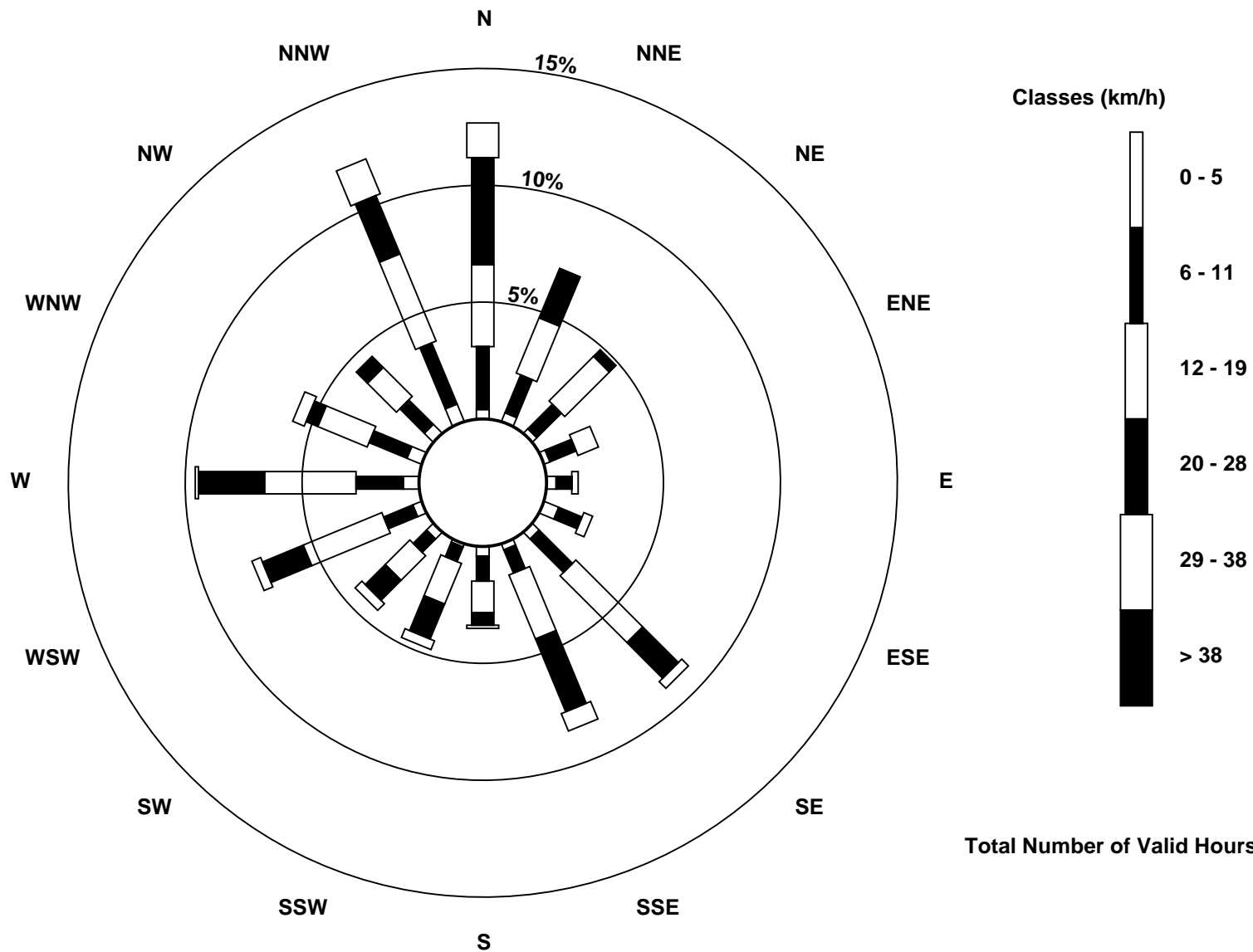
Total Number of Valid Hours: 742

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

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





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Direction 20 m (WD20m) - deg

Mannix - July 2016

Direction of Maximum Speed: 290 deg on Jul 24 17:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 341.2 deg on Jul 12	Hours of Data: 744
Direction of Minimum Speed: 4 deg on Jul 14 09:00	Hours of Missing Data: 0
Direction of Minimum Daily Speed Average: 2.2 deg on Jul 10	Percent Operational Time: 100.0
Monthly Average Direction: 282.2 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-Jul	176	158	147	145	135	144	143	143	150	140	156	138	155	160	154	124	132	131	151	160	158	146	143	144	147.0
2-Jul	155	151	139	139	139	144	141	124	142	147	165	156	163	165	159	173	165	134	135	134	134	134	138	136	147.9
3-Jul	132	134	133	135	135	136	133	140	134	126	181	244	147	80	96	86	163	148	104	123	161	136	198	260	145.0
4-Jul	251	243	236	239	234	251	241	255	236	253	257	243	243	238	228	223	256	259	216	202	176	152	154	285	237.0
5-Jul	332	15	5	5	324	316	267	308	356	24	43	99	317	15	129	104	121	328	218	280	270	257	273	267	312.7
6-Jul	265	261	260	280	309	345	64	339	3	20	19	48	68	21	43	54	60	51	50	15	11	356	348	359	10.0
7-Jul	6	352	345	347	346	339	335	339	346	326	332	322	31	321	3	16	27	26	16	23	6	359	352	354	358.3
8-Jul	13	21	22	26	23	10	24	36	27	43	351	26	6	1	17	61	72	34	49	21	21	17	27	25	26.1
9-Jul	14	19	26	25	357	342	5	14	31	270	249	271	254	41	59	49	62	4	34	49	44	44	59	60	26.1
10-Jul	27	3	14	10	36	103	132	124	33	31	11	43	65	66	57	52	81	192	252	254	264	286	288	282	17.2
11-Jul	320	9	334	319	342	353	18	327	304	12	33	338	285	300	321	325	304	349	355	354	12	0	344	336	339.3
12-Jul	343	342	347	348	344	359	355	354	347	333	332	351	344	339	341	332	322	342	341	340	340	332	335	346	341.2
13-Jul	342	332	338	333	334	328	332	329	328	339	353	7	358	4	14	30	26	16	7	5	9	5	9	40	358.3
14-Jul	17	32	87	258	240	218	263	73	4	311	306	305	292	279	308	295	341	0	357	344	332	329	288	301	321.0
15-Jul	245	268	261	256	231	191	179	221	246	274	290	263	274	289	270	329	302	280	289	289	329	288	285	259	280.7
16-Jul	254	253	229	238	234	221	232	260	265	268	271	301	274	308	295	136	250	343	340	316	324	315	325	331	287.0
17-Jul	328	338	346	337	335	355	357	339	324	333	326	327	313	330	332	323	335	351	353	34	35	38	69	235	339.4
18-Jul	207	160	148	142	151	146	143	140	141	138	136	127	122	175	180	227	227	204	224	211	193	195	192	189	175.5
19-Jul	187	168	162	168	142	156	147	136	125	153	251	243	242	248	255	288	288	267	267	244	257	27	241	323	239.5
20-Jul	28	30	16	337	323	330	342	335	343	330	253	324	11	290	311	285	290	303	261	258	231	204	196	221	305.0
21-Jul	237	237	233	220	172	205	233	258	259	257	247	253	249	255	251	275	5	359	353	15	17	19	49	87	283.3
22-Jul	142	169	163	153	153	153	148	149	143	153	146	145	179	201	195	217	262	280	258	266	338	315	341	240	185.8
23-Jul	227	252	245	262	264	274	277	20	305	255	282	282	252	218	233	3	264	66	195	207	190	240	192	158	249.0
24-Jul	155	145	153	150	149	195	203	218	243	238	238	228	237	238	242	236	290	284	279	250	260	262	260	245	241.8
25-Jul	259	263	281	274	247	274	265	280	282	283	297	278	273	303	320	343	359	5	40	48	24	33	99	142	289.4
26-Jul	137	139	124	102	116	127	138	133	142	121	186	209	168	194	251	250	146	145	144	141	154	144	154	145	150.8
27-Jul	139	147	158	168	167	181	195	241	263	314	346	7	300	321	339	350	9	2	20	35	28	11	22	25	1.8
28-Jul	35	309	261	246	255	241	242	318	332	197	121	122	141	120	155	223	72	62	302	220	238	172	189	207	205.8
29-Jul	222	212	219	226	209	188	189	171	184	148	135	167	144	163	162	186	203	190	145	164	151	156	144	140	169.8
30-Jul	136	138	175	224	144	166	196	151	239	133	96	151	131	155	159	351	32	24	23	358	12	11	24	13	66.5
31-Jul	45	42	32	2	1	353	351	336	314	263	283	236	274	273	272	278	274	343	268	262	269	269	255	266	293.9

290.1 288.0 272.1 267.2 251.1 247.4 230.6 265.5 273.3 258.7 260.7 255.3 255.2 270.2 285.7 310.8 329.1 342.0 326.5 321.9 331.6 333.1 318.1 298.4

Diurnal Average

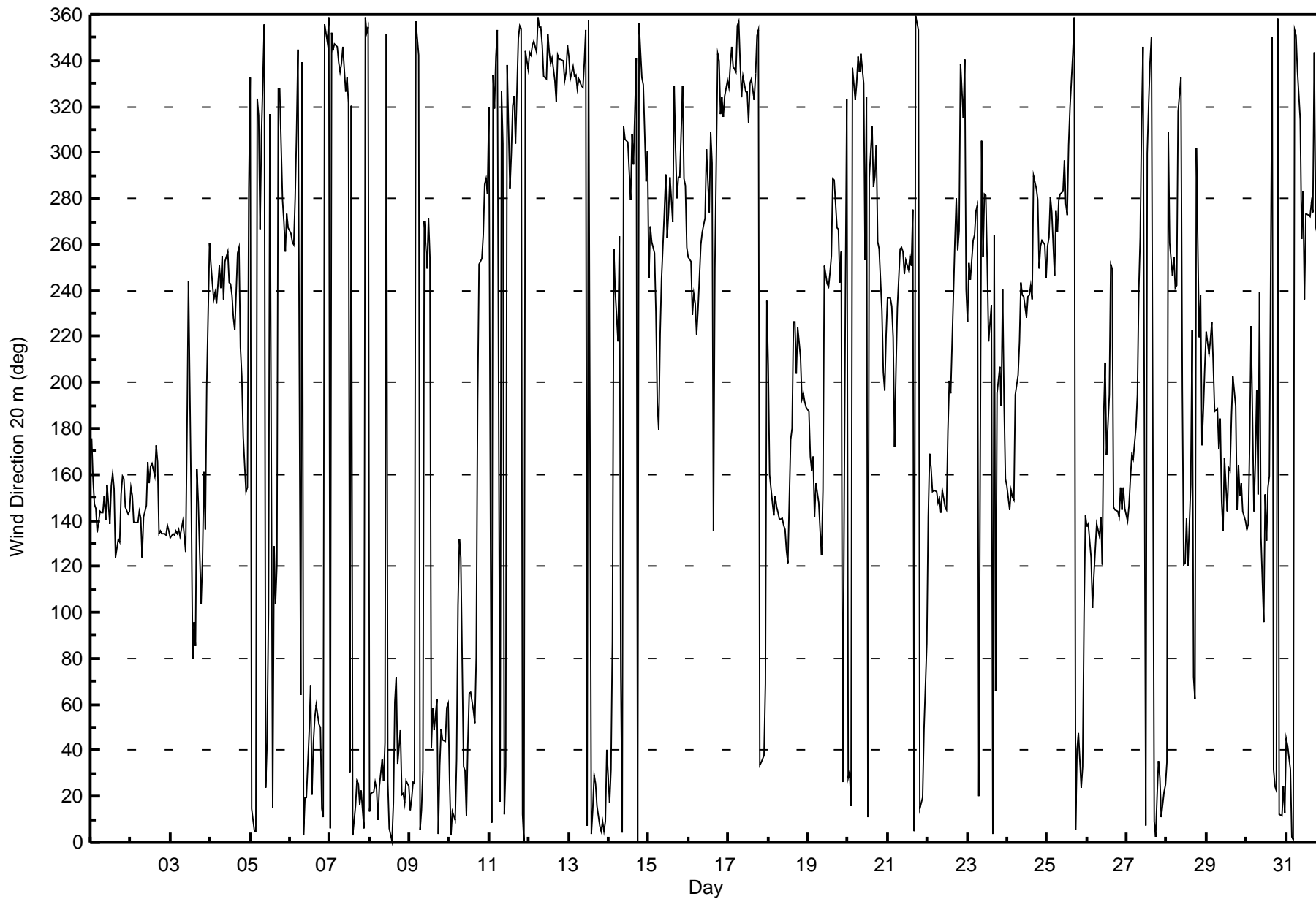
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

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

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 104 deg on Jul 18 15:00 Minimum Value: 7 deg on Jul 15 03:00		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																							
Percentiles: P ₁ = 8 P ₁₀ = 11 Q ₁ = 14 Median = 19 Q ₃ = 30 P ₉₀ = 48 P ₉₉ = 87																									
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-Jul	13	10	9	11	11	11	14	18	16	16	17	19	26	30	31	28	23	22	19	14	12	10	10	14	31
2-Jul	11	14	11	11	10	13	15	16	16	18	20	18	19	22	19	26	33	17	16	23	15	10	12	12	33
3-Jul	10	10	10	12	11	13	13	15	19	45	18	23	66	31	27	21	47	39	31	31	32	18	42	13	66
4-Jul	11	14	16	10	14	11	10	10	12	12	13	14	12	11	14	17	25	23	23	20	23	14	46	88	88
5-Jul	47	9	8	18	27	25	15	32	30	59	45	42	44	50	53	28	79	86	61	49	10	9	10	20	86
6-Jul	10	26	25	11	27	20	42	21	25	14	20	23	23	15	17	17	17	16	16	18	11	16	14	15	42
7-Jul	14	17	19	14	17	23	26	25	37	24	29	43	44	27	37	35	16	18	19	14	16	16	17	14	44
8-Jul	14	22	23	22	16	26	20	18	30	54	60	61	57	56	65	49	28	40	25	12	11	11	12	14	65
9-Jul	14	13	10	11	19	23	18	38	36	76	17	36	56	85	42	80	41	17	17	12	13	11	14	8	85
10-Jul	24	10	12	15	32	34	23	41	50	48	54	53	40	18	18	21	27	44	14	11	8	14	41	12	54
11-Jul	28	34	34	25	13	19	28	39	39	28	23	34	15	25	21	18	26	23	20	20	12	15	14	15	39
12-Jul	15	15	15	15	14	17	20	23	33	26	19	25	23	19	22	22	21	17	17	16	16	15	15	15	33
13-Jul	18	17	15	16	16	16	18	19	19	25	24	19	23	21	21	22	20	16	15	22	11	11	18	13	25
14-Jul	23	15	48	66	20	49	27	72	84	62	26	57	52	43	49	33	26	22	22	20	29	61	44	49	84
15-Jul	19	9	7	11	12	26	30	31	30	21	27	49	58	73	62	19	30	17	22	18	18	14	11	13	73
16-Jul	12	13	9	8	9	13	21	11	11	16	22	23	19	30	63	101	42	34	20	17	14	16	15	15	101
17-Jul	14	17	15	16	17	20	25	23	26	34	26	26	26	34	30	26	27	36	26	18	16	8	56	15	56
18-Jul	25	11	14	12	10	14	13	15	17	16	22	16	45	48	104	37	26	34	18	16	11	10	11	14	104
19-Jul	13	12	11	19	20	24	21	15	24	70	18	21	18	22	22	24	13	14	17	27	31	70	51	46	70
20-Jul	15	15	20	23	17	17	24	27	20	30	21	67	74	20	27	17	26	34	32	17	8	13	15	15	74
21-Jul	10	13	33	16	17	60	48	14	12	11	17	14	18	12	13	42	16	18	19	16	13	18	25	35	60
22-Jul	15	14	13	12	12	12	12	15	16	15	22	15	25	19	21	24	22	14	12	21	15	18	34	77	77
23-Jul	9	10	11	7	10	14	13	43	81	41	31	26	36	38	58	75	27	64	18	23	41	14	30	12	81
24-Jul	17	13	12	12	13	21	16	21	15	17	17	16	17	16	15	21	23	17	16	14	8	7	11	11	23
25-Jul	11	7	14	21	25	13	13	13	20	20	44	33	20	41	44	56	43	57	31	11	12	11	45	12	57
26-Jul	11	10	15	14	12	13	15	13	14	23	37	24	26	34	33	87	62	16	17	12	11	11	10	15	87
27-Jul	11	12	12	12	11	15	34	28	21	48	33	41	23	39	22	22	40	22	15	14	14	13	13	28	48
28-Jul	24	33	48	37	48	15	27	75	64	64	42	43	30	42	57	94	55	41	62	20	44	18	17	26	94
29-Jul	21	31	58	19	10	16	19	24	43	24	20	51	23	18	38	32	24	38	13	16	10	29	11	14	58
30-Jul	92	35	32	37	27	17	25	23	51	25	36	84	53	18	14	90	19	16	14	14	15	12	15	13	92
31-Jul	28	12	24	22	20	37	16	16	19	53	49	11	18	14	11	13	17	34	26	13	11	19	12	13	53
	92	35	58	66	48	60	48	75	84	76	60	84	74	85	104	101	79	86	62	49	44	70	56	88	
	Diurnal Maximum																								





Direction of Maximum Speed: 287 deg on Jul 24 17:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 338.3 deg on Jul 12	Hours of Data: 744
Direction of Minimum Speed: 196 deg on Jul 16 16:00	Hours of Missing Data: 0
Direction of Minimum Daily Speed Average: 3.0 deg on Jul 30	Percent Operational Time: 100.0
Monthly Average Direction: 288.2 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-Jul	179	157	140	139	125	132	135	140	142	135	149	134	151	159	149	119	124	127	147	155	154	140	139	139	142.6
2-Jul	147	148	136	129	130	134	130	116	135	140	158	150	157	159	153	167	160	129	130	131	130	129	134	131	142.5
3-Jul	128	128	125	133	125	128	127	133	127	126	174	231	155	73	88	80	163	151	90	116	157	136	194	259	143.2
4-Jul	252	246	234	236	234	250	239	251	231	248	253	237	239	233	223	218	248	255	210	199	174	156	154	219	229.6
5-Jul	318	10	356	1	339	319	266	309	348	6	32	88	315	3	121	93	122	324	325	277	266	252	272	271	312.8
6-Jul	263	262	259	279	307	343	57	336	356	12	13	42	56	14	35	45	49	40	39	7	6	354	344	356	359.7
7-Jul	1	352	346	345	345	338	332	336	337	324	328	320	10	319	354	6	19	17	9	16	2	357	350	352	352.1
8-Jul	6	15	20	16	17	0	16	25	15	25	341	13	352	350	359	48	60	27	38	15	15	13	22	19	17.0
9-Jul	10	12	22	26	355	344	358	0	17	277	246	269	261	45	46	39	50	0	26	40	38	41	65	59	20.6
10-Jul	39	0	16	18	47	100	126	117	11	10	354	23	54	57	48	43	74	181	245	250	264	284	306	294	4.7
11-Jul	330	358	346	326	335	348	0	325	302	3	21	336	284	299	319	323	303	345	350	350	4	357	341	336	335.9
12-Jul	343	341	345	348	344	353	350	348	343	330	329	346	340	336	337	329	318	339	338	337	336	329	334	343	338.3
13-Jul	338	328	334	330	332	327	328	326	326	336	349	1	353	359	6	21	18	10	3	359	3	1	4	32	351.8
14-Jul	15	45	82	200	237	267	283	57	293	298	307	308	294	284	307	295	339	354	348	339	328	330	319	336	324.9
15-Jul	329	309	293	288	250	207	187	216	242	270	287	258	271	280	267	325	303	278	288	291	324	293	284	261	285.2
16-Jul	258	254	243	242	247	230	233	254	261	265	268	300	271	306	289	196	250	338	334	314	321	314	323	327	288.7
17-Jul	326	334	342	338	342	352	353	334	322	330	325	323	309	326	328	321	331	344	347	26	28	32	55	130	338.2
18-Jul	155	157	152	137	143	142	140	138	136	137	134	121	123	176	200	214	219	200	217	205	188	194	192	193	172.9
19-Jul	192	188	171	191	149	162	148	132	123	160	245	236	234	243	249	286	285	264	261	236	257	1	210	305	231.4
20-Jul	19	20	8	335	321	329	338	327	337	329	255	323	346	286	307	282	290	300	255	254	233	201	195	216	300.5
21-Jul	235	239	239	221	182	212	231	253	255	252	241	247	242	250	243	273	359	354	349	7	9	13	41	80	280.5
22-Jul	129	162	161	152	149	149	144	145	141	148	142	139	172	193	189	209	256	277	255	264	334	313	335	258	178.6
23-Jul	232	248	253	263	268	282	284	7	291	254	277	278	251	205	227	350	262	43	189	199	198	234	215	181	247.2
24-Jul	174	144	149	149	149	198	198	209	237	231	231	222	231	233	236	228	287	282	277	245	255	257	257	241	233.4
25-Jul	255	257	279	272	257	273	263	276	280	280	299	276	269	300	318	339	347	353	32	39	23	42	98	130	288.0
26-Jul	130	132	118	99	108	120	130	127	136	119	179	201	165	190	250	251	143	139	140	137	153	142	150	149	147.3
27-Jul	141	147	155	167	172	201	212	238	262	319	338	352	300	319	335	345	359	356	14	27	20	6	21	43	354.5
28-Jul	45	316	297	254	273	243	244	292	312	202	123	122	140	113	159	167	57	44	303	214	231	172	181	204	210.4
29-Jul	219	225	241	237	213	192	188	173	182	144	131	160	139	159	157	180	194	185	141	162	149	155	135	135	168.9
30-Jul	103	128	184	236	160	170	192	154	235	129	90	163	124	148	155	346	24	17	18	355	6	5	17	7	60.2
31-Jul	35	34	28	5	359	348	349	333	315	277	286	234	271	271	268	277	273	338	268	259	266	266	254	265	297.0

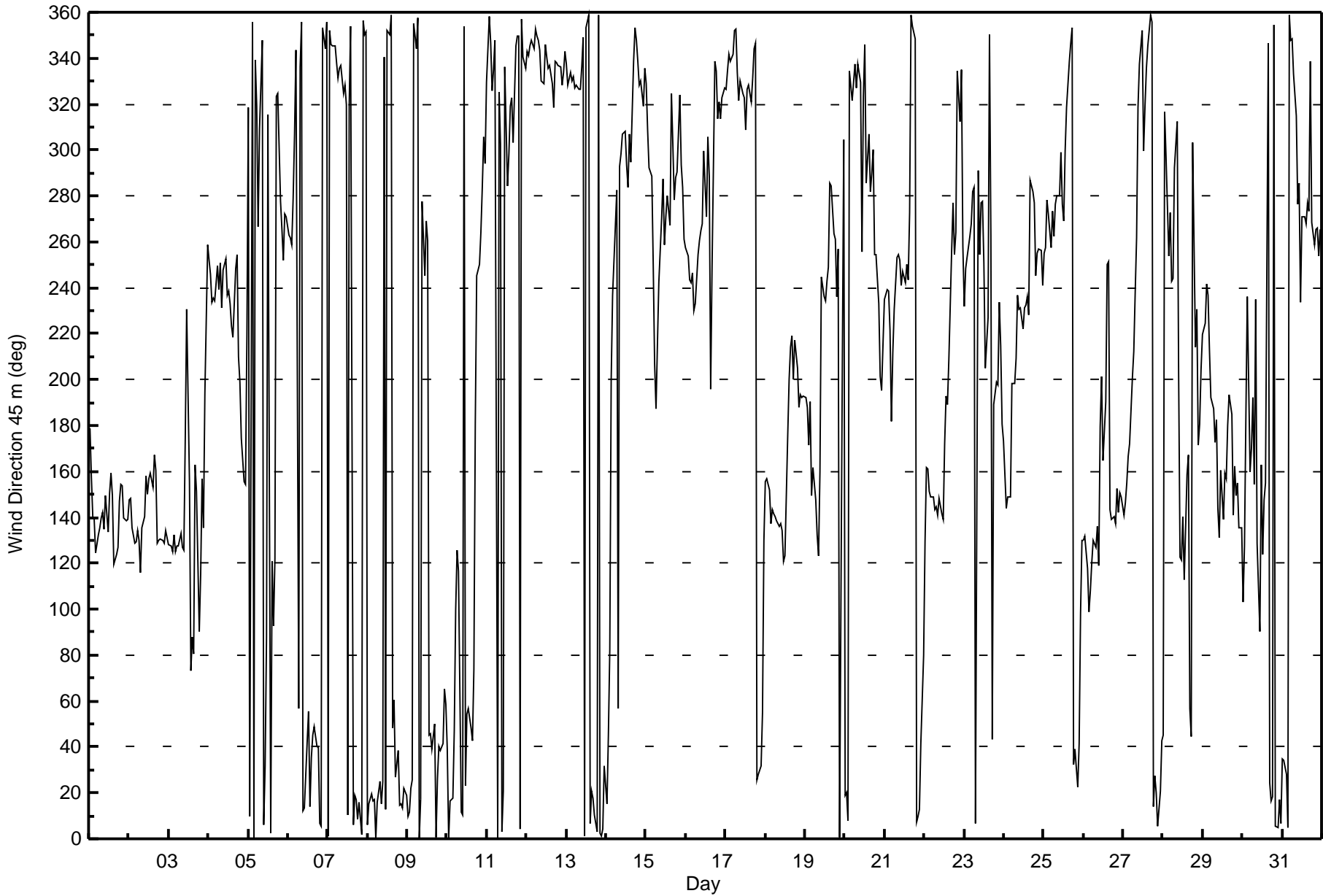
296.9 283.6 264.8 269.9 284.8 258.5 235.8 274.0 280.5 272.3 256.9 251.8 251.7 264.9 282.9 302.9 321.6 336.0 322.5 315.9 329.5 327.0 316.3 299.5
Diurnal Average

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



Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 110 deg on Jul 16 16:00			Hours of Data:	744
Minimum Value: 3 deg on Jul 18 22:00			Hours of Missing Data:	0
Percentiles: P ₁ = 4 P ₁₀ = 7 Q ₁ = 9 Median = 14 Q ₃ = 23 P ₉₀ = 41 P ₉₉ = 79			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-Jul	5	6	3	8	5	7	9	12	10	12	12	17	20	24	27	25	19	19	16	8	6	4	6	9	27
2-Jul	5	8	5	7	6	9	11	15	12	15	13	13	13	16	13	21	25	15	14	21	12	6	8	9	25
3-Jul	7	6	6	6	5	9	9	9	15	35	11	23	62	28	29	18	43	36	28	30	27	16	41	9	62
4-Jul	7	13	12	7	10	7	6	8	10	10	10	11	9	7	10	12	21	20	14	17	9	26	49	49	
5-Jul	50	6	6	9	18	14	12	26	22	56	42	40	31	44	51	28	87	72	54	47	9	7	7	14	87
6-Jul	8	21	20	7	23	14	33	17	18	9	13	19	20	11	13	13	15	12	13	14	8	12	7	10	33
7-Jul	8	9	11	7	9	13	16	16	29	15	21	38	36	18	31	26	11	14	12	9	9	10	10	9	38
8-Jul	8	14	17	15	11	17	13	12	21	48	40	45	42	43	65	42	25	40	21	8	7	7	10	10	65
9-Jul	9	10	6	7	11	14	15	45	28	57	14	30	51	77	32	86	35	12	12	11	10	9	11	7	86
10-Jul	19	7	13	11	23	23	17	43	52	34	39	57	33	14	15	18	26	39	11	8	8	8	25	9	57
11-Jul	17	19	24	19	7	12	21	26	28	21	19	26	11	19	15	12	22	17	15	14	6	9	7	8	28
12-Jul	7	7	7	9	6	10	12	14	26	19	11	20	17	12	14	18	15	12	10	9	8	8	8	11	26
13-Jul	11	10	8	9	8	9	10	11	12	19	18	15	17	14	16	19	15	11	10	16	5	6	13	8	19
14-Jul	15	21	16	62	27	63	24	69	80	47	20	48	46	37	36	25	20	17	17	11	23	44	19	15	80
15-Jul	67	17	10	22	12	21	18	20	28	20	19	37	43	67	36	13	27	14	18	13	12	9	6	10	67
16-Jul	8	7	7	8	4	9	14	8	9	14	20	17	17	28	37	110	33	31	17	10	8	9	9	8	110
17-Jul	8	10	8	8	10	10	13	15	16	23	20	16	19	24	21	19	22	29	21	12	8	5	13	30	30
18-Jul	16	6	7	7	5	8	7	9	9	11	19	15	35	38	79	28	22	28	16	9	3	3	4	5	79
19-Jul	4	7	13	13	14	18	20	11	20	62	18	18	16	20	19	21	10	14	14	25	28	63	53	52	63
20-Jul	10	10	14	18	10	10	14	19	12	21	16	53	74	15	19	12	20	24	27	14	5	9	6	10	74
21-Jul	6	11	18	12	11	56	35	11	9	9	14	10	16	12	10	42	12	12	14	11	8	13	15	32	56
22-Jul	10	11	6	8	5	6	7	9	10	9	16	10	16	11	12	18	21	11	9	22	8	10	24	63	63
23-Jul	5	9	7	4	5	10	11	32	73	37	26	19	36	38	55	69	25	65	10	15	38	8	15	12	73
24-Jul	16	8	5	6	8	15	7	16	12	13	14	11	14	13	12	18	23	16	15	11	6	6	10	8	23
25-Jul	9	6	11	13	17	10	10	11	17	16	38	30	17	37	36	41	28	45	26	8	9	15	37	7	45
26-Jul	6	7	10	13	9	12	11	9	10	18	32	18	18	24	27	77	69	11	14	7	6	6	4	9	77
27-Jul	6	6	5	6	9	13	18	17	16	34	24	34	16	26	14	17	31	16	11	9	10	7	10	32	34
28-Jul	23	21	54	40	34	9	19	53	55	62	39	81	25	37	57	95	64	29	62	19	39	12	9	26	95
29-Jul	20	19	38	13	5	10	10	17	29	20	18	42	19	13	32	25	14	29	8	10	5	25	7	9	42
30-Jul	73	26	29	15	51	18	20	19	42	21	31	69	49	13	8	90	16	12	9	7	10	7	11	8	90
31-Jul	22	9	18	13	12	29	8	10	12	46	48	8	17	13	9	10	11	30	30	10	10	15	9	12	48
	73	26	54	62	51	63	35	69	80	62	48	81	74	77	79	110	87	72	62	47	39	63	53	63	
	Diurnal Maximum																								





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Direction 75 m (WD75m) - deg

Mannix - July 2016

Direction of Maximum Speed: 2 deg on Jul 21 17:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 343.3 deg on Jul 12	Hours of Data: 744
Direction of Minimum Speed: 341 deg on Jul 16 16:00	Hours of Missing Data: 0
Direction of Minimum Daily Speed Average: 3.0 deg on Jul 30	Percent Operational Time: 100.0
Monthly Average Direction: 292.2 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-Jul	183	162	141	141	126	127	134	138	139	135	148	136	150	159	150	123	124	128	147	155	154	139	140	140	143.6
2-Jul	151	155	139	131	127	129	124	116	134	141	156	148	156	157	153	164	156	131	132	134	132	130	135	132	143.0
3-Jul	132	129	128	133	124	127	129	134	126	124	171	222	173	77	88	92	166	153	77	108	150	141	201	263	147.0
4-Jul	260	257	241	240	239	254	247	253	233	249	257	239	241	234	226	221	250	258	212	204	175	161	160	228	232.4
5-Jul	326	11	353	3	359	337	279	316	351	10	35	75	319	5	115	91	118	330	331	281	268	258	279	278	320.9
6-Jul	267	267	264	282	310	350	58	339	359	14	18	45	56	17	38	46	48	41	40	10	12	359	347	359	2.1
7-Jul	5	358	354	352	352	342	335	340	339	328	331	327	8	325	359	7	20	18	12	18	6	3	357	357	356.7
8-Jul	10	17	24	17	18	4	20	27	21	29	347	17	2	357	12	48	60	32	39	17	20	21	31	31	21.5
9-Jul	22	22	40	43	9	357	360	2	22	300	249	278	271	46	49	51	48	8	32	44	46	55	76	71	32.3
10-Jul	56	27	45	44	76	107	127	109	8	15	357	23	57	58	50	43	72	176	247	253	270	291	314	312	12.4
11-Jul	343	5	4	338	342	353	357	335	310	4	22	340	289	302	324	326	309	348	353	353	6	1	347	345	342.0
12-Jul	351	350	354	354	353	358	353	351	346	334	333	350	343	339	339	333	322	343	341	342	340	333	338	348	343.3
13-Jul	343	336	341	336	340	335	332	330	331	340	354	4	356	2	8	24	21	13	7	2	6	5	8	35	356.1
14-Jul	29	75	116	123	178	292	309	9	288	299	311	310	300	288	309	301	343	355	347	338	334	335	327	340	332.1
15-Jul	3	325	329	304	264	251	219	217	246	271	288	260	277	279	268	327	306	281	290	296	327	300	292	275	291.9
16-Jul	264	261	256	249	255	246	245	258	260	266	268	302	273	308	288	341	262	342	340	319	325	320	327	331	293.2
17-Jul	332	340	348	348	355	357	358	339	327	334	329	326	312	330	331	324	336	350	351	29	31	35	58	100	344.8
18-Jul	141	153	156	146	146	150	147	144	139	143	140	122	119	172	202	211	218	201	216	206	192	199	198	202	175.5
19-Jul	202	201	196	208	174	178	161	138	131	170	242	237	234	242	249	287	286	266	263	239	261	357	187	320	235.2
20-Jul	21	20	10	341	325	337	342	327	342	337	266	339	344	289	310	283	293	305	257	255	237	203	200	220	306.1
21-Jul	238	244	244	228	199	221	235	255	256	253	241	248	244	251	244	273	2	356	352	9	11	16	43	75	281.1
22-Jul	124	155	163	154	150	152	146	147	144	149	142	139	170	193	191	210	256	279	257	268	336	316	336	287	177.8
23-Jul	242	255	261	270	276	293	304	10	286	261	279	280	259	203	229	354	264	43	192	202	214	233	225	205	254.5
24-Jul	196	159	164	165	173	207	202	212	237	231	231	223	232	233	238	229	289	284	279	248	258	259	260	244	235.0
25-Jul	257	258	279	274	266	276	267	278	284	282	302	279	271	301	323	340	348	360	36	43	34	57	110	128	290.6
26-Jul	131	133	123	106	112	123	128	126	136	124	180	200	165	192	251	252	141	138	143	139	153	145	152	154	149.7
27-Jul	148	154	173	189	208	238	247	249	277	324	341	355	305	322	339	349	3	1	18	30	25	12	35	68	356.0
28-Jul	60	330	333	267	273	246	252	295	311	209	114	116	141	109	149	139	58	45	328	215	234	177	182	215	216.3
29-Jul	228	235	253	256	224	207	199	176	184	150	132	161	139	159	155	181	194	185	142	165	152	155	134	134	172.3
30-Jul	98	125	196	245	181	184	194	168	235	130	90	156	122	146	157	351	25	18	22	360	8	7	20	10	49.8
31-Jul	37	39	37	14	3	352	354	340	322	299	299	240	272	275	270	281	282	344	277	266	270	269	261	271	304.8
317.4 285.5 268.4 273.7 301.2 277.6 249.5 278.9 288.7 283.4 259.2 254.2 254.9 268.8 285.4 305.6 326.5 340.8 328.5 323.1 338.7 337.5 327.1 313.5																									
Diurnal Average																									

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

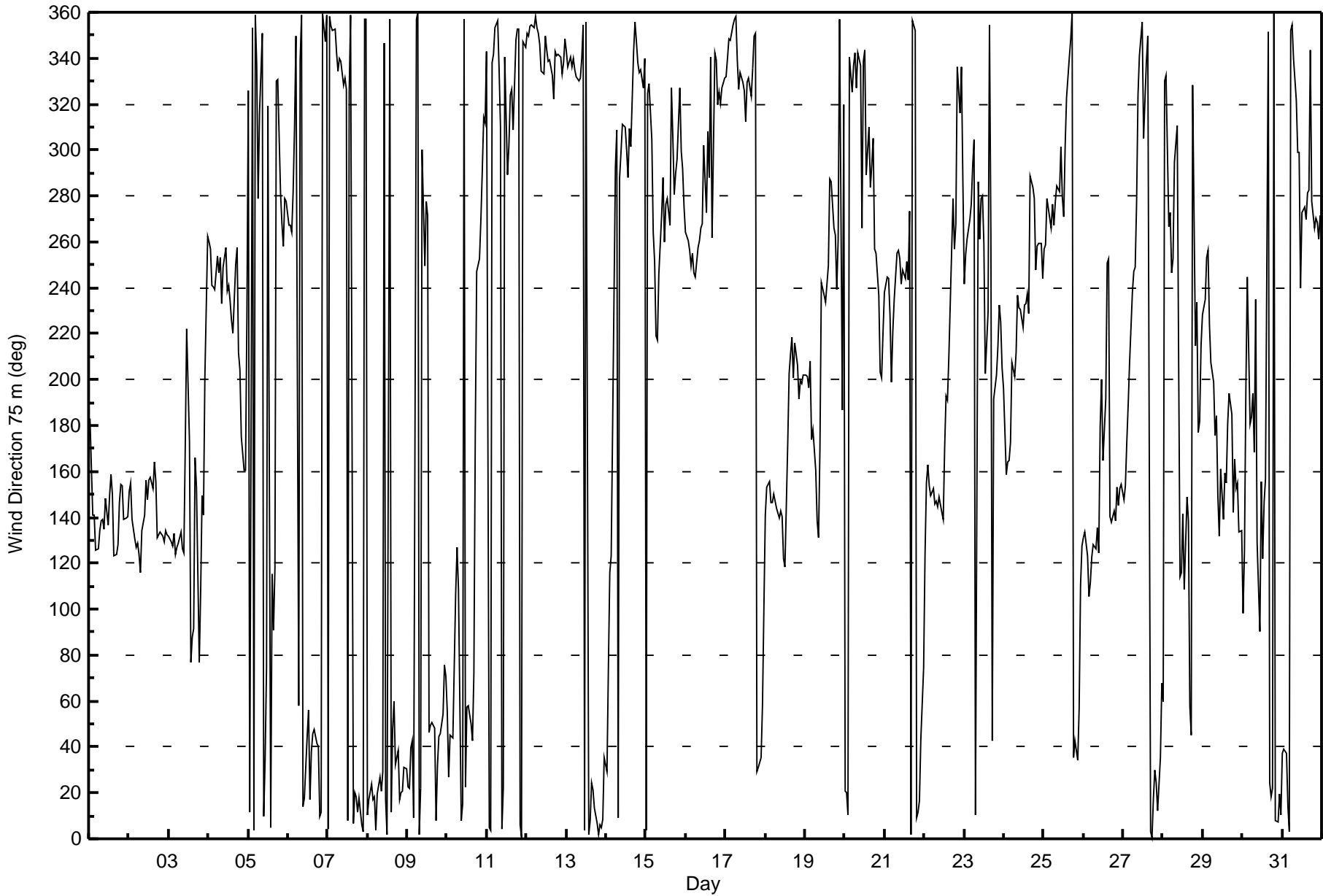


Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction 75 m (WD75m) - deg

Mannix - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 102 deg on Jul 16 16:00 Minimum Value: 3 deg on Jul 18 22:00 Percentiles: P ₁ = 3 P ₁₀ = 6 Q ₁ = 8 Median = 13 Q ₃ = 21 P ₉₀ = 36 P ₉₉ = 81																			Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0						
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Jul	6	7	3	10	7	8	8	10	10	10	12	16	19	22	25	25	19	19	15	7	6	3	4	8	25
2-Jul	4	9	3	9	7	7	13	16	12	13	13	12	11	14	12	18	20	14	15	20	13	6	6	8	20
3-Jul	7	7	7	5	8	11	9	9	16	30	13	23	57	25	33	21	32	33	28	28	21	14	38	7	57
4-Jul	5	11	9	6	8	6	5	7	10	9	9	11	8	6	9	10	19	22	20	13	17	9	27	34	34
5-Jul	45	5	7	9	12	10	18	25	17	35	38	38	27	39	47	31	86	74	50	48	9	6	6	9	86
6-Jul	7	17	15	5	20	15	30	19	16	7	11	17	19	10	13	11	14	11	11	11	7	12	7	9	30
7-Jul	7	7	8	5	7	13	13	14	27	14	20	35	30	16	28	24	9	12	11	6	7	8	9	8	35
8-Jul	5	10	12	12	9	17	11	8	17	38	34	34	32	42	40	33	21	37	18	6	4	5	8	9	42
9-Jul	13	13	7	8	12	12	16	41	22	60	15	37	71	45	28	79	27	12	9	9	8	12	8	8	79
10-Jul	13	14	16	23	13	18	15	42	51	28	35	51	26	11	11	15	23	36	11	7	7	8	12	7	51
11-Jul	14	13	8	17	8	9	25	25	28	20	16	22	8	18	12	11	18	16	15	12	4	7	6	5	28
12-Jul	6	5	5	7	5	8	9	13	25	18	9	19	15	12	13	17	14	12	8	8	7	5	6	9	25
13-Jul	9	8	7	7	6	8	9	10	10	18	17	14	15	13	14	17	13	9	7	16	4	4	11	5	18
14-Jul	11	30	14	17	32	68	19	94	84	43	20	42	44	35	34	26	20	14	21	10	19	31	8	12	94
15-Jul	14	7	13	13	13	8	23	25	31	17	18	35	40	50	36	12	26	12	18	12	11	8	6	9	50
16-Jul	5	4	7	6	4	7	9	7	8	12	19	19	15	27	28	102	33	28	19	8	7	7	8	6	102
17-Jul	6	7	5	7	7	7	9	13	16	21	18	15	18	23	19	18	21	28	20	9	3	5	10	20	28
18-Jul	10	6	4	9	12	5	5	7	9	11	19	18	28	33	66	26	21	27	17	8	3	3	4	4	66
19-Jul	3	6	11	6	21	23	26	13	25	56	18	17	15	20	18	21	10	14	11	18	30	52	47	54	56
20-Jul	7	6	10	17	9	8	15	16	11	20	16	48	65	14	18	11	18	20	27	14	6	7	4	10	65
21-Jul	4	10	15	10	10	40	18	11	8	8	12	8	16	12	9	42	10	11	13	9	7	11	12	28	42
22-Jul	13	13	4	6	3	5	6	8	10	8	14	10	15	11	13	16	22	11	8	22	7	9	21	61	61
23-Jul	7	8	5	5	5	10	11	26	82	42	25	18	36	37	56	62	23	63	10	14	29	6	9	16	82
24-Jul	15	13	6	6	10	6	7	14	11	13	13	11	14	12	11	17	24	15	13	10	5	5	9	6	24
25-Jul	9	7	10	8	13	8	9	9	17	14	36	31	17	38	37	34	26	37	24	7	7	18	24	9	38
26-Jul	5	6	12	16	13	12	10	11	8	17	29	17	17	23	24	82	78	10	13	7	5	4	3	7	82
27-Jul	3	6	8	12	13	13	14	17	21	30	22	30	13	26	14	15	28	15	9	6	7	5	8	18	30
28-Jul	10	22	67	42	30	7	15	36	45	73	66	71	24	34	48	78	52	25	65	18	34	11	8	23	78
29-Jul	14	9	15	14	8	11	12	16	27	20	21	41	16	11	29	29	13	27	6	10	5	20	5	8	41
30-Jul	62	22	31	11	52	20	16	17	27	20	30	66	36	12	7	88	13	10	7	6	8	4	10	5	88
31-Jul	17	7	14	10	9	22	7	9	11	42	46	8	17	14	8	8	9	31	32	6	7	13	8	13	46
Diurnal Maximum																									
62 30 67 42 52 68 30 94 84 73 66 71 71 50 66 102 86 74 65 48 34 52 47 61																									





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction 90 m (WD90m) - deg

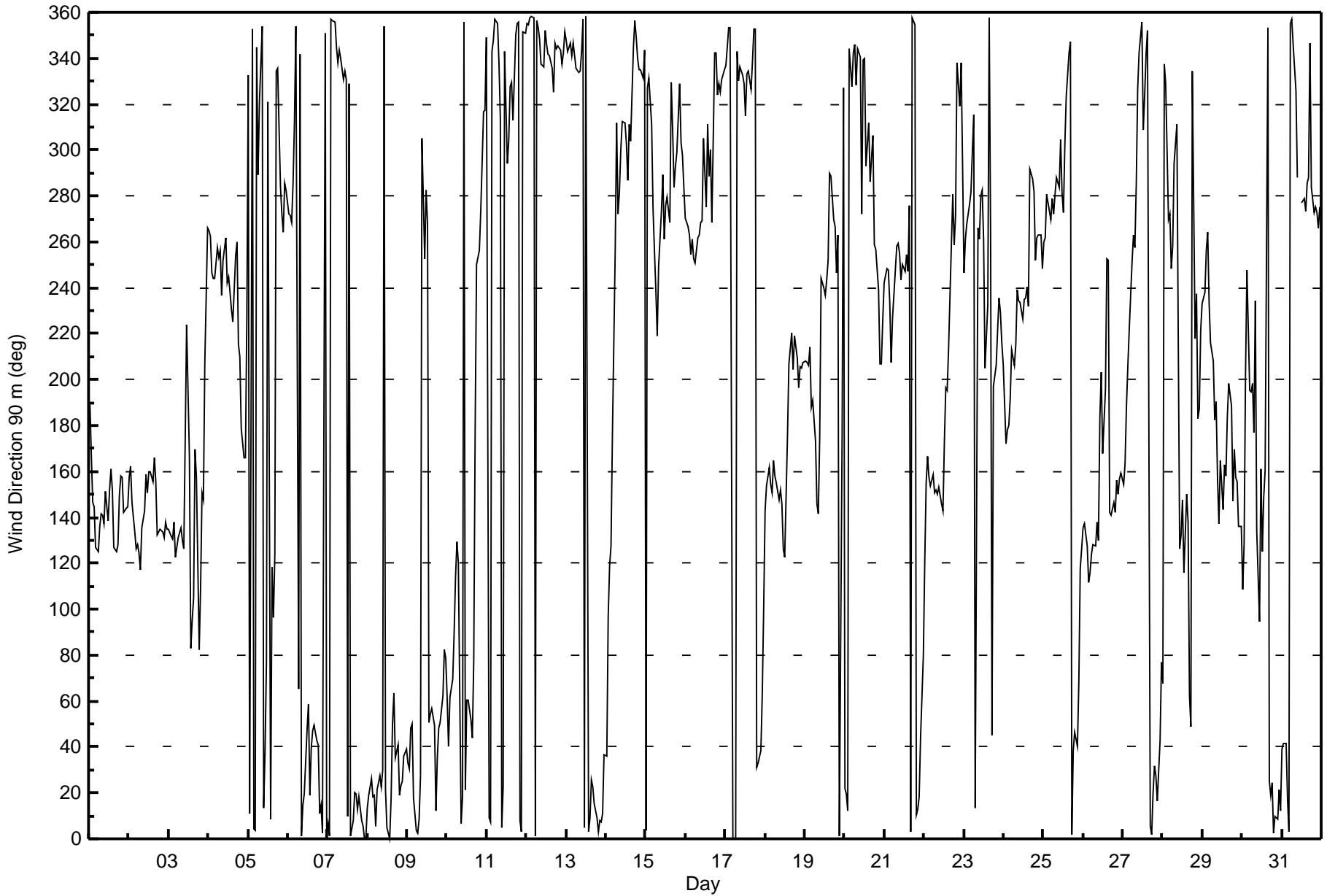
Mannix - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 104 deg on Jul 16 16:00 Minimum Value: 2 deg on Jul 22 05:00 Percentiles: P ₁ = 3 P ₁₀ = 5 Q ₁ = 8 Median = 12 Q ₃ = 20 P ₉₀ = 35 P ₉₉ = 83																		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-Jul	6	7	4	10	4	6	8	11	11	11	12	15	19	22	24	25	18	18	16	7	6	3	4	8	25					
2-Jul	4	9	3	10	4	6	11	16	12	14	12	12	11	14	11	17	19	14	15	19	12	5	5	6	19					
3-Jul	7	5	6	5	5	9	7	9	17	27	13	20	53	24	35	20	26	31	26	25	18	12	37	7	53					
4-Jul	5	10	7	5	7	6	5	6	10	9	9	10	8	6	8	9	18	21	20	12	17	9	27	33	33					
5-Jul	40	6	8	10	9	9	22	23	15	32	40	37	27	40	45	35	87	85	49	50	9	6	7	8	87					
6-Jul	7	15	13	4	19	15	31	20	15	6	10	17	20	9	14	11	13	11	11	10	7	12	7	8	31					
7-Jul	6	6	6	4	6	13	13	13	27	14	21	33	28	15	26	24	8	10	11	6	5	6	8	7	33					
8-Jul	5	8	11	10	8	16	10	8	17	37	40	32	33	48	39	32	23	36	17	5	4	4	8	10	48					
9-Jul	15	15	8	9	13	10	17	46	24	80	15	40	75	41	29	73	25	12	8	8	9	14	7	7	80					
10-Jul	11	13	17	25	10	13	14	43	58	30	38	45	26	11	12	15	24	35	11	6	7	9	11	7	58					
11-Jul	13	12	7	17	8	8	28	25	29	20	15	20	7	18	12	11	17	16	14	11	3	5	5	4	29					
12-Jul	5	4	5	6	4	6	8	13	24	17	9	18	14	11	12	16	14	11	7	7	6	4	5	8	24					
13-Jul	7	7	6	7	5	7	9	10	10	17	17	12	14	12	13	17	12	8	7	16	3	3	11	5	17					
14-Jul	10	25	7	13	29	72	17	91	92	42	19	42	45	33	32	24	19	12	20	10	18	29	6	12	92					
15-Jul	14	6	10	10	17	5	19	23	30	15	18	35	35	45	34	11	26	11	19	12	11	8	6	10	45					
16-Jul	6	5	7	5	6	5	6	6	7	12	18	19	15	26	25	104	33	30	19	8	6	6	7	5	104					
17-Jul	5	6	4	6	6	6	9	12	16	20	18	14	18	23	19	17	20	26	18	8	3	5	9	15	26					
18-Jul	10	7	3	8	14	6	4	7	9	12	19	18	31	30	59	26	20	27	17	8	4	2	4	3	59					
19-Jul	3	5	7	5	22	22	26	14	26	50	17	17	15	19	17	21	10	14	11	18	32	50	44	52	52					
20-Jul	6	5	8	16	8	7	14	15	11	20	18	49	70	14	17	10	18	18	26	14	6	6	3	10	70					
21-Jul	4	9	13	8	9	25	16	10	8	8	11	8	15	12	8	42	9	10	12	9	6	10	12	26	42					
22-Jul	10	14	3	5	2	5	6	7	10	7	13	10	14	10	13	15	22	11	8	22	8	9	19	61	61					
23-Jul	8	8	4	6	4	11	12	24	95	38	25	17	36	36	57	65	22	67	9	13	22	6	7	14	95					
24-Jul	13	14	8	6	10	5	6	13	10	12	12	10	13	12	10	17	24	15	12	9	5	5	9	5	24					
25-Jul	8	6	9	7	11	7	9	9	17	13	35	30	16	37	37	39	26	40	23	6	7	20	18	8	40					
26-Jul	5	5	8	9	7	8	7	9	9	16	29	16	16	22	23	66	75	10	12	7	4	3	2	5	75					
27-Jul	4	9	9	13	12	16	10	18	23	29	22	30	13	26	13	14	27	15	9	5	6	5	8	16	30					
28-Jul	7	32	71	36	29	8	13	31	33	76	65	77	22	34	44	72	51	27	68	16	32	11	9	21	77					
29-Jul	11	6	11	14	9	12	11	17	24	21	20	41	16	11	27	27	13	25	7	10	6	18	5	8	41					
30-Jul	59	16	31	9	48	19	15	17	22	22	32	62	35	13	6	88	13	9	7	6	8	3	9	4	88					
31-Jul	16	7	14	9	8	20	6	8	11	37	UO	UO	17	13	7	8	8	30	31	5	6	12	8	13	37					
																		59 32 71 36 48 72 31 91 95 80						65 77 75 48 59 104 87 85 68 50 32 50 44 61						
Diurnal Maximum																														
UO - Unstable Operation																														



Wood Buffalo Environmental Association
Hourly Averages

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





Maximum Value: 1.4 km/h on Jul 10 13:00		Maximum Daily Average: 0.5 km/h on Jul 2		Hours in Service: 744																							
Minimum Value: -0.8 km/h on Jul 24 17:00		Minimum Daily Average: -0.2 km/h on Jul 12		Hours of Data: 744																							
Maximum Diurnal Average: 0.2 km/h at hour 10		Minimum Diurnal Average: 0.0 km/h at hour 4		Hours of Missing Data: 0																							
Monthly Average: 0.11 km/h		Percentiles: P ₁ = -0.5 P ₁₀ = -0.3 Q ₁ = -0.1 Median = 0.0 Q ₃ = 0.3 P ₉₀ = 0.5 P ₉₉ = 1.0		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-Jul	-0.1	0.3	0.4	0.4	0.5	0.3	0.4	0.6	0.5	0.8	0.5	0.6	0.4	0.5	0.4	1.0	1.0	0.8	0.7	0.6	0.7	0.5	0.5	0.5	0.5	0.5	1.0
2-Jul	0.4	0.5	0.4	0.4	0.4	0.3	0.3	0.7	0.7	0.8	0.3	0.8	0.4	0.5	0.6	0.5	0.3	0.8	0.7	0.6	0.7	0.6	0.6	0.4	0.4	0.5	0.8
3-Jul	0.4	0.4	0.4	0.3	0.3	0.4	0.6	0.4	0.5	0.4	0.0	-0.2	0.7	1.0	0.8	0.8	0.2	0.3	0.5	0.5	0.2	0.5	0.2	0.1	0.4	0.4	1.0
4-Jul	0.0	-0.1	-0.2	-0.3	-0.2	-0.3	-0.3	0.0	-0.3	-0.1	-0.1	-0.2	-0.1	-0.2	-0.4	-0.3	0.0	0.1	-0.1	-0.1	0.1	0.4	0.2	0.0	0.0	-0.1	0.4
5-Jul	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.1	0.3	0.3	0.5	0.1	0.4	0.2	0.6	0.4	0.0	-0.3	0.0	0.2	-0.1	0.0	0.0	0.1	0.1	0.6
6-Jul	0.0	-0.3	0.0	0.0	-0.2	-0.2	0.7	-0.1	0.0	0.1	0.5	0.9	0.6	0.3	0.7	1.0	1.3	0.9	0.9	0.1	-0.1	-0.1	-0.2	-0.1	0.3	1.3	
7-Jul	-0.1	-0.2	-0.1	-0.2	-0.1	0.1	0.1	0.0	0.0	-0.1	0.0	-0.1	0.7	-0.1	0.2	0.5	0.5	0.6	0.3	0.5	0.0	-0.1	-0.2	-0.1	0.1	0.7	
8-Jul	-0.1	0.3	0.1	0.3	0.1	0.1	0.2	0.5	0.4	0.5	0.2	0.1	0.5	0.2	0.6	0.5	0.7	0.3	0.6	0.1	0.3	0.1	0.3	0.2	0.3	0.7	
9-Jul	0.0	0.1	0.4	0.2	0.0	-0.1	-0.1	0.2	0.2	0.1	-0.1	-0.2	-0.2	0.3	0.5	0.6	0.5	-0.1	0.5	0.7	0.5	0.3	0.4	0.6	0.2	0.7	
10-Jul	0.1	-0.1	0.0	0.0	0.3	0.3	0.3	0.2	0.3	0.1	0.4	0.1	1.4	1.3	1.1	1.2	1.1	0.0	-0.4	0.0	0.0	-0.1	-0.1	0.1	0.3	1.4	
11-Jul	-0.1	0.1	0.0	-0.1	-0.1	0.0	0.2	0.3	0.1	0.2	0.3	0.1	-0.1	-0.5	-0.3	-0.3	-0.1	-0.2	-0.2	0.0	-0.1	-0.2	-0.3	-0.1	-0.1	0.3	
12-Jul	-0.1	-0.1	-0.3	-0.3	-0.2	-0.1	0.2	0.2	0.1	0.0	-0.2	0.1	-0.5	-0.3	-0.2	-0.6	-0.6	-0.4	-0.5	-0.1	-0.2	-0.3	-0.3	-0.3	-0.2	0.2	
13-Jul	-0.2	-0.1	0.0	-0.2	-0.1	-0.4	-0.2	-0.3	-0.2	-0.1	0.0	-0.2	-0.1	0.0	0.2	0.4	0.6	0.2	0.1	0.0	-0.1	-0.2	0.0	0.6	0.0	0.6	
14-Jul	0.1	0.3	0.2	-0.1	-0.1	0.2	-0.1	0.3	0.2	0.3	-0.2	0.4	-0.1	0.1	0.0	-0.3	-0.1	0.0	-0.1	-0.2	-0.3	0.0	0.1	-0.2	0.0	0.4	
15-Jul	-0.2	-0.2	0.0	0.0	-0.3	0.2	0.5	-0.2	-0.4	-0.1	0.0	-0.2	-0.1	-0.1	-0.1	-0.7	-0.3	0.0	-0.2	-0.2	-0.2	-0.2	-0.2	0.1	-0.1	0.5	
16-Jul	0.0	-0.1	-0.2	-0.4	-0.2	-0.2	-0.1	0.0	0.1	0.1	0.0	-0.1	-0.1	-0.4	0.0	0.2	-0.2	-0.3	-0.2	-0.4	-0.5	-0.5	-0.5	-0.4	-0.2	0.2	
17-Jul	-0.5	-0.1	-0.1	0.0	-0.1	0.0	0.2	0.0	0.1	0.1	-0.2	-0.3	-0.4	-0.1	-0.3	-0.1	-0.2	0.2	-0.1	0.6	0.4	0.2	0.2	-0.3	0.0	0.6	
18-Jul	-0.3	0.1	0.4	0.2	0.4	0.4	0.6	0.6	0.4	0.4	0.3	0.4	0.5	0.1	0.0	-0.1	-0.2	0.2	-0.1	-0.1	-0.2	-0.2	-0.1	-0.1	0.2	0.6	
19-Jul	-0.1	-0.1	0.2	0.0	0.3	0.3	0.4	0.4	0.4	0.3	-0.3	-0.5	-0.2	-0.1	-0.3	-0.8	-0.7	-0.2	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.4	
20-Jul	0.4	0.4	0.0	-0.1	-0.2	0.0	0.1	0.1	-0.1	0.0	0.0	0.4	0.2	-0.1	0.0	-0.3	0.1	0.0	0.0	0.1	-0.2	-0.2	-0.1	-0.2	0.0	0.4	
21-Jul	-0.2	-0.2	-0.1	-0.2	0.0	-0.2	-0.1	-0.1	0.0	0.1	-0.1	-0.2	0.0	-0.1	-0.2	-0.1	-0.3	0.0	-0.3	0.2	0.1	0.1	0.5	0.6	0.0	0.6	
22-Jul	0.5	0.1	0.4	0.5	0.5	0.5	0.5	0.6	0.6	0.8	0.5	0.9	0.4	0.0	0.0	-0.2	-0.1	-0.1	0.0	0.0	-0.2	-0.2	0.0	-0.1	0.2	0.9	
23-Jul	-0.3	-0.2	-0.3	-0.1	0.0	-0.1	-0.1	0.2	0.2	0.0	-0.4	-0.1	-0.1	-0.1	0.2	0.0	0.2	0.0	0.0	0.2	-0.1	-0.1	0.0	0.0	0.0	0.2	
24-Jul	0.1	0.4	0.5	0.6	0.3	-0.1	-0.1	-0.2	-0.1	-0.3	-0.4	-0.5	-0.4	-0.3	-0.3	-0.8	-0.6	-0.4	-0.1	0.1	0.2	-0.1	-0.3	-0.3	-0.1	0.6	
25-Jul	0.1	0.1	-0.3	-0.1	-0.2	0.0	0.0	-0.2	-0.2	-0.2	0.1	0.2	-0.1	-0.4	0.0	0.2	-0.1	0.2	0.5	0.6	0.1	0.2	0.3	0.3	0.0	0.6	
26-Jul	0.4	0.4	0.6	0.8	0.8	0.6	0.4	0.6	0.4	1.0	0.2	0.0	0.2	0.0	-0.3	0.2	0.6	0.6	0.5	0.4	0.4	0.5	0.5	0.4	0.4	1.0	
27-Jul	0.5	0.3	0.2	0.0	0.0	0.0	0.1	-0.2	-0.1	0.3	0.2	0.4	-0.4	0.2	0.1	-0.1	0.5	0.2	0.1	0.7	0.2	0.0	0.1	0.2	0.1	0.7	
28-Jul	0.2	-0.1	0.0	-0.2	-0.2	-0.3	-0.2	0.1	0.2	0.0	0.2	0.3	0.3	0.4	0.2	0.0	0.5	0.4	0.0	-0.2	0.0	0.2	0.0	-0.1	0.1	0.5	
29-Jul	-0.1	-0.1	-0.1	-0.1	-0.3	0.1	0.1	0.4	0.5	0.2	0.2	0.2	0.4	0.3	0.3	0.1	0.0	0.2	0.6	0.3	0.5	0.3	0.5	0.4	0.2	0.6	
30-Jul	0.1	0.3	0.2	0.0	0.3	0.2	0.0	0.2	0.1	0.4	0.3	0.0	0.6	0.5	0.5	-0.1	0.6	0.2	0.2	-0.2	0.1	0.1	0.1	-0.1	0.2	0.6	
31-Jul	0.5	0.5	0.4	-0.1	-0.1	0.1	-0.2	-0.2	-0.3	-0.1	-0.1	-0.2	-0.1	0.0	0.2	0.0	0.0	-0.1	-0.1	0.0	0.0	-0.2	-0.1	-0.1	0.0	0.5	
		0.0	0.1	0.1	0.0	0.0	0.1	0.1	0.2	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.0	0.1	0.1	Diurnal Average	
		0.5	0.5	0.6	0.8	0.8	0.6	0.7	0.7	0.7	1.0	0.5	0.9	1.4	1.3	1.1	1.2	1.3	0.9	0.9	0.7	0.7	0.6	0.6	0.6	Diurnal Maximum	



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

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

Mannix - July 2016

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



Summary of Hour Averages

Mannix - July 2016

Maximum Value: 2.0 km/h on Jul 2 12:00		Maximum Daily Average: 1.2 km/h on Jul 2		Hours in Service: 744																							
Minimum Value: -2.0 km/h on Jul 12 19:00		Minimum Daily Average: -0.9 km/h on Jul 12		Hours of Data: 744																							
Maximum Diurnal Average: 0.3 km/h at hour 13		Minimum Diurnal Average: -0.1 km/h at hour 21		Hours of Missing Data: 0																							
Monthly Average: 0.07 km/h		Percentiles: P ₁ = -1.3 P ₁₀ = -0.6 Q ₁ = -0.3 Median = 0.0 Q ₃ = 0.4 P ₉₀ = 1.0 P ₉₉ = 1.6		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-Jul	0.4	0.9	1.0	1.0	0.9	0.5	0.9	1.2	1.0	1.5	1.3	1.2	1.2	1.0	0.9	1.5	1.5	0.9	1.5	1.4	1.5	1.1	1.2	1.5	1.1	1.5	
2-Jul	1.3	1.4	1.0	1.0	1.1	0.6	0.3	0.8	1.3	1.5	1.5	2.0	1.4	1.6	1.6	1.4	0.7	1.3	1.1	1.0	1.0	1.2	1.3	0.9	1.2	2.0	
3-Jul	0.7	0.9	0.7	0.7	0.7	0.7	0.9	0.6	0.7	0.5	0.9	-0.3	0.8	0.7	0.6	0.7	0.5	0.6	0.4	0.5	0.6	0.7	0.5	0.0	0.6	0.9	
4-Jul	-0.1	-0.1	-0.1	-0.2	0.0	-0.1	-0.2	-0.1	-0.1	-0.1	0.0	-0.1	-0.1	0.1	-0.3	-0.1	0.0	0.1	0.1	0.2	0.4	0.8	0.5	0.0	0.0	0.8	
5-Jul	-0.2	-0.3	-0.4	-0.2	-0.2	-0.3	0.1	-0.1	0.0	0.1	0.2	0.5	0.3	0.3	0.4	0.3	0.6	-0.3	-0.8	0.1	0.0	-0.3	-0.4	-0.3	0.0	0.6	
6-Jul	-0.2	-0.2	-0.2	-0.2	-0.3	-0.5	0.6	-0.4	-0.6	-0.6	-0.1	0.1	0.0	-0.3	0.1	0.6	0.7	0.2	0.5	-0.2	-0.5	-0.5	-1.0	-0.7	-0.1	0.7	
7-Jul	-0.7	-0.5	-0.5	-0.9	-0.6	-0.3	-0.2	-0.3	-0.1	-0.5	0.1	-0.3	0.1	-0.4	0.0	0.2	0.2	0.2	0.1	0.0	-0.4	-0.5	-0.8	-0.4	-0.3	0.2	
8-Jul	-0.6	0.2	-0.1	-0.1	-0.1	-0.1	-0.1	0.3	0.5	0.5	0.1	-0.2	0.6	0.2	0.6	0.2	0.2	0.1	0.4	-0.1	-0.5	-0.4	-0.3	-0.2	0.0	0.6	
9-Jul	-0.3	-0.2	-0.1	0.1	-0.3	-0.3	-0.3	0.0	0.2	-0.1	-0.1	-0.1	-0.1	0.1	0.3	0.3	-0.3	-0.6	0.3	0.3	0.1	0.1	0.2	0.3	0.0	0.3	
10-Jul	0.2	-0.2	-0.3	-0.1	0.2	0.4	0.5	0.3	0.2	-0.1	0.4	-0.2	1.1	0.6	1.0	1.0	0.6	0.3	-0.3	-0.2	-0.3	-0.4	-0.3	-0.2	0.2	1.1	
11-Jul	-0.4	-0.3	-0.1	-0.2	-0.6	-0.3	0.2	0.5	0.4	0.2	-0.2	-0.5	-0.2	-0.5	-0.2	-0.7	-0.3	-1.2	-0.6	-0.6	-1.1	-0.9	-1.4	-1.3	-0.4	0.5	
12-Jul	-1.1	-1.1	-1.2	-1.0	-1.0	-0.7	-0.1	-0.1	0.2	-0.2	-0.9	-0.2	-1.1	-0.8	-1.0	-1.2	-1.1	-1.2	-2.0	-1.5	-1.4	-1.2	-1.4	-1.2	-0.9	0.2	
13-Jul	-1.1	-0.7	-0.8	-0.9	-1.0	-0.8	-0.7	-0.5	-0.5	-0.4	-0.4	-0.9	-0.6	-0.5	-0.7	-0.1	-0.2	-0.2	-0.5	-0.4	-0.5	-0.9	-0.6	-0.6	0.1	-0.6	0.1
14-Jul	-0.3	0.3	0.2	0.0	0.0	0.1	0.0	0.2	0.2	0.5	-0.1	0.5	-0.2	0.1	0.2	-0.2	-0.7	-0.5	-0.4	-0.7	-0.7	-0.3	-0.2	-0.3	-0.1	-0.1	0.5
15-Jul	0.0	-0.3	-0.3	-0.2	-0.2	0.0	0.3	0.0	-0.1	-0.3	-0.3	-0.2	0.1	-0.4	-0.1	-1.4	-0.5	0.0	-0.2	-0.2	-0.8	-0.3	-0.3	-0.1	-0.2	0.3	
16-Jul	-0.2	-0.4	-0.2	-0.3	0.1	-0.2	-0.1	-0.1	0.1	0.2	0.1	-0.4	0.0	-0.9	-0.2	0.3	-0.1	-1.2	-0.6	-0.6	-1.2	-0.7	-1.0	-1.4	-0.4	0.3	
17-Jul	-1.3	-1.0	-0.9	-0.6	-0.4	-0.3	0.0	-0.3	0.1	0.2	-0.6	-0.7	-0.2	-0.5	-0.7	-0.1	-0.6	0.1	-0.5	0.2	0.2	-0.1	0.1	0.3	-0.3	0.3	
18-Jul	0.4	0.6	0.8	0.6	1.0	0.8	1.1	1.2	0.9	0.7	0.6	0.6	1.1	0.4	0.0	0.0	0.0	0.7	0.4	0.1	0.4	0.2	0.3	0.2	0.5	1.2	
19-Jul	0.3	0.2	0.6	0.1	0.8	0.6	0.7	0.6	0.4	0.6	-0.2	-0.3	0.3	-0.1	-0.1	-0.8	-0.7	-0.4	-0.3	0.0	-0.1	-0.3	0.3	-0.1	0.1	0.8	
20-Jul	-0.1	-0.1	-0.2	-0.2	-0.6	-0.5	0.0	0.1	-0.4	-0.2	0.2	0.7	0.3	0.0	-0.3	-0.4	0.0	-0.2	0.1	0.0	0.0	0.1	0.2	-0.1	-0.1	0.7	
21-Jul	-0.3	-0.2	-0.1	0.0	0.1	-0.1	0.0	-0.2	-0.1	0.1	-0.1	-0.2	0.3	-0.4	-0.2	-0.7	-1.0	-0.9	-1.0	-0.3	-0.6	-0.4	0.4	0.6	-0.2	0.6	
22-Jul	1.2	0.6	1.1	1.1	1.3	1.1	1.4	1.5	1.6	1.7	1.3	1.8	1.7	0.7	0.4	0.2	0.0	-0.1	0.0	-0.2	-1.1	-0.4	-0.4	0.0	0.7	1.8	
23-Jul	-0.2	-0.4	-0.4	-0.4	-0.3	-0.4	-0.2	0.0	0.3	0.3	-0.4	-0.1	0.4	0.2	0.0	-0.1	0.3	0.4	0.4	0.3	0.4	0.0	0.1	0.2	0.0	0.4	
24-Jul	0.3	0.9	1.3	1.4	0.9	0.1	0.3	0.3	0.2	0.3	-0.3	0.0	-0.2	0.1	-0.3	-1.1	-0.9	-0.7	-0.2	-0.1	-0.1	-0.2	-0.3	-0.3	0.1	1.4	
25-Jul	-0.2	-0.2	-0.4	-0.2	-0.5	-0.2	-0.2	-0.2	0.1	0.0	0.2	0.2	0.1	-0.5	0.0	-0.5	-0.2	0.1	0.2	0.1	0.0	0.0	0.4	0.8	0.0	0.8	
26-Jul	1.2	0.7	0.9	0.8	1.1	0.8	0.8	1.0	0.6	1.2	0.8	0.5	0.9	0.4	-0.2	0.6	1.2	1.1	0.8	0.9	1.2	1.2	1.3	0.8	0.9	1.3	
27-Jul	1.1	0.7	1.0	0.3	0.1	0.0	0.2	0.1	0.0	0.3	0.1	0.5	-0.7	0.4	-0.5	-0.6	0.4	-0.1	-0.4	0.1	-0.2	-0.4	-0.2	0.1	0.1	1.1	
28-Jul	0.1	-0.2	0.1	-0.1	-0.2	-0.3	-0.3	-0.1	0.1	0.1	0.2	0.5	0.4	0.6	0.4	0.1	0.6	0.1	-0.1	0.0	0.2	0.8	0.6	0.0	0.1	0.8	
29-Jul	0.0	0.0	-0.1	-0.1	-0.2	0.1	0.3	0.6	1.0	0.7	0.4	0.5	0.9	1.0	0.7	0.7	0.5	0.5	1.2	0.9	1.1	1.0	1.0	1.0	0.6	1.2	
30-Jul	0.4	0.6	0.5	-0.1	0.5	0.6	0.4	0.5	0.2	0.7	0.1	-0.1	1.2	1.2	1.2	-0.1	-0.3	-0.3	-0.2	-0.7	-0.6	-0.7	-0.4	-0.6	0.2	1.2	
31-Jul	0.2	0.1	0.1	-0.3	-0.7	-0.8	-1.0	-0.9	-0.6	-0.1	-0.2	-0.1	-0.3	0.0	-0.1	-0.1	-0.1	-0.2	0.0	-0.2	-0.3	-0.3	-0.2	-0.4	-0.3	0.2	0.2
																								Diurnal Average			
																								Diurnal Maximum			



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

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

Mannix - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 3.9 km/h on Jul 24 15:00 Minimum Value: 0.2 km/h on Jul 5 00:00 Percentiles: P ₁ = 0.3 P ₁₀ = 0.6 Q ₁ = 1.0 Median = 1.6 Q ₃ = 2.2 P ₉₀ = 2.7 P ₉₉ = 3.5																						Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0			
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Jul	0.3	0.4	0.6	0.8	0.9	1.2	2.0	2.1	2.3	3.2	3.0	3.2	2.9	2.9	3.0	2.7	2.9	2.6	2.4	1.8	1.4	1.2	1.2	1.5	3.2
2-Jul	1.0	0.9	1.2	0.9	1.3	1.2	1.2	2.1	2.9	3.1	2.9	2.7	2.6	3.0	2.6	2.5	1.9	2.6	2.5	1.7	1.5	1.6	1.9	1.5	3.1
3-Jul	1.0	1.1	0.9	1.1	1.0	1.6	1.6	1.8	2.2	1.9	2.0	1.2	1.9	1.6	1.1	1.1	1.4	0.9	0.8	1.0	1.0	1.1	1.0	2.2	
4-Jul	0.7	0.6	0.8	0.9	1.3	1.1	1.0	1.4	1.3	1.6	1.4	1.6	1.5	1.8	1.6	2.0	1.8	1.9	1.0	1.1	0.7	0.6	0.7	0.2	2.0
5-Jul	0.5	0.4	0.4	0.3	0.4	0.7	1.1	1.9	2.1	1.3	1.1	1.1	2.1	2.4	2.0	1.9	1.3	2.1	1.9	1.4	1.2	1.0	0.9	1.0	2.4
6-Jul	1.0	1.0	1.4	1.5	1.5	1.2	1.2	1.7	2.5	2.3	2.4	2.0	1.7	2.3	2.5	2.5	2.5	2.0	1.8	1.8	1.4	1.2	1.6	1.9	2.5
7-Jul	1.9	1.6	1.6	1.4	1.5	1.7	1.8	1.8	1.5	2.0	2.2	1.7	1.9	1.8	2.4	2.6	2.6	2.4	2.4	2.1	1.8	1.5	1.4	1.4	2.6
8-Jul	1.4	1.4	1.1	1.2	1.2	1.0	1.3	1.5	1.7	1.9	2.3	2.5	2.3	2.3	2.0	2.2	2.0	1.9	1.7	1.6	1.7	1.8	1.7	1.2	2.5
9-Jul	0.8	0.8	1.1	1.0	0.9	1.0	0.9	0.8	1.1	1.1	1.4	1.5	1.5	2.0	2.4	2.6	1.5	1.0	1.2	1.5	0.9	0.7	0.5	0.6	2.6
10-Jul	1.0	0.5	0.4	0.3	0.6	0.9	1.0	0.8	1.3	1.6	1.8	1.8	2.8	2.7	2.7	2.8	2.0	2.0	3.0	1.9	1.0	0.9	0.6	0.6	3.0
11-Jul	1.1	0.8	0.5	0.5	0.8	0.9	1.3	1.7	1.9	2.4	2.3	2.5	2.2	2.7	3.2	2.4	2.0	2.5	2.4	2.6	2.5	2.2	2.3	2.2	3.2
12-Jul	2.4	2.2	2.0	1.8	1.9	2.2	2.3	2.2	2.6	2.7	2.7	3.4	3.4	3.8	3.6	3.4	3.4	3.2	3.4	2.9	2.7	2.2	2.5	2.2	3.8
13-Jul	1.9	2.0	1.8	2.1	2.1	2.1	2.4	2.5	2.5	3.1	3.6	3.1	3.1	3.4	3.4	3.4	3.0	2.9	2.1	2.0	1.5	1.4	1.7	1.4	3.6
14-Jul	0.9	0.5	0.4	0.3	0.3	0.4	0.8	0.9	1.4	1.9	2.1	1.8	2.1	2.7	2.9	2.7	3.0	1.7	1.6	1.6	1.5	1.0	0.8	0.9	3.0
15-Jul	0.4	0.3	0.4	0.3	0.3	0.6	1.1	1.3	1.7	2.0	2.2	2.5	2.5	2.3	2.7	3.2	2.5	1.9	1.8	1.6	1.7	0.8	0.6	0.6	3.2
16-Jul	0.5	0.5	0.5	0.4	0.4	0.6	1.2	1.6	1.7	1.8	1.9	1.7	2.1	2.8	1.3	1.2	1.3	3.3	1.4	1.9	2.5	2.3	2.6	2.5	3.3
17-Jul	2.4	2.4	1.9	1.5	1.2	1.6	1.9	2.0	2.7	3.1	2.9	2.8	2.9	3.1	2.9	3.3	2.9	2.7	1.7	1.6	1.1	0.5	0.3	0.3	3.3
18-Jul	0.5	0.3	0.5	0.8	0.8	1.2	1.5	1.6	1.6	1.8	1.8	2.0	2.2	2.3	2.2	2.3	2.0	2.0	2.1	1.7	0.6	0.5	0.6	0.6	2.3
19-Jul	0.5	0.7	0.6	0.8	0.9	0.9	1.1	1.4	1.5	2.0	2.7	2.8	3.0	2.7	2.8	2.9	2.7	2.1	1.0	0.5	0.9	0.8	0.4	0.7	3.0
20-Jul	1.6	1.7	1.3	1.3	1.6	1.5	1.6	1.1	0.9	0.6	1.1	1.8	1.8	1.7	1.9	1.7	1.9	1.4	1.5	0.9	0.3	0.3	0.6	0.7	1.9
21-Jul	0.8	0.9	1.0	1.4	0.8	1.1	1.5	2.2	1.7	1.7	1.9	2.6	3.1	2.5	2.9	2.9	3.2	3.7	3.0	2.6	2.2	1.6	1.2	1.1	3.7
22-Jul	0.9	0.7	0.8	1.0	1.1	1.3	1.7	2.1	2.2	2.3	2.5	3.0	3.1	2.8	1.7	2.5	1.6	1.4	1.0	1.4	1.6	1.5	1.5	0.3	3.1
23-Jul	0.3	0.8	0.7	0.7	0.7	0.8	0.7	1.7	1.8	2.2	2.0	2.5	2.2	2.4	2.4	1.9	1.8	1.6	1.6	1.2	0.8	0.6	0.8	0.5	2.5
24-Jul	0.6	1.1	1.0	1.1	1.0	1.3	1.7	2.8	2.9	2.8	2.8	3.5	3.5	3.5	3.9	2.8	3.5	3.3	2.6	1.7	1.6	1.4	1.6	1.5	3.9
25-Jul	2.1	2.0	1.6	1.0	1.0	1.4	1.6	2.5	2.4	2.1	2.4	2.7	2.8	2.8	2.6	2.2	2.2	2.0	1.7	1.3	0.9	0.7	0.9	1.0	2.8
26-Jul	1.2	1.0	1.1	1.1	1.5	1.3	1.5	1.8	2.0	2.0	2.4	2.0	2.2	2.7	2.1	2.0	2.2	2.0	1.5	1.3	0.7	1.3	0.9	0.8	2.7
27-Jul	0.9	0.9	0.7	0.5	0.4	0.3	0.6	1.0	1.2	1.6	1.9	2.5	2.3	3.2	3.0	2.6	2.6	2.1	1.5	1.5	1.3	1.1	0.7	0.6	3.2
28-Jul	0.8	0.5	0.4	0.5	0.4	0.8	0.8	0.6	0.6	0.8	1.2	1.4	2.0	2.0	2.1	2.0	1.9	1.7	0.8	1.3	1.9	1.1	1.2	0.6	2.1
29-Jul	0.5	0.4	0.5	0.4	0.4	0.6	1.1	1.5	1.8	2.0	2.1	1.9	1.9	2.5	2.6	2.4	2.3	1.9	1.7	0.9	0.5	0.7	1.1	1.1	2.6
30-Jul	1.1	0.7	0.9	0.9	1.0	1.0	1.4	0.8	0.8	1.4	1.9	2.4	2.5	2.3	2.0	3.2	2.3	2.1	1.4	1.4	2.0	2.3	1.4	1.7	3.2
31-Jul	1.3	1.1	1.1	0.6	1.5	2.3	1.9	2.1	1.7	1.1	1.1	1.1	1.6	1.4	1.3	1.6	0.8	1.0	1.1	1.0	1.1	1.6	1.2	1.4	2.3
Diurnal Maximum																									



Summary of Hour Averages

Mannix - July 2016

Maximum Value: 1.4 km/h on Jul 2 12:00 Maximum Daily Average: 0.5 km/h on Jul 22		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																																														
Minimum Value: -1.2 km/h on Jul 12 19:00 Maximum Diurnal Average: 0.4 km/h at hour 13 Monthly Average: 0.17 km/h		Minimum Daily Average: -0.2 km/h on Jul 12 Minimum Diurnal Average: 0.0 km/h at hour 23 Percentiles: $P_1 = -0.7$ $P_{10} = -0.2$ $Q_1 = 0.0$ Median = 0.1 $Q_3 = 0.4$ $P_{90} = 0.6$ $P_{99} = 1.0$																																														
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Jul	0.1	0.6	0.3	0.4	0.1	-0.2	0.1	0.5	0.3	0.3	0.0	0.2	0.7	0.2	0.3	0.9	0.7	0.2	0.8	0.8	1.0	0.1	0.2	0.5	0.4	1.0																						
2-Jul	1.0	1.0	0.2	0.2	0.1	-0.1	-0.1	0.3	0.3	0.1	1.0	1.4	0.6	1.1	0.8	1.0	0.4	0.5	0.3	0.3	0.1	0.1	0.2	0.1	0.5	1.4																						
3-Jul	-0.2	0.0	-0.1	0.0	-0.2	-0.1	0.1	-0.2	0.1	0.1	0.6	-0.1	0.5	0.3	0.3	0.5	0.3	0.3	0.1	0.3	0.3	0.3	0.3	0.3	0.2	0.6																						
4-Jul	0.1	0.1	0.0	-0.1	0.1	0.0	-0.1	0.1	-0.2	0.2	0.1	0.0	0.0	0.1	-0.3	0.1	0.3	0.5	0.0	0.0	0.2	0.5	0.2	0.1	0.1	0.5																						
5-Jul	0.0	-0.2	-0.2	0.0	0.1	0.0	0.3	0.1	0.3	0.1	0.2	0.4	0.7	0.4	0.1	-0.2	0.7	0.2	-0.3	0.3	0.4	0.0	0.1	0.1	0.1	0.7																						
6-Jul	0.2	0.4	0.1	0.3	0.3	-0.3	0.5	0.1	0.0	-0.3	0.1	0.0	-0.2	0.0	-0.1	0.4	0.3	0.4	0.7	0.0	-0.2	0.0	-0.6	0.0	0.1	0.7																						
7-Jul	-0.1	-0.1	0.0	-0.3	0.0	0.1	-0.1	-0.1	0.1	-0.2	0.7	-0.1	0.0	-0.1	0.2	0.5	0.5	0.3	0.1	0.1	0.2	0.2	-0.3	0.2	0.1	0.7																						
8-Jul	-0.1	0.4	0.0	-0.1	0.0	0.1	0.0	0.3	0.9	0.5	0.0	-0.3	0.8	0.3	0.6	0.1	0.0	0.3	0.0	0.0	-0.2	-0.2	-0.3	-0.1	0.1	0.9																						
9-Jul	-0.1	0.0	0.2	0.4	0.1	0.0	-0.1	0.0	0.1	0.0	-0.1	0.0	-0.2	-0.1	0.2	0.0	-0.7	-0.3	0.2	0.0	0.1	0.1	-0.1	0.1	0.0	0.4																						
10-Jul	0.3	0.1	-0.1	0.1	0.3	0.4	0.4	0.2	0.2	-0.3	0.5	-0.3	1.0	0.1	0.9	1.0	0.2	0.1	0.4	-0.2	-0.2	0.1	0.0	0.0	0.2	1.0																						
11-Jul	-0.1	-0.1	0.0	0.0	-0.2	0.0	0.2	0.8	0.7	0.5	-0.2	-0.3	0.5	0.2	0.7	-0.1	0.4	-0.6	0.2	0.5	-0.7	-0.2	-0.4	-0.4	0.1	0.8																						
12-Jul	-0.3	-0.3	-0.6	-0.4	-0.2	0.2	0.3	0.5	1.0	0.2	-0.4	0.5	-0.2	-0.1	-0.3	-0.4	-0.1	-0.3	-1.2	-0.7	-0.7	-0.7	-0.7	-0.6	-0.2	1.0																						
13-Jul	-0.3	-0.2	0.0	-0.3	-0.2	-0.1	-0.1	0.1	0.0	0.3	0.4	-0.6	0.0	0.6	-0.2	0.0	0.0	-0.1	-0.1	0.1	-0.4	-0.2	-0.1	0.1	-0.1	0.6																						
14-Jul	0.1	0.2	0.2	0.0	0.1	0.1	0.2	0.2	0.3	0.7	0.1	0.4	-0.1	0.5	0.8	0.2	0.0	-0.2	0.0	-0.6	-0.8	-0.3	0.1	-0.2	0.1	0.8																						
15-Jul	-0.1	0.0	0.1	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.2	0.0	0.3	-0.2	0.2	-0.6	0.2	0.8	0.5	0.6	-0.3	0.3	0.3	0.2	0.1	0.8																						
16-Jul	0.1	-0.1	0.2	-0.2	0.5	0.0	0.2	0.3	0.5	0.5	0.4	0.2	0.5	-0.2	0.6	0.4	0.1	-0.3	-0.2	-0.1	-0.5	-0.2	-0.6	-0.8	0.1	0.6																						
17-Jul	-0.9	-0.3	-0.2	0.0	0.4	0.2	0.7	0.2	0.7	0.6	-0.1	-0.5	0.3	-0.1	-0.1	0.7	-0.2	0.5	-0.2	0.3	0.2	0.0	0.1	0.1	0.1	0.7																						
18-Jul	0.2	0.7	0.9	0.5	0.6	0.5	0.6	0.6	0.4	0.3	0.1	0.1	1.1	0.0	-0.5	0.0	0.1	0.3	0.5	0.0	0.2	-0.3	-0.2	-0.1	0.3	1.1																						
19-Jul	-0.1	0.0	0.1	0.0	0.3	0.3	0.4	0.1	0.1	0.5	0.0	0.3	0.6	0.2	0.3	0.5	0.5	0.4	0.0	-0.1	0.1	-0.1	0.2	0.1	0.2	0.6																						
20-Jul	0.1	0.2	0.2	0.2	-0.3	-0.1	0.2	0.3	-0.2	0.0	0.4	0.8	0.5	0.4	-0.2	0.1	0.5	0.0	0.2	0.2	0.1	0.0	-0.1	-0.1	0.1	0.8																						
21-Jul	-0.2	0.0	0.3	0.0	-0.2	-0.1	0.1	0.3	0.3	0.3	0.1	0.1	0.7	0.1	0.0	-0.1	-0.1	0.1	-0.4	0.7	-0.3	-0.1	0.5	0.4	0.1	0.7																						
22-Jul	0.6	0.6	0.8	1.0	1.1	0.8	0.7	0.8	1.0	0.8	0.7	0.7	1.3	0.1	0.1	0.2	0.4	0.5	0.3	0.1	-0.6	0.2	0.1	0.1	0.5	1.3																						
23-Jul	0.0	-0.1	0.0	-0.1	0.2	-0.1	0.1	0.0	0.8	0.4	-0.3	0.2	0.6	0.2	0.1	0.1	0.8	0.4	0.1	0.4	0.4	0.1	0.2	0.0	0.2	0.8																						
24-Jul	0.0	0.8	0.8	0.8	0.5	-0.1	0.0	0.1	0.7	0.7	-0.1	0.4	-0.1	0.1	0.6	0.1	0.1	0.6	0.4	0.2	0.5	0.4	0.1	-0.2	0.3	0.8																						
25-Jul	0.2	0.3	0.4	0.3	-0.3	0.4	0.3	0.4	0.7	0.5	0.4	0.6	0.6	0.1	0.4	-0.3	0.0	0.3	0.2	0.1	0.2	0.0	0.2	0.1	0.3	0.7																						
26-Jul	0.1	-0.1	0.3	0.7	0.5	0.2	0.0	0.2	-0.1	0.7	0.4	0.3	0.6	0.1	-0.2	0.9	1.0	0.3	0.1	0.2	1.0	0.5	0.9	0.7	0.4	1.0																						
27-Jul	0.8	0.5	0.2	0.1	-0.1	0.1	0.3	0.3	0.2	0.6	0.4	1.0	-0.4	0.9	0.0	0.0	0.7	0.4	-0.1	0.1	0.1	-0.1	-0.2	0.1	0.3	1.0																						
28-Jul	0.3	0.0	0.1	0.1	0.1	-0.1	-0.2	0.0	0.1	0.0	-0.1	0.2	0.0	0.5	0.4	0.0	0.4	0.0	0.0	0.0	0.2	0.5	0.3	-0.1	0.1	0.5																						
29-Jul	0.0	0.1	0.1	0.1	-0.1	-0.1	0.1	0.5	0.9	0.5	-0.2	0.5	0.4	0.5	0.5	0.5	0.5	0.2	0.3	0.4	0.6	0.7	0.8	0.0	0.1	0.3	0.9																					
30-Jul	0.1	0.2	0.4	0.1	0.3	0.4	0.0	0.3	0.3	0.4	-0.2	-0.7	1.0	0.4	0.7	0.4	-0.1	-0.4	0.0	-0.4	0.0	-0.3	-0.1	-0.2	0.1	1.0																						
31-Jul	0.2	0.1	0.2	-0.2	-0.4	-0.3	-0.4	-0.2	0.0	0.1	0.1	-0.1	0.4	0.5	0.5	0.8	0.3	0.3	0.1	0.1	0.3	0.4	0.2	0.2	0.1	0.8																						
																								0.1	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.2	0.2	0.4	0.2	0.2	0.2	0.3	0.2	0.1	0.1	0.0	0.1	0.0	0.0	Diurnal Average
																								1.0	1.0	0.9	1.0	1.1	0.8	0.7	0.8	1.0	0.8	1.0	1.4	1.3	1.1	0.9	1.0	1.0	0.8	0.8	0.8	1.0	0.8	0.9	0.7	Diurnal Maximum



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

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

Mannix - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 4.0 km/h on Jul 12 14:00 Minimum Value: 0.2 km/h on Jul 17 22:00 Percentiles: P ₁ = 0.3 P ₁₀ = 0.6 Q ₁ = 0.9 Median = 1.5 Q ₃ = 2.3 P ₉₀ = 2.9 P ₉₉ = 3.7																								Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Jul	0.3	0.4	0.4	0.8	1.4	1.4	1.8	2.1	2.5	3.5	3.1	3.6	3.2	2.9	3.3	3.2	3.3	2.9	2.5	1.7	1.2	0.9	0.8	1.2	3.6
2-Jul	0.7	0.7	0.6	1.3	1.5	1.2	1.4	2.3	3.1	3.4	2.9	3.2	2.8	3.5	2.8	2.5	1.9	3.0	2.6	1.9	1.6	1.7	1.7	1.5	3.5
3-Jul	1.0	1.2	1.1	0.8	1.5	1.7	1.6	1.9	2.6	2.3	1.7	0.6	2.1	1.8	1.3	1.7	1.1	1.4	1.0	1.0	0.8	1.0	0.9	0.9	2.6
4-Jul	0.5	0.5	0.6	0.8	1.2	1.0	0.8	1.2	1.1	1.4	1.3	1.5	1.3	1.5	1.4	2.0	1.8	2.0	0.9	1.0	0.8	0.5	0.5	0.2	2.0
5-Jul	0.5	0.4	0.5	0.4	0.5	0.5	0.8	1.7	2.1	1.3	1.3	1.2	2.3	2.9	2.2	2.2	1.5	1.8	1.6	1.6	1.1	0.7	0.7	1.2	2.9
6-Jul	1.0	0.9	1.6	1.3	1.4	1.0	1.4	1.8	2.4	2.2	2.5	2.2	2.0	2.0	2.4	2.5	2.6	2.1	2.0	1.7	1.0	1.2	1.5	2.0	2.6
7-Jul	1.6	1.5	1.5	1.2	1.4	1.6	1.8	1.8	1.5	2.0	2.5	1.8	1.6	1.8	2.5	2.8	2.6	2.4	2.3	1.8	1.5	1.4	1.4	1.4	2.8
8-Jul	1.0	1.2	1.2	1.0	1.0	0.9	1.3	1.5	1.9	2.2	2.6	2.8	2.7	2.7	2.5	2.7	2.4	2.1	1.8	1.4	1.2	1.4	1.6	1.2	2.8
9-Jul	0.9	0.8	1.0	1.1	0.8	0.8	0.7	0.8	1.0	1.1	1.2	1.8	1.6	2.4	2.7	2.8	1.6	1.1	1.1	1.1	0.6	0.6	0.8	0.7	2.8
10-Jul	1.1	0.6	0.4	0.4	0.9	1.1	1.1	0.7	1.3	1.8	2.0	1.9	3.0	2.9	2.9	2.9	2.3	2.1	2.6	1.8	1.2	0.7	0.8	0.7	3.0
11-Jul	1.1	0.8	0.6	0.4	0.8	0.9	1.2	1.9	2.2	2.8	2.7	2.9	2.1	3.1	3.3	2.3	2.1	2.5	2.4	2.5	1.8	1.7	1.9	1.8	3.3
12-Jul	2.1	1.9	1.9	1.8	1.6	2.2	2.3	2.5	2.7	2.9	2.6	3.7	3.8	4.0	3.8	3.5	3.4	3.1	3.0	2.4	2.4	1.7	2.2	2.1	4.0
13-Jul	1.8	1.8	1.7	1.8	1.8	1.9	2.3	2.3	2.5	3.2	3.6	3.2	3.1	3.7	3.1	3.2	2.7	2.7	2.0	2.0	1.2	0.9	1.4	0.9	3.7
14-Jul	0.7	0.7	0.7	0.6	0.3	0.3	0.7	0.8	1.5	2.1	2.4	2.2	2.3	3.2	3.6	3.3	3.2	1.4	1.8	1.5	1.6	1.3	0.9	0.9	3.6
15-Jul	0.5	0.2	0.3	0.4	0.3	0.3	0.8	1.5	1.8	2.1	2.6	3.0	3.0	2.8	3.1	2.9	2.9	2.2	2.0	1.5	1.5	0.8	0.6	0.4	3.1
16-Jul	0.5	0.4	0.4	0.4	0.5	0.5	1.1	1.5	1.8	2.0	2.1	2.3	2.2	2.7	1.5	1.3	1.3	2.9	1.3	1.9	2.3	2.2	2.4	2.1	2.9
17-Jul	2.1	2.3	1.6	1.4	1.2	1.4	2.0	2.2	2.8	3.3	3.2	3.1	3.3	3.6	3.4	3.9	3.2	3.0	1.8	1.3	0.6	0.2	0.2	0.8	3.9
18-Jul	0.7	0.4	0.2	0.5	0.8	0.7	1.0	1.2	1.4	1.7	1.8	1.9	2.6	2.6	2.6	2.7	2.3	2.2	2.0	1.5	0.7	0.5	0.6	0.7	2.7
19-Jul	0.6	0.9	0.8	1.0	0.7	0.9	0.9	1.3	1.5	2.0	2.9	3.2	3.4	3.4	3.2	3.1	2.9	2.1	0.9	0.5	1.0	0.8	0.5	0.6	3.4
20-Jul	1.4	1.4	1.2	1.4	1.4	1.2	1.6	1.1	0.8	0.5	1.2	2.1	2.1	1.9	2.3	1.8	2.2	1.4	1.7	1.0	0.3	0.3	0.5	0.7	2.3
21-Jul	0.7	0.9	0.9	1.4	1.0	1.5	1.8	2.3	1.8	1.8	2.0	2.5	3.2	2.3	2.6	2.7	2.9	3.7	2.8	2.6	1.9	1.5	1.2	1.4	3.7
22-Jul	1.4	0.6	0.6	0.7	0.8	0.9	1.5	1.8	2.2	2.1	2.5	2.9	3.4	2.8	1.8	2.5	1.5	1.6	1.1	1.6	1.3	1.5	1.1	0.4	3.4
23-Jul	0.3	0.5	0.5	0.6	0.6	0.7	0.7	1.8	1.9	2.5	2.2	2.8	2.6	2.7	2.6	1.6	1.9	1.7	1.6	1.2	0.9	0.4	0.8	0.6	2.8
24-Jul	0.8	1.1	0.7	0.8	0.8	1.2	1.6	2.8	3.0	3.0	2.8	3.4	3.5	3.7	3.7	2.9	3.4	3.6	2.4	1.6	1.4	1.4	1.6	1.5	3.7
25-Jul	2.3	2.2	1.6	0.9	1.2	1.3	1.6	2.5	2.6	2.4	2.7	3.0	3.1	3.3	3.1	2.6	2.5	2.4	1.9	1.1	0.7	0.8	1.5	1.4	3.3
26-Jul	1.1	1.1	1.5	1.6	1.7	1.5	1.6	2.0	2.1	2.2	2.4	2.2	2.6	3.1	2.3	2.4	2.4	2.1	1.5	0.9	0.5	1.0	0.7	0.6	3.1
27-Jul	0.6	1.0	0.8	0.7	0.4	0.3	0.5	0.9	1.2	1.7	2.0	2.8	2.5	3.5	3.1	2.5	2.9	2.4	1.3	1.0	0.8	0.8	0.6	0.8	3.5
28-Jul	0.8	0.5	0.3	0.5	0.5	0.7	0.8	0.7	0.7	0.7	1.2	1.5	2.1	2.1	2.4	2.3	2.2	2.1	1.0	1.1	1.7	1.1	0.9	0.5	2.4
29-Jul	0.5	0.5	0.5	0.5	0.4	0.4	1.1	1.5	2.0	2.0	2.1	2.3	2.1	2.7	3.0	2.6	2.5	2.2	1.3	0.7	0.5	1.0	1.0	1.1	3.0
30-Jul	1.2	0.9	0.9	1.0	1.0	1.1	1.1	0.8	0.8	1.4	1.9	2.4	2.8	2.5	1.7	2.9	1.9	1.9	1.1	1.1	1.7	1.7	0.6	0.9	2.9
31-Jul	1.0	0.9	1.0	0.7	1.1	2.0	1.8	2.0	1.6	1.2	1.1	0.8	1.5	1.3	1.2	1.4	0.6	1.0	1.0	0.9	0.9	1.3	1.1	1.2	2.0
Diurnal Maximum																									



Summary of Hour Averages

Mannix - July 2016

Maximum Value: 3.8 km/h on Jul 24 18:00		Maximum Daily Average: 1.9 km/h on Jul 12		Hours in Service: 744																						
Minimum Value: -1.0 km/h on Jul 30 12:00		Minimum Daily Average: 0.1 km/h on Jul 3		Hours of Data: 742																						
Maximum Diurnal Average: 1.1 km/h at hour 18		Minimum Diurnal Average: 0.6 km/h at hour 12		Hours of Missing Data: 2																						
Monthly Average: 0.81 km/h		Percentiles: P ₁ = -0.5 P ₁₀ = 0.0 Q ₁ = 0.2 Median = 0.7 Q ₃ = 1.3 P ₉₀ = 1.9 P ₉₉ = 2.9		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-Jul	0.2	0.5	0.4	0.3	-0.2	-0.6	0.1	0.4	0.0	0.0	-0.1	0.0	0.5	-0.1	0.2	0.4	0.2	-0.2	0.5	0.6	0.9	0.2	0.4	0.7	0.2	0.9
2-Jul	1.0	0.7	0.6	0.2	-0.4	-0.3	-0.2	-0.2	0.1	-0.2	0.9	1.4	0.4	0.9	0.6	0.9	0.2	0.2	-0.1	0.1	-0.1	0.0	0.3	0.1	0.3	1.4
3-Jul	-0.1	0.0	-0.1	0.2	-0.7	-0.5	-0.1	-0.5	-0.3	-0.3	0.7	0.1	0.3	0.2	0.1	0.2	0.1	0.2	0.0	0.3	0.3	0.3	0.4	1.3	0.1	1.3
4-Jul	0.9	0.8	0.4	0.3	0.6	0.7	0.5	0.7	0.1	0.7	0.8	0.3	0.3	0.4	0.0	0.2	1.0	1.1	0.0	-0.1	0.0	0.4	0.2	0.2	0.4	1.1
5-Jul	0.7	0.4	0.7	0.7	0.9	0.9	0.8	1.3	1.4	0.5	0.3	0.4	1.3	0.8	0.0	-0.3	0.7	1.5	1.5	1.1	1.6	1.0	1.5	1.4	0.9	1.6
6-Jul	1.4	1.4	1.1	1.7	1.8	0.7	0.5	1.3	1.7	0.9	0.9	0.4	-0.1	1.3	0.4	0.6	0.5	0.8	1.1	0.9	0.9	1.2	1.2	1.8	1.0	1.8
7-Jul	1.6	1.4	1.4	1.4	1.4	1.3	1.1	0.7	0.8	0.9	1.5	0.8	0.5	1.2	1.5	1.2	1.6	1.3	1.1	1.0	1.7	1.7	1.2	1.7	1.3	1.7
8-Jul	1.3	1.4	0.4	0.3	0.3	0.5	0.4	0.6	1.3	0.7	0.1	0.0	1.3	0.6	0.8	0.3	0.0	0.7	0.3	1.0	1.0	0.8	0.2	0.2	0.6	1.4
9-Jul	0.4	0.5	0.5	0.7	0.6	0.7	0.5	0.2	0.2	0.2	0.1	0.2	-0.2	-0.1	0.2	0.1	-0.6	0.6	0.5	0.3	0.5	0.2	-0.1	0.2	0.3	0.7
10-Jul	0.5	0.4	0.0	0.2	0.1	0.2	0.2	0.2	0.3	-0.1	0.8	-0.3	1.0	0.2	1.1	1.5	0.1	-0.1	1.4	0.7	0.7	1.7	0.9	1.2	0.5	1.7
11-Jul	1.3	0.5	0.5	0.9	1.0	0.7	0.7	1.2	1.4	1.0	0.4	0.7	2.8	1.9	2.8	1.8	1.9	1.3	2.1	3.0	1.2	1.8	2.2	2.5	1.5	3.0
12-Jul	2.1	2.2	1.4	1.4	2.1	2.0	1.9	1.6	2.0	1.7	1.3	2.1	1.9	2.0	2.0	2.0	2.6	2.4	1.8	1.8	1.9	1.8	1.9	1.7	1.9	2.6
13-Jul	1.8	1.7	2.2	2.1	2.2	2.0	1.7	1.7	1.9	2.1	2.2	0.8	1.9	2.5	1.7	1.1	1.1	1.3	1.3	1.4	1.0	1.3	1.5	0.6	1.6	2.5
14-Jul	0.5	0.1	0.1	0.1	0.1	0.2	0.6	0.3	0.5	1.1	0.7	0.7	0.4	1.2	1.9	1.2	1.8	1.1	0.8	0.5	-0.3	0.2	1.7	0.9	0.7	1.9
15-Jul	0.4	0.8	0.7	0.8	0.7	0.7	0.3	0.3	0.4	0.7	1.0	0.3	0.6	0.0	0.6	1.7	1.5	2.1	1.8	2.3	1.5	2.2	2.0	1.5	1.0	2.3
16-Jul	1.2	0.9	1.0	0.5	1.7	0.7	0.9	1.0	1.2	1.1	0.9	1.2	1.3	2.1	2.4	0.5	0.3	2.4	1.3	2.0	2.1	2.3	2.0	2.1	1.4	2.4
17-Jul	2.1	2.6	2.1	2.0	2.1	1.6	1.9	1.4	1.9	2.1	1.6	0.9	1.6	1.1	1.4	2.2	1.3	1.6	1.0	0.7	0.6	0.2	0.2	0.0	1.4	2.6
18-Jul	0.2	0.5	0.7	0.4	0.4	0.3	0.6	0.5	0.4	0.2	0.0	-0.2	0.6	-0.2	-0.6	0.1	0.1	0.2	0.6	-0.1	0.0	-0.6	-0.5	-0.3	0.1	0.7
19-Jul	-0.3	-0.2	-0.1	-0.1	0.2	0.1	0.3	0.0	0.0	0.5	0.4	0.8	0.9	0.8	1.0	2.9	3.4	2.3	0.8	0.3	0.9	0.6	0.1	0.7	0.7	3.4
20-Jul	1.1	1.2	1.3	1.4	1.1	1.4	1.2	1.1	0.5	0.5	0.7	1.0	0.8	1.2	0.5	1.2	1.3	0.8	0.6	0.7	0.2	-0.1	-0.4	0.1	0.8	1.4
21-Jul	0.2	0.6	0.9	0.2	-0.3	-0.1	0.1	1.5	1.4	1.0	0.4	0.9	1.5	1.3	0.7	1.7	2.6	3.0	1.7	2.4	1.3	0.9	0.8	0.4	1.0	3.0
22-Jul	0.3	0.5	0.6	0.9	1.0	0.6	0.7	0.8	1.0	0.7	0.6	0.7	1.2	-0.2	-0.1	0.2	1.2	1.5	1.0	1.2	1.4	1.9	1.7	0.4	0.8	1.9
23-Jul	0.4	1.0	1.1	1.1	1.6	1.5	0.8	0.5	1.0	0.6	0.1	0.9	0.9	0.3	0.6	0.9	1.6	0.6	-0.1	0.3	0.5	0.4	0.3	0.0	0.7	1.6
24-Jul	-0.1	0.5	0.5	0.6	0.3	-0.2	-0.2	0.2	1.2	1.0	0.4	0.7	0.3	0.7	1.3	0.3	3.4	3.8	3.2	1.0	1.8	1.8	1.6	0.6	1.0	3.8
25-Jul	1.5	1.7	2.5	1.9	0.3	1.9	1.4	1.8	1.9	1.5	1.2	1.3	1.6	1.0	1.2	0.2	0.7	0.7	0.6	0.4	0.5	0.2	0.1	-0.2	1.1	2.5
26-Jul	0.3	0.0	0.1	0.3	0.1	0.0	-0.3	-0.1	-0.2	0.3	0.3	0.2	0.5	-0.1	0.2	1.3	1.0	0.2	0.2	0.3	0.9	0.6	0.8	0.6	0.3	1.3
27-Jul	0.9	0.3	0.1	0.0	0.0	0.5	0.7	0.6	0.6	1.2	1.2	1.7	0.4	2.0	1.7	1.6	1.6	1.6	0.6	0.6	0.8	0.9	0.1	0.2	0.8	2.0
28-Jul	0.4	0.5	0.4	0.6	0.6	0.4	0.6	1.0	0.6	0.0	-0.1	0.0	-0.2	0.3	0.4	-0.1	0.3	0.1	0.2	0.0	0.7	0.3	0.2	0.0	0.3	1.0
29-Jul	0.2	0.4	0.6	0.6	0.0	-0.1	0.0	0.4	0.9	0.5	-0.5	0.6	0.2	0.2	0.2	0.3	0.1	0.2	0.3	0.5	0.5	0.5	0.2	0.1	0.3	0.9
30-Jul	0.0	0.1	0.5	0.7	0.4	0.2	-0.1	0.3	0.5	0.3	-0.3	-1.0	0.5	0.3	0.5	1.9	0.8	0.5	0.5	0.9	1.8	1.8	1.0	1.2	0.5	1.9
31-Jul	0.6	0.5	0.5	0.2	1.2	1.9	1.5	2.0	1.9	0.8	UO	UO	1.8	1.8	1.9	2.6	1.5	1.2	1.0	1.2	1.9	1.8	1.3	1.9	1.4	2.6
																								Diurnal Average		
																								Diurnal Maximum		
UO - Unstable Operation																										



Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 4.1 km/h on Jul 12 14:00 Minimum Value: 0.2 km/h on Jul 17 22:00 Percentiles: P ₁ = 0.3 P ₁₀ = 0.6 Q ₁ = 0.9 Median = 1.5 Q ₃ = 2.4 P ₉₀ = 3.0 P ₉₉ = 3.9																						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-Jul	0.3	0.3	0.4	0.6	1.0	1.3	1.6	2.1	2.4	3.5	3.2	3.6	3.4	3.0	3.2	2.9	3.0	2.7	2.4	1.7	1.2	0.8	0.6	0.9	3.6
2-Jul	0.6	0.5	0.5	1.0	1.1	0.9	1.2	2.0	3.1	3.5	3.0	3.2	2.9	3.6	2.8	2.4	1.8	3.0	2.7	1.6	1.4	1.4	1.5	1.3	3.6
3-Jul	0.8	0.9	0.9	0.6	1.2	1.5	1.4	1.9	2.3	2.2	1.6	0.6	1.7	1.5	1.2	1.3	1.2	1.4	0.9	0.7	0.8	0.8	1.0	0.8	2.3
4-Jul	0.5	0.5	0.6	0.8	1.2	1.1	0.7	1.1	1.1	1.4	1.3	1.5	1.3	1.6	1.3	2.0	1.9	2.0	0.9	0.9	0.7	0.5	0.4	0.4	2.0
5-Jul	0.7	0.5	0.6	0.6	0.7	0.6	0.8	1.5	2.1	1.3	1.2	1.1	2.2	2.9	2.1	1.8	1.5	1.8	1.7	1.8	1.2	0.8	0.9	1.2	2.9
6-Jul	1.1	1.1	1.5	1.2	1.5	1.1	1.2	1.7	2.5	2.2	2.5	2.1	1.9	2.0	2.3	2.5	2.6	2.0	2.0	1.7	0.9	1.2	1.8	2.1	2.6
7-Jul	1.6	1.6	1.5	1.3	1.4	1.6	1.8	1.8	1.6	2.1	2.5	1.9	1.6	1.8	2.4	2.9	2.6	2.5	2.4	1.6	1.5	1.6	1.5	1.6	2.9
8-Jul	0.9	1.1	1.1	1.0	0.9	0.9	1.2	1.4	1.9	2.2	2.6	2.9	2.8	2.8	2.8	2.7	2.2	2.2	1.8	1.3	1.1	1.4	1.5	1.2	2.9
9-Jul	1.1	0.9	1.1	1.2	0.9	0.9	0.7	0.7	0.9	1.2	1.2	1.8	1.6	2.4	2.6	2.8	1.5	1.1	0.9	0.9	0.5	0.5	0.6	0.7	2.8
10-Jul	1.1	0.7	0.4	0.4	0.6	0.9	0.9	0.7	1.2	1.7	1.9	1.8	2.9	2.8	2.8	2.9	2.0	2.1	2.6	1.9	1.1	0.8	1.0	0.9	2.9
11-Jul	1.2	0.9	0.6	0.6	0.9	1.0	1.1	1.9	2.2	3.0	2.8	3.0	2.2	3.4	3.4	2.3	2.1	2.7	2.7	2.7	1.8	1.6	2.0	1.9	3.4
12-Jul	2.4	2.1	2.1	2.0	1.8	2.5	2.4	2.5	2.9	3.0	2.6	3.7	3.9	4.1	3.9	3.6	3.5	3.2	2.8	2.4	2.3	1.5	2.0	2.3	4.1
13-Jul	2.0	1.9	1.7	1.7	1.7	2.0	2.4	2.2	2.5	3.2	3.5	3.3	3.3	3.8	3.2	3.1	2.8	2.7	2.1	2.0	1.1	0.8	1.4	0.8	3.8
14-Jul	0.7	0.6	0.7	0.5	0.3	0.3	0.7	0.8	1.5	2.1	2.6	2.3	2.4	3.3	3.8	3.3	3.3	3.3	1.5	1.9	1.5	1.7	1.5	0.9	3.8
15-Jul	0.5	0.4	0.4	0.5	0.4	0.4	0.7	1.5	1.8	2.2	2.7	3.2	3.0	3.1	3.3	2.8	2.9	2.3	2.1	1.5	1.5	0.8	0.6	0.5	3.3
16-Jul	0.5	0.4	0.5	0.5	0.5	0.6	1.1	1.3	1.8	2.0	2.2	2.4	2.4	2.8	2.0	1.2	1.3	3.1	1.5	2.0	2.4	2.2	2.4	2.0	3.1
17-Jul	1.8	2.0	1.5	1.5	1.4	1.5	1.9	2.2	2.6	3.3	3.3	3.2	3.4	3.7	3.6	4.0	3.2	2.8	1.9	1.1	0.5	0.2	0.2	0.4	4.0
18-Jul	0.6	0.4	0.2	0.3	0.4	0.4	0.7	1.1	1.2	1.6	1.8	1.8	2.3	2.5	2.7	2.9	2.4	2.3	2.1	1.6	0.7	0.4	0.5	0.7	2.9
19-Jul	0.7	1.0	1.0	1.2	0.6	0.8	0.9	1.2	1.4	1.9	3.0	3.2	3.4	3.7	3.4	3.4	2.7	2.3	1.0	0.5	0.9	0.9	0.4	0.7	3.7
20-Jul	1.3	1.2	1.2	1.5	1.4	1.2	1.5	1.1	0.9	0.6	1.1	2.1	2.2	1.9	2.2	1.9	2.3	1.5	1.8	1.1	0.3	0.2	0.4	0.7	2.3
21-Jul	0.7	1.0	1.2	1.4	1.0	1.7	1.8	2.5	1.8	1.8	2.0	2.6	3.3	2.4	2.6	2.8	2.9	3.7	2.8	2.7	1.9	1.3	1.2	1.0	3.7
22-Jul	1.3	0.6	0.5	0.6	0.7	0.8	1.5	1.8	2.2	2.0	2.4	2.9	3.6	2.7	1.8	2.5	1.7	1.6	1.2	1.6	1.2	1.5	1.3	0.6	3.6
23-Jul	0.4	0.6	0.6	0.5	0.7	0.7	0.9	1.9	1.8	2.5	2.4	2.7	2.8	2.8	2.7	1.4	1.8	1.6	1.5	1.3	0.9	0.5	0.8	0.7	2.8
24-Jul	0.8	1.1	0.8	0.7	0.9	1.1	1.7	2.9	3.1	3.1	3.0	3.8	3.7	3.9	3.9	3.0	3.9	3.6	2.5	1.5	1.5	1.4	1.7	1.5	3.9
25-Jul	2.3	2.2	1.6	1.1	1.2	1.3	1.5	2.4	2.6	2.4	2.8	3.2	3.2	3.4	3.1	2.8	2.6	2.6	1.9	1.1	0.6	0.7	1.2	1.3	3.4
26-Jul	0.8	0.9	1.4	1.3	1.4	1.4	1.5	1.8	2.1	1.9	2.4	2.2	2.6	3.2	2.5	2.5	2.4	2.0	1.4	0.6	0.4	0.9	0.6	0.5	3.2
27-Jul	0.6	1.2	0.7	0.7	0.5	0.4	0.5	0.8	1.2	1.7	2.1	3.0	2.5	3.5	3.2	2.7	3.1	2.5	1.4	0.9	0.7	0.8	0.5	0.8	3.5
28-Jul	0.8	0.6	0.3	0.6	0.7	0.7	0.8	0.9	0.7	0.6	1.1	1.4	2.0	2.0	2.4	2.2	2.2	2.0	1.0	1.1	1.6	1.1	0.8	0.6	2.4
29-Jul	0.5	0.7	0.6	0.6	0.4	0.5	1.0	1.5	2.1	2.1	2.0	2.5	2.1	2.8	3.1	2.8	2.6	2.3	1.2	0.6	0.5	0.8	0.7	1.0	3.1
30-Jul	1.1	0.7	0.9	1.1	1.0	1.2	1.1	0.8	0.8	1.2	1.6	2.2	2.5	2.5	1.6	2.9	1.8	1.9	1.0	1.3	1.8	1.5	0.6	0.8	2.9
31-Jul	1.0	1.0	1.0	0.8	1.3	2.0	2.2	2.2	1.8	1.2	UO	UO	1.5	1.3	1.5	1.4	0.7	1.1	1.1	0.8	0.9	1.3	1.1	1.4	2.2
Diurnal Maximum																									
UO - Unstable Operation																									



Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	July 4, 2016	Last Calibration	June 7, 2016
Station Name	Mannix	Station Number	AMS 5
Reason:	Routine		
Start Time (MST)	9:20	End Time (MST)	11:40
Gas Cert Reference	S960161A	Station temp.	22 Deg C
Cal Gas Concentration	50 ppm	Cal Gas Exp Date	26/09/2017
Calibrator Make/Model	Sabio 4010	Serial Number	11061107
ZAG Make/Model	API 701	Serial Number	1083
DACS make/model	Campbell Scientific CR3000	DACS serial No.	2633

Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 1000 ppb		PMT voltage	-635	-635
Analyzer IP address	192.168.1.43		Lamp voltage	818	814
Calculated slope	1.003925	1.001862	Chamber temp	45.1	45.1
Calculated intercept	0.144398	0.705913	Pressure	687.9	688.2
Analyzer Background	7.4	7.4	Flow	0.465	0.466
Analyzer Coefficient	0.974	0.974	Intensity	90	91

Analyzer make TEI 43i Analyzer serial # 1008841399

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.0	----
as found span	5000	60.0	600.0	598.1	1.003
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	60.0	600.0	598.1	1.003
second point	5000	30.0	300.0	299.6	1.001
third point	5000	15.0	150.0	147.5	1.017
as left zero	5000	0.0	0.0	0.3	----
as left span	5000	60.0	600.0	599.7	1.001
Average Correction Factor					1.007

Corrected As found 598.1 Previous response 597.5 % change -0.1%

Notes:

Inlet filter changed after as founds. No adjustments.

Calibration Performed By: Evan Magill



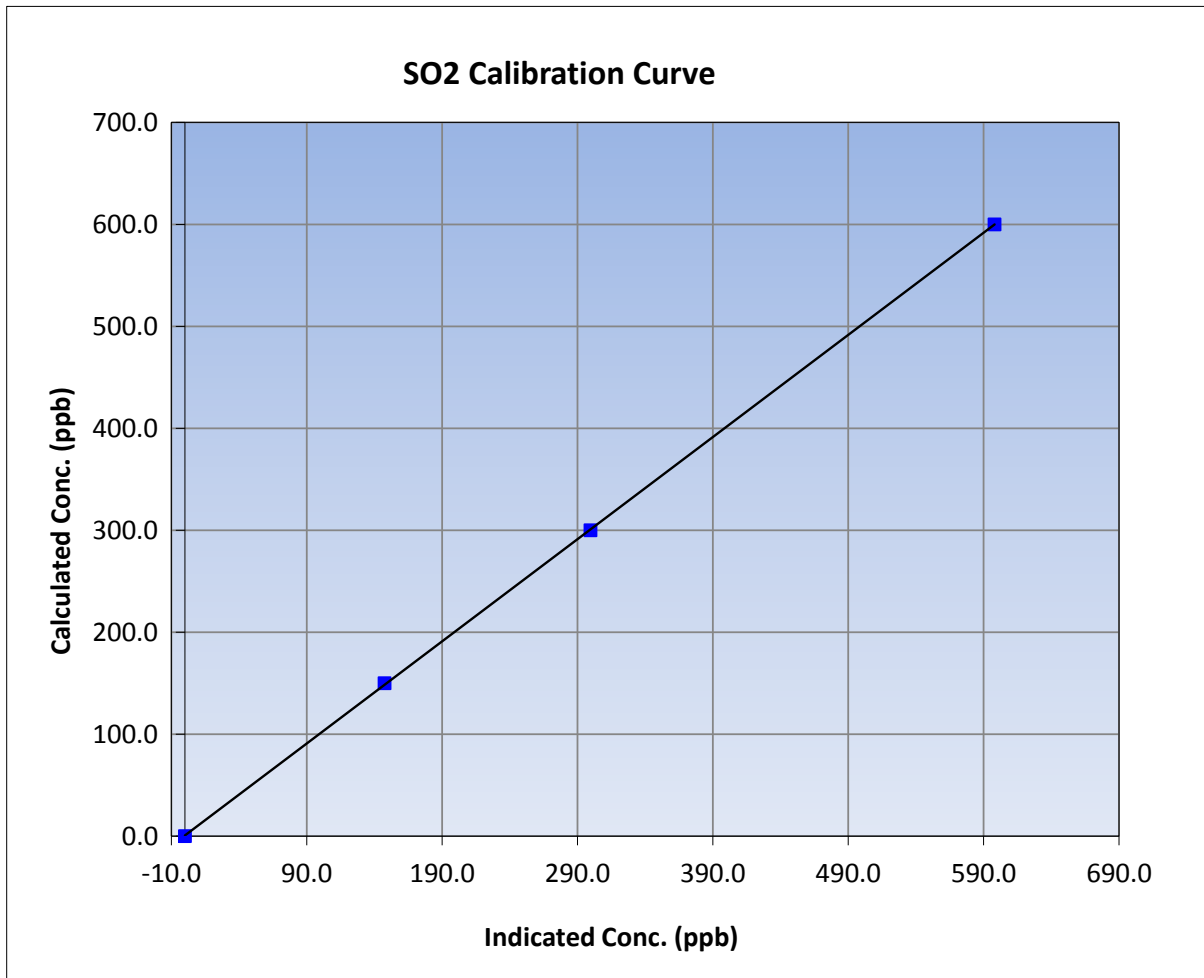
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	July 4, 2016	Previous Calibration	June 7, 2016
Station Name	Mannix	Station Number	AMS 5
Start Time (MST)	9:20	End Time (MST)	11:40
Analyzer make	TEI 43i	Analyzer serial #	1008841399

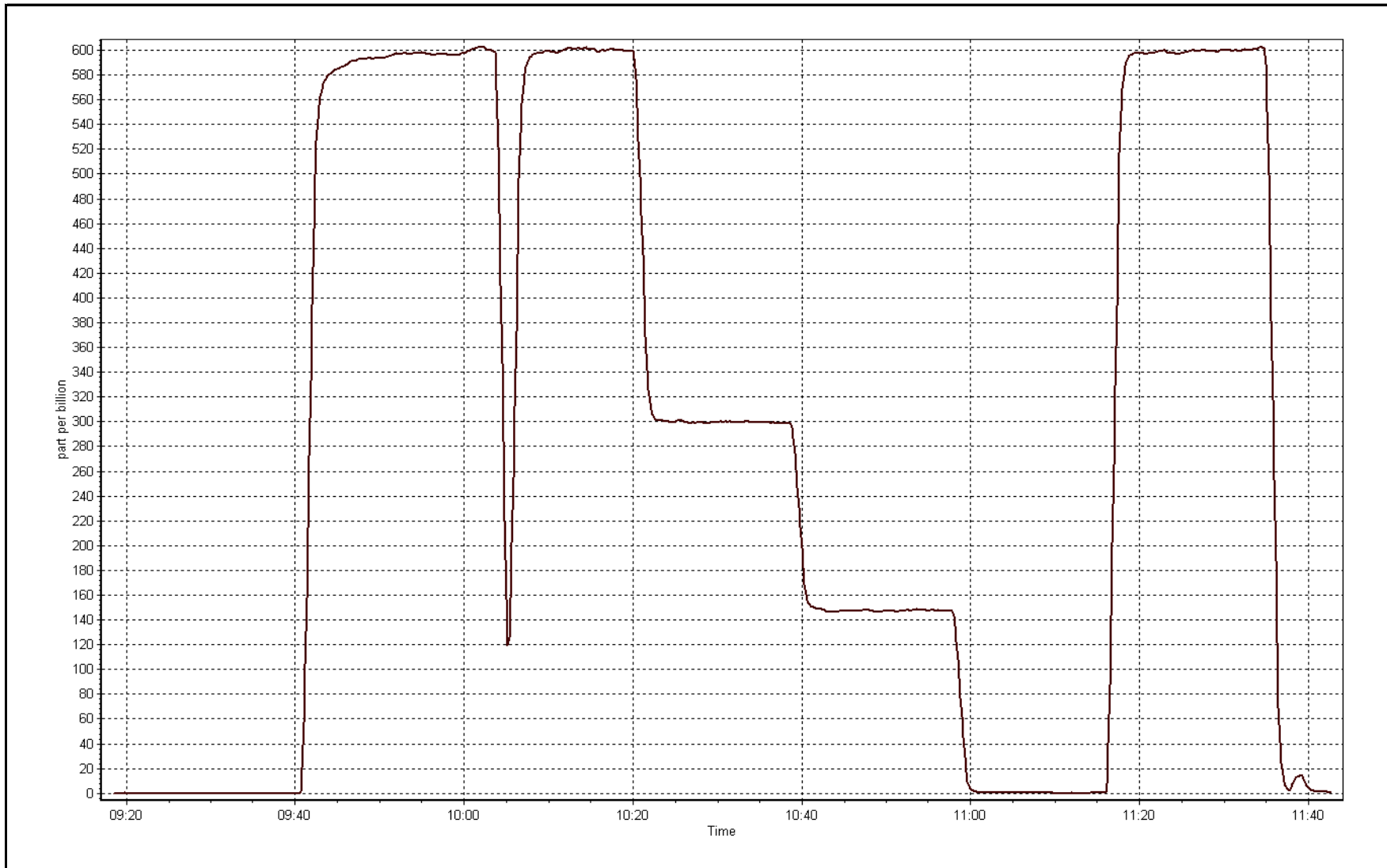
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999982
600.0	598.1	1.0032		
300.0	299.6	1.0013	Slope	1.001862
150.0	147.5	1.0167		
			Intercept	0.705913



SO2 Calibration Plot

Date: July 4, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	July 4, 2016	Last Calibration	June 7, 2016
Station Name	Mannix	Station Number	AMS 5
Reason:	Routine		
Start Time (MST)	11:45	End Time (MST)	14:43
Gas Cert Reference	CC62844	Station temp.	21 Deg C
Cal Gas Concentration	5.04 ppm	Cal Gas Exp Date	09/09/2017
Calibrator Make/Model	Sabio 4010	Serial Number	11061107
ZAG air Make/Model	API 701	Serial Number	138
DACS make/model	Campbell Scientific CR3000	Serial Number	2633
SO2 gas concentration	50 ppm	SO2 gas cert/exp	S960161A 09-Sep-17

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-658	-658
Analyzer IP address	192.168.1.42		Lamp voltage	811	811
Calculated slope	0.998130	0.993430	Chamber temp	45	45
Calculated intercept	-0.106478	0.006592	Pressure	509.2	509.2
Analyzer Background	20.2	20.6	Flow	1.011	1.012
Analyzer Coefficient	0.997	1.007	Intensity	102	103
			Converter temp.	325	327

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

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.3	----
as found span	5000	74.4	75.0	73.5	1.021
SO2 scrubber check	5000	15.0	150.0	1.6	----
calibrator zero	5000	0.0	0.0	-0.1	----
high point	5000	74.4	75.0	75.4	0.994
second point	5000	41.7	42.0	42.4	0.991
third point	5000	24.8	25.0	25.2	0.991
as left zero	5000	0.0	0.0	0.1	----
as left span	5000	74.4	75.0	75.5	0.993
Average Correction Factor					0.992

Corrected As found	73.2	Previous response	75.2	% change	2.8%
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Notes:

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

Calibration Performed By: Evan Magill



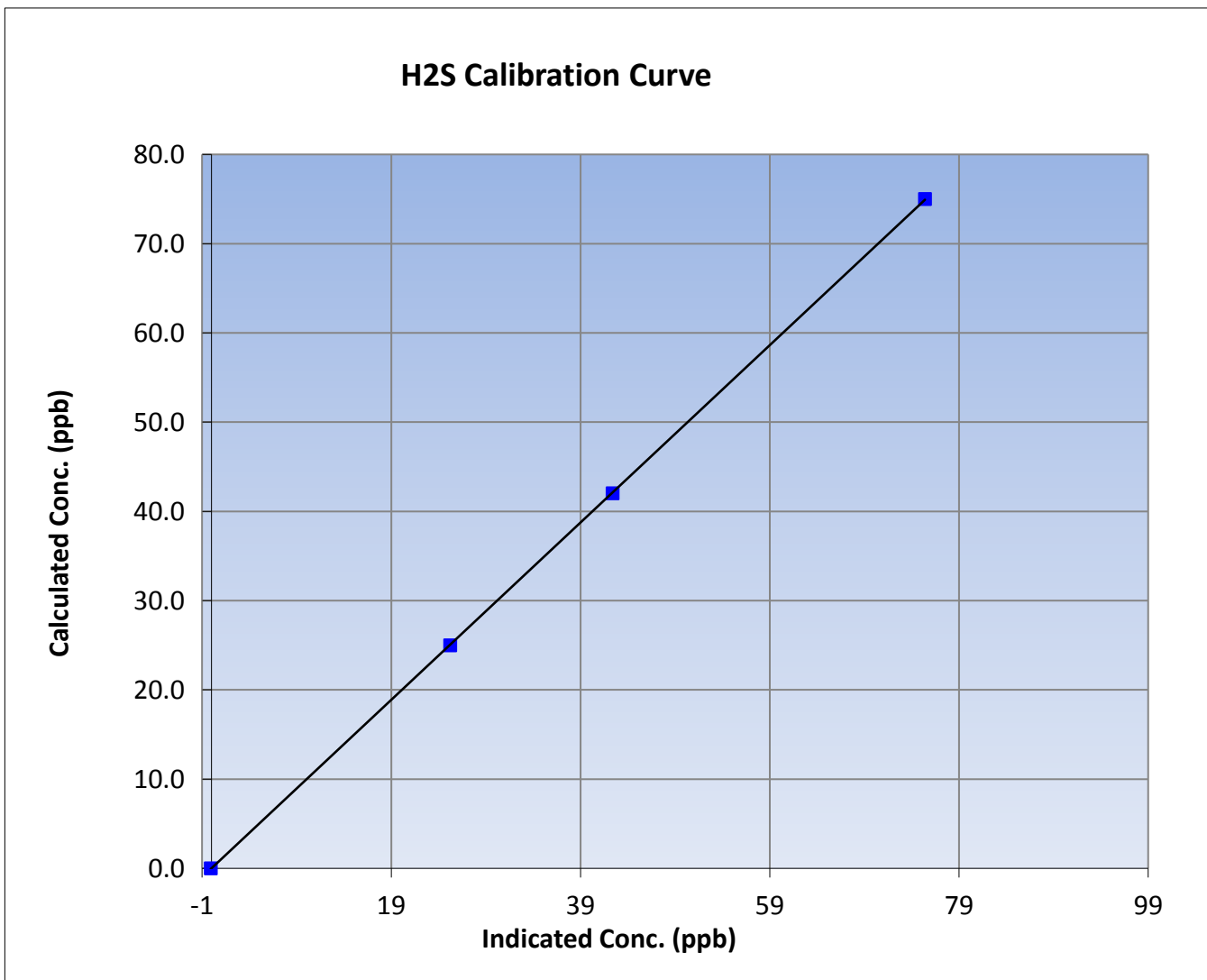
Wood Buffalo Environmental Association H2S Calibration Report

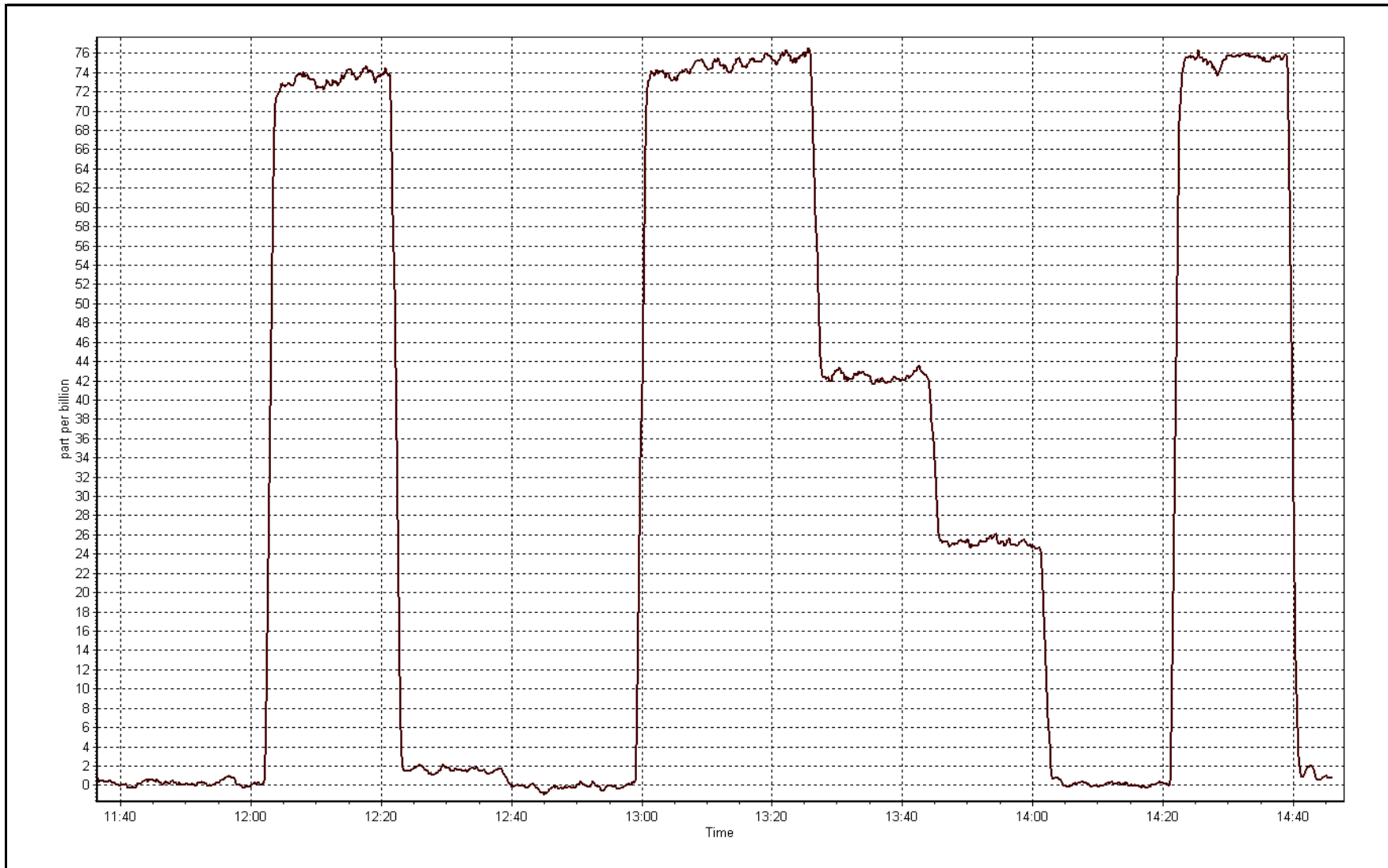
Station Information

Calibration Date	July 4, 2016	Previous Calibration	June 7, 2016
Station Name	Mannix	Station Number	AMS 5
Start Time (MST)	11:45	End Time (MST)	14:43
Analyzer make	Thermo 450i	Analyzer serial #	815129108

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999992
75.0	75.4	0.9945		
42.0	42.4	0.9914	Slope	0.993430
25.0	25.2	0.9912		
			Intercept	0.006592







Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	July-04-16	Last Calibration	June-07-16
Station Name	Mannix	Station Number	AMS 5
Reason:	Routine		
Start Time (MST)	9:20	End Time (MST)	11:40
Gas Cert Reference	S961061A	Cal Gas Expiry Date	Sept-26-2017
CH4 Cal Gas Conc.	499 ppm	CH4 Equiv Conc.	1038.0 ppm
C3H8 Cal Gas Conc.	196 ppm	Station temp.	22 Deg C
Calibrator Make/Model	Sabio 4010	Serial Number	11061107
ZAG make/model	Teledyne API 701	Serial Number	1083
DACS make/model	Campbell Scientific CR3000	Serial Number	2633

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 50 ppm		Sample Pressure	9.4	9.4
Analyzer IP address	192.168.1.51		Air or Bypass Press	42.3	42.3
Calculated slope	1.000005	1.001274	Fuel Pressure	20.2	20.2
Calculated intercept	0.044473	0.050128	Analyzer Coeff	3.398	3.398
			Analyzer BKG	2.96	2.96

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

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	-0.03	----
as found span	5000	60.0	12.46	12.40	1.005
calibrator zero	5000	0.0	0.00	-0.03	----
high point	5000	60.0	12.46	12.40	1.005
second point	5000	30.0	6.23	6.16	1.011
third point	5000	15.0	3.11	3.04	1.024
as left zero	5000	0.0	0.00	-0.01	----
as left span	5000	60.0	12.46	12.45	1.000
Average Correction Factor					1.013

Corrected As found	12.43	Previous response	12.41	% change	-0.1%
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Notes:

Inlet filter changed after as founds. No adjustments.

Calibration Performed By:

Evan Magill



Wood Buffalo Environmental Association THC Calibration Report

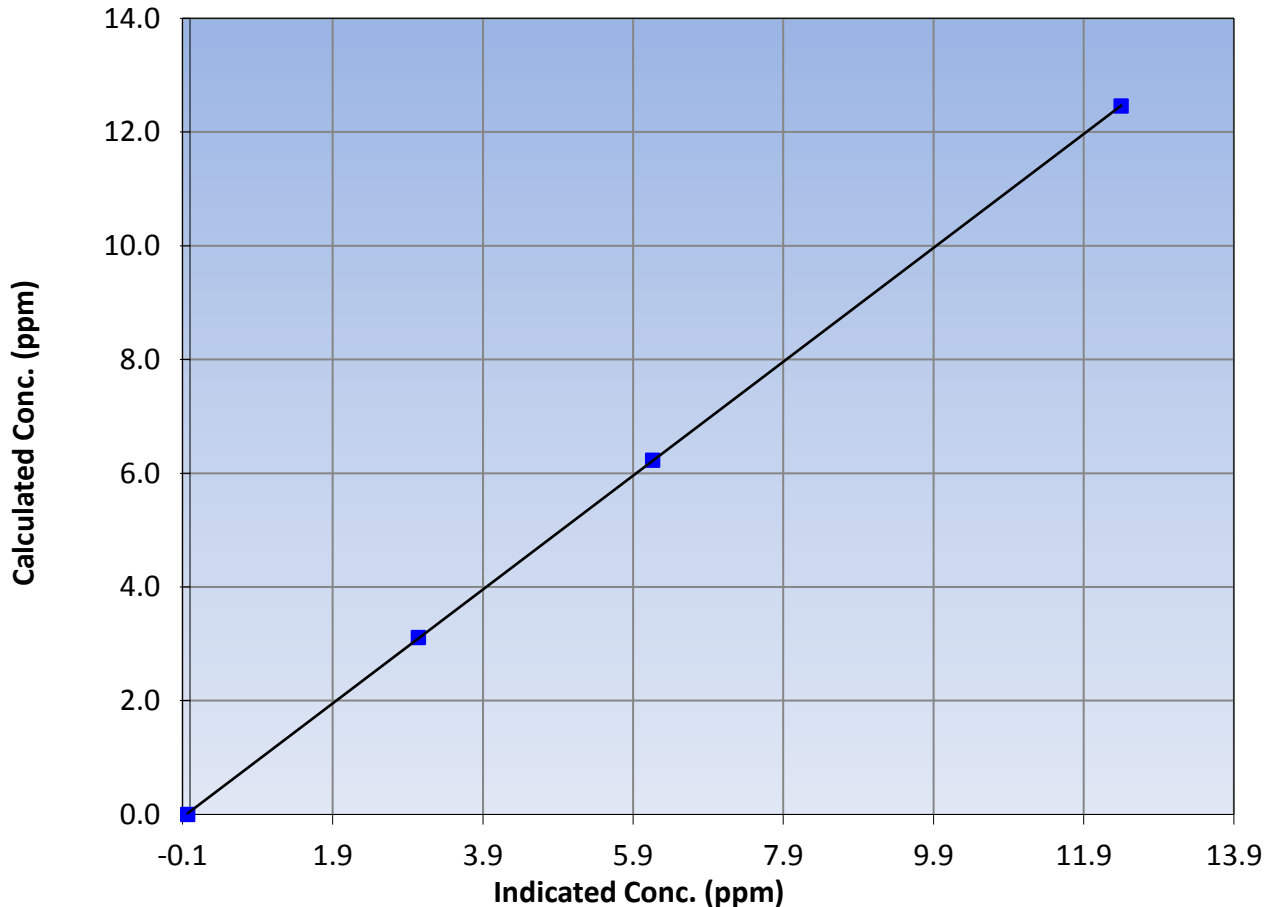
Station Information

Calibration Date	July 4, 2016	Previous Calibration	June 7, 2016
Station Name	Mannix	Station Number	AMS 5
Start Time (MST)	9:20	End Time (MST)	11:40
Analyzer make	Thermo 51i-LT	Analyzer serial #	1317958295

Calibration Data

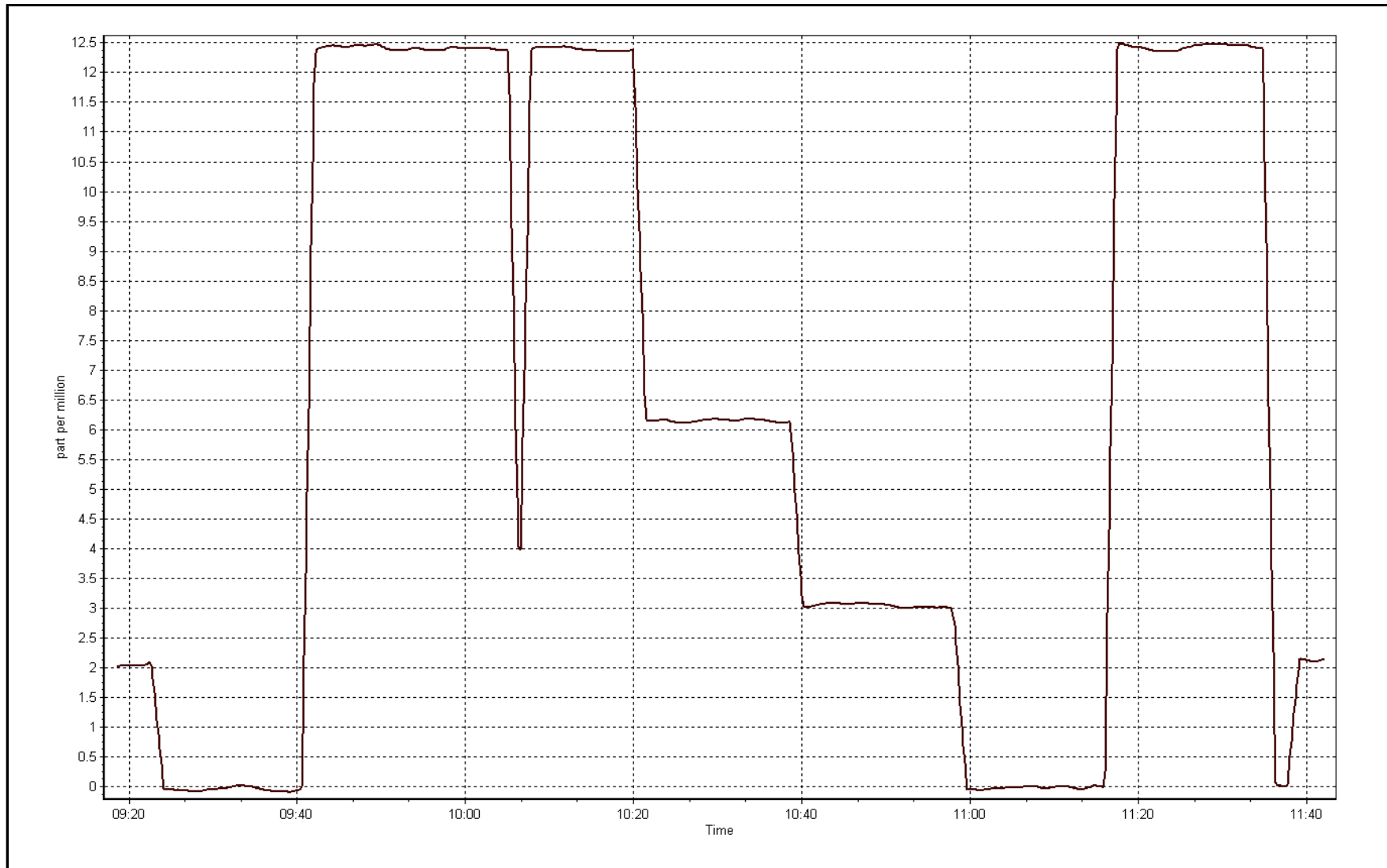
Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	-0.03	----	Correlation Coefficient	0.999988
12.46	12.40	1.0045		
6.23	6.16	1.0110	Slope	1.001274
3.11	3.04	1.0243		
			Intercept	0.050128

THC Calibration Curve



THC Calibration Plot

Date: July 4, 2016





WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

AMS 6
PATRICIA MCINNES
JULY 2016

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

August 29, 2016



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

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	709	35	35	100.00	56	0	9	0
TRS (ppb) Average	708	36	36	100.00	2	0	1	0
THC (ppm) Average	708	35	36	99.87	3.1	-	2.2	-
NMHC(ppm) Average	708	35	36	99.87	0.141	-	0.011	-
CH4(ppm) Average	708	35	36	99.87	3.1	-	2.2	-
O3 (ppb) Average	707	37	37	100.00	53	0	38	-
NO2 (ppb) Average	708	36	36	100.00	12	0	6	-
NO (ppb) Average	708	36	36	100.00	11	-	2	-
NOX (ppb) Average	708	36	36	100.00	22	-	8	-
NH3 (ppb) Average	631	42	113	90.46	19	0	2	-
PM2.5 (ug/m3) Average	742	2	2	100.00	55.5	-	22.1	0
Temperature 2 m (C) Average	744	0	0	100.00	29.8	-	23	-
Relative Humidity (%) Average	744	0	0	100.00	98	-	90	-
Wind Speed 10 m (km/h) Average	744	0	0	100.00	26	-	16	-
Wind Direction 10 m (deg) Average	744	0	0	100.00	-	-	-	-

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

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

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	709	1.9	4	-	0	0	0	0	1	6	56
TRS (ppb) Average	708	0.2	0	-	0	0	0	0	0	0	2
THC (ppm) Average	708	2.06	0.1	-	1.9	2	2	2	2.1	2.2	3.1
NMHC(ppm) Average	708	0.001	0.009	-	0	0	0	0	0	0	0.141
CH4(ppm) Average	708	2.06	0.1	-	1.9	2	2	2	2.1	2.2	3.1
O3 (ppb) Average	707	28.2	10	-	5	15	20	27	36	43	53
NO2 (ppb) Average	708	2.9	3	-	0	0	1	2	4	7	12
NO (ppb) Average	708	0.7	1	-	0	0	0	0	1	2	11
NOX (ppb) Average	708	3.6	3	-	0	0	1	3	5	8	22
NH3 (ppb) Average	631	0.1	1	-	0	0	0	0	0	0	19
PM2.5 (ug/m3) Average	742	7.31	6.7	-	0.5	1.6	2.9	5.5	9	15	55.5
Temperature 2 m (C) Average	744	18.75	4.4	-	6.5	13.7	15.5	18.1	22.3	25	29.8
Relative Humidity (%) Average	744	66.3	19	-	19	40	49	69	83	90	98
Wind Speed 10 m (km/h) Average	744	9.6	5	-	1	4	6	9	13	16	26
Wind Direction 10 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-

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

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
NMHC, CH4, THC	28 Jul 2016 13:00	28 Jul 2016 13:00	1	Maintenance - replaced carrier gas
NH3	01 Jul 2016 05:00	31 Jul 2016 06:00	69	Stabilization after daily span
NH3	05 Jul 2016 07:00	05 Jul 2016 08:00	2	Power spike and stabilization



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

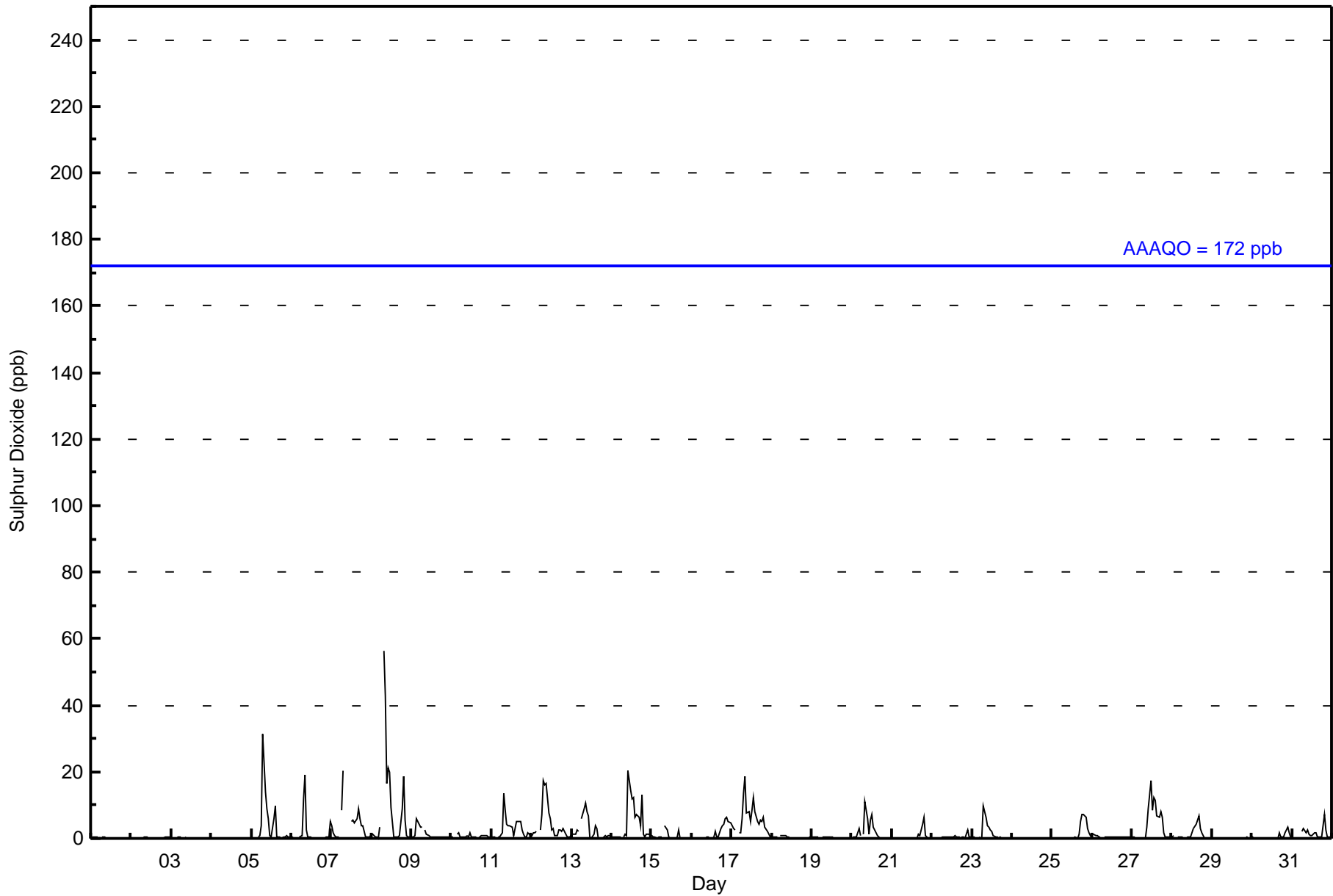
Patricia McInnes - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 56 ppb on Jul 8 08:00 Maximum Daily Average: 9.2 ppb on Jul 8										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 Jul 1 15:00 Maximum Diurnal Average: 7.4 ppb at hour 8 Monthly Average: 1.9 ppb										Minimum Daily Average: 0.1 ppb on Jul 24 Minimum Diurnal Average: 0.5 ppb at hour 3 Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 6 P ₉₉ = 20																	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Jul	0	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-Jul	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
3-Jul	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	
4-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
5-Jul	0	0	0	Z	0	1	4	31	14	9	6	1	1	6	10	0	0	0	0	0	0	1	1	0	0	3.7	31
6-Jul	0	0	0	0	Z	0	1	12	19	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.9	19	
7-Jul	4	2	1	0	1	Z	9	20	C	C	C	C	5	6	5	6	9	6	4	4	0	1	1	1	4.4	20	
8-Jul	1	1	1	0	0	3	Z	56	43	16	21	20	9	0	0	0	1	1	9	19	6	1	0	0	9.2	56	
9-Jul	0	1	1	6	5	4	3	Z	3	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1.3	6	
10-Jul	0	0	Z	1	2	0	0	0	0	1	0	2	1	1	0	0	0	0	0	1	1	1	1	1	0.6	2	
11-Jul	0	0	0	Z	1	1	2	13	8	4	4	4	3	1	3	5	5	5	2	1	0	0	2	1	2.9	13	
12-Jul	1	2	2	2	Z	2	7	17	16	17	8	6	3	3	1	1	3	3	2	3	1	0	1	0	4.3	17	
13-Jul	1	1	1	2	2	Z	6	9	11	8	7	0	0	1	4	3	0	0	0	0	1	0	1	1	2.6	11	
14-Jul	0	0	0	0	0	1	Z	1	1	1	20	14	12	12	6	7	6	4	13	1	1	1	1	1	4.6	20	
15-Jul	1	0	0	0	0	0	0	Z	4	3	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0.6	4	
16-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	2	0	0	3	4	4	6	6	5	5	1.6	6	
17-Jul	4	3	3	Z	2	2	6	14	18	8	8	5	8	12	8	5	4	6	5	6	4	2	1	1	5.8	18	
18-Jul	1	0	0	0	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
19-Jul	0	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-Jul	0	0	0	0	3	1	Z	1	11	6	1	6	7	4	2	1	0	0	0	0	0	0	0	0	2.0	11	
21-Jul	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	1	4	6	1	0	0	0	0.7	6	
22-Jul	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	3	0	0	0.4	3	
23-Jul	0	0	0	Z	0	0	1	10	6	4	3	2	2	1	0	0	0	0	0	0	0	0	0	0	1.4	10	
24-Jul	0	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-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	5	7	7	6	3	2	1	1.6	7	
26-Jul	1	1	1	1	0	1	Z	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.5	1	
27-Jul	0	0	0	0	0	0	0	Z	0	3	9	18	9	12	11	7	6	8	6	2	0	0	0	0	4.1	18	
28-Jul	0	1	Z	1	0	0	0	0	0	1	1	1	2	3	4	5	7	3	2	0	0	0	0	0	1.4	7	
29-Jul	0	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	
30-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	2	1	1	0	2	4	2	0	0.6	4	
31-Jul	0	0	0	0	0	Z	2	3	2	3	1	1	1	2	2	0	0	0	0	0	7	2	0	0	1.2	7	
0.6 0.5 0.5 0.6 0.7 0.7 1.7 7.4 5.3 3.0 3.2 2.8 2.1 2.2 2.0 1.5 1.7 1.6 2.1 2.1 1.1 0.9 0.6 0.6																								Diurnal Average			
4 3 3 6 5 4 9 56 43 17 21 20 12 12 11 7 9 8 13 19 6 6 5 5																								Diurnal Maximum			
Z - zerospan C - Calibration Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb																											



Wood Buffalo Environmental Association
Hourly Averages

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





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	681	96.05	96.05
11 - 20	24	3.39	99.44
21 - 60	4	0.56	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Patricia McInnes - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	84	53	15	10	9	21	35	54	35	51	52	52	29	39	42	100	681
11 - 20	7	4	0	0	0	0	0	0	0	0	0	0	1	0	0	12	24
21 - 60	2	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	4
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	93	58	15	10	9	21	35	54	35	51	52	52	30	39	43	112	709

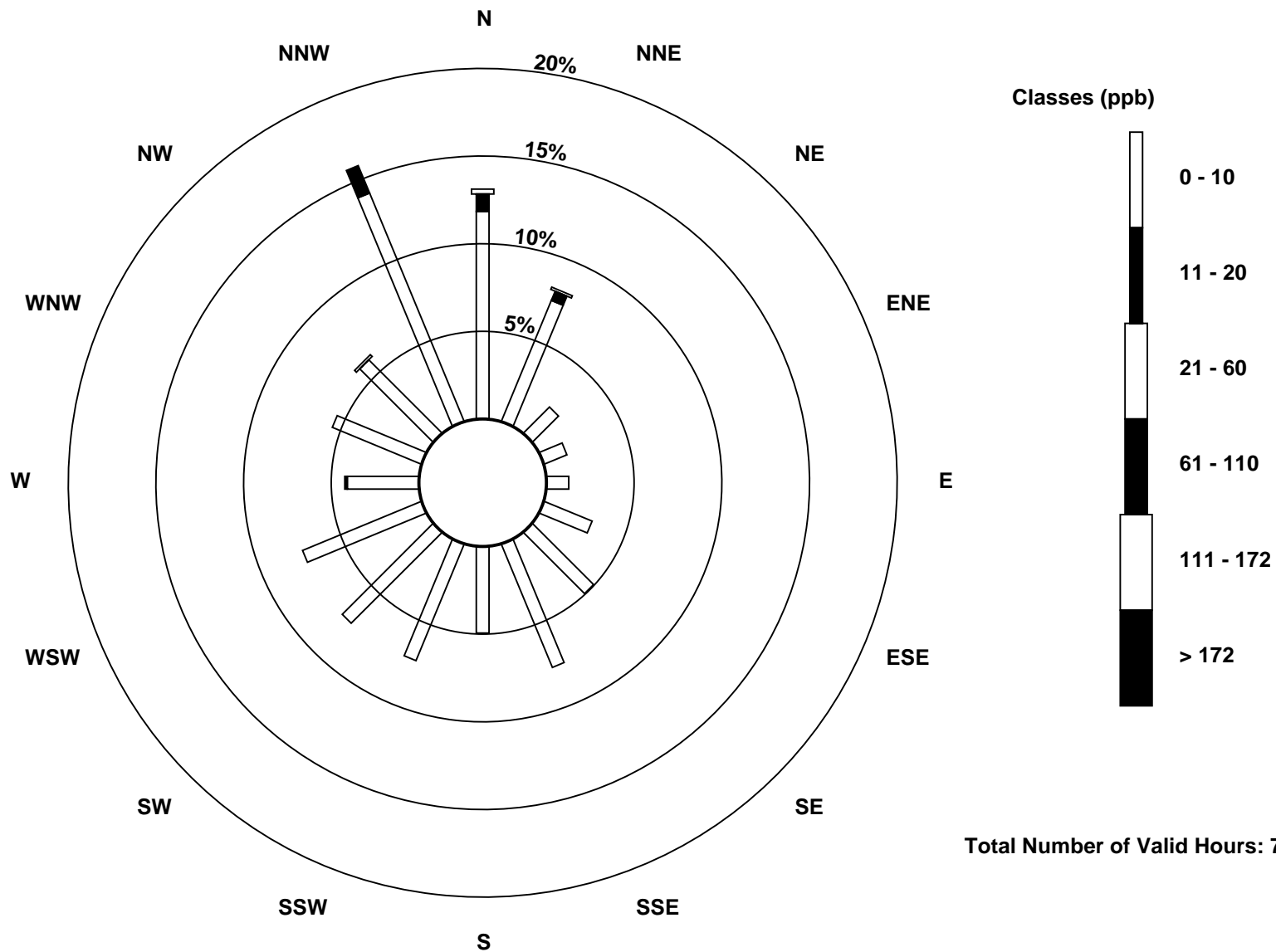
Total Number of Valid Hours: 709

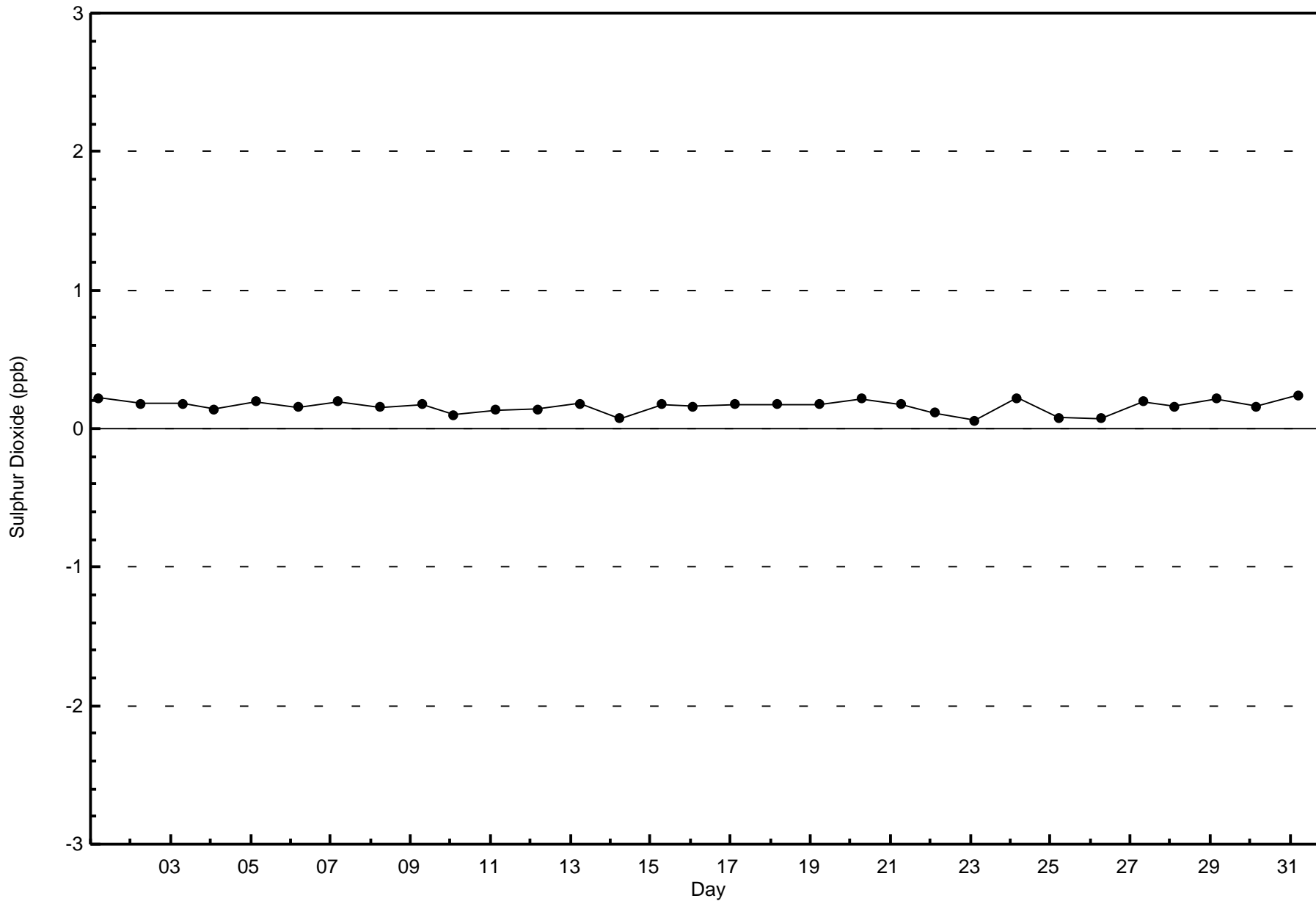
Total Number of Hours: 744

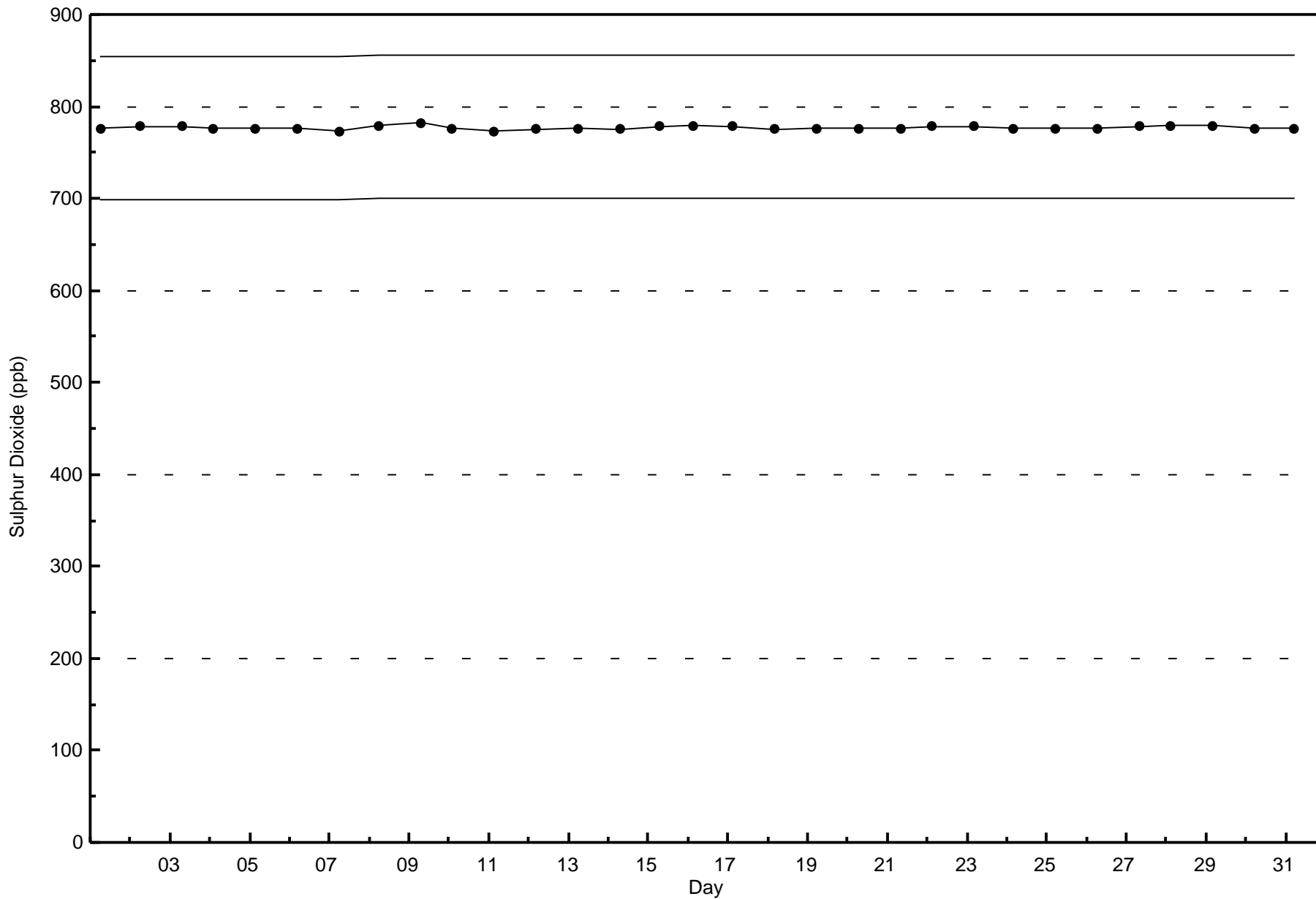


Wood Buffalo Environmental Association
Wind Rose Jul 2016

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







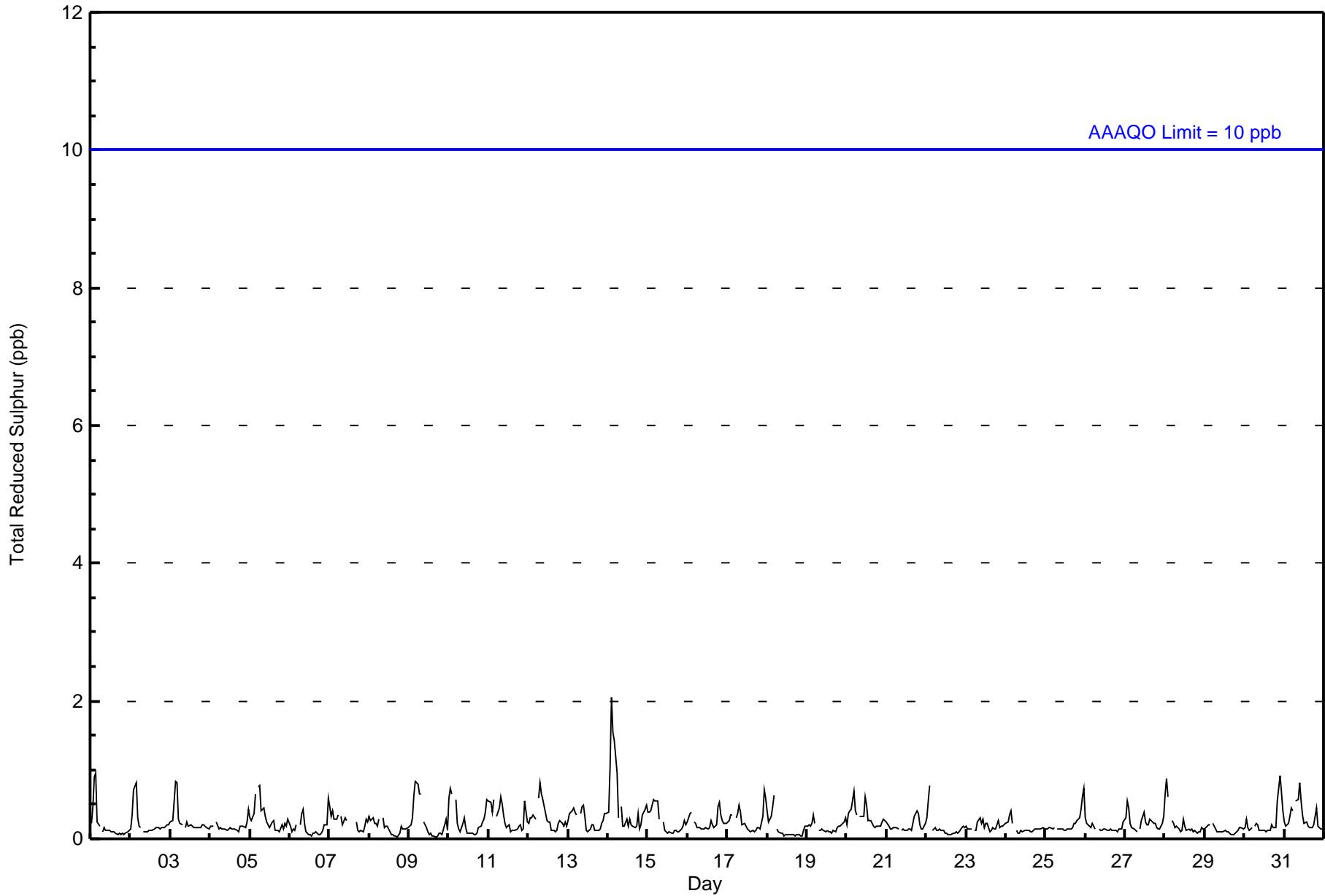


Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																	
Maximum Value: 2 ppb on Jul 14 03:00										Maximum Daily Average: 0.5 ppb on Jul 14										Hours of Data: 708							
Minimum Value: 0 ppb on Jul 8 18:00										Minimum Daily Average: 0.1 ppb on Jul 29										Hours of Missing Data: 36							
Maximum Diurnal Average: 0.4 ppb at hour 4										Minimum Diurnal Average: 0.1 ppb at hour 16										Hours of Calibration: 36							
Monthly Average: 0.2 ppb										Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 1										Percent Operational Time: 100.0							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Jul	0	0	1	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
2-Jul	0	0	1	1	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
3-Jul	0	0	1	1	1	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
4-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
5-Jul	0	0	0	1	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
6-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2	1	
7-Jul	0	0	0	0	0	0	Z	0	0	0	0	C	C	C	C	C	0	0	0	0	0	0	0	0	0.3	0	
8-Jul	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	
9-Jul	0	0	0	1	1	1	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
10-Jul	1	1	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.3	1	
11-Jul	1	1	0	1	Z	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.3	1	
12-Jul	0	0	0	0	0	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
13-Jul	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	
14-Jul	0	1	2	2	1	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	2	
15-Jul	0	0	0	1	1	1	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
16-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.2	1	
17-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.3	1	
18-Jul	0	0	0	0	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
19-Jul	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
20-Jul	0	0	0	0	1	0	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
21-Jul	0	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
22-Jul	0	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	
23-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
24-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
25-Jul	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	
26-Jul	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	
27-Jul	0	1	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
28-Jul	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	
29-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
30-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0.2	1
31-Jul	0	0	0	0	0	0	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
0.3 0.3 0.4 0.4 0.4 0.3 0.3 0.3 0.3 0.2 0.2 0.2 0.2 0.1 0.1 0.1 0.1 0.1 0.2 0.2 0.2 0.2 0.3 0.3																								Diurnal Average			
1 1 2 2 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0 0 1 1 1 1 1																								Diurnal Maximum			
Z - zerospan C - Calibration																											
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb 24-hr 3 ppb																											



Wood Buffalo Environmental Association
Hourly Averages

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





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	708	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

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

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	91	57	15	10	9	22	34	53	36	52	51	53	30	39	40	116	708
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	91	57	15	10	9	22	34	53	36	52	51	53	30	39	40	116	708

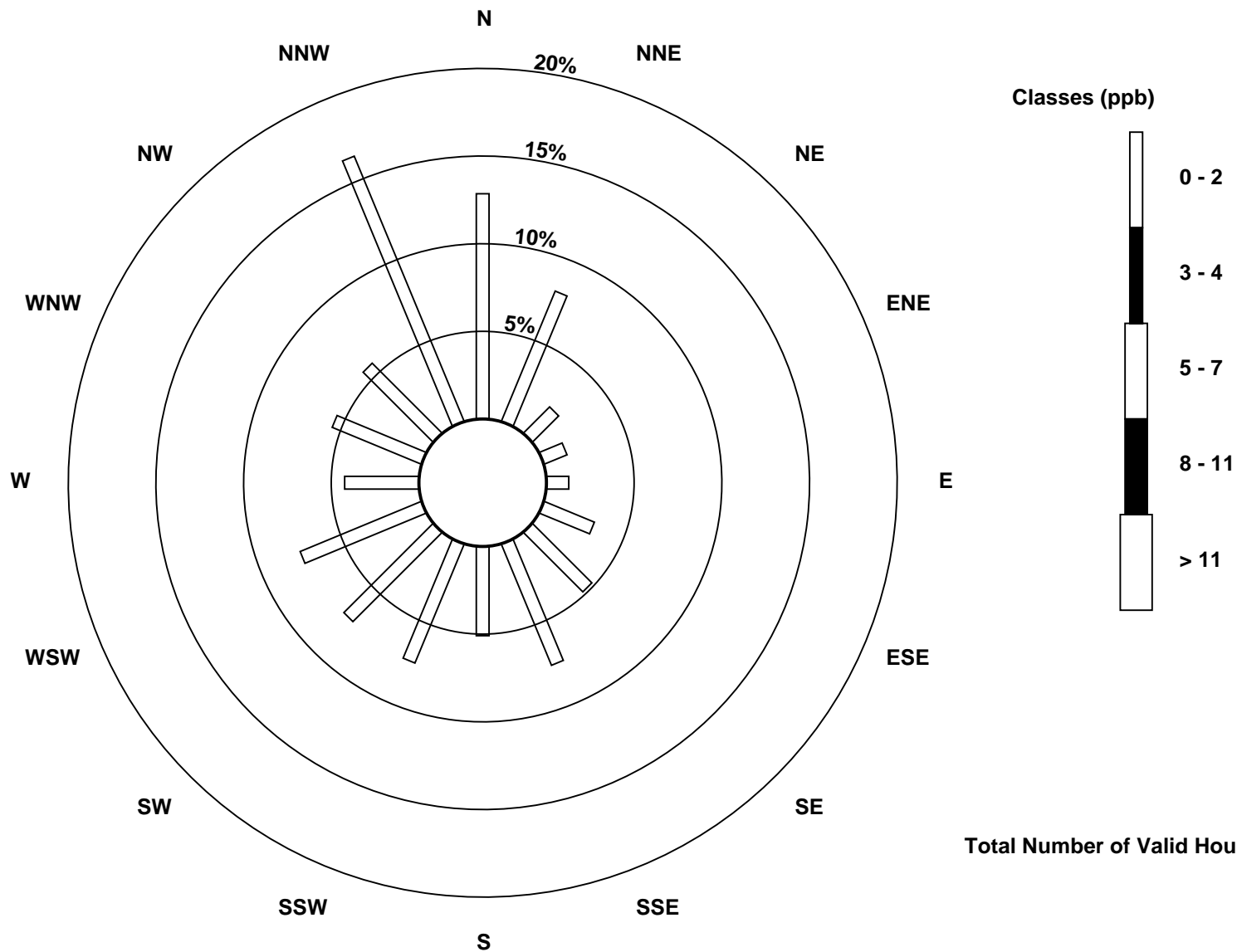
Total Number of Valid Hours: 708

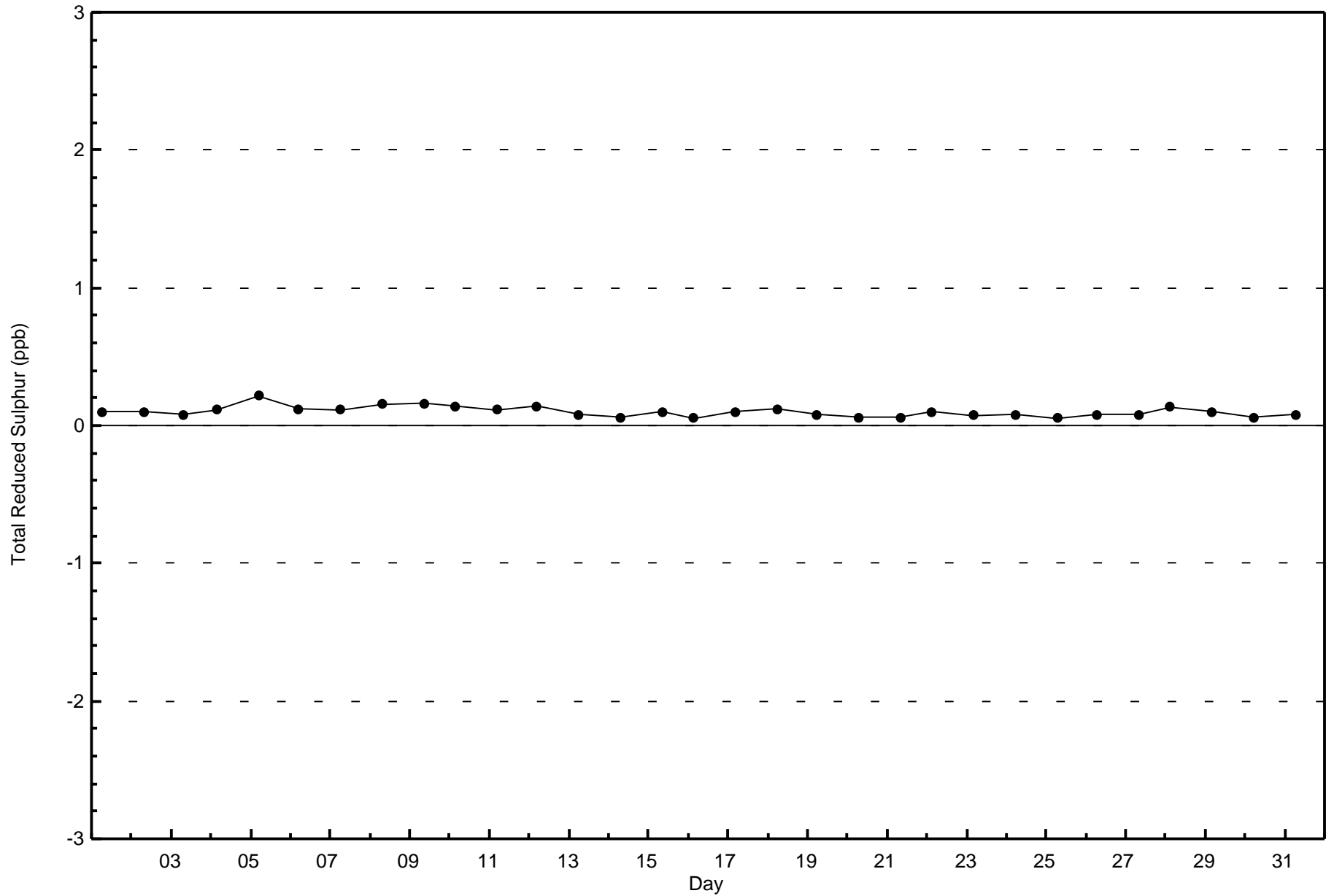
Total Number of Hours: 744

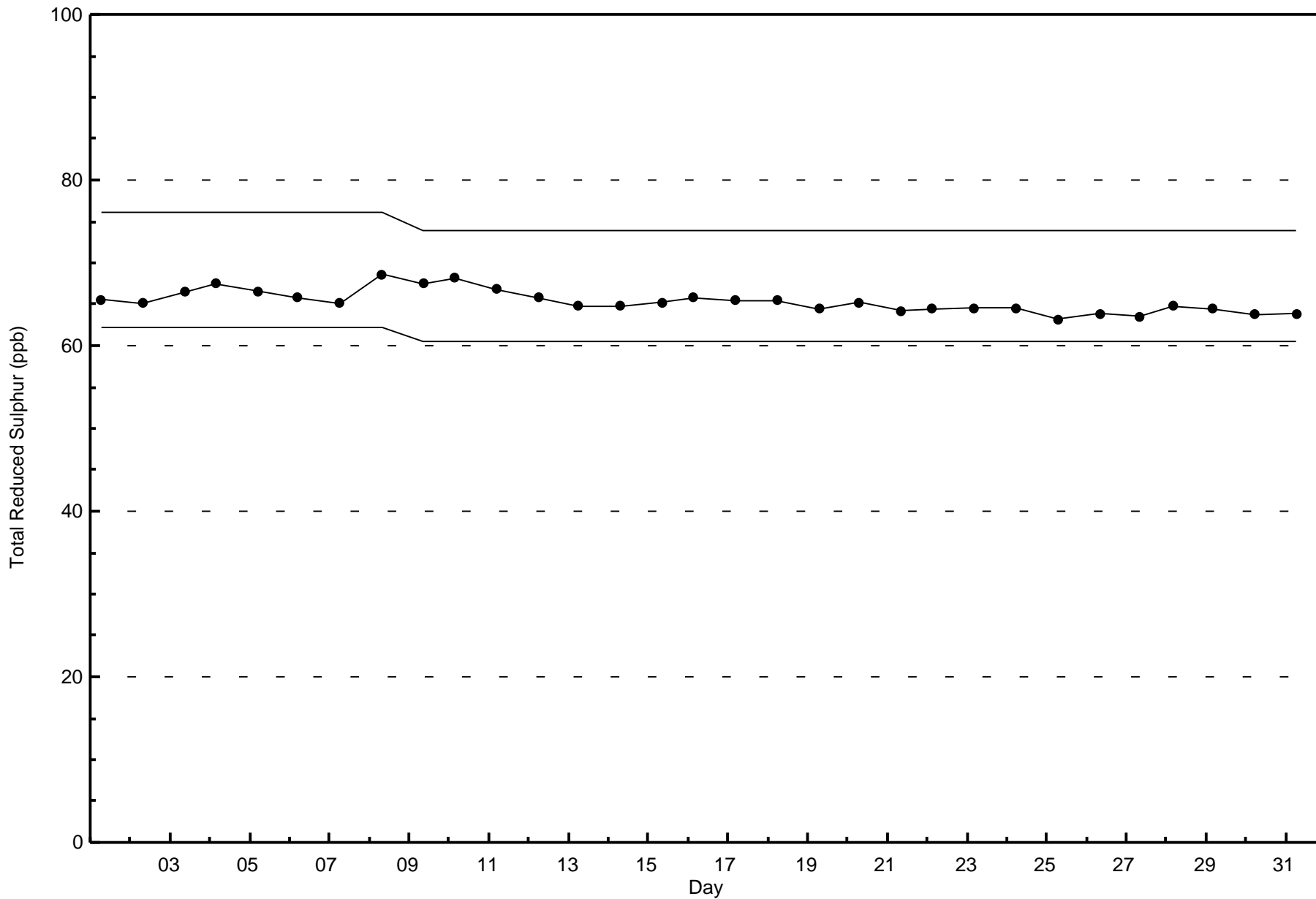


Wood Buffalo Environmental Association
Wind Rose Jul 2016

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



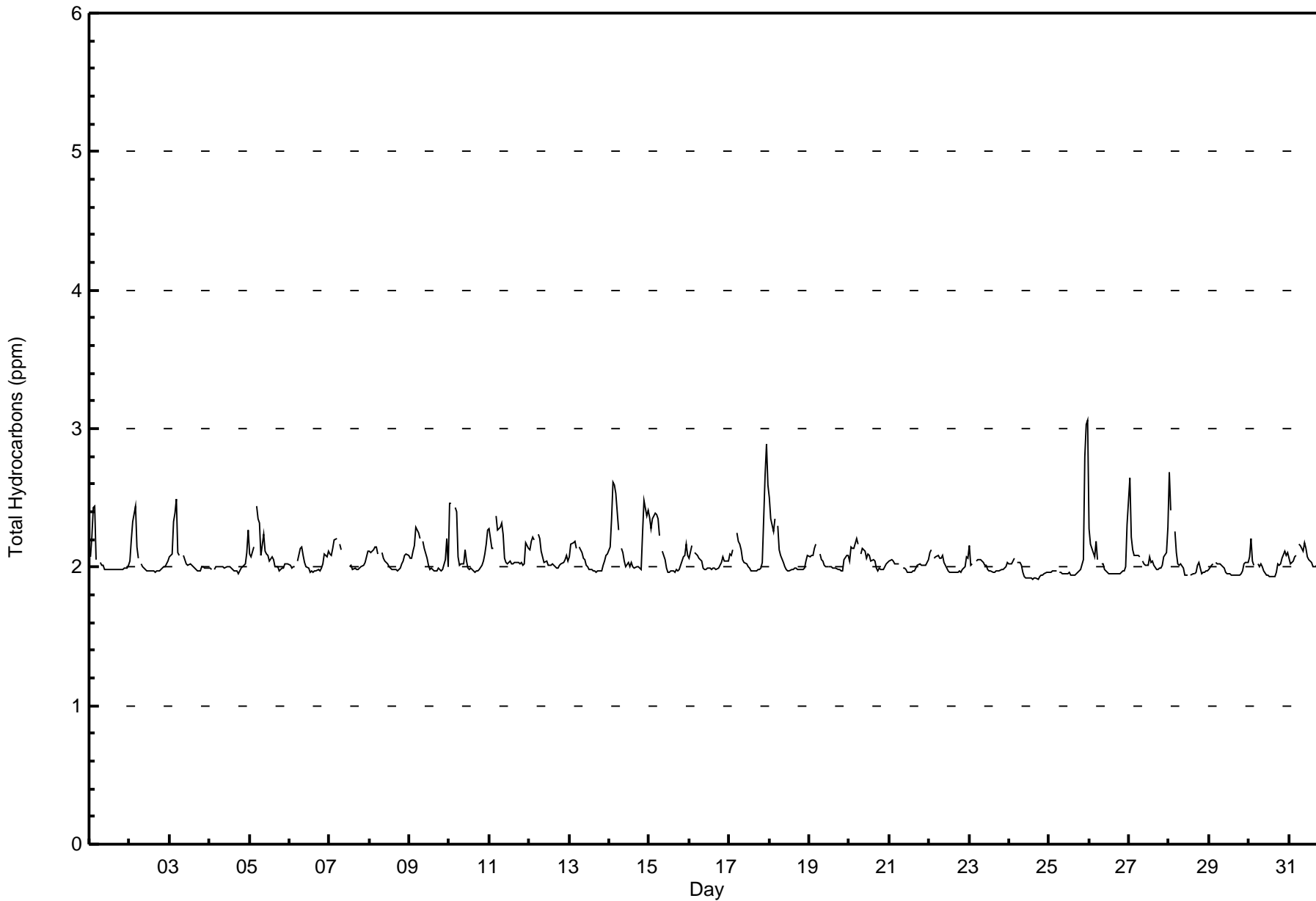






Wood Buffalo Environmental Association
Hourly Averages

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





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	466	65.82	65.82
2.1 - 3.0	241	34.04	99.86
3.1 - 10.0	1	0.14	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

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

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	61	44	11	10	7	11	23	37	25	38	34	46	23	25	21	50	466
2.1 - 3.0	32	13	4	0	1	10	12	17	10	13	18	6	7	14	22	62	241
3.1 - 10.0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	93	57	15	10	9	21	35	54	35	51	52	52	30	39	43	112	708

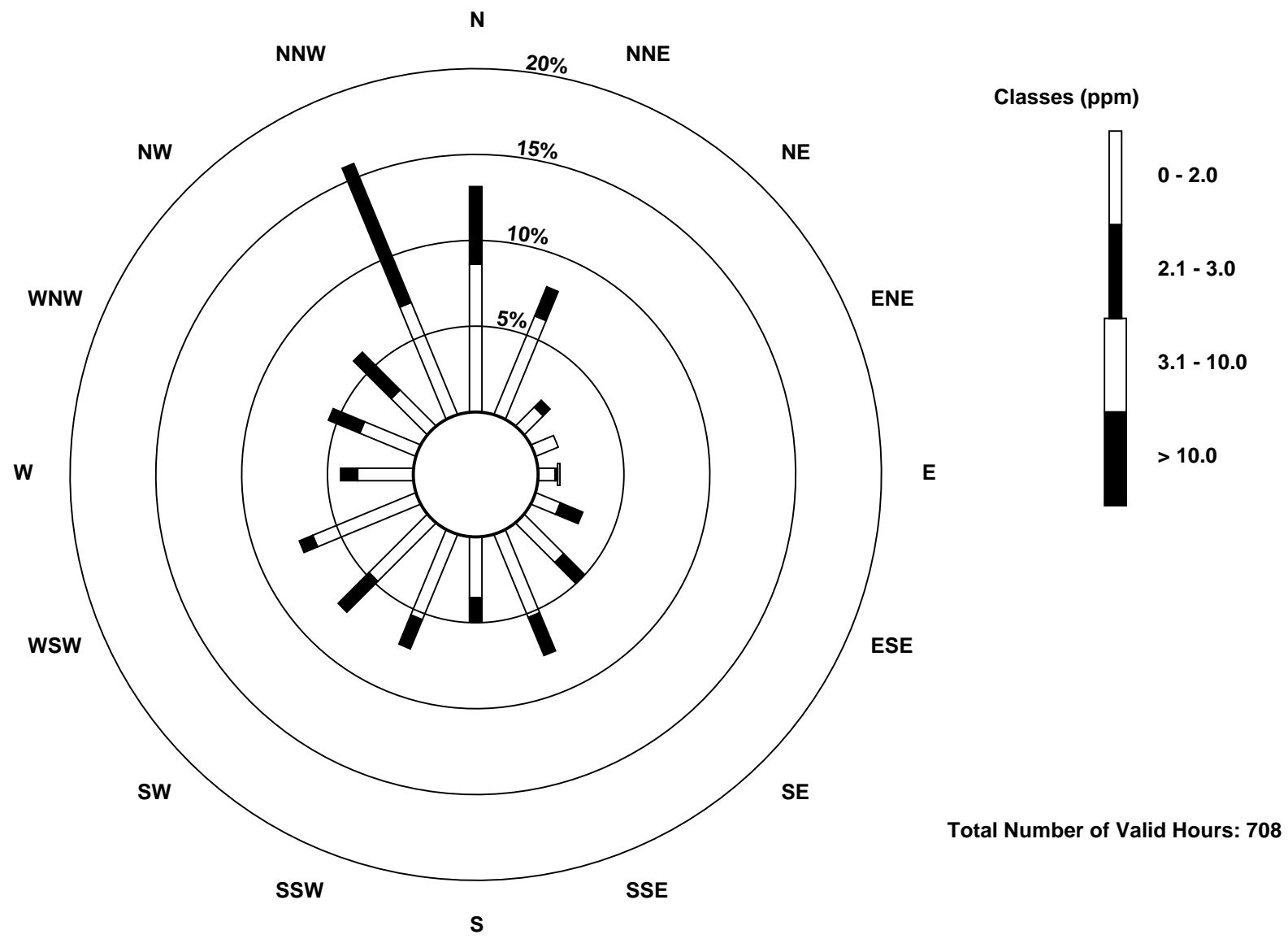
Total Number of Valid Hours: 708

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

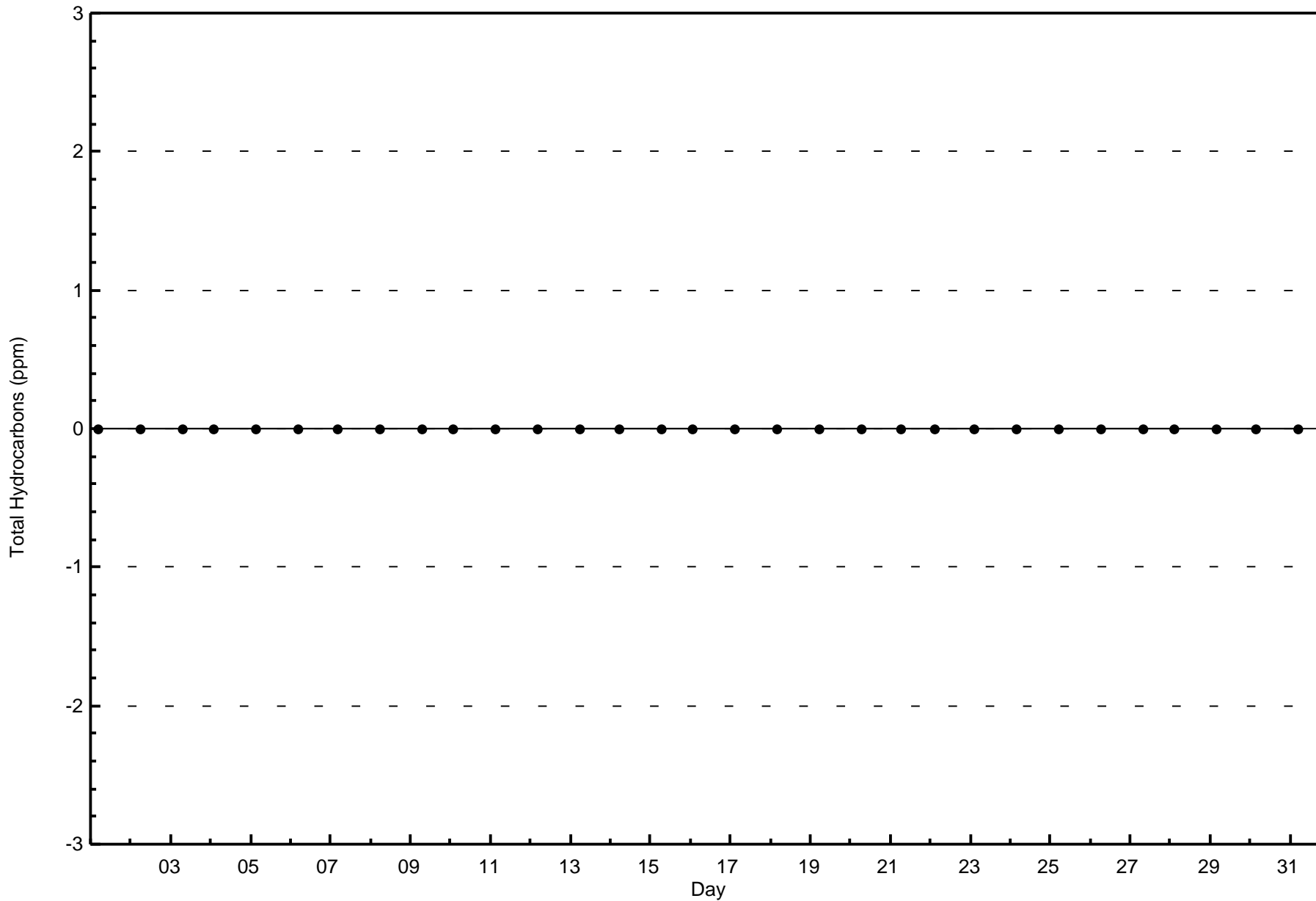
Total Hydrocarbons (THC) - ppm
Patricia McInnes (AMS 6)

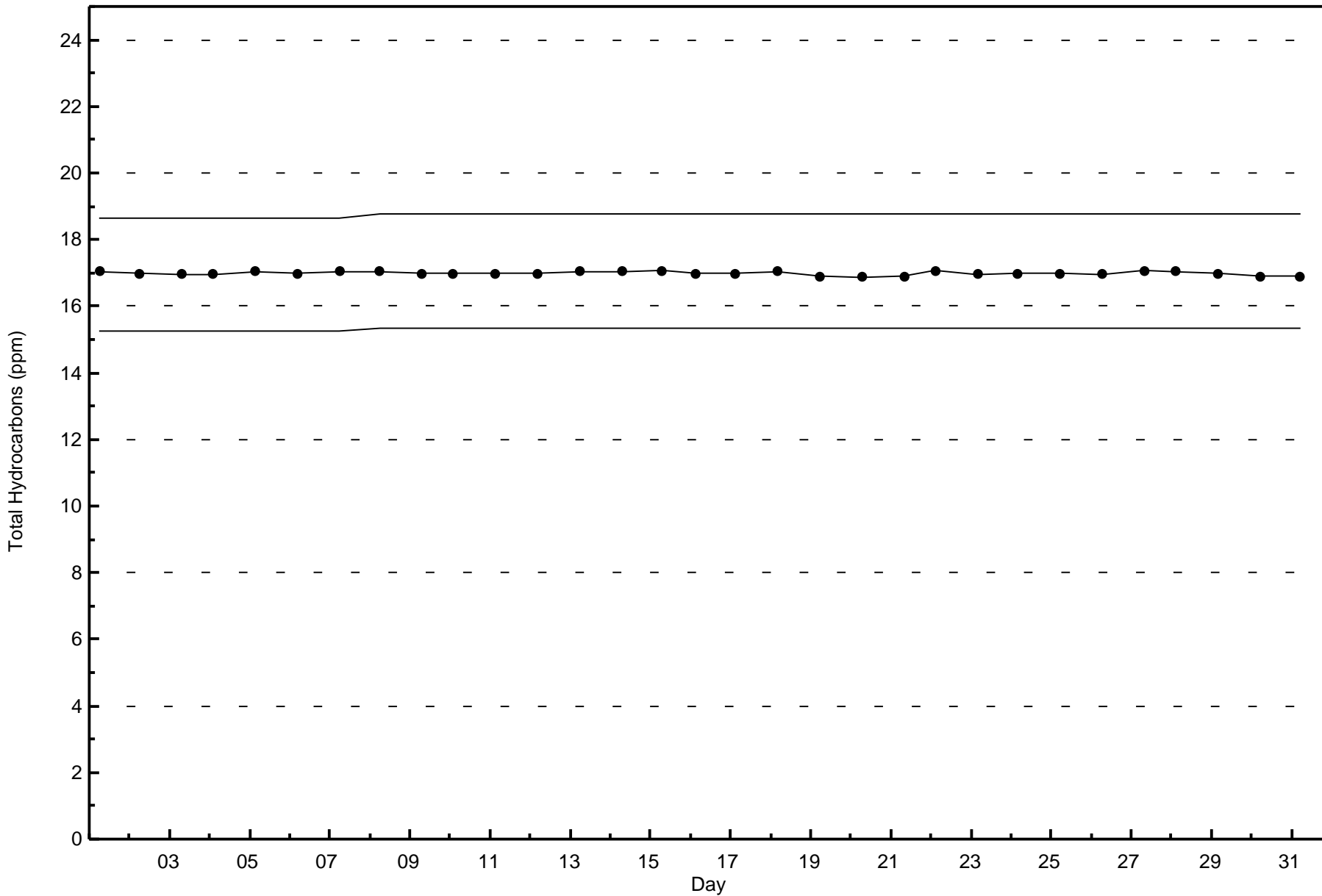




Wood Buffalo Environmental Association
Zero Responses

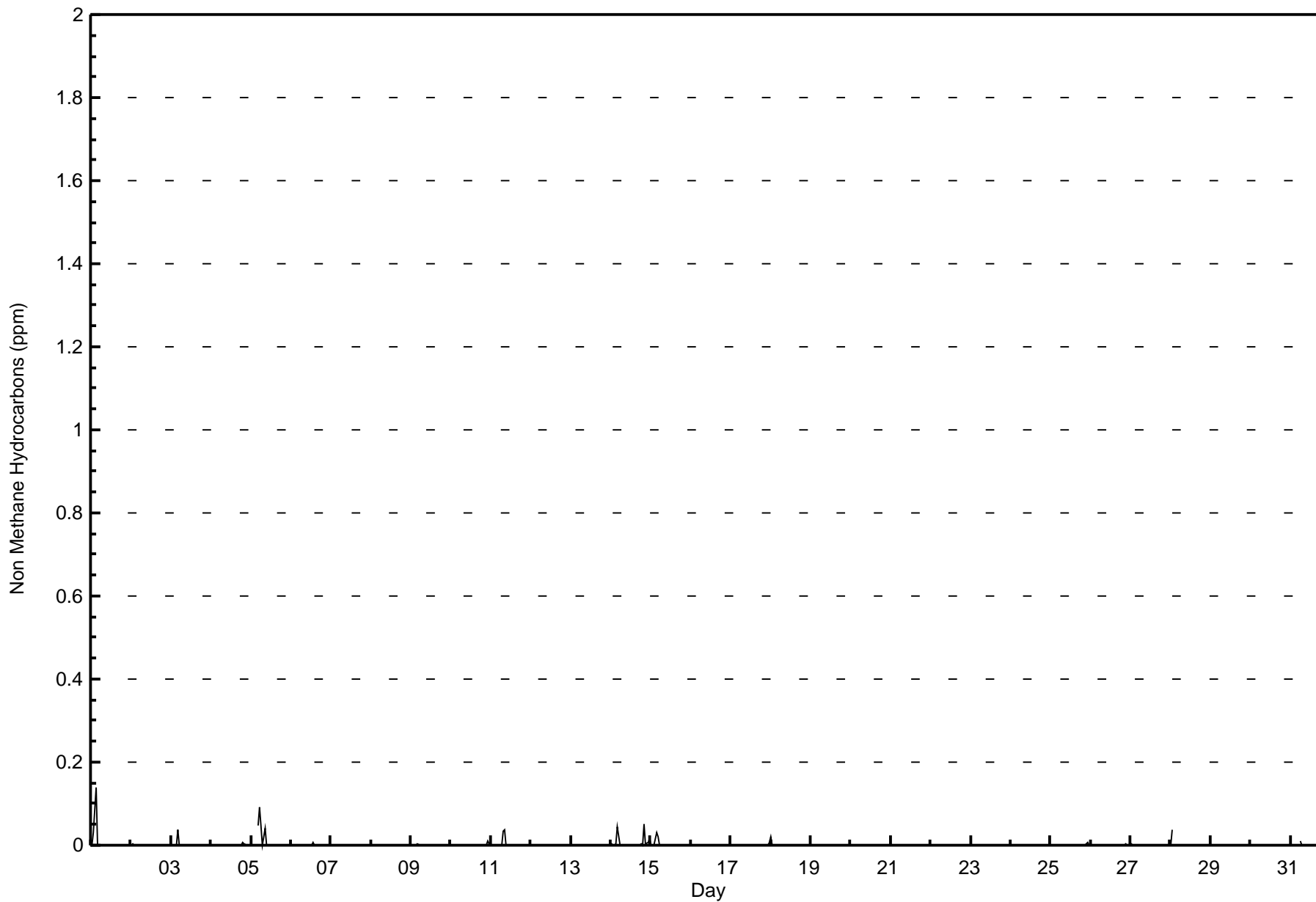
Total Hydrocarbons (THC) - ppm
Patricia McInnes - July 2016







Maximum Value: 0.141 ppm on Jul 1 04:00		Maximum Daily Average: 0.011 ppm on Jul 1		Hours in Service: 744																							
Minimum Value: 0.000 ppm on Jul 1 01:00		Minimum Daily Average: 0.000 ppm on Jul 7		Hours of Data: 708																							
Maximum Diurnal Average: 0.007 ppm at hour 4		Minimum Diurnal Average: 0.000 ppm at hour 10		Hours of Missing Data: 36																							
Monthly Average: 0.001 ppm		Percentiles: P ₁ = 0.0 P ₁₀ = 0.0 Q ₁ = 0.0 Median = 0.0 Q ₃ = 0.0 P ₉₀ = 0.0 P ₉₉ = 0.0		Hours of Calibration: 35																							
				Percent Operational Time: 99.9																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Jul	0.000	0.031	0.086	0.141	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	0.011	0.141	
2-Jul	0.000	0.003	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	0.003
3-Jul	0.000	0.000	0.000	0.001	0.036	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	0.036	
4-Jul	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.004	0.000	0.000	0.000	0.001	0.008	
5-Jul	0.000	0.000	0.000	Z	0.047	0.091	0.047	0.000	0.041	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.091		
6-Jul	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	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	
7-Jul	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	C	C	C	C	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
8-Jul	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	
9-Jul	0.000	0.000	0.000	0.000	0.003	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	0.003	
10-Jul	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	0.009	0.005	0.001	0.009	
11-Jul	0.000	0.000	0.000	Z	0.000	0.000	0.001	0.033	0.039	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.039	
12-Jul	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	
13-Jul	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	
14-Jul	0.004	0.000	0.000	0.003	0.043	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.052	0.003	0.007	0.017	0.006	0.052	
15-Jul	0.000	0.000	0.000	0.029	0.021	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	0.029	
16-Jul	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-Jul	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	0.007	0.000	0.007	0.000	
18-Jul	0.019	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	0.001	0.019	
19-Jul	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	
20-Jul	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	
21-Jul	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	
22-Jul	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-Jul	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	
24-Jul	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	
25-Jul	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	0.002	0.008	0.000	0.000	0.008	
26-Jul	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	0.002	0.000	0.000	0.000	0.002	
27-Jul	0.002	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	0.002	
28-Jul	0.000	0.037	Z	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	0.002	0.037	
29-Jul	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	
30-Jul	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	0.001	
31-Jul	0.000	0.000	0.000	0.000	0.000	Z	0.009	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	0.009	
		0.001	0.002	0.003	0.007	0.006	0.004	0.002	0.001	0.003	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	0.001	Diurnal Average		
		0.019	0.037	0.086	0.141	0.047	0.091	0.047	0.033	0.041	0.000	0.000	0.000	0.000	0.006	0.000	0.000	0.000	0.000	0.002	0.008	0.052	0.003	0.009	0.017	Diurnal Maximum	
Z - zerospan		C - Calibration			M - Maintenance																						





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 0.005	684	96.61	96.61
0.006 - 0.05	21	2.97	99.58
0.06 - 0.1	3	0.42	100.00
> 0.1	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

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

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 0.005	91	55	14	10	9	20	34	53	35	48	50	50	28	37	41	109	684
0.006 - 0.05	2	2	1	0	0	0	1	0	0	3	2	2	2	2	2	2	21
0.06 - 0.1	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	3
> 0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	93	57	15	10	9	21	35	54	35	51	52	52	30	39	43	112	708

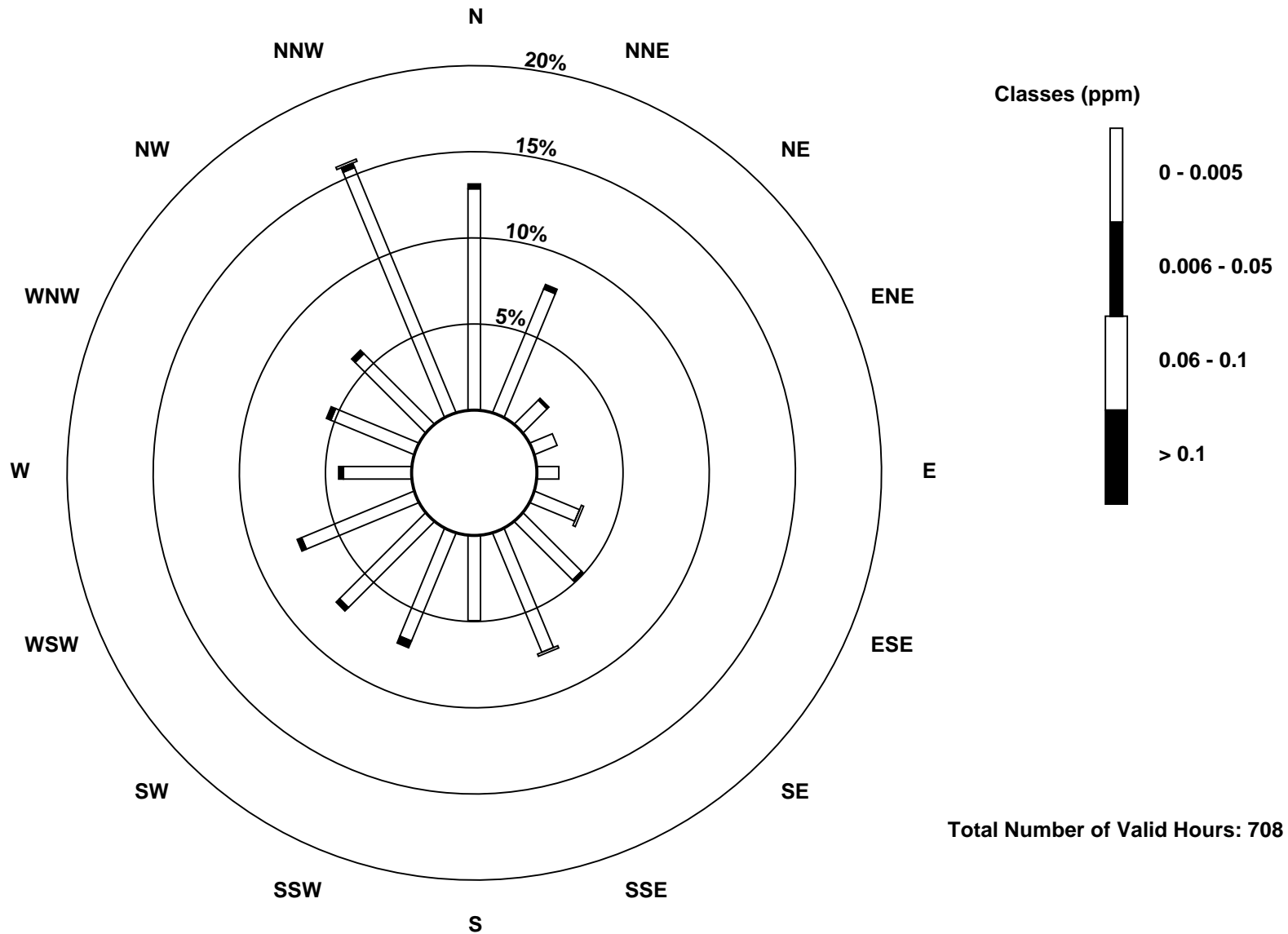
Total Number of Valid Hours: 708

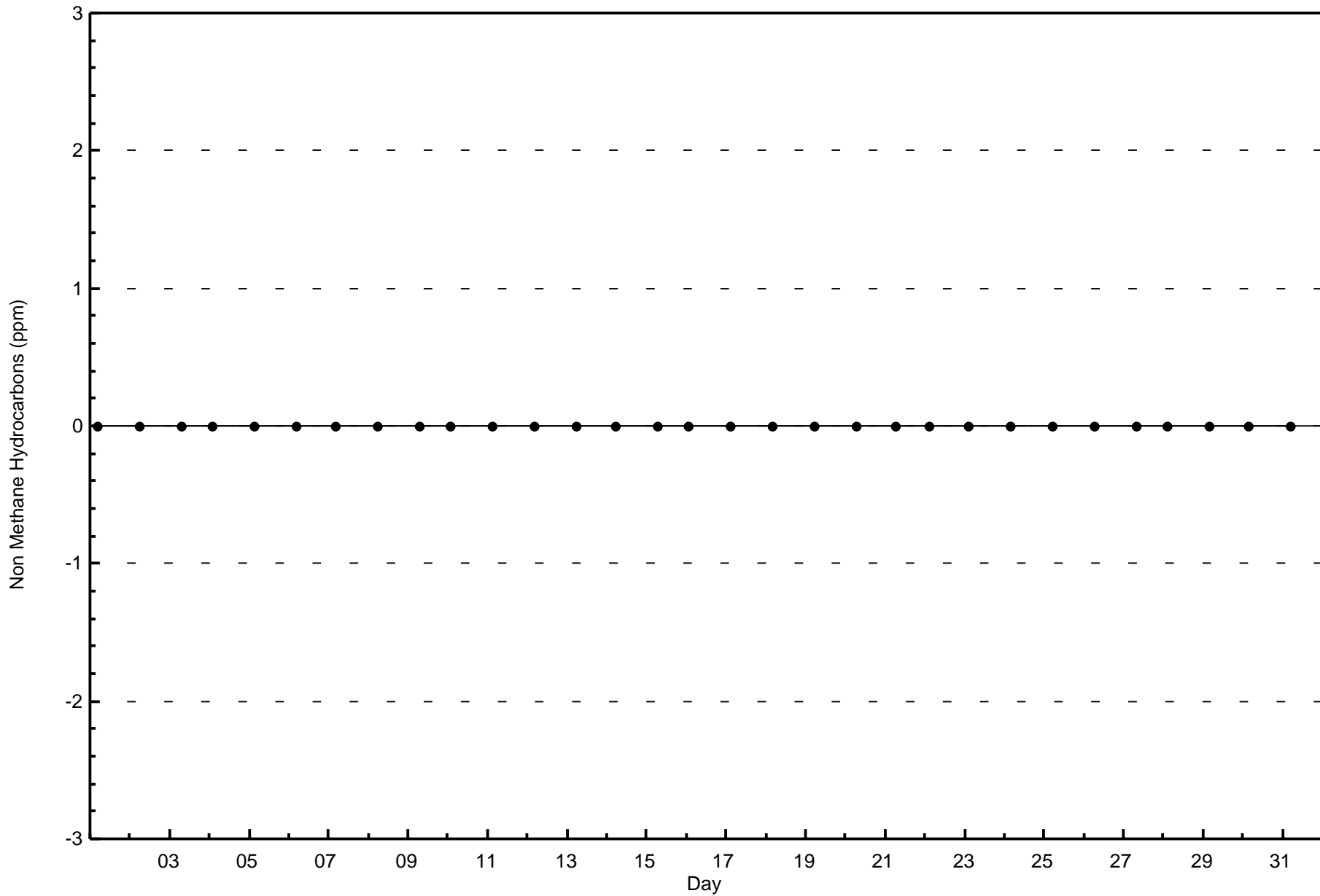
Total Number of Hours: 744

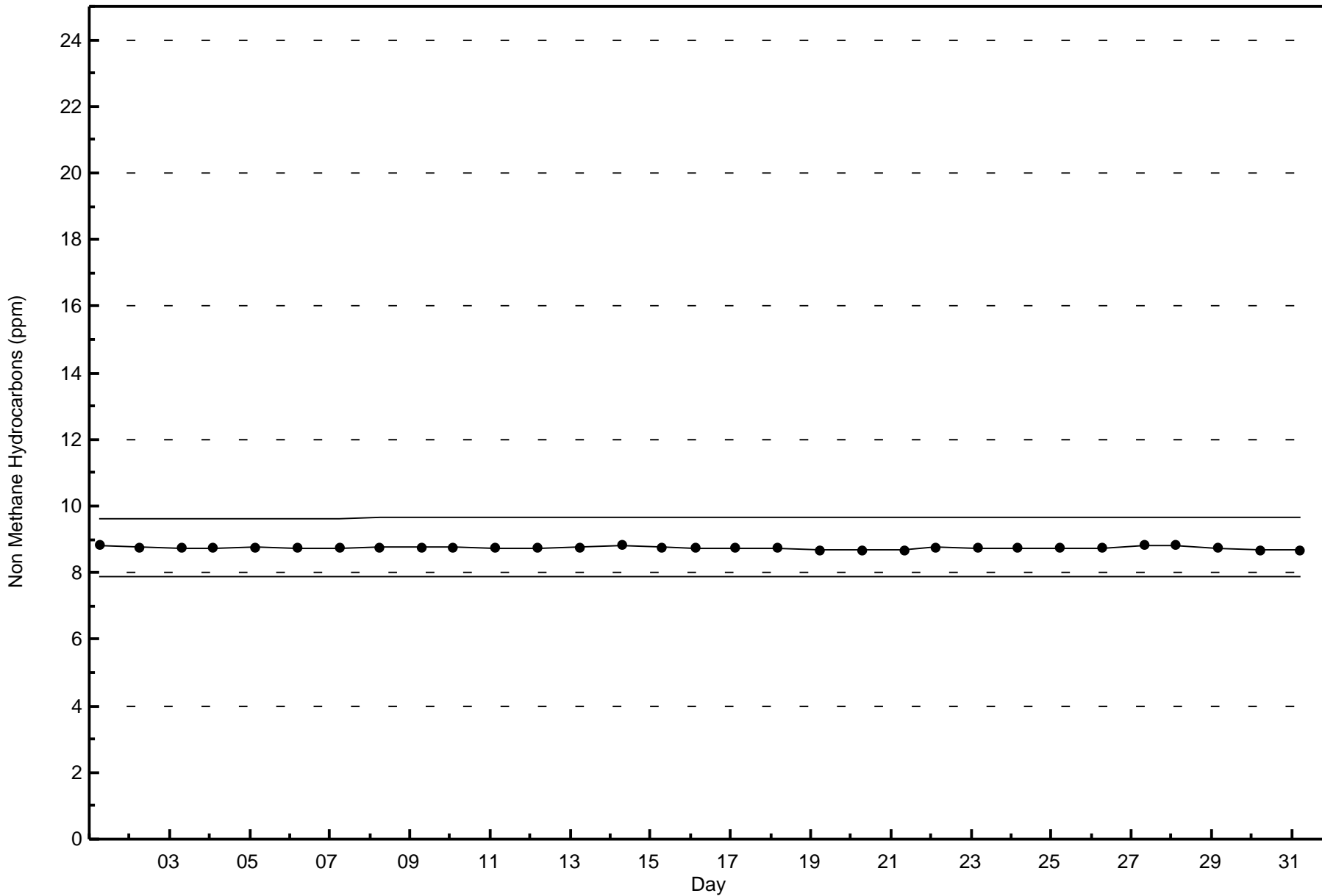


Wood Buffalo Environmental Association
Wind Rose Jul 2016

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









Wood Buffalo Environmental Association

Summary of Hour Averages

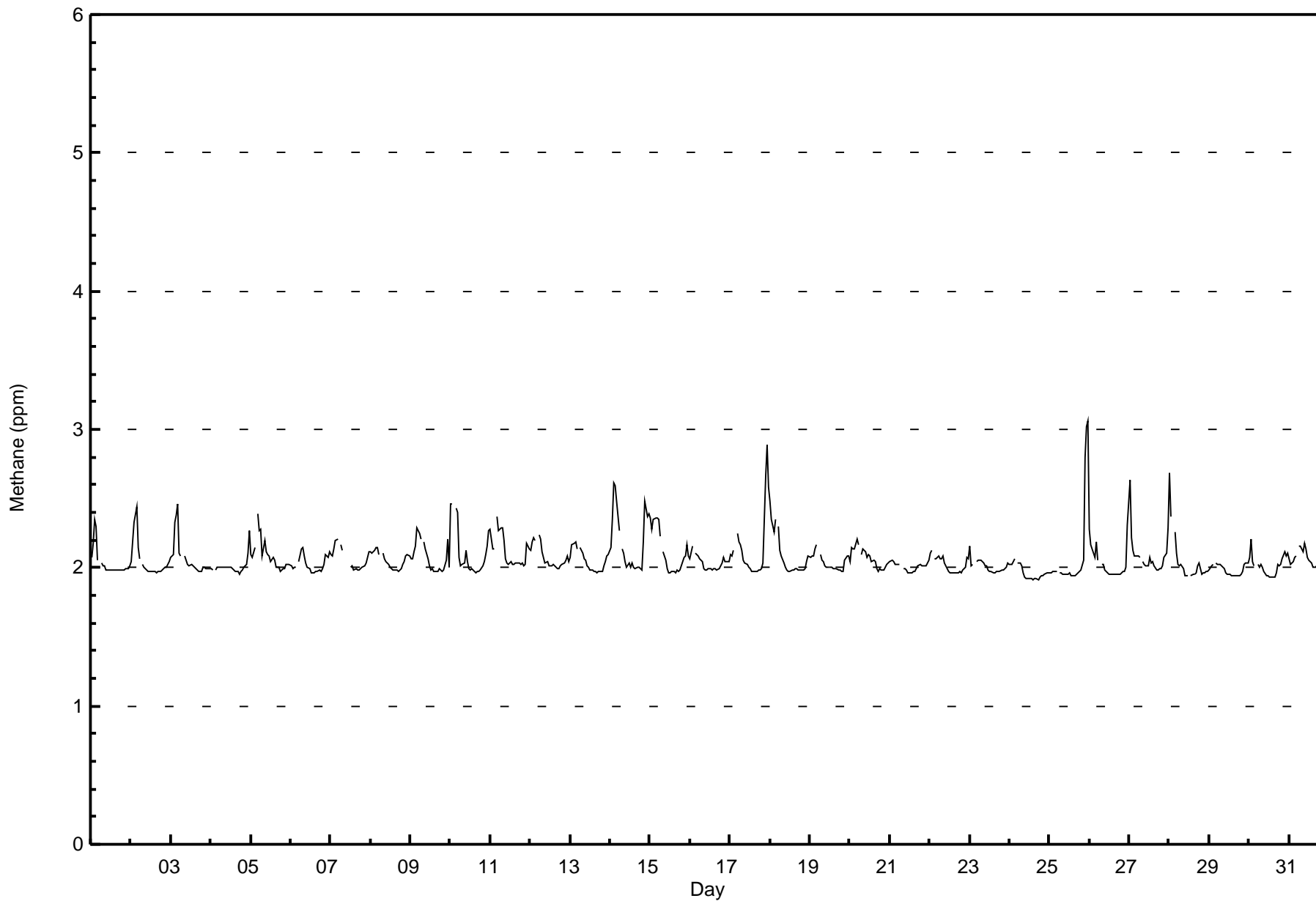
Methane (CH₄) - ppm

Patricia McInnes - July 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 3.1 ppm on Jul 26 00:00	Maximum Daily Average: 2.2 ppm on Jul 14		Hours of Data:	708
Minimum Value: 1.9 ppm on Jul 24 15:00	Minimum Daily Average: 2.0 ppm on Jul 24		Hours of Missing Data:	36
Maximum Diurnal Average: 2.2 ppm at hour 5	Minimum Diurnal Average: 2.0 ppm at hour 16		Hours of Calibration:	35
Monthly Average: 2.06 ppm	Percentiles: P ₁ = 1.9 P ₁₀ = 2.0 Q ₁ = 2.0 Median = 2.0 Q ₃ = 2.1 P ₉₀ = 2.2 P ₉₉ = 2.6		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-Jul	2.1	2.2	2.3	2.3	2.1	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																						
2-Jul	2.0	2.2	2.3	2.4	2.1	2.1	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																						
3-Jul	2.1	2.1	2.3	2.4	2.5	2.1	2.1	Z	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																						
4-Jul	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	2.3	2.0	2.0	2.0	2.0																						
5-Jul	2.1	2.1	2.1	Z	2.4	2.3	2.3	2.1	2.2	2.1	2.1	2.1	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																						
6-Jul	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	2.0	2.0	2.1	2.1	2.1	2.0	2.0	2.1																						
7-Jul	2.1	2.1	2.1	2.2	2.2	Z	2.2	2.1	C	C	C	C	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																						
8-Jul	2.1	2.1	2.1	2.1	2.1	2.1	Z	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1																						
9-Jul	2.1	2.1	2.1	2.2	2.3	2.3	2.2	Z	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	2.1	2.2	2.0	2.1	2.1	2.3																						
10-Jul	2.5	2.5	Z	2.4	2.4	2.1	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.2	2.3	2.1	2.1	2.5																						
11-Jul	2.3	2.1	2.1	Z	2.4	2.3	2.3	2.3	2.2	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.2	2.1	2.1	2.1	2.4																						
12-Jul	2.1	2.2	2.2	2.2	Z	2.2	2.2	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.0	2.1	2.1	2.2																						
13-Jul	2.1	2.2	2.2	2.2	2.1	Z	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.2																						
14-Jul	2.1	2.4	2.6	2.6	2.5	2.3	Z	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.2	2.5	2.4	2.4	2.2	2.2	2.6																						
15-Jul	2.4	2.3	2.3	2.4	2.4	2.3	2.2	Z	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.2	2.1	2.1	2.1	2.4																						
16-Jul	2.1	2.2	Z	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.2																						
17-Jul	2.1	2.1	2.1	Z	2.2	2.2	2.2	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.7	2.9	2.6	2.1	2.1	2.9																						
18-Jul	2.5	2.3	2.3	2.4	Z	2.3	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.5																						
19-Jul	2.1	2.1	2.1	2.1	2.2	Z	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.0	2.0	2.2																						
20-Jul	2.0	2.1	2.1	2.1	2.2	2.2	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.2																						
21-Jul	2.0	2.1	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	2.1	2.0	2.1																						
22-Jul	2.1	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.0	2.1																						
23-Jul	2.2	2.0	2.0	Z	2.0	2.1	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.2																						
24-Jul	2.0	2.0	2.0	2.1	Z	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.1																						
25-Jul	2.0	2.0	2.0	2.0	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	2.0	2.0	2.0	2.0	2.1	2.8	3.0	3.1	2.1	3.1																						
26-Jul	2.3	2.2	2.1	2.1	2.2	2.1	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.3	2.0	2.3																						
27-Jul	2.6	2.2	2.1	2.1	2.1	2.1	2.1	Z	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.3	2.1	2.1	2.6																						
28-Jul	2.7	2.4	Z	2.3	2.1	2.0	2.0	2.0	2.0	1.9	1.9	1.9	M	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	2.7																						
29-Jul	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	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-Jul	2.1	2.2	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.0	2.2																						
31-Jul	2.1	2.0	2.0	2.1	2.1	Z	2.2	2.2	2.1	2.2	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.2																					
																								2.2	2.1	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	Diurnal Average	
																								2.7	2.5	2.6	2.6	2.5	2.3	2.3	2.3	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.2	2.8	3.0	3.1	Diurnal Maximum	

Z - zerospan C - Calibration M - Maintenance





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Methane (CH₄) - ppm
Patricia McInnes - July 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	466	65.82	65.82
2.1 - 3.0	241	34.04	99.86
3.1 - 10.0	1	0.14	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Methane (CH₄) - ppm
Patricia McInnes - July 2016**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	61	44	11	10	7	11	23	37	25	38	34	46	23	25	21	50	466
2.1 - 3.0	32	13	4	0	1	10	12	17	10	13	18	6	7	14	22	62	241
3.1 - 10.0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	93	57	15	10	9	21	35	54	35	51	52	52	30	39	43	112	708

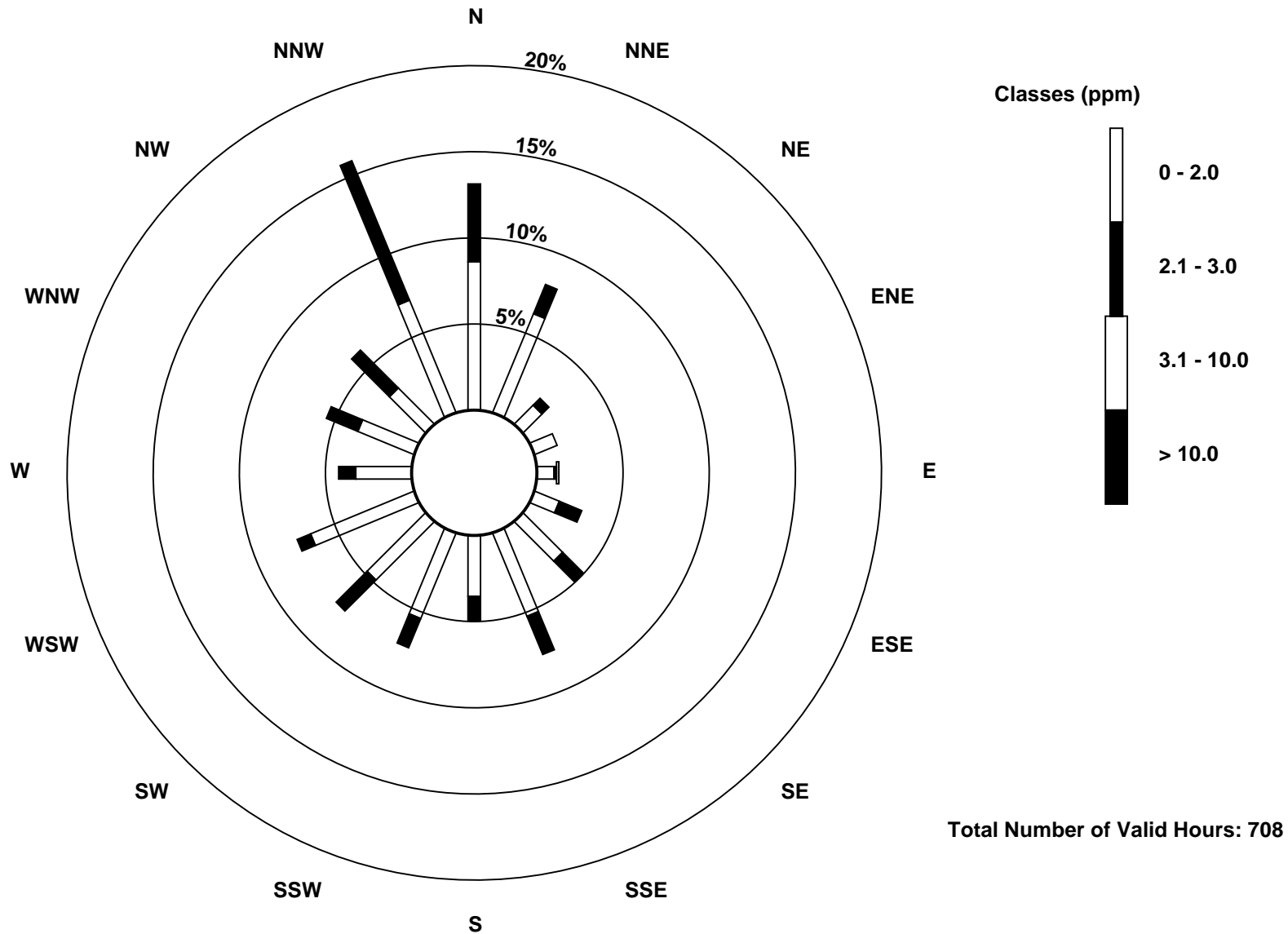
Total Number of Valid Hours: 708

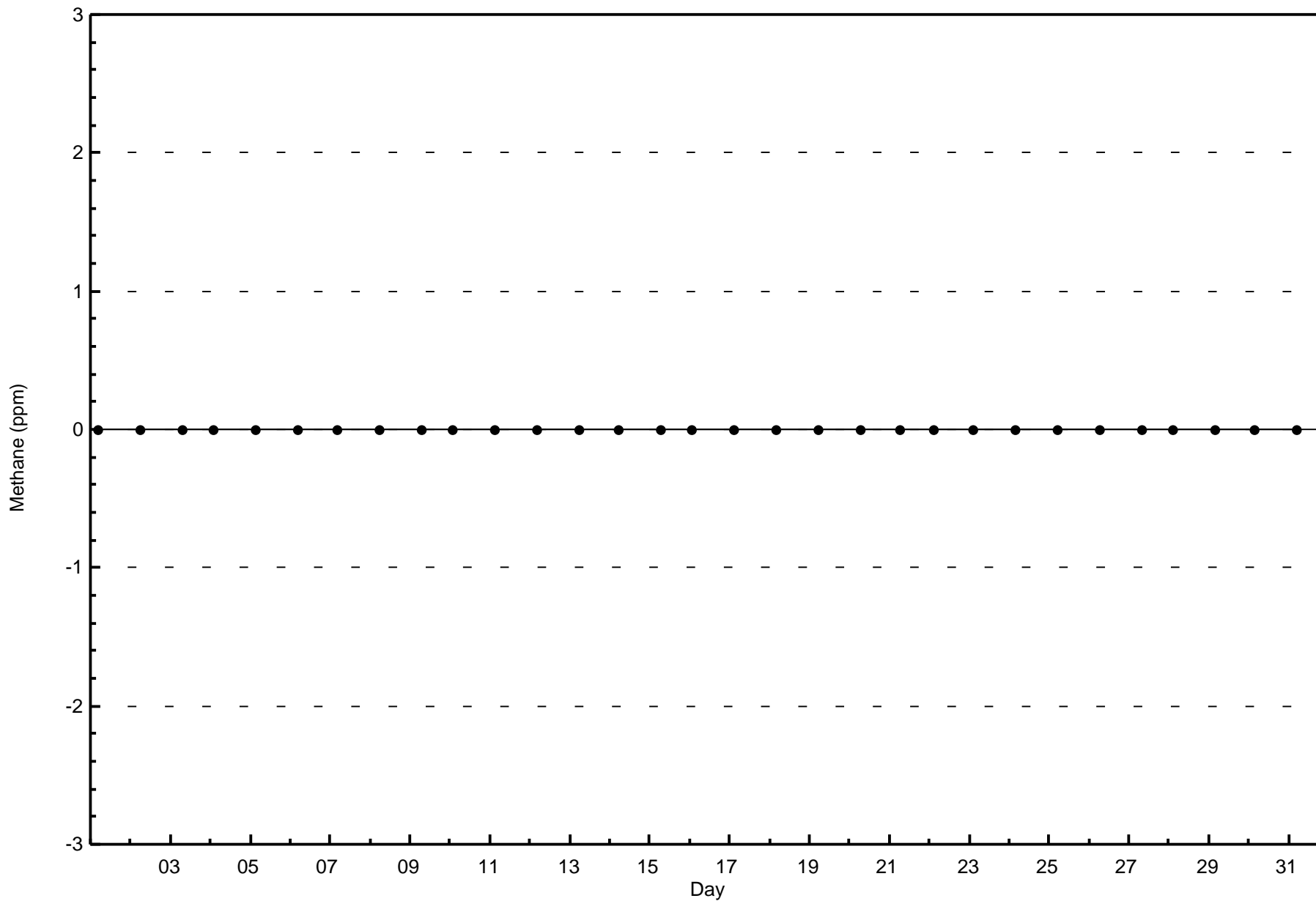
Total Number of Hours: 744

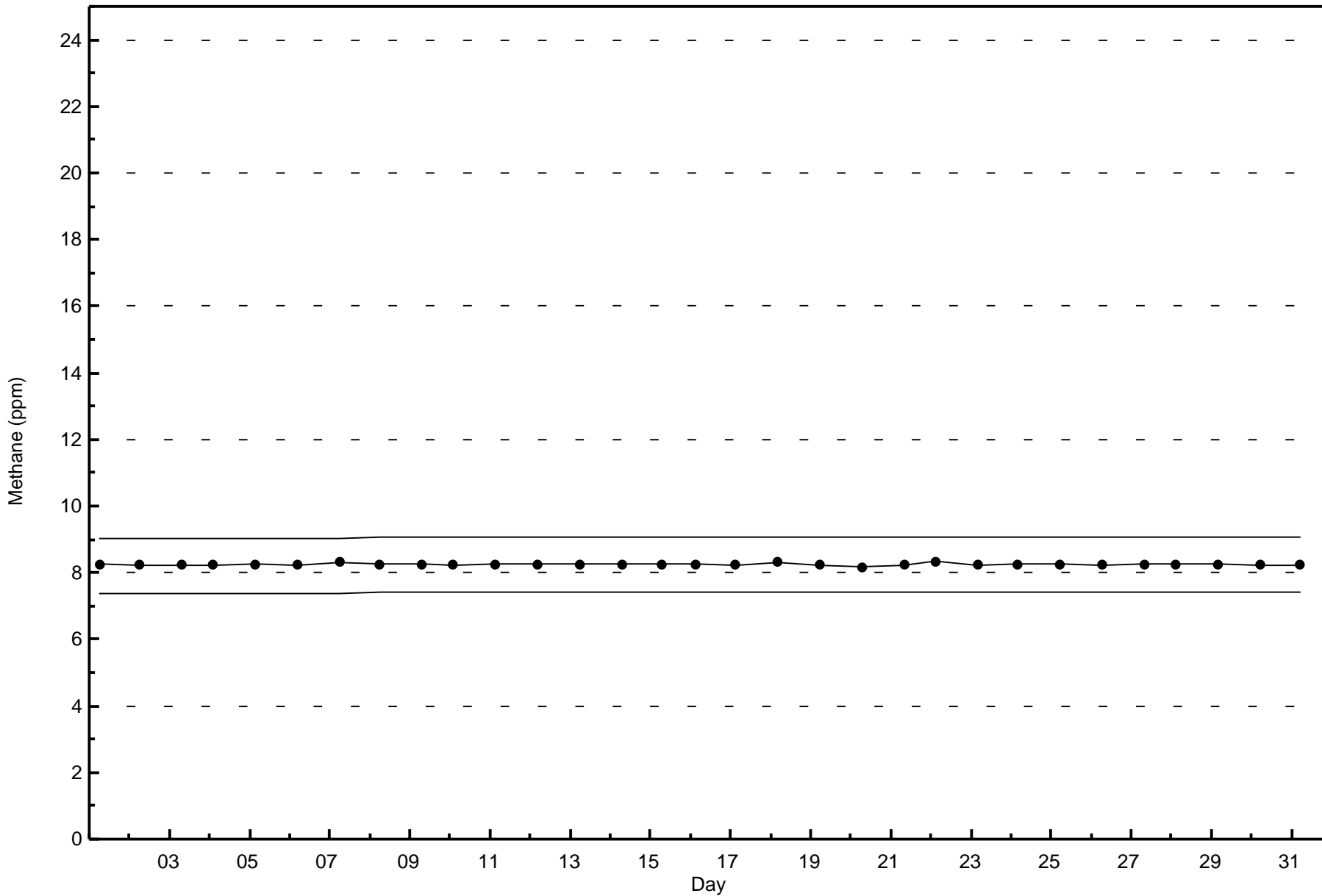


Wood Buffalo Environmental Association
Wind Rose Jul 2016

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









Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O₃) - ppb

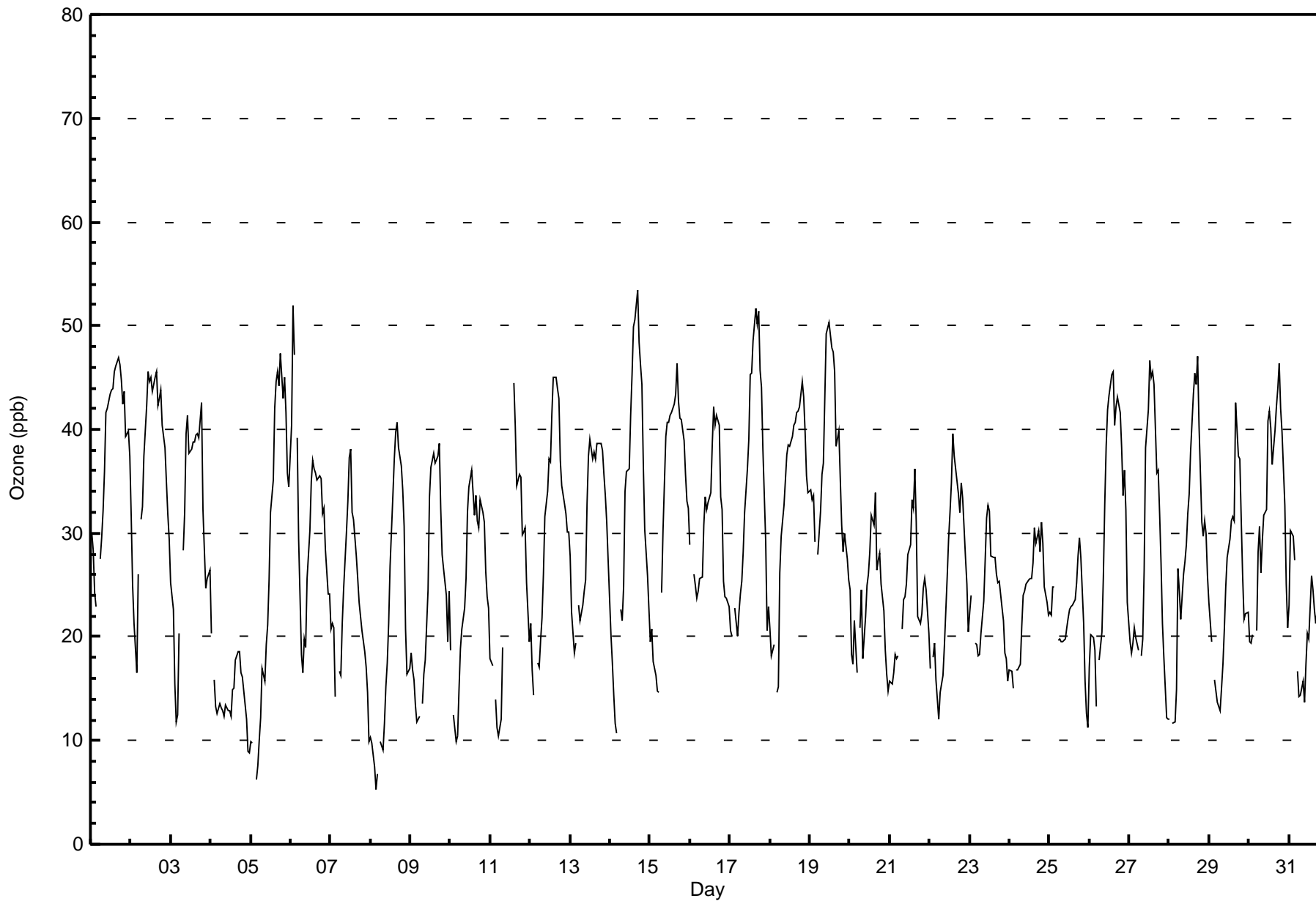
Patricia McInnes - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																																							
Maximum Value: 53 ppb on Jul 14 17:00										Maximum Daily Average: 38.2 ppb on Jul 1										Hours of Data: 707																													
Minimum Value: 5 ppb on Jul 8 04:00										Minimum Daily Average: 14.2 ppb on Jul 4										Hours of Missing Data: 37																													
Maximum Diurnal Average: 37.9 ppb at hour 16										Minimum Diurnal Average: 16.4 ppb at hour 5										Hours of Calibration: 37																													
Monthly Average: 28.2 ppb										Percentiles: P ₁ = 9 P ₁₀ = 15 Q ₁ = 20 Median = 27 Q ₃ = 36 P ₉₀ = 43 P ₉₉ = 50										Percent Operational Time: 100.0																													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Jul	30	28	24	23	Z	28	30	32	36	42	42	43	44	44	46	46	47	46	45	42	44	39	40	37	38.2	47																							
2-Jul	32	25	21	17	26	Z	31	33	37	42	46	45	45	44	45	46	42	43	44	40	38	35	32	29	36.4	46																							
3-Jul	25	23	15	12	12	20	Z	28	32	40	41	38	38	39	39	39	40	39	43	32	28	25	26	26	30.5	43																							
4-Jul	20	Z	16	13	13	14	13	13	12	13	13	12	15	15	18	19	19	17	16	15	12	9	9	9	14.2	20																							
5-Jul	10	10	Z	6	8	10	12	17	16	19	21	26	32	35	42	45	46	44	47	43	45	42	36	34	28.0	47																							
6-Jul	40	52	47	Z	39	29	18	17	20	19	26	30	35	37	36	36	35	36	35	32	32	28	24	24	31.7	52																							
7-Jul	21	21	21	14	Z	17	16	21	25	30	33	37	38	32	31	28	26	23	22	21	19	17	15	10	23.4	38																							
8-Jul	10	10	8	5	7	Z	10	9	12	15	18	21	27	34	37	40	41	38	36	34	31	21	16	17	21.6	41																							
9-Jul	18	17	16	13	12	12	Z	14	16	18	25	33	36	37	38	37	37	39	32	28	27	24	19	24	24.9	39																							
10-Jul	19	Z	12	10	10	15	19	21	23	26	32	34	35	36	32	34	31	31	33	32	31	26	24	23	25.6	36																							
11-Jul	18	17	Z	14	11	10	12	19	C	C	C	C	C	C	45	40	35	36	35	30	30	30	25	19	--	45																							
12-Jul	21	17	14	Z	18	17	20	22	26	32	34	37	37	41	45	45	44	43	37	35	33	32	30	30	30.8	45																							
13-Jul	28	22	18	19	Z	23	22	23	24	25	33	37	39	37	38	37	39	39	39	38	36	34	31	27	30.8	39																							
14-Jul	20	17	14	12	11	Z	23	22	25	34	36	36	41	45	50	51	53	48	46	44	37	30	26	23	32.4	53																							
15-Jul	19	21	18	16	15	15	Z	24	30	39	41	41	41	42	42	43	46	43	41	41	39	36	33	32	33.0	46																							
16-Jul	29	Z	26	25	24	24	26	31	34	32	33	34	39	42	40	41	40	33	32	25	24	24	23	23	30.8	42																							
17-Jul	21	20	Z	23	20	22	24	25	28	32	36	39	45	45	49	52	50	51	46	44	38	29	21	23	34.1	52																							
18-Jul	21	18	19	Z	15	15	26	30	33	35	38	39	38	39	40	41	42	42	42	45	43	40	36	34	33.4	45																							
19-Jul	34	33	34	29	Z	28	32	36	37	43	49	50	49	48	47	46	38	40	35	31	28	30	28	26	37.0	50																							
20-Jul	25	18	17	22	16	Z	21	24	18	22	25	26	28	32	31	34	26	27	28	25	23	19	16	15	23.4	34																							
21-Jul	16	15	17	18	18	18	Z	21	24	24	25	28	29	33	32	36	31	22	21	22	25	26	24	20	23.7	36																							
22-Jul	17	Z	18	19	16	12	15	15	16	19	26	29	32	35	40	37	35	34	32	35	33	28	25	20	25.6	40																							
23-Jul	22	24	Z	19	19	18	18	20	23	27	31	33	32	28	28	28	26	25	25	23	22	18	18	16	23.7	33																							
24-Jul	17	17	15	Z	17	17	17	21	24	24	25	25	26	26	27	31	29	30	28	31	29	25	23	22	23.8	31																							
25-Jul	22	22	25	25	Z	20	20	19	20	20	21	22	23	23	23	24	25	28	30	28	21	16	13	11	21.7	30																							
26-Jul	17	20	20	19	13	Z	18	20	26	33	38	42	43	45	46	40	42	43	42	38	34	36	32	23	31.8	46																							
27-Jul	19	18	19	21	20	19	Z	18	20	26	38	42	47	45	46	44	36	36	32	27	21	18	12	12	27.7	47																							
28-Jul	12	Z	12	12	15	27	24	22	26	27	29	32	34	38	43	45	44	47	40	31	30	31	30	26	29.4	47																							
29-Jul	23	20	Z	16	15	14	13	15	17	21	25	28	29	31	32	31	43	37	37	31	26	22	22	22	24.8	43																							
30-Jul	19	19	20	Z	21	28	31	26	29	32	32	41	42	40	37	40	42	44	46	42	40	33	25	21	32.6	46																							
31-Jul	23	30	30	27	Z	17	14	14	16	14	17	20	20	26	25	23	21	23	23	27	33	30	30	31	23.2	33																							
																								21.6	21.4	19.9	17.3	16.4	18.8	20.2	21.5	24.0	27.6	30.9	33.4	35.1	36.4	37.6	37.9	37.2	36.6	35.3	32.9	30.8	27.6	24.7	23.0	Diurnal Average	
																								40	52	47	29	39	29	32	36	37	43	49	50	49	48	50	52	53	51	47	45	45	42	40	37	Diurnal Maximum	
Z - zerospan C - Calibration																																																	
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb																																																	



Wood Buffalo Environmental Association
Hourly Averages

Ozone (O₃) - ppb
Patricia McInnes - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Ozone (O₃) - ppb
Patricia McInnes - July 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	192	27.16	27.16
21 - 50	510	72.14	99.29
51 - 82	5	0.71	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Ozone (O₃) - ppb
Patricia McInnes - July 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	24	7	2	0	2	3	10	13	10	14	29	15	6	9	15	33	192
21 - 50	66	48	13	10	7	18	26	40	26	36	23	37	22	31	25	82	510
51 - 82	2	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	5
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	92	56	15	10	9	21	36	53	36	50	52	52	29	40	40	116	707

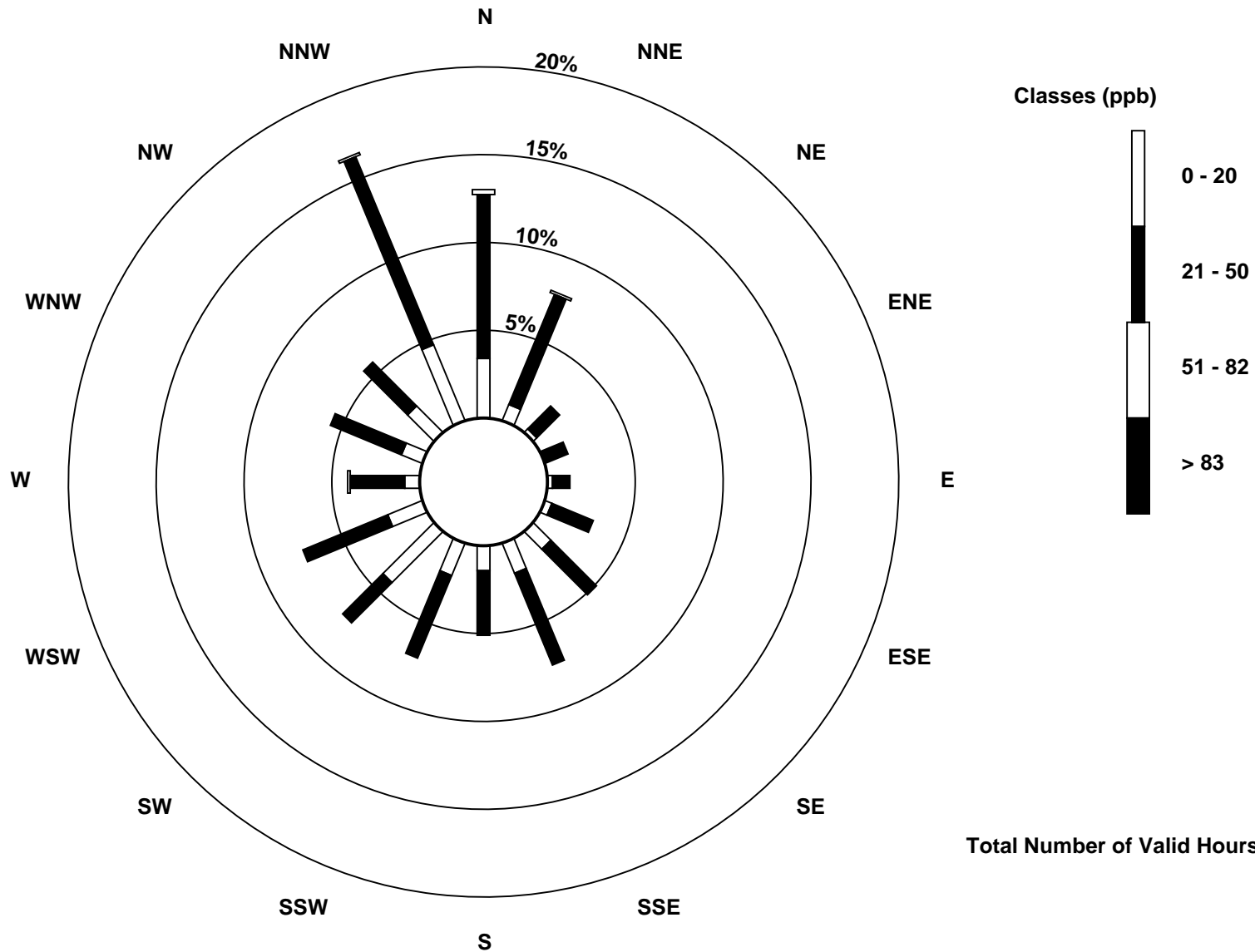
Total Number of Valid Hours: 707

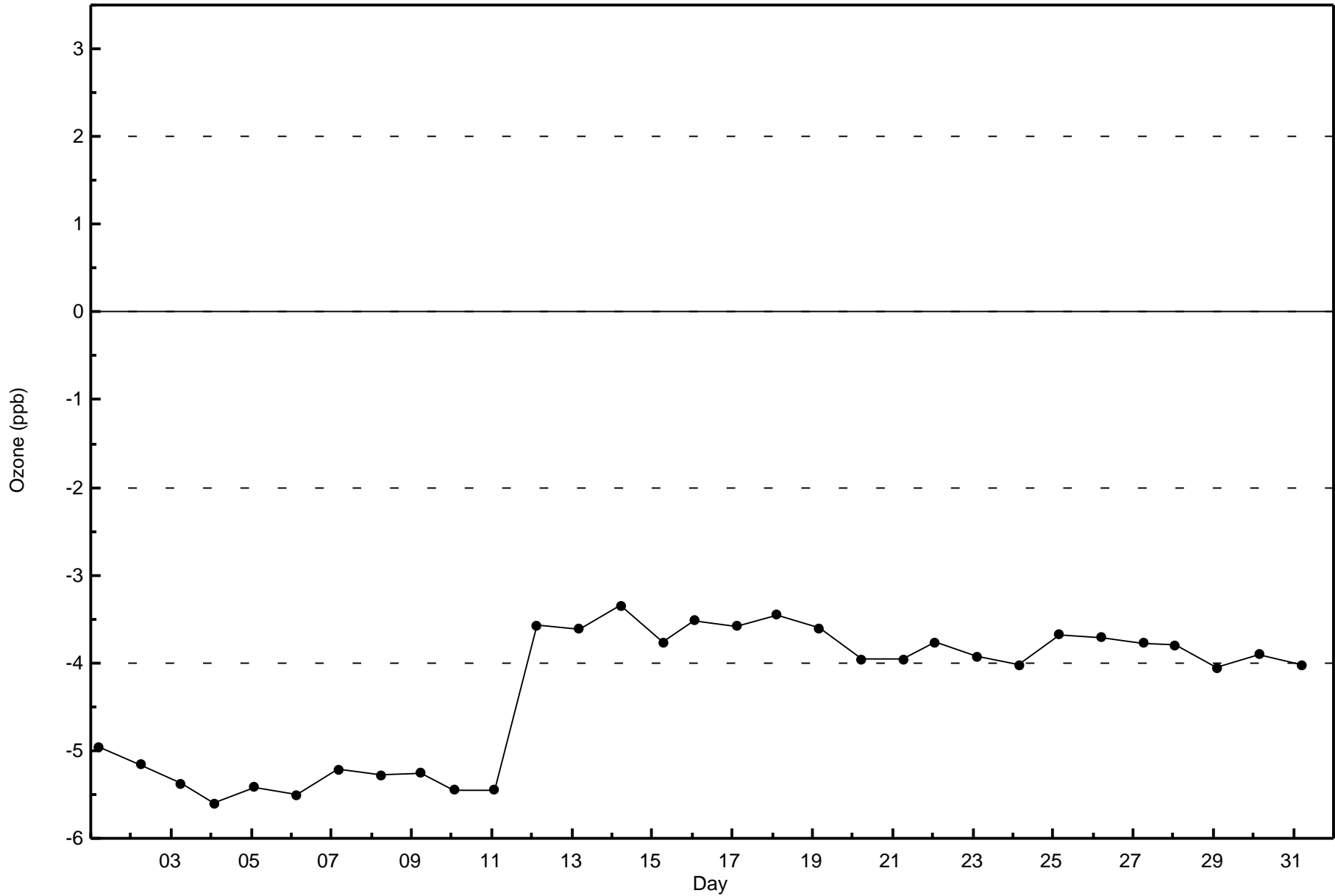
Total Number of Hours: 744

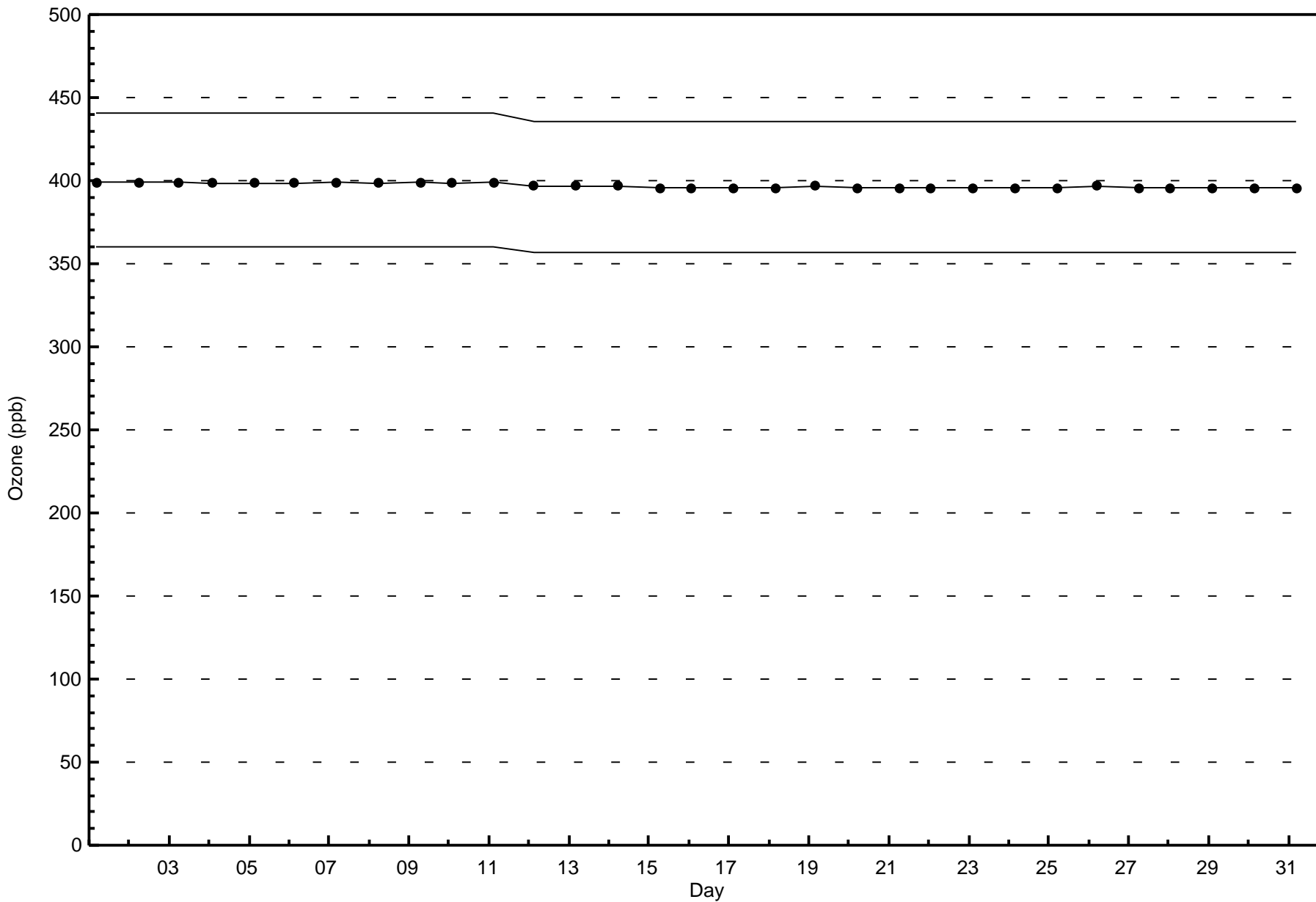


Wood Buffalo Environmental Association
Wind Rose Jul 2016

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







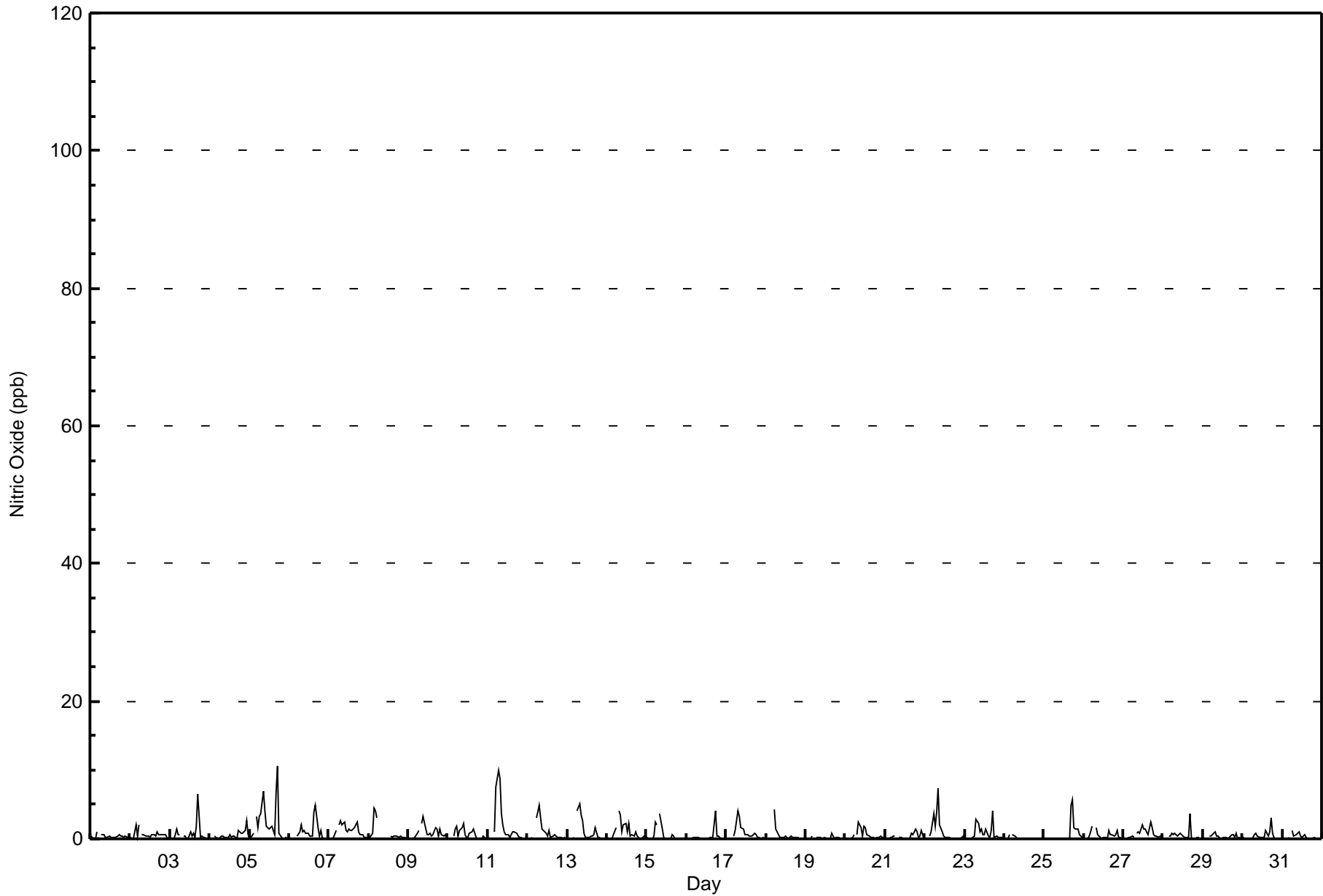


Maximum Value: 11 ppb on Jul 8 08:00																	Maximum Daily Average: 2.2 ppb on Jul 5																	Hours in Service: 744	
Minimum Value: 0 ppb on Jul 1 02:00																	Minimum Daily Average: 0.1 ppb on Jul 24																	Hours of Data: 708	
Maximum Diurnal Average: 2.4 ppb at hour 8																	Minimum Diurnal Average: 0.0 ppb at hour 2																	Hours of Missing Data: 36	
Monthly Average: 0.7 ppb																	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 2 P ₉₉ = 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-Jul	0	0	0	0	1	Z	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.3	1									
2-Jul	0	0	0	2	0	2	Z	1	1	0	0	0	1	1	0	1	1	1	1	1	1	1	0	0	0.6	2									
3-Jul	0	0	0	1	1	1	1	Z	0	0	0	0	1	0	1	0	2	7	0	0	0	0	0	0	0.7	7									
4-Jul	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	1	1	3	1	0	0.5	3									
5-Jul	0	0	1	Z	3	2	3	4	7	4	2	2	1	2	1	1	7	11	1	0	0	0	0	0	2.2	11									
6-Jul	0	0	0	0	Z	0	1	2	1	1	1	1	0	0	4	5	2	0	1	0	0	0	0	0	0.9	5									
7-Jul	0	0	0	0	1	Z	2	3	2	2	1	1	1	1	2	2	2	2	1	1	1	0	0	0	1.1	3									
8-Jul	0	0	1	5	4	3	Z	11	C	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0	1.5	11									
9-Jul	0	0	0	0	0	1	1	Z	2	3	1	1	1	1	0	1	2	1	0	1	1	0	1	0	0.8	3									
10-Jul	0	0	Z	0	2	2	0	1	2	2	1	0	0	1	1	1	1	0	0	0	0	0	0	0	0.7	2									
11-Jul	0	0	0	Z	1	8	10	9	4	2	1	1	1	0	1	1	1	1	0	0	0	0	0	0	1.7	10									
12-Jul	0	0	0	0	Z	3	4	5	3	1	1	1	0	1	0	0	1	0	0	0	0	0	0	0	1.0	5									
13-Jul	0	0	0	0	0	Z	4	5	3	3	1	0	0	0	0	1	2	0	0	0	0	0	0	0	0.9	5									
14-Jul	0	0	0	0	1	2	Z	4	3	1	2	2	1	2	0	1	0	1	0	0	0	0	0	0	1.0	4									
15-Jul	0	0	0	0	0	2	2	Z	4	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.5	4									
16-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0.3	4									
17-Jul	0	0	0	Z	0	1	3	4	3	2	1	1	1	1	0	0	1	1	1	0	0	0	0	0	0.9	4									
18-Jul	0	0	0	0	Z	4	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	4									
19-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.1	1									
20-Jul	0	0	0	0	0	1	Z	1	2	2	0	2	2	1	0	0	0	0	0	0	0	0	0	0	0.5	2									
21-Jul	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	1	1	1	0	0	1	0	0.3	1									
22-Jul	0	0	Z	0	1	4	2	4	7	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1.0	7									
23-Jul	0	0	0	Z	0	0	0	3	2	1	1	1	1	1	0	0	1	4	0	0	0	0	0	0	0.8	4									
24-Jul	0	0	0	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1									
25-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	5	6	2	1	1	1	0	0	0.7	6									
26-Jul	0	0	0	0	1	2	Z	2	1	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0.5	2									
27-Jul	0	0	0	0	0	0	0	Z	1	1	1	2	1	1	1	1	2	2	1	0	0	0	1	0	0.7	2									
28-Jul	0	0	Z	0	0	1	1	1	0	1	1	1	0	0	0	4	0	0	0	0	0	0	0	0	0.5	4									
29-Jul	0	0	0	Z	0	0	1	1	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0.3	1									
30-Jul	0	0	0	0	Z	0	0	1	1	0	0	0	0	0	1	0	1	3	1	0	0	0	0	0	0.4	3									
31-Jul	0	0	0	0	0	Z	1	1	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0.3	1									
																	Diurnal Average		Diurnal Maximum																
0.1 0.0 0.1 0.4 0.8 1.6 1.5 2.4 1.8 1.1 0.7 0.5 0.5 0.5 0.4 0.5 1.3 1.7 0.4 0.4 0.3 0.2 0.3 0.1																																			
0 0 1 5 4 8 10 11 7 4 2 2 2 2 1 4 7 11 2 1 1 1 3 1																																			
Z - zerospan		C - Calibration																																	



Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	708	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

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

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	91	56	15	10	9	21	35	54	35	51	52	52	30	39	43	115	708
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	91	56	15	10	9	21	35	54	35	51	52	52	30	39	43	115	708

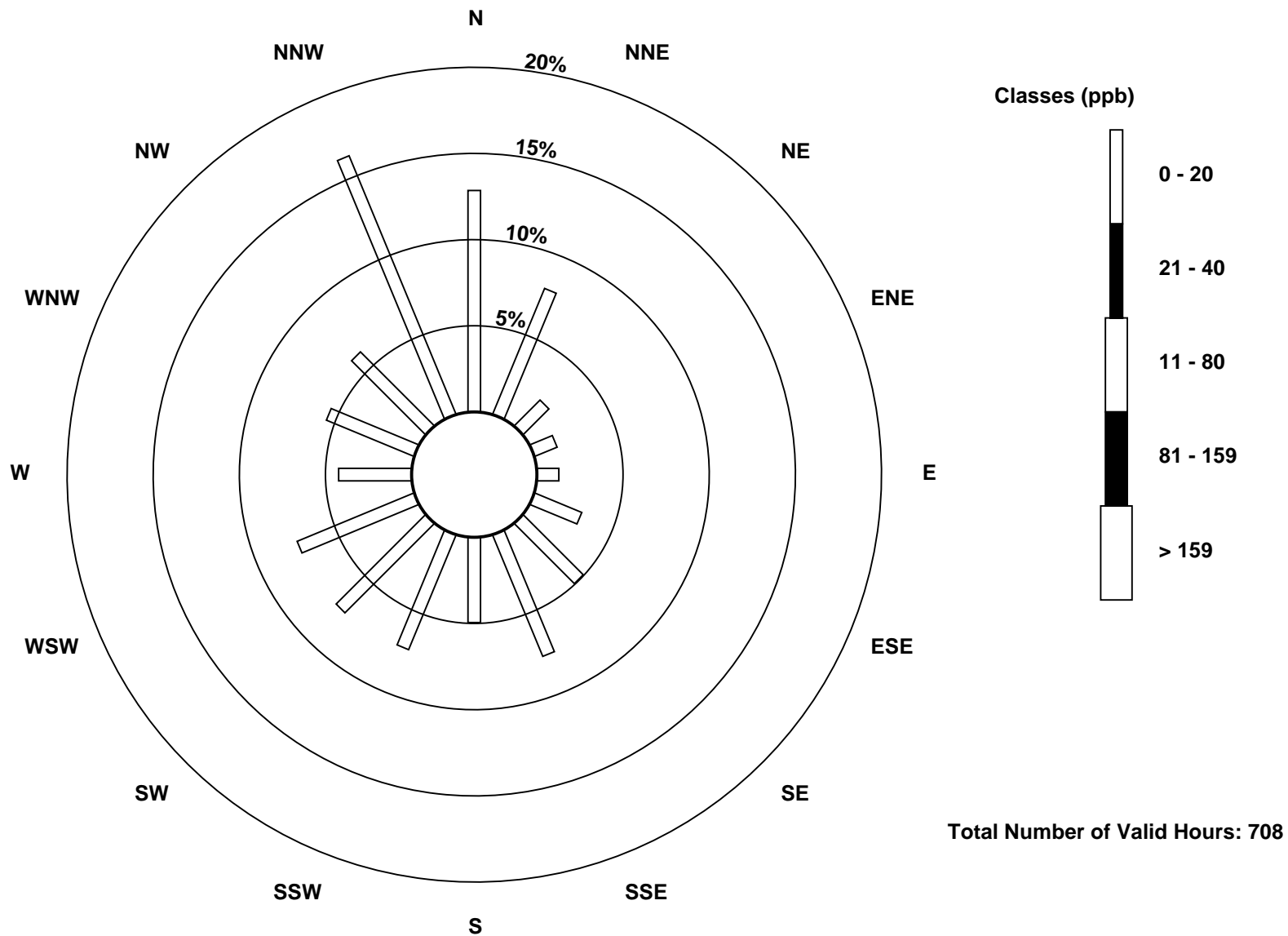
Total Number of Valid Hours: 708

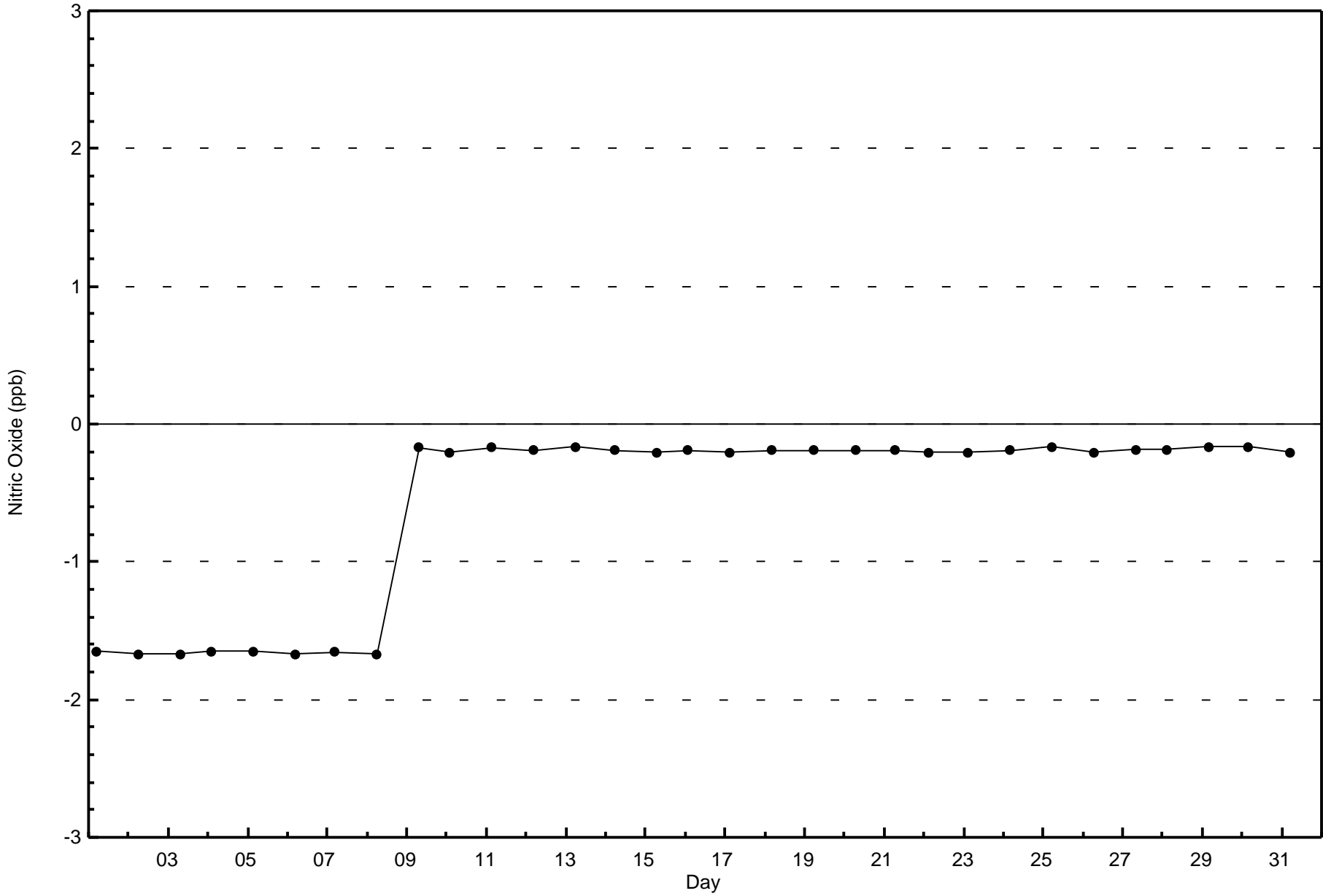
Total Number of Hours: 744

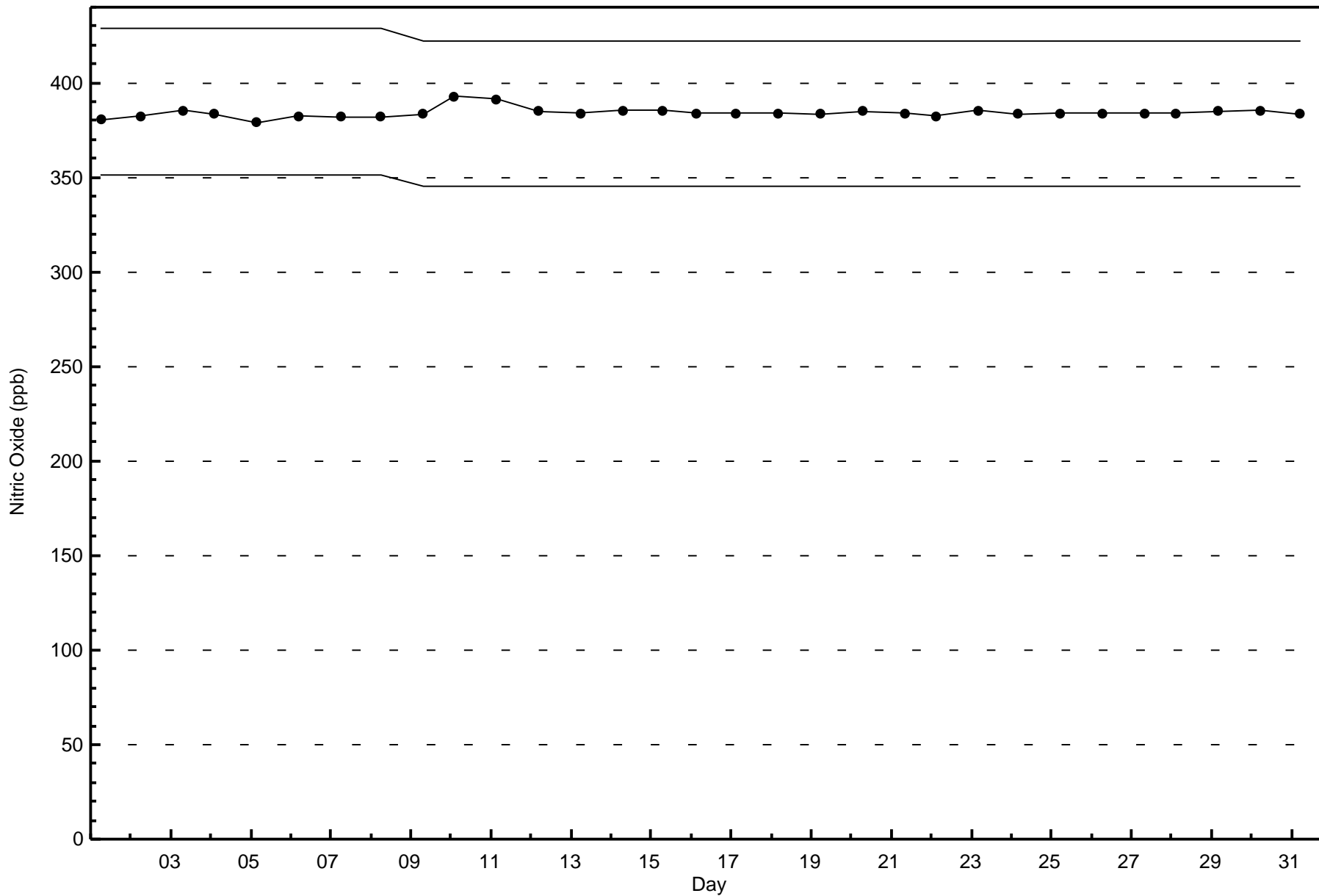


Wood Buffalo Environmental Association
Wind Rose Jul 2016

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









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

Patricia McInnes - July 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 12 ppb on Jul 8 22:00	Maximum Daily Average: 6.4 ppb on Jul 8		Hours of Data:	708
Minimum Value: 0 ppb on Jul 15 12:00	Minimum Daily Average: 0.4 ppb on Jul 24		Hours of Missing Data:	36
Maximum Diurnal Average: 4.5 ppb at hour 8	Minimum Diurnal Average: 1.7 ppb at hour 14		Hours of Calibration:	36
Monthly Average: 2.9 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 2 Q ₃ = 4 P ₉₀ = 7 P ₉₉ = 11		Percent Operational Time:	100.0

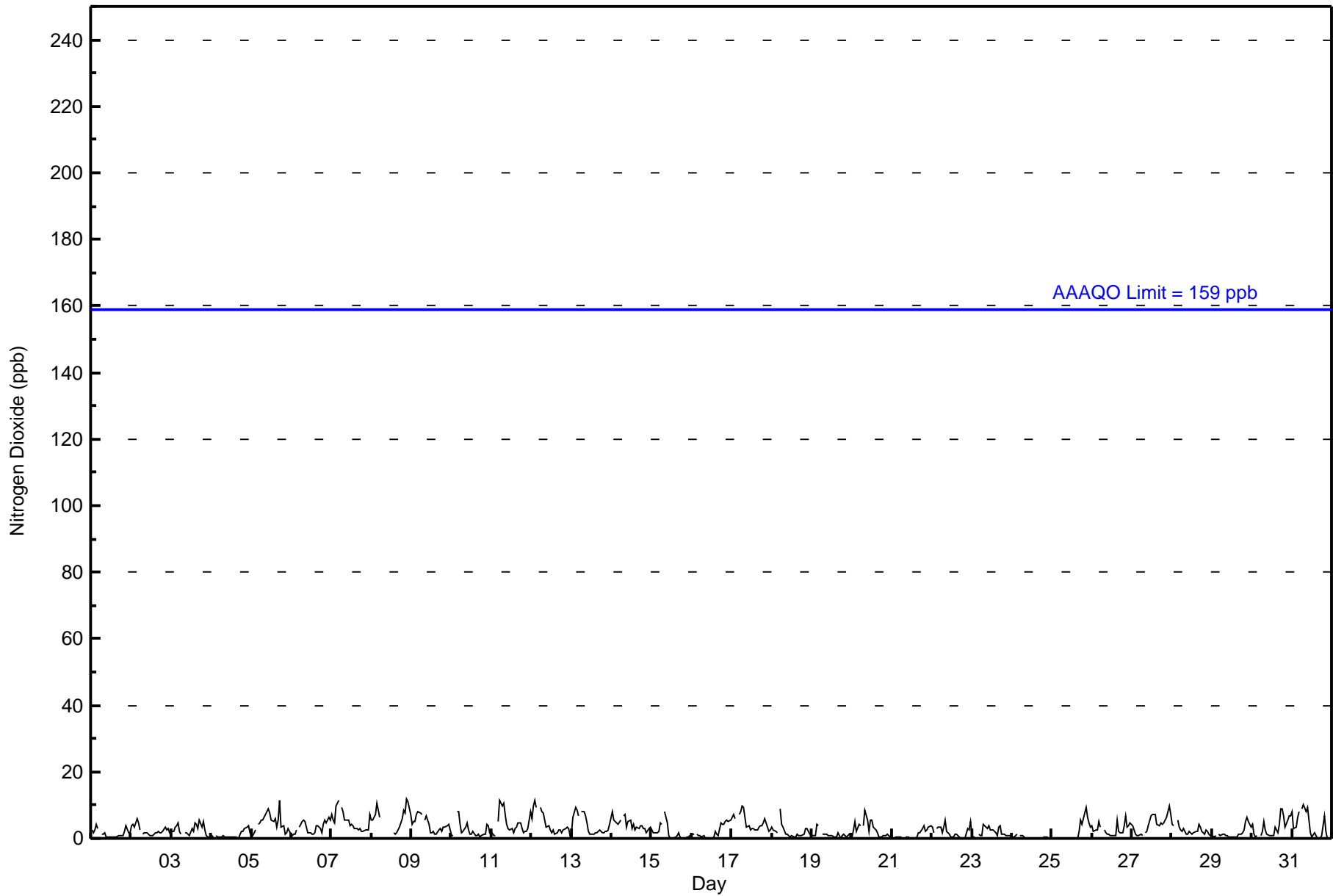
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	3	2	3	4	3	Z	1	1	2	1	0	1	0	1	0	0	1	1	1	1	2	4	2	2	1.5	4
2-Jul	4	4	3	6	5	3	Z	1	2	2	1	1	1	1	2	2	2	2	2	2	3	2	3	2	2.4	6
3-Jul	2	2	3	4	5	2	1	Z	2	2	1	1	3	2	5	4	3	6	3	5	3	1	1	0	2.6	6
4-Jul	1	0	Z	1	1	0	1	1	1	1	1	1	1	0	1	1	0	1	2	2	3	4	4	2	1.1	4
5-Jul	1	1	3	Z	4	5	6	6	7	8	9	8	6	5	6	3	6	11	3	4	1	2	3	2	4.7	11
6-Jul	1	1	1	3	Z	3	5	6	5	3	2	2	1	1	2	4	4	3	2	4	5	5	6	6	3.3	6
7-Jul	7	6	5	10	11	Z	10	8	6	5	5	4	4	4	3	3	3	3	2	2	2	2	3	7	5.0	11
8-Jul	6	6	7	11	9	6	Z	9	C	C	C	C	C	2	1	2	3	4	6	8	8	12	11	7	6.4	12
9-Jul	4	5	5	7	8	8	7	Z	5	7	4	2	2	2	1	1	2	3	2	4	3	4	4	3	4.1	8
10-Jul	1	1	Z	8	8	4	2	2	3	5	3	1	1	2	1	1	1	1	1	1	1	4	4	2	2.5	8
11-Jul	2	1	1	Z	5	11	10	11	7	4	3	3	3	2	3	3	5	5	3	2	2	2	3	8	4.3	11
12-Jul	6	10	12	10	Z	9	8	8	5	3	4	3	2	2	1	2	3	3	2	3	3	3	3	1	4.5	12
13-Jul	2	6	10	8	7	Z	8	8	7	5	2	1	1	1	2	2	2	3	2	2	2	2	3	4	3.9	10
14-Jul	8	6	5	5	4	5	Z	7	7	3	5	5	3	4	3	3	3	4	4	3	3	2	3	4	4.3	8
15-Jul	3	2	2	2	2	5	4	Z	8	5	1	0	0	0	0	1	2	1	0	0	0	0	0	1	1.7	8
16-Jul	1	1	Z	1	1	1	1	1	0	0	0	0	0	1	2	1	1	5	4	4	5	5	5	5	2.0	5
17-Jul	7	7	6	Z	7	8	10	9	6	4	4	3	3	3	3	3	3	4	4	5	6	3	2	2	4.8	10
18-Jul	4	3	2	2	Z	9	4	3	1	1	1	1	1	0	1	1	1	1	1	1	3	3	2	1	2.0	9
19-Jul	1	1	1	4	4	Z	1	1	1	1	1	1	1	1	0	2	0	1	1	1	1	1	1	1	1.2	4
20-Jul	0	2	5	2	4	4	Z	4	9	5	2	5	6	4	3	2	1	0	0	1	1	1	1	1	2.7	9
21-Jul	0	0	0	1	1	1	1	Z	0	0	0	0	0	0	0	0	2	2	3	4	2	3	3	4	1.2	4
22-Jul	3	2	Z	3	4	4	2	4	6	2	1	1	1	0	1	1	0	0	0	0	0	3	3	5	2.0	6
23-Jul	1	0	0	Z	1	1	1	4	4	3	4	3	3	2	1	4	4	1	1	1	1	1	1	1	1.9	4
24-Jul	0	0	1	1	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
25-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	2	6	4	6	10	6	5	4	1.9	10	
26-Jul	4	2	2	3	5	4	Z	2	2	1	1	1	1	1	5	2	2	2	2	4	7	3	4	5	2.8	7
27-Jul	4	3	1	1	1	1	1	Z	2	2	4	7	7	7	7	4	4	5	4	5	6	7	10	7	4.3	10
28-Jul	4	4	Z	6	4	2	2	3	1	1	2	2	1	2	2	2	4	3	2	1	2	2	1	1	2.4	6
29-Jul	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	0	1	1	1	2	2	5	6	5	4	1.7	6
30-Jul	4	1	0	1	Z	1	2	5	3	1	1	1	1	1	3	2	4	9	9	7	4	6	7	7	3.4	9
31-Jul	8	3	3	6	8	Z	9	10	8	10	6	2	1	2	1	0	0	0	1	7	2	0	0	0	3.8	10
	3.0	2.7	3.2	4.2	4.3	4.0	3.8	4.5	3.7	2.9	2.3	1.9	1.8	1.7	1.8	1.8	2.3	2.9	2.3	3.0	3.1	3.2	3.3	3.1	Diurnal Average	
	8	10	12	11	11	11	10	11	9	10	9	8	7	7	7	5	6	11	9	8	10	12	11	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 (NO₂) - ppb
Patricia McInnes - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	708	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Patricia McInnes - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	91	56	15	10	9	21	35	54	35	51	52	52	30	39	43	115	708
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	91	56	15	10	9	21	35	54	35	51	52	52	30	39	43	115	708

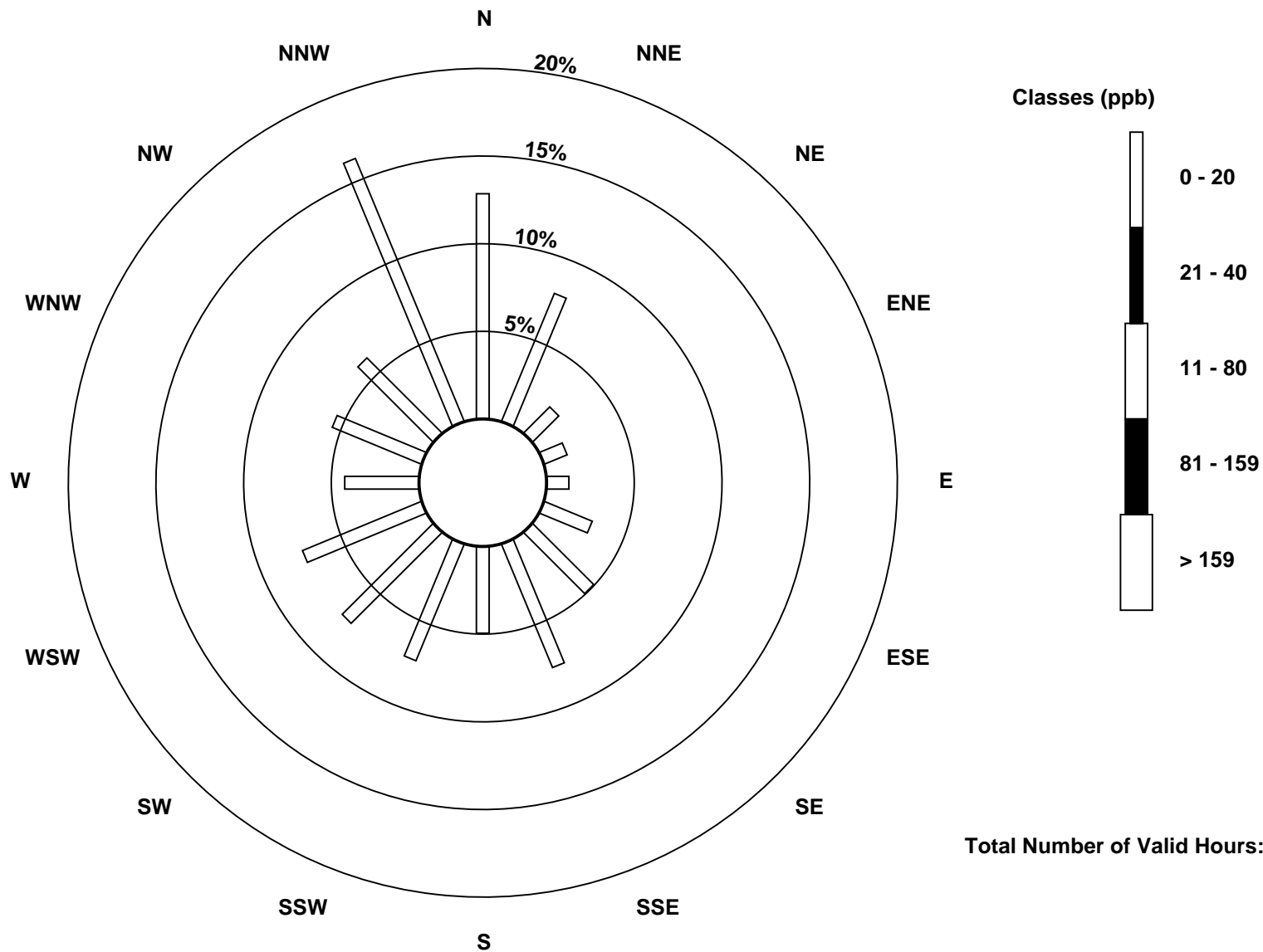
Total Number of Valid Hours: 708

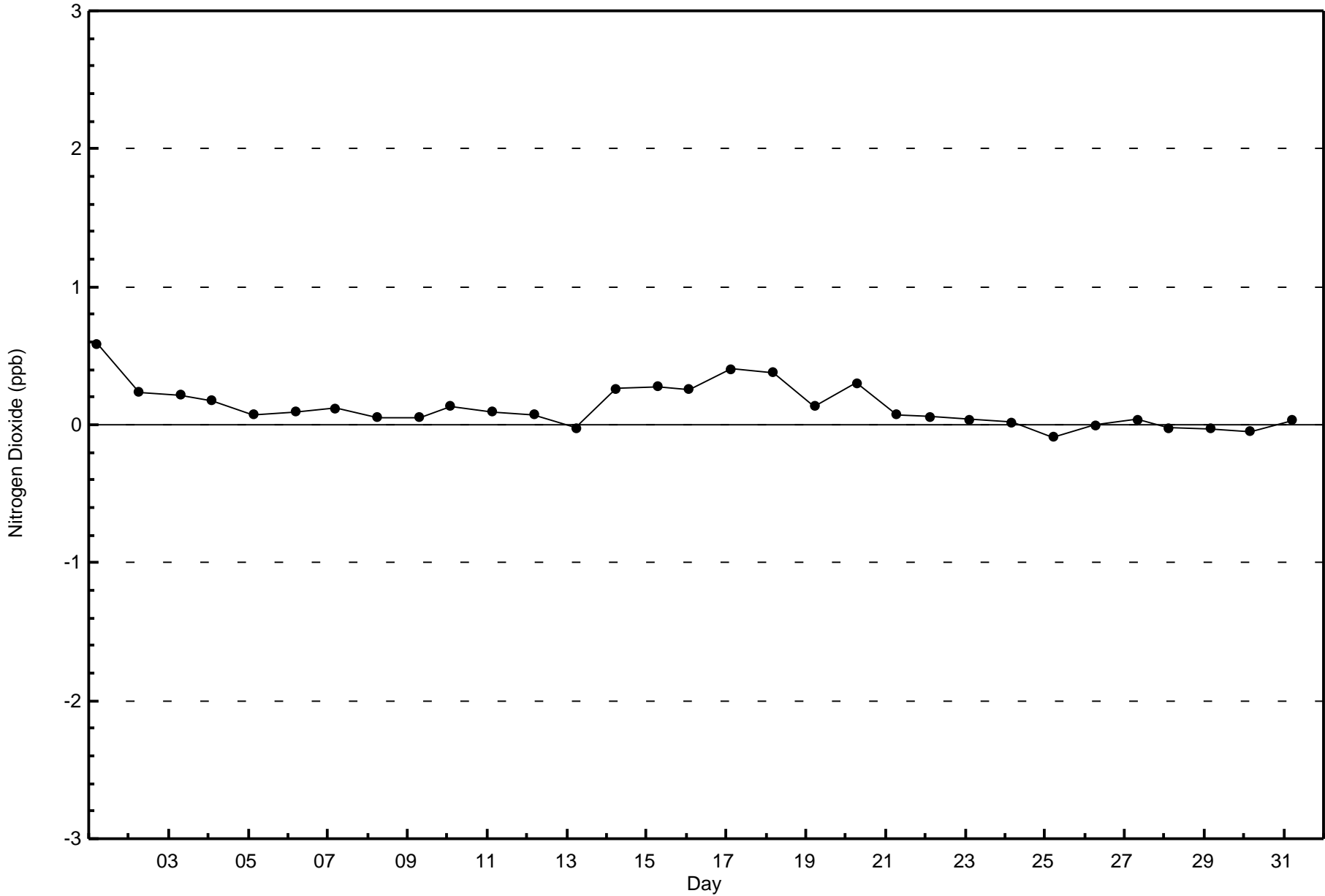
Total Number of Hours: 744

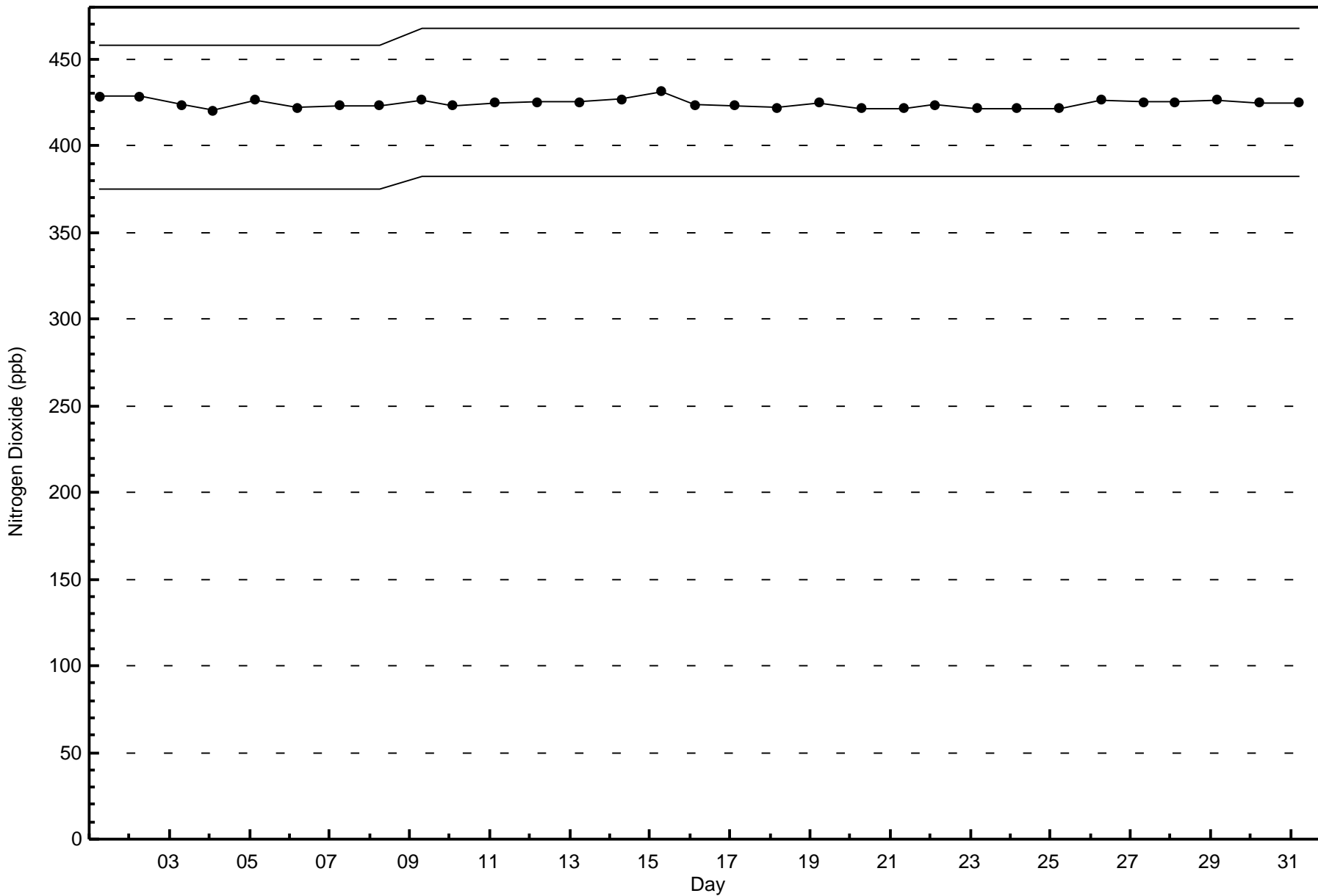


Wood Buffalo Environmental Association
Wind Rose Jul 2016

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









Wood Buffalo Environmental Association
Summary of Hour Averages

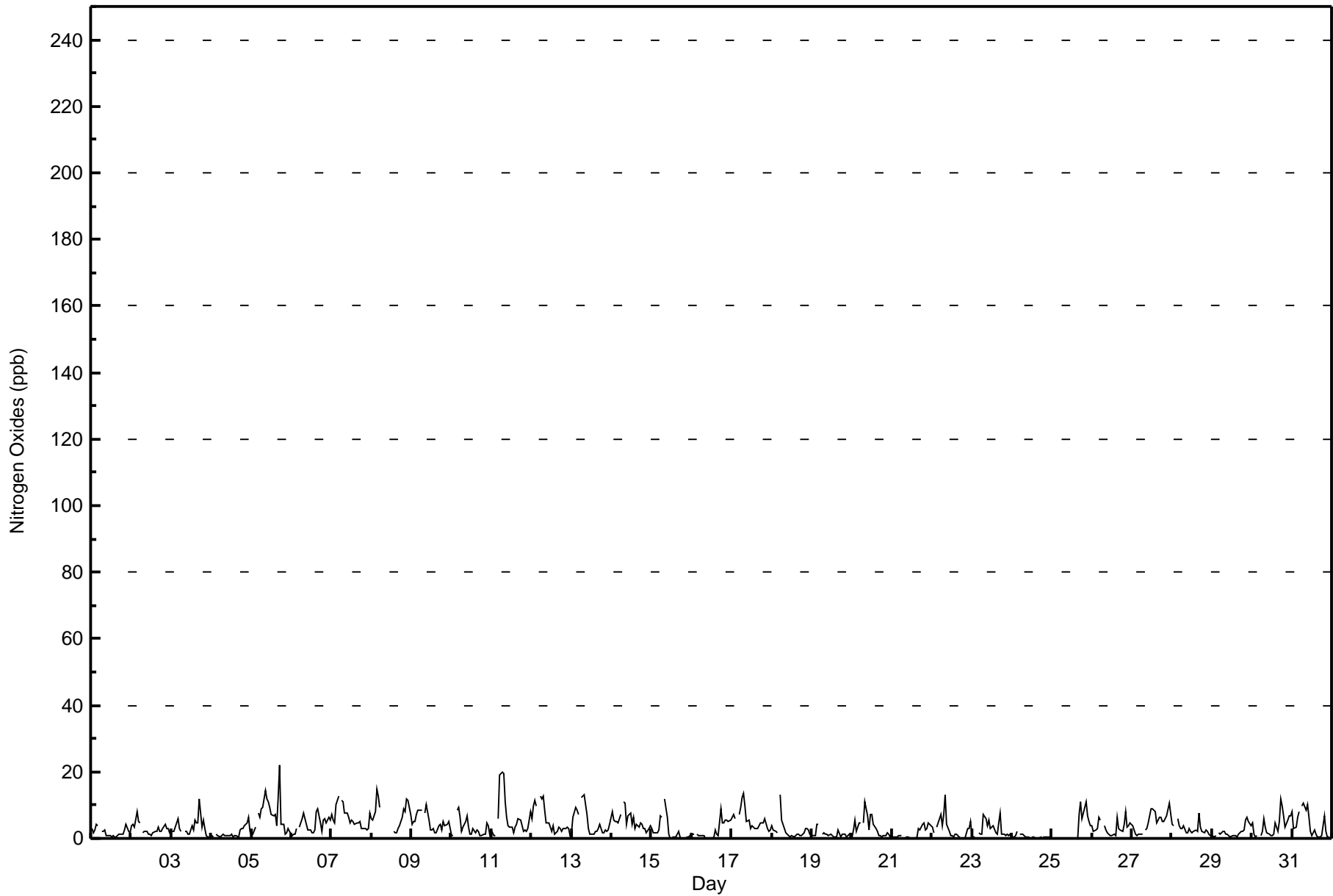
Nitrogen Oxides (NO_x) - ppb
Patricia McInnes - July 2016

Maximum Value: 22 ppb on Jul 5 18:00														Maximum Daily Average: 7.9 ppb on Jul 8														Hours in Service: 744	
Minimum Value: 0 ppb on Jul 15 12:00														Minimum Daily Average: 0.5 ppb on Jul 24														Hours of Data: 708	
Maximum Diurnal Average: 6.9 ppb at hour 8														Minimum Diurnal Average: 2.2 ppb at hour 15														Hours of Missing Data: 36	
Monthly Average: 3.6 ppb														Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 3 Q ₃ = 5 P ₉₀ = 8 P ₉₉ = 14														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-Jul	3	2	3	4	4	Z	2	2	2	1	1	1	1	1	0	0	1	1	1	1	2	4	2	2	1.8	4			
2-Jul	4	4	3	8	5	5	Z	2	2	2	1	1	1	2	2	2	3	2	2	3	4	3	3	2	2.9	8			
3-Jul	2	2	3	4	6	3	2	Z	2	2	1	1	4	3	5	4	5	12	4	5	3	1	1	0	3.3	12			
4-Jul	1	0	Z	1	1	0	1	1	1	1	1	1	1	1	1	1	0	3	3	3	4	5	6	2	1.7	6			
5-Jul	1	1	3	Z	8	6	9	9	14	12	11	9	7	7	7	4	12	22	4	4	1	2	3	2	7.0	22			
6-Jul	1	1	1	3	Z	3	6	8	6	4	2	3	2	2	2	8	9	5	2	6	6	5	6	5	4.2	9			
7-Jul	7	6	5	10	13	Z	12	11	8	8	6	5	6	5	4	5	5	5	3	3	3	3	3	8	6.1	13			
8-Jul	6	6	8	15	13	9	Z	20	C	C	C	C	C	2	2	2	3	4	6	9	8	12	11	7	7.9	20			
9-Jul	4	5	5	7	8	8	8	Z	8	10	5	3	2	3	2	2	4	4	2	5	4	4	5	3	4.9	10			
10-Jul	1	1	Z	9	9	6	2	3	5	7	3	1	1	3	2	2	2	1	1	1	1	5	4	1	3.1	9			
11-Jul	2	1	1	Z	6	19	20	20	11	6	4	3	4	2	3	4	6	5	4	2	3	2	3	8	6.0	20			
12-Jul	6	10	12	10	Z	13	12	13	8	5	5	3	2	4	1	2	3	3	2	3	3	3	3	1	5.5	13			
13-Jul	2	6	9	8	7	Z	12	13	10	7	3	1	1	1	2	2	3	4	2	2	2	3	4	4.8	13				
14-Jul	8	5	5	5	5	7	Z	11	10	4	7	8	4	6	3	4	4	5	4	3	3	2	3	4	5.2	11			
15-Jul	3	2	2	2	3	7	6	Z	12	6	1	0	0	0	0	1	2	0	0	0	0	0	0	1	2.1	12			
16-Jul	1	1	Z	1	1	1	1	1	0	0	0	0	0	1	2	1	1	9	4	5	5	5	5	5	2.3	9			
17-Jul	7	7	6	Z	7	9	12	13	10	5	5	3	4	4	3	3	4	5	5	5	6	3	2	2	5.7	13			
18-Jul	4	2	2	2	Z	13	6	4	2	1	1	1	1	0	1	1	1	1	1	2	3	3	2	1	2.4	13			
19-Jul	1	1	1	4	4	Z	1	2	1	1	1	1	1	1	0	0	3	0	1	1	1	1	1	1	1.3	4			
20-Jul	0	2	5	2	5	5	Z	4	11	7	3	7	7	4	3	2	1	1	0	1	1	2	1	1	3.3	11			
21-Jul	0	0	0	1	1	1	1	Z	0	0	0	0	0	0	0	0	3	2	4	5	3	3	5	4	1.5	5			
22-Jul	3	2	Z	3	4	7	4	7	13	4	2	1	1	1	1	1	0	0	0	0	0	3	3	5	2.9	13			
23-Jul	1	0	0	Z	1	1	1	7	6	4	5	3	3	4	2	1	5	8	1	1	1	1	1	1	2.6	8			
24-Jul	1	0	1	2	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	2			
25-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	7	11	6	7	11	7	5	4	2.6	11			
26-Jul	4	2	2	3	6	5	Z	4	2	2	1	1	1	1	1	6	3	2	2	4	8	4	4	5	3.2	8			
27-Jul	4	3	1	1	1	1	1	Z	3	3	5	9	9	9	8	5	6	6	5	5	6	7	10	7	5.0	10			
28-Jul	4	4	Z	6	4	3	3	4	2	2	3	2	2	2	2	2	8	3	2	2	3	2	1	1	2.9	8			
29-Jul	1	1	1	Z	2	1	2	2	1	1	1	1	1	1	1	0	1	2	2	3	6	6	5	4	2.0	6			
30-Jul	4	1	0	1	Z	1	2	6	4	2	1	1	1	1	5	2	5	12	10	7	4	6	7	7	3.8	12			
31-Jul	8	3	3	6	8	Z	10	11	9	10	7	2	1	2	1	0	0	0	1	7	2	0	0	0	4.0	11			
																												Diurnal Average	
3.0														2.7														8	
8														10														12	
15														13														19	
20														20														20	
20														14														12	
11														9														9	
9														2.3														2.3	
8														8														8	
8														12														22	
10														2.8														3.4	
9														11														12	
11														3.4														3.6	
11														3.2														8	
Diurnal Maximum																													
Z - zerospan														C - Calibration															



Wood Buffalo Environmental Association
Hourly Averages

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





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	707	99.86	99.86
21 - 40	1	0.14	100.00
11 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Patricia McInnes - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	91	56	15	9	9	21	35	54	35	51	52	52	30	39	43	115	707
21 - 40	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	91	56	15	10	9	21	35	54	35	51	52	52	30	39	43	115	708

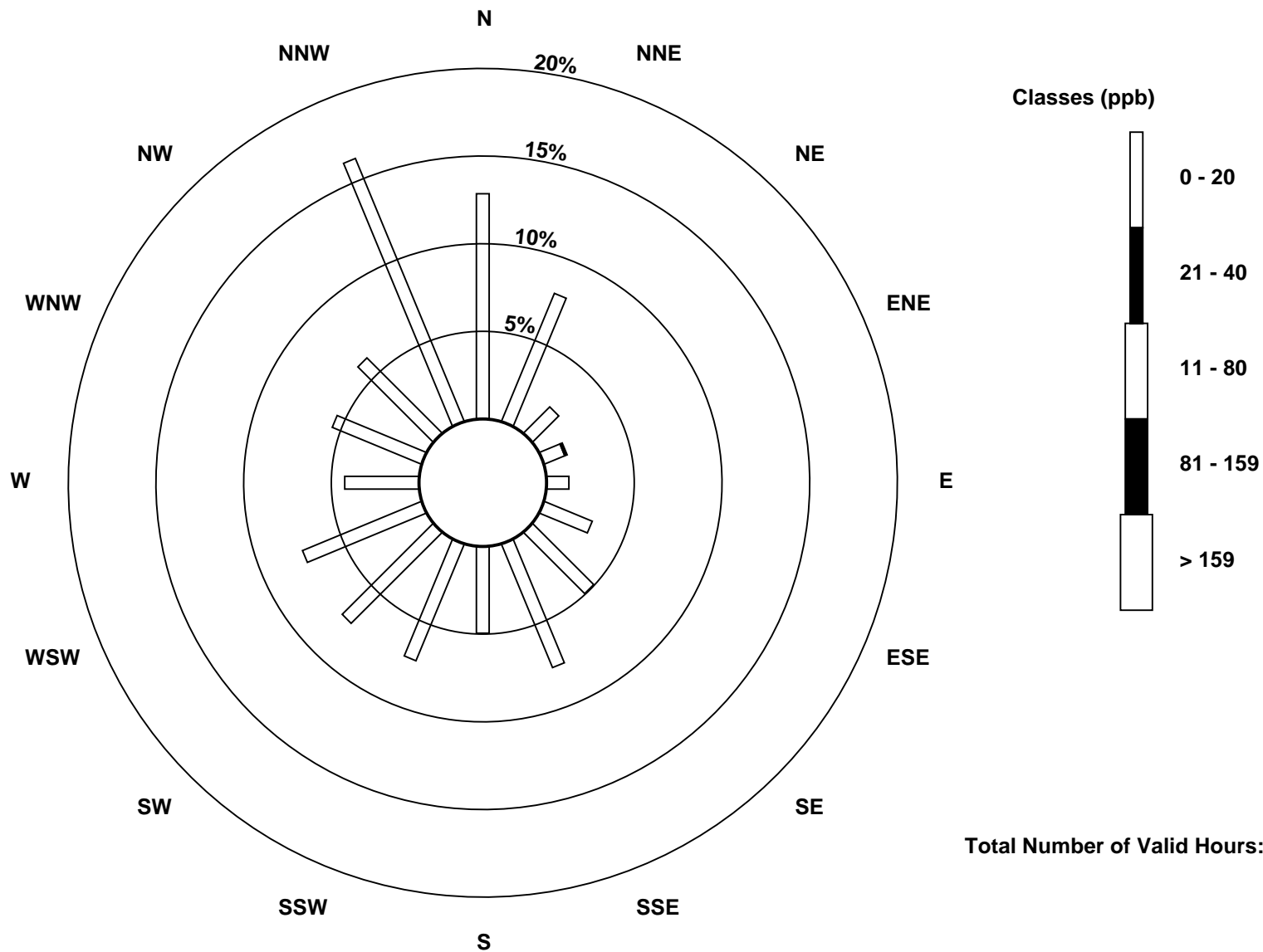
Total Number of Valid Hours: 708

Total Number of Hours: 744

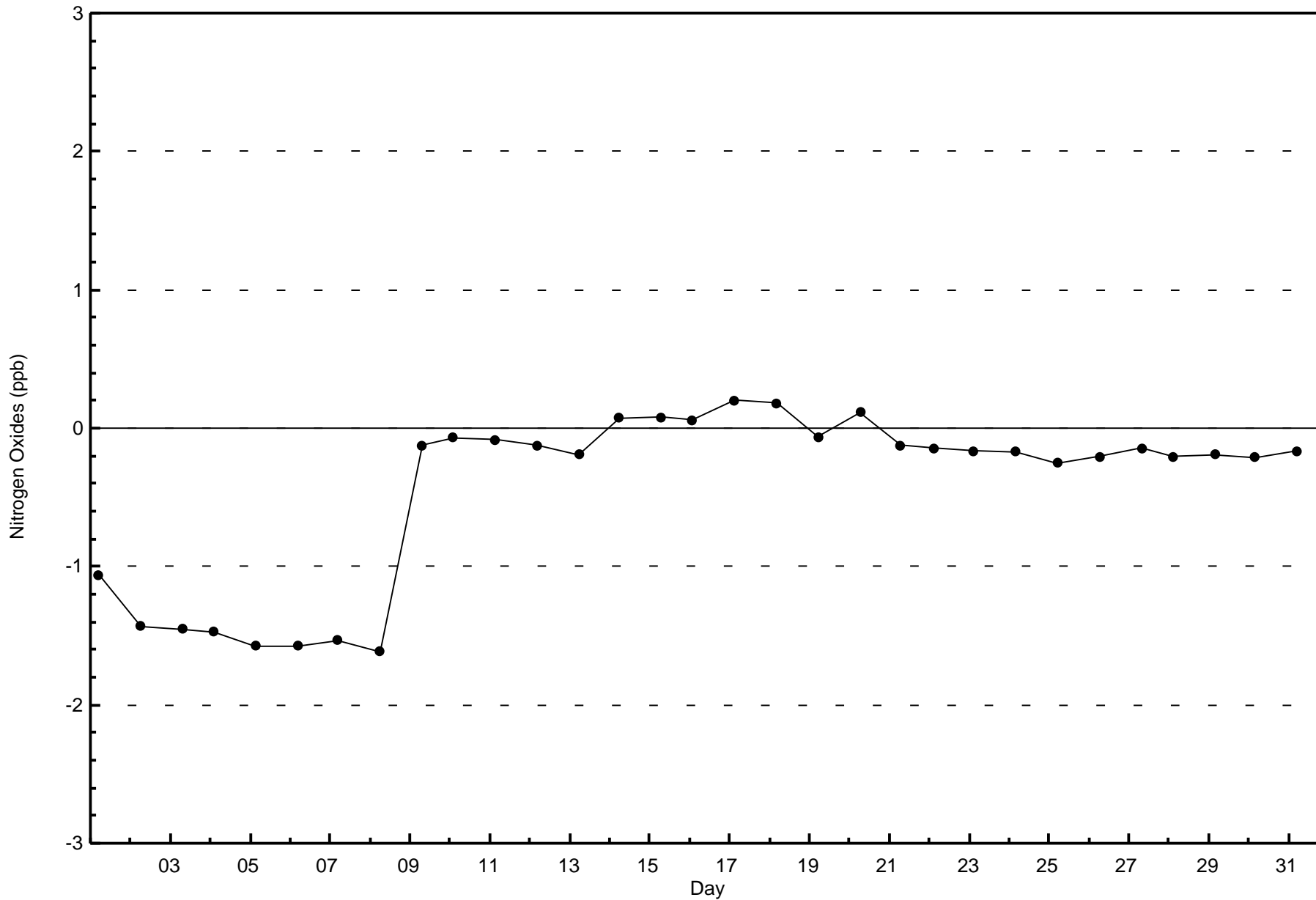


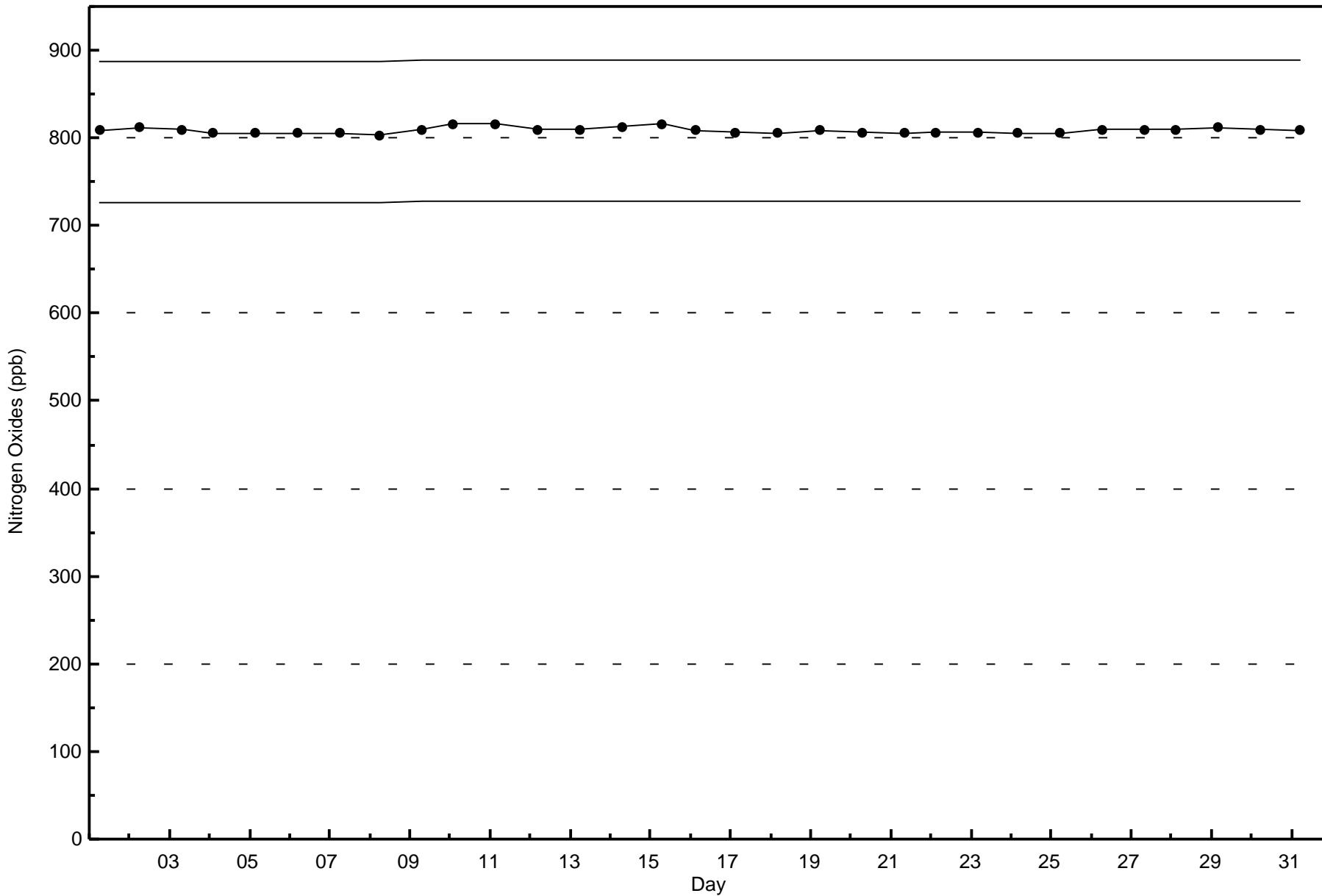
Wood Buffalo Environmental Association
Wind Rose Jul 2016

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



Total Number of Valid Hours: 708







Wood Buffalo Environmental Association

Summary of Hour Averages

Ammonia (NH₃) - ppb

Patricia McInnes - July 2016

Number of Exceedences (AAAQO): 1-hr: 0	Hours in Service: 744
Maximum Value: 19 ppb on Jul 1 03:00	Maximum Daily Average: 1.7 ppb on Jul 15
Minimum Value: 0 ppb on Jul 1 01:00	Hours of Data: 631
Maximum Diurnal Average: 1.6 ppb at hour 5	Hours of Missing Data: 113
Monthly Average: 0.1 ppb	Hours of Calibration: 42
Minimum Daily Average: 0.0 ppb on Jul 2	Percent Operational Time: 90.5
Minimum Diurnal Average: 0.0 ppb at hour 2	
Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 10	

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	0	0	19	Z	RE	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.9	19
2-Jul	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
3-Jul	0	0	0	0	10	Z	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	10
4-Jul	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
5-Jul	0	Z	RE	RE	0	0	PF	PF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
6-Jul	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
7-Jul	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
8-Jul	0	0	0	0	Z	RE	0	0	C	C	C	C	C	C	C	C	C	C	C	0	0	0	0	0	--	0
9-Jul	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
10-Jul	Z	RE	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
11-Jul	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
12-Jul	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
13-Jul	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
14-Jul	0	0	0	0	Z	RE	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0.7	14
15-Jul	11	0	0	10	14	Z	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.7	14
16-Jul	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
17-Jul	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
18-Jul	11	0	Z	RE	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	11
19-Jul	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
20-Jul	0	0	RE	RE	Z	RE	RE	RE	RE	RE	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	--	0
21-Jul	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
22-Jul	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
23-Jul	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
24-Jul	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
25-Jul	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
26-Jul	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
27-Jul	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
28-Jul	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
29-Jul	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
30-Jul	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
31-Jul	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

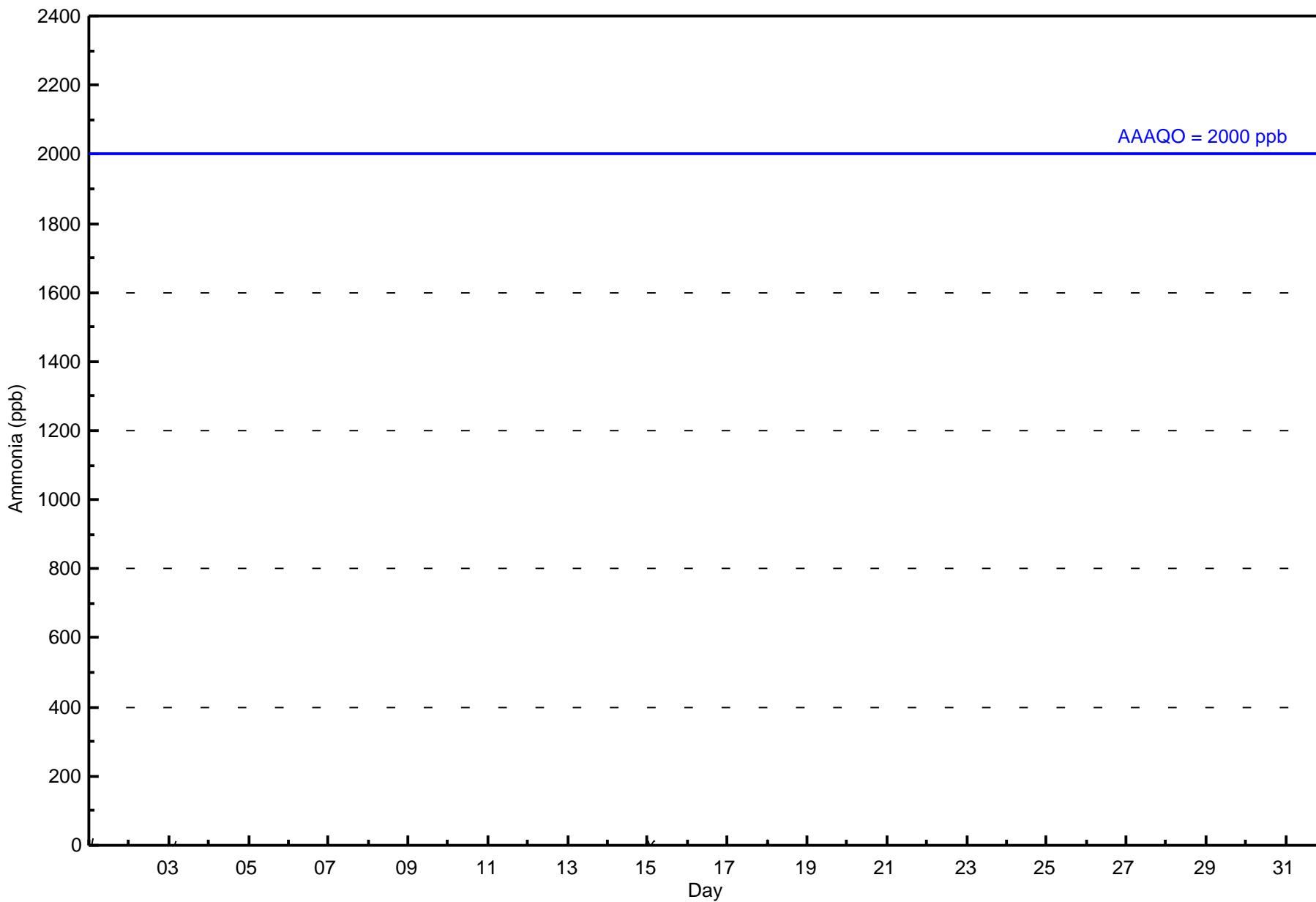
0.8	0.0	1.2	0.7	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	Diurnal Average
11	0	19	10	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

Ammonia (NH₃) - ppb
Patricia McInnes - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Ammonia (NH₃) - ppb
Patricia McInnes - July 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 5	624	98.89	98.89
6 - 10	2	0.32	99.21
11 - 15	4	0.63	99.84
16 - 20	1	0.16	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 (NH₃) - ppb
Patricia McInnes - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	81	53	15	10	9	16	30	49	31	44	41	47	25	37	35	101	624
6 - 10	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	2
11 - 15	0	0	0	0	0	0	0	0	0	1	2	1	0	0	0	0	4
16 - 20	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
21 - 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	81	53	15	10	9	16	31	50	31	45	44	48	25	37	35	101	631

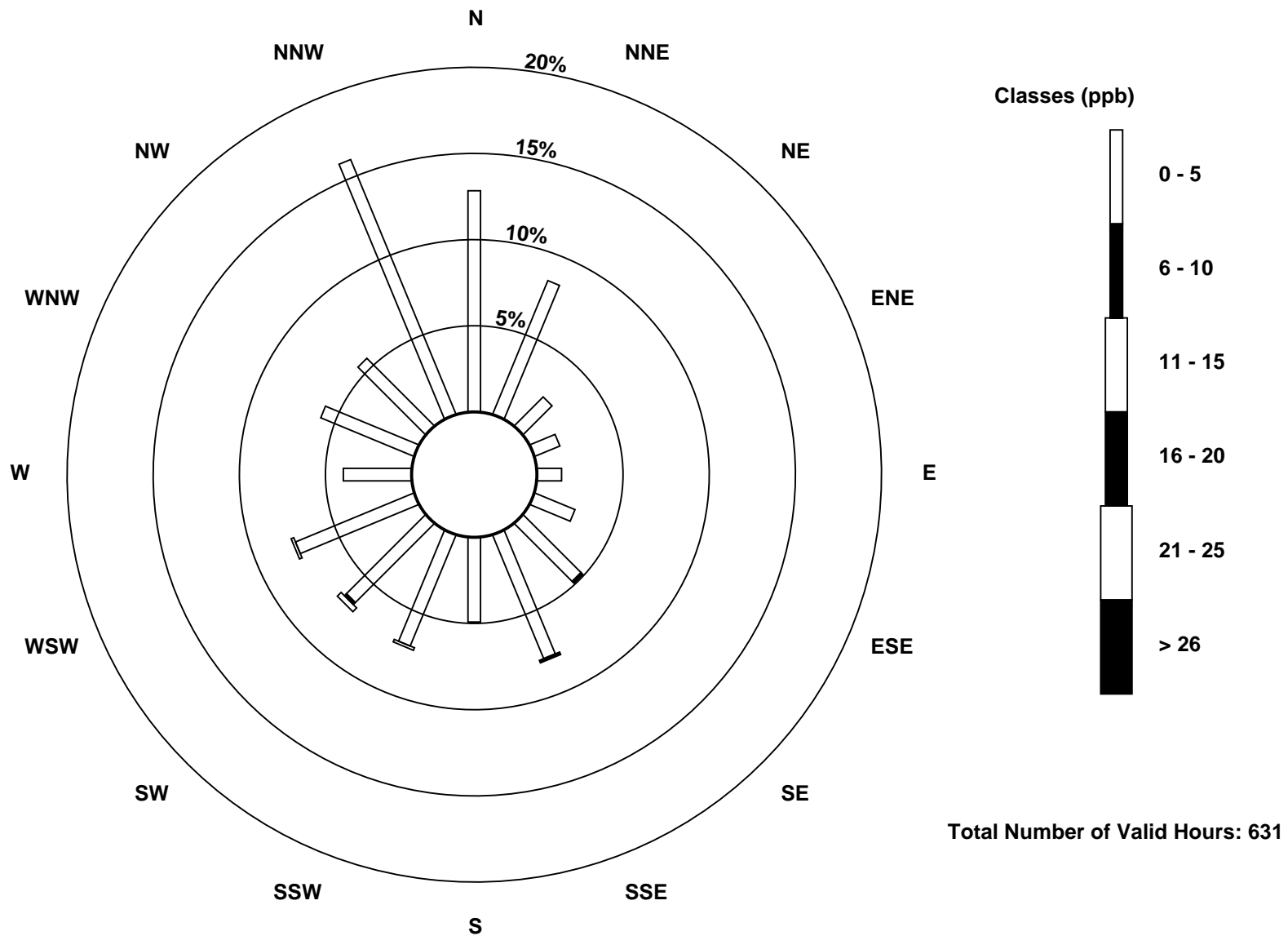
Total Number of Valid Hours: 631

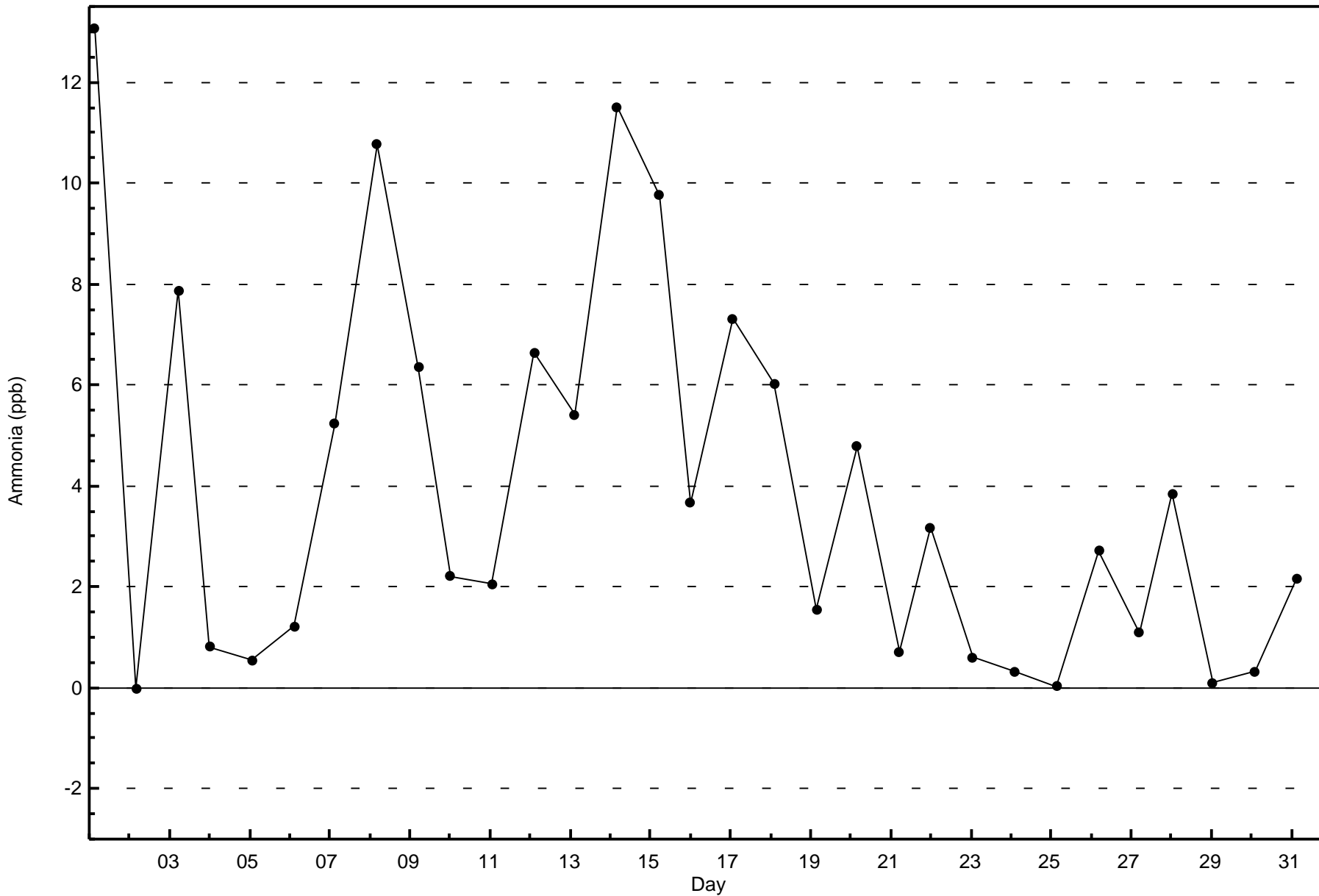
Total Number of Hours: 744

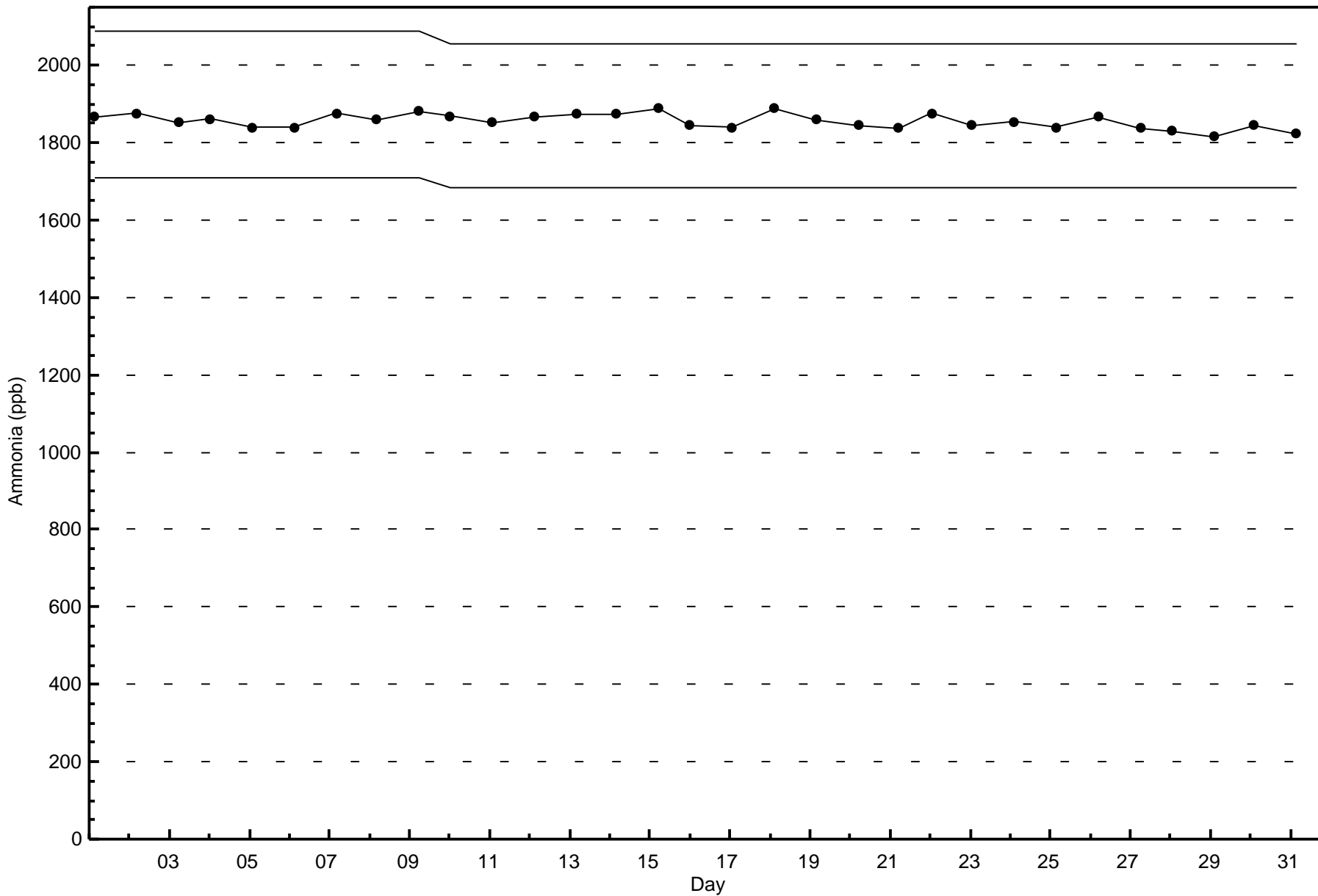


Wood Buffalo Environmental Association
Wind Rose Jul 2016

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









Summary of Hour Averages

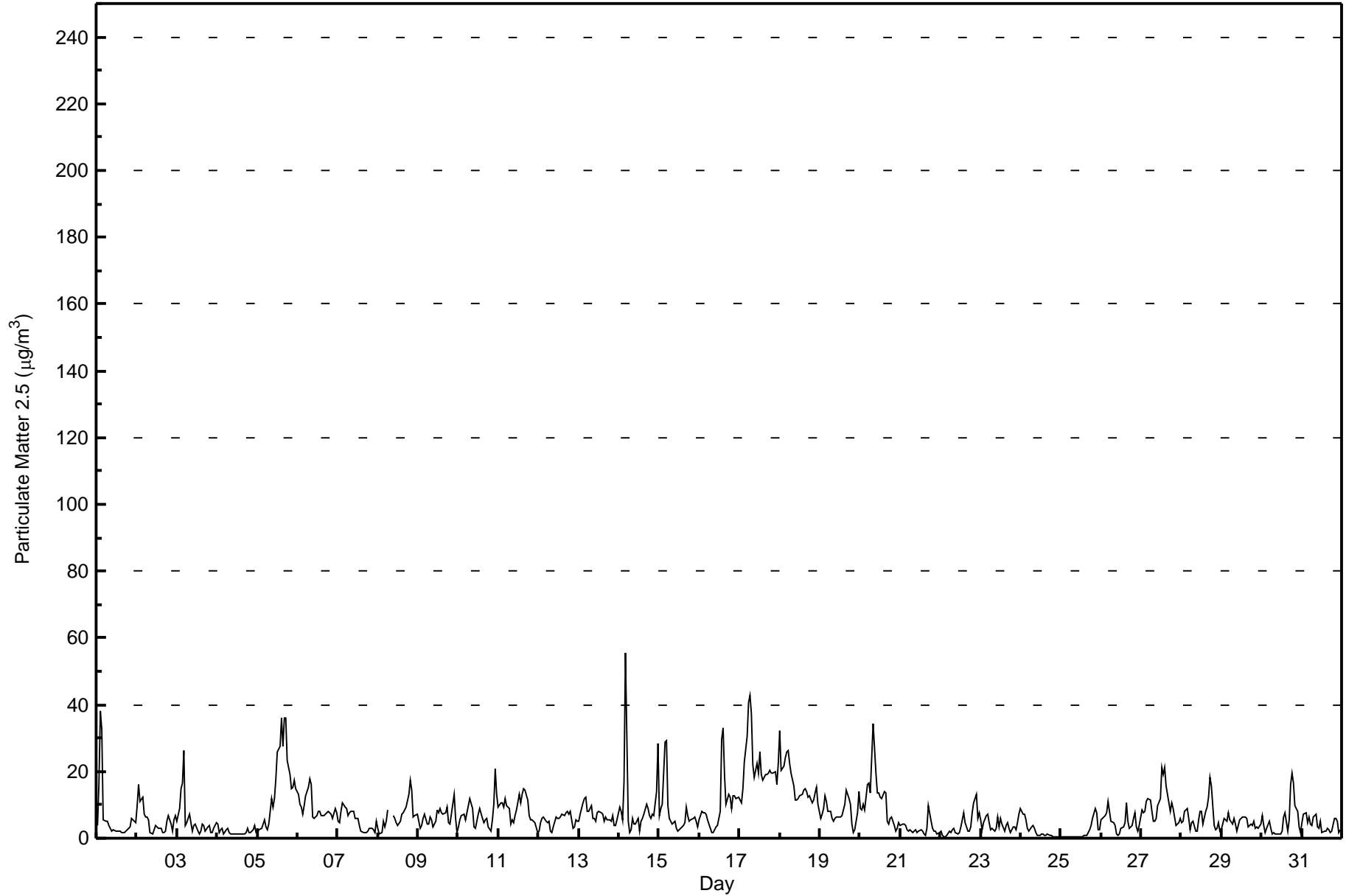
Patricia McInnes - July 2016

Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 55.5 µg/m ³ on Jul 14 05:00 Minimum Value: 0.5 µg/m ³ on Jul 22 04:00 Maximum Diurnal Average: 11.2 µg/m ³ at hour 5 Monthly Average: 7.31 µg/m ³		Maximum Daily Average: 22.1 µg/m ³ on Jul 17 Minimum Daily Average: 1.9 µg/m ³ on Jul 25 Minimum Diurnal Average: 4.8 µg/m ³ at hour 10 Percentiles: P ₁ = 0.6 P ₁₀ = 1.6 Q ₁ = 2.9 Median = 5.5 Q ₃ = 9.0 P ₉₀ = 15.0 P ₉₉ = 35.8		Hours in Service: 744 Hours of Data: 742 Hours of Missing Data: 2 Hours of Calibration: 2 Percent Operational Time: 100.0																																													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Jul	3.7	16.5	37.9	32.5	5.7	5.3	5.0	3.9	2.8	2.0	2.4	2.2	2.2	2.3	2.0	1.9	1.9	2.0	2.5	2.9	3.5	6.0	5.2	4.8	6.5	37.9																							
2-Jul	9.8	16.3	11.0	12.1	7.1	6.3	6.4	5.3	1.8	1.3	2.5	3.8	3.3	2.8	3.1	1.8	1.7	2.3	5.1	7.0	4.0	2.3	5.5	6.7	5.4	16.3																							
3-Jul	5.0	9.0	14.9	16.3	26.2	3.7	4.6	7.1	4.9	2.2	3.8	4.4	2.2	1.2	2.1	4.2	3.6	2.0	3.2	3.7	1.7	1.5	2.9	4.7	5.6	26.2																							
4-Jul	4.4	1.6	2.5	3.1	1.3	2.6	2.8	1.7	1.4	1.4	1.4	1.5	1.4	1.3	1.3	1.4	1.8	2.8	1.5	1.6	2.6	3.8	1.7	2.0	4.4	2.0																							
5-Jul	1.9	2.6	2.8	4.1	5.6	3.4	2.7	4.4	11.9	9.2	11.7	17.9	25.9	27.5	35.9	27.7	35.8	36.0	23.2	19.2	14.7	15.2	17.4	15.0	15.5	36.0																							
6-Jul	13.0	10.0	9.1	7.0	9.6	12.5	15.1	17.7	16.2	6.5	6.1	6.6	7.9	8.0	6.9	6.6	6.8	7.7	8.3	7.5	7.1	6.1	9.1	7.4	9.1	17.7																							
7-Jul	5.0	4.6	7.9	10.6	9.4	9.0	6.9	7.7	8.2	7.8	5.9	6.1	6.1	3.7	2.0	1.8	1.6	1.7	2.0	3.0	2.9	2.5	1.6	5.1	5.1	10.6																							
8-Jul	2.8	1.2	1.8	4.9	3.2	4.9	8.3	C	C	6.6	5.9	4.6	4.0	5.2	7.0	7.8	8.5	9.5	13.1	17.5	14.4	6.2	6.9	7.0	6.9	17.5																							
9-Jul	5.3	2.9	3.9	5.9	7.1	4.2	4.0	6.4	5.5	3.3	5.2	8.5	7.5	9.1	7.7	7.2	7.4	9.2	4.6	4.4	7.1	13.2	6.1	1.7	6.1	13.2																							
10-Jul	3.5	5.4	6.9	7.3	5.5	7.4	9.8	11.7	9.1	3.3	2.8	5.2	7.1	9.0	6.1	4.8	5.7	6.1	3.2	2.3	5.4	10.0	20.8	13.2	7.1	20.8																							
11-Jul	9.5	10.6	10.6	9.2	11.9	9.7	8.9	4.0	5.3	4.8	6.9	8.5	13.1	10.5	12.9	14.8	14.5	11.3	6.8	5.4	5.3	5.2	4.7	1.5	8.6	14.8																							
12-Jul	1.9	4.6	6.0	6.5	5.2	4.6	5.3	2.1	1.5	3.5	6.5	6.0	6.1	6.5	7.3	6.8	7.8	8.2	7.4	8.1	2.8	3.6	5.4	5.2	5.4	8.2																							
13-Jul	4.9	7.3	10.5	12.0	12.2	8.0	8.0	9.6	6.0	5.8	5.3	7.4	7.9	7.6	7.1	5.3	6.3	5.3	5.4	5.2	6.9	3.8	3.6	5.7	7.0	12.2																							
14-Jul	9.3	8.2	5.4	16.9	55.5	5.1	1.6	2.4	6.1	4.2	4.3	6.0	2.0	4.9	5.9	7.1	10.0	8.8	6.6	5.8	7.0	6.6	14.1	28.4	9.7	55.5																							
15-Jul	7.0	8.8	10.0	28.6	29.3	9.6	6.1	5.3	4.2	4.9	2.9	2.1	2.5	3.0	3.6	4.8	9.2	6.7	5.3	5.6	5.7	6.4	5.0	3.4	7.5	29.3																							
16-Jul	5.7	8.2	7.8	7.7	7.1	5.4	4.2	1.7	1.5	2.4	3.6	4.0	8.1	29.8	33.0	19.1	10.1	13.2	12.5	8.8	12.7	12.8	12.0	12.5	10.2	33.0																							
17-Jul	11.4	10.7	14.6	23.0	30.5	40.8	42.6	37.5	22.1	18.1	22.6	19.5	25.9	19.0	17.4	19.0	18.9	19.6	20.5	19.7	19.5	19.8	16.1	22.2	22.1	42.6																							
18-Jul	32.1	20.4	21.7	24.2	26.0	26.4	22.6	19.4	15.6	11.3	11.4	12.0	12.6	13.3	14.6	14.7	13.9	12.1	12.5	10.7	11.5	13.7	15.1	10.0	16.6	32.1																							
19-Jul	5.9	7.2	8.8	12.8	11.2	7.9	7.8	6.0	5.1	5.8	6.2	6.4	6.5	6.8	8.3	10.2	14.3	12.0	10.1	4.1	1.9	2.3	7.7	13.8	7.9	14.3																							
20-Jul	9.0	8.5	10.4	8.6	16.3	16.6	13.4	24.2	34.1	19.6	13.3	13.6	12.2	12.1	14.1	13.8	5.0	4.4	5.9	6.2	3.7	2.1	2.9	4.5	11.4	34.1																							
21-Jul	3.9	4.3	4.3	3.9	2.6	2.1	2.6	1.6	2.2	2.4	1.6	2.1	2.4	2.1	1.4	0.7	2.9	9.8	5.2	3.0	2.2	2.0	1.2	1.5	2.8	9.8																							
22-Jul	2.2	0.7	0.6	0.5	1.0	2.2	1.9	2.6	2.8	1.7	1.1	1.5	3.4	5.5	7.6	4.6	2.3	1.9	3.3	7.5	10.6	13.1	5.9	7.5	3.8	13.1																							
23-Jul	5.5	2.5	4.8	6.9	7.4	4.5	2.6	3.1	2.3	3.1	6.2	3.4	6.1	4.1	2.0	3.7	4.7	2.8	1.6	3.3	3.3	2.5	4.6	7.1	4.1	7.4																							
24-Jul	9.1	7.4	7.3	5.5	3.1	1.9	3.2	4.0	3.0	1.6	0.9	0.9	1.3	1.2	1.0	0.9	1.2	0.9	0.6	0.6	0.6	0.6	0.6	0.6	2.4	9.1																							
25-Jul	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.6	0.6	0.7	1.6	2.6	4.0	5.8	9.0	7.7	2.6	2.7	1.9	9.0																							
26-Jul	5.3	5.9	6.9	7.5	10.9	8.2	5.1	4.5	3.8	1.1	0.8	1.5	2.8	3.4	4.7	10.5	5.3	3.1	3.9	5.9	7.7	3.3	2.2	4.0	4.9	10.9																							
27-Jul	8.6	7.6	8.2	11.2	11.8	11.6	8.3	5.1	5.3	5.9	9.7	12.0	21.4	19.0	21.1	15.8	10.8	8.2	10.4	9.0	6.3	3.7	4.8	6.0	10.1	21.4																							
28-Jul	4.7	5.2	7.9	8.9	5.9	2.5	4.5	5.1	2.0	2.3	5.7	7.9	8.0	4.4	7.9	9.4	12.2	18.3	15.9	3.9	2.7	3.1	4.6	2.1	6.5	18.3																							
29-Jul	2.7	5.9	5.5	5.1	7.5	5.6	4.0	6.0	4.2	2.1	3.6	5.3	6.3	6.5	6.3	5.9	3.3	4.2	4.0	5.3	3.1	3.3	3.0	4.2	4.7	7.5																							
30-Jul	6.7	3.8	1.7	3.1	5.2	2.9	1.4	1.6	1.4	1.3	1.3	1.1	2.0	6.3	7.5	2.1	5.4	16.3	19.4	16.4	9.9	8.1	3.4	1.8	5.4	19.4																							
31-Jul	4.6	7.3	7.6	4.8	6.5	4.3	4.0	6.5	7.4	3.4	3.2	5.3	1.7	2.2	2.0	2.9	2.6	1.6	2.0	5.9	5.8	5.1	1.7	2.4	4.2	7.6																							
																								6.6	7.0	8.4	10.0	11.2	7.7	7.2	7.3	6.6	4.8	5.3	6.1	7.1	7.7	8.4	7.7	7.6	8.1	7.5	6.9	6.5	6.3	6.5	6.9	Diurnal Average	
																								32.1	20.4	37.9	32.5	55.5	40.8	42.6	37.5	34.1	19.6	22.6	19.5	25.9	29.8	35.9	27.7	35.8	36.0	23.2	19.7	19.5	19.8	20.8	28.4	Diurnal Maximum	
C - Calibration																																																	
Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m ³																																																	



Wood Buffalo Environmental Association
Hourly Averages

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





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	343	46.23	46.23
6 - 15	296	39.89	86.12
16 - 25	48	6.47	92.59
26 - 80	24	3.23	95.82
> 81.0	0	0.00	95.82

Total Number of Valid Hours: 742

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

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

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	39	15	7	4	5	12	28	35	19	21	32	36	10	19	16	45	343
6 - 15	42	34	7	5	4	11	8	12	13	29	20	10	12	10	17	62	296
16 - 25	12	4	1	0	0	0	0	5	3	2	1	1	3	3	5	8	48
26 - 80	1	5	0	1	0	1	1	2	1	1	2	1	1	1	2	4	24
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	94	58	15	10	9	24	37	54	36	53	55	48	26	33	40	119	711

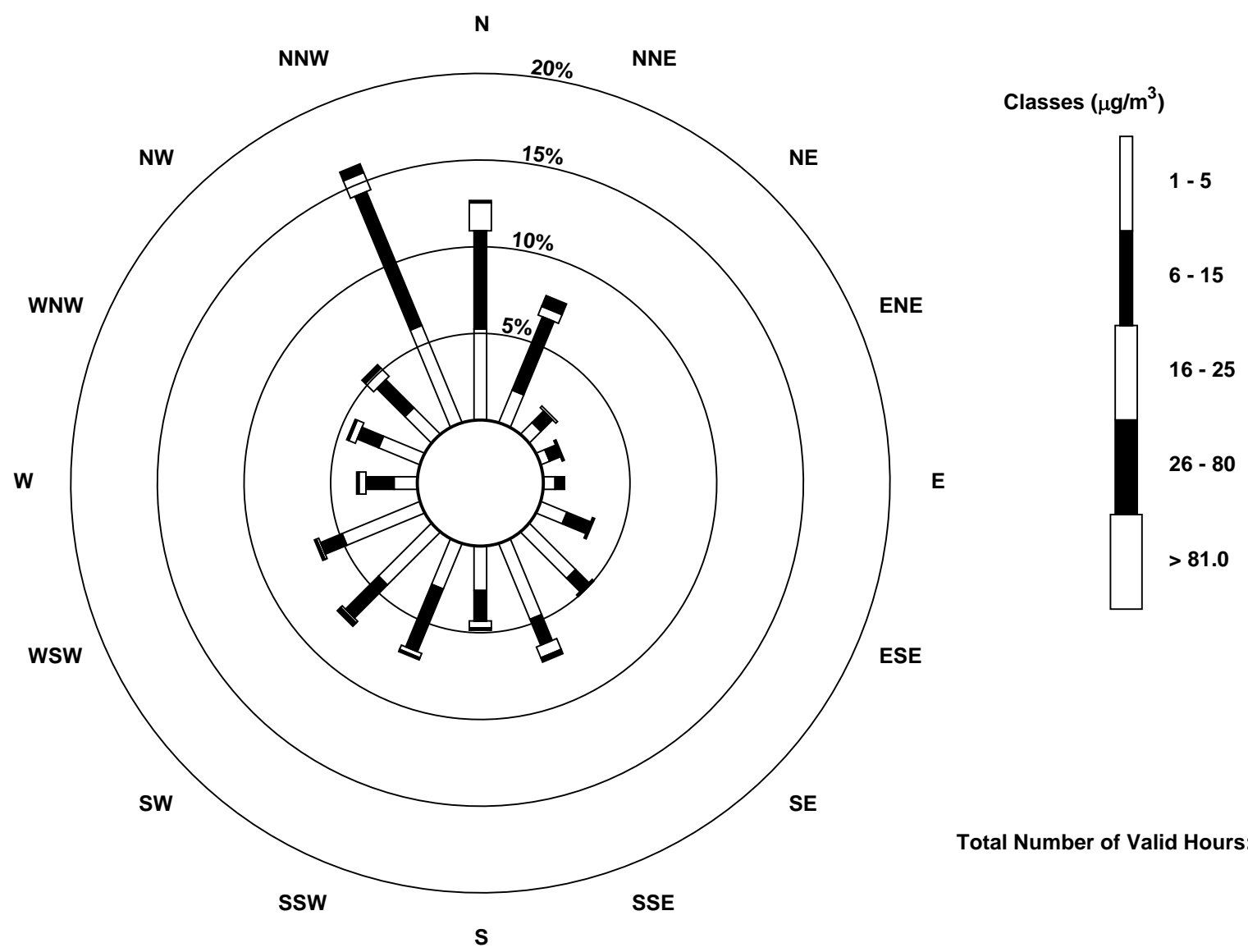
Total Number of Valid Hours: 742

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

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





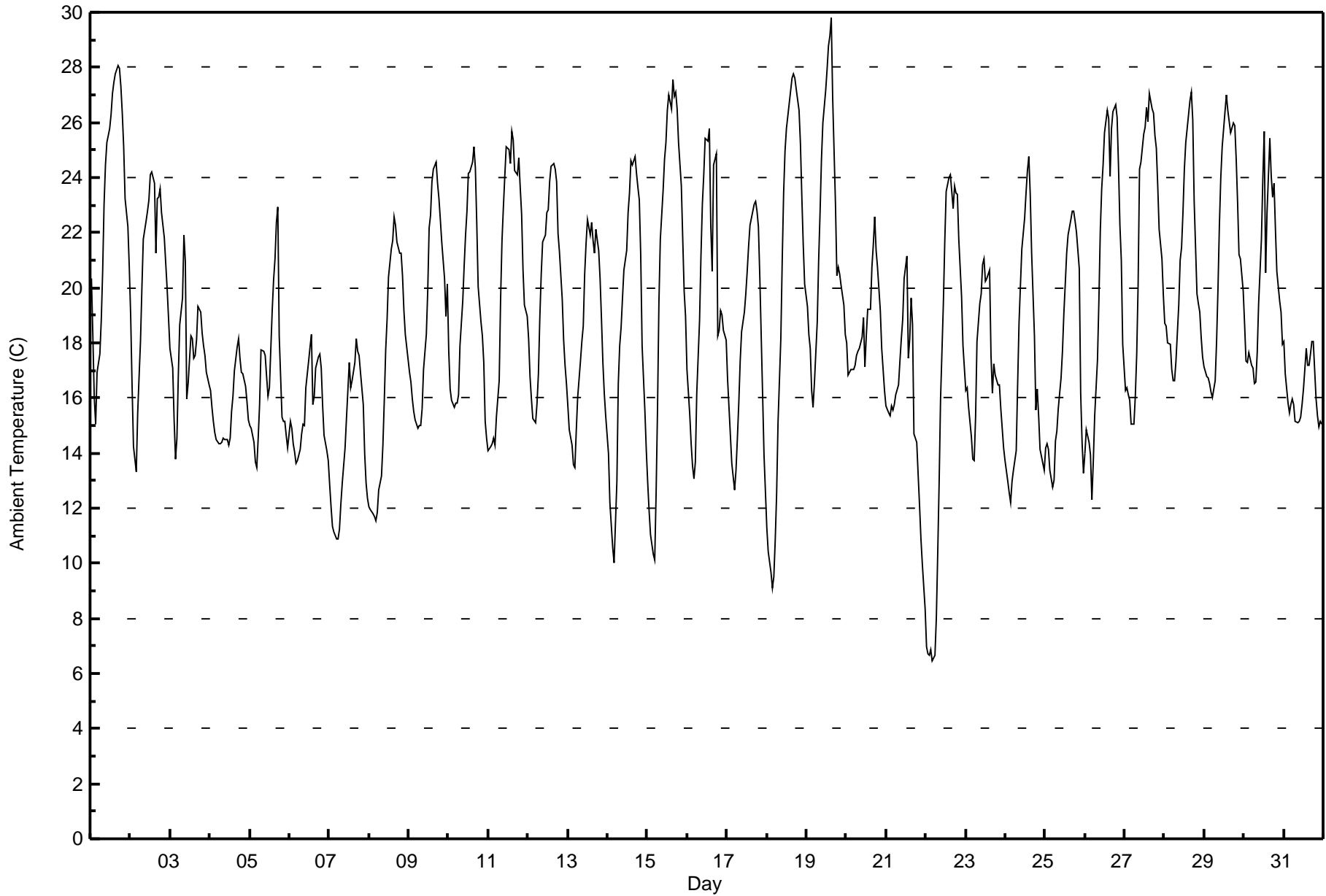
Wood Buffalo Environmental Association

Summary of Hour Averages

Ambient Temperature (AT) - C

Patricia McInnes - July 2016

Maximum Value: 29.8 C on Jul 19 16:00 Maximum Daily Average: 23.0 C on Jul 1																						Hours in Service: 744 Hours of Data: 744				
Minimum Value: 6.5 C on Jul 22 05:00 Minimum Daily Average: 14.3 C on Jul 7 Maximum Diurnal Average: 22.9 C at hour 17 Minimum Diurnal Average: 13.8 C at hour 5 Monthly Average: 18.75 C Percentiles: P ₁ = 8.3 P ₁₀ = 13.7 Q ₁ = 15.5 Median = 18.1 Q ₃ = 22.3 P ₉₀ = 25.0 P ₉₉ = 27.6																						Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0				
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	20.3	18.3	16.0	15.0	16.9	17.6	18.8	20.6	23.0	24.5	25.3	25.8	26.3	27.0	27.5	27.8	28.1	28.0	27.3	26.4	25.1	23.3	22.2	20.7	23.0	28.1
2-Jul	19.0	16.4	14.2	13.3	15.4	16.8	18.1	20.0	21.8	22.4	22.8	23.2	24.1	24.2	23.8	21.3	23.2	23.3	23.6	22.7	21.8	20.9	20.0	18.9	20.5	24.2
3-Jul	17.8	17.1	15.2	13.8	14.6	16.8	18.7	19.6	21.9	20.9	15.9	16.5	18.3	18.2	17.5	17.5	18.1	19.3	19.1	18.4	17.9	17.6	16.9	16.5	17.7	21.9
4-Jul	16.3	15.7	15.1	14.7	14.5	14.3	14.3	14.4	14.5	14.5	14.3	14.5	15.5	16.1	17.0	17.8	18.2	17.5	16.9	16.9	16.4	15.9	15.2	15.6	15.6	18.2
5-Jul	15.0	14.9	14.4	13.7	13.5	14.5	15.8	17.8	17.7	17.6	16.8	16.1	16.4	19.2	20.3	21.1	22.4	22.9	18.3	15.3	15.2	15.1	14.7	14.2	16.8	22.9
6-Jul	15.1	14.9	14.3	14.1	13.6	13.7	14.1	14.7	15.0	15.0	16.4	17.4	17.9	18.3	15.8	16.1	17.1	17.5	17.6	17.1	15.7	14.6	14.1	13.7	15.6	18.3
7-Jul	12.9	12.0	11.4	11.1	10.9	10.9	11.3	12.2	12.9	14.2	15.3	16.3	17.3	16.4	16.6	17.3	18.1	17.7	17.5	16.9	15.8	14.0	12.9	12.4	14.3	18.1
8-Jul	12.1	12.0	11.8	11.7	11.6	11.9	12.6	13.2	14.3	15.9	17.8	18.9	20.4	21.4	21.7	22.6	22.3	21.7	21.2	21.2	20.5	19.2	18.3	17.4	17.1	22.6
9-Jul	16.9	16.6	16.0	15.5	15.2	14.9	15.0	15.0	15.6	17.1	18.3	19.9	22.2	22.6	23.8	24.3	24.5	23.8	23.2	22.5	21.7	20.3	19.0	20.1	19.3	24.5
10-Jul	17.7	16.3	15.9	15.7	15.8	15.8	16.1	17.9	19.5	20.8	21.9	22.8	24.2	24.2	24.6	25.1	24.4	22.3	20.0	18.8	18.3	17.3	15.1	14.5	19.4	25.1
11-Jul	14.1	14.3	14.4	14.5	14.3	15.3	16.6	19.6	21.7	22.9	24.1	25.1	25.0	24.5	25.7	25.4	24.3	24.1	24.7	23.6	22.7	20.6	19.4	19.0	20.7	25.7
12-Jul	18.1	16.8	16.0	15.3	15.1	15.8	16.9	18.9	20.5	21.6	21.9	22.7	22.8	23.9	24.4	24.5	24.3	23.8	21.9	21.3	19.6	18.1	17.2	16.5	19.9	24.5
13-Jul	15.7	14.9	14.3	13.6	13.5	14.8	16.0	17.3	18.0	18.6	20.5	21.6	22.5	21.9	22.4	21.7	21.3	22.1	21.4	20.3	18.9	17.3	16.2	15.3	18.3	22.5
14-Jul	14.0	12.2	11.4	10.6	10.0	13.0	16.5	17.9	18.6	19.6	20.6	21.4	22.7	23.4	24.6	24.4	24.8	24.2	23.7	23.2	21.2	17.9	15.5	14.1	18.6	24.8
15-Jul	12.9	11.9	11.1	10.3	10.1	12.5	15.6	19.5	21.8	23.5	24.7	25.3	26.4	27.0	26.5	27.6	26.9	27.1	26.5	25.3	23.7	21.7	19.9	19.0	20.7	27.6
16-Jul	17.0	15.4	14.3	13.5	13.1	13.7	16.2	18.8	21.1	23.0	24.1	25.4	25.3	25.8	22.2	20.6	24.4	24.8	18.3	18.4	19.2	19.0	18.5	18.1	19.6	25.8
17-Jul	16.7	15.7	14.7	13.6	12.7	13.4	14.5	15.8	17.3	18.4	19.1	19.8	20.6	21.5	22.3	22.8	23.1	23.1	22.8	22.2	20.4	16.1	13.9	12.6	18.0	23.1
18-Jul	11.3	10.4	9.7	9.1	9.5	10.9	12.5	15.1	18.1	21.0	23.4	25.0	25.8	26.7	27.2	27.6	27.7	27.6	27.2	26.4	25.2	23.3	21.6	20.1	20.1	27.7
19-Jul	19.3	18.3	17.8	16.3	15.7	16.6	18.8	21.0	22.7	24.6	26.0	27.1	27.9	28.8	29.1	29.8	26.9	23.0	20.5	20.7	20.5	20.1	19.4	18.3	22.0	29.8
20-Jul	18.0	16.8	16.9	17.0	17.1	17.2	17.5	17.7	17.8	18.2	18.9	17.1	18.3	19.2	19.2	20.8	21.5	22.6	21.4	20.7	19.2	17.8	17.0	16.3	18.5	22.6
21-Jul	15.7	15.5	15.4	15.7	15.6	15.8	16.1	16.5	17.3	18.2	18.9	20.3	21.2	17.5	18.1	19.6	18.7	14.7	14.4	13.2	12.1	10.9	10.0	8.4	15.8	21.2
22-Jul	7.0	6.7	6.6	6.8	6.5	6.6	8.0	10.4	13.0	16.0	19.4	21.7	23.5	23.7	24.0	24.1	22.9	23.7	23.5	23.4	21.8	19.7	17.9	17.1	16.4	24.1
23-Jul	16.3	16.4	15.7	14.6	13.8	13.8	15.3	18.0	19.4	19.8	20.8	21.0	20.2	20.4	20.6	17.5	16.2	17.3	16.8	16.5	16.5	15.6	14.9	14.2	17.2	21.0
24-Jul	13.7	13.0	12.5	12.2	13.0	13.4	14.1	16.5	18.7	20.1	21.4	22.5	23.4	24.3	24.7	23.4	21.2	18.3	15.5	16.3	15.3	14.1	13.6	13.4	17.3	24.7
25-Jul	14.2	14.4	14.1	13.4	12.7	13.0	14.5	14.8	15.6	16.7	17.7	19.1	20.2	21.2	21.9	22.5	22.8	22.8	22.4	22.0	20.7	16.2	14.4	13.3	17.5	22.8
26-Jul	14.0	14.8	14.4	13.9	12.3	13.7	15.4	17.4	19.5	22.1	23.6	24.4	25.6	26.4	26.1	24.0	25.8	26.4	26.7	26.2	24.4	22.3	21.0	17.9	20.8	26.7
27-Jul	16.2	16.4	16.1	15.9	15.1	15.1	16.1	17.6	20.1	24.3	24.5	25.6	25.8	26.6	26.0	27.1	26.5	26.3	25.5	25.1	23.7	22.1	21.1	19.8	21.6	27.1
28-Jul	18.7	18.6	18.0	18.0	17.0	16.6	16.6	17.3	19.4	21.0	21.5	22.7	24.3	25.3	26.3	26.8	27.1	26.1	23.1	19.8	19.4	19.1	18.2	17.5	20.8	27.1
29-Jul	17.1	16.8	16.8	16.5	16.2	16.0	16.6	18.1	20.0	22.3	24.0	25.1	26.4	27.0	26.4	26.1	25.6	26.0	25.9	24.7	23.1	21.2	21.0	19.9	21.6	27.0
30-Jul	18.7	17.3	17.3	17.6	17.2	17.1	16.5	16.6	17.6	19.4	21.8	24.0	25.7	20.5	22.7	25.4	24.0	23.3	23.8	22.1	20.6	19.5	19.1	18.0	20.2	25.7
31-Jul	18.0	16.9	15.8	15.5	15.8	16.0	15.7	15.2	15.1	15.2	15.3	15.8	16.3	17.8	17.2	17.2	17.6	18.0	18.0	16.0	15.4	14.9	15.1	15.0	16.2	18.0
																						Diurnal Average				
																						Diurnal Maximum				





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	12	1.61	1.61
10 - 20	449	60.35	61.96
> 20	283	38.04	100.00

Total Number of Valid Hours: 744

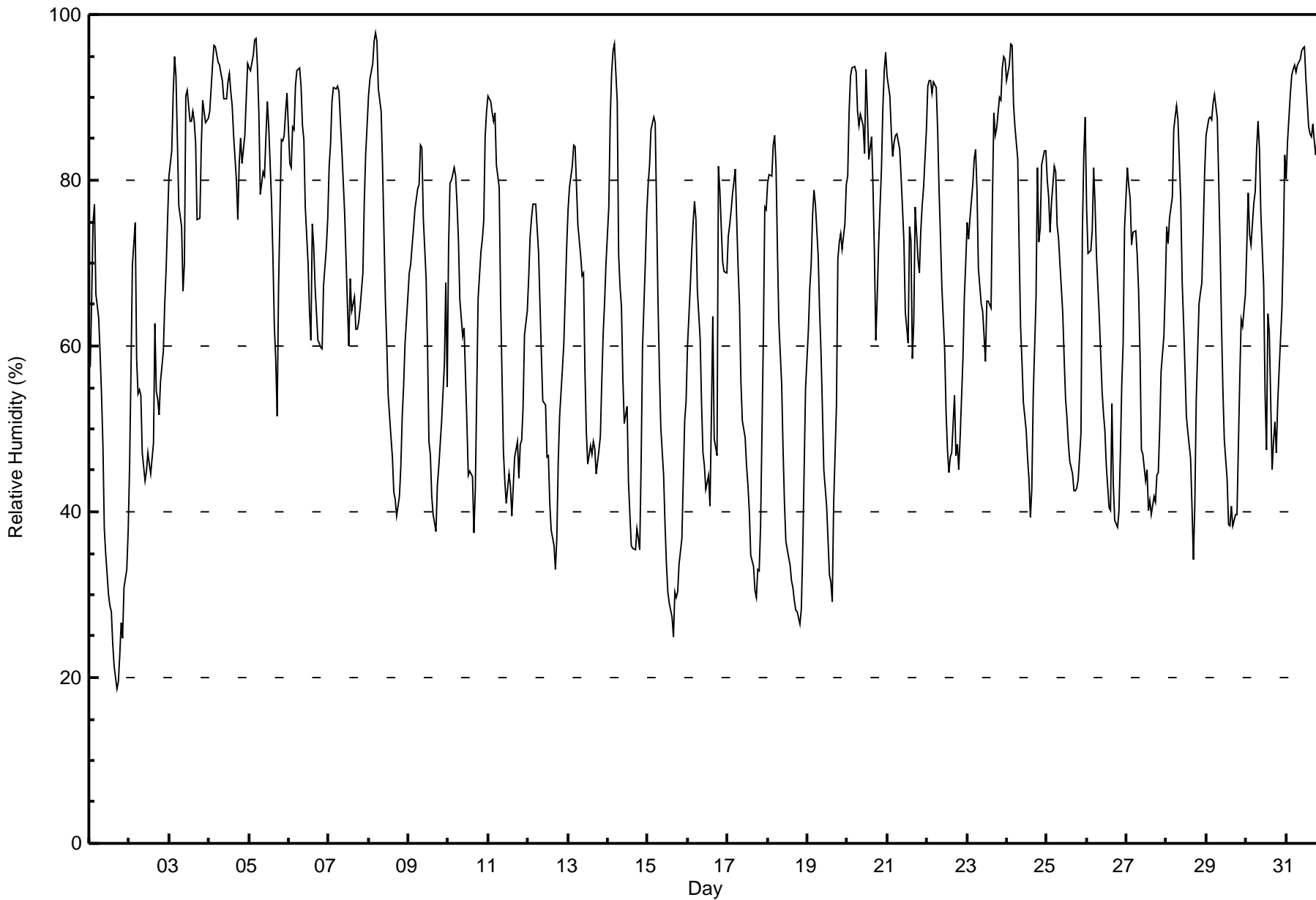
Total Number of Hours: 744



Wood Buffalo Environmental Association
Summary of Hour Averages

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

Maximum Value: 98 % on Jul 8 05:00																	Maximum Daily Average: 89.5 % on Jul 31																	Hours in Service: 744															
Minimum Value: 19 % on Jul 1 17:00																	Minimum Daily Average: 41.1 % on Jul 1																	Hours of Data: 744															
Maximum Diurnal Average: 84.8 % at hour 5																	Minimum Diurnal Average: 50.2 % at hour 17																	Hours of Missing Data: 0															
Monthly Average: 66.3 %																	Percentiles: P ₁ = 26 P ₁₀ = 40 Q ₁ = 49 Median = 69 Q ₃ = 83 P ₉₀ = 90 P ₉₉ = 96																	Hours of Calibration: 0															
																																		Percent Operational Time: 100.0															
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Jul	57	66	75	77	66	63	59	54	48	38	35	30	29	28	24	21	19	20	23	27	25	31	33	38	41.1	77																							
2-Jul	46	57	70	75	59	54	55	54	47	44	45	47	46	45	48	63	55	54	52	56	59	65	69	75	55.7	75																							
3-Jul	81	84	90	95	92	85	77	74	67	70	90	91	87	87	88	87	84	75	75	84	90	88	87	87	84.0	95																							
4-Jul	88	91	94	96	96	94	94	93	92	90	90	92	93	91	89	85	80	75	82	85	82	86	90	94	89.3	96																							
5-Jul	94	93	95	97	97	94	88	78	81	80	85	90	87	77	71	62	58	52	67	85	85	85	88	91	82.5	97																							
6-Jul	82	81	87	86	91	93	94	91	87	85	77	70	64	61	75	72	67	61	60	60	60	67	72	76	75.8	94																							
7-Jul	82	84	89	91	91	91	91	87	84	76	71	65	60	68	64	66	62	62	63	65	69	77	83	87	76.2	91																							
8-Jul	90	92	94	97	98	97	91	88	82	74	66	60	54	49	47	42	41	40	42	46	52	55	60	66	67.5	98																							
9-Jul	69	70	72	74	76	79	79	84	84	75	68	60	49	47	42	40	38	43	45	48	51	58	68	55	61.4	84																							
10-Jul	72	80	80	81	80	77	73	66	61	62	56	51	44	45	44	37	43	54	66	71	73	75	85	88	65.3	88																							
11-Jul	90	89	88	87	88	82	79	66	56	47	44	41	45	43	39	43	47	49	44	48	49	53	61	64	60.1	90																							
12-Jul	68	73	75	77	77	74	71	65	59	53	53	47	47	41	38	36	33	37	46	52	57	60	66	72	57.4	77																							
13-Jul	76	79	82	84	84	79	75	71	69	69	57	50	46	48	47	49	48	45	47	49	56	62	65	70	62.7	84																							
14-Jul	77	87	93	96	96	89	71	67	65	56	51	53	44	40	36	36	35	38	37	35	46	60	70	76	60.6	96																							
15-Jul	79	82	86	88	87	76	65	57	50	44	38	34	30	29	27	25	30	30	30	34	37	44	51	53	50.4	88																							
16-Jul	60	67	71	75	77	75	67	61	53	47	46	43	44	41	52	64	49	47	82	79	74	70	69	69	61.7	82																							
17-Jul	73	75	76	78	81	75	69	65	56	51	49	46	43	40	35	33	31	30	33	33	38	61	77	76	55.2	81																							
18-Jul	80	81	81	84	85	82	72	63	55	48	41	36	35	33	32	31	29	28	28	26	28	35	45	55	50.6	85																							
19-Jul	62	67	70	76	79	77	71	64	59	52	45	41	37	32	32	29	41	53	71	73	74	72	75	79	59.5	79																							
20-Jul	81	88	93	94	94	93	88	87	88	87	83	93	88	82	85	79	71	61	66	72	81	89	93	95	84.7	95																							
21-Jul	93	90	86	83	85	86	86	84	80	77	73	64	60	74	73	59	63	77	70	69	74	77	79	86	76.9	93																							
22-Jul	91	92	92	91	92	91	86	79	73	67	59	52	47	45	47	47	54	47	48	45	49	58	66	70	66.2	92																							
23-Jul	75	73	75	79	83	84	79	69	65	64	61	58	65	65	65	78	88	85	86	90	90	94	95	95	77.6	95																							
24-Jul	92	94	96	96	89	86	83	72	62	58	53	50	46	44	39	43	54	66	82	73	74	82	84	84	70.9	96																							
25-Jul	80	78	74	77	82	81	75	73	70	64	59	54	51	48	46	45	43	43	43	44	49	74	83	88	63.4	88																							
26-Jul	77	71	72	74	82	77	71	64	59	55	52	50	46	41	40	53	43	39	38	40	47	55	60	74	57.4	82																							
27-Jul	82	79	78	72	74	74	71	67	59	47	47	44	45	40	41	40	42	41	44	45	50	57	61	67	57.0	82																							
28-Jul	74	72	75	78	86	88	89	87	78	68	63	57	51	50	47	40	34	41	53	65	66	68	74	81	66.1	89																							
29-Jul	85	88	88	87	89	90	88	80	72	63	55	49	44	39	38	41	38	40	40	48	56	63	62	66	62.8	90																							
30-Jul	72	78	73	72	77	79	84	87	84	76	67	54	47	64	62	45	49	51	47	53	57	65	72	83	66.6	87																							
31-Jul	80	85	90	93	93	94	93	94	95	96	96	96	92	87	86	85	87	85	83	87	86	90	89	87	89.5	96																							
																								77.7	80.3	82.6	84.2	84.8	82.6	78.4	73.9	69.0	64.0	60.5	56.9	53.8	52.4	51.5	50.8	50.2	50.5	54.7	57.6	60.8	67.0	72.1	75.7	Diurnal Average	
																								94	94	96	97	98	97	94	94	95	96	96	96	93	91	89	87	88	85	86	90	90	94	95	95	Diurnal Maximum	





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed (WS) - km/h

Patricia McInnes - July 2016

Maximum Speed: 26 km/h on Jul 19 18:00	Maximum Daily Speed Average: 16.1 km/h on Jul 12	Hours in Service: 744
Minimum Speed Value: 1 km/h on Jul 9 22:00	Minimum Daily Speed Average: 0.4 km/h on Jul 30	Hours of Data: 744
Maximum Diurnal Speed Average: 6.4 km/h at hour 18	Minimum Diurnal Speed Average: 1.8 km/h at hour 9	Hours of Missing Data: 0
Monthly Average Velocity: 2.9 km/h 311.4 deg	Percentiles: P ₁ = 2 P ₁₀ = 4 Q ₁ = 6 Median = 9 Q ₃ = 13 P ₉₀ = 16 P ₉₉ = 23	Percent Operational Time: 100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Jul	S4	SSW3	SSE2	ESE4	ESE6	SE8	SE8	ESE8	ESE11	SSE21	SE20	SE16	SSE16	SSE13	SSE13	SSE16	SSE14	SSE15	SSE15	SSE15	SSE11	SSE8	SSE10	SSE7	SSE10.4	SSE21	
2-Jul	SSE5	SSE3	SSE2	SSE2	SE6	ESE5	ESE9	SE10	SE14	SE19	SSE18	SSE16	SSE12	SSE15	SE17	SSE15	SE18	SSE14	SSE13	SSE10	SE9	SE10	SE8	SE6	SE10.4	SE19	
3-Jul	SE5	SE5	SSE2	S2	SE3	SE6	ESE7	ESE6	ESE5	SE9	W7	WSW9	E9	S7	ENE5	SE2	ESE4	ENE5	NE4	S5	S5	SW8	WSW8	WSW8	SSE2.7	WSW9	
4-Jul	SSW3	SW8	SW7	SW5	SW8	WSW8	WSW10	WSW9	WSW10	WSW12	WSW8	WSW8	WSW10	WSW13	WSW14	SW12	W9	WNW2	SSE4	SSW6	S6	SSE6	NW3	NNW4	WSW6.8	WSW14	
5-Jul	N3	N6	NNW5	NW4	NW7	NNW8	NNW9	NW8	NNE16	NNE12	NNE10	N10	NNW6	NNE7	NNW13	NNE9	NNE11	ENE9	NE9	W11	W14	WNW10	SSE4	SSW5	N5.8	NNE16	
6-Jul	W13	W14	WNW12	W3	SW4	W5	NW10	NNW11	N15	N15	N15	N16	NNE17	NNE15	N21	NNE16	NNE10	NNE13	NNE13	N11	N7	NNW7	N8	N10	N9.2	N21	
7-Jul	NNW9	NNW10	NNW10	NNW13	NNW12	NNW9	NNW9	NNW11	NNW13	N11	NNW6	N8	N16	N16	N15	N14	N15	NNE17	NNE14	N13	N11	NNW10	NNW9	NNW9	N11.3	NNE17	
8-Jul	NNW9	NNW7	N8	N10	N8	N10	N11	N9	N9	N10	NNE9	NNE9	N10	N9	N8	N8	N10	NNE10	N8	NNE7	N8	N9	N9	N7	N8.8	N11	
9-Jul	N8	N8	NNW7	NNW7	NNW7	NNW7	N7	N6	N7	N5	NNW5	NNE5	ENE6	E6	ENE7	E7	ENE7	NNE14	NE13	E9	ESE5	ESE1	NNW3	ENE5	NNE4.9	NNE14	
10-Jul	N3	NNW4	NNW4	NW3	NNE3	ESE4	SE3	ENE4	NE4	NNE7	N9	NNW7	N5	NE15	E17	E12	ESE10	WSW10	WNW17	NW11	NW8	N2	WSW2	W4	N2.6	WNW17	
11-Jul	SW4	SW7	WSW4	W2	NNW4	NE3	N3	N9	N8	NNE13	NNE15	N14	NNW19	NW18	NW17	NNW19	NNW17	NNW14	N16	NNW14	N12	NNW11	NW12	NNW15	NNW9.7	NNW19	
12-Jul	NNW14	NNW13	NNW14	NNW13	NNW14	NNW14	NNW16	NNW16	NNW16	NNW16	N15	N16	NNW19	NNW19	NNW20	NNW21	NNW24	NNW23	NNW19	NNW20	NNW13	NNW11	NNW11	NNW12	NNW16.1	NNW24	
13-Jul	NNW11	NW11	NW13	NW11	NW11	NNW13	NNW15	NNW16	NNW17	NNW17	N18	N19	NNE19	N17	NNW19	N19	NNE19	NNE16	N16	NNW14	NNW10	NNW8	NNW9	N8	NNW13.9	N19	
14-Jul	NNE5	NW5	NW4	WNW3	WNW3	NW3	NNW3	NNE5	N6	N6	NNW8	NNW3	NNW7	N6	NNE6	NNE8	NNW9	N15	NNE14	NNE8	NNW4	WNW5	WNW4	SSW3	N5.0	N15	
15-Jul	SW3	SW3	SW2	SW4	SW4	SW4	SSE3	S4	ESE4	ESE5	ESE6	SW3	WSW6	SW3	NNW2	NE2	N4	NNW15	NW10	WNW11	NW9	WNW8	WNW8	WNW10	WNW4	WNW2.7	NNW15
16-Jul	S4	SSW5	S6	S6	S8	SSW8	SSW7	SW4	WSW7	W10	WSW10	NW11	NW14	NW14	N23	NW8	NNW9	N10	NNE17	NNW10	NNW16	NNW19	NNW19	NNW16	NW6.6	N23	
17-Jul	NNW11	NNW12	NW10	NW8	NW9	NNW12	NNW13	NNW12	NNW13	N14	N14	NNW15	NNW15	N16	NNW14	N15	NNW16	N13	N10	NNE8	NNW6	NW5	WNW5	W3	NNW10.7	N16	
18-Jul	WSW2	SSW2	S3	S3	S4	SSE5	SSE6	SSE8	SSE9	S9	SSW8	S11	S11	SSW11	S15	S15	SSW13	SSW14	SSW15	SSW12	SSW7	SSW6	SSW6	SW8	SSW8.1	S15	
19-Jul	SSW8	SW8	SW10	SW4	SSW7	SSW6	SW8	SSW9	SSW11	SSW10	SSW15	SW16	WSW16	WSW14	WSW14	W14	NW23	WNW26	WSW7	SW10	WSW7	NW6	WNW2	WSW5	WSW8.6	WNW26	
20-Jul	WSW7	NNW9	NNW8	NNW7	W5	NW7	NNW8	NW8	W5	WNW6	NNW7	NNE9	NNE7	NNW2	WSW3	NW3	WNW7	NNW7	W5	SW10	SW10	SW8	SW8	SW10	WNW4.3	SW10	
21-Jul	SW12	WSW13	WSW13	SW12	SW12	SW13	SW13	WSW11	WSW13	WSW14	WSW13	W17	W18	WNW19	W17	WNW22	NNW18	N24	N20	N14	N13	NNE10	NE7	E3	WNW8.4	N24	
22-Jul	SSE3	SSW5	S5	S6	SSE6	SSE6	SSE8	SSE7	SE9	SE10	S13	S17	SSW20	SSW19	SSW17	SSW12	WSW12	WNW13	WNW11	W14	WNW12	NNW14	NW5	SW4	SSW5.9	SSW20	
23-Jul	W6	WSW6	WSW6	SSW7	SW6	SW6	SW5	NNE5	NNE3	NNW3	ESE8	ESE3	NNE8	ESE9	SSE9	NW7	SE5	ESE5	WSW7	SW8	SW10	SW8	SW7	SSW5	SW2.4	SW10	
24-Jul	SW9	SSW7	S5	SSW5	SW10	SSW10	S9	SSW9	WSW18	WSW20	WSW21	WSW21	WSW20	WSW20	WSW20	WNW17	WNW20	NW24	WNW18	WSW11	WSW15	WSW15	W14	WSW15	WSW12.5	NW24	
25-Jul	W19	W16	W14	W11	W11	WNW10	WNW14	WNW18	NW14	NW14	NNW14	NNW13	NNW13	NW13	NNW14	N10	NNW9	NNE8	NE10	ENE10	NE8	NE6	NNW3	NE1	E1	NW7.8	W19
26-Jul	SE5	ESE4	SE5	SE6	ESE5	SE8	SE9	SE7	S9	SSW13	SSW14	SW12	WSW9	S11	WSW5	ENE4	S10	S11	SSE8	SSE8	SE8	SSE7	SSE7	SE4	S6.1	SSW14	
27-Jul	SSE5	S5	S7	SSW9	SW11	SW9	SW7	SW6	SSW3	N4	NNE9	N11	N13	N13	NNW12	N16	NNE18	NNE15	NNE13	NNE10	N7	N6	NNW7	NNW5	N4.3	NNE18	
28-Jul	NNW5	W5	W4	W5	SW5	WNW6	NNE5	N3	W1	N7	NE6	NE6	NNE9	NNE8	NNE6	NNE9	N10	NNW6	SW13	SW14	S7	SSE9	SSW9	SW9	NW1.8	SW14	
29-Jul	SW8	WSW8	S5	SSW6	SSW7	SSW8	SSW9	SSW7	SSW7	S7	SSW6	S7	SSE11	S11	SSW9	SW11	SSW15	S10	S10	S9	SSE6	S4	SE6	SE6	SSW7.5	SSW15	
30-Jul	SSE6	SW6	SW12	SSW9	SSW10	SW11	SSW7	SSW1	SSE8	SSE8	SE11	SE12	SE11	N17	E4	ESE11	NNE14	NNE13	NNE11	N10	NNW12	NNW12	N6	N4	ENE0.4	N17	
31-Jul	NE7	N6	NNW11	NNW8	N14	N12	NW9	NNW14	NNE5	NW7	WNW8	WNW10	WNW14	NW13	WNW14	WNW7	WNW7	NW6	NW6	NW9	WNW9	WNW9	WNW13	W15	NW8.5	W15	

W2.5 W3.8 W3.5 W2.7 W2.7 W2.4	NNW2.0 NNW2.7	NNW1.8 NNW1.9	NNW2.1	NNW2.9 NNW3.5	NW4.3 NNW3.2	NNW4.2	NNW5.8 NNW4.7	NW3.3	NNW3.2	NNW3.6	NNW3.2	NNW2.9												Diurnal Average								
W19 W16	NNW14 NNW13	NNW14 NNW14	NNW16	NNW18	WSW18	SSE21	WSW21	WSW21	SSW20	WSW20	N23	WNW22	NNW24	WNW26	N20	NNW20	NNW16	NNW19	NNW19	NNW16												Diurnal Maximum

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



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

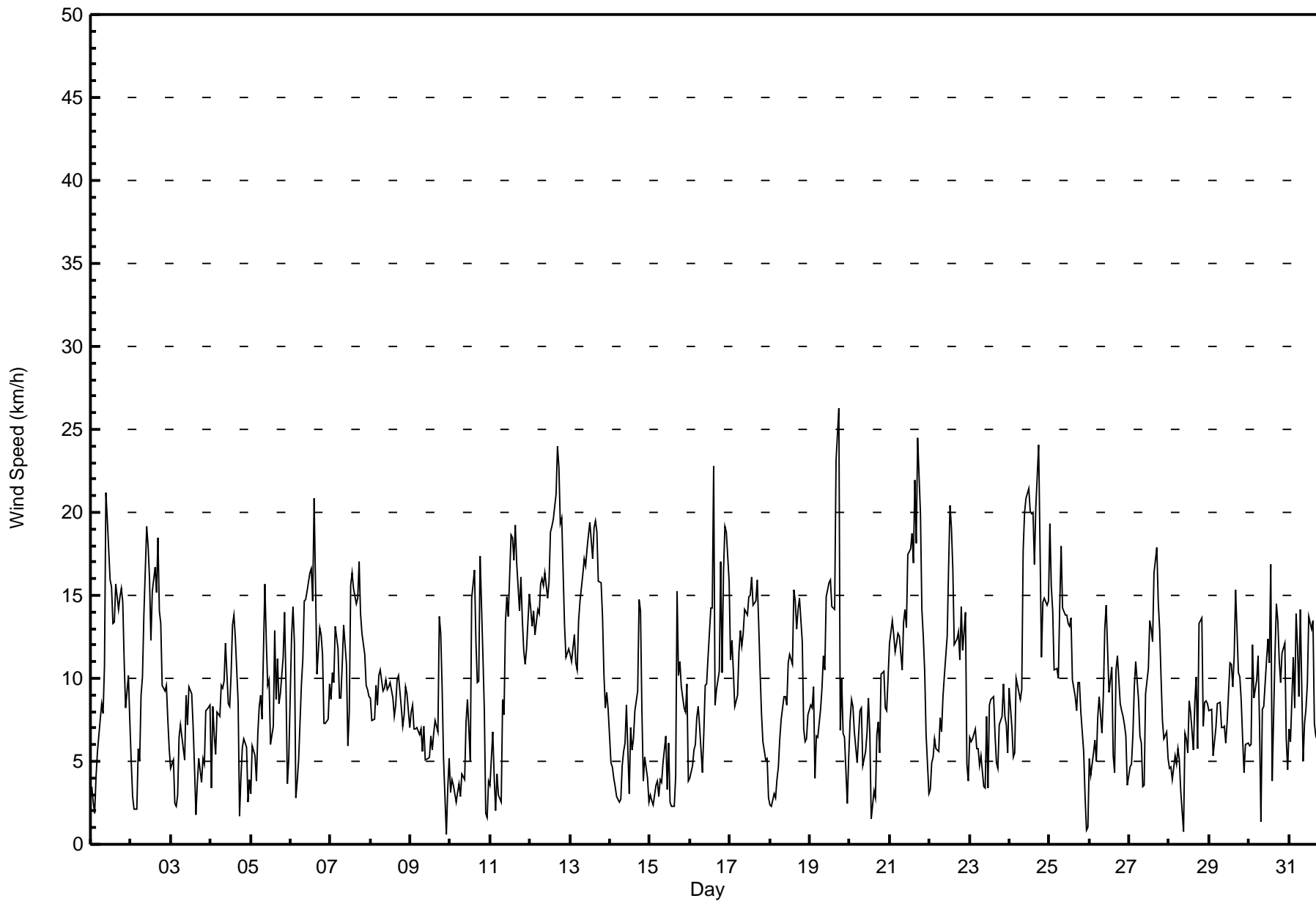
Wind Speed (WS) - km/h
Patricia McInnes - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 12 km/h on Jul 3 10:00 Minimum Value: 0 km/h on Jul 14 03:00 Percentiles: P ₁ = 1 P ₁₀ = 1 O ₁ = 2 Median = 2 O ₃ = 3 P ₉₀ = 4 P ₉₉ = 8																	Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Jul	2	2	1	2	2	2	2	2	4	6	5	4	5	4	4	5	5	4	4	4	4	2	2	2	6
2-Jul	1	1	1	2	2	2	3	3	5	5	4	4	4	4	5	6	4	3	3	2	2	2	1	3	6
3-Jul	1	1	1	1	2	2	1	1	2	12	4	2	5	3	2	2	2	2	2	1	1	2	2	3	12
4-Jul	2	2	2	1	1	2	2	2	2	3	2	2	4	3	3	3	3	3	2	2	1	1	1	2	4
5-Jul	1	1	1	1	2	1	2	2	5	3	3	3	2	2	3	3	3	3	6	3	3	3	2	1	6
6-Jul	4	3	3	3	1	2	2	2	3	3	3	3	4	5	6	4	2	3	2	3	2	1	1	2	6
7-Jul	1	2	2	2	2	2	2	3	3	2	3	5	4	3	3	5	4	3	3	2	1	1	2	5	
8-Jul	1	1	1	2	2	2	3	2	2	2	3	3	3	2	3	2	2	2	1	2	2	1	1	3	3
9-Jul	1	1	1	1	1	2	2	3	2	2	1	2	3	3	3	3	3	4	3	3	2	1	1	2	4
10-Jul	1	1	1	2	1	1	1	1	2	2	2	3	3	5	4	4	3	5	4	3	2	1	1	1	5
11-Jul	1	1	1	1	1	1	3	2	2	3	3	4	6	3	4	4	3	3	4	3	3	2	2	3	6
12-Jul	3	2	2	2	2	2	3	3	3	3	3	4	4	5	4	4	5	5	4	5	3	2	3	2	5
13-Jul	2	2	2	2	2	2	3	3	4	4	4	5	5	4	5	4	4	4	4	3	2	1	1	2	5
14-Jul	1	1	0	1	1	1	1	1	2	2	3	3	4	3	4	4	3	5	3	2	1	1	1	1	5
15-Jul	1	1	1	1	0	2	1	1	2	2	2	3	3	3	2	4	4	3	3	3	2	1	1	3	4
16-Jul	1	2	2	2	1	2	1	1	2	3	2	3	3	3	6	6	2	11	8	2	3	3	3	3	11
17-Jul	2	2	1	2	1	2	3	2	3	3	4	4	5	4	4	5	4	3	3	2	1	1	1	1	5
18-Jul	1	2	1	1	1	1	1	2	2	2	3	4	4	4	5	4	4	4	4	4	1	1	1	1	5
19-Jul	1	1	1	2	2	1	2	3	2	3	4	5	5	5	5	5	5	7	4	3	3	2	2	2	7
20-Jul	1	2	2	1	1	1	2	2	1	1	5	3	1	2	2	2	3	2	1	2	2	1	1	2	5
21-Jul	2	2	2	2	2	2	3	3	2	3	3	6	5	9	4	9	7	5	4	4	3	3	2	2	9
22-Jul	1	1	1	1	1	1	1	2	2	2	5	4	5	5	4	4	7	4	3	4	2	3	3	1	7
23-Jul	1	1	1	1	1	2	1	2	2	2	3	3	2	2	3	5	3	2	2	2	2	1	2	2	5
24-Jul	2	1	1	1	2	2	2	4	4	4	5	5	5	4	5	6	9	7	8	3	3	3	3	3	9
25-Jul	4	3	3	3	2	3	3	3	3	3	4	4	4	4	4	3	3	3	3	2	2	1	1	1	4
26-Jul	1	1	1	1	2	1	2	2	2	3	4	4	3	4	4	3	4	3	2	2	3	2	2	2	4
27-Jul	1	1	1	2	3	2	2	1	1	3	3	3	3	3	3	4	4	4	3	2	2	1	2	1	4
28-Jul	1	2	1	4	3	3	3	2	1	2	2	2	3	3	3	4	3	2	10	4	2	2	2	2	10
29-Jul	5	3	1	2	1	2	2	2	2	2	3	4	3	4	3	5	5	2	2	2	2	1	1	2	5
30-Jul	1	3	2	2	3	3	3	2	2	2	2	3	3	11	2	2	7	3	2	2	2	2	3	4	11
31-Jul	2	3	2	3	3	3	2	4	5	4	2	3	2	3	3	2	1	1	3	2	2	2	2	3	5
																	Diurnal Maximum								



Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	156	20.97	20.97
6 - 11	352	47.31	68.28
12 - 19	213	28.63	96.91
20 - 28	23	3.09	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

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

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	10	8	5	5	3	13	9	13	13	11	15	6	12	8	9	16	156
6 - 11	49	27	8	5	4	11	21	25	21	32	29	26	7	16	24	47	352
12 - 19	34	23	2	0	2	0	6	15	4	11	11	16	13	13	10	53	213
20 - 28	4	0	0	0	0	0	1	1	0	1	0	6	0	3	2	5	23
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	97	58	15	10	9	24	37	54	38	55	55	54	32	40	45	121	744

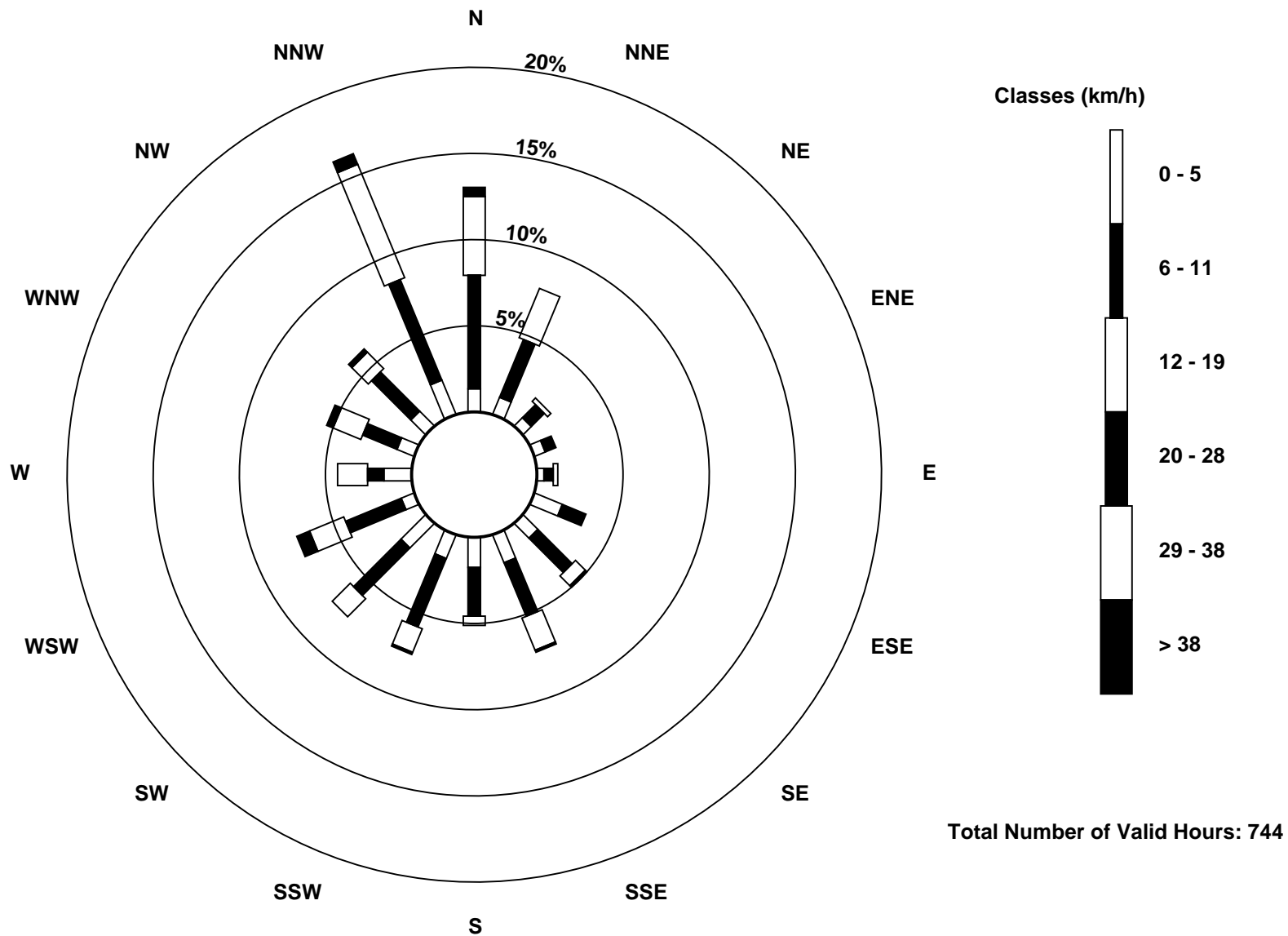
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

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





Wood Buffalo Environmental Association
Summary of Hour Averages

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

Direction of Maximum Speed: 294 deg on Jul 19 18:00 Direction of Maximum Daily Speed Average: 339.0 deg on Jul 12	Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0
Direction of Minimum Speed: 111 deg on Jul 9 22:00 Direction of Minimum Daily Speed Average: 0.4 deg on Jul 30	Percent Operational Time: 100.0
Monthly Average Direction: 297.3 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-Jul	186	194	155	119	116	132	131	115	106	147	132	139	155	162	163	168	156	148	161	162	155	154	147	167	148.5
2-Jul	151	164	160	163	129	120	121	129	128	142	157	148	152	165	144	156	127	150	150	151	128	133	133	130	143.0
3-Jul	132	139	167	190	140	132	110	115	107	130	278	251	97	171	77	137	113	66	49	183	185	216	253	257	155.5
4-Jul	204	236	236	214	236	256	251	244	239	254	242	246	238	249	237	230	267	286	163	198	178	164	324	328	237.8
5-Jul	355	0	340	310	314	329	343	324	15	15	24	354	27	23	23	12	12	61	42	280	264	286	158	203	352.6
6-Jul	260	276	290	260	220	275	314	331	352	351	351	8	18	15	11	30	25	18	13	355	357	339	357	356	350.0
7-Jul	340	337	331	331	340	339	328	337	338	350	341	349	358	6	356	1	1	12	14	0	354	338	333	346	349.9
8-Jul	348	347	351	7	354	6	9	360	11	4	18	15	360	357	356	5	1	19	10	16	355	353	352	355	2.4
9-Jul	351	358	341	343	338	327	349	357	9	357	328	15	65	87	76	96	76	25	50	91	114	111	340	63	26.3
10-Jul	357	335	341	325	18	116	133	66	39	23	9	329	357	36	101	91	112	249	288	312	304	352	240	272	7.8
11-Jul	219	228	258	267	340	50	350	349	2	24	27	8	347	320	326	347	340	337	7	346	356	339	326	334	344.8
12-Jul	341	329	329	335	338	342	342	342	343	341	354	357	348	338	336	332	334	338	341	342	337	331	331	337	339.0
13-Jul	333	321	324	324	324	328	343	347	345	344	354	5	16	356	348	353	15	19	355	347	333	333	342	350	348.7
14-Jul	14	318	307	299	285	305	345	33	5	10	343	343	338	5	28	17	341	8	22	23	328	300	288	212	353.1
15-Jul	220	221	233	227	229	167	169	111	120	119	230	253	226	327	41	11	342	324	303	306	301	302	298	303	294.8
16-Jul	186	200	188	185	189	203	211	225	256	269	253	310	321	316	1	312	334	8	12	336	328	333	333	333	316.1
17-Jul	327	331	325	324	317	327	340	343	348	5	349	345	341	351	347	351	333	2	11	15	345	305	301	263	342.0
18-Jul	240	210	188	182	173	160	159	164	167	172	192	191	185	198	185	188	208	210	206	209	202	202	202	214	192.8
19-Jul	212	216	214	214	203	203	217	212	197	213	211	216	246	252	253	273	318	294	255	219	238	315	286	244	243.0
20-Jul	248	327	340	333	280	304	327	319	266	283	334	16	16	327	247	315	302	337	272	229	226	216	217	222	290.0
21-Jul	227	237	239	229	217	224	230	251	243	251	257	268	272	286	265	293	335	7	357	357	7	17	56	94	281.3
22-Jul	163	205	171	173	150	159	154	148	143	127	172	174	194	211	197	210	245	294	288	262	293	340	318	222	207.3
23-Jul	264	255	239	210	233	234	235	12	20	342	112	120	29	106	155	315	125	106	248	220	225	221	227	194	214.8
24-Jul	215	195	187	194	216	210	190	213	243	244	242	241	243	237	240	300	300	314	288	245	257	258	260	257	250.4
25-Jul	259	263	278	281	261	295	299	303	312	313	314	298	313	329	353	344	33	40	57	44	40	341	37	93	311.8
26-Jul	131	114	129	137	123	129	126	145	177	210	213	232	238	190	247	61	184	176	163	159	142	162	165	146	172.3
27-Jul	158	179	190	209	218	223	218	215	204	359	15	1	351	351	332	8	23	24	13	13	9	351	347	342	351.1
28-Jul	342	280	265	268	231	288	20	8	269	351	48	39	24	25	23	14	7	347	231	231	179	166	213	230	306.6
29-Jul	215	239	181	199	210	209	209	203	196	169	199	190	168	188	201	234	209	178	188	181	160	184	131	143	193.7
30-Jul	152	220	232	208	209	229	209	211	160	153	130	144	144	356	93	120	13	17	14	352	341	346	357	350	77.9
31-Jul	39	353	344	336	354	354	321	327	20	310	300	296	302	321	297	282	289	307	310	307	283	288	286	281	314.8

269.2 276.8 279.0 269.2 262.3 272.1 290.3 319.5 327.1 319.2 307.7 303.4 323.6 319.3 324.7 335.1 343.5 353.5 345.6 309.0 303.7 307.6 301.6 289.9
 Diurnal Average

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



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

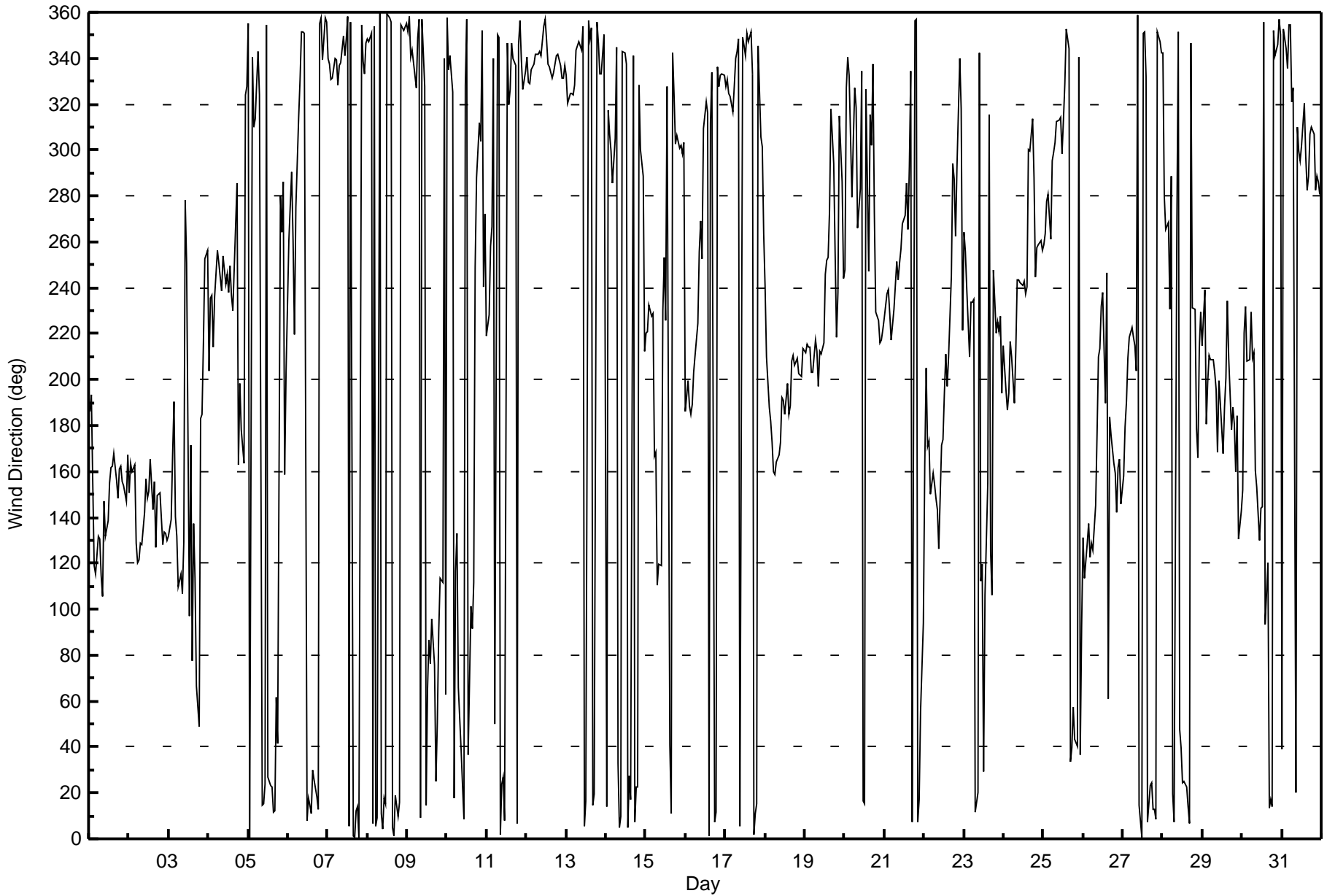
Wind Direction (WD) - deg
Patricia McInnes - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 101 deg on Jul 28 09:00 Minimum Value: 5 deg on Jul 17 23:00 Percentiles: P ₁ = 8 P ₁₀ = 11 Q ₁ = 14 Median = 19 Q ₃ = 28 P ₉₀ = 44 P ₉₉ = 89																			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-Jul	50	28	73	30	19	22	18	21	22	18	21	23	21	28	25	23	30	22	17	16	14	11	12	20	73
2-Jul	19	36	12	27	26	19	19	18	25	19	21	23	27	18	21	22	16	19	19	15	11	12	11	24	36
3-Jul	14	17	19	23	22	17	22	26	47	61	50	16	42	31	52	39	39	32	56	15	21	14	22	20	61
4-Jul	39	14	23	17	14	12	15	16	14	15	18	16	18	13	13	15	30	86	49	26	18	19	46	37	86
5-Jul	31	20	28	32	9	9	15	29	26	15	16	31	28	34	20	27	27	25	75	28	12	12	51	26	75
6-Jul	15	15	19	95	34	28	16	13	15	17	18	19	16	20	13	17	23	15	14	21	14	9	13	21	95
7-Jul	13	12	9	10	12	12	13	14	14	25	48	38	20	17	17	23	22	17	18	16	15	11	9	12	48
8-Jul	13	14	14	16	15	16	20	19	23	20	27	29	28	30	32	31	24	14	12	11	15	13	14	13	32
9-Jul	11	13	15	12	15	15	16	29	14	23	23	27	46	56	45	43	37	16	27	17	16	88	38	19	88
10-Jul	35	15	23	37	33	23	38	32	49	30	25	34	69	26	24	26	38	66	11	25	21	78	62	32	78
11-Jul	39	12	28	40	27	47	89	19	27	16	18	25	23	17	21	20	15	14	16	14	16	13	8	9	89
12-Jul	12	8	8	12	11	11	13	13	15	17	21	23	20	21	21	20	16	18	12	14	10	9	10	10	23
13-Jul	10	9	8	8	9	10	15	15	14	16	20	19	18	23	18	15	16	18	17	10	8	12	13	23	23
14-Jul	12	27	10	11	35	30	40	32	25	35	29	90	55	64	63	42	30	29	14	16	20	11	29	28	90
15-Jul	9	26	39	19	18	41	25	33	34	44	77	51	89	95	83	88	18	24	20	13	11	11	7	56	95
16-Jul	36	48	17	19	13	13	15	28	21	21	19	31	16	16	21	42	30	34	18	17	10	10	10	10	48
17-Jul	9	8	7	14	8	8	14	17	23	23	23	21	21	21	22	26	17	24	24	18	11	13	5	47	47
18-Jul	44	50	28	23	23	14	16	17	15	22	32	32	26	39	26	26	25	21	16	14	12	12	12	11	50
19-Jul	11	11	11	40	25	21	20	19	18	26	22	27	22	27	29	21	12	15	44	20	53	29	52	25	53
20-Jul	26	13	13	17	27	19	17	16	27	19	44	19	19	69	52	78	40	32	30	14	11	9	9	10	78
21-Jul	10	11	11	13	12	11	15	17	12	14	16	19	21	20	13	21	36	15	19	15	14	17	21	32	36
22-Jul	39	14	20	12	13	14	18	19	23	17	29	18	21	17	19	21	30	20	15	15	11	13	51	13	51
23-Jul	11	20	12	20	15	13	27	40	56	64	41	82	26	27	24	70	66	57	27	19	11	12	16	39	82
24-Jul	12	13	14	14	13	13	16	24	15	15	17	17	20	15	18	21	17	17	25	14	13	11	12	11	25
25-Jul	12	12	15	13	12	18	14	12	20	22	19	29	20	20	40	43	43	23	20	18	13	18	72	69	72
26-Jul	13	17	9	11	11	14	16	26	23	23	22	22	42	36	66	69	23	19	23	12	24	14	17	18	69
27-Jul	9	11	15	12	13	13	16	17	44	76	25	26	21	22	20	21	16	15	16	15	14	15	13	10	76
28-Jul	15	43	27	56	60	39	68	71	101	30	29	39	31	40	47	34	22	43	36	13	35	21	15	24	101
29-Jul	34	56	27	22	15	14	15	22	28	30	48	48	34	45	25	24	22	20	19	15	21	26	16	12	56
30-Jul	11	48	12	33	24	22	23	99	18	23	20	21	37	44	52	17	42	19	13	21	10	12	55	53	99
31-Jul	21	43	14	26	20	23	18	15	60	48	20	20	19	10	17	16	16	17	40	11	13	15	12	11	60
Diurnal Maximum																									



Wood Buffalo Environmental Association
Hourly Averages

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





Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	July 7, 2016	Last Calibration	June 2, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Reason:	Routine		
Start Time (MST)	8:15	End Time (MST)	11:20
Gas Cert Reference	EY0000355	Station temp.	21 Deg C
Cal Gas Concentration	49.8 ppm	Cal Gas Exp Date	18/09/2018
Calibrator Make/Model	Teledyne API T700	Serial Number	2449
ZAG Make/Model	Teledyne API 701	Serial Number	60
DACS make/model	Campbell Scientific CR3000	DACS serial No.	9036

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-678	-678
Analyzer IP address	192.168.1.43		Lamp voltage	765	761
Calculated slope	0.999589	0.996585	Chamber temp	45.1	45.1
Calculated intercept	1.198572	0.817363	Pressure	690.4	692.2
Analyzer Background	6.0	6.0	Flow	0.441	0.441
Analyzer Coefficient	1.122	1.122	Intensity	91	91

Analyzer make Thermo 43i Analyzer serial # 1008841397

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	6000	0.0	0.0	0.1	----
as found span	6000	94.7	786.0	782.3	1.005
calibrator zero	6000	0.0	0.0	0.3	----
high point	6000	94.7	786.0	788.3	0.997
second point	6000	47.5	394.3	394.6	0.999
third point	6000	23.8	197.5	196.0	1.008
as left zero	5000	0.0	0.0	0.3	----
as left span	5500	86.8	785.9	788.6	0.997
Average Correction Factor					1.001

Corrected As found 782.2 Previous response 785.1 % change 0.4%

Notes:

Inlet filter changed after as founds. No adjustments made.

Calibration Performed By: Devin Russell



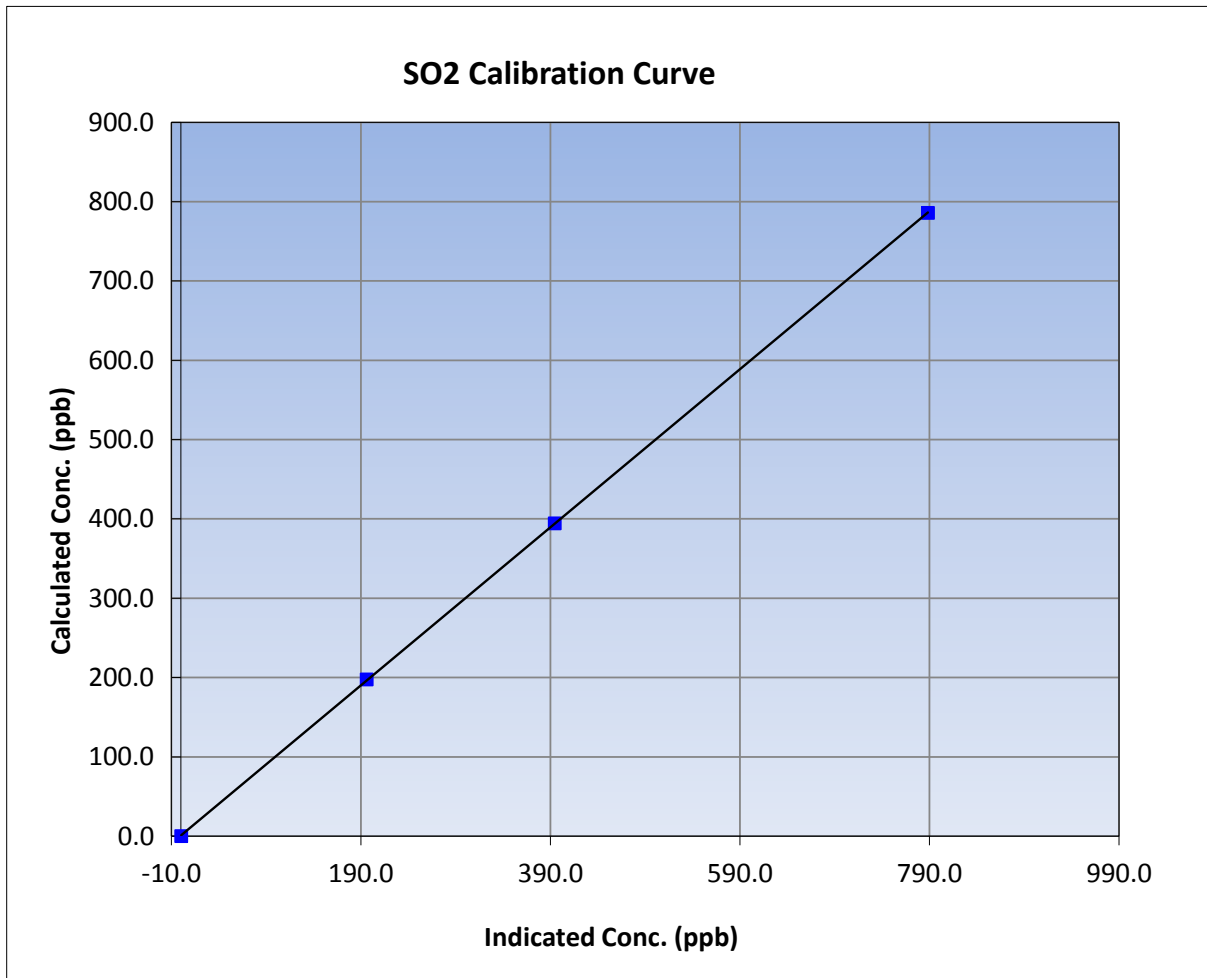
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	July 7, 2016	Previous Calibration	June 2, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	8:15	End Time (MST)	11:20
Analyzer make	Thermo 43i	Analyzer serial #	1008841397

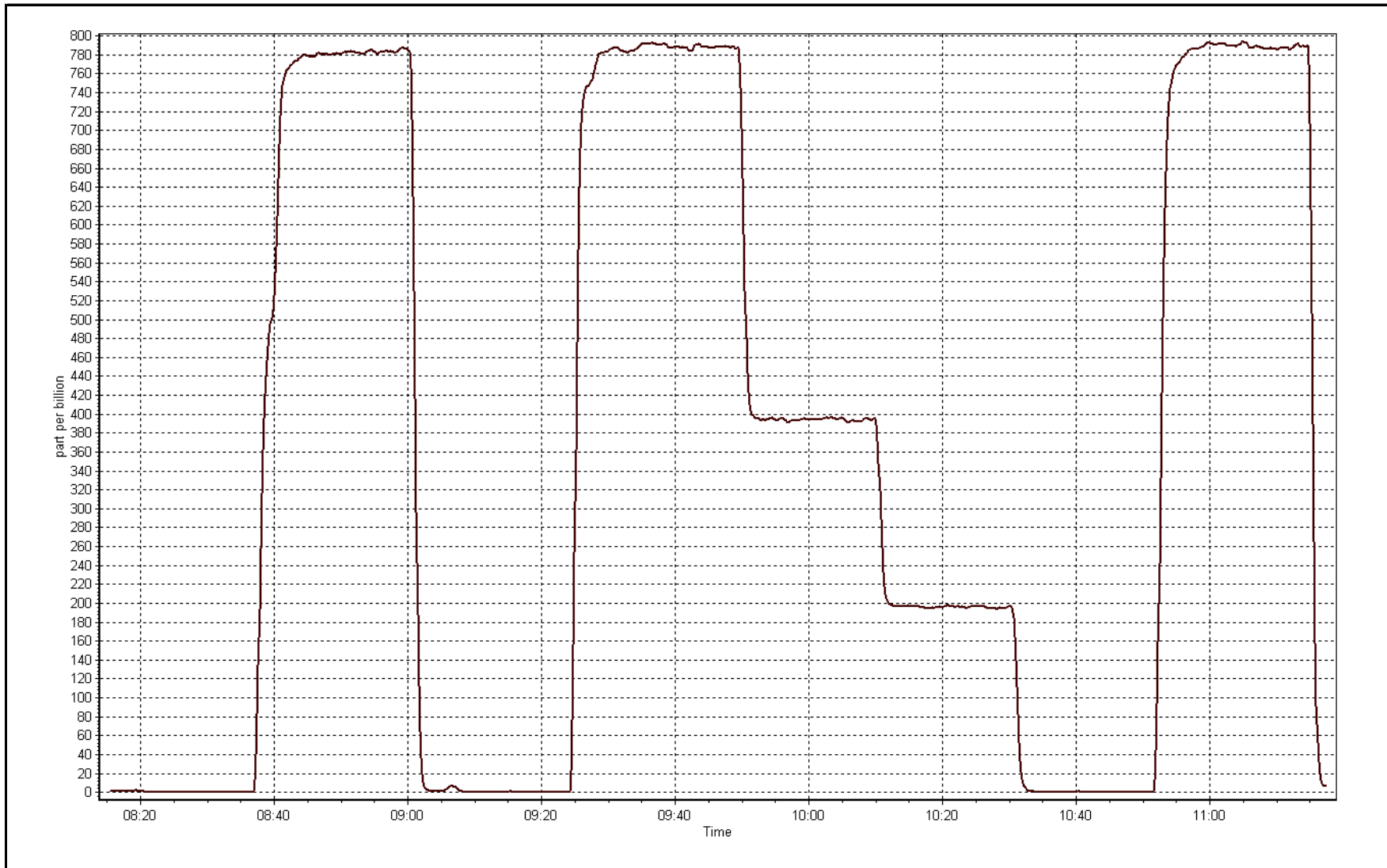
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	----	Correlation Coefficient	0.999990
786.0	788.3	0.9971		
394.3	394.6	0.9991	Slope	0.996585
197.5	196.0	1.0080		
			Intercept	0.817363



SO2 Calibration Plot

Date: July 7, 2016





Wood Buffalo Environmental Association TRS Calibration Report

Station Information

Calibration Date	July 7, 2016	Last Calibration	June 5, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Reason:	Routine		
Start Time (MST)	11:20	End Time (MST)	15:20
Gas Cert Reference	SA5551	Station temp.	22 Deg C
Cal Gas Concentration	5.28 ppm	Cal Gas Exp Date	13/02/2018
Calibrator Make/Model	Teledyne API T700	Serial Number	2449
Dil air Make/Model	Teledyne API 701	Serial Number	60
DACS make/model	Campbell Scientific CR3000	DACS serial No.	9036
SO2 gas concentration	49.8 ppm	SO2 gas cert/exp	SA130110A 12/Dec/16

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-720	-720
Analyzer IP address	192.168.1.42		Lamp voltage	991	980
Calculated slope	0.988131	1.007747	Chamber temp	45	45
Calculated intercept	-0.205843	-0.401627	Pressure	689.4	680.6
Analyzer Background	2.16	2.22	Flow	0.435	0.432
Analyzer Coefficient	1.199	1.21	Intensity	90	90
			Converter temp.	800	800
Analyzer make/model	Thermo 43i-TLE		Analyzer serial #	1218153358	
Converter make/model	CDN-101		Converter serial #	520	

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5500	0.0	0.0	0.1	----
as found span	5500	73.1	70.2	65.8	1.066
SO2 scrubber check	5500	21.7	196.5	0.3	----
calibrator zero	5500	0.0	0.0	0.2	----
high point	5500	73.1	70.2	69.8	1.005
second point	5500	41.8	40.1	40.5	0.990
third point	5500	20.9	20.1	20.5	0.980
as left zero	5500	0.0	0.0	0.3	----
as left span	5500	73.1	70.2	71.9	0.977
Average Correction Factor					0.992

Corrected As found	65.8	Previous response	71.2	% change	8.3%
--------------------	------	-------------------	------	----------	------

Notes:

Inlet filter changed after as founds. Scrubber check completed after as founds. Span adjusted. High point drifted up after adjustment, adjusted again.

Calibration Performed By:

Devin Russell



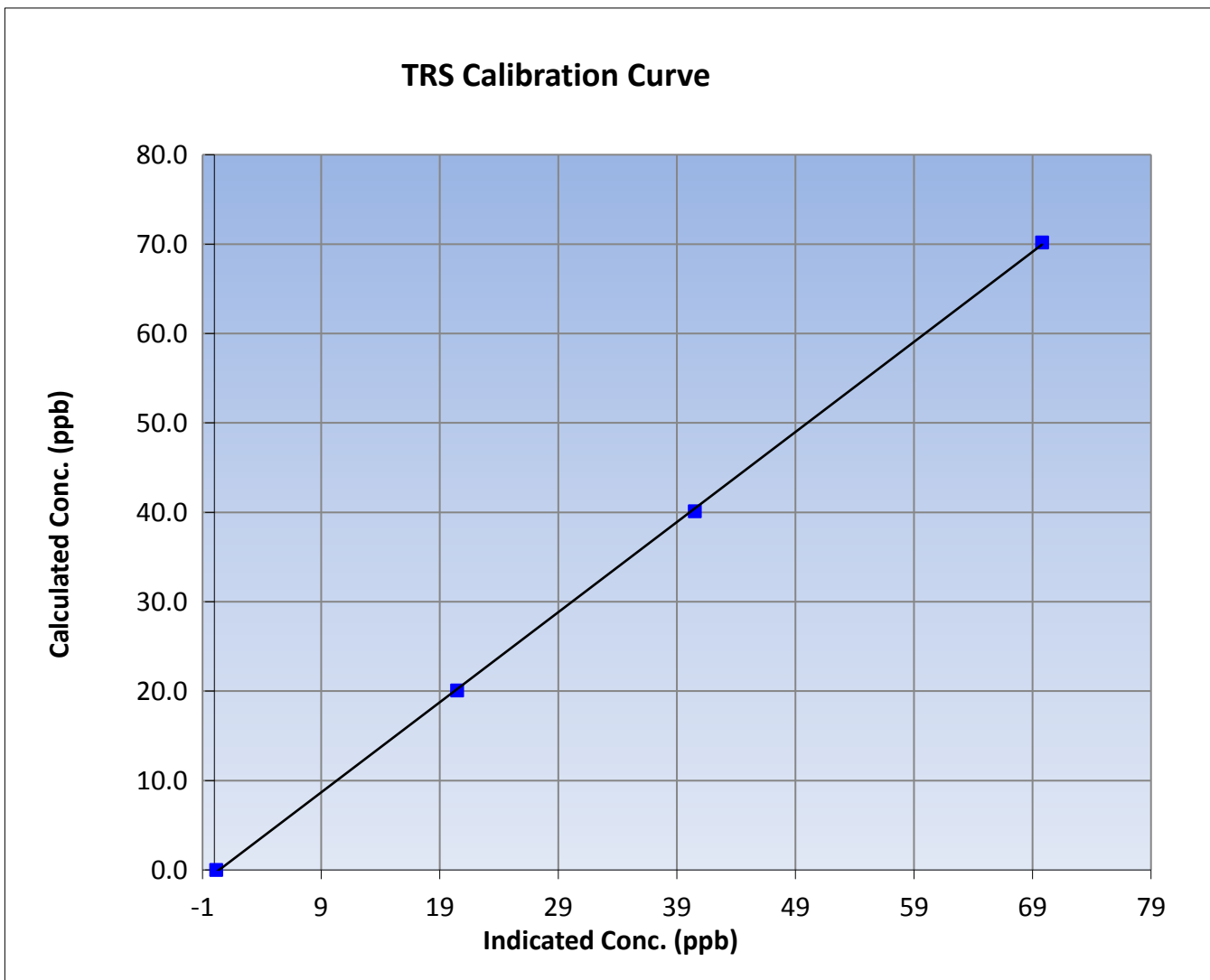
Wood Buffalo Environmental Association TRS Calibration Report

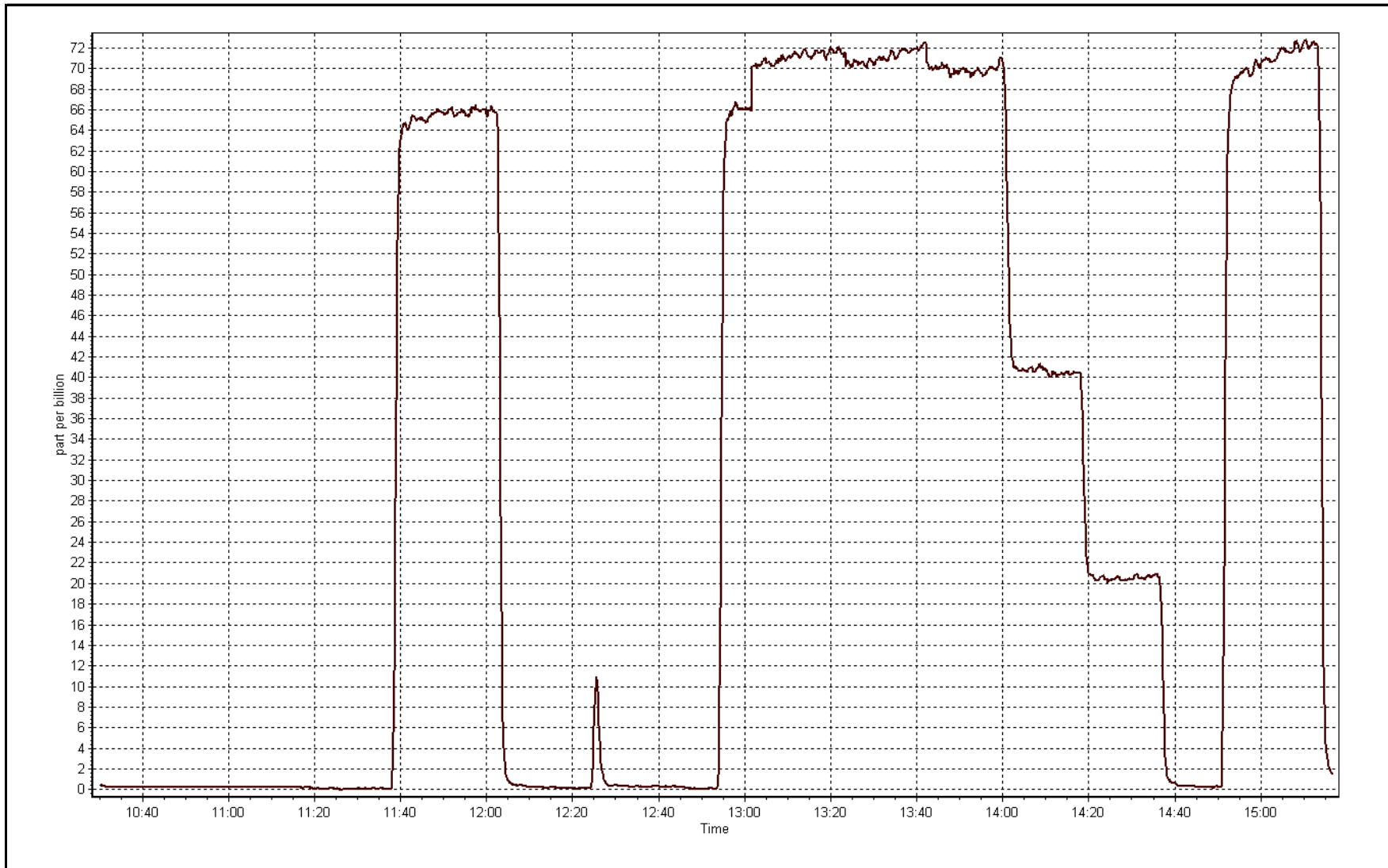
Station Information

Calibration Date	July 7, 2016	Previous Calibration	June 5, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	11:20	End Time (MST)	15:20
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1218153358

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	----	Correlation Coefficient	0.999912
70.2	69.8	1.0052		
40.1	40.5	0.9903	Slope	1.007747
20.1	20.5	0.9797		
			Intercept	-0.401627







Wood Buffalo Environmental Association THC / NMHC Calibration Report

Station Information

Calibration Date	July-07-16	Last Calibration	June-02-16
Station Name	Patricia McInnes	Station Number	AMS 6
Reason:	Routine		
Start Time (MST)	8:15	End Time (MST)	11:20
Gas Cert Reference	EY0000355	Cal Gas Expiry Date	September-08-18
CH4 Cal Gas Conc.	518.0 ppm	CH4 Equiv Conc.	1068.0 ppm
C3H8 Cal Gas Conc.	200.0 ppm	Station temp.	21 Deg C
Calibrator Model	Teledyne API T700	Serial Number	2449
ZAG make/model	Teledyne API 701	Serial Number	60
DACS make/model	Campbell Scientific CR3000	Serial Number	9036

Analyzer Information

	Before	After		Before	After
THC Range (ppm)	0 - 50 ppm		Column Temp	75.0	75.0
NMHC Range (ppm)	0 - 25 ppm		Detector Temp	175.0	175.0
Analyzer IP address	192.168.1.55		Flame Temp	405.0	405.0
THC Calc slope	0.998602	0.995569	Carrier Pressure	34.5	34.5
THC Calc intercept	0.032298	0.032235	Fuel Pressure	42.3	42.3
NMHC Calc slope	0.999952	0.994844	Air Pressure	32.4	32.4
NMHC Calc intercept	0.009347	0.011323			

Analyzer make Thermo 55i Analyzer serial # 1331259521

THC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	6000	0.0	0.00	0.00	----
as found span	6000	94.7	16.86	16.96	0.994
calibrator zero	6000	0.0	0.00	0.00	----
high point	6000	94.7	16.86	16.92	0.996
second point	6000	47.5	8.46	8.43	1.003
third point	6000	23.8	4.24	4.20	1.009
as left zero	5000	0.0	0.00	0.00	----
as left span	5500	86.8	16.85	16.99	0.992
Average Correction Factor					1.003

Corrected As found 16.96 Previous response 16.85 % change -0.7%

Notes:

Inlet filter changed after as founds. H2 cylinder changed after as founds. No adjustments made.

Calibration Performed By: Devin Russell



Wood Buffalo Environmental Association THC / NMHC Calibration Report

NMHC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	6000	0	0.00	0.00	----
as found span	6000	94.7	8.68	8.74	0.993
calibrator zero	6000	0.0	0.00	0.00	----
high point	6000	94.7	8.68	8.72	0.996
second point	6000	47.5	4.35	4.36	0.999
third point	6000	23.8	2.18	2.17	1.005
as left zero	5000	0.0	0.00	0.00	----
as left span	5500	86.8	8.68	8.75	0.992
Average Correction Factor					1.000

Corrected As found 8.74 Previous response 8.67 % change -0.8%

CH4 Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	6000	0	0.00	0.00	----
as found span	6000	94.7	8.18	8.22	0.995
calibrator zero	6000	0.0	0.00	0.00	----
high point	6000	94.7	8.18	8.20	0.997
second point	6000	47.5	4.10	4.07	1.008
third point	6000	23.8	2.05	2.03	1.012
as left zero	5000	0.0	0.00	0.00	----
as left span	5500	86.8	8.17	8.24	0.992
Average Correction Factor					1.006

Corrected As found 8.22 Previous response 8.18 % change -0.5%



Wood Buffalo Environmental Association

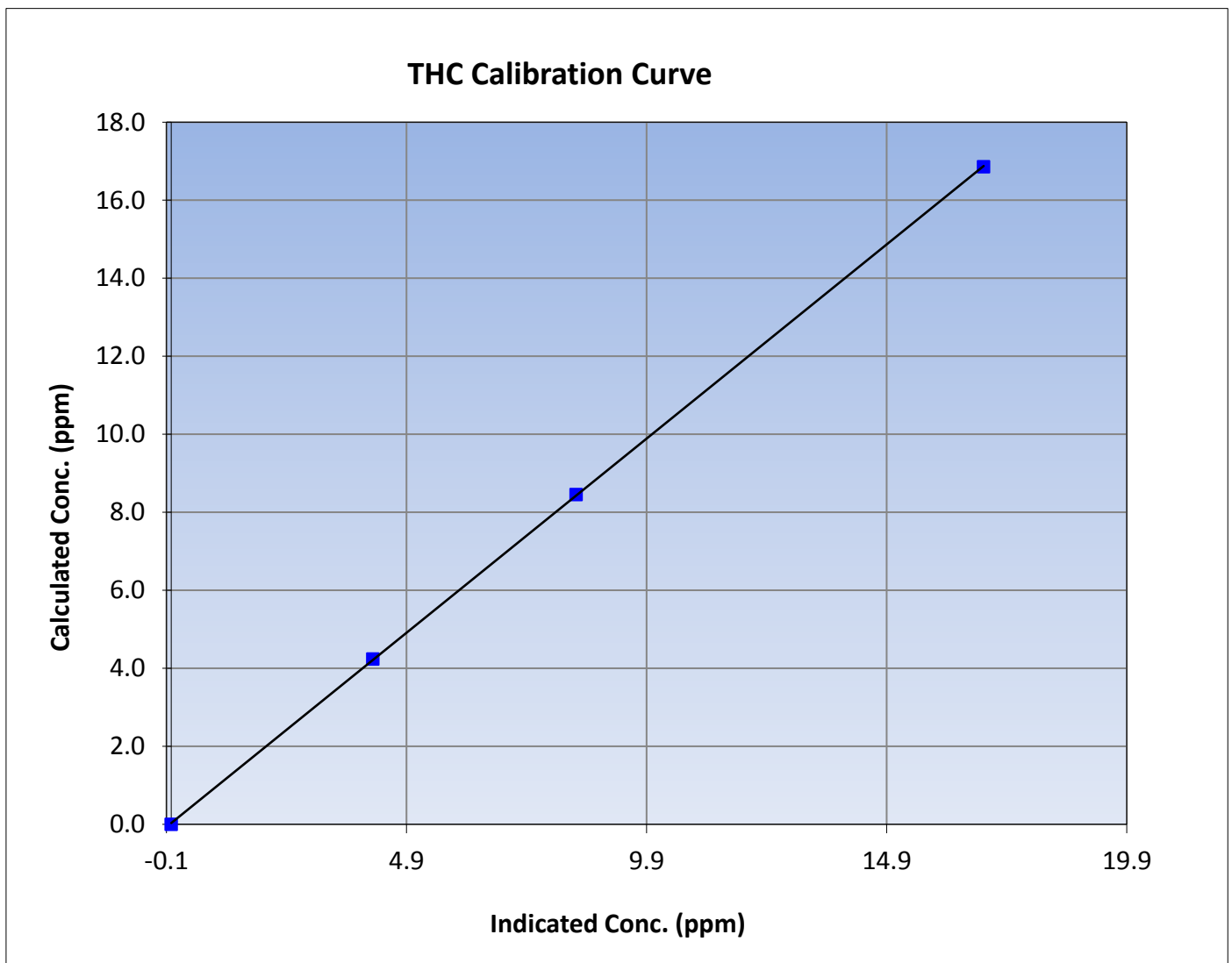
THC Calibration Summary

Station Information

Calibration Date	July 7, 2016	Previous Calibration	June 2, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	8:15	End Time (MST)	11:20
Analyzer make	Thermo 55i	Analyzer serial #	1331259521

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999981
16.86	16.92	0.9963		
8.46	8.43	1.0030	Slope	0.995569
4.24	4.20	1.0087		
			Intercept	0.032235





Wood Buffalo Environmental Association

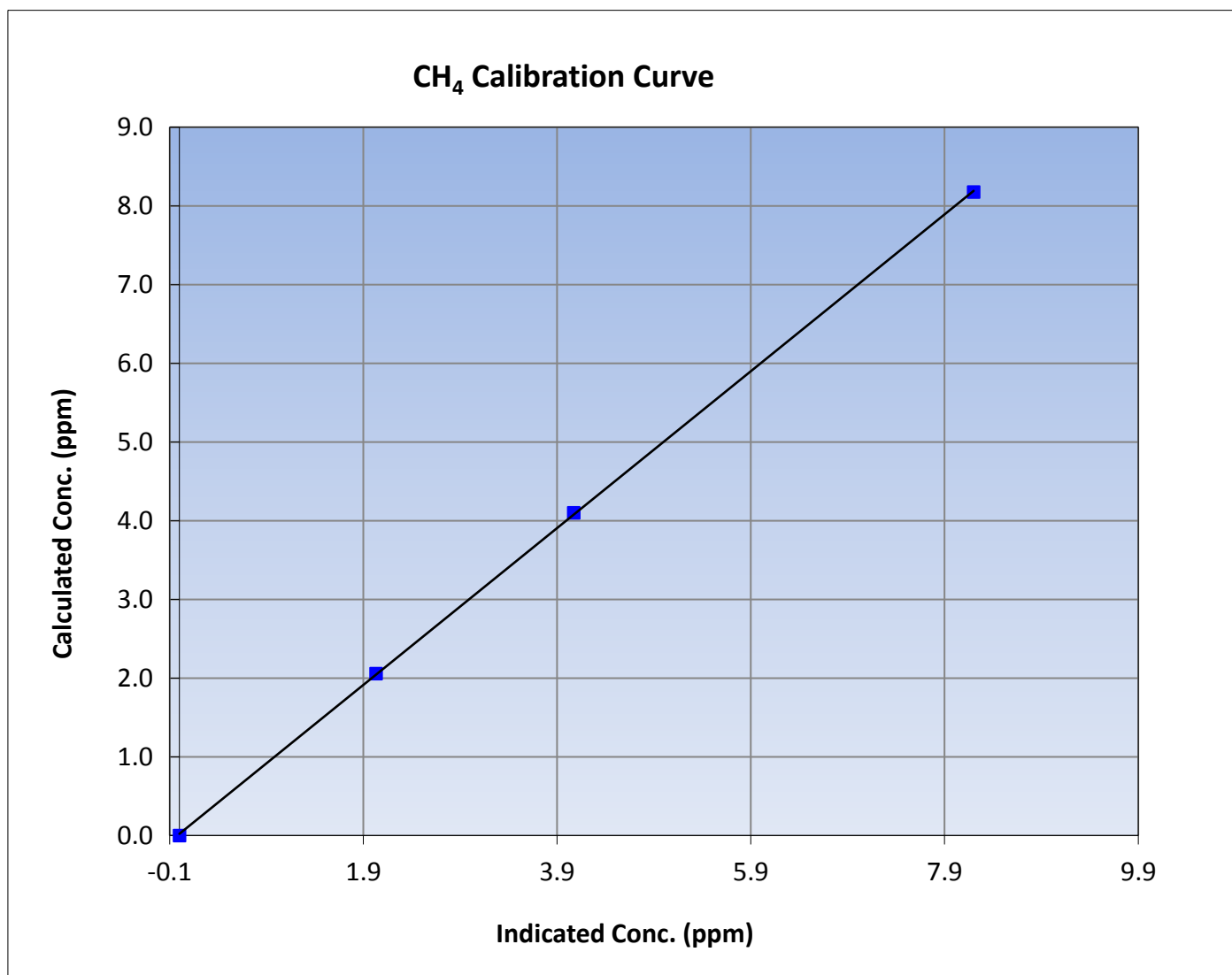
CH₄ Calibration Summary

Station Information

Calibration Date	July 7, 2016	Previous Calibration	June 2, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	8:15	End Time (MST)	11:20
Analyzer make	Thermo 55i	Analyzer serial #	1331259521

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999961
8.18	8.20	0.9970		
4.10	4.07	1.0076	Slope	0.996331
2.05	2.03	1.0122		
			Intercept	0.020950





Wood Buffalo Environmental Association

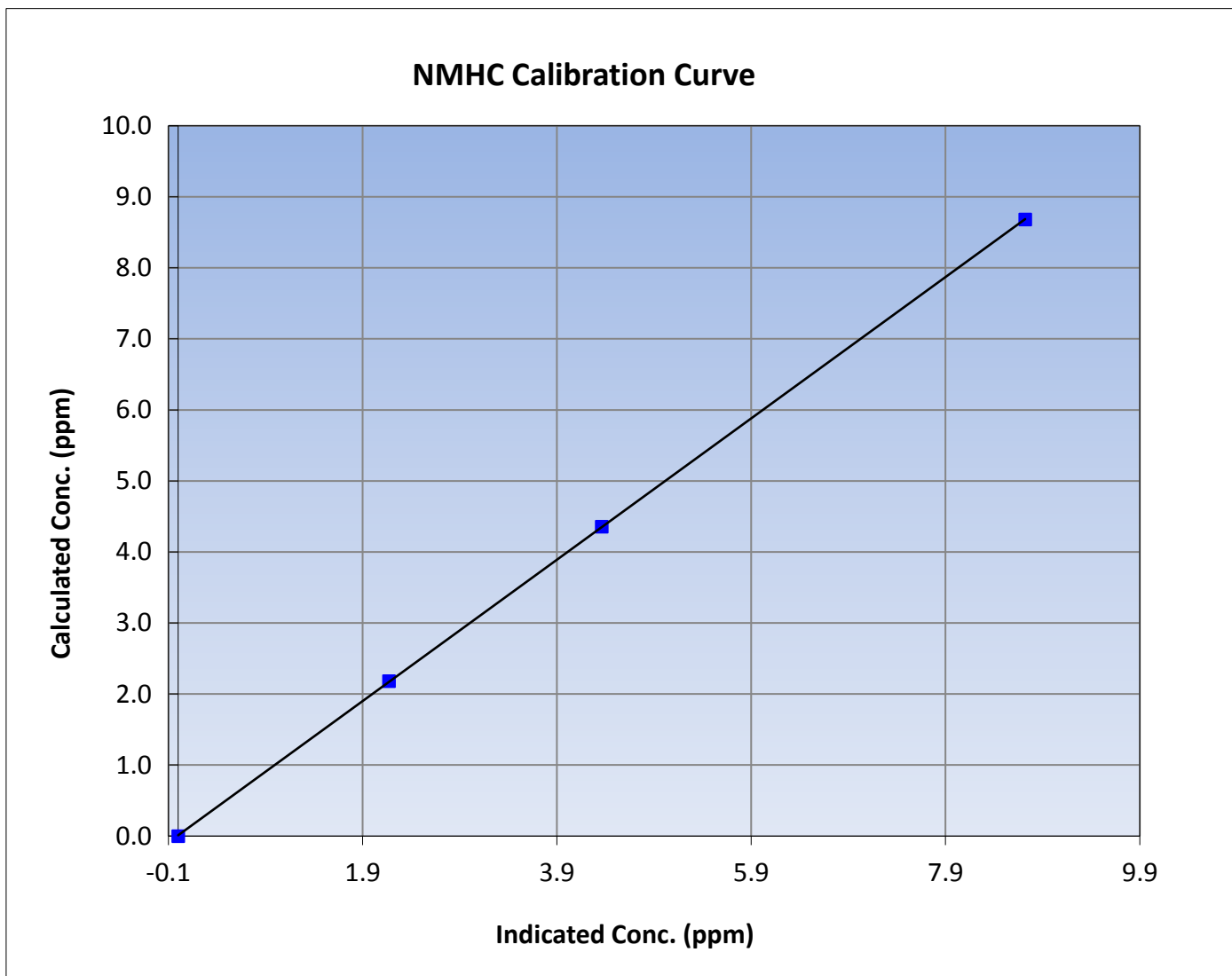
NMHC Calibration Summary

Station Information

Calibration Date	July 7, 2016	Previous Calibration	June 2, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	8:15	End Time (MST)	11:20
Analyzer make	Thermo 55i	Analyzer serial #	1331259521

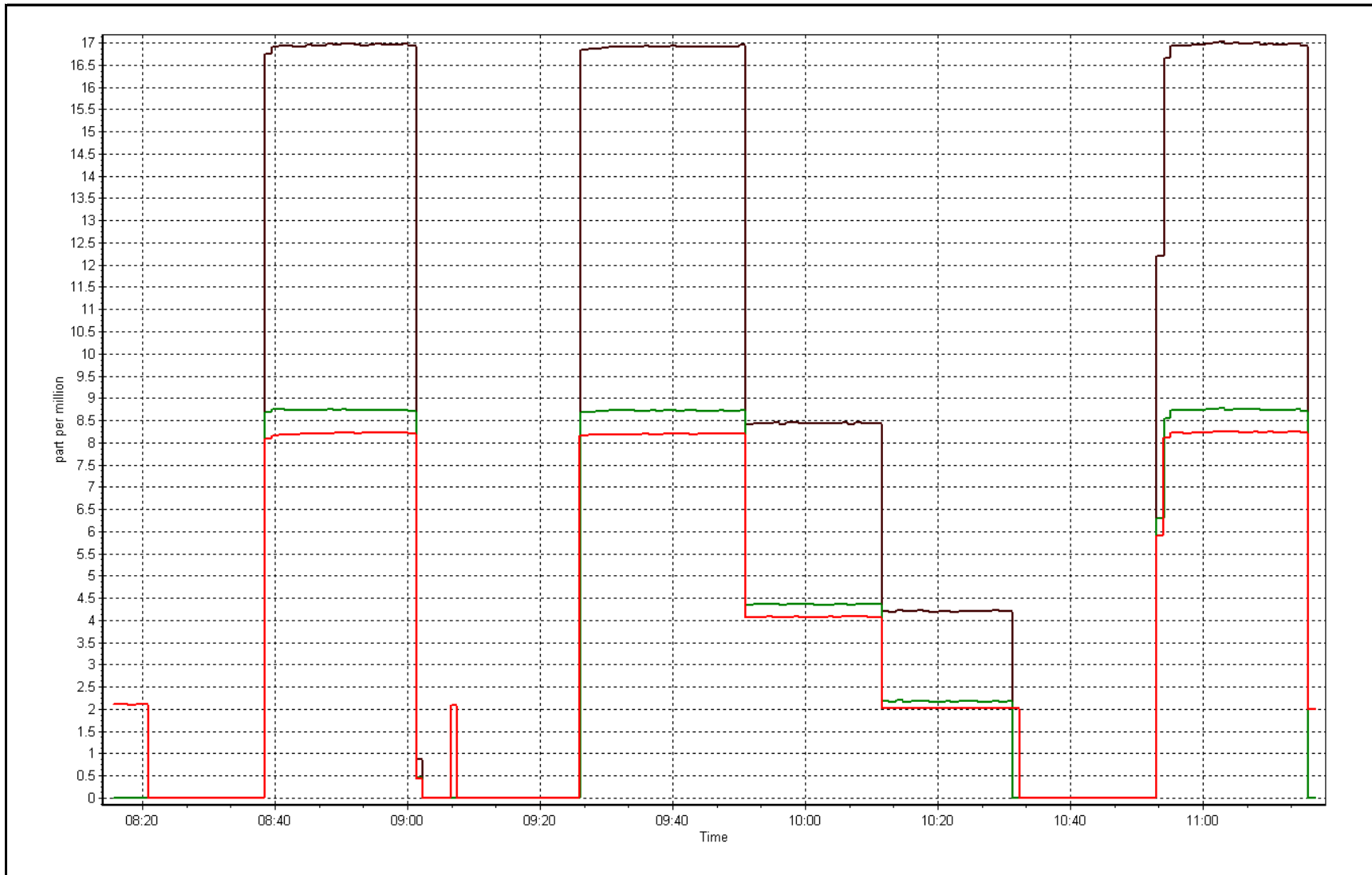
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999992
8.68	8.72	0.9955		
4.35	4.36	0.9987	Slope	0.994844
2.18	2.17	1.0054		
			Intercept	0.011323



THC Calibration Plot

Date: July 7, 2016





Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	July 11, 2016	Previous Calibration	June 4, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Reason:	Routine		
Start Time (MST)	8:20	End Time (MST)	13:30
NO2 GPT Ref date	NA	Transfer Standard	23
		Station temp.	23 Deg C
Calibrator Make/Model	Teledyne API T700	Serial Number	2449
ZAG make/model	Teledyne API 701	Serial Number	60
DACS make/model	Campbell Scientific CR3000	Serial Number	10957

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Bench temp.	26.9	27.9
Analyzer IP address	192.168.1.48		Lamp temp.	53.4	53.5
Calculated slope	1.000320	0.997496	Pressure	678.6	675.4
Calculated intercept	-1.146375	-2.110371	Flow cell A	0.634	0.582
Analyzer Background	0.1	-1.8	Flow cell B	0.656	0.599
Analyzer Coefficient	1.001	1.001	Cell A Intensity	88560	86911
			Cell B Intensity	89473	87440

Analyzer make	Thermo 49i	Analyzer serial #	1300156234
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Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator O3 Generator Drive Voltage (mV)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5500	800.0	0.0	-2.0	----
as found span	5500	1101.7	400.0	399.5	1.001
calibrator zero	5500	800.0	0.0	0.3	----
high point	5500	1073.1	400.0	402.3	0.994
second point	5500	926.2	200.0	203.0	0.985
third point	5500	821.1	100.0	104.6	0.956
as left zero	5500	800.0	0.0	0.3	----
as left span	5500	1072.7	400.0	398.5	1.004
Average Correction Factor					0.978

Corrected As found	401.4	Previous response	401.0	% change	-0.1%
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Notes:

Inlet filter changed after as founds. Zero was slow to stabilize. Zero adjusted. Drift during high point caused third point to be greater than 5% out. Generated high point again and adjusted span. Third point 4.4% low. Flow has dropped since last calibration.

Calibration Performed By: Devin Russell



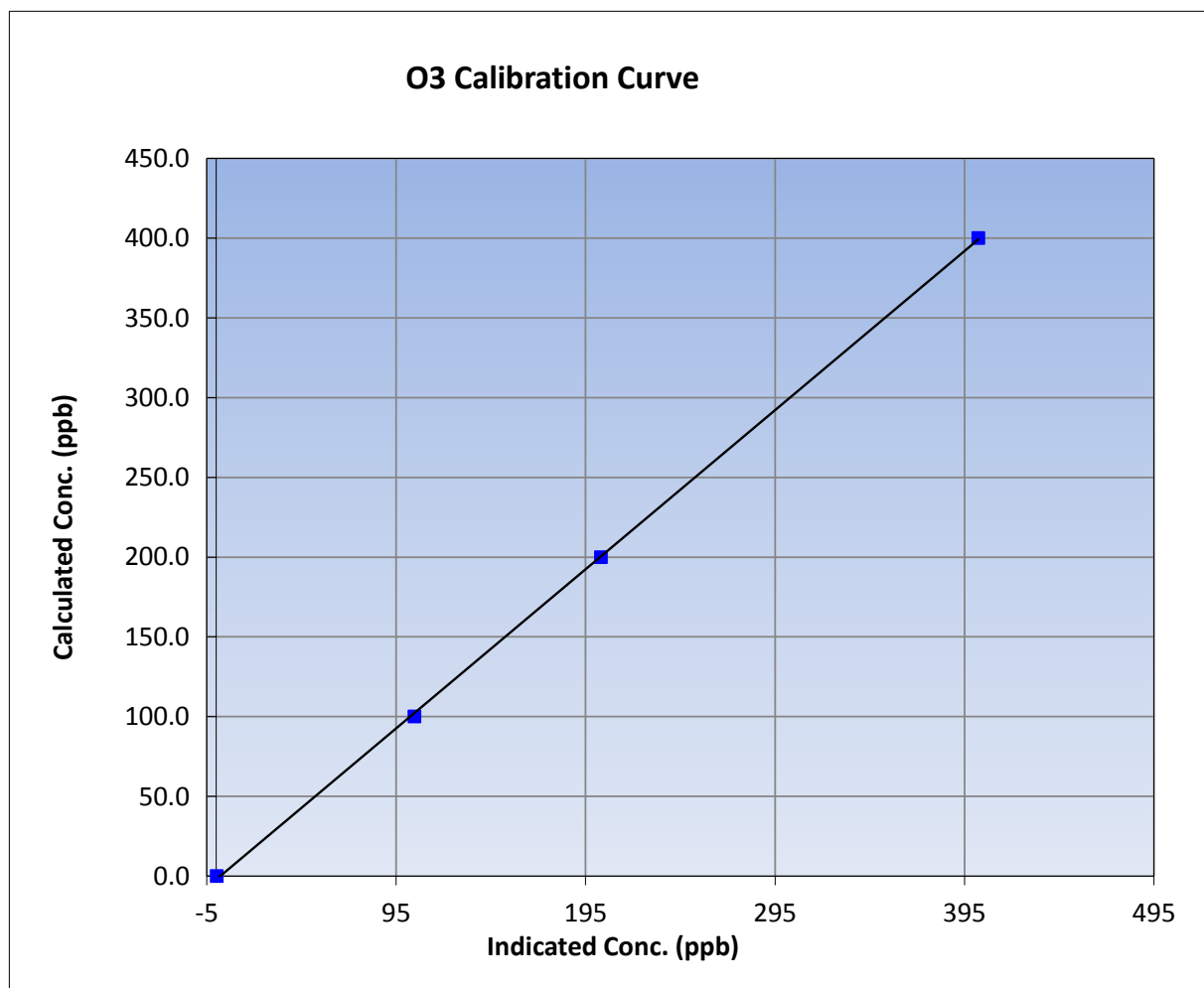
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	July-11-16	Previous Calibration	June 4, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	8:20	End Time (MST)	13:30
Analyzer make	Thermo 49i	Analyzer serial #	1300156234

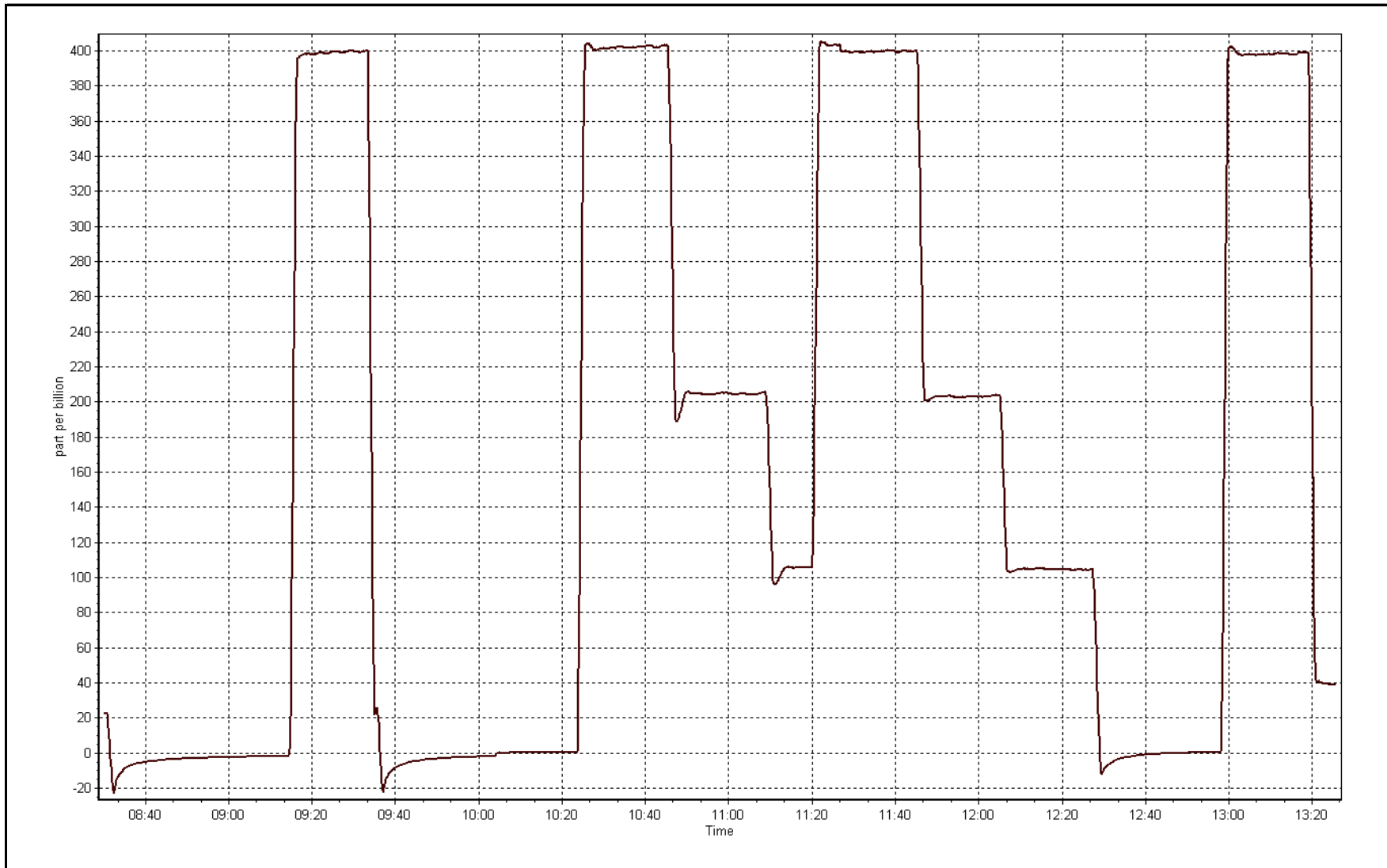
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	----	Correlation Coefficient	0.999896
400.0	402.3	0.9942		
200.0	203.0	0.9850	Slope	0.997496
100.0	104.6	0.9561		
			Intercept	-2.110371



O3 Calibration Plot

Date: July 11, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	July 8, 2016	Previous Calibration	June 3, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Reason:	Routine		
Start Time (MST)	7:50	End Time (MST)	12:55
NO Cal Gas Conc	50.7 ppm	Gas Cert Reference	EY0000355
NOx Cal Gas Conc	50.9 ppm	Cal Gas Expiry Date	18/09/2018
Calibrator	Teledyne API T700	Serial Number	2449
Zero air Generator	Teledyne API 701	Serial Number	60

DACS Information

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

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.997201	0.996760	0.992425
	Data Offset	1.075697	1.185603	-0.143845
Current Calibration	Data Slope	0.999526	0.997719	1.000062
	Data Offset	0.274804	0.245822	0.753881

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1218153460
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.43		192.168.1.42	
NO coefficient	1.017		1.017	
NOx coefficient	1.003		1.003	
NO2 coefficient	1.000		1.000	
NO bkgrnd	4.4		3.0	
NOx bkgrnd	4.6		3.2	
Chamber Temp	50.4	Deg C	50.7	Deg C
Moly Temp	327.6	Deg C	322.4	Deg C
PMT voltage	-773.3	V	-773.3	V
PMT Temp	-2.9	Deg C	-2.8	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	185.1	mmHg	185.3	mmHg
R Cell Press Nox	185.3	mmHg	185.6	mmHg
NO sample flow	0.754	lpm	0.763	lpm
Nox sample Flow	0.753	lpm	0.762	lpm

Notes:

Inlet filter changed after as founds. Zero adjusted. Ignore beginning of GPT portion as 400 ppb of O3 was generated by mistake.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

July 8, 2016

Station Number:

AMS 6

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5500	0.0	0.0	0.0	0.0	-1.4	-1.6	0.2	----	----
as found span	5500	86.9	804.2	801.1	3.2	802.6	799.5	3.1	1.0021	1.0020
calibrator zero	5500	0.0	0.0	0.0	0.0	-0.1	-0.1	0.1	----	----
high point	5500	86.9	804.2	801.1	3.2	804.2	802.5	1.8	1.0000	0.9983
second point	5500	43.5	402.6	401.0	1.6	403.0	402.4	0.7	0.9988	0.9966
third point	5500	21.8	201.7	201.0	0.8	200.9	200.6	0.4	1.0041	1.0020
as left zero	5500	0.0	0.0	0.0	0.0	0.1	-0.1	0.2	----	----
as left span	5500	86.9	804.2	381.4	422.8	806.9	383.7	423.1	0.9967	0.9940
Average Correction Factor									1.0010	0.9990

Corrected As found

NO_x= 803.9

NO= 801.1

Percent Change

NO_x= 0.2%

NO= 0.2%

Previous Response

NO_x= 805.4

NO= 802.5

GPT Calibration Data

Dilution Flow (total) 5500 ccm

Source Gas Flow 86.90 ccm

NOx ref calc conc = 804.2 ppb

NO ref calc conc = 801.1 ppb

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
1st NO ref point		3.2	806.5	803.0	0.1	0.9971	0.9976	----	----
1st NO2 (400)	381.4	424.7	805.7	381.4	424.3	0.9981	----	1.0011	99.9%
2nd NO2 (200)	610.4	195.8	805.1	610.4	194.7	0.9989	----	1.0053	99.5%
3rd NO2 (100)	704.8	101.4	804.5	704.8	99.7	0.9996	----	1.0163	98.4%
2nd NO ref point	----	3.2	803.9	800.5	3.3	1.0005	1.0007	----	----
Average Correction Factor						0.9993		1.0076	99.3%

Calibration Performed By:

Devin Russell



Wood Buffalo Environmental Association

NO_x Calibration Summary

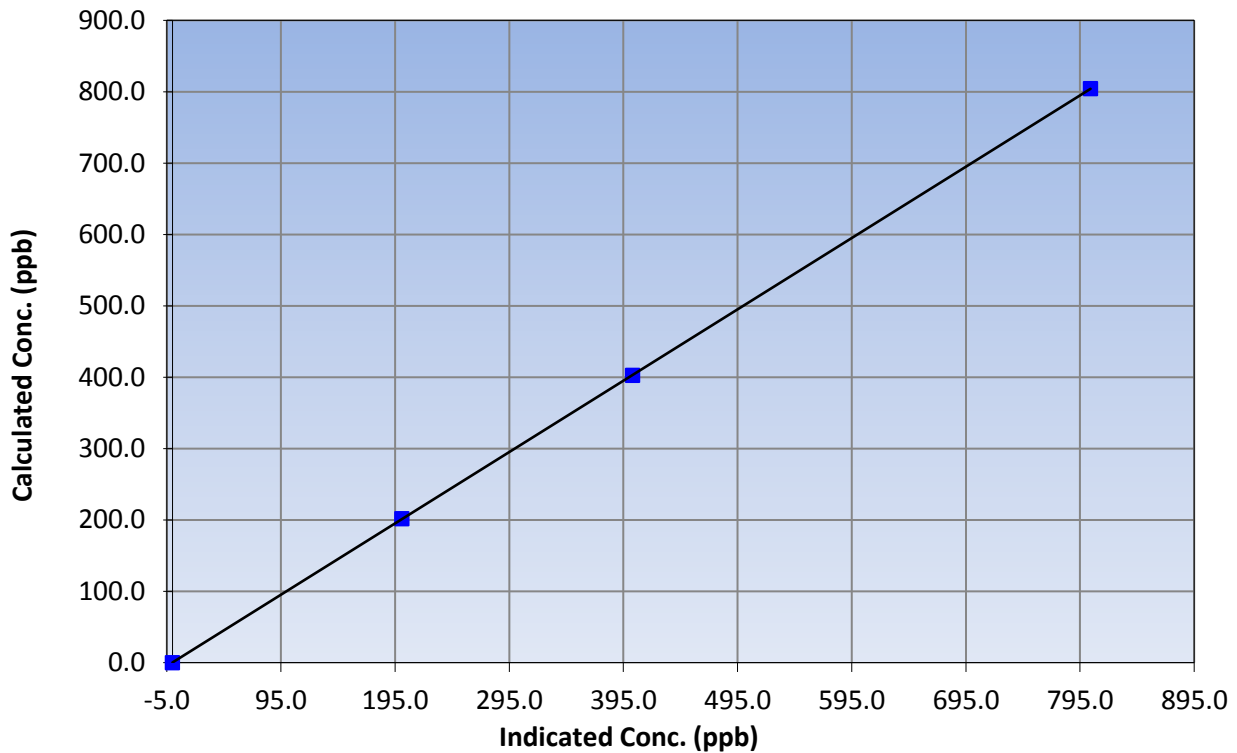
Station Information

Calibration Date	July 8, 2016	Previous Calibration	June 3, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	7:50	End Time (MST)	12:55
Analyzer make	Thermo 42i	Analyzer serial #	1218153460

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999998
804.2	804.2	1.0000		
402.6	403.0	0.9988	Slope	0.999526
201.7	200.9	1.0041		
			Intercept	0.274804

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

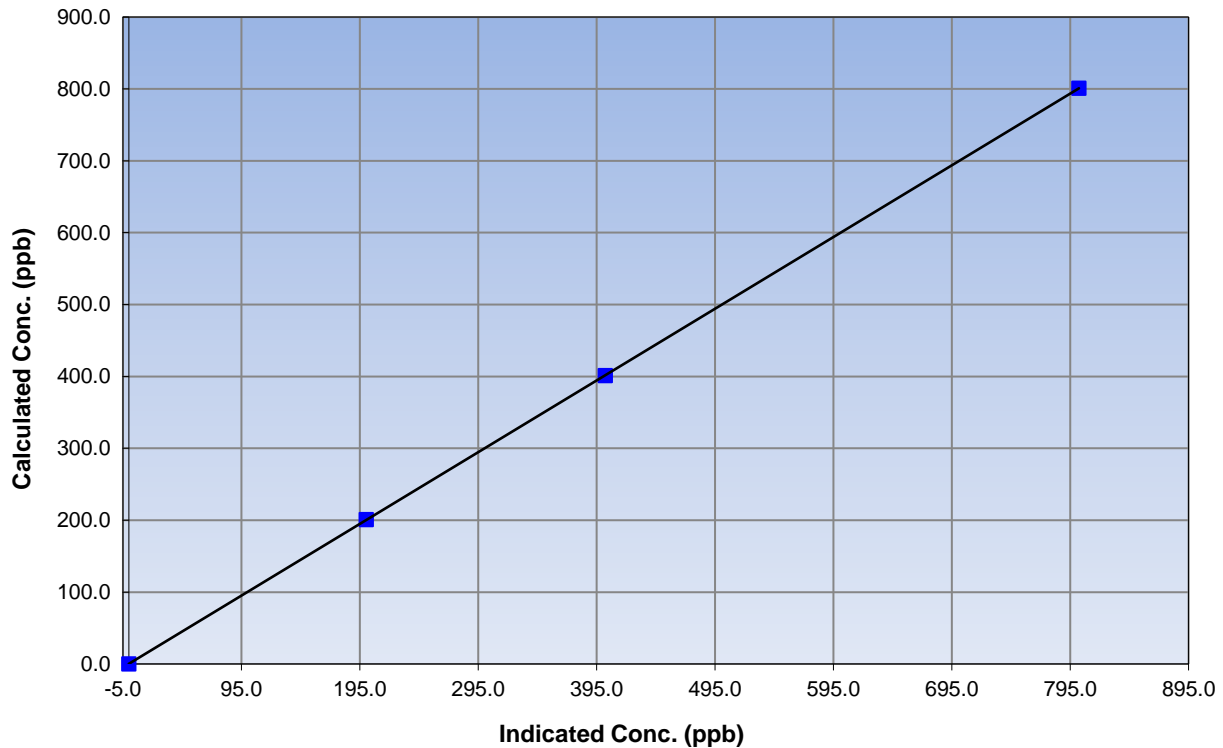
Station Information

Calibration Date	July 8, 2016	Previous Calibration	June 3, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	7:50	End Time (MST)	12:55
Analyzer make	Thermo 42i	Analyzer serial #	1218153460

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999997
801.1	802.5	0.9983		
401.0	402.4	0.9966	Slope	0.997719
201.0	200.6	1.0020		
			Intercept	0.245822

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

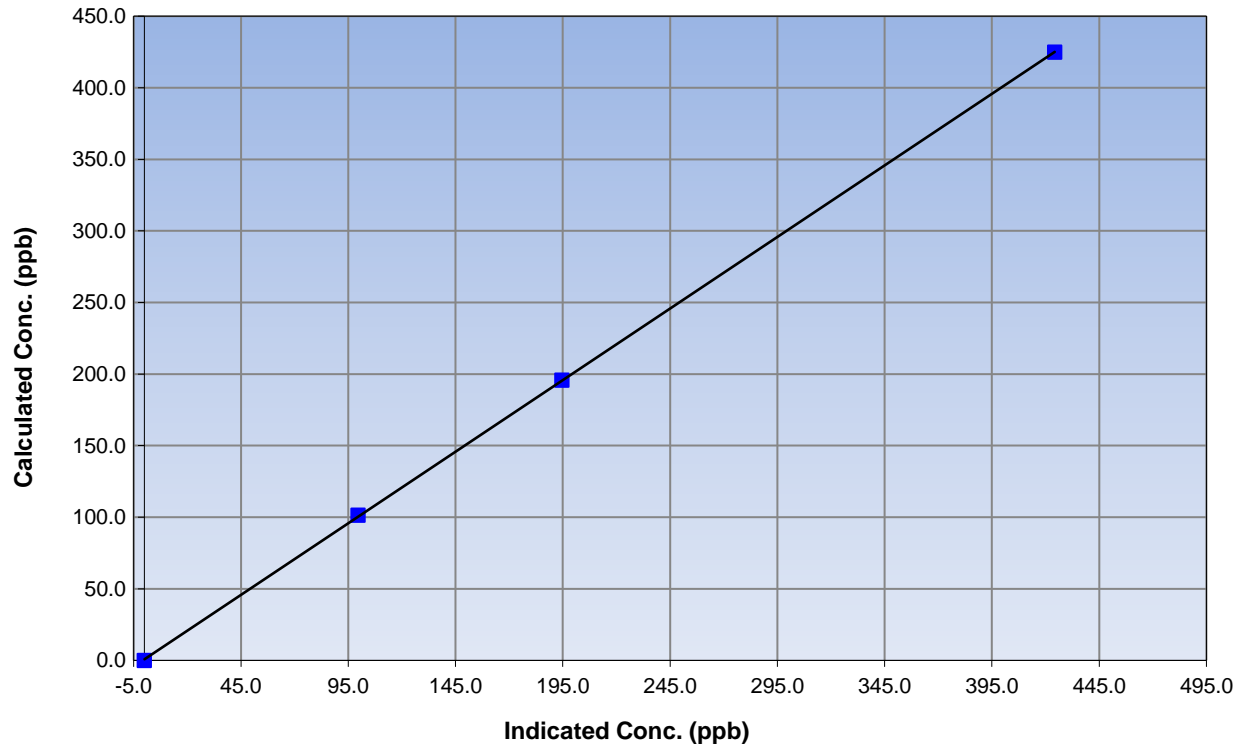
Station Information

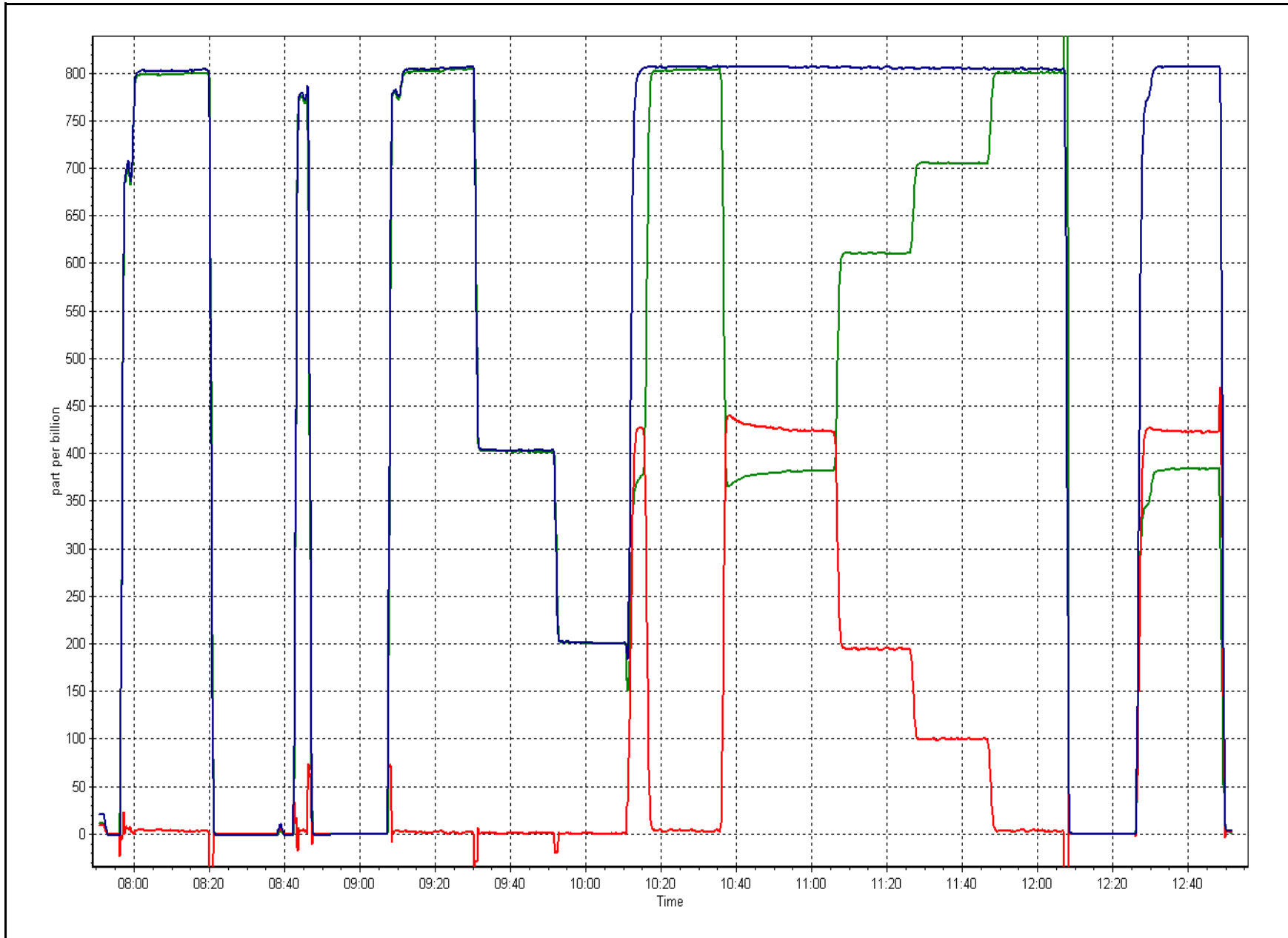
Calibration Date	July 8, 2016	Previous Calibration	June 3, 2016
Station Number	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	7:50	End Time (MST)	12:55
Analyzer make	Thermo 42i	Analyzer serial #	1218153460

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	N/A	Correlation Coefficient	0.999984
424.7	424.3	1.0011		
195.8	194.7	1.0053	Slope	1.000062
101.4	99.7	1.0163		
			Intercept	0.753881

NO₂ Calibration Curve







Wood Buffalo Environmental Association

N_t-NO_x-NH₃ Calibration Report

Station Information

Station Name	Patricia McInnis	Station Number	AMS 6
NOX Calibration Date	July 8, 2016	NOX Previous Cal Date	June 9, 2016
NH3 Calibration Date	July 8, 2016	NH3 Previous Cal Date	June 10, 2016
Reason:	Routine		
Start Time (MST)	7:50	End Time (MST)	15:15
Calibrator	Teledyne API T700	Station Temperature	21.0 Deg C
NH3 Cal Gas Conc	75.1 ppm	Serial Number	2449
NOx Cal Gas Conc	50.9 ppm	NH3 Expiry Date / SN	4/Aug/2012 SGAL-3617
NO Cal Gas Conc	50.7 ppm	NO Expiry Date / SN	18/Sep/2018 EY0000355

DACS Information

DACS make & model Campbell Scientific CR3000 DACS serial No. 2582

Parameter		NH3	Nt	NOx	NO	NO2
Cal Stats As Found	Data Slope	1.001695	0.981529	0.999915	0.999485	0.993907
	Data Offset	-3.293573	-6.120323	0.796342	1.103903	-0.961617
Cal Stats After	Data Slope	1.009126	0.989810	1.001279	1.002858	1.003469
	Data Offset	-7.846124	-10.11336	1.032006	2.063120	-0.473365
IP address			192.168.1.17			

Analyzer Information

Analyzer make/model Teledyne T201 Analyzer serial # 215
 Converter Converter serial #

Test Point	before		after	
NH3 Conc range	2500	ppb	2500	ppb
NOX Conc range	1000	ppb	1000	ppb
NO BKG	-2.9	ppb	-2.9	ppb
NOx BKG	-3.1	ppb	-3.1	ppb
Nt BKG	-0.3		-0.3	
NO coefficient	1.026		1.026	
NO2 coefficient	1.000	ppb	1.000	ppb
NOx coefficient	1.051		1.051	
NH3 coefficient	0.965		0.965	
Nt coefficient	1.054		1.054	
NH3 conv temp	825	DegC	825	Deg C
Chamber Temp	50.0	Deg C	50.0	Deg C
Moly Temp	315.4	Deg C	316.1	Deg C
PMT Temp	7.0	Deg C	7.0	Deg C
O3 flow	85.0	ccm	86.0	ccm
R Cell Press	6.0	mmHg	6.1	mmHg
PMT Voltage	693.0	v	693.0	v
Sample Flow 1 NO	557.0	ccm	556.0	ccm
Sample Flow 2 Nox	557.0	ccm	556.0	ccm
Sample Flow 3 Nt	546.0	ccm	546.0	ccm

Notes:

Inlet filter changed after as founds. No adjustments made. Ignore beginning of GPT portion as 400 ppb of O3 was generated by mistake. Second High NO point used as GPT reference. No adjustment made to NH3.



Wood Buffalo Environmental Association

NH₃ Calibration Report

Station Information

Calibration Date:

July 8, 2016

Station Number:

AMS 6

NH₃ Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated Nt conc (ppb)	Calculated NOx conc (ppb)	Calculated NH ₃ conc (ppb)	Indicated Nt conc (ppb)	Indicated NOx conc (ppb)	Indicated NH ₃ conc (ppb)	Nt Correction factor	NH ₃ Correction factor
as found zero	5500	0.0	0.0	0.0	0.0	-1.0	-0.8	-0.2	----	----
as found NO	5500	86.9	804.2	804.2	----	781.0	797.2	-16.1	1.030	----
calibrator zero	5500	0.0	0.0	0.0	0.0	0.8	1.2	-0.4	----	----
high NO point	5500	86.9	804.2	804.2	----	800.5	803.5	-3.1	1.005	----
NO/O ₃ point	5500	86.9	804.2	804.2	----	793.6	796.8	-3.2	1.013	----
as found NH ₃	3500	93.2	1999.8	NA	1999.8	2023.6	40.4	1983.2	0.988	1.008
first NH ₃	3500	93.2	1999.8	NA	1999.8	2023.6	40.4	1983.2	0.988	1.008
second NH ₃	3500	46.6	999.9	NA	999.9	1031.4	22.5	1008.9	0.969	0.991
third NH ₃	3500	23.3	500.0	NA	500.0	520.7	13.4	507.4	0.960	0.985
Average Correction Factor									1.0090	0.9949

Nt Corrected As Found Nt = 782.0 ppb
 NOx Corrected As Found NOx = 798.0 ppb
 NH₃ Previous Converter Efficiency = 96.5 %

Previous Response Nt = 825.5 ppb
 Previous Response NOx = 803.5 ppb
 NH₃ Current Converter Efficiency = 96.5 %

Nt percent change 5.6%
 NOx percent change 0.7%
 NH₃ percent change 0.0%



Wood Buffalo Environmental Association

NO_x(NH₃) Calibration Report

Station Information

Calibration Date:

July 8, 2016

Station Number:

AMS 6

NO_x / NO / Nt Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NO _x conc (ppb)	Calculated NO conc (ppb)	Calculated Nt conc (ppb)	Indicated NO _x conc (ppb)	Indicated NO conc (ppb)	Indicated Nt conc (ppb)	NO _x Correction factor	NO Correction factor
as found zero	5500	0.0	0.0	0.0	0.0	-0.8	-1.3	-1.0	----	----
as found span	5500	86.9	804.2	801.1	804.2	797.2	789.9	781.0	1.0088	1.0141
calibrator zero	5500	0.0	0.0	0.0	0.0	1.2	0.6	0.8	----	----
high point	5500	86.9	804.2	801.1	804.2	803.5	798.2	800.5	1.0009	1.0036
second point	5500	43.5	402.6	401.0	402.6	399.2	396.0	399.2	1.0085	1.0125
third point	5500	21.8	201.7	201.0	201.7	198.8	196.0	198.7	1.0151	1.0255
Average Correction Factor									1.0082	1.0139

	<u>Nt</u>	<u>NO_x</u>	<u>NO</u>	<u>NO₂</u>
Corrected As found	782.0	798.0	791.3	----
Previous Response	825.5	803.5	800.4	----
Percent Change	5.6%	0.7%	1.1%	-0.5%

GPT Calibration Data

Dilution Flow (total) 5500 ccm Source Gas Flow 86.9 ccm NO_x ref calc conc = 804.2 ppb NO ref calc conc = 801.1 ppb

O ₃ Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO ₂ conc (ppb)	Indicated NO _x conc (ppb)	Indicated NO conc (ppb)	Indicated NO ₂ conc (ppb)	NO _x Correction factor	NO Correction factor	NO ₂ Correction factor	Converter Efficiency
1st NO ref point	----	3.2	796.8	793.7	3.1	1.0093	1.0093	----	----
1st NO ₂ (400)	377.4	419.5	795.8	377.4	418.3	1.0106	----	1.0027	99.7%
2nd NO ₂ (200)	605.8	191.1	797.2	605.8	191.4	1.0088	----	0.9981	100.2%
3rd NO ₂ (100)	699.5	97.4	796.4	699.5	97.0	1.0098	----	1.0041	99.6%
2nd NO ref point	----	3.2	797.3	796.2	0.9	1.0087	1.0061	----	----
Average Correction Factor						1.0095	1.0077	1.0016	99.8%

Calibration Performed By: Devin Russell



Wood Buffalo Environmental Association

NH3 Calibration Summary

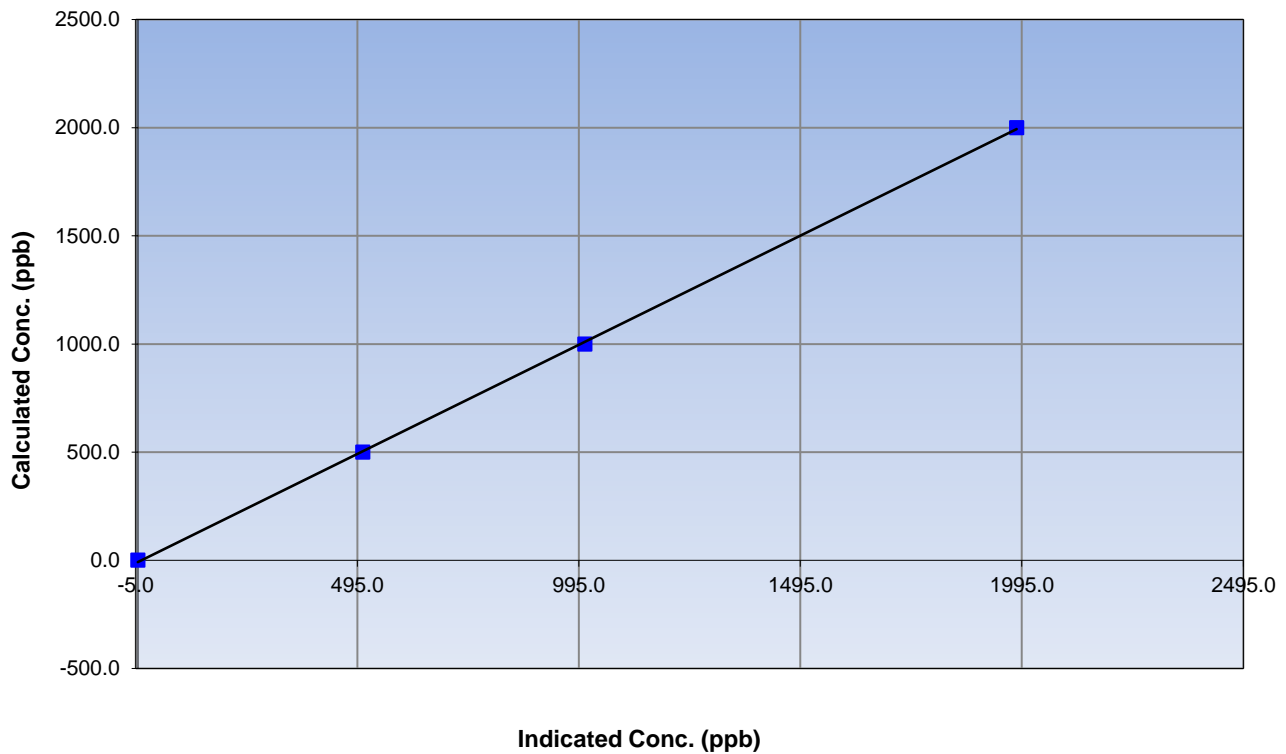
Station Information

Calibration Date	July 8, 2016	Previous Calibration	June 9, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	7:50	End Time (MST)	15:15
Analyzer make	Teledyne T201	Analyzer serial #	215

NH3 Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.4	----	Correlation Coefficient	0.999893
1999.8	1983.2	1.0084		
999.9	1008.9	0.9911	Slope	1.009126
500.0	507.4	0.9853	Intercept	-7.846124

NH3 Calibration Curve





Wood Buffalo Environmental Association

Nt Calibration Summary

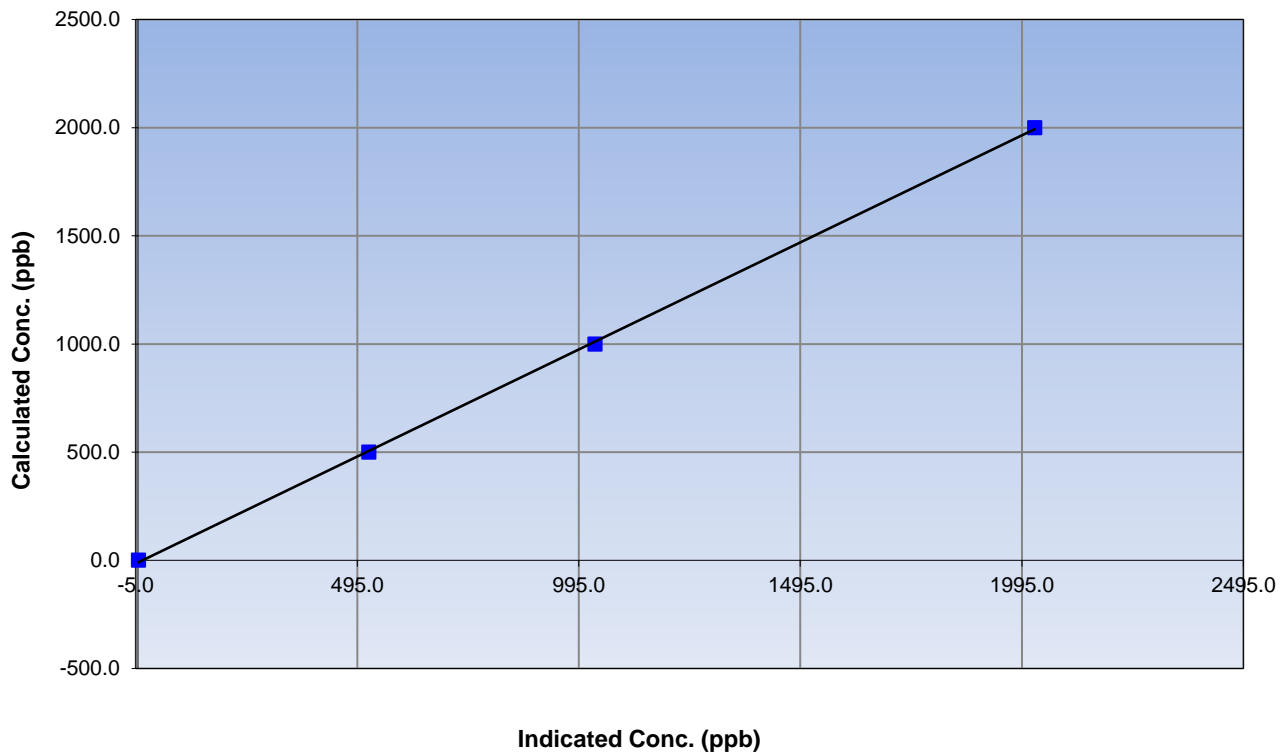
Station Information

Calibration Date	July 8, 2016	Previous Calibration	June 9, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	7:50	End Time (MST)	15:15
Analyzer make	Teledyne T201	Analyzer serial #	215

Nt (NH₃) Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.8	----	Correlation Coefficient	0.999870
1999.8	2023.6	0.9882		
999.9	1031.4	0.9694	Slope	0.989810
500.0	520.7	0.9601		
			Intercept	-10.113364

Nt Calibration Curve





Wood Buffalo Environmental Association

NOx Calibration Summary

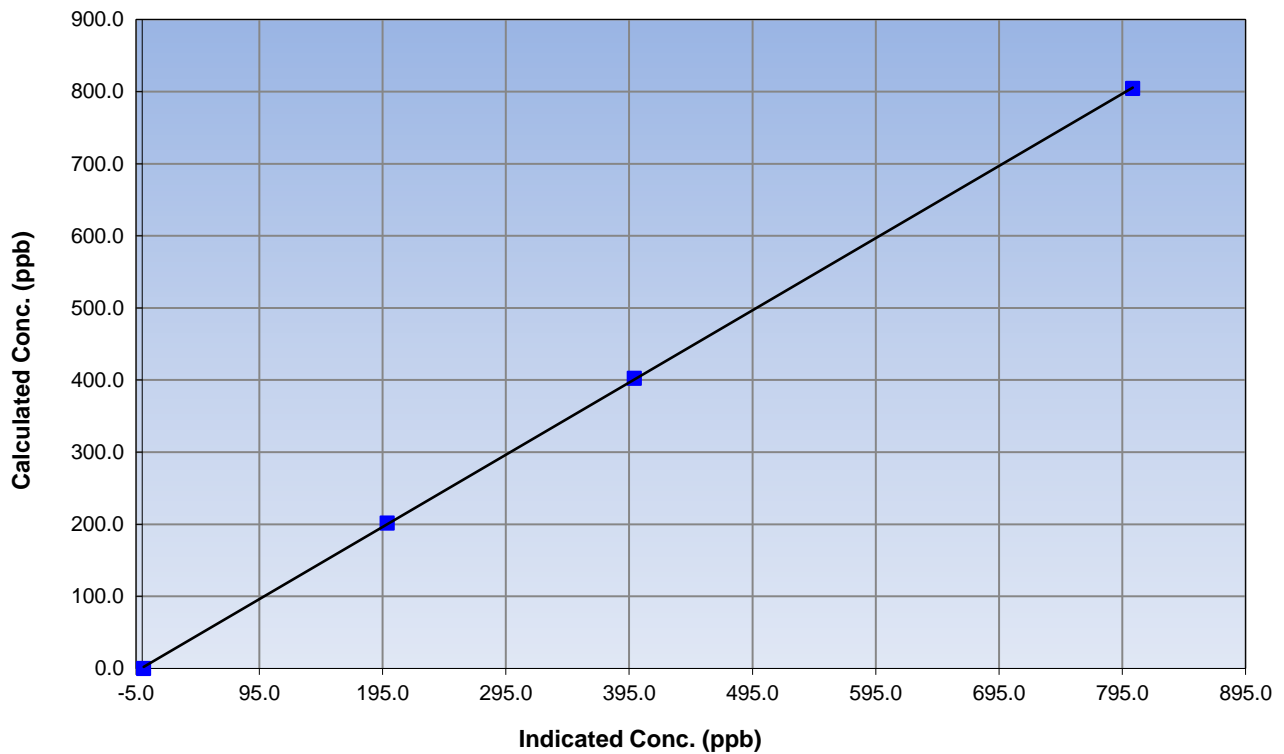
Station Information

Calibration Date	July 8, 2016	Previous Calibration	June 9, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	7:50	End Time (MST)	15:15
Analyzer make	Teledyne T201	Analyzer serial #	215

NO_x Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	1.2	----	Correlation Coefficient	0.999963
804.2	803.5	1.0009		
402.6	399.2	1.0085	Slope	1.001279
201.7	198.8	1.0151		
			Intercept	1.032006

NOx Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

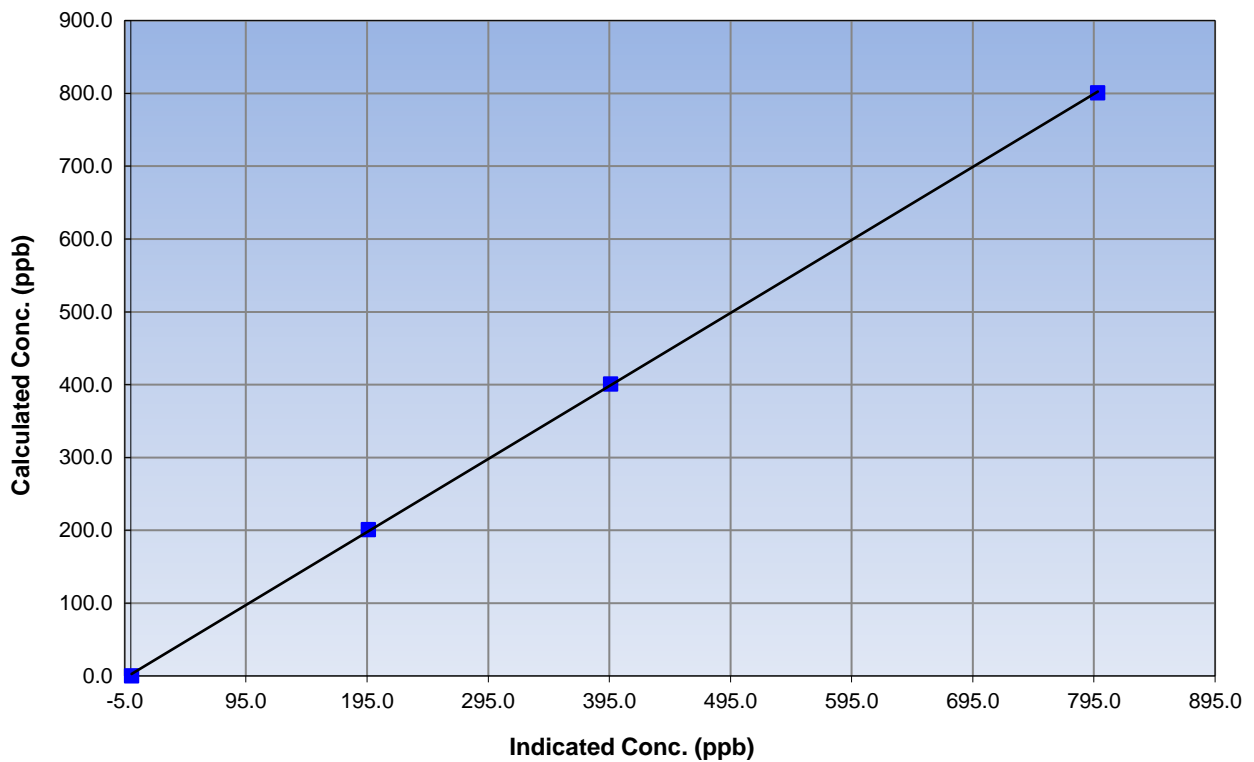
Station Information

Calibration Date	July 8, 2016	Previous Calibration	June 9, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	7:50	End Time (MST)	15:15
Analyzer make	Teledyne T201	Analyzer serial #	215

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.6	----	Correlation Coefficient	0.999948
801.1	798.2	1.0036		
401.0	396.0	1.0125	Slope	1.002858
201.0	196.0	1.0255		
			Intercept	2.063120

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

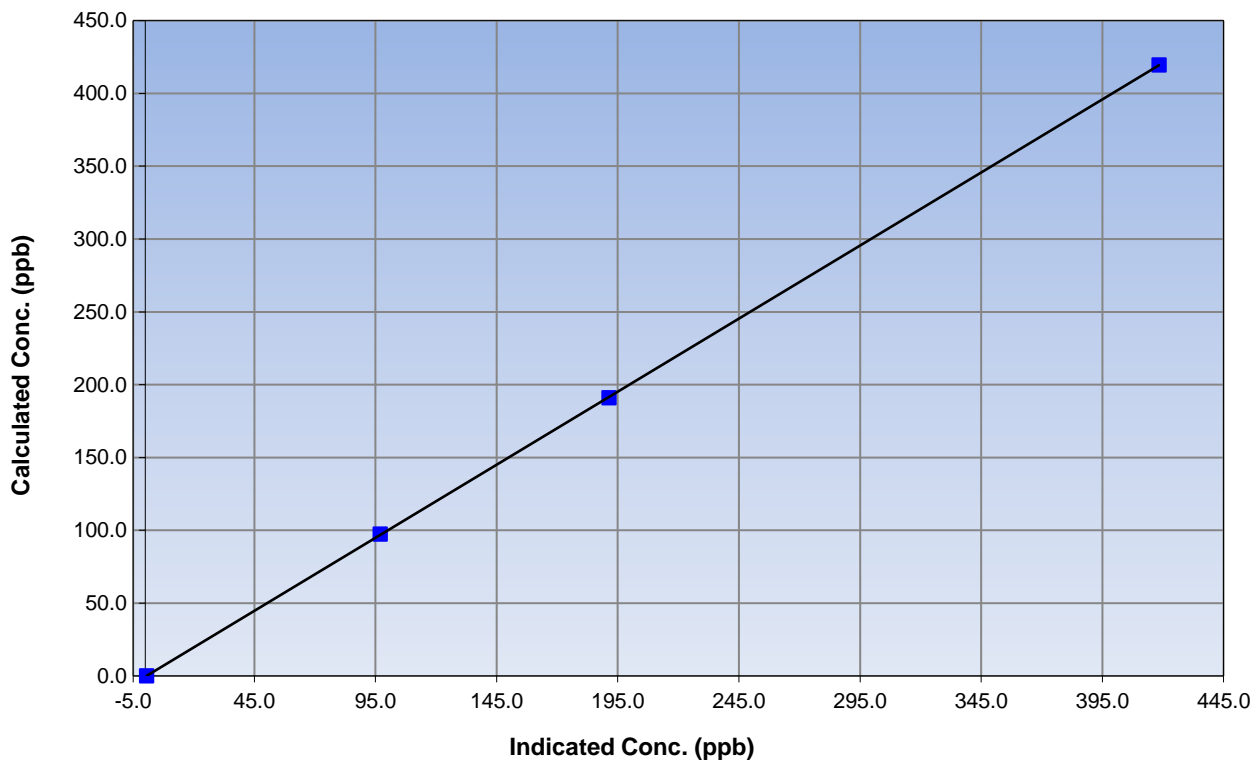
Station Information

Calibration Date	July 8, 2016	Previous Calibration	June 9, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	7:50	End Time (MST)	15:15
Analyzer make	Teledyne T201	Analyzer serial #	215

Calibration Information

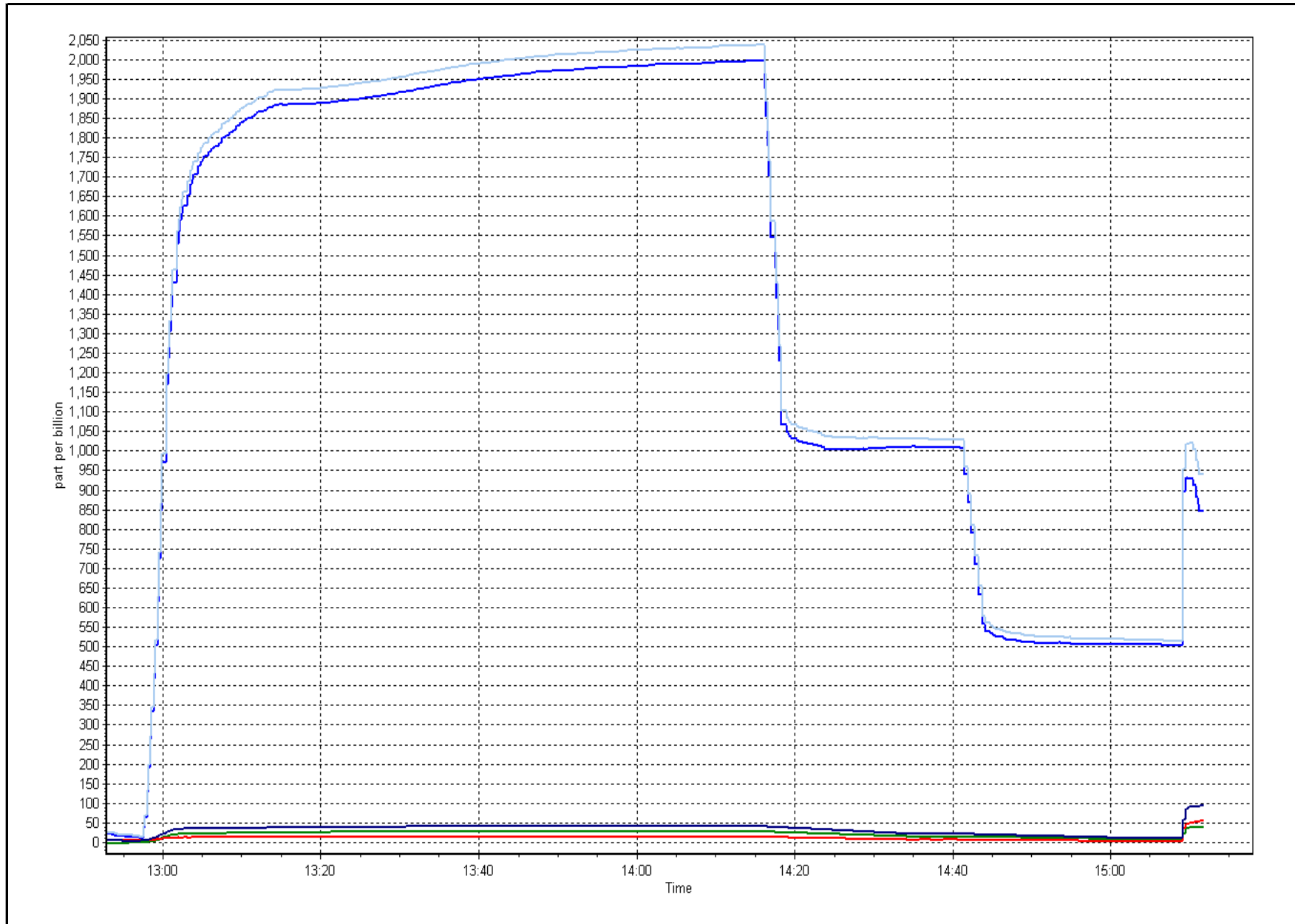
Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.6	----	Correlation Coefficient	0.999993
419.5	418.3	1.0027		
191.1	191.4	0.9981	Slope	1.003469
97.4	97.0	1.0041		
			Intercept	-0.473365

NO₂ Calibration Curve



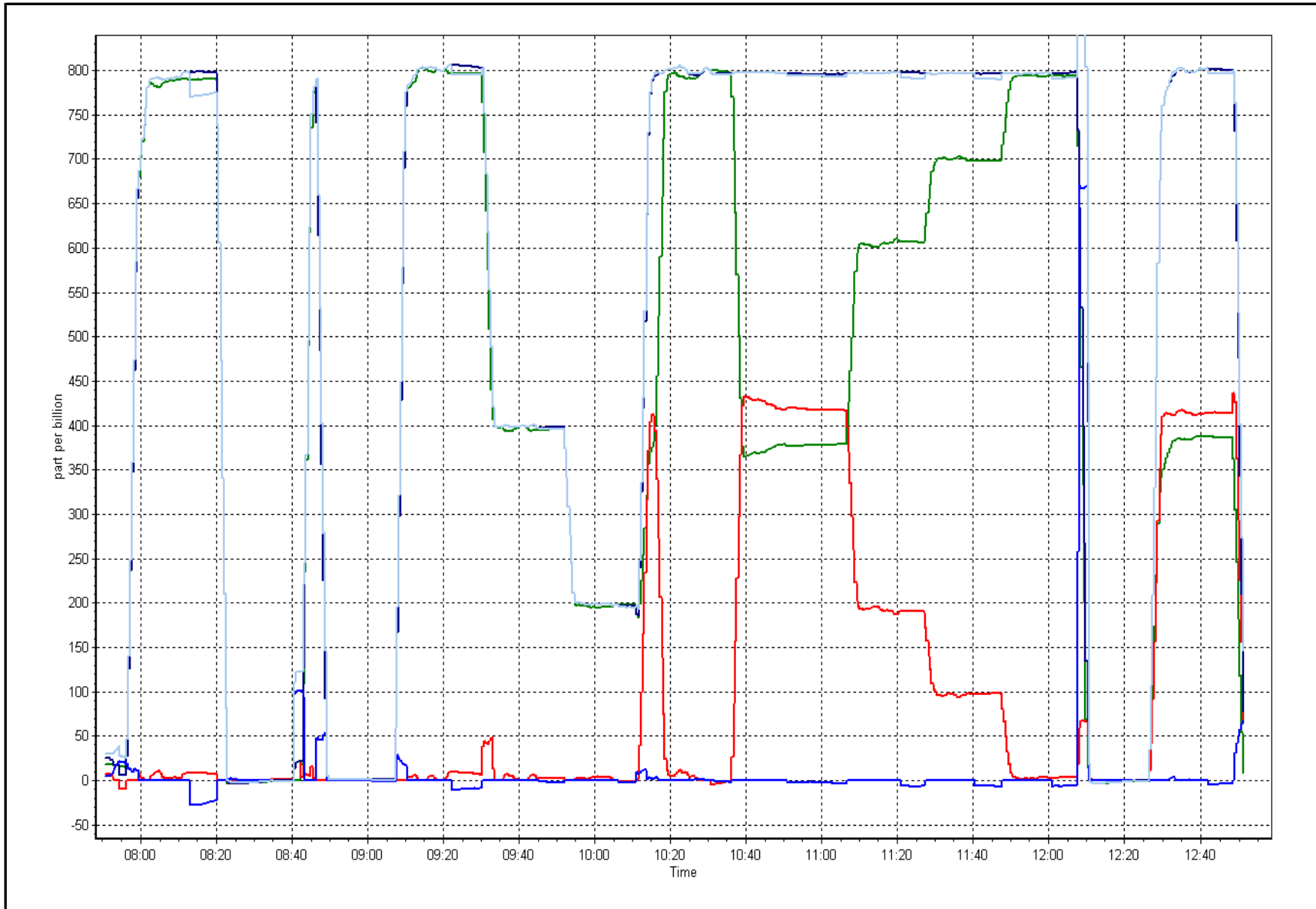
NH₃ Calibration Plot

Date: July 8, 2016



NOX Calibration Plot

Date: July 8, 2016





Wood Buffalo Environmental Association

SHARP CALIBRATION

STATION INFORMATION			
Calibration Date:	July 8, 2016	Previous Calibration:	June 14, 2016
Station Name:	Patricia McInnis	Station Number:	AMS 6
Start Time (MST):	7:22	End Time (MST):	8:45
Calibrator Make/Model:	Delta Cal	Calibrator Serial Number:	141228

SHARP INFORMATION			
Particulate Fraction:	PM2.5		
Make/Model:	Thermo / SHARP 5030		
Serial Number	E1475		
C ₁₄ Source SN:	5680		
Confirmation of Time settings:	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Parameters Checked:	T1 <input checked="" type="checkbox"/>	T2 <input type="checkbox"/>	T3 <input type="checkbox"/>
	T4 <input type="checkbox"/>	P3 <input checked="" type="checkbox"/>	Main Flow <input checked="" type="checkbox"/>
		Beta <input type="checkbox"/>	Neph <input checked="" type="checkbox"/>

CALIBRATION DATA				
Temperature (°C)				
Sensor	Indicated	Measured	Difference (Limit +/- 2.0°C)	Final Indicated
T1	14.0	12.1	-1.9	12.0
T2	26.0	NA	#VALUE!	26.0
T3	25.0	NA	#VALUE!	25.0
T4	30.0	NA	#VALUE!	30.0
RH (%)	39.0	NA	#VALUE!	39.0

Pressure (Hpa)				
Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	970	965.9	-4.1	970

Main Flow (Lph)				
Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1000	991	-9	1004	1000

Nephelometer Calibration			
Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	209		209
Neph	0.3		0.3
C14	5.4		5.4
Indicated Concentration (ug/m3)	0.1	no	0.1
Offset 1	210.2		210.2
Offset 2	33.4		33.4

Leak Check (Quarterly)			
Leak Check Date:		Previous Leak Check Date:	June 14, 2016
	Measured	Difference LPM (Limit +/- 0.42 LPM)	
Flow without adaptor (LPM):		0.00	
*Flow with adaptor (LPM):			
<i>*Note - do not attach adaptor without shutting off the pump first</i>			

Mass Foil Calibration (Annually)			
Foil Calibration Date:		Previous Foil Calibration:	June 9, 2016
Zeroed?:			
Foil Mass:		Mass foil set S/N:2597	
Previous Correction Factor:			
New Correction Factor:			

INSPECTION DATA			
Item	Condition	Date of install or rebuild	
Cyclone	Good	08/07/2016	
Pump	Good		
Filter Tape	Good		
Mass Foil Cal Set	na		
HEPA filter	Good	08/07/2016	

NOTES:

T1 adjusted. Flow adjusted. Nephelometer zero check completed; no adjustments made. Cyclone head cleaned.

Calibration Performed By: Devin Russell



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

AMS 7
ATHABASCA VALLEY
JULY 2016

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

August 29, 2016



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

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	690	43	54	98.52	25	0	6	0
TRS (ppb) Average	625	36	119	88.84	2	0	1	0
THC (ppm) Average	684	41	60	97.45	2.5	-	2	-
NMHC (ppm) Average	684	41	60	97.45	0.413	-	0.072	-
CH4(ppm) Average	684	41	60	97.45	2.4	-	2	-
O3 (ppb) Average	698	34	46	98.39	58	0	35	-
NO2 (ppb) Average	688	45	56	98.52	19	0	6	-
NO (ppb) Average	688	45	56	98.52	21	-	3	-
NOX (ppb) Average	688	45	56	98.52	28	-	8	-
PM2.5 (ug/m3) Average	689	3	55	93.01	52.4	-	20.6	0
CO(ppm) Average	685	31	59	96.24	0.4	0	0.2	-
Temperature 2 m (C) Average	741	0	3	99.60	30.5	-	24.1	-
Barometric Pressure (inHg) Average	741	0	3	99.60	29.2	-	29.2	-
Relative Humidity (%) Average	741	0	3	99.60	97	-	88	-
Wind Speed 10 m (km/h) Average	741	0	3	99.60	24	-	16	-
Wind Direction 10 m (deg) Average	741	0	3	99.60	-	-	-	-

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

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

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	690	1.4	3	-	0	0	0	0	1	4	25
TRS (ppb) Average	625	0.4	0	-	0	0	0	0	0	1	2
THC (ppm) Average	684	1.94	0.1	-	1.8	1.8	1.9	1.9	2	2.1	2.5
NMHC (ppm) Average	684	0.022	0.056	-	0	0	0	0	0	0.1	0.413
CH4(ppm) Average	684	1.91	0.1	-	1.8	1.8	1.9	1.9	1.9	2	2.4
O3 (ppb) Average	698	24.5	10	-	0	11	17	24	31	38	58
NO2 (ppb) Average	688	3.7	3	-	0	1	2	3	5	8	19
NO (ppb) Average	688	1	2	-	0	0	0	0	1	3	21
NOX (ppb) Average	688	4.7	4	-	0	1	2	4	6	10	28
PM2.5 (ug/m3) Average	689	8.5	7.1	-	0	2.2	3.9	6.6	10.8	17.5	52.4
CO(ppm) Average	685	0.11	0	-	0	0.1	0.1	0.1	0.1	0.2	0.4
Temperature 2 m (C) Average	741	19.54	4.2	-	5.7	14.9	16.6	18.9	22.8	25.3	30.5
Barometric Pressure (inHg) Average	741	28.86	0.1	-	28.6	28.7	28.8	28.8	29	29.1	29.2
Relative Humidity (%) Average	741	66.4	18	-	17	41	52	69	81	88	97
Wind Speed 10 m (km/h) Average	741	8.6	4	-	0	3	5	8	11	15	24
Wind Direction 10 m (deg) Average	741	-	-	-	-	-	-	-	-	-	-

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

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
ALL PARAMETERS	17 Jul 2016 17:00	17 Jul 2016 19:00	3	Maintenance - wiring/data logger upgrades
SO2	04 Jul 2016 11:00	04 Jul 2016 11:00	1	Maintenance - zero air generator serviced
SO2	07 Jul 2016 08:00	07 Jul 2016 08:00	1	Maintenance - sample manifold cleaned
SO2	26 Jul 2016 09:00	26 Jul 2016 14:00	6	Maintenance - new calibrator installed
TRS	04 Jul 2016 10:00	04 Jul 2016 10:00	1	Maintenance - zero air generator serviced
TRS	20 Jul 2016 06:00	21 Jul 2016 10:00	29	Analyzer failure - operation outside of AMD criteria
TRS	21 Jul 2016 11:00	21 Jul 2016 12:00	2	Maintenance - troubleshooting
TRS	25 Jul 2016 20:00	26 Jul 2016 11:00	16	Analyzer failure - sample pump failed
TRS	26 Jul 2016 12:00	26 Jul 2016 18:00	7	Maintenance - replace sample pump
TRS	29 Jul 2016 09:00	29 Jul 2016 13:00	5	Maintenance - repair and recalibrate
TRS	29 Jul 2016 14:00	30 Jul 2016 09:00	20	Analyzer failure - operation outside of AMD criteria
THC	04 Jul 2016 11:00	04 Jul 2016 12:00	2	Maintenance - zero air generator serviced
THC	07 Jul 2016 08:00	07 Jul 2016 08:00	1	Maintenance - sample manifold cleaned
THC	08 Jul 2016 02:00	08 Jul 2016 03:00	2	Unstable Operation
THC	08 Jul 2016 11:00	08 Jul 2016 13:00	3	Maintenance - diagnostics collected
THC	09 Jul 2016 12:00	09 Jul 2016 12:00	1	Unstable Operation
THC	26 Jul 2016 09:00	26 Jul 2016 14:00	6	Maintenance - new calibrator installed
THC	27 Jul 2016 10:00	27 Jul 2016 10:00	1	Maintenance - replaced carrier gas
O3	04 Jul 2016 10:00	04 Jul 2016 10:00	1	Maintenance - zero air generator serviced
O3	07 Jul 2016 08:00	07 Jul 2016 08:00	1	Maintenance - sample manifold cleaned
O3	26 Jul 2016 09:00	26 Jul 2016 15:00	7	Maintenance - new calibrator installed
NO2	04 Jul 2016 11:00	04 Jul 2016 11:00	1	Maintenance - zero air generator serviced
NO2	07 Jul 2016 08:00	07 Jul 2016 08:00	1	Maintenance - sample manifold cleaned
NO2	26 Jul 2016 09:00	26 Jul 2016 14:00	6	Maintenance - new calibrator installed
PM2.5	01 Jul 2016 14:00	01 Jul 2016 18:00	5	Unstable operation - excessive baseline drift
PM2.5	20 Jul 2016 21:00	20 Jul 2016 21:00	1	Unstable operation - excessive baseline drift
PM2.5	21 Jul 2016 08:00	21 Jul 2016 11:00	4	Unstable operation - excessive baseline drift
PM2.5	21 Jul 2016 16:00	21 Jul 2016 17:00	2	Unstable operation - excessive baseline drift
PM2.5	22 Jul 2016 00:00	22 Jul 2016 09:00	10	Analyzer Failure - debris in chamber
PM2.5	22 Jul 2016 10:00	22 Jul 2016 12:00	3	Maintenance - chamber/inlet cleaning
PM2.5	22 Jul 2016 13:00	23 Jul 2016 07:00	19	Unstable operation following maintenance
PM2.5	23 Jul 2016 16:00	23 Jul 2016 16:00	1	Unstable operation - excessive baseline drift
PM2.5	23 Jul 2016 19:00	23 Jul 2016 20:00	2	Unstable operation - excessive baseline drift

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

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
PM2.5	28 Jul 2016 07:00	28 Jul 2016 07:00	1	Unstable operation - excessive baseline drift
PM2.5	30 Jul 2016 12:00	30 Jul 2016 12:00	1	Unstable operation - excessive baseline drift
CO	04 Jul 2016 10:00	04 Jul 2016 11:00	2	Maintenance - zero air generator serviced
CO	07 Jul 2016 08:00	07 Jul 2016 08:00	1	Maintenance - sample manifold cleaned
CO	18 Jul 2016 18:00	19 Jul 2016 08:00	15	Maintenance - new datalogger program
CO	26 Jul 2016 09:00	26 Jul 2016 15:00	7	Maintenance - new calibrator installed



Wood Buffalo Environmental Association
Summary of Hour Averages

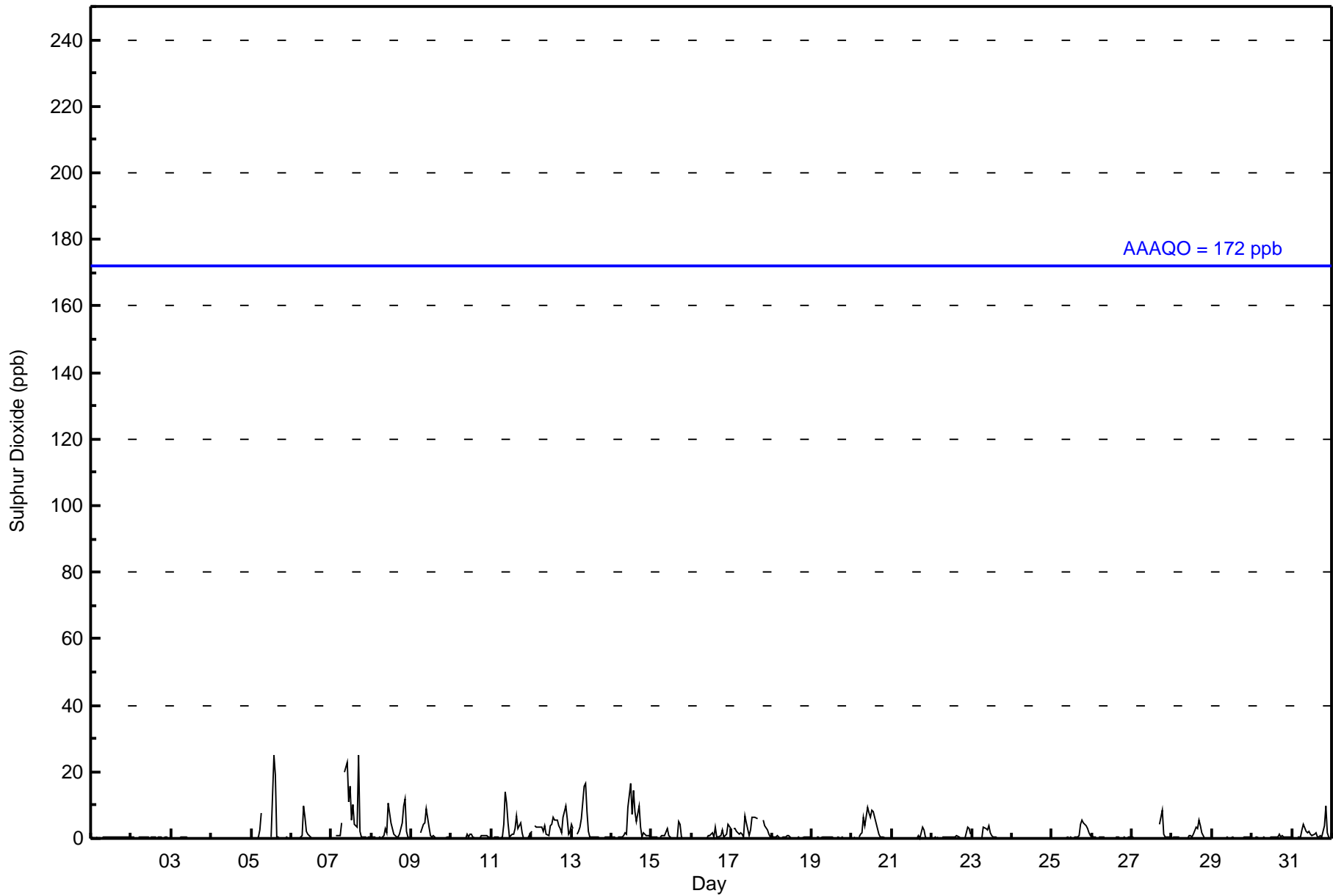
Sulphur Dioxide (SO₂) - ppb
Athabasca Valley - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0														Hours in Service: 744																																		
Maximum Value: 25 ppb on Jul 5 14:00														Maximum Daily Average: 5.9 ppb on Jul 7																																		
Minimum Value: 0 ppb on Jul 6 03:00														Minimum Daily Average: 0.1 ppb on Jul 4																																		
Maximum Diurnal Average: 3.1 ppb at hour 9														Minimum Diurnal Average: 0.4 ppb at hour 2																																		
Monthly Average: 1.4 ppb														Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 4 P ₉₉ = 16																																		
Hours of Data: 690														Hours of Missing Data: 54																																		
Hours of Calibration: 43														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-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																						
2-Jul	0	0	0	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1																						
3-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
4-Jul	0	0	0	0	0	Z	0	0	0	0	M	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
5-Jul	Z	0	0	0	0	3	8	C	C	C	C	C	0	25	19	1	0	0	0	0	0	0	0	0	3.2	25																						
6-Jul	0	Z	0	0	0	0	1	10	6	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.9	10																						
7-Jul	0	0	Z	1	1	1	5	M	20	23	11	16	5	10	4	3	25	2	1	0	0	0	0	1	5.9	25																						
8-Jul	0	0	0	Z	0	0	0	1	3	1	11	8	5	1	1	1	1	1	5	10	12	2	0	0	2.7	12																						
9-Jul	0	0	0	0	Z	2	3	4	5	9	4	1	1	1	0	0	0	0	0	0	0	0	0	0	1.3	9																						
10-Jul	0	0	0	0	0	Z	0	0	0	1	1	1	1	1	0	0	0	0	0	1	1	1	1	0	0.5	1																						
11-Jul	Z	0	0	0	0	0	0	4	14	11	5	1	1	1	3	7	3	5	2	0	0	0	0	2	2.6	14																						
12-Jul	2	Z	4	3	3	3	3	2	4	1	1	4	4	6	5	6	4	3	2	6	10	6	1	2	3.8	10																						
13-Jul	4	3	Z	1	2	3	6	16	16	8	2	0	0	0	0	0	0	0	0	0	0	1	0	0	2.9	16																						
14-Jul	0	0	0	Z	0	0	0	1	2	1	9	17	7	14	8	5	10	3	0	2	1	1	1	1	3.7	17																						
15-Jul	0	0	0	0	Z	1	1	1	1	3	1	0	0	0	0	5	4	0	0	0	0	0	0	0	0.9	5																						
16-Jul	0	0	0	0	0	Z	0	0	0	0	1	1	2	0	3	0	0	1	2	1	1	1	4	3	0.9	4																						
17-Jul	Z	3	3	2	1	2	1	1	7	5	1	3	6	6	6	6	M	M	M	5	4	2	1	1	3.3	7																						
18-Jul	1	0	1	1	0	0	0	0	0	1	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0.3	1																						
19-Jul	0	0	Z	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1																						
20-Jul	0	0	0	Z	0	1	2	6	4	9	8	6	9	8	4	3	1	0	0	0	0	0	0	0	2.8	9																						
21-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	4	3	1	0	0	0	0.5	4																						
22-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	3	3	1	0.6	3																						
23-Jul	Z	0	0	0	0	0	0	3	3	3	4	2	1	0	0	0	0	0	0	0	0	0	0	0	0.8	4																						
24-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
25-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	6	5	4	3	2	1	1.2	6																					
26-Jul	1	1	0	Z	0	0	0	0	M	M	M	M	M	M	1	0	0	0	0	0	0	0	0	0	--	1																						
27-Jul	0	0	0	0	Z	0	0	0	0	C	C	C	C	C	C	C	C	4	6	9	1	0	0	0	--	9																						
28-Jul	0	0	0	0	0	Z	0	0	0	0	1	1	0	1	3	3	5	4	2	0	0	0	0	0	1.0	5																						
29-Jul	Z	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																						
30-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	1	0	0	0.3	1																						
31-Jul	0	0	Z	0	0	0	3	4	2	2	2	1	1	1	2	0	0	1	1	4	10	2	0	0	1.6	10																						
																								0.5	0.4	0.5	0.5	0.5	0.7	1.1	1.9	3.1	3.0	2.4	2.3	1.6	2.8	2.1	1.3	2.2	1.3	1.2	1.3	1.5	0.9	0.6	0.5	Diurnal Average
																								4	3	4	3	3	3	8	16	20	23	11	17	9	25	19	7	25	6	9	10	12	6	4	3	Diurnal Maximum
Z - zerospan C - Calibration M - Maintenance																																																
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb																																																



Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Athabasca Valley - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	675	97.83	97.83
11 - 20	12	1.74	99.57
21 - 60	3	0.43	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: 690

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Athabasca Valley - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	83	15	12	10	17	19	91	35	29	24	47	61	25	20	33	154	675
11 - 20	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	12
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	87	15	12	10	17	19	91	35	29	24	47	61	25	20	33	165	690

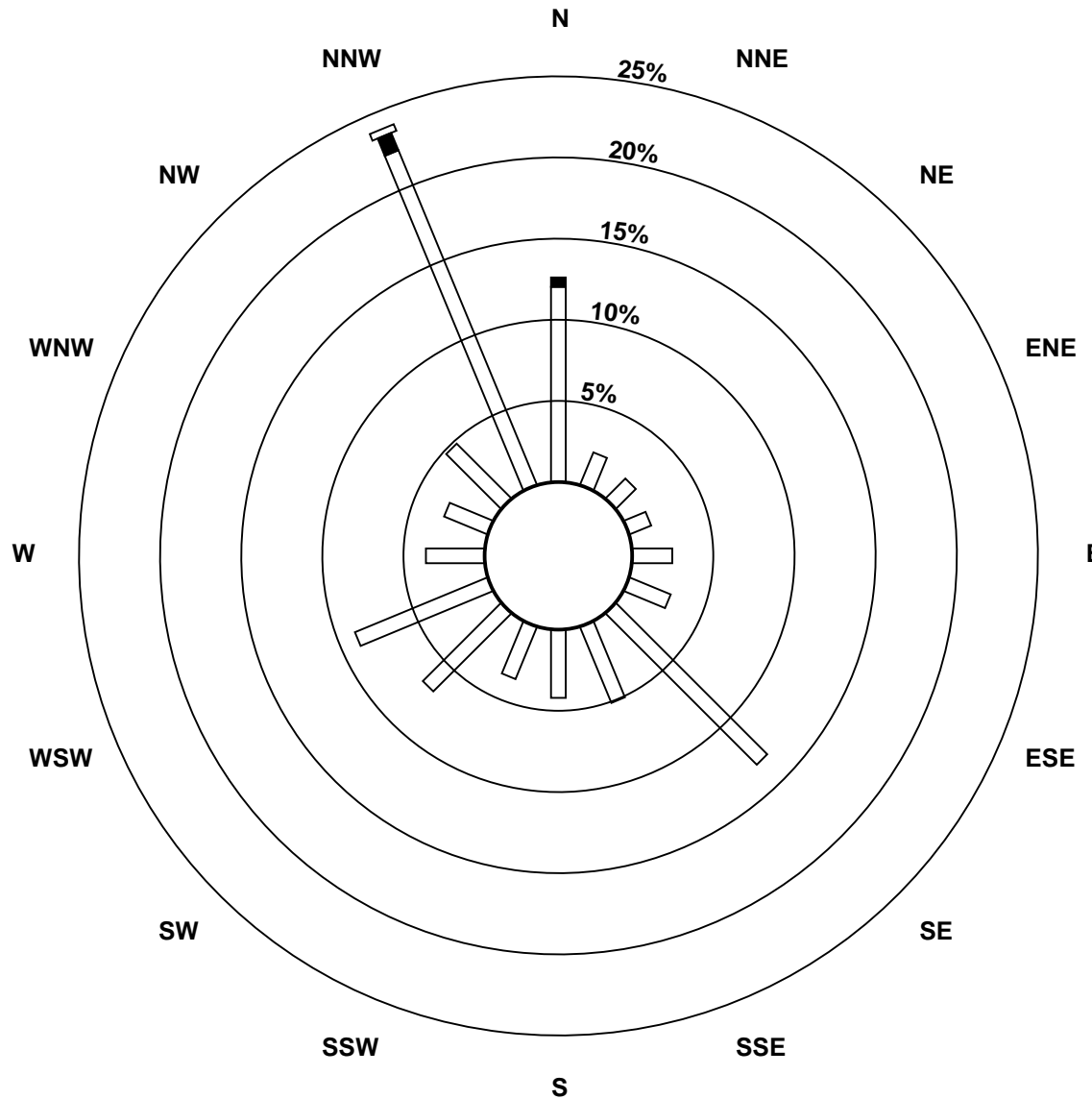
Total Number of Valid Hours: 690

Total Number of Hours: 744

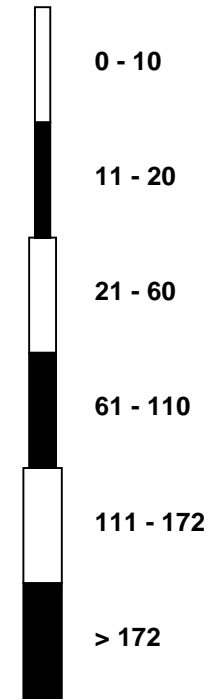


Wood Buffalo Environmental Association
Wind Rose Jul 2016

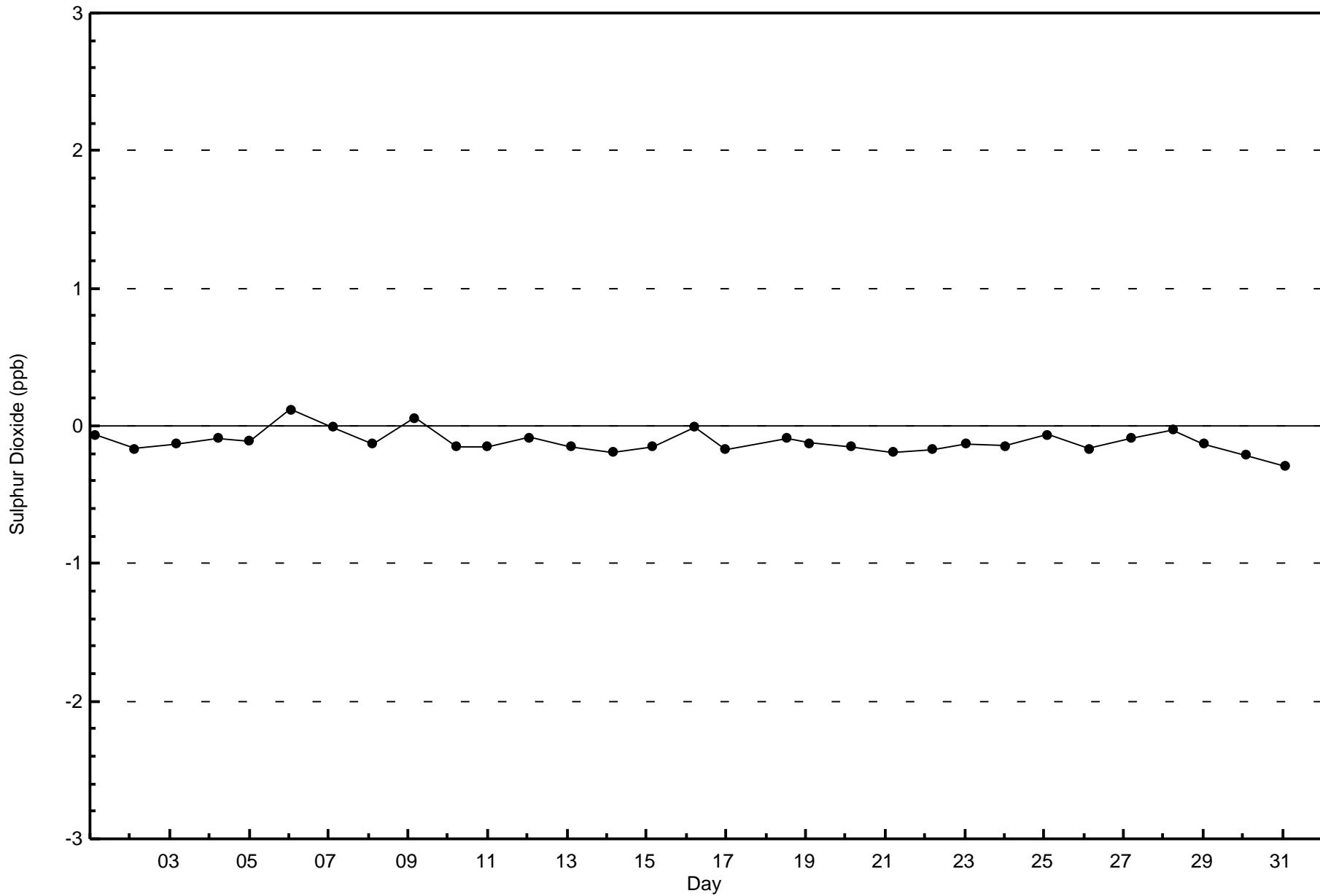
Sulphur Dioxide (SO₂) - ppb
Athabasca Valley (AMS 7)

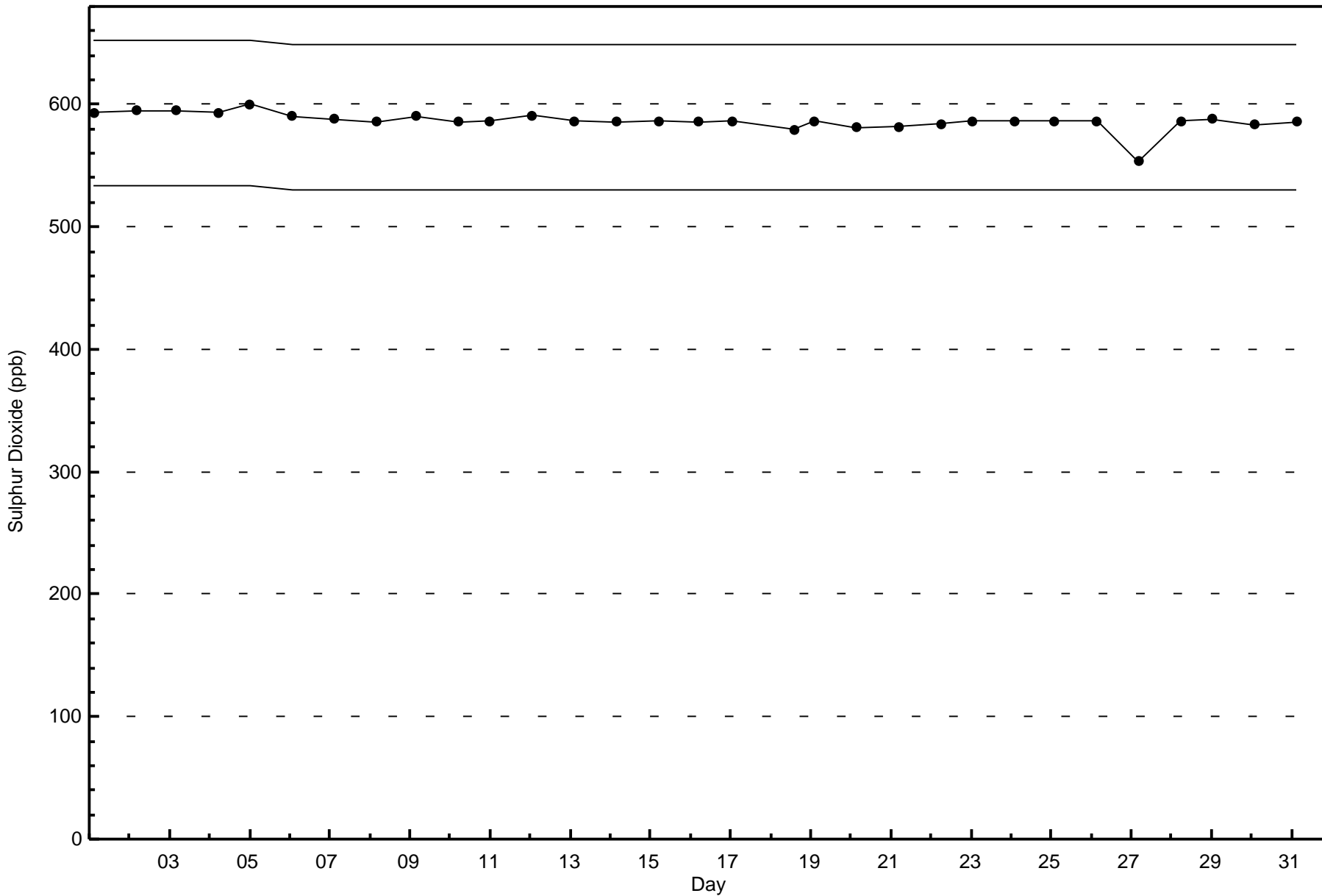


Classes (ppb)



Total Number of Valid Hours: 690







Wood Buffalo Environmental Association

Summary of Hour Averages

Total Reduced Sulphur (TRS) - ppb

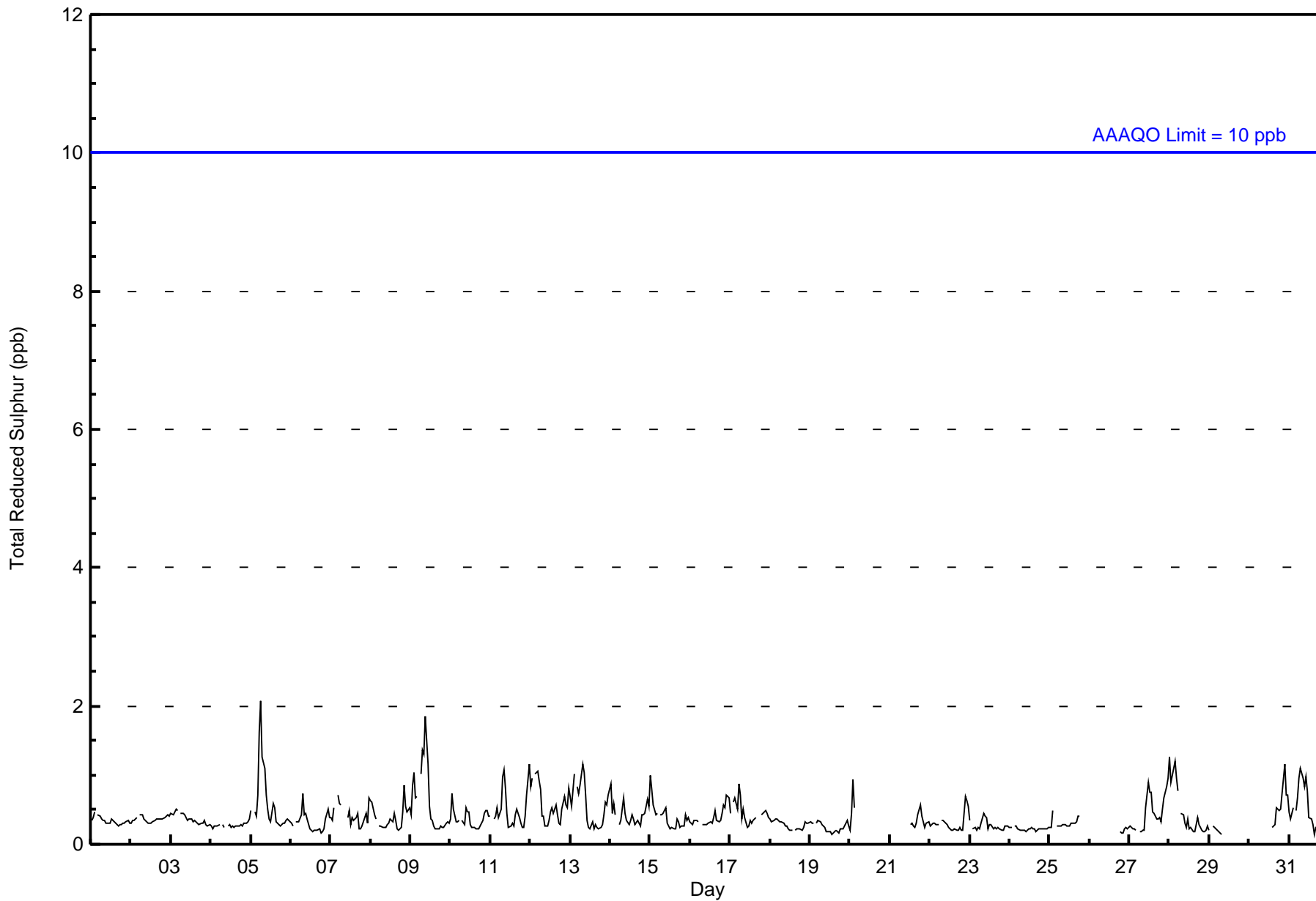
Athabasca Valley - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 2 ppb on Jul 5 07:00 Maximum Daily Average: 0.6 ppb on Jul 9		Hours in Service: 744 Hours of Data: 625 Hours of Missing Data: 119 Hours of Calibration: 36 Percent Operational Time: 88.8																									
Minimum Value: 0 ppb on Jul 31 23:00 Maximum Diurnal Average: 0.5 ppb at hour 7 Monthly Average: 0.4 ppb		Minimum Daily Average: 0.2 ppb on Jul 24 Minimum Diurnal Average: 0.3 ppb at hour 19 Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 1																									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Jul	0	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	
2-Jul	0	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	
3-Jul	0	0	0	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
4-Jul	0	0	0	0	0	0	Z	0	0	M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	
5-Jul	0	Z	0	0	1	2	2	1	1	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0.6	2	
6-Jul	0	0	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.3	1	
7-Jul	0	0	1	Z	1	1	1	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.4	1	
8-Jul	1	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0.4	1	
9-Jul	0	1	1	1	1	Z	1	1	1	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.6	2	
10-Jul	0	1	1	0	0	0	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
11-Jul	0	Z	0	0	1	0	1	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0.5	1	
12-Jul	1	1	Z	1	1	1	1	0	0	0	0	0	1	0	1	0	0	0	0	1	1	1	1	1	0.6	1	
13-Jul	1	1	1	Z	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0.5	1	
14-Jul	1	0	1	0	Z	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0.4	1	
15-Jul	1	1	1	0	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
16-Jul	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0.4	1	
17-Jul	0	Z	1	1	0	1	1	0	1	0	0	0	0	0	0	0	M	M	M	0	0	0	0	0	0.5	1	
18-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0.3	0	
19-Jul	0	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	
20-Jul	0	0	1	1	Z	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	1	
21-Jul	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	M	M	0	0	0	0	0	0	1	0	0	0	0	0	--	1	
22-Jul	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0.3	1	
23-Jul	0	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	
24-Jul	0	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	
25-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	AF	AF	AF	AF	AF	0.3	0
26-Jul	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	M	M	M	M	M	M	M	0	0	0	0	0	0	--	0	
27-Jul	0	0	0	0	0	Z	0	0	0	0	1	1	1	1	0	0	0	0	0	0	1	1	1	1	0.4	1	
28-Jul	1	1	1	1	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1	
29-Jul	0	Z	0	0	0	0	0	0	M	M	M	M	M	M	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	0	
30-Jul	AF	AF	AF	AF	AF	AF	AF	AF	AF	C	C	C	C	C	C	0	0	1	1	0	1	1	1	1	--	1	
31-Jul	0	0	1	Z	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1	
																								Diurnal Average	Diurnal Maximum		
0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.4 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.4 0.4 0.4 0.5 1 1 1 1 1 2 2 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1																											
Z - zerospan C - Calibration M - Maintenance 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
Athabasca Valley - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	625	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: 625

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

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

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	88	15	12	10	17	13	71	31	26	20	41	43	22	23	26	167	625
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	88	15	12	10	17	13	71	31	26	20	41	43	22	23	26	167	625

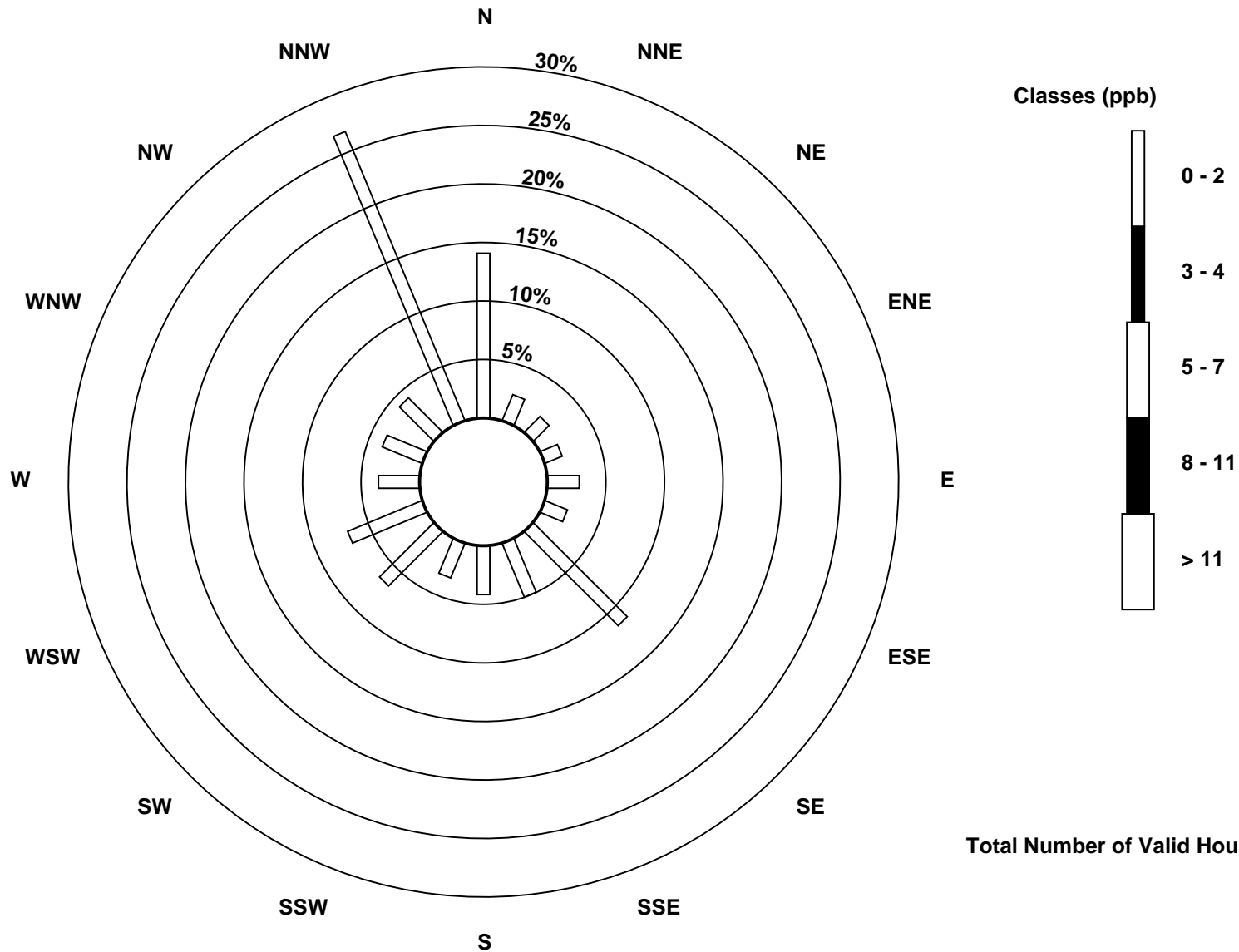
Total Number of Valid Hours: 625

Total Number of Hours: 744

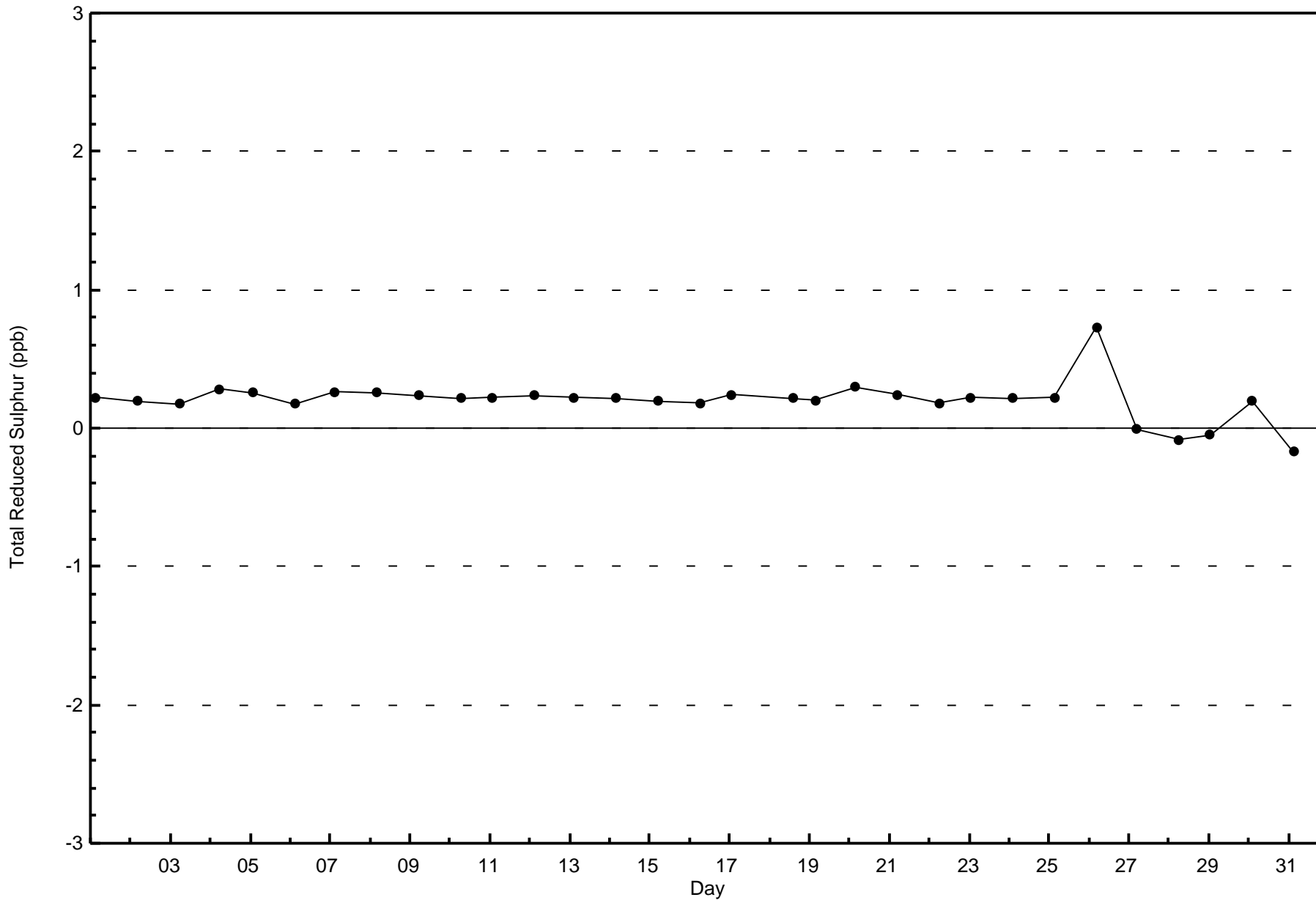


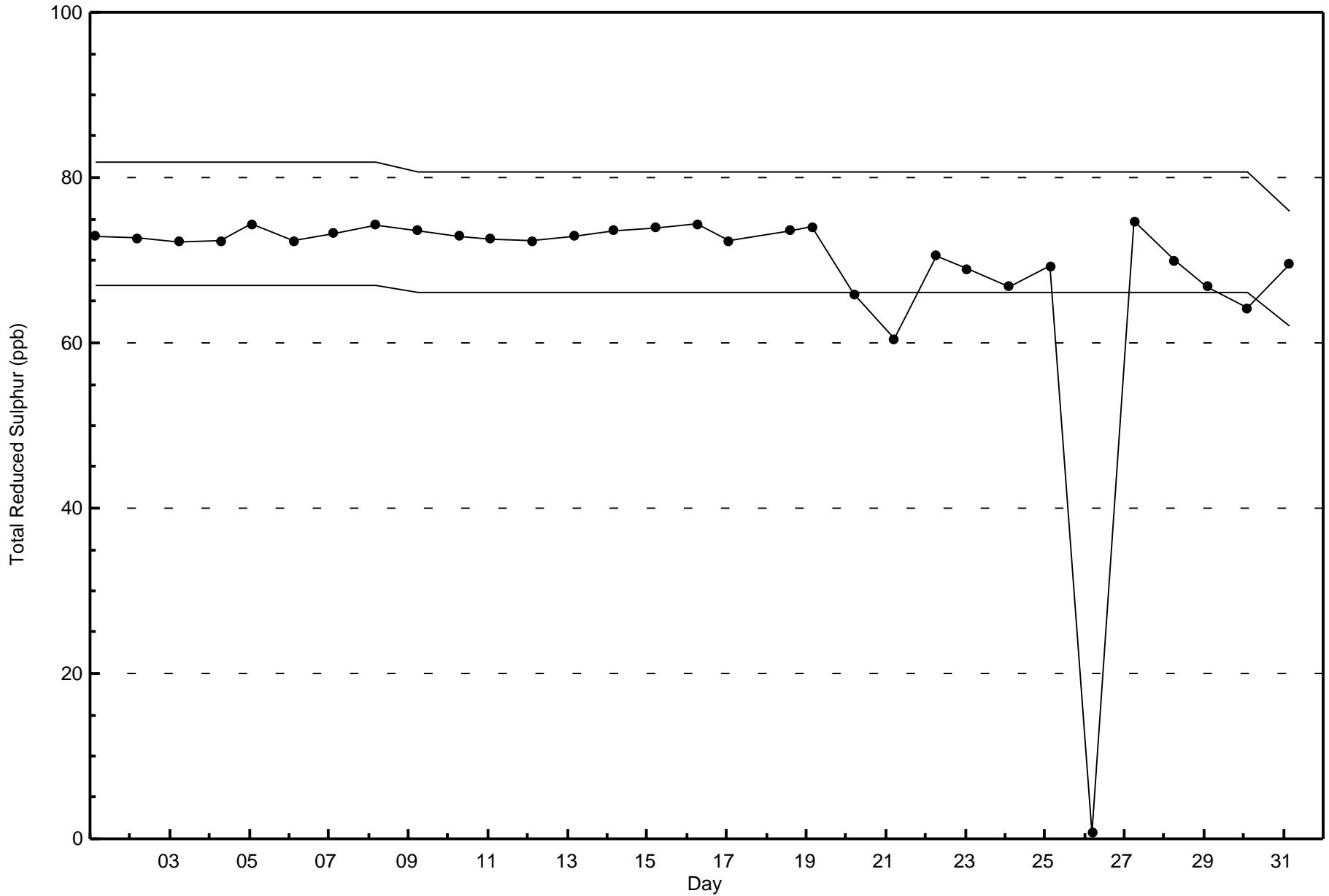
Wood Buffalo Environmental Association
Wind Rose Jul 2016

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



Total Number of Valid Hours: 625





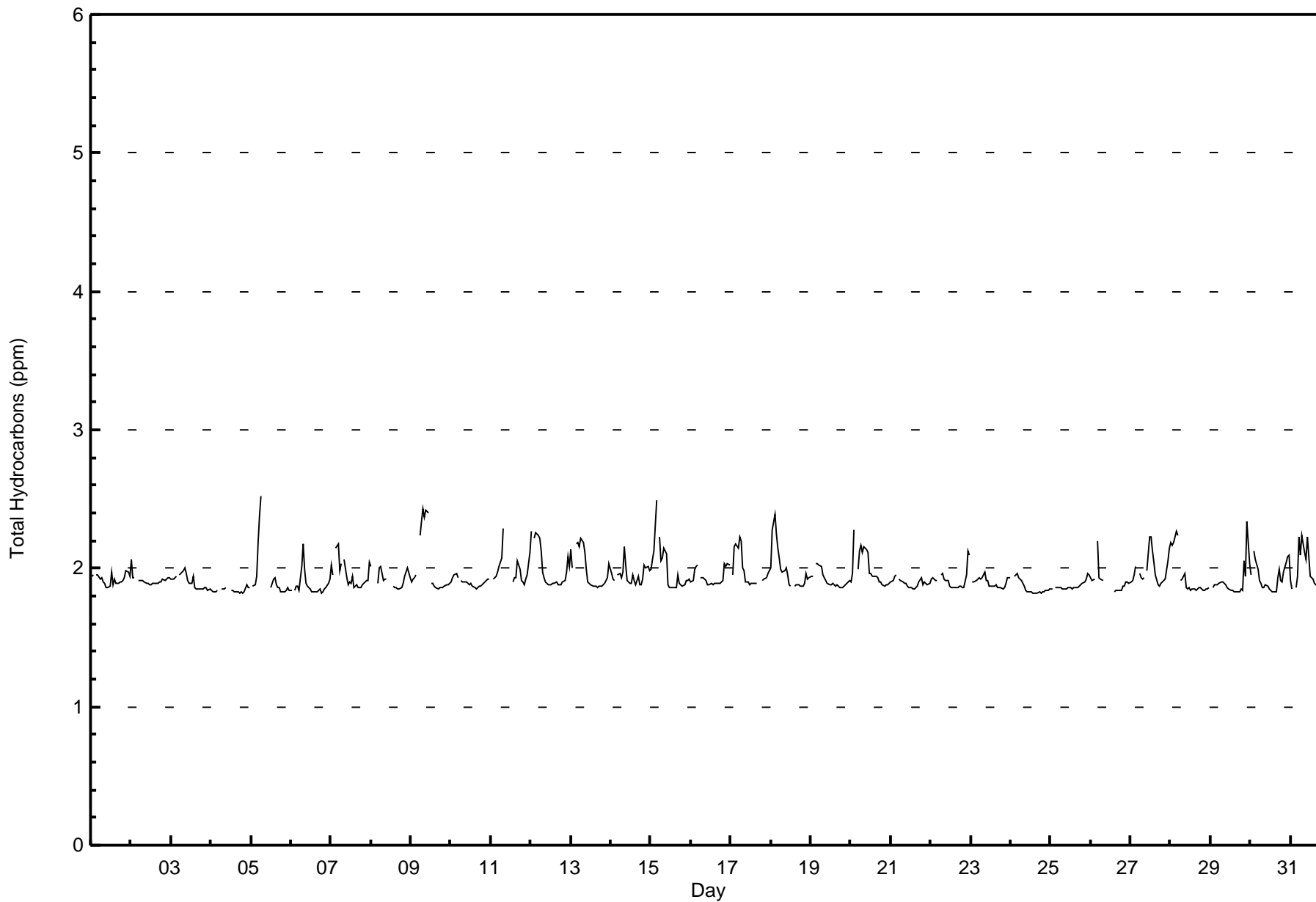


Maximum Value: 2.5 ppm on Jul 5 07:00		Maximum Daily Average: 2.0 ppm on Jul 9		Hours in Service:	744																																											
Minimum Value: 1.8 ppm on Jul 6 19:00		Minimum Daily Average: 1.8 ppm on Jul 4		Hours of Data:	684																																											
Maximum Diurnal Average: 2.0 ppm at hour 6		Minimum Diurnal Average: 1.9 ppm at hour 5		Hours of Missing Data:	60																																											
Monthly Average: 1.94 ppm		Percentiles: P ₁ = 1.8 P ₁₀ = 1.8 Q ₁ = 1.9 Median = 1.9 Q ₃ = 2.0 P ₉₀ = 2.1 P ₉₉ = 2.4		Hours of Calibration:	41																																											
				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-Jul	1.9	2.0	Z	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	1.9	1.9	2.0																							
2-Jul	2.1	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.1																						
3-Jul	1.9	1.9	1.9	1.9	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																							
4-Jul	1.8	1.8	1.8	1.8	1.8	Z	1.8	1.8	1.9	1.9	M	M	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9	1.9	1.9	1.9	1.9																						
5-Jul	Z	1.9	1.9	1.9	2.2	2.4	2.5	C	C	C	C	C	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.8	1.8	1.8	1.9	1.8	2.5																							
6-Jul	1.8	Z	1.8	1.9	1.9	1.8	2.0	2.2	2.0	1.9	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9	1.9	1.9	1.9	2.2																							
7-Jul	2.0	2.0	Z	2.1	2.2	2.0	2.0	M	2.1	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.2																							
8-Jul	2.0	UO	UO	Z	1.9	2.0	2.0	1.9	1.9	1.9	M	M	M	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	1.9	2.0																							
9-Jul	1.9	1.9	1.9	2.0	Z	2.2	2.3	2.4	2.4	2.4	2.4	UO	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.4																							
10-Jul	1.9	1.9	2.0	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	2.0																							
11-Jul	Z	1.9	1.9	1.9	2.0	2.0	2.1	2.3	C	C	C	C	C	1.9	1.9	1.9	2.1	2.0	1.9	1.9	1.9	1.9	2.0	2.1	2.3																							
12-Jul	2.3	Z	2.2	2.3	2.2	2.2	2.1	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.1	2.0	2.3																							
13-Jul	2.1	2.0	Z	2.2	2.2	2.2	2.2	2.2	2.1	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.2																							
14-Jul	2.0	1.9	1.9	Z	2.0	2.0	1.9	2.0	2.2	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	2.2																							
15-Jul	2.0	2.1	2.1	2.5	Z	2.2	2.1	2.1	2.1	2.1	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	2.5																							
16-Jul	1.9	1.9	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	2.0	2.0	2.0	2.0	2.0																							
17-Jul	Z	2.0	2.2	2.2	2.1	2.2	2.2	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	M	M	M	1.9	1.9	1.9	2.0	2.2																							
18-Jul	2.0	2.3	2.4	2.3	2.1	2.1	2.0	2.0	2.0	2.0	2.0	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	1.9	2.4																							
19-Jul	1.9	1.9	Z	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0																							
20-Jul	1.9	2.0	2.3	Z	2.0	2.1	2.2	2.1	2.2	2.1	2.1	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.3																							
21-Jul	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																							
22-Jul	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	2.1	2.1	2.1																							
23-Jul	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0																							
24-Jul	1.9	Z	1.9	2.0	2.0	1.9	1.9	1.9	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9	2.0																							
25-Jul	1.8	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0																							
26-Jul	1.9	1.9	1.9	Z	2.2	1.9	1.9	1.9	M	M	M	M	M	M	1.8	1.8	1.8	1.8	1.8	1.9	1.9	1.9	1.9	1.9	--																							
27-Jul	1.9	1.9	2.0	2.0	Z	2.0	1.9	1.9	1.9	M	M	2.0	2.2	2.2	2.1	2.0	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.1	2.2																							
28-Jul	2.2	2.2	2.2	2.3	2.2	Z	1.9	1.9	2.0	1.9	1.9	1.9	1.8	1.9	1.8	1.8	1.8	1.8	1.9	1.9	1.8	1.8	1.9	1.9	2.3																							
29-Jul	Z	1.9	1.9	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	1.8	1.8	2.1	1.9	2.3	2.0	2.3																							
30-Jul	2.0	Z	2.1	2.1	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.8	1.8	1.8	1.8	1.9	2.0	1.9	1.9	2.0	2.0	2.1	2.1	2.1																							
31-Jul	1.9	1.9	Z	1.9	1.9	2.2	2.1	2.2	2.1	2.1	2.2	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	2.2																							
																								2.0	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	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	Diurnal Average	
																								2.3	2.3	2.4	2.5	2.2	2.4	2.5	2.4	2.4	2.4	2.4	2.2	2.2	2.1	2.0	1.9	2.1	2.0	1.9	1.9	2.1	2.0	2.3	2.1	Diurnal Maximum
Z - zerospan																								C - Calibration				M - Maintenance				UO - Unstable Operation																



Wood Buffalo Environmental Association
Hourly Averages

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





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	601	87.87	87.87
2.1 - 3.0	83	12.13	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 684

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

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

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	75	14	12	6	15	16	82	32	29	24	46	59	24	17	25	125	601
2.1 - 3.0	13	0	0	4	2	3	9	3	0	0	0	2	1	3	8	35	83
3.1 - 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	88	14	12	10	17	19	91	35	29	24	46	61	25	20	33	160	684

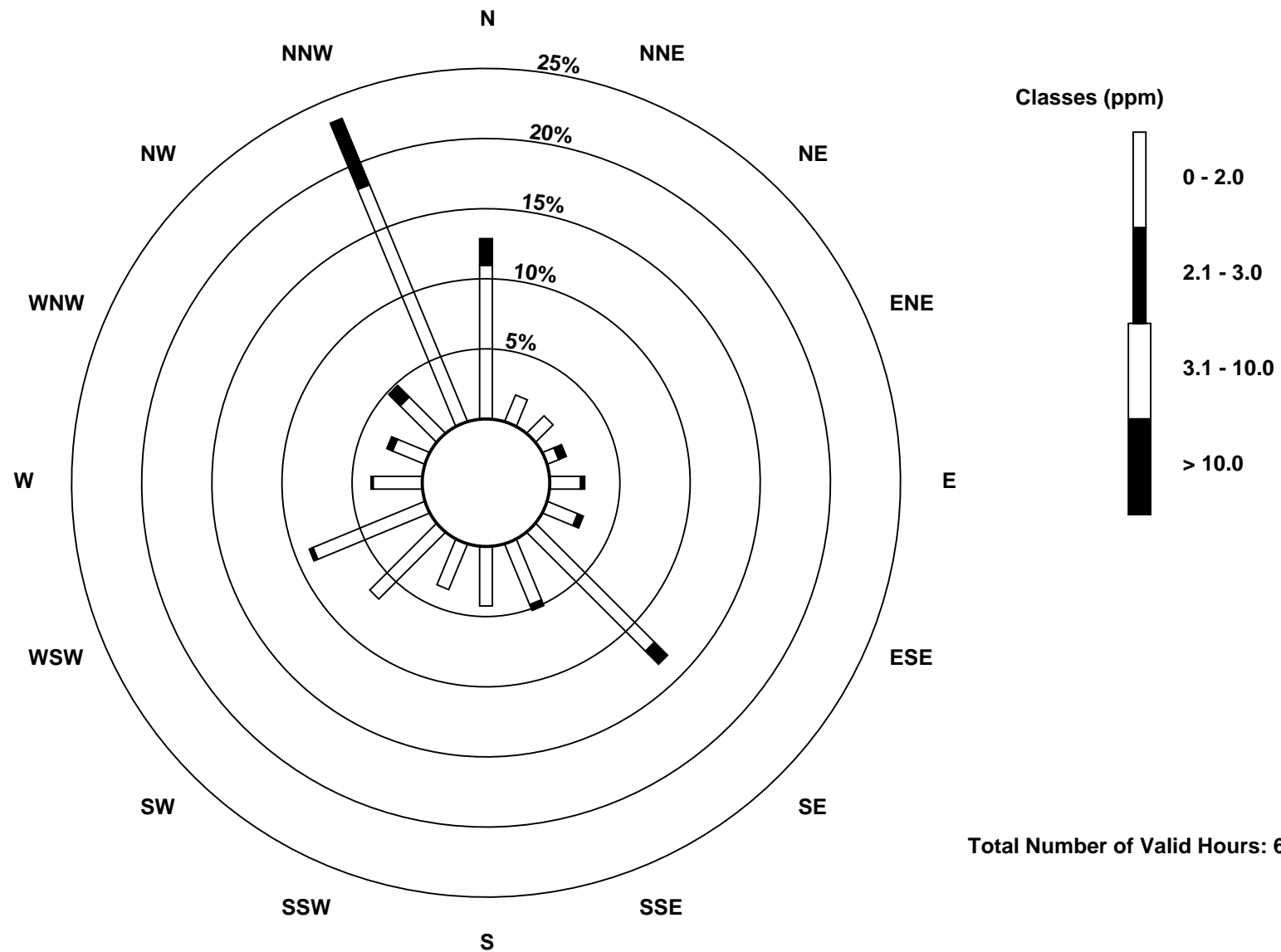
Total Number of Valid Hours: 684

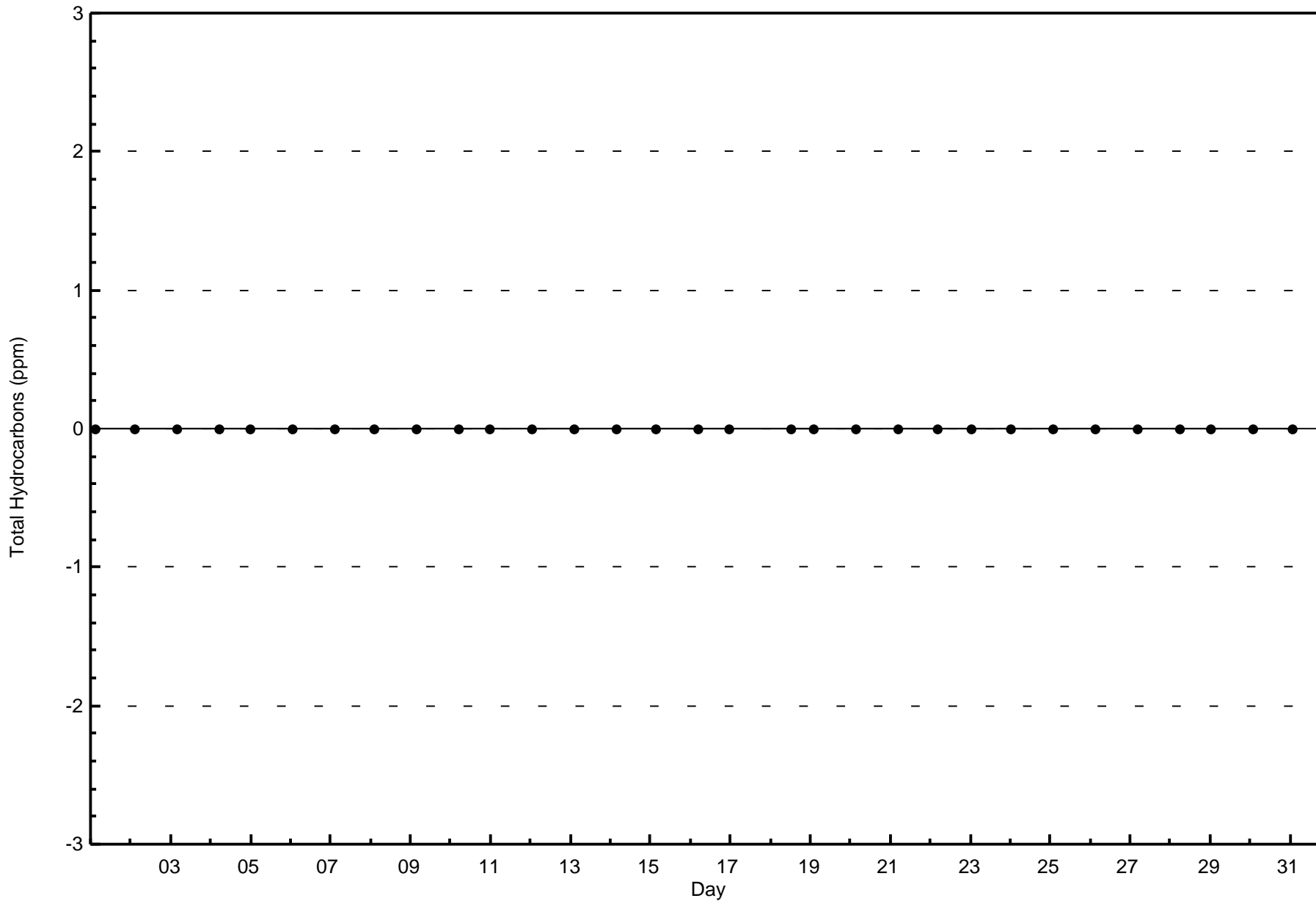
Total Number of Hours: 744

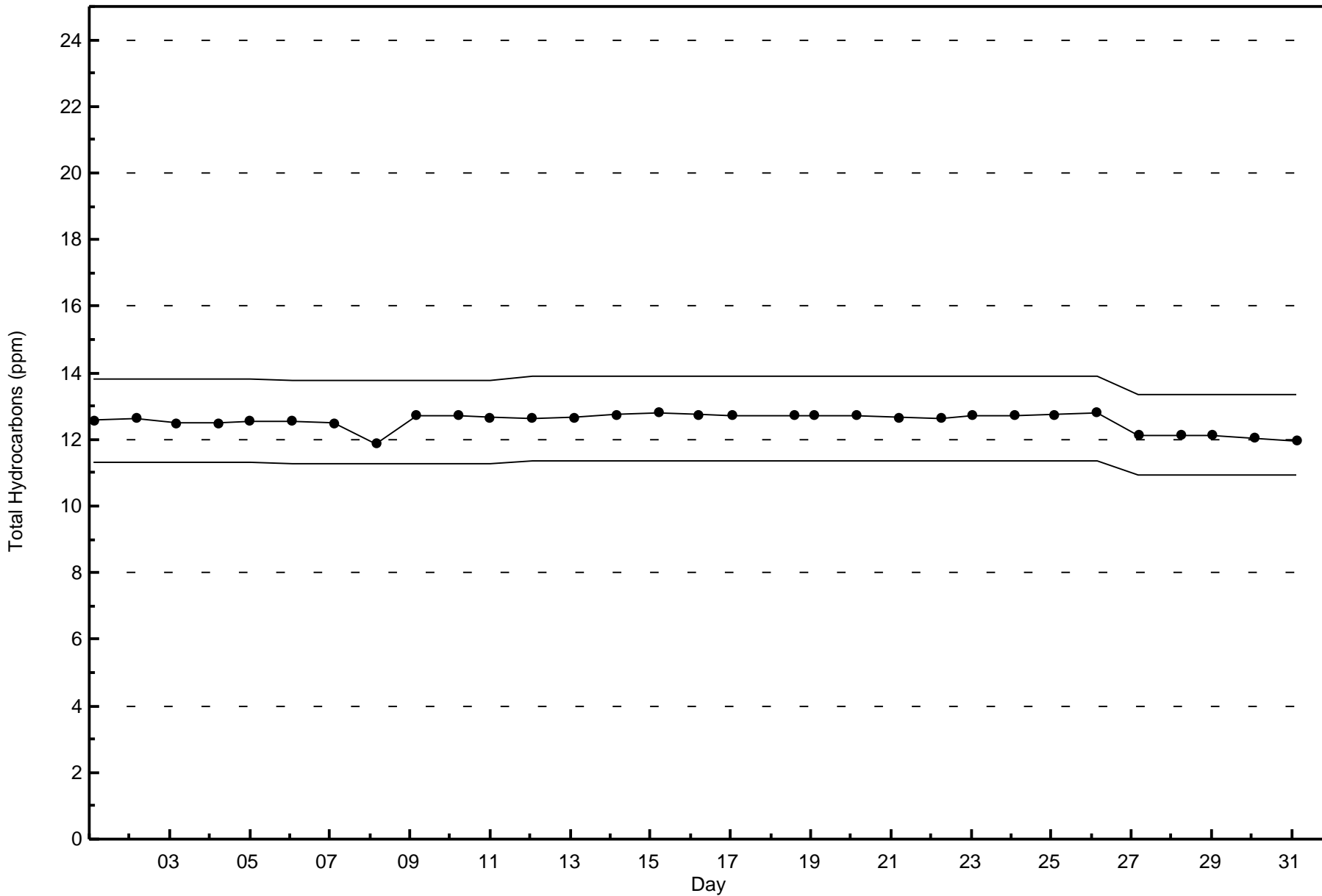


Wood Buffalo Environmental Association
Wind Rose Jul 2016

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

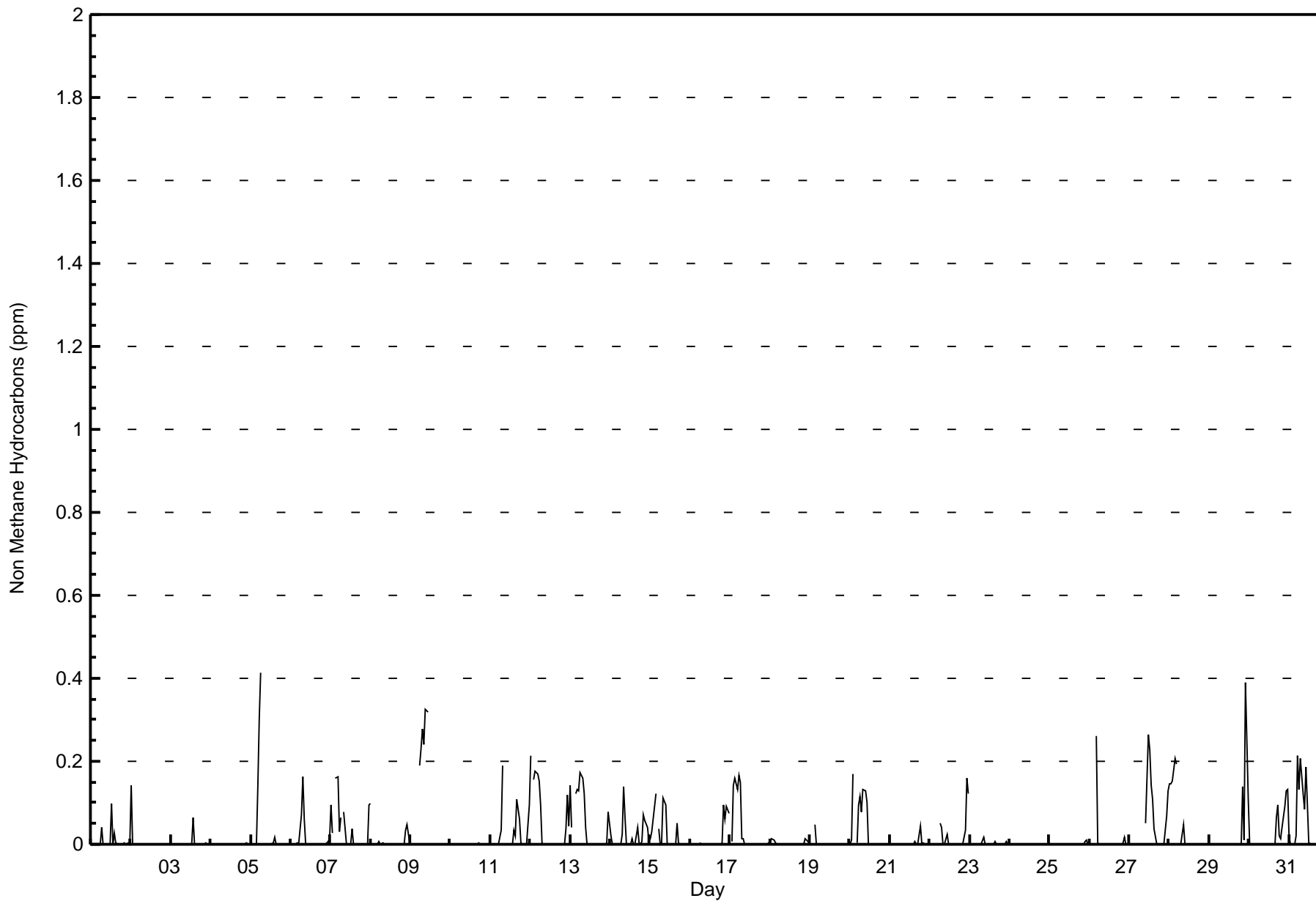








Maximum Value: 0.413 ppm on Jul 5 07:00																								Maximum Daily Average: 0.072 ppm on Jul 9																								Hours in Service: 744	
Minimum Value: 0.000 ppm on Jul 1 01:00																								Minimum Daily Average: 0.000 ppm on Jul 24																								Hours of Data: 684	
Maximum Diurnal Average: 0.051 ppm at hour 6																								Minimum Diurnal Average: 0.001 ppm at hour 20																								Hours of Missing Data: 60	
Monthly Average: 0.022 ppm																								Percentiles: P ₁ = 0.0 P ₁₀ = 0.0 Q ₁ = 0.0 Median = 0.0 Q ₃ = 0.0 P ₉₀ = 0.1 P ₉₉ = 0.3																								Hours of Calibration: 41	
Percentiles: P ₁ = 0.0 P ₁₀ = 0.0 Q ₁ = 0.0 Median = 0.0 Q ₃ = 0.0 P ₉₀ = 0.1 P ₉₉ = 0.3																								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-Jul	0.000	0.000	Z	0.000	0.000	0.000	0.039	0.000	0.000	0.000	0.000	0.000	0.098	0.000	0.027	0.003	0.000	0.000	0.000	0.000	0.003	0.000	0.003	0.000	0.007	0.098																							
2-Jul	0.142	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	0.006	0.142																							
3-Jul	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	0.065	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.003	0.065																							
4-Jul	0.001	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	M	M	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.003																							
5-Jul	Z	0.000	0.000	0.000	0.140	0.300	0.413	C	C	C	C	C	0.000	0.003	0.017	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.048	0.413																							
6-Jul	0.000	Z	0.000	0.000	0.003	0.000	0.073	0.162	0.061	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.013	0.014	0.162																								
7-Jul	0.096	0.026	Z	0.160	0.164	0.030	0.064	M	0.079	0.000	0.000	0.001	0.000	0.038	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.095	0.034	0.164																							
8-Jul	0.098	UO	UO	Z	0.000	0.007	0.001	0.002	0.000	0.000	M	M	M	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.035	0.049	0.004	0.011	0.098																							
9-Jul	0.000	0.000	0.000	0.000	Z	0.189	0.231	0.277	0.240	0.326	0.318	UO	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.072	0.326																							
10-Jul	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	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004																							
11-Jul	Z	0.000	0.000	0.000	0.000	0.000	0.035	0.189	C	C	C	C	C	0.000	0.033	0.022	0.107	0.062	0.005	0.000	0.000	0.000	0.000	0.094	0.030	0.189																							
12-Jul	0.214	Z	0.156	0.178	0.170	0.152	0.094	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	0.038	0.118	0.045	0.051	0.214																								
13-Jul	0.143	0.042	Z	0.124	0.132	0.127	0.173	0.161	0.122	0.041	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.078	0.050	0.173																							
14-Jul	0.021	0.000	0.000	Z	0.000	0.000	0.000	0.023	0.141	0.065	0.000	0.000	0.000	0.013	0.000	0.000	0.040	0.002	0.001	0.006	0.071	0.057	0.040	0.007	0.021	0.141																							
15-Jul	0.014	0.031	0.059	0.123	Z	0.038	0.000	0.003	0.113	0.094	0.000	0.000	0.000	0.000	0.000	0.050	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.023	0.123																							
16-Jul	0.000	0.000	0.000	0.000	0.000	Z	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	0.002	0.096	0.061	0.092	0.074	0.014	0.096																							
17-Jul	Z	0.008	0.141	0.159	0.133	0.165	0.151	0.015	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	M	M	M	0.000	0.000	0.000	0.000	0.003	0.039	0.165																							
18-Jul	0.005	0.012	0.011	0.002	0.001	0.000	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	0.002	0.012	0.009	0.007	0.003	0.012																						
19-Jul	0.000	0.000	Z	0.047	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.047	0.047																						
20-Jul	0.000	0.011	0.170	Z	0.004	0.097	0.115	0.077	0.133	0.128	0.101	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.036	0.170																							
21-Jul	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	0.006	0.000	0.001	0.043	0.000	0.003	0.000	0.000	0.000	0.002	0.043																							
22-Jul	0.000	0.000	0.000	0.000	0.000	Z	0.051	0.039	0.000	0.000	0.023	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.034	0.159	0.121	0.019	0.159																								
23-Jul	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.016	0.000	0.000	0.000	0.000	0.000	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.000	0.001	0.016																							
24-Jul	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																							
25-Jul	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	0.007	0.011	0.000	0.001	0.011																							
26-Jul	0.000	0.000	0.000	Z	0.263	0.002	0.000	0.000	M	M	M	M	M	M	0.000	0.000	0.000	0.000	0.000	0.001	0.003	0.018	0.002	0.000	--	0.263																							
27-Jul	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	M	M	0.052	0.265	0.227	0.142	0.107	0.037	0.000	0.000	0.000	0.000	0.000	0.068	0.130	0.047	0.265																							
28-Jul	0.146	0.147	0.151	0.205	0.195	Z	0.000	0.000	0.048	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.039	0.205																							
29-Jul	Z	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.141	0.010	0.389	0.108	0.389																							
30-Jul	0.001	Z	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.063	0.094	0.020	0.014	0.042	0.092	0.129	0.134	0.026	0.134																							
31-Jul	0.017	0.000	Z	0.000	0.019	0.213	0.131	0.208	0.122	0.085	0.186	0.100	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.002	0.000	0.000	0.000	0.048	0.213																							
																								0.035	0.011	0.029	0.038	0.047	0.051	0.051	0.040	0.039	0.027	0.026	0.015	0.012	0.009	0.006	0.002	0.009	0.006	0.002	0.001	0.012	0.012	0.035	0.029	Diurnal Average	
																								0.214	0.147	0.170	0.205	0.263	0.300	0.413	0.277	0.240	0.326	0.318	0.265	0.227	0.142	0.107	0.037	0.107	0.094	0.043	0.014	0.141	0.092	0.389	0.134	Diurnal Maximum	
Z - zerospan																								C - Calibration						M - Maintenance				UO - Unstable Operation															





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 0.005	529	77.34	77.34
0.006 - 0.05	61	8.92	86.26
0.06 - 0.1	60	8.77	95.03
> 0.1	34	4.97	100.00

Total Number of Valid Hours: 684

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

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

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 0.005	63	12	9	7	14	16	81	29	24	22	46	59	23	16	21	87	529
0.006 - 0.05	8	2	3	1	1	2	7	3	3	2	0	0	0	1	3	25	61
0.06 - 0.1	11	0	0	2	2	1	1	2	2	0	0	2	2	1	7	27	60
> 0.1	6	0	0	0	0	0	2	1	0	0	0	0	0	2	2	21	34
Totals	88	14	12	10	17	19	91	35	29	24	46	61	25	20	33	160	684

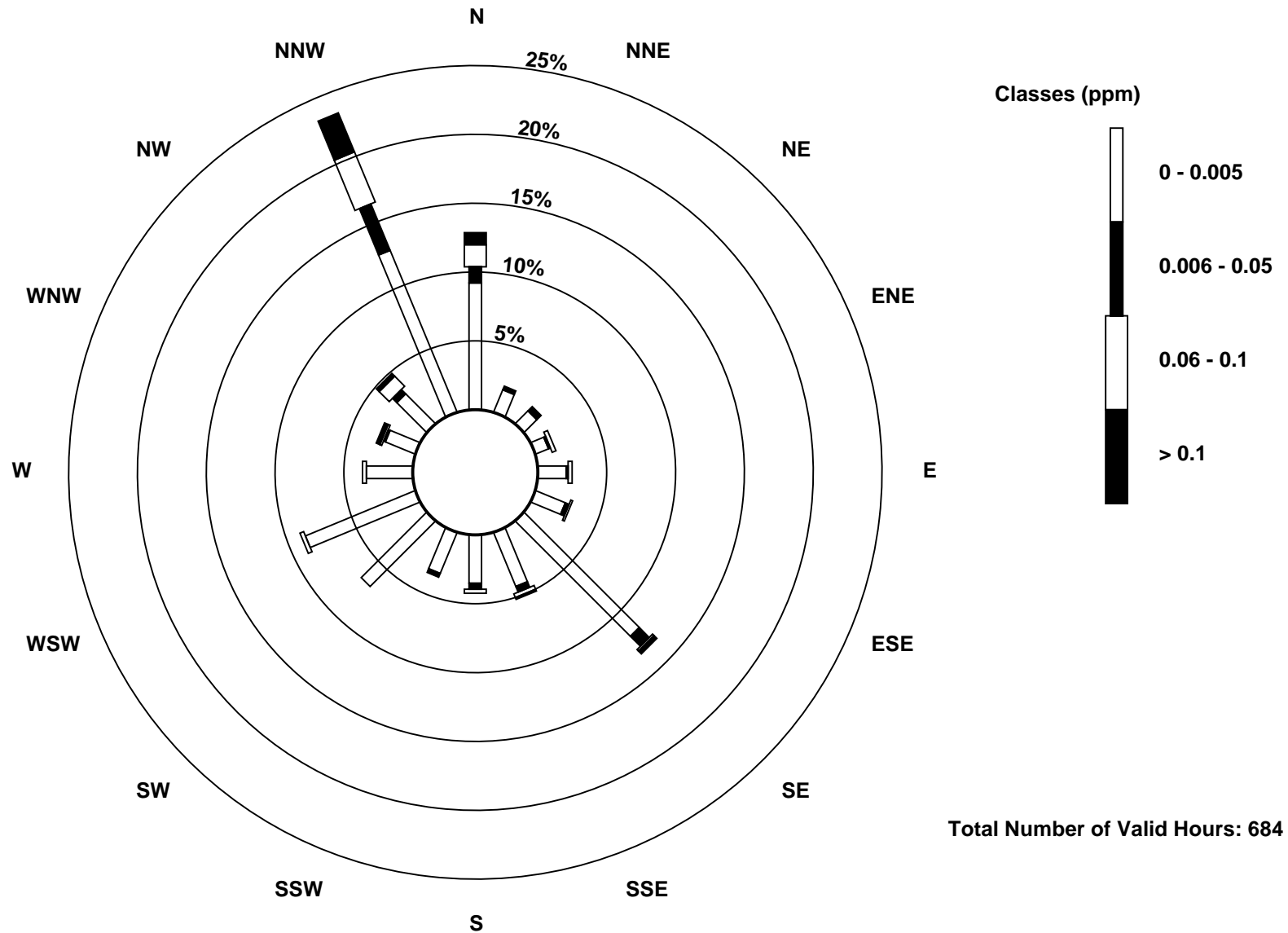
Total Number of Valid Hours: 684

Total Number of Hours: 744

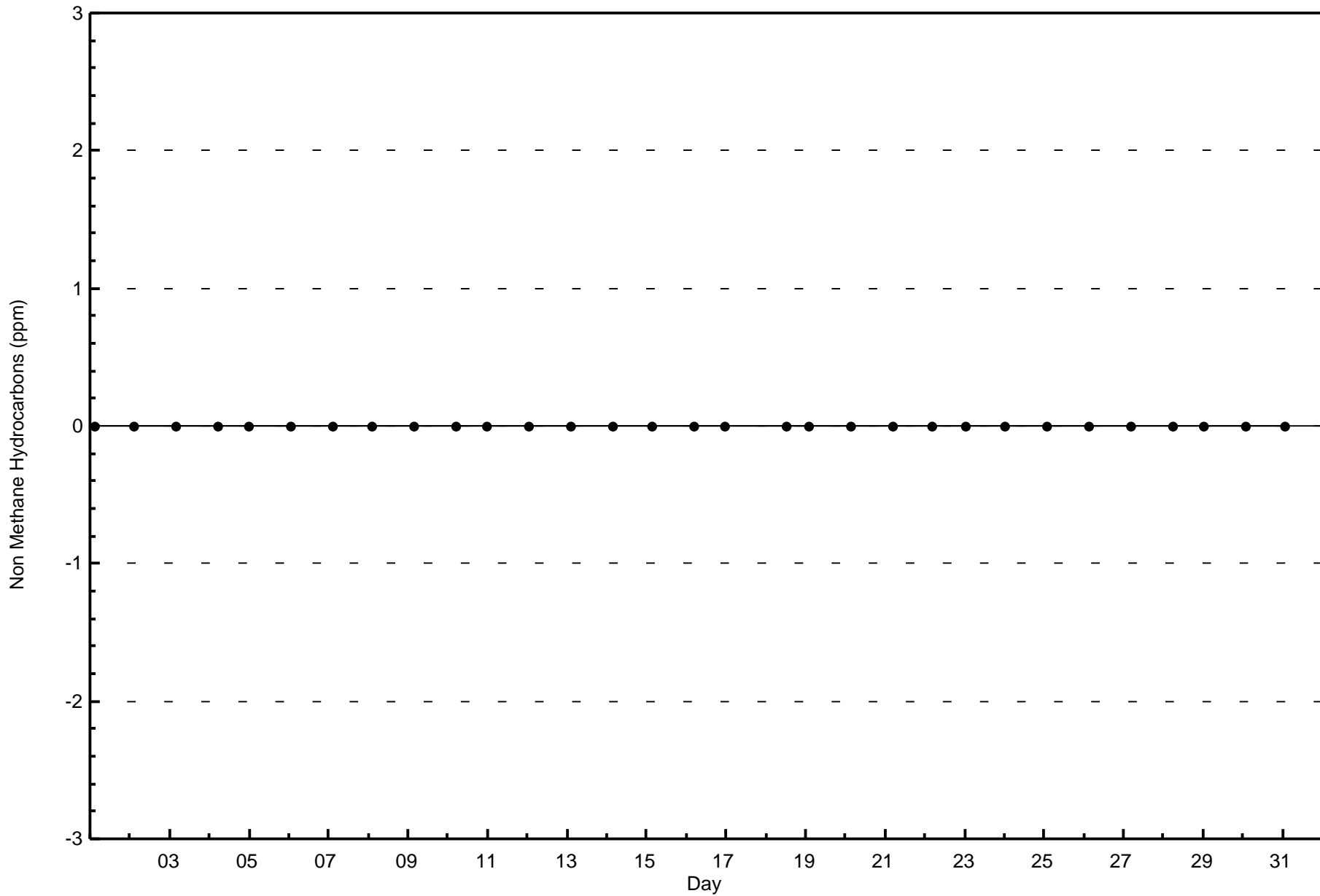


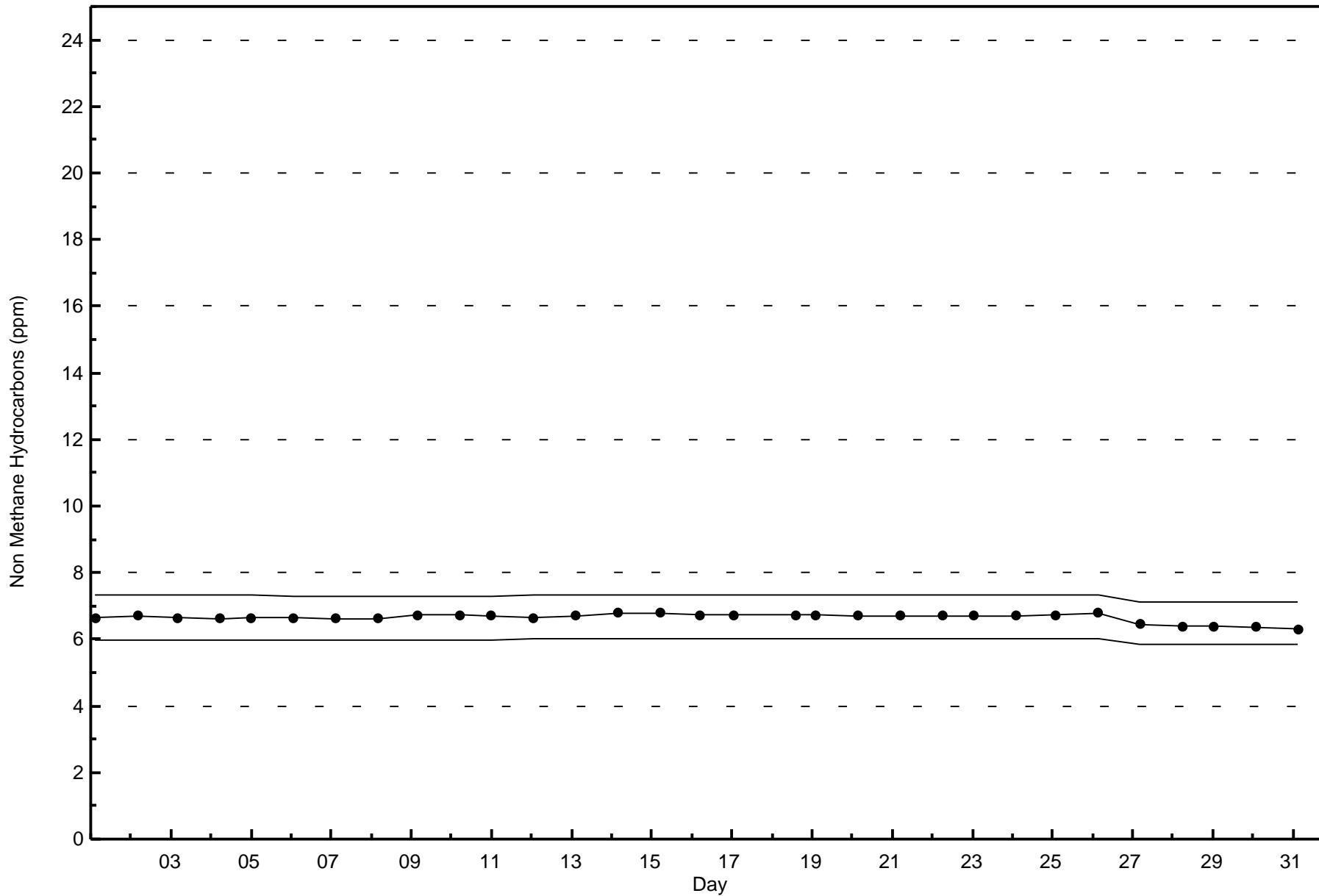
Wood Buffalo Environmental Association
Wind Rose Jul 2016

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



Total Number of Valid Hours: 684





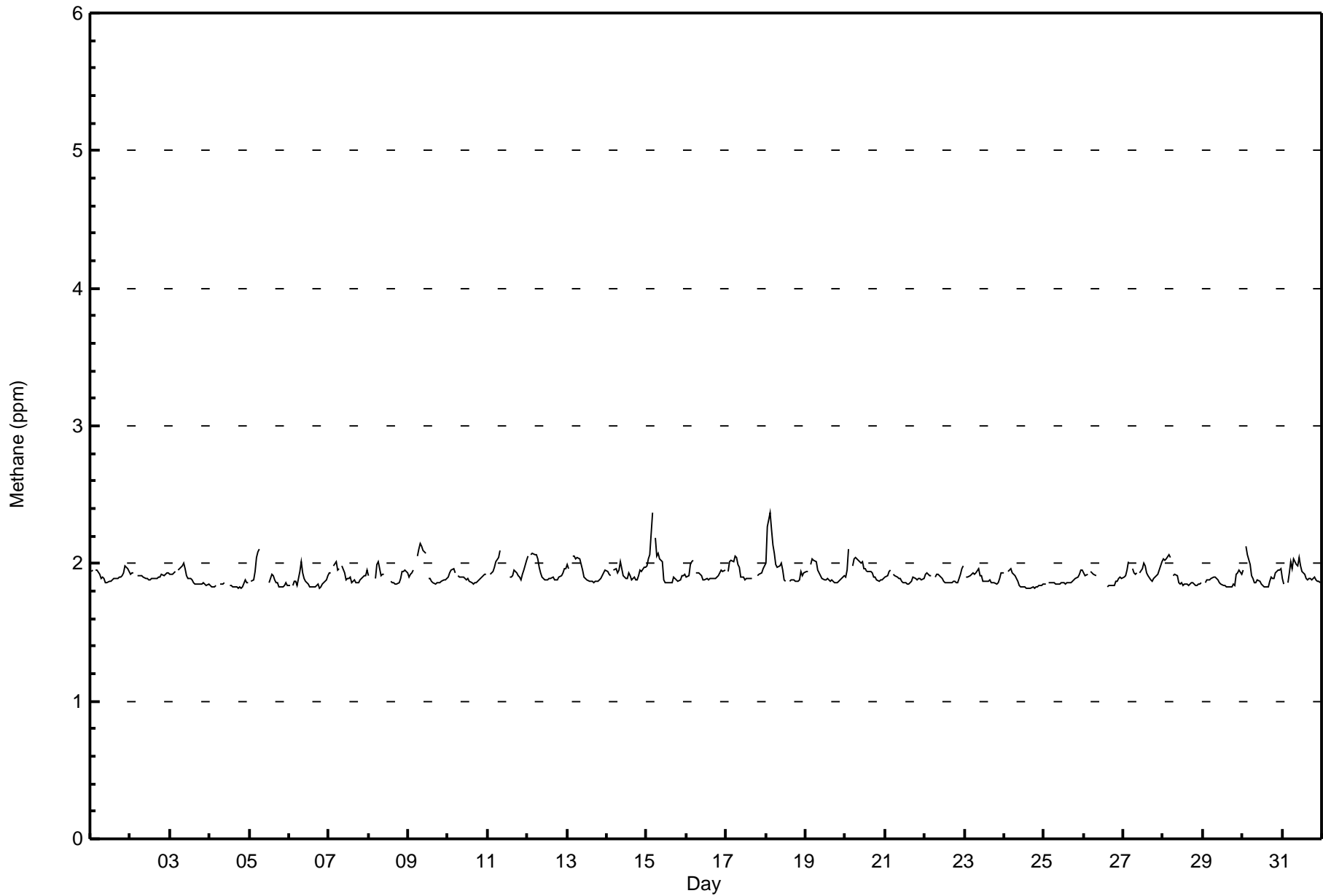


Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 2.4 ppm on Jul 18 03:00 Maximum Daily Average: 2.0 ppm on Jul 18																	Hours in Service: 744 Hours of Data: 684 Hours of Missing Data: 60 Hours of Calibration: 41 Percent Operational Time: 97.5									
Minimum Value: 1.8 ppm on Jul 6 19:00 Minimum Daily Average: 1.8 ppm on Jul 4 Maximum Diurnal Average: 2.0 ppm at hour 4 Minimum Diurnal Average: 1.9 ppm at hour 19 Monthly Average: 1.91 ppm Percentiles: P ₁ = 1.8 P ₁₀ = 1.8 Q ₁ = 1.9 Median = 1.9 Q ₃ = 1.9 P ₉₀ = 2.0 P ₉₉ = 2.1																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	1.9	2.0	Z	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	1.9	1.9	2.0	
2-Jul	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	
3-Jul	1.9	1.9	1.9	1.9	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	1.8	1.9	1.9	1.9	1.8	1.8	1.9	2.0	
4-Jul	1.8	1.8	1.8	1.8	1.8	Z	1.8	1.8	1.9	1.9	M	M	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9	1.9	1.9	1.9	
5-Jul	Z	1.9	1.9	1.9	2.0	2.1	2.1	C	C	C	C	C	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.8	1.8	1.8	1.9	1.8	2.1	
6-Jul	1.8	Z	1.8	1.9	1.9	1.8	1.9	2.0	1.9	1.9	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9	1.9	1.9	1.9	2.0	
7-Jul	1.9	1.9	Z	2.0	2.0	2.0	2.0	M	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	
8-Jul	1.9	UO	UO	Z	1.9	2.0	2.0	1.9	1.9	1.9	M	M	M	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	1.9	2.0	
9-Jul	1.9	1.9	1.9	2.0	Z	2.1	2.1	2.1	2.1	2.1	2.1	UO	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.1	
10-Jul	1.9	1.9	2.0	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	2.0	
11-Jul	Z	1.9	1.9	1.9	2.0	2.0	2.0	2.1	C	C	C	C	C	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.1	
12-Jul	2.1	Z	2.1	2.1	2.1	2.1	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	1.9	2.1	
13-Jul	2.0	2.0	Z	2.1	2.1	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	2.1	
14-Jul	1.9	1.9	1.9	Z	2.0	2.0	1.9	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	2.0	1.9	2.0	
15-Jul	2.0	2.0	2.1	2.4	Z	2.2	2.1	2.1	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.4	
16-Jul	1.9	1.9	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	2.0	1.9	2.0	
17-Jul	Z	1.9	2.0	2.0	2.0	2.1	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	M	M	M	1.9	1.9	1.9	2.0	2.1	
18-Jul	2.0	2.3	2.4	2.2	2.1	2.1	2.0	2.0	2.0	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	1.9	2.4	
19-Jul	1.9	1.9	Z	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	
20-Jul	1.9	1.9	2.1	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	2.1	
21-Jul	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	
22-Jul	1.9	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	1.9	2.0	
23-Jul	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	
24-Jul	1.9	Z	1.9	2.0	2.0	1.9	1.9	1.9	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9	2.0	
25-Jul	1.8	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	2.0	
26-Jul	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	M	M	M	M	M	M	1.8	1.8	1.8	1.8	1.8	1.8	1.9	1.9	1.9	1.9	--	
27-Jul	1.9	1.9	2.0	2.0	Z	2.0	1.9	1.9	1.9	M	M	1.9	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	1.9	
28-Jul	2.0	2.0	2.0	2.1	2.0	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.8	1.9	1.8	1.8	1.8	1.8	1.8	1.9	1.9	1.8	1.8	1.9	2.1	
29-Jul	Z	1.9	1.9	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	1.8	1.8	1.8	1.9	1.9	1.9	1.9	
30-Jul	1.9	Z	2.1	2.1	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.8	1.8	1.8	1.8	1.8	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.1	
31-Jul	1.9	1.9	Z	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	1.9	1.9	1.9	1.9	1.9	1.9	2.0	
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan C - Calibration M - Maintenance UO - Unstable Operation																										



Wood Buffalo Environmental Association
Hourly Averages

Methane (CH₄) - ppm
Athabasca Valley - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	653	95.47	95.47
2.1 - 3.0	31	4.53	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 684

Total Number of Hours: 744



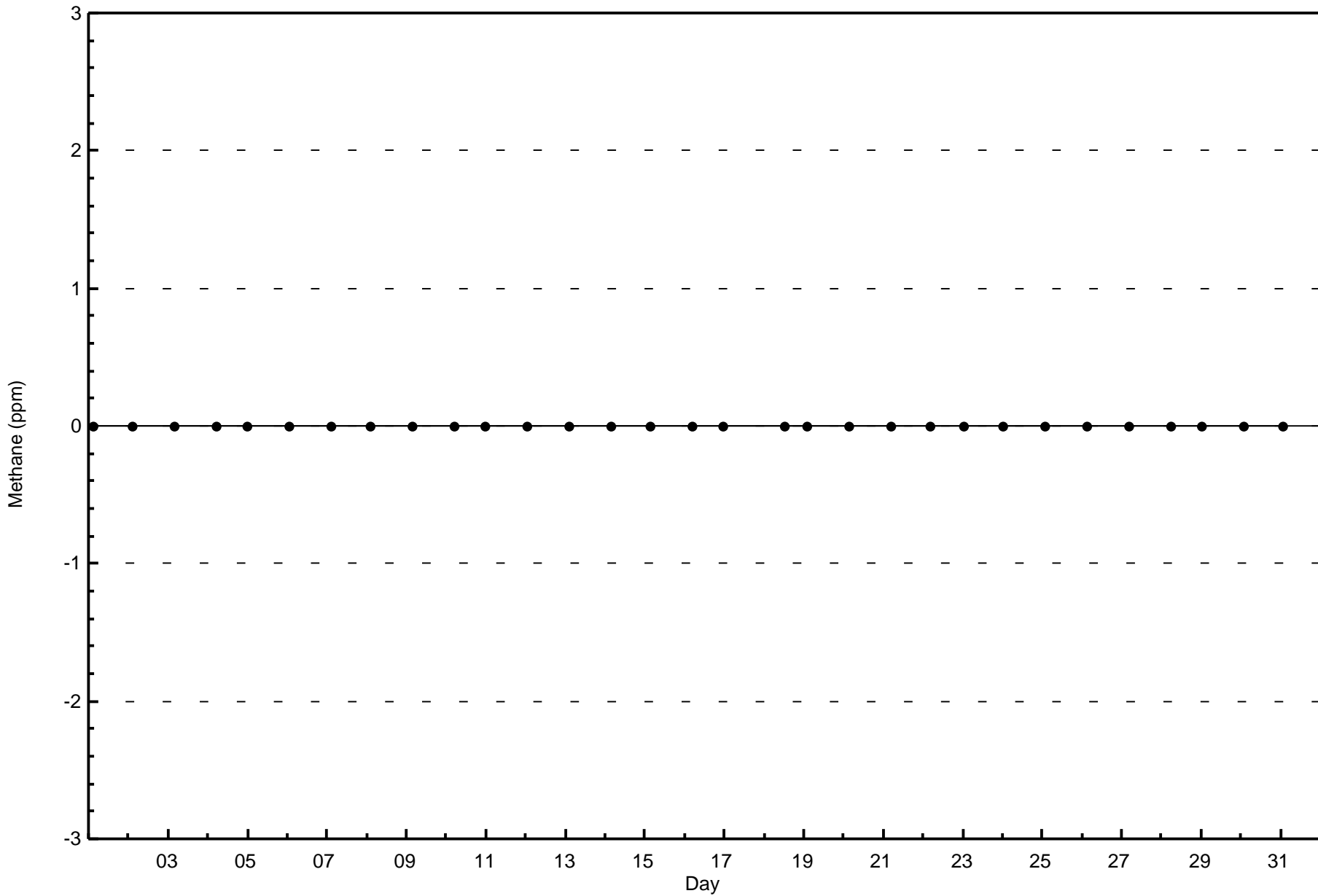
**Wood Buffalo Environmental Association
Frequency Distribution**

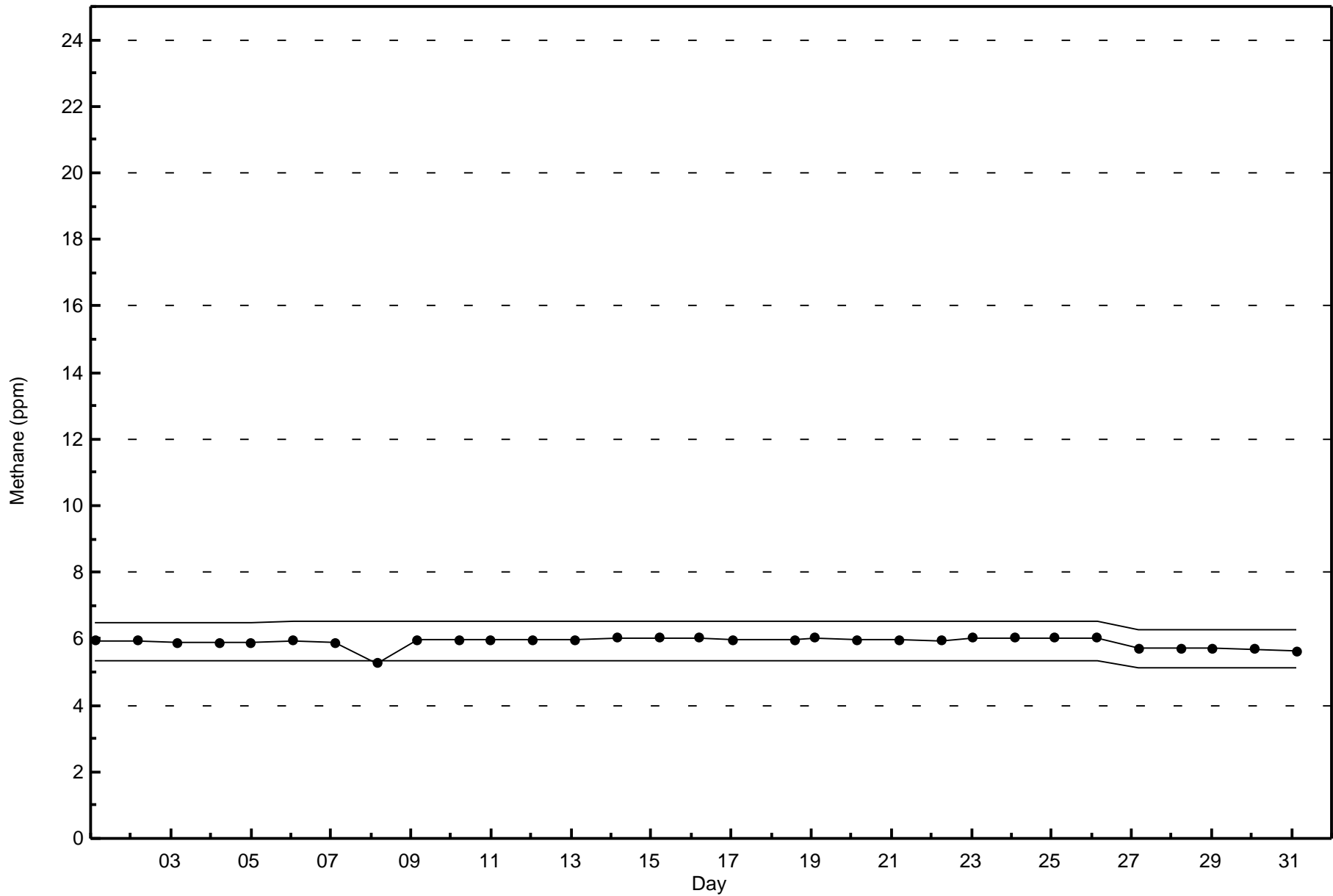
**Methane (CH₄) - ppm
Athabasca Valley - July 2016**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	85	14	12	9	16	16	84	35	29	24	46	61	25	20	33	144	653
2.1 - 3.0	3	0	0	1	1	3	7	0	0	0	0	0	0	0	0	16	31
3.1 - 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	88	14	12	10	17	19	91	35	29	24	46	61	25	20	33	160	684

Total Number of Valid Hours: 684

Total Number of Hours: 744







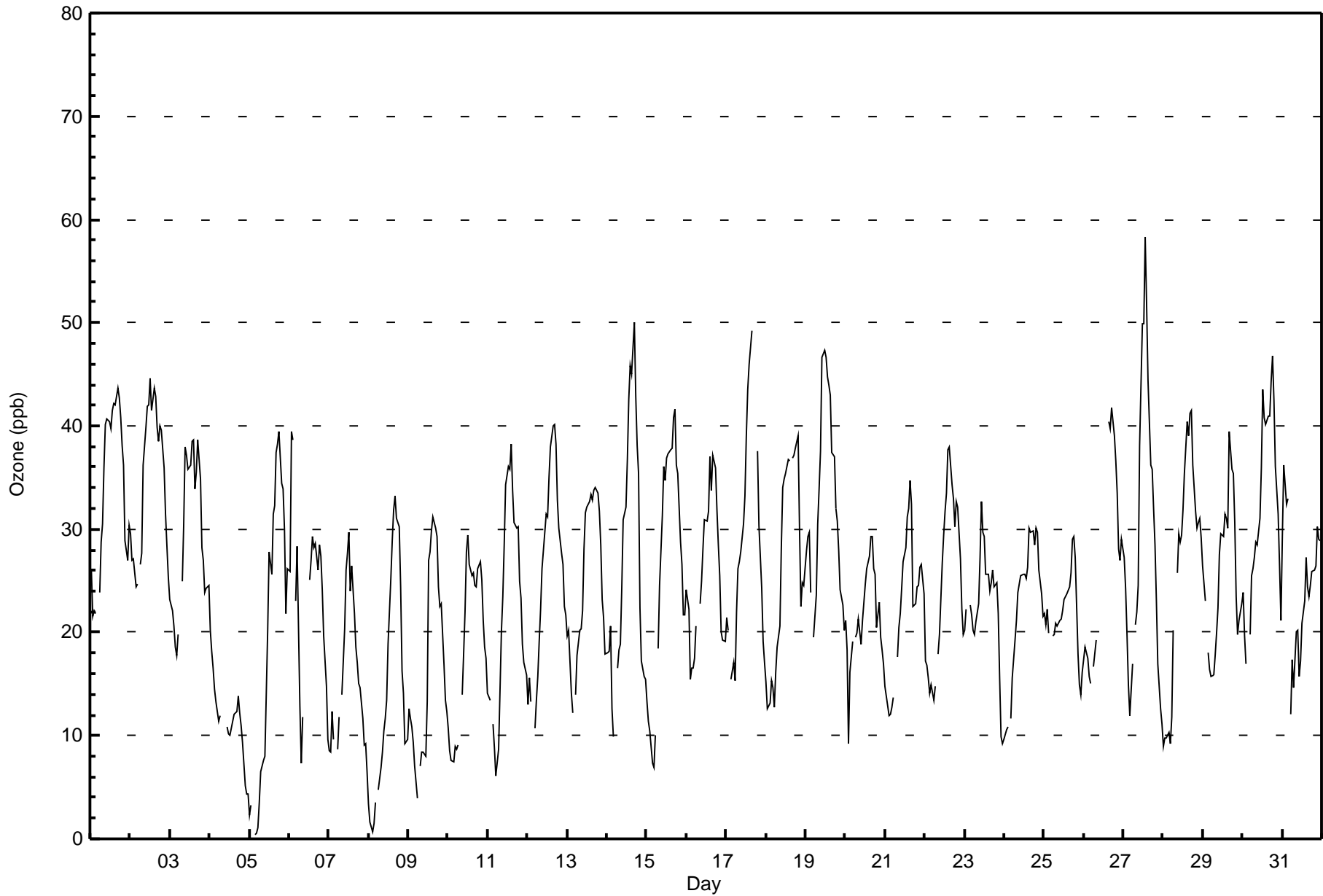
Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O₃) - ppb

Athabasca Valley - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																																							
Maximum Value: 58 ppb on Jul 27 14:00										Maximum Daily Average: 34.7 ppb on Jul 2										Hours of Data: 698																													
Minimum Value: 0 ppb on Jul 5 04:00										Minimum Daily Average: 11.6 ppb on Jul 4										Hours of Missing Data: 46																													
Maximum Diurnal Average: 34.2 ppb at hour 15										Minimum Diurnal Average: 13.4 ppb at hour 5										Hours of Calibration: 34																													
Monthly Average: 24.5 ppb										Percentiles: P ₁ = 3 P ₁₀ = 11 Q ₁ = 17 Median = 24 Q ₃ = 31 P ₉₀ = 38 P ₉₉ = 46										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-Jul	26	22	22	22	Z	24	29	31	36	40	41	40	40	42	42	42	44	43	41	38	36	29	27	30	34.1	44																							
2-Jul	30	27	27	24	25	Z	27	28	36	40	42	42	45	42	44	43	40	38	40	40	36	31	28	25	34.7	45																							
3-Jul	23	22	21	19	18	20	Z	25	30	38	37	36	36	39	39	34	36	39	35	28	27	24	24	25	29.2	39																							
4-Jul	20	18	17	15	13	11	12	Z	12	M	11	10	10	11	11	12	12	14	12	11	9	5	4	4	11.6	20																							
5-Jul	2	3	Z	0	0	1	3	6	8	8	14	20	28	26	31	32	37	38	39	34	34	30	22	26	19.4	39																							
6-Jul	26	39	39	Z	23	28	13	7	12	C	C	C	25	27	29	28	29	26	28	27	24	20	15	10	23.8	39																							
7-Jul	9	8	12	10	Z	9	12	M	14	20	26	28	30	24	26	22	19	17	15	15	12	9	9	7	16.0	30																							
8-Jul	3	2	1	1	3	Z	5	7	8	10	12	13	19	25	29	32	33	31	30	24	16	14	9	10	14.7	33																							
9-Jul	13	12	11	9	7	4	Z	7	8	8	8	13	27	28	30	31	30	29	24	22	23	17	13	12	16.9	31																							
10-Jul	11	9	8	7	9	9	9	Z	14	18	22	28	29	27	26	26	24	24	26	27	25	21	19	17	18.9	29																							
11-Jul	14	13	Z	11	9	6	9	14	20	23	28	34	36	36	38	34	31	30	30	25	23	19	17	16	22.5	38																							
12-Jul	13	16	13	Z	11	13	16	19	22	26	30	31	31	35	38	40	40	38	33	30	28	27	23	22	25.8	40																							
13-Jul	20	20	14	12	Z	14	18	20	20	22	28	32	32	33	33	33	34	34	33	32	28	23	21	18	25.0	34																							
14-Jul	18	18	21	13	10	Z	16	18	19	24	31	32	37	43	46	45	50	43	38	35	22	17	16	15	27.3	50																							
15-Jul	13	11	10	7	7	10	Z	18	25	31	36	35	37	37	38	38	41	42	36	35	29	27	22	22	26.4	42																							
16-Jul	24	22	15	17	17	18	21	Z	23	25	28	31	31	32	37	34	37	36	32	29	26	20	19	19	25.7	37																							
17-Jul	21	20	Z	16	17	15	22	26	27	28	31	33	39	44	46	49	M	M	M	38	30	24	19	17	28.1	49																							
18-Jul	15	13	13	15	15	13	16	19	21	28	34	35	35	37	37	Z	37	37	38	39	30	23	25	25	26.0	39																							
19-Jul	28	29	30	24	Z	20	24	30	34	38	47	47	47	45	44	43	37	37	32	31	28	24	23	20	33.1	47																							
20-Jul	21	18	9	16	19	Z	20	20	21	19	21	23	25	26	27	29	29	26	26	20	23	20	18	17	21.5	29																							
21-Jul	15	13	12	12	13	14	Z	18	20	22	24	27	28	31	32	35	32	23	23	24	25	26	27	24	22.5	35																							
22-Jul	17	17	16	14	15	13	15	Z	18	20	27	29	32	33	38	38	34	33	30	33	32	27	22	20	24.9	38																							
23-Jul	20	22	Z	23	22	20	20	21	23	27	33	30	29	26	26	24	25	26	24	25	22	16	10	9	22.7	33																							
24-Jul	10	11	11	Z	12	16	19	21	24	25	25	26	26	25	26	30	30	30	28	30	30	26	24	22	22.8	30																							
25-Jul	22	21	22	20	Z	20	20	21	21	21	21	22	23	23	24	24	26	29	29	27	18	15	14	16	21.7	29																							
26-Jul	17	19	17	16	15	Z	17	19	M	M	M	M	M	M	M	M	40	40	42	39	37	33	28	27	29	--	42																						
27-Jul	27	24	20	15	12	17	Z	21	22	24	38	50	50	58	52	44	36	36	32	29	23	17	13	11	29.2	58																							
28-Jul	9	10	10	10	9	12	20	Z	26	30	29	29	32	35	40	39	41	41	36	32	30	31	31	29	26.6	41																							
29-Jul	26	23	Z	18	16	16	16	18	20	22	28	30	29	31	31	30	39	36	35	31	23	20	21	23	25.4	39																							
30-Jul	24	20	17	Z	20	25	26	27	29	28	31	36	44	41	40	41	41	44	47	42	36	31	26	21	32.1	47																							
31-Jul	29	36	32	33	Z	12	17	15	20	20	16	17	21	23	27	24	24	25	26	26	26	30	29	29	24.3	36																							
																								18.3	18.0	16.9	14.8	13.4	14.6	16.9	19.1	21.1	24.5	27.5	29.7	31.7	32.8	34.2	33.9	33.6	32.9	31.3	29.6	26.1	22.3	19.9	19.0	Diurnal Average	
																								30	39	39	33	25	28	29	31	36	40	47	50	50	58	52	49	50	44	47	42	36	31	31	30	Diurnal Maximum	
Z - zerospan C - Calibration M - Maintenance																																																	
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb																																																	





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ozone (O₃) - ppb
Athabasca Valley - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	252	36.10	36.10
21 - 50	444	63.61	99.71
51 - 82	2	0.29	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 698

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Ozone (O₃) - ppb
Athabasca Valley - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	33	4	6	2	6	11	45	14	6	6	15	18	4	6	10	66	252
21 - 50	55	9	7	8	10	7	46	24	22	18	34	38	21	18	22	105	444
51 - 82	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	89	13	13	10	16	18	91	38	28	24	49	56	25	24	32	172	698

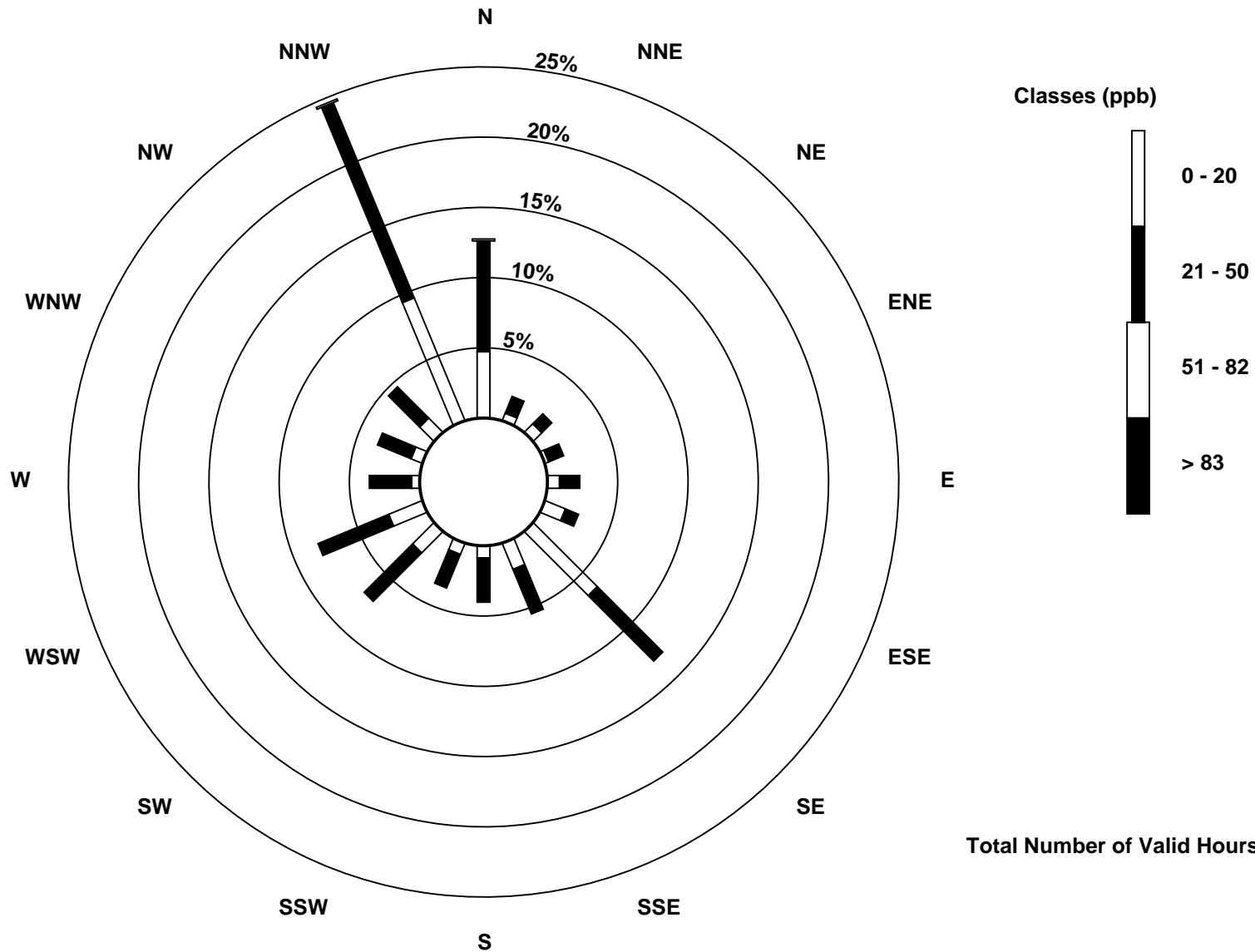
Total Number of Valid Hours: 698

Total Number of Hours: 744

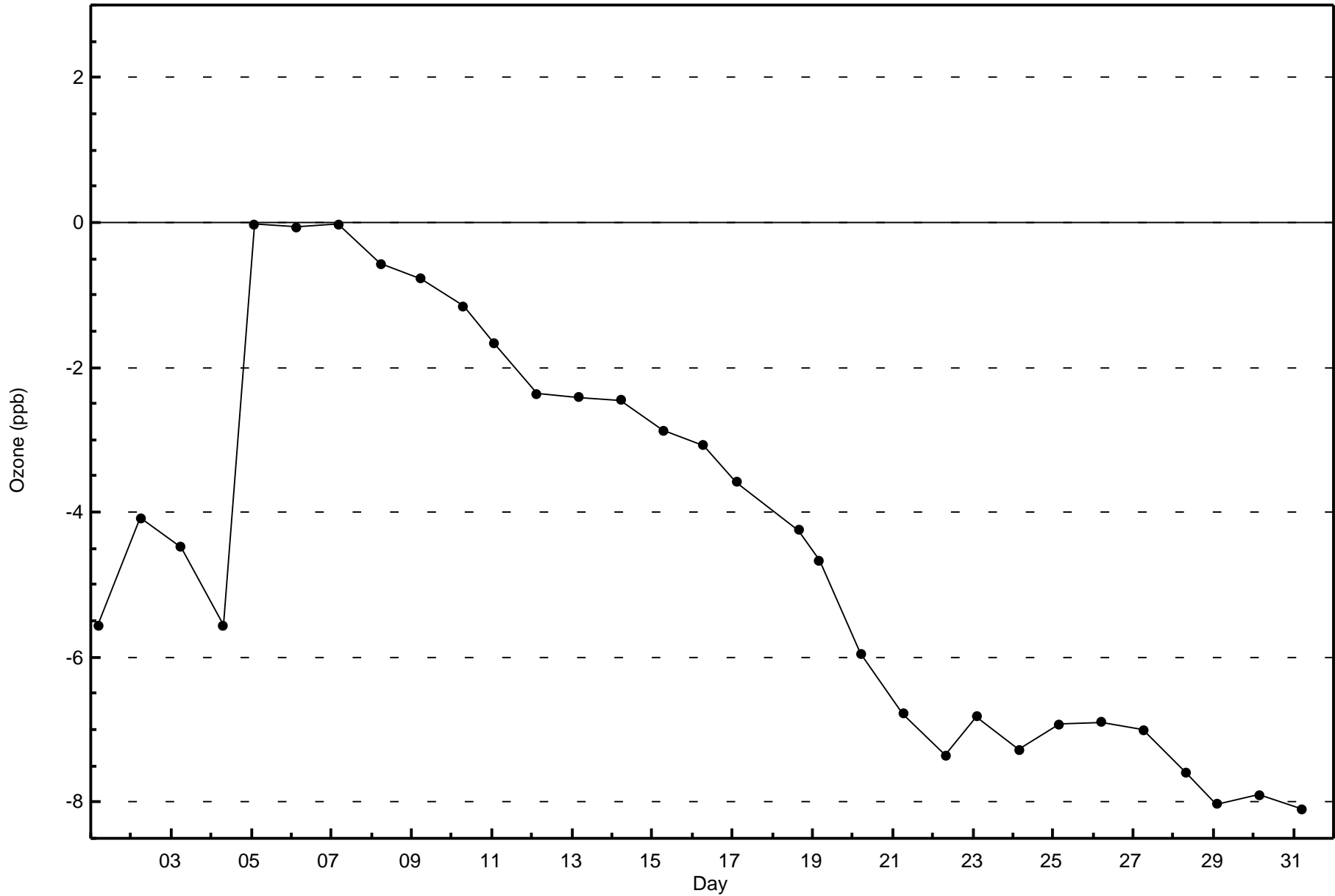


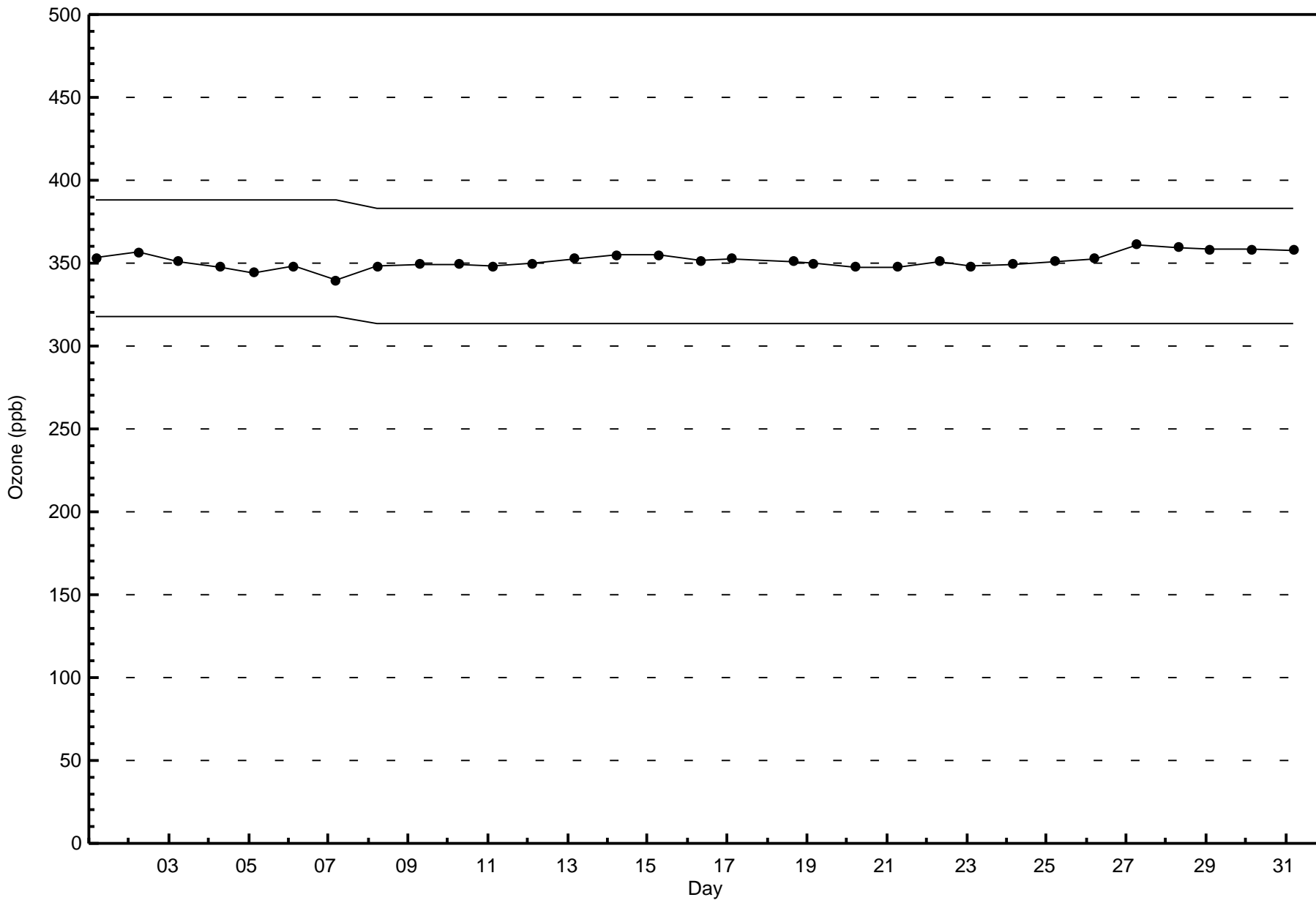
Wood Buffalo Environmental Association
Wind Rose Jul 2016

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



Total Number of Valid Hours: 698







Wood Buffalo Environmental Association
Summary of Hour Averages

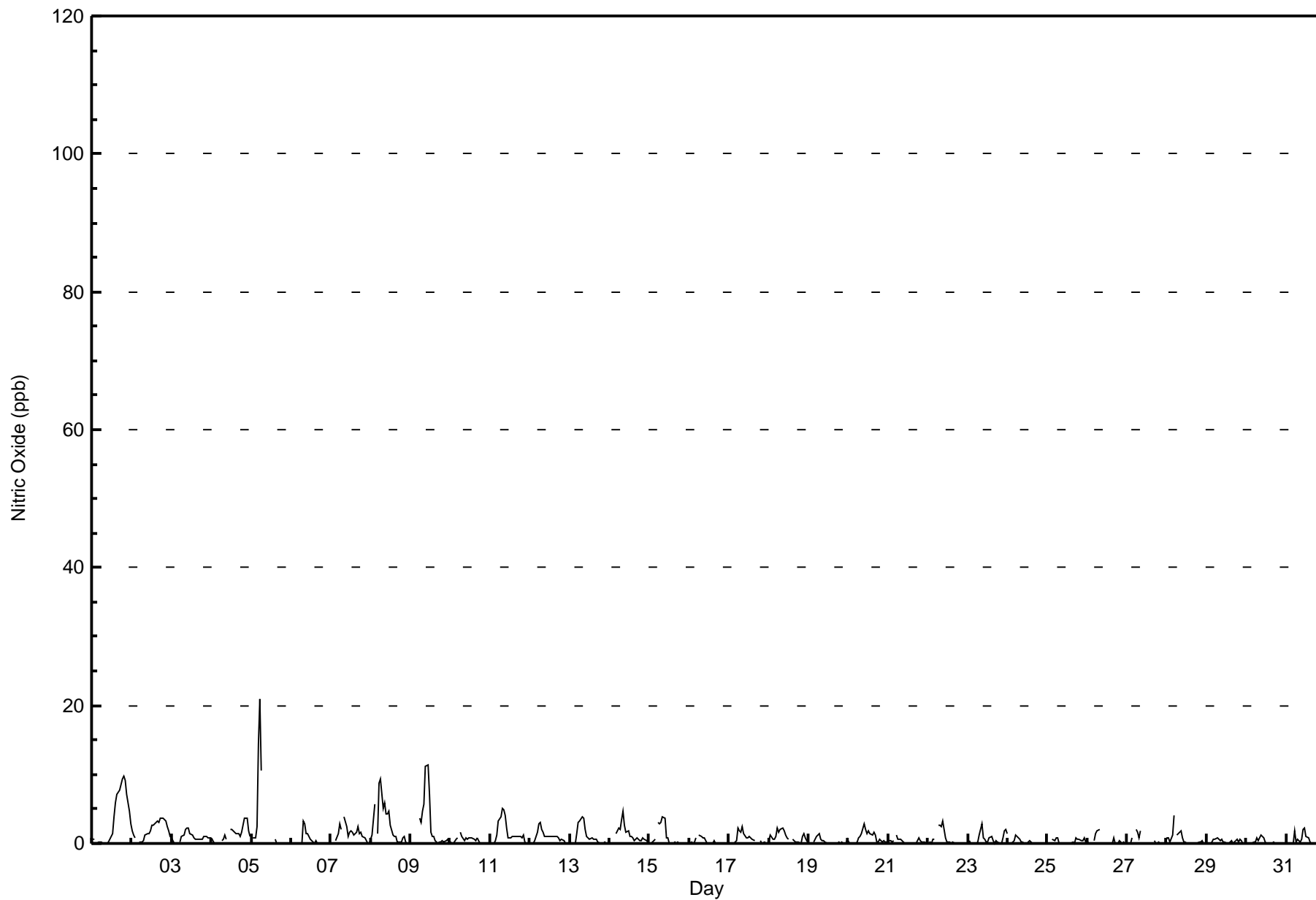
Nitric Oxide (NO) - ppb
Athabasca Valley - July 2016

Maximum Value: 21 ppb on Jul 5 06:00		Maximum Daily Average: 3.5 ppb on Jul 1		Hours in Service: 744																																													
Minimum Value: 0 ppb on Jul 1 04:00		Minimum Daily Average: 0.2 ppb on Jul 30		Hours of Data: 688																																													
Maximum Diurnal Average: 2.6 ppb at hour 6		Minimum Diurnal Average: 0.3 ppb at hour 2		Hours of Missing Data: 56																																													
Monthly Average: 1.0 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 3 P ₉₉ = 9		Hours of Calibration: 45																																													
				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-Jul	1	1	Z	0	0	0	0	0	0	0	0	1	1	4	6	7	8	8	9	10	9	7	5	3	3.5	10																							
2-Jul	2	1	1	Z	0	0	0	0	1	1	1	2	3	3	3	3	3	4	4	4	3	2	2	1	2.0	4																							
3-Jul	1	0	0	0	Z	0	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	2																							
4-Jul	1	0	0	0	0	Z	0	1	1	1	1	M	2	2	2	2	1	1	1	2	3	4	4	2	1.3	4																							
5-Jul	Z	1	1	3	15	21	11	C	C	C	C	C	C	C	1	0	0	0	0	0	0	0	0	0	--	21																							
6-Jul	0	Z	0	0	0	0	0	3	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	3																							
7-Jul	0	0	Z	0	1	3	2	M	4	2	1	2	2	2	1	2	2	1	2	1	1	0	0	0	1.4	4																							
8-Jul	1	1	6	Z	1	9	9	5	6	4	4	5	3	1	1	1	0	0	0	1	1	0	0	0	2.6	9																							
9-Jul	0	0	0	0	Z	4	3	5	6	11	11	7	2	1	1	0	0	0	0	0	0	0	1	0	2.3	11																							
10-Jul	0	0	0	1	1	Z	2	1	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0.5	2																							
11-Jul	Z	0	0	0	1	3	4	5	5	4	2	1	1	1	1	1	1	1	1	1	1	1	0	0	1.5	5																							
12-Jul	0	Z	0	0	2	3	3	2	2	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0.9	3																							
13-Jul	0	0	Z	0	1	3	3	4	4	2	1	1	1	1	1	1	1	0	0	0	0	0	0	0	1.0	4																							
14-Jul	0	0	0	Z	1	2	2	3	5	3	2	2	1	1	1	0	1	1	0	0	1	1	0	0	1.2	5																							
15-Jul	0	0	0	1	Z	3	3	3	4	4	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.9	4																							
16-Jul	0	0	0	0	1	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1																							
17-Jul	Z	0	0	0	0	2	2	2	2	1	1	1	1	1	1	0	M	M	M	0	0	0	0	0	0.7	2																							
18-Jul	0	1	1	1	1	2	2	2	2	2	1	1	1	Z	1	0	0	0	0	0	0	1	2	1	0.9	2																							
19-Jul	0	0	Z	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.3	1																							
20-Jul	0	0	0	Z	0	0	1	1	1	3	2	1	2	1	1	2	1	0	0	1	0	0	0	0	0.8	3																							
21-Jul	0	0	0	0	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.3	1																							
22-Jul	0	0	0	1	1	Z	3	3	3	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	3																							
23-Jul	Z	0	0	0	0	0	0	1	3	1	1	0	0	1	1	0	0	0	0	0	0	1	2	2	0.6	3																							
24-Jul	2	Z	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	2																							
25-Jul	0	0	Z	1	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	1	0	0.3	1																							
26-Jul	0	0	0	Z	0	2	2	2	M	M	M	M	M	M	0	0	1	0	0	0	0	0	0	0	--	2																							
27-Jul	0	0	0	1	Z	2	2	1	2	C	C	C	C	C	C	C	0	0	0	0	0	0	0	0	--	2																							
28-Jul	1	1	0	1	4	Z	1	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	4																							
29-Jul	Z	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0.3	1																							
30-Jul	0	Z	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1																							
31-Jul	0	0	Z	0	0	2	0	1	0	1	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0.4	2																							
																								0.3	0.3	0.4	0.4	1.3	2.6	2.0	1.8	2.1	1.9	1.4	1.2	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.8	0.8	0.7	0.5	0.3	Diurnal Average	
																								2	1	6	3	15	21	11	5	6	11	11	7	3	4	6	7	8	8	9	10	9	7	5	3	Diurnal Maximum	
Z - zerospan			C - Calibration			M - Maintenance																																											



Wood Buffalo Environmental Association
Hourly Averages

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





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	687	99.85	99.85
21 - 40	1	0.15	100.00
11 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 688

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

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

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	87	15	12	10	17	19	91	35	29	24	47	61	25	20	33	162	687
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	87	15	12	10	17	19	91	35	29	24	47	61	25	20	33	163	688

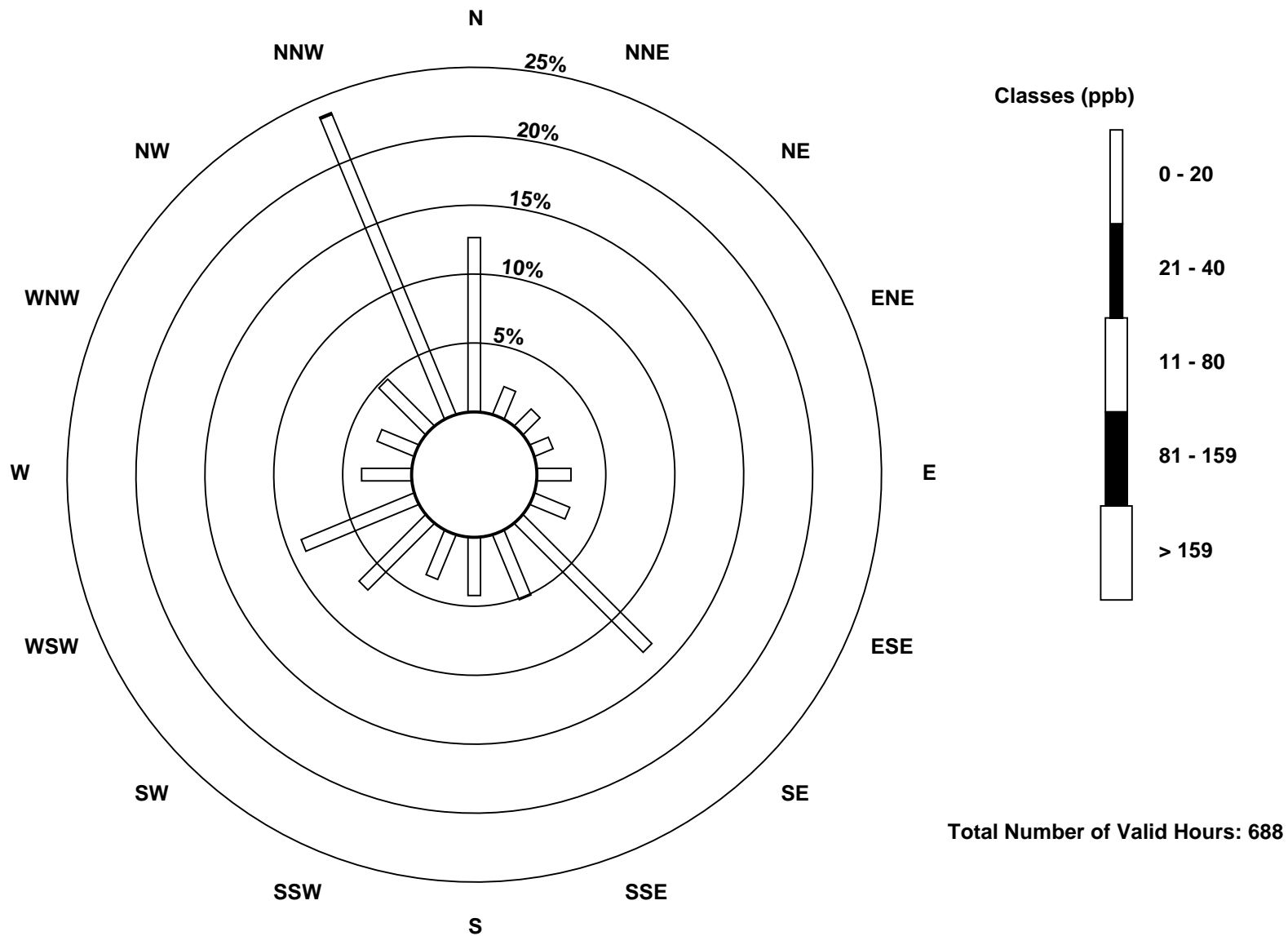
Total Number of Valid Hours: 688

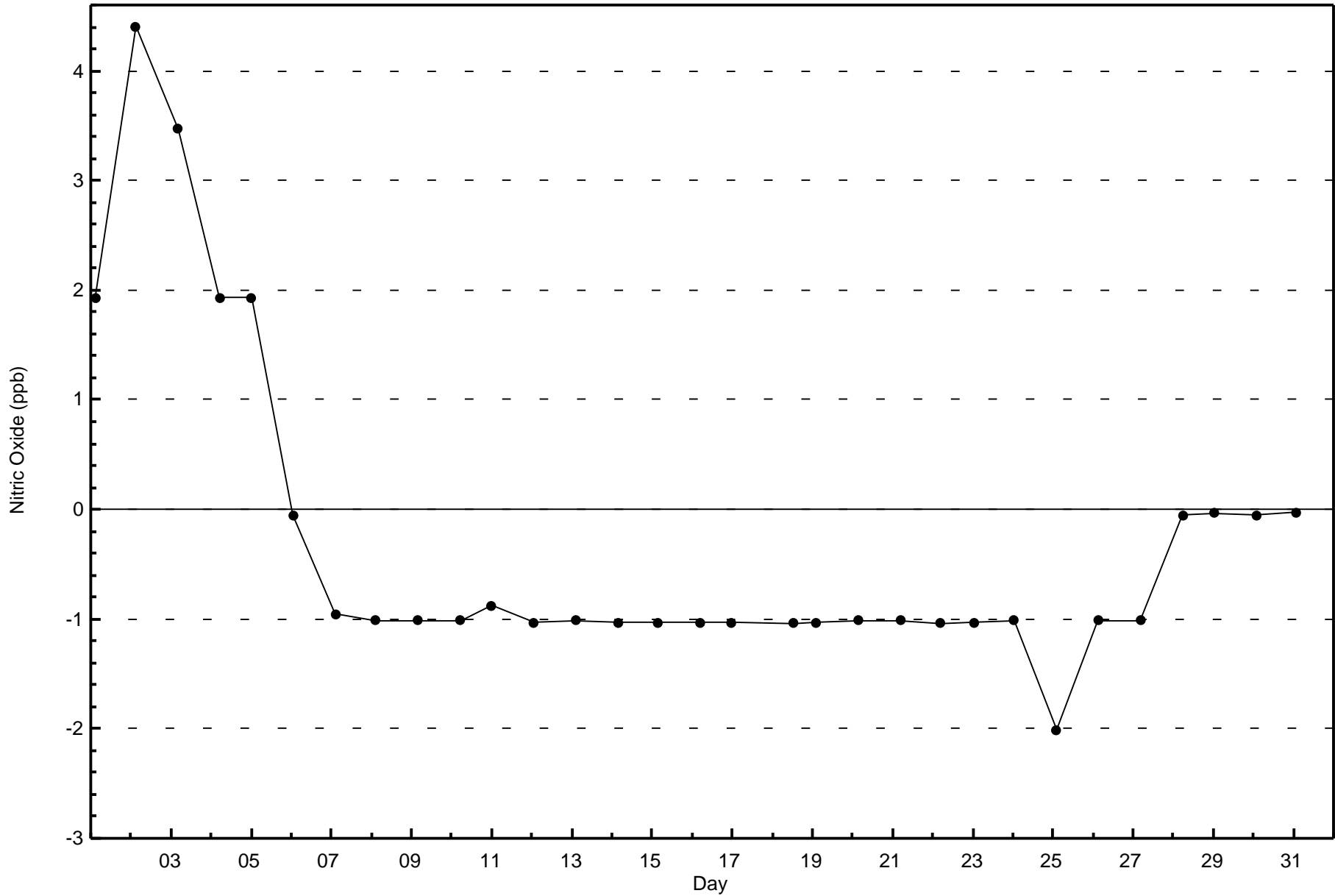
Total Number of Hours: 744

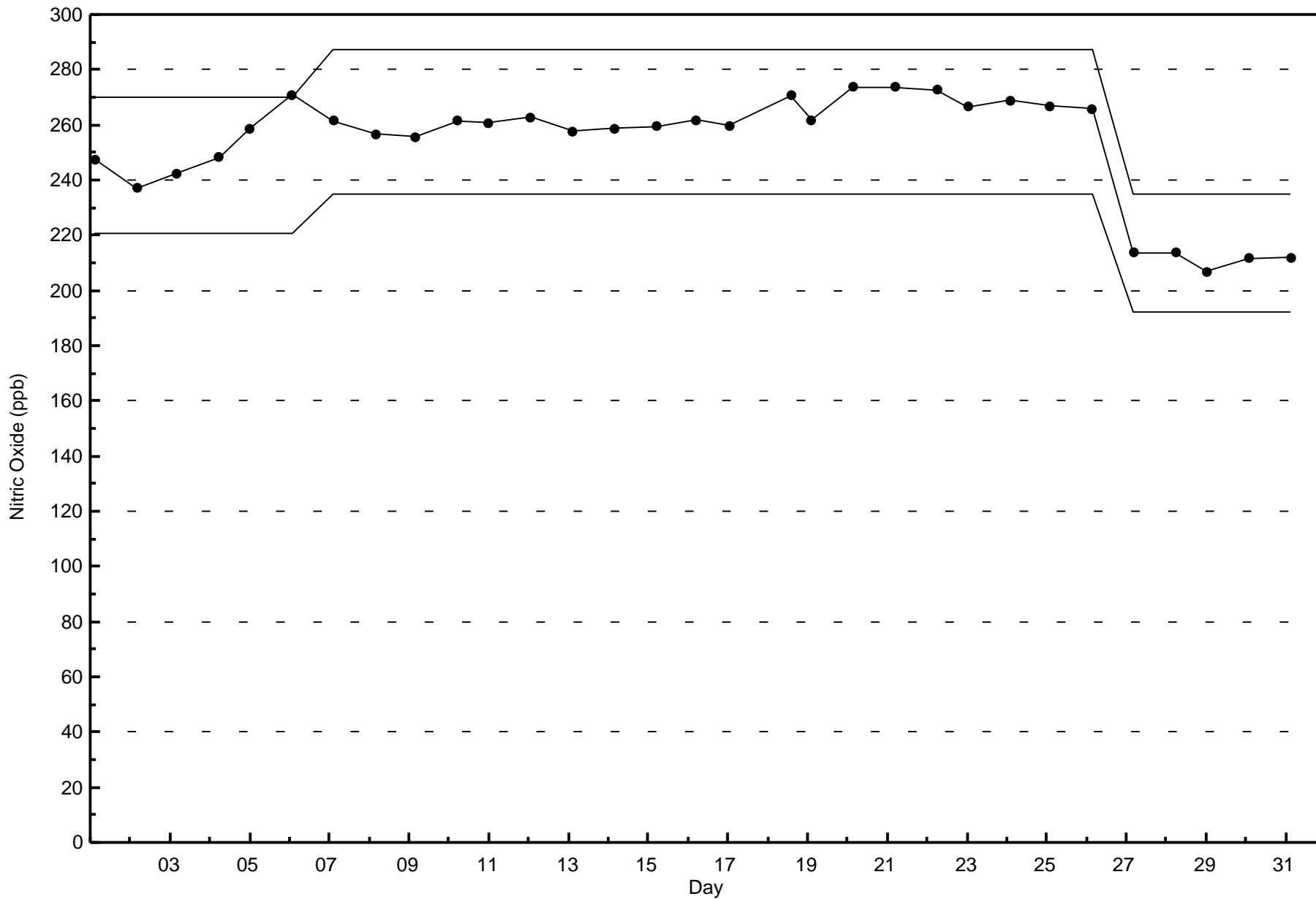


Wood Buffalo Environmental Association
Wind Rose Jul 2016

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









Wood Buffalo Environmental Association
Summary of Hour Averages

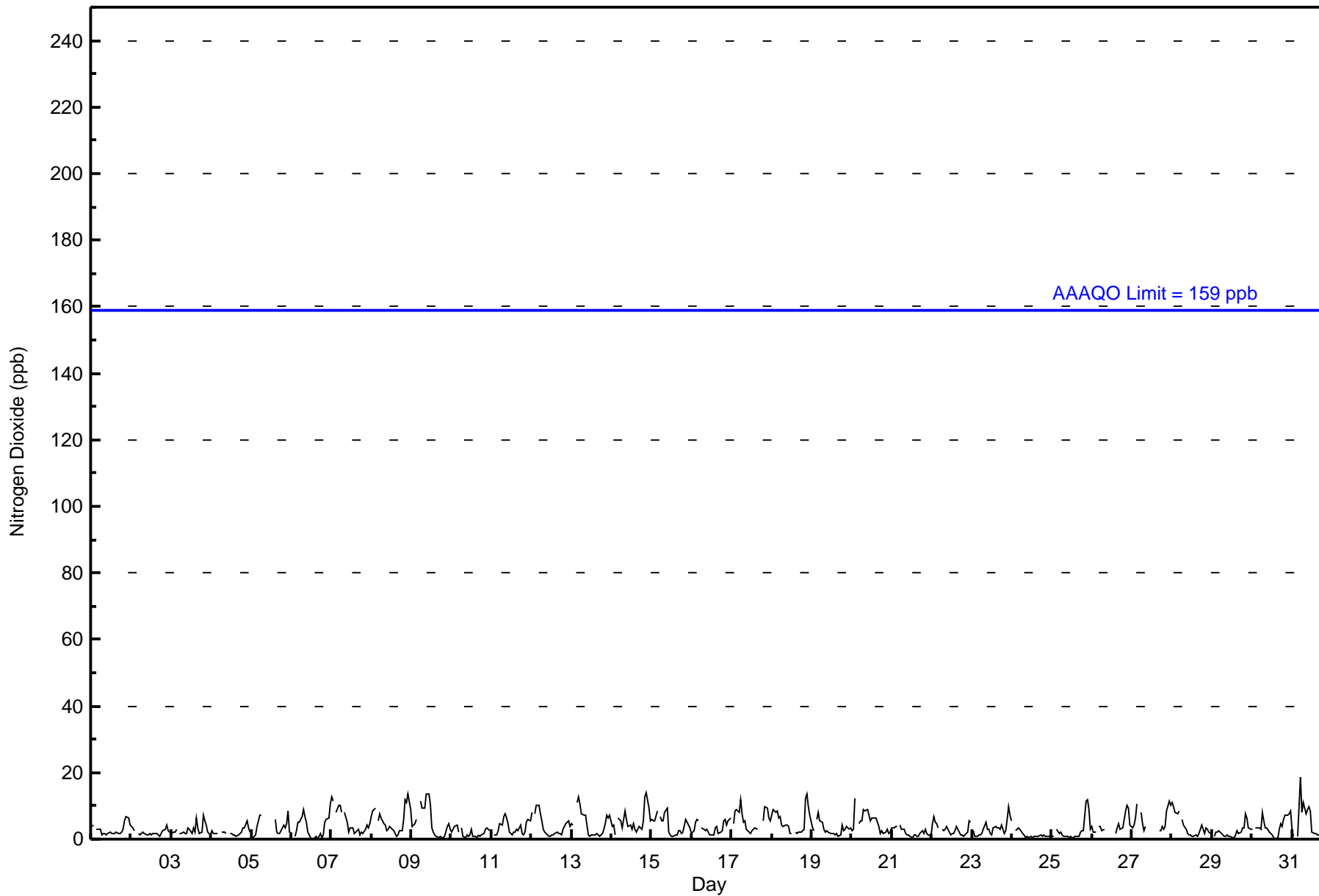
Nitrogen Dioxide (NO₂) - ppb
Athabasca Valley - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0														Hours in Service: 744													
Maximum Value: 19 ppb on Jul 31 06:00														Maximum Daily Average: 5.7 ppb on Jul 17													
Minimum Value: 0 ppb on Jul 6 13:00														Minimum Daily Average: 1.5 ppb on Jul 24													
Maximum Diurnal Average: 6.1 ppb at hour 6														Minimum Diurnal Average: 1.8 ppb at hour 13													
Monthly Average: 3.7 ppb														Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 2 Median = 3 O ₃ = 5 P ₉₀ = 8 P ₉₉ = 13													
														Hours of Data: 688													
														Hours of Missing Data: 56													
														Hours of Calibration: 45													
														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-Jul	4	4	Z	3	3	3	1	2	2	1	2	2	2	2	2	2	2	2	2	3	6	7	6	4	2.8	7	
2-Jul	4	3	3	Z	2	1	2	2	2	1	1	2	1	2	2	2	1	1	2	3	3	4	3	2	2.0	4	
3-Jul	2	2	2	3	Z	2	2	2	2	2	3	2	2	4	2	6	4	2	2	7	5	4	2	1	2.9	7	
4-Jul	2	2	2	2	2	Z	2	2	2	2	M	2	2	1	1	1	1	2	2	3	3	5	4	2	2.1	5	
5-Jul	Z	1	1	4	6	7	7	C	C	C	C	C	C	C	6	2	2	2	3	4	4	5	9	2	--	9	
6-Jul	2	Z	1	2	5	5	7	9	7	5	2	1	0	0	1	1	0	2	0	1	5	6	7	10	3.4	10	
7-Jul	13	12	Z	8	10	10	8	M	8	5	2	4	4	4	2	3	3	1	2	2	3	4	4	5	5.2	13	
8-Jul	7	8	9	Z	5	8	7	5	4	2	3	4	4	2	2	1	1	2	3	6	12	11	14	9	5.6	14	
9-Jul	4	4	5	6	Z	11	9	10	9	13	14	10	3	2	1	1	1	1	1	1	1	4	5	3	5.1	14	
10-Jul	2	3	4	4	2	Z	3	1	1	1	1	1	3	1	1	1	1	1	1	2	3	4	3	3	2.0	4	
11-Jul	Z	1	1	1	3	5	4	7	8	6	5	2	1	2	2	3	3	4	2	1	2	5	6	6	3.5	8	
12-Jul	8	Z	8	10	10	8	5	3	2	2	1	1	1	2	2	2	2	2	1	3	5	5	6	4	3.9	10	
13-Jul	5	4	Z	11	13	11	8	7	7	4	1	1	1	1	2	1	1	2	3	5	7	7	7	7	4.8	13	
14-Jul	4	4	1	Z	6	6	3	6	8	6	4	4	3	5	3	2	4	3	3	6	13	14	9	6	5.3	14	
15-Jul	6	5	5	9	Z	7	5	5	8	10	2	1	1	1	1	1	3	3	2	2	6	5	4	3	4.1	10	
16-Jul	2	3	5	6	5	Z	4	3	3	3	2	1	1	1	3	4	2	2	3	6	6	4	6	6	3.5	6	
17-Jul	Z	5	9	9	8	12	8	5	6	3	2	2	3	3	3	3	M	M	M	5	10	9	7	5	5.7	12	
18-Jul	7	9	8	8	7	7	4	4	4	4	4	2	2	Z	2	2	2	2	2	3	12	14	10	7	5.5	14	
19-Jul	3	3	Z	6	8	6	5	3	2	3	2	2	2	2	1	2	1	1	4	3	3	4	3	4	3.1	8	
20-Jul	3	3	12	Z	5	6	6	9	8	9	7	6	6	6	6	5	4	2	2	2	2	3	2	2	5.0	12	
21-Jul	3	4	4	4	Z	4	3	3	2	1	1	1	1	1	1	1	1	2	3	2	3	2	1	1	2.0	4	
22-Jul	5	7	5	5	3	Z	3	3	3	4	2	1	2	2	2	4	2	1	1	1	1	2	5	5	3.0	7	
23-Jul	Z	3	1	1	1	1	2	3	5	3	3	2	1	4	4	3	4	3	4	2	3	6	10	7	3.2	10	
24-Jul	6	Z	2	3	3	3	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.5	6	
25-Jul	1	1	Z	3	2	2	1	1	1	1	1	1	1	0	1	1	1	2	3	3	12	12	9	3	2.6	12	
26-Jul	4	2	2	Z	4	4	3	3	M	M	M	M	M	M	2	3	5	3	3	6	9	10	9	4	--	10	
27-Jul	3	4	6	11	Z	8	5	2	4	C	C	C	C	C	C	C	C	3	3	4	3	4	9	11	10	--	11
28-Jul	11	10	8	8	8	Z	6	4	3	2	1	1	1	1	1	1	2	3	4	2	3	3	2	2	3.8	11	
29-Jul	Z	1	2	2	3	2	1	1	1	1	1	1	0	1	1	2	2	2	3	3	8	6	3	3	2.2	8	
30-Jul	3	Z	3	4	4	3	8	6	4	3	2	2	1	0	0	0	3	5	4	6	7	7	8	9	3.9	9	
31-Jul	3	1	Z	1	10	19	8	11	8	9	10	8	2	2	2	1	1	2	2	5	9	2	1	1	5.0	19	
4.4 3.9 4.4 5.1 5.3 6.1 4.5 4.2 4.2 3.8 3.0 2.4 1.8 1.9 2.0 2.1 2.0 2.0 2.0 2.3 3.1 5.4 6.0 5.6 4.4																								Diurnal Average			
13 12 12 11 13 19 9 11 9 13 14 10 6 6 6 6 5 5 5 4 7 13 14 14 10																								Diurnal Maximum			
Z - zerospan C - Calibration M - Maintenance																											
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb																											



Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	688	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: 688

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

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

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	87	15	12	10	17	19	91	35	29	24	47	61	25	20	33	163	688
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	87	15	12	10	17	19	91	35	29	24	47	61	25	20	33	163	688

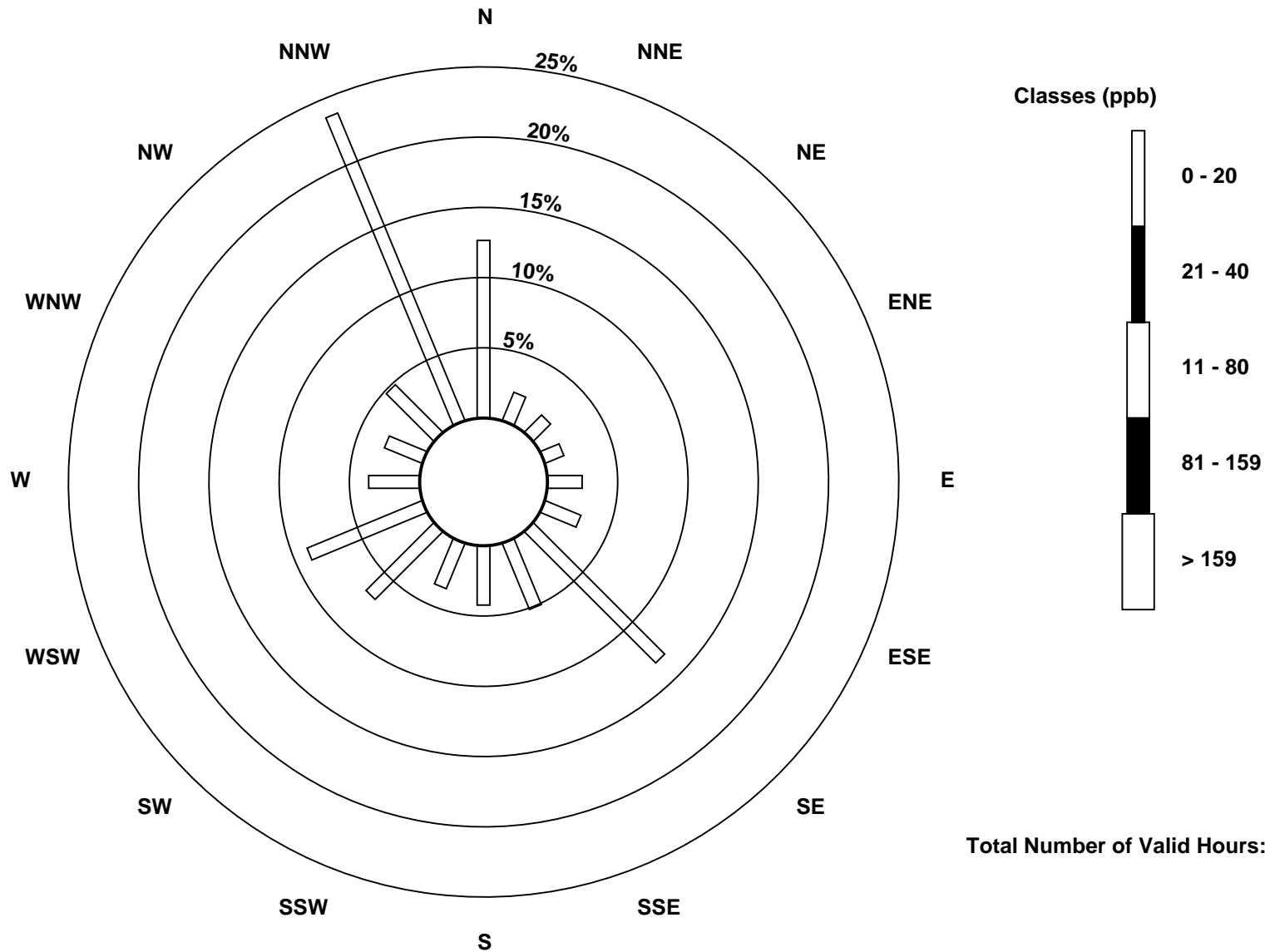
Total Number of Valid Hours: 688

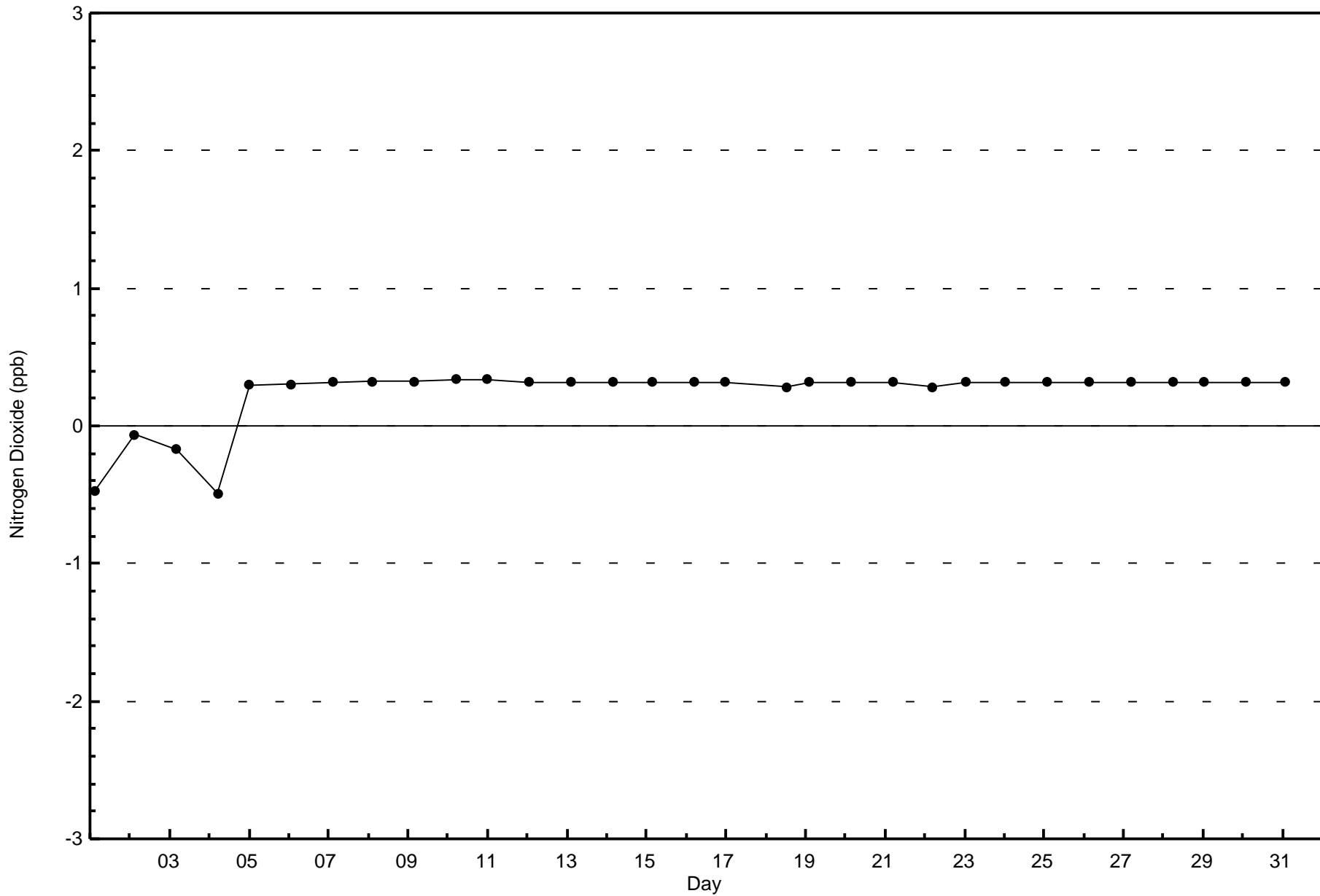
Total Number of Hours: 744

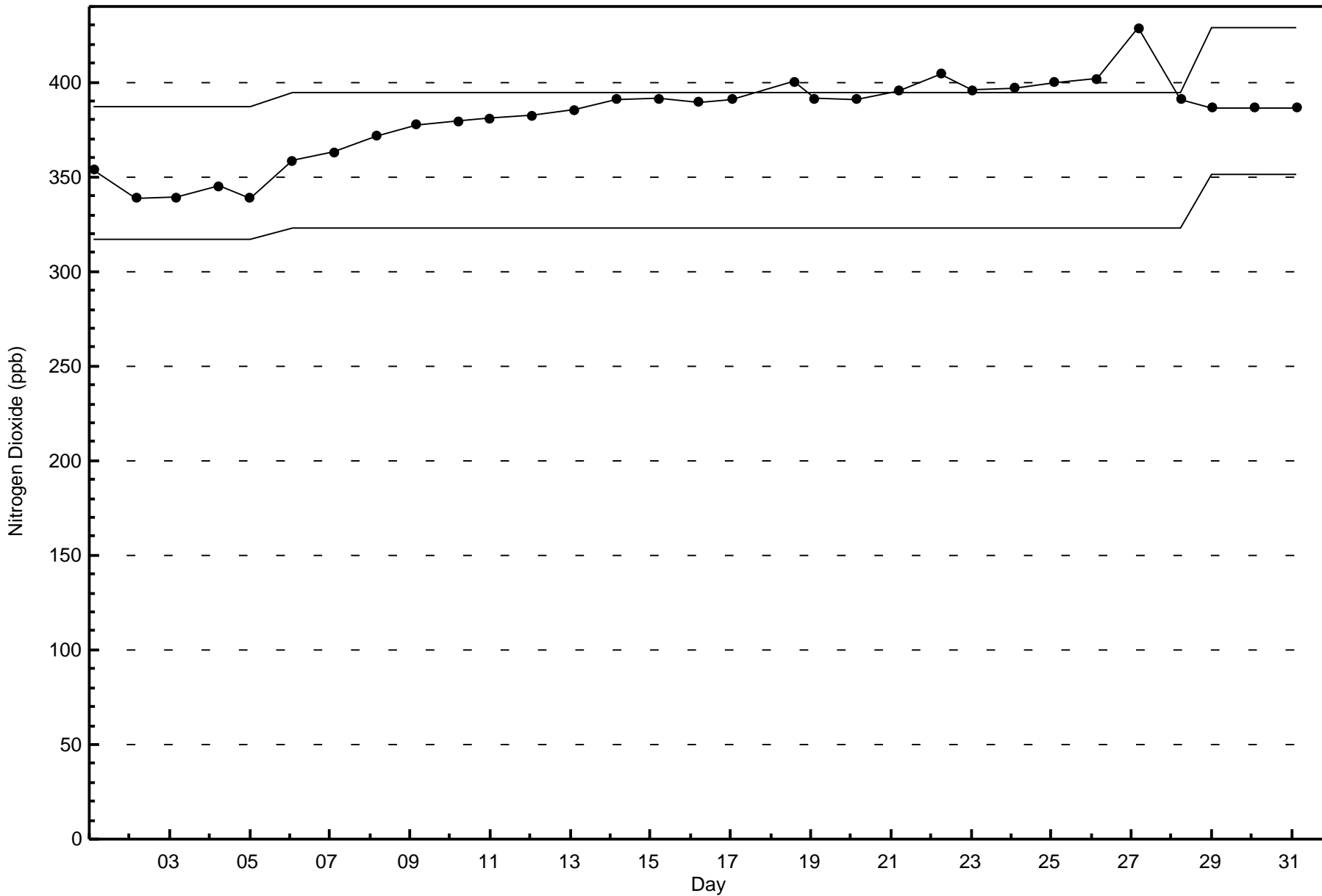


Wood Buffalo Environmental Association
Wind Rose Jul 2016

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









Wood Buffalo Environmental Association
Summary of Hour Averages

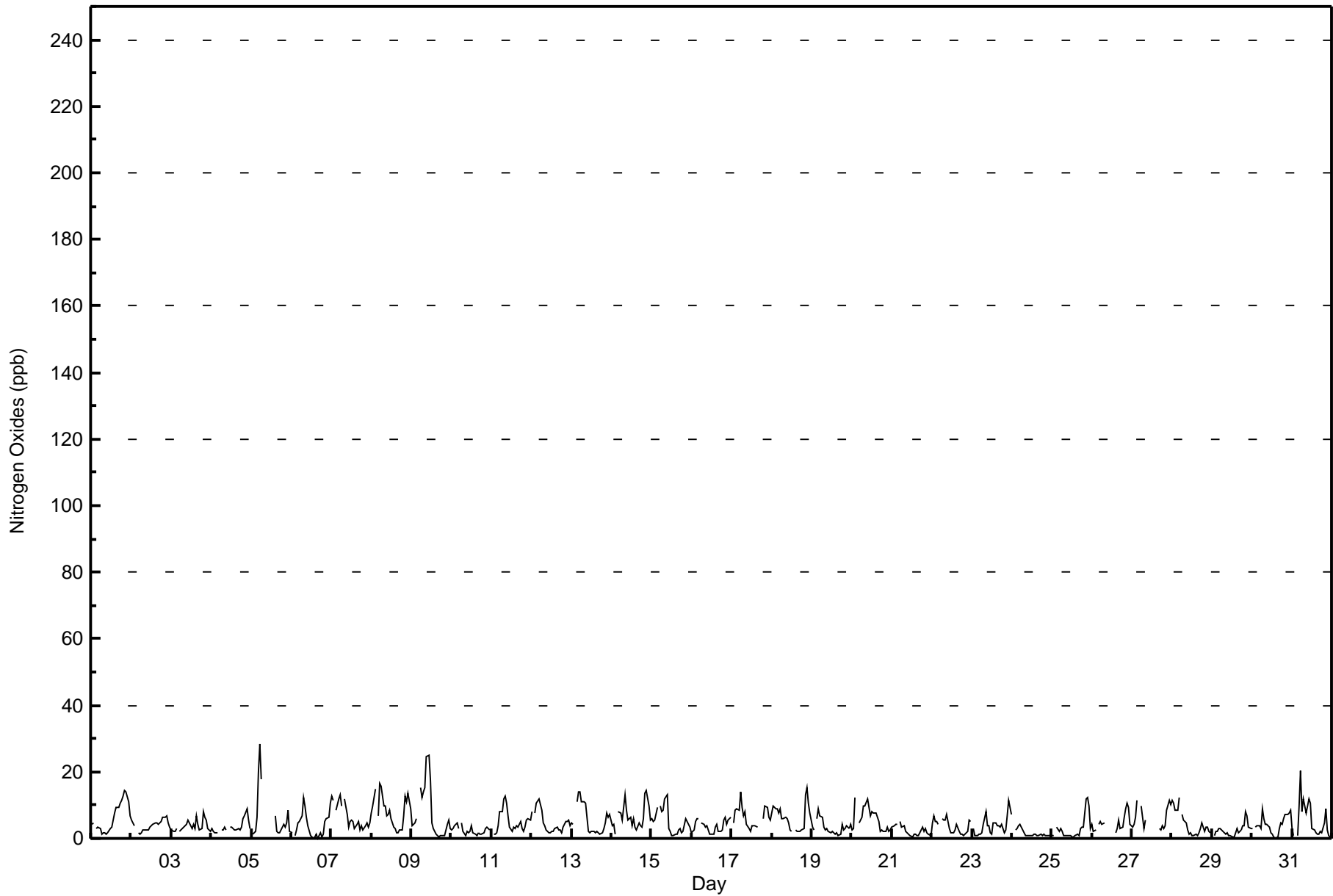
Nitrogen Oxides (NO_x) - ppb
Athabasca Valley - July 2016

Maximum Value: 28 ppb on Jul 5 06:00 Minimum Value: 0 ppb on Jul 6 17:00 Maximum Diurnal Average: 8.6 ppb at hour 6 Monthly Average: 4.7 ppb		Maximum Daily Average: 8.2 ppb on Jul 8 Minimum Daily Average: 1.8 ppb on Jul 24 Minimum Diurnal Average: 2.6 ppb at hour 13 Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 2 Median = 4 Q ₃ = 6 P ₉₀ = 10 P ₉₉ = 17		Hours in Service: 744 Hours of Data: 688 Hours of Missing Data: 56 Hours of Calibration: 45 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-Jul	4	5	Z	3	3	3	1	2	2	1	2	3	3	5	8	9	9	10	11	13	15	14	11	7	6.3	15	
2-Jul	6	5	4	Z	2	1	2	2	3	3	3	3	4	4	5	5	4	5	5	7	6	7	5	3	4.0	7	
3-Jul	2	2	2	3	Z	2	2	3	4	4	6	4	3	4	3	7	4	2	3	8	6	5	3	2	3.8	8	
4-Jul	3	2	2	2	2	Z	2	3	3	2	2	M	4	4	3	3	2	3	4	6	7	9	5	3	3.4	9	
5-Jul	Z	1	2	6	20	28	18	C	C	C	C	C	C	C	7	2	2	2	3	4	3	5	9	2	--	28	
6-Jul	2	Z	1	2	5	5	7	12	10	6	4	1	0	0	1	1	0	2	0	1	5	6	6	10	3.8	12	
7-Jul	13	12	Z	8	12	13	10	M	12	7	3	5	5	5	3	4	5	3	4	3	4	5	3	5	6.6	13	
8-Jul	7	10	15	Z	7	16	16	10	10	7	7	9	6	4	3	2	2	3	3	7	13	11	13	9	8.2	16	
9-Jul	4	4	5	6	Z	15	12	14	15	25	25	17	5	3	2	1	0	1	1	1	1	4	5	3	7.4	25	
10-Jul	2	3	4	5	3	Z	5	2	1	2	2	2	4	2	1	1	2	1	1	2	3	4	3	3	2.4	5	
11-Jul	Z	1	1	2	4	8	8	12	13	10	7	3	2	3	3	4	4	5	3	2	3	5	6	5	5.0	13	
12-Jul	8	Z	8	11	12	10	8	5	4	3	2	2	2	2	3	3	3	2	2	3	5	5	6	4	4.9	12	
13-Jul	5	4	Z	11	14	14	11	11	11	6	2	2	2	2	2	2	2	1	2	3	5	8	7	7	5.8	14	
14-Jul	4	4	1	Z	8	8	5	9	13	8	6	6	4	6	4	3	5	4	3	6	13	14	10	6	6.5	14	
15-Jul	6	5	6	9	Z	10	8	8	12	13	3	2	1	1	1	1	3	3	2	2	6	5	4	4	5.0	13	
16-Jul	2	3	5	6	6	Z	5	4	3	4	2	1	1	1	3	4	2	2	3	6	6	4	6	6	3.7	6	
17-Jul	Z	5	9	9	8	14	9	7	8	4	3	2	4	4	4	3	M	M	M	6	10	10	6	5	6.5	14	
18-Jul	8	10	9	9	8	9	6	6	7	6	5	3	2	Z	3	2	2	2	2	3	13	15	11	7	6.4	15	
19-Jul	4	3	Z	6	9	7	6	4	3	3	2	2	2	2	1	2	1	1	4	3	3	4	3	4	3.3	9	
20-Jul	3	3	12	Z	4	6	6	10	10	12	9	7	8	8	8	7	5	2	3	2	2	3	2	2	5.8	12	
21-Jul	4	4	4	4	Z	5	3	4	2	2	1	1	1	1	1	1	1	2	4	2	3	2	1	1	2.3	5	
22-Jul	5	7	5	5	4	Z	6	5	5	7	3	2	2	2	3	4	2	1	1	1	1	2	5	5	3.6	7	
23-Jul	Z	3	1	1	1	1	2	4	8	4	4	2	1	4	5	4	4	4	2	3	7	12	9	3.8	12		
24-Jul	7	Z	2	3	4	4	3	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.8	7	
25-Jul	1	1	Z	4	2	3	2	1	1	1	1	1	1	0	1	1	1	3	3	3	12	12	10	3	2.9	12	
26-Jul	4	2	2	Z	4	5	4	5	M	M	M	M	M	M	2	3	5	3	3	7	9	10	10	4	--	10	
27-Jul	3	4	6	12	Z	10	6	3	6	C	C	C	C	C	C	C	C	3	3	4	3	4	9	11	10	--	12
28-Jul	12	11	8	9	12	Z	7	5	5	3	1	2	1	1	1	1	2	3	5	2	4	3	2	2	4.4	12	
29-Jul	Z	1	2	2	3	3	2	2	1	2	1	1	1	1	2	3	2	2	4	4	8	7	3	3	2.5	8	
30-Jul	3	Z	3	4	4	3	9	6	4	4	3	2	1	0	0	0	3	4	4	6	7	7	8	9	4.2	9	
31-Jul	3	1	Z	1	10	20	8	12	8	10	12	11	3	3	2	1	1	2	2	5	9	2	1	1	5.5	20	
4.7 4.2 4.8 5.5 6.6 8.6 6.5 5.9 6.3 5.7 4.4 3.6 2.6 2.7 2.8 2.9 2.7 2.7 3.1 3.9 6.2 6.7 6.1 4.7 13 12 15 12 20 28 18 14 15 25 25 17 8 8 8 9 9 9 10 11 13 15 15 13 10																								Diurnal Average	Diurnal Maximum		
Z - zerospan C - Calibration M - Maintenance																											



Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	685	99.56	99.56
21 - 40	3	0.44	100.00
11 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 688

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

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

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	86	15	12	10	17	19	91	35	29	24	47	61	25	20	33	161	685
21 - 40	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	87	15	12	10	17	19	91	35	29	24	47	61	25	20	33	163	688

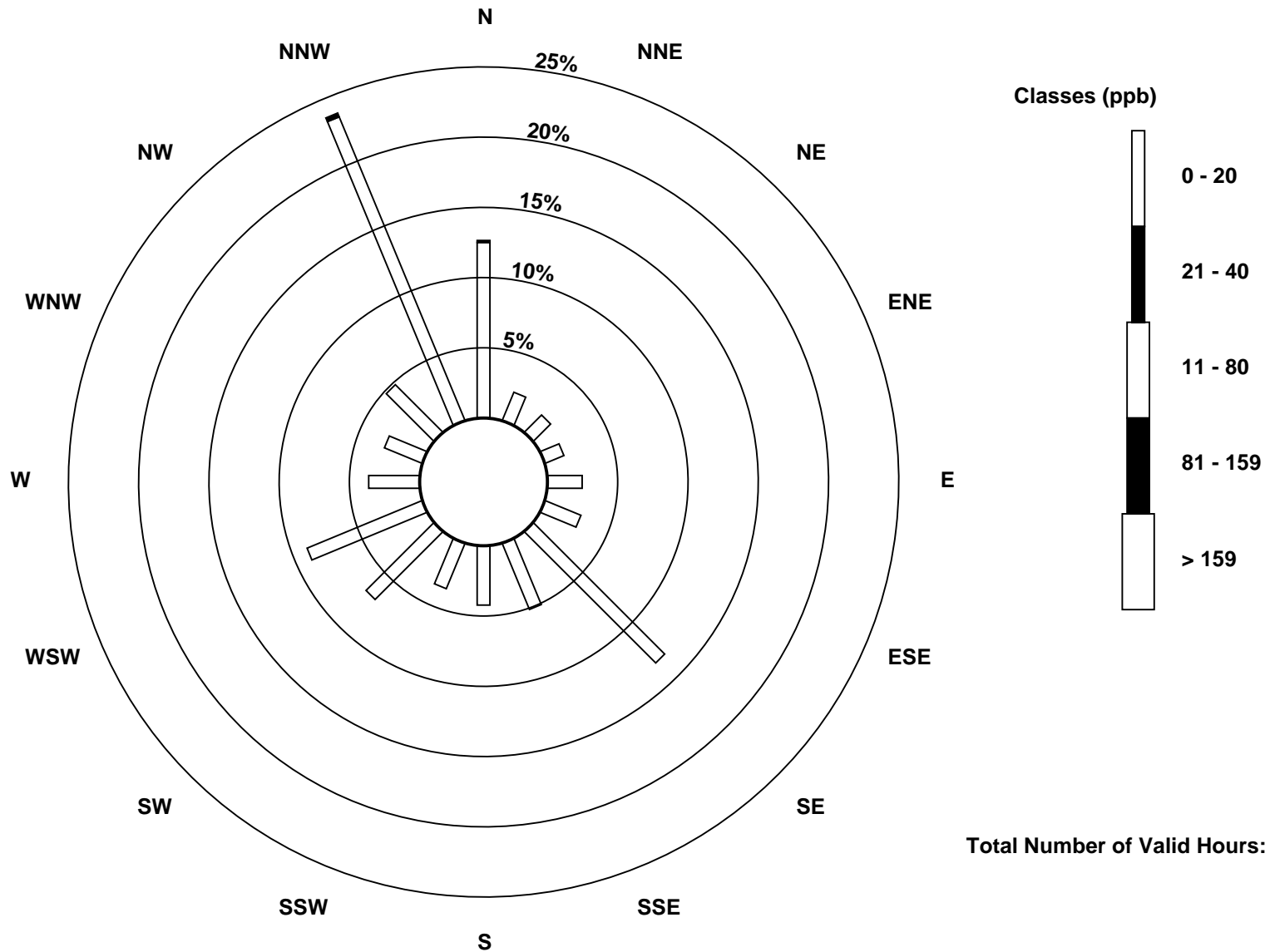
Total Number of Valid Hours: 688

Total Number of Hours: 744

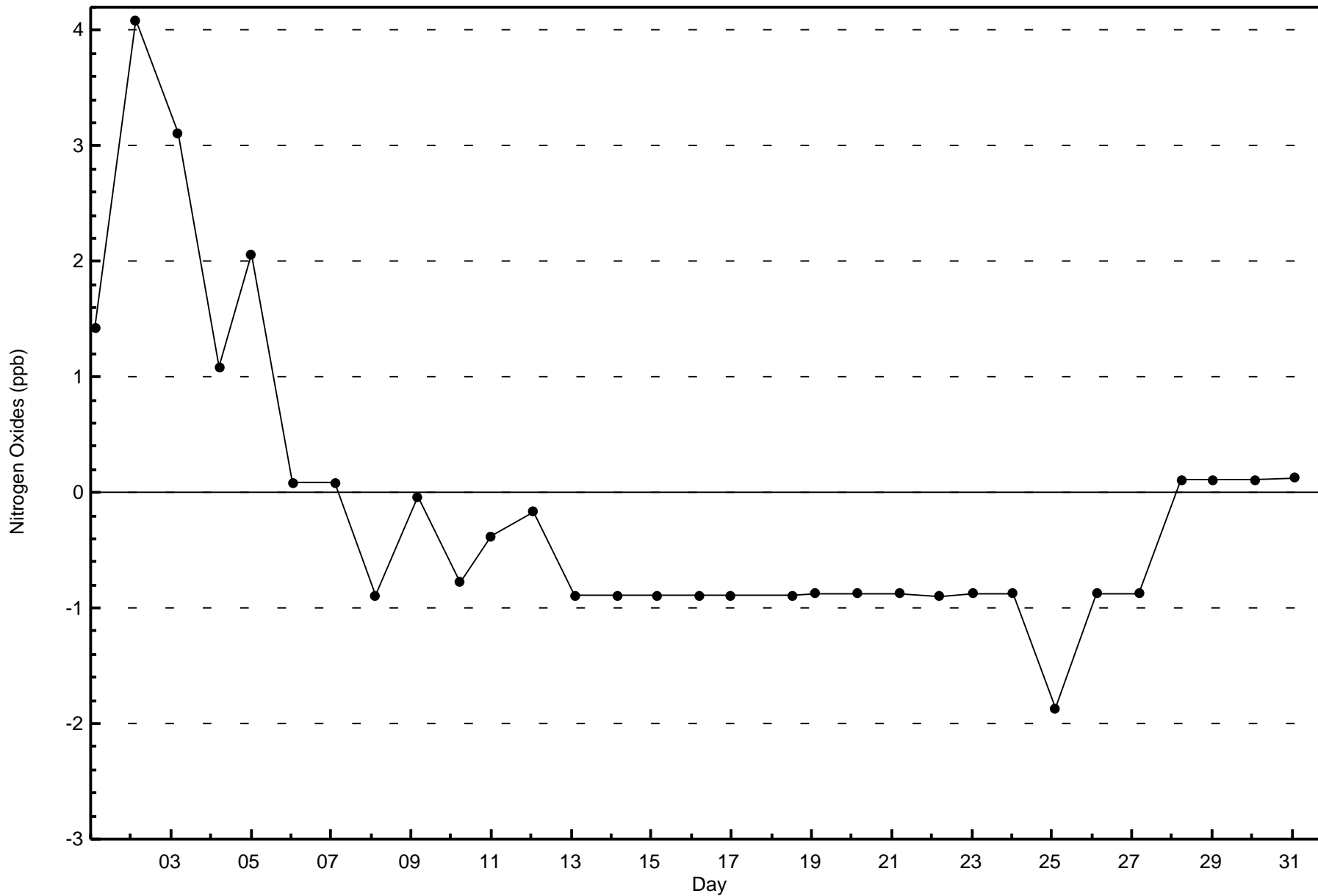


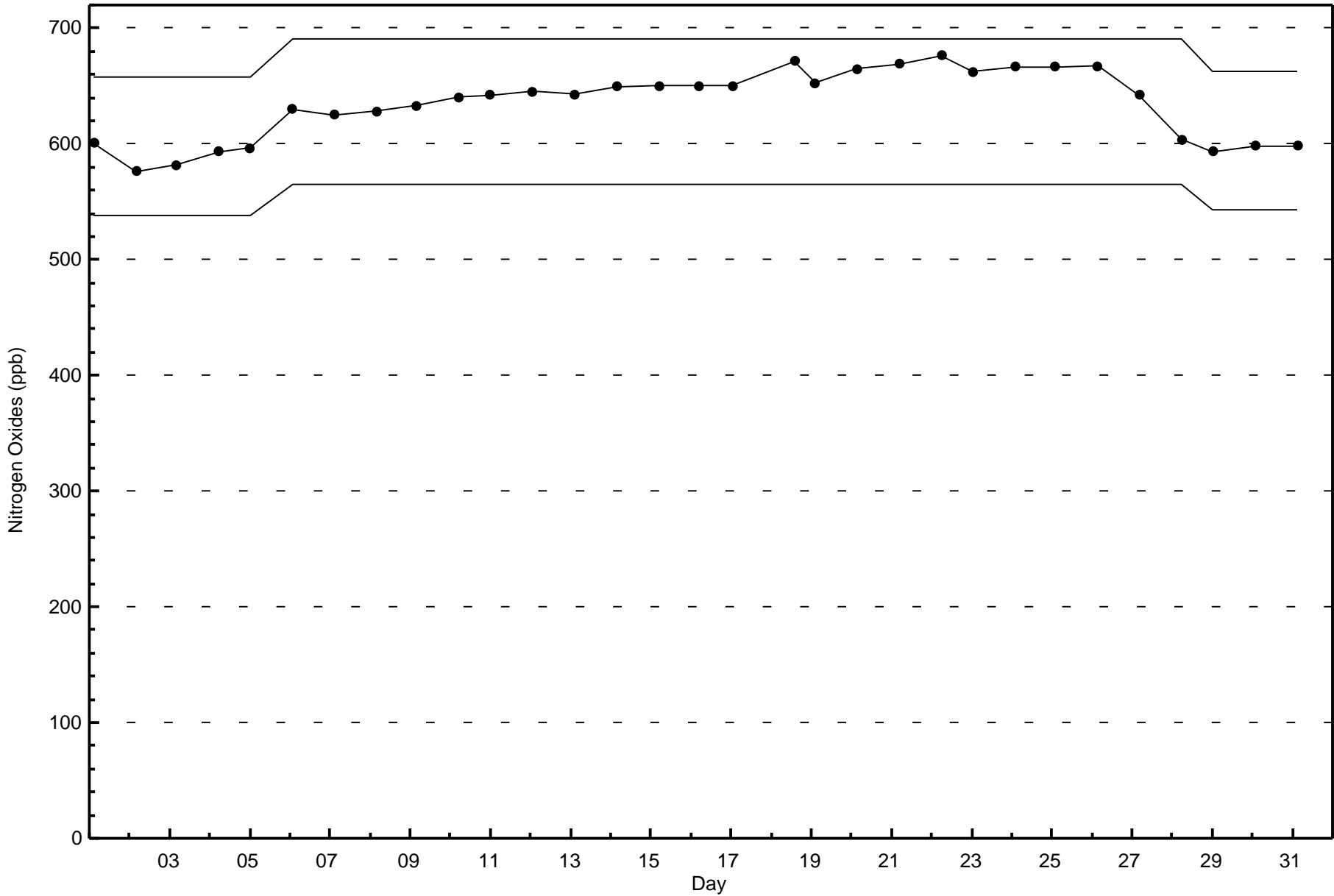
Wood Buffalo Environmental Association
Wind Rose Jul 2016

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



Total Number of Valid Hours: 688





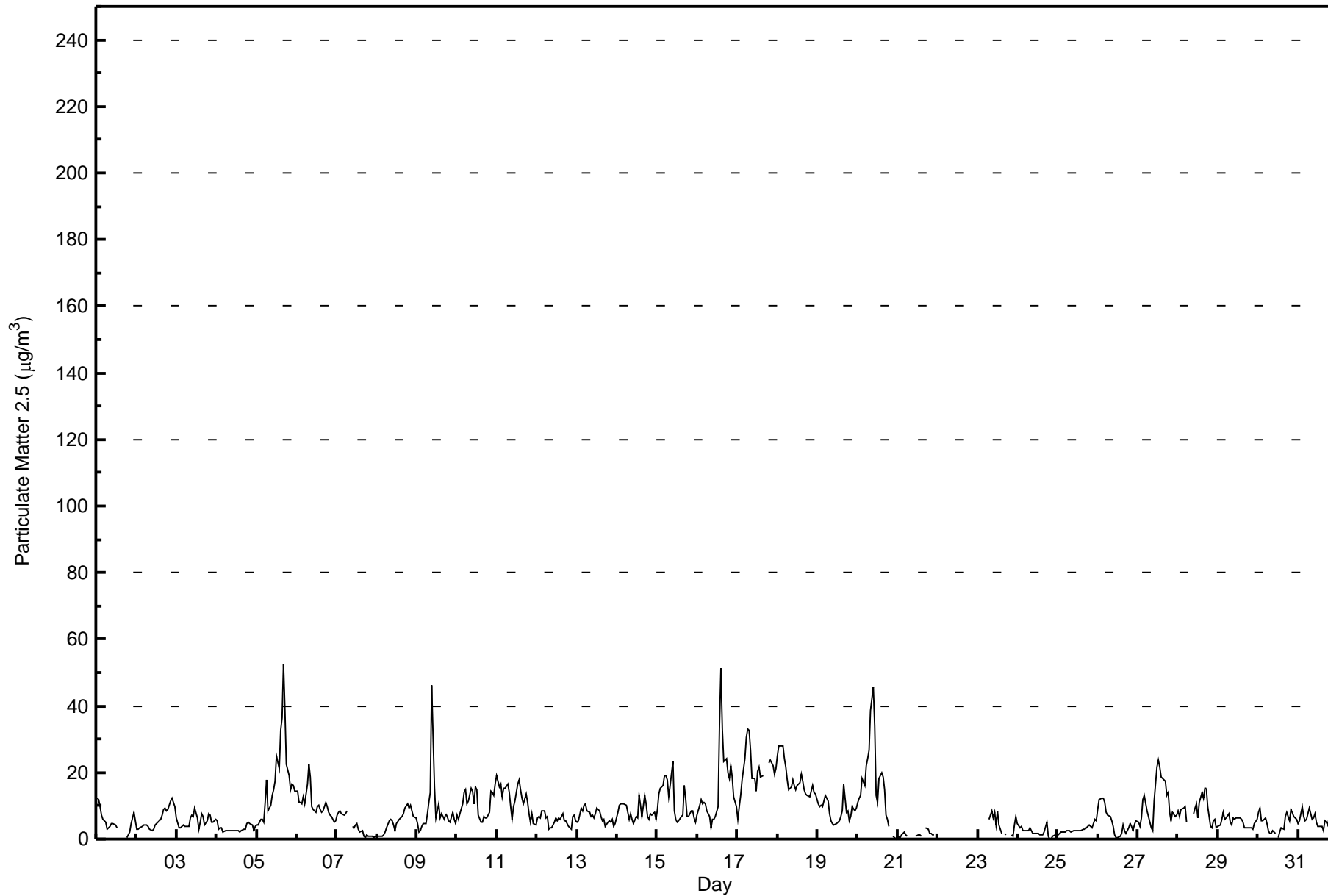


Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 52.4 µg/m ³ on Jul 5 17:00 Maximum Daily Average: 20.6 µg/m ³ on Jul 17		Hours in Service: 744 Hours of Data: 689 Hours of Missing Data: 55 Hours of Calibration: 3 Percent Operational Time: 93.0																								
Minimum Value: 0.0 µg/m ³ on Jul 24 20:00 Maximum Diurnal Average: 10.3 µg/m ³ at hour 17 Monthly Average: 8.50 µg/m ³		Minimum Daily Average: 2.1 µg/m ³ on Jul 24 Minimum Diurnal Average: 6.8 µg/m ³ at hour 23 Percentiles: P ₁ = 0.6 P ₁₀ = 2.2 Q ₁ = 3.9 Median = 6.6 Q ₃ = 10.8 P ₉₀ = 17.5 P ₉₉ = 35.5																								
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-Jul	12.1	11.8	9.9	7.3	6.0	4.9	3.2	3.4	3.6	4.5	4.6	4.2	3.4	UO	UO	UO	UO	UO	0.3	1.4	2.0	4.7	8.0	5.3	5.3	12.1
2-Jul	3.0	3.2	3.5	3.8	4.1	4.2	4.2	4.0	3.2	2.5	2.9	4.1	4.6	5.2	6.1	7.4	8.7	9.3	8.3	9.0	11.3	12.1	11.0	9.9	6.1	12.1
3-Jul	6.5	3.4	3.6	3.9	4.0	4.0	3.8	3.9	6.4	7.1	6.8	9.3	6.5	3.1	4.9	7.5	6.8	4.3	5.6	7.7	7.2	5.0	5.0	5.9	5.5	9.3
4-Jul	5.3	3.1	3.3	3.3	2.1	2.4	2.6	2.5	2.6	2.6	2.7	2.6	2.5	2.2	2.7	2.8	3.0	4.7	5.0	4.5	4.4	2.7	3.8	3.2	3.2	5.3
5-Jul	4.4	4.1	5.9	5.9	5.1	11.1	17.8	8.5	10.1	13.1	14.8	17.5	25.2	21.3	32.5	36.3	52.4	38.8	22.6	18.9	14.8	16.7	16.1	14.6	17.9	52.4
6-Jul	14.5	10.8	10.8	10.8	12.7	10.5	16.6	22.5	18.5	9.6	8.8	8.2	9.8	10.0	9.1	8.2	8.6	10.9	9.8	8.2	7.1	6.6	5.2	5.7	10.6	22.5
7-Jul	7.1	7.9	8.4	7.7	7.4	7.8	8.5	C	C	3.9	3.4	4.3	4.8	3.2	2.2	2.7	0.9	0.6	1.1	0.9	1.0	0.9	0.6	0.9	3.9	8.5
8-Jul	0.7	0.7	0.9	0.9	1.4	2.2	3.3	5.4	5.8	5.3	4.3	2.6	4.8	5.9	6.2	6.6	7.5	9.5	10.6	9.1	10.2	8.3	6.7	6.6	5.2	10.6
9-Jul	4.8	2.1	2.5	3.8	4.8	4.5	7.5	10.9	13.9	46.4	15.6	6.2	8.6	10.4	6.3	7.7	5.9	7.6	6.6	5.6	4.9	8.2	5.8	4.8	8.6	46.4
10-Jul	7.1	6.1	7.7	10.7	13.9	14.6	10.7	11.3	15.2	14.4	10.8	15.9	14.9	7.4	5.0	4.9	6.8	6.5	6.2	8.0	14.6	13.9	13.2	16.6	10.7	16.6
11-Jul	19.3	15.7	16.5	12.9	15.1	15.3	16.5	13.8	9.8	6.1	9.6	11.6	16.4	18.0	14.9	12.2	10.4	13.7	11.0	7.4	5.2	7.6	4.7	4.1	12.0	19.3
12-Jul	6.3	6.7	6.3	8.3	8.5	6.3	6.8	3.1	3.3	3.3	5.1	6.2	5.5	6.4	5.8	7.5	5.7	5.6	4.8	3.9	3.0	6.8	7.2	5.6	5.7	8.5
13-Jul	5.1	5.5	9.2	8.6	10.1	10.7	8.5	8.0	7.0	7.2	6.2	7.8	9.2	8.5	6.9	5.4	6.0	3.7	5.0	5.4	5.1	5.8	3.7	4.5	6.8	10.7
14-Jul	7.9	10.1	10.4	10.8	10.6	10.3	8.3	5.7	7.5	6.0	4.6	7.0	6.4	13.0	10.1	6.8	13.3	10.8	6.7	5.8	7.8	7.0	8.0	6.0	8.4	13.3
15-Jul	8.7	13.5	15.3	16.0	19.0	19.1	17.9	12.7	16.2	23.3	8.5	5.8	5.0	5.4	6.8	7.1	16.2	12.5	6.7	6.7	8.4	8.4	6.4	5.0	11.3	23.3
16-Jul	7.1	10.2	11.9	10.8	11.1	10.7	8.6	6.8	3.6	6.1	5.9	6.9	9.8	34.2	51.4	32.9	23.5	24.0	20.0	18.4	22.0	18.8	12.6	9.9	15.7	51.4
17-Jul	6.0	9.8	13.0	17.7	24.3	30.6	33.2	32.4	26.7	18.1	18.2	14.3	20.4	21.7	18.6	19.2	M	M	M	23.0	23.5	22.0	19.6	21.1	20.6	33.2
18-Jul	25.0	27.9	27.8	27.9	24.3	21.7	17.6	14.7	15.5	17.7	16.1	14.7	16.1	17.0	19.6	17.5	14.7	13.4	13.2	12.7	14.5	16.1	14.0	13.5	18.0	27.9
19-Jul	10.6	9.9	10.1	9.7	11.6	13.3	11.3	7.7	5.5	4.9	4.1	4.7	5.2	5.6	6.9	8.3	16.3	8.2	8.7	5.6	6.7	9.8	8.5	9.5	8.4	16.3
20-Jul	11.2	12.4	13.2	18.0	16.2	22.2	24.2	26.8	38.5	45.6	33.7	13.0	11.1	18.3	19.9	18.5	15.0	7.3	5.9	4.0	UO	0.9	0.4	0.2	16.4	45.6
21-Jul	1.0	0.6	1.5	1.9	2.0	1.2	0.7	UO	UO	UO	UO	0.7	1.1	1.5	0.8	UO	UO	3.5	2.9	1.6	1.8	1.4	1.5	AF	--	3.5
22-Jul	AF	AF	AF	AF	AF	AF	AF	AF	AF	M	M	M	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	--
23-Jul	UO	UO	UO	UO	UO	UO	UO	5.8	8.6	6.5	8.2	4.0	8.4	4.2	1.5	UO	1.8	1.2	UO	UO	1.2	0.9	4.2	6.9	--	8.6
24-Jul	4.7	3.5	3.6	2.7	2.5	2.4	2.7	3.2	2.7	1.9	1.7	1.7	1.6	1.4	1.4	1.4	1.9	5.2	0.7	0.0	0.2	0.9	1.3	1.5	2.1	5.2
25-Jul	1.3	1.7	2.1	2.3	2.3	2.4	2.6	2.4	2.3	2.7	2.4	2.7	2.4	2.4	2.6	3.0	2.8	3.5	3.9	4.2	3.5	4.6	6.0	5.5	3.0	6.0
26-Jul	9.0	11.8	12.3	12.4	10.9	8.1	7.2	6.6	5.3	3.9	1.1	0.4	0.4	0.8	1.5	4.4	2.7	1.9	3.5	4.8	3.6	2.4	4.3	5.7	5.2	12.4
27-Jul	5.3	3.9	6.5	12.0	13.1	8.5	6.7	5.0	3.3	2.3	11.3	21.6	23.9	21.6	18.8	18.4	17.2	13.2	14.0	8.1	5.6	8.1	6.8	7.2	10.9	23.9
28-Jul	8.5	6.8	8.9	9.3	9.6	5.1	UO	2.5	C	7.7	9.3	10.7	6.5	11.1	14.0	12.4	15.1	15.4	9.9	3.7	3.6	5.7	6.0	3.3	8.4	15.4
29-Jul	3.9	4.4	6.1	8.2	6.1	6.4	7.7	5.2	4.2	6.3	5.8	6.2	6.3	6.2	5.9	5.0	3.5	3.4	3.3	3.4	3.5	3.0	4.6	5.9	5.2	8.2
30-Jul	8.2	9.4	5.6	5.6	6.6	4.5	2.3	1.9	1.5	2.7	1.7	UO	0.6	1.9	3.2	2.8	6.6	8.2	6.8	5.5	8.9	6.8	6.2	5.7	4.9	9.4
31-Jul	4.5	5.4	9.5	6.6	5.4	5.9	7.7	9.4	6.0	6.4	7.5	5.2	3.9	3.9	3.8	2.6	5.7	5.1	4.2	8.3	11.5	6.8	2.5	2.7	5.8	11.5
																								Diurnal Average		
7.6 7.7 8.5 9.0 9.3 9.3 9.6 8.8 9.1 9.9 8.1 7.6 8.2 9.4 10.0 10.0 10.3 8.9 7.4 7.1 7.5 7.5 6.8 6.8																								Diurnal Maximum		
25.0 27.9 27.8 27.9 24.3 30.6 33.2 32.4 38.5 46.4 33.7 21.6 25.2 34.2 51.4 36.3 52.4 38.8 22.6 23.0 23.5 22.0 19.6 21.1																										
C - Calibration M - Maintenance AF - Analyzer Failure UO - Unstable Operation Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m ³																										



Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	239	34.69	34.69
6 - 15	332	48.19	82.87
16 - 25	71	10.30	93.18
26 - 80	19	2.76	95.94
> 81.0	0	0.00	95.94

Total Number of Valid Hours: 689

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

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

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	25	8	7	2	6	4	43	14	12	10	24	28	4	6	12	34	239
6 - 15	52	4	5	6	9	8	39	16	12	7	17	21	12	12	14	98	332
16 - 25	10	1	0	3	1	3	7	1	0	4	1	6	4	0	3	27	71
26 - 80	1	1	1	0	0	1	2	0	0	0	0	1	0	0	1	11	19
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	88	14	13	11	16	16	91	31	24	21	42	56	20	18	30	170	661

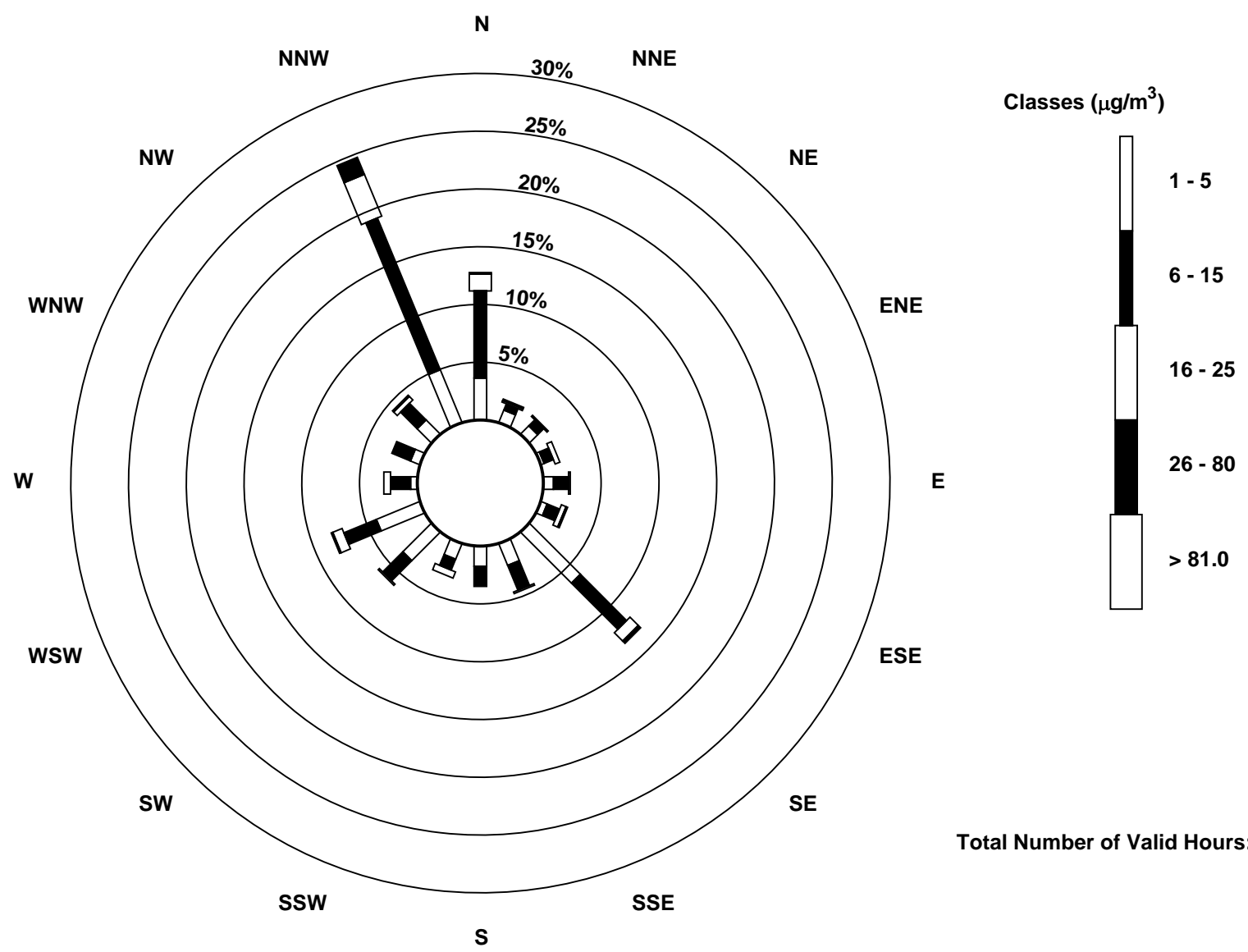
Total Number of Valid Hours: 689

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

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





Wood Buffalo Environmental Association
Summary of Hour Averages

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

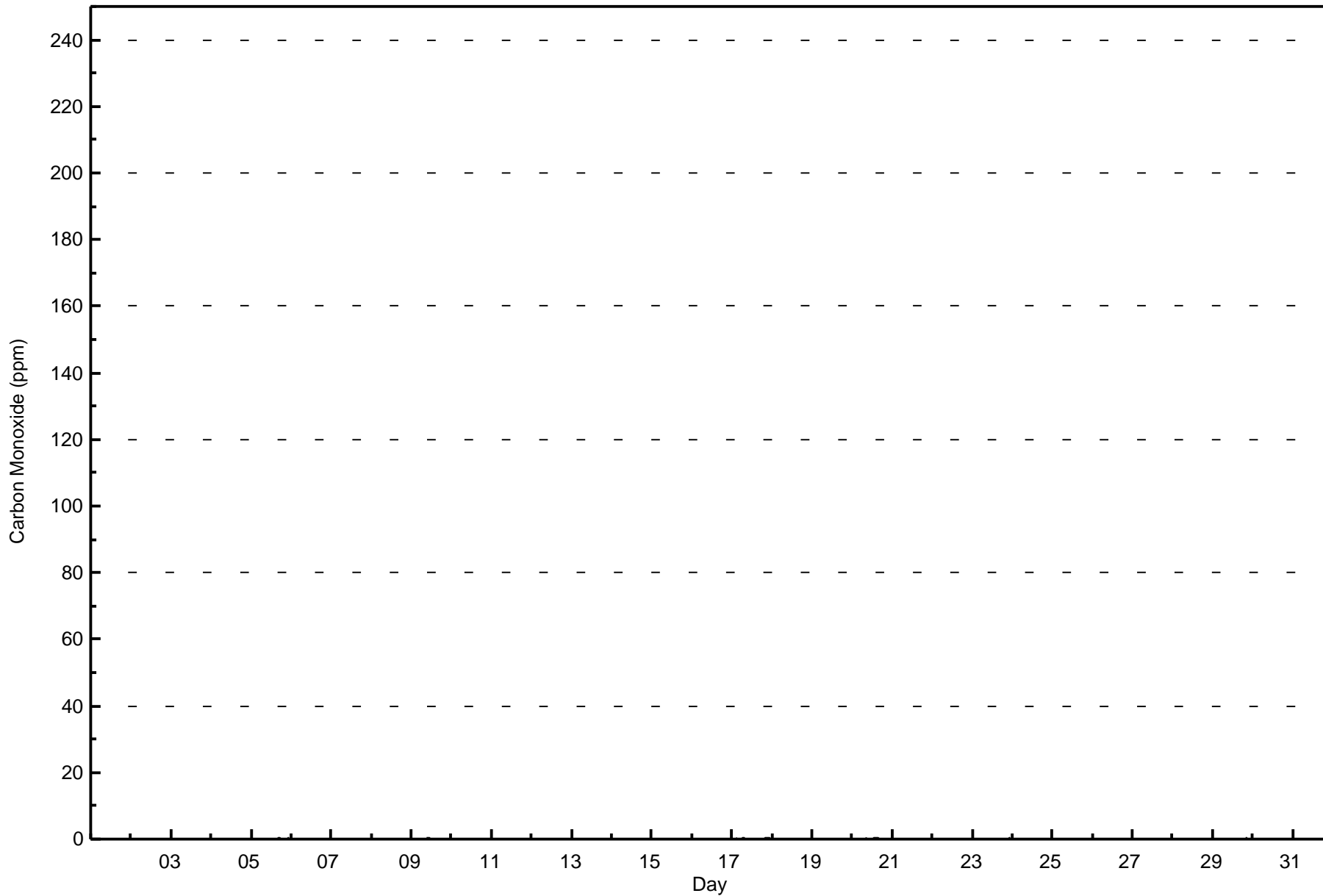
Number of Exceedences (AAAQO):		1-hr: 0 24-hr: 0		Hours in Service:		744																						
Maximum Value: 0.4 ppm on Jul 9 10:00		Maximum Daily Average: 0.2 ppm on Jul 17		Hours of Data:		685																						
Minimum Value: 0.0 ppm on Jul 1 19:00		Minimum Daily Average: 0.1 ppm on Jul 4		Hours of Missing Data:		59																						
Maximum Diurnal Average: 0.1 ppm at hour 22		Minimum Diurnal Average: 0.1 ppm at hour 18		Hours of Calibration:		31																						
Monthly Average: 0.11 ppm		Percentiles: P ₁ = 0.1 P ₁₀ = 0.1 Q ₁ = 0.1 Median = 0.1 Q ₃ = 0.1 P ₉₀ = 0.2 P ₉₉ = 0.2		Percent Operational Time:		96.2																						
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-Jul	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	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.1	0.1	0.2		
2-Jul	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	0.1	0.1
3-Jul	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
4-Jul	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	M	M	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
5-Jul	0.1	0.1	0.1	0.1	Z	0.2	0.2	0.1	0.1	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	0.2	0.2	0.2	0.2	0.2
6-Jul	0.2	0.2	0.2	0.2	0.2	Z	0.2	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	0.1	0.1	0.1	0.1	0.1
7-Jul	0.1	0.1	0.1	0.1	0.1	0.1	Z	M	0.1	0.1	C	C	C	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
8-Jul	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	0.2	0.1	0.1	0.1	0.1	0.1	0.1
9-Jul	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.4	0.4	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
10-Jul	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
11-Jul	0.1	0.1	0.1	0.1	Z	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
12-Jul	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	0.1	0.1
13-Jul	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
14-Jul	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	0.2	0.1	0.1	0.1	0.1	0.1
15-Jul	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2
16-Jul	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	0.2	0.2	0.2	0.2	0.2	0.1
17-Jul	0.2	0.2	0.1	0.2	Z	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	M	M	M	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.2
18-Jul	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	M	M	M	M	M	M	M	M	M	M
19-Jul	M	M	M	M	M	M	M	M	M	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
20-Jul	0.1	0.1	0.1	0.1	0.1	0.2	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	0.1	0.1	0.2	0.1	0.1	0.1	0.1
21-Jul	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
22-Jul	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
23-Jul	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.1
24-Jul	0.2	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	0.1	0.1
25-Jul	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	0.2	0.2	0.2	0.1	0.1	0.1
26-Jul	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Z	M	M	M	M	M	M	M	M	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1
27-Jul	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
28-Jul	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
29-Jul	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	0.3	0.2	0.1	0.1	0.1	0.1
30-Jul	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	0.1	0.1
31-Jul	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
																								Diurnal Average				
																								Diurnal Maximum				
																								0.1				
																								0.2				

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 - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

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

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 0.3	683	99.71	99.71
0.4 - 0.5	2	0.29	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: 685

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Carbon Monoxide (CO) - ppm
Athabasca Valley - July 2016**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 0.3	86	15	14	9	17	18	92	38	26	20	46	54	23	23	32	170	683
0.4 - 0.5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2
0.6 - 0.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.8 - 1.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.5 - 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	87	15	14	9	17	18	92	38	26	20	46	54	23	23	32	171	685

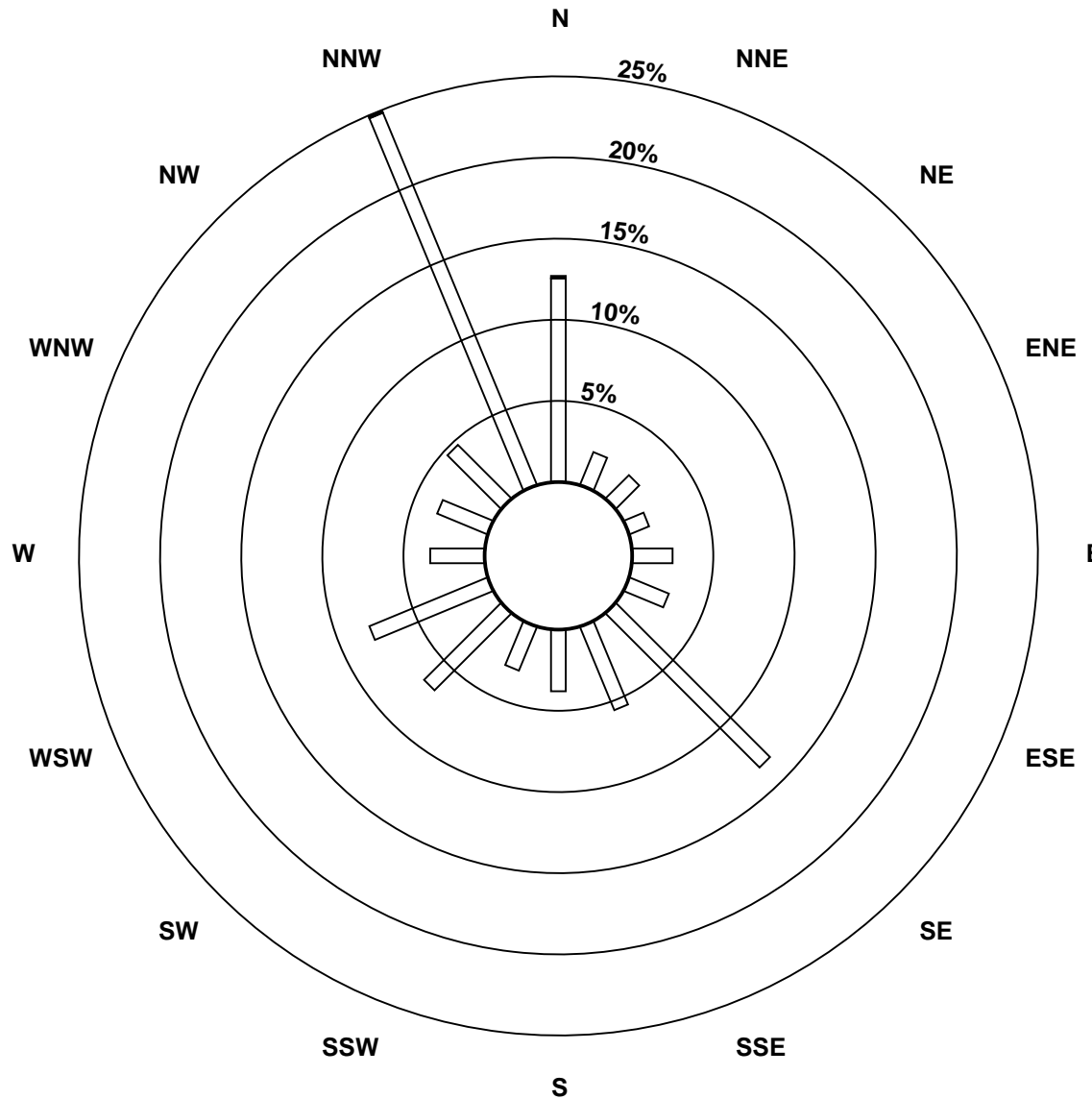
Total Number of Valid Hours: 685

Total Number of Hours: 744

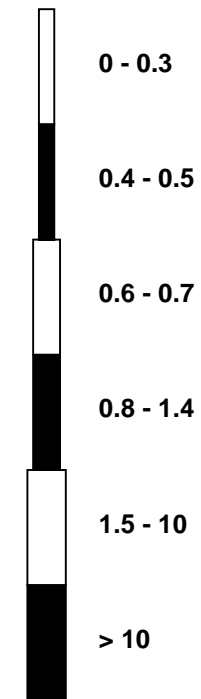


Wood Buffalo Environmental Association
Wind Rose Jul 2016

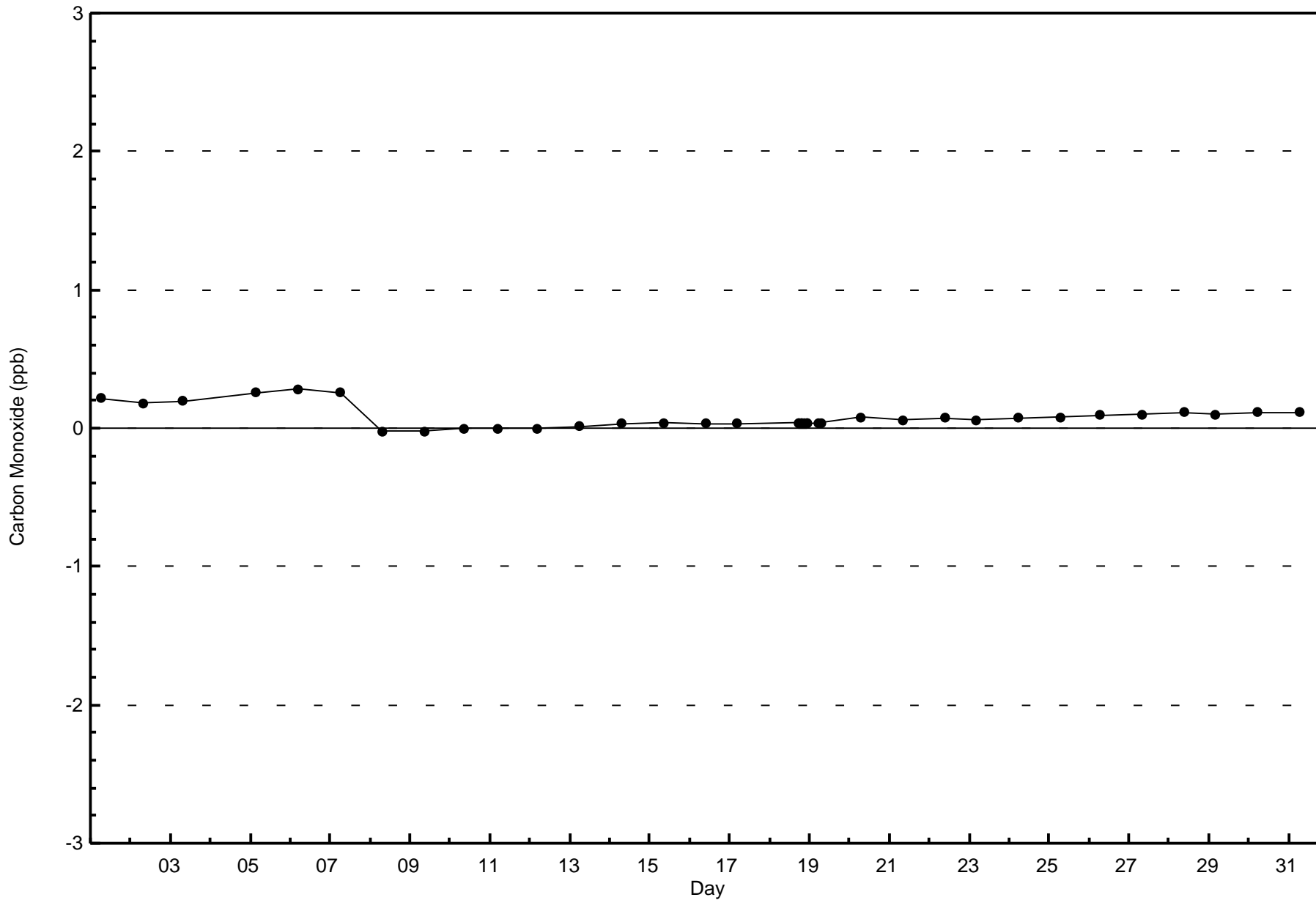
Carbon Monoxide (CO) - ppm
Athabasca Valley (AMS 7)



Classes (ppm)



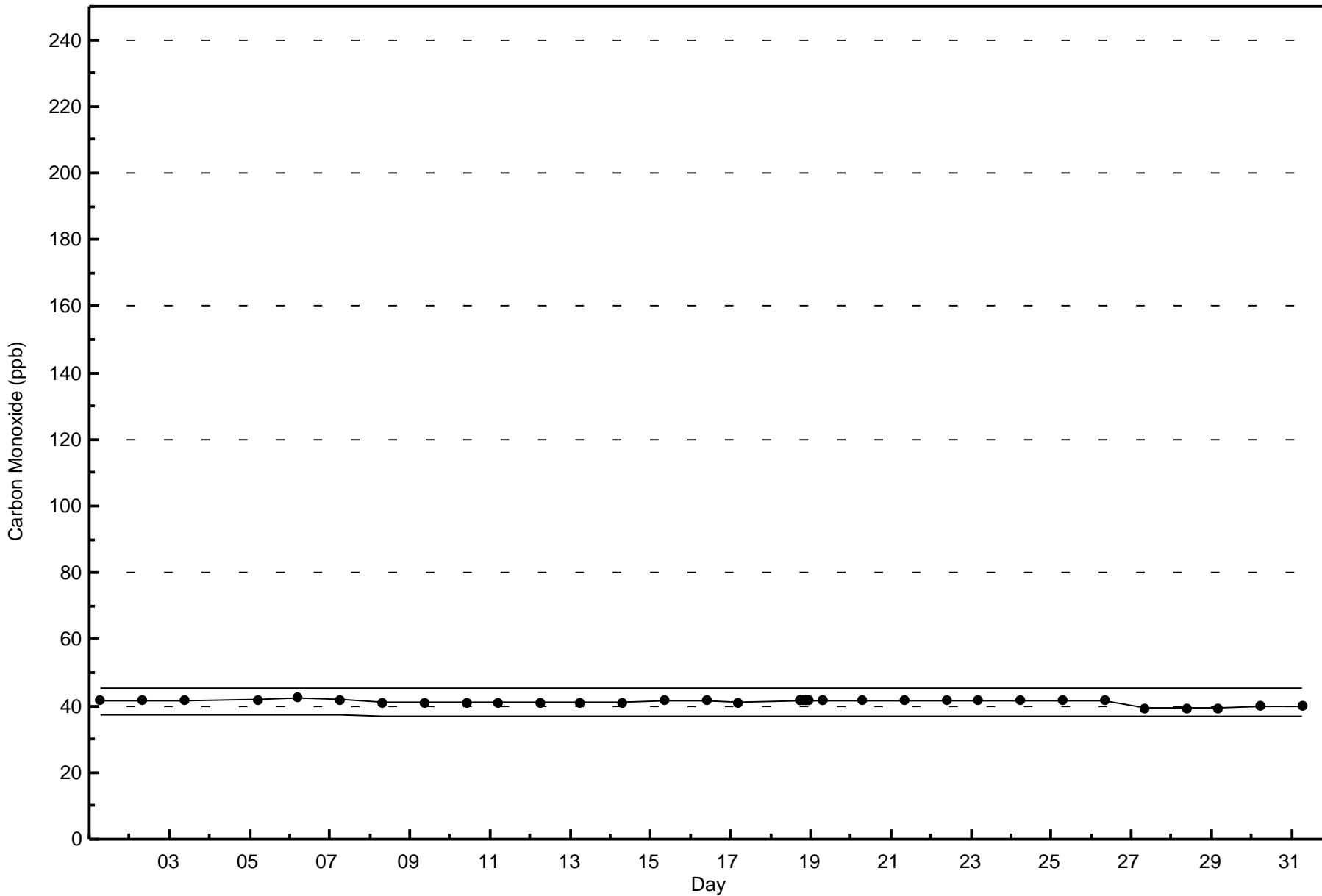
Total Number of Valid Hours: 685





Wood Buffalo Environmental Association
Span Responses

Carbon Monoxide (CO) - ppb
Athabasca Valley - July 2016

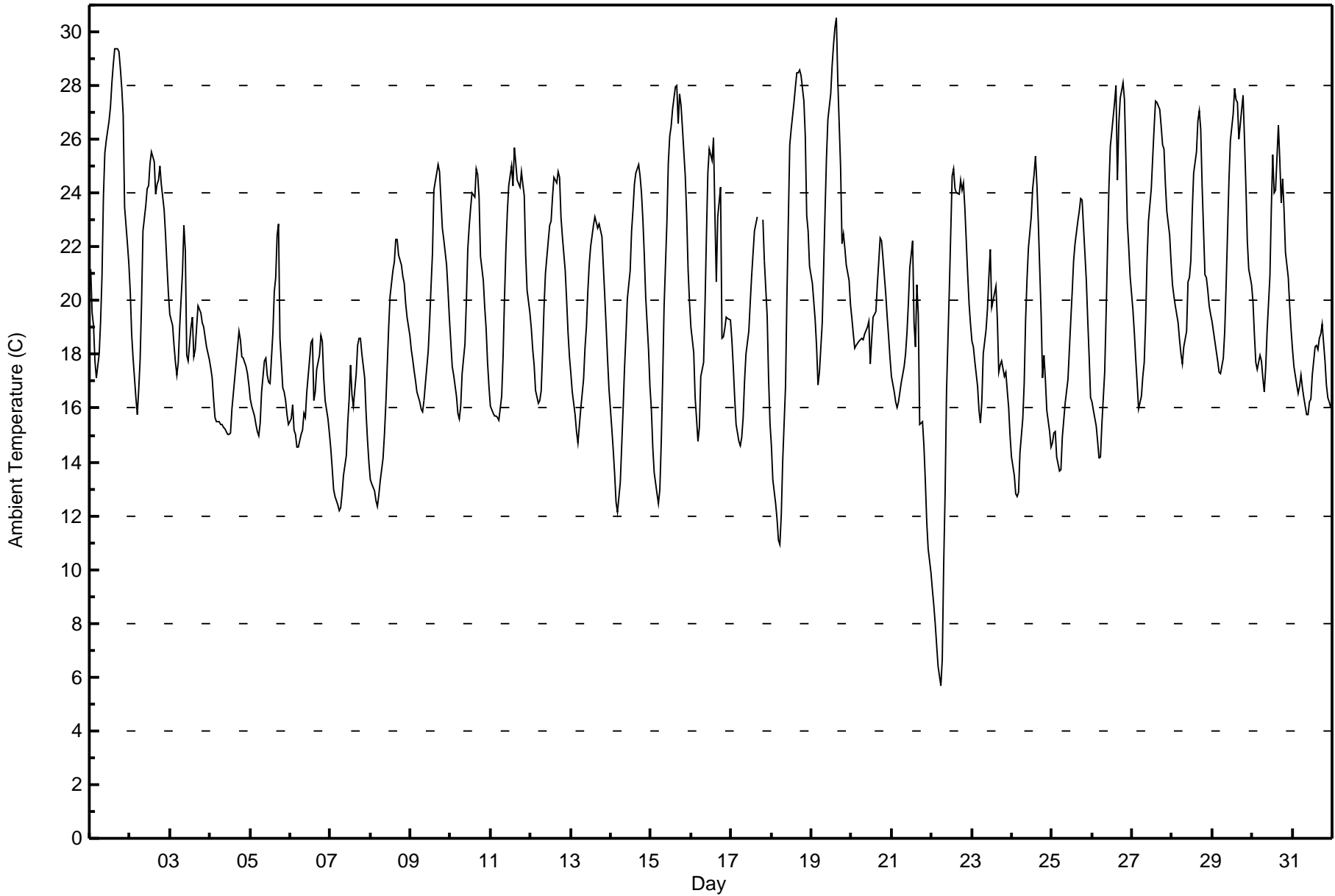




Wood Buffalo Environmental Association
Summary of Hour Averages

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

Maximum Value: 30.5 C on Jul 19 16:00 Maximum Daily Average: 24.1 C on Jul 1																						Hours in Service: 744 Hours of Data: 741																										
Minimum Value: 5.7 C on Jul 22 06:00 Minimum Daily Average: 15.2 C on Jul 7 Maximum Diurnal Average: 23.5 C at hour 17 Minimum Diurnal Average: 15.0 C at hour 5 Monthly Average: 19.54 C Percentiles: P ₁ = 9.8 P ₁₀ = 14.9 Q ₁ = 16.6 Median = 18.9 Q ₃ = 22.8 P ₉₀ = 25.3 P ₉₉ = 28.4																						Hours of Missing Data: 3 Hours of Calibration: 0 Percent Operational Time: 99.6																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Jul	21.2	19.5	19.1	17.8	17.1	18.0	19.2	20.9	23.9	25.5	26.0	26.7	27.2	28.1	28.8	29.4	29.4	29.3	28.7	27.9	26.9	23.5	22.1	21.4	24.1	29.4																						
2-Jul	20.3	18.8	17.8	16.4	15.8	16.7	17.8	19.9	22.6	23.5	24.1	24.3	25.1	25.5	25.2	24.0	24.3	24.5	25.0	24.3	23.4	22.4	21.3	20.3	21.8	25.5																						
3-Jul	19.5	19.1	18.3	17.7	17.2	17.7	19.0	21.1	22.8	21.8	18.0	17.8	19.0	19.4	17.9	18.2	19.0	19.8	19.6	19.2	19.0	18.7	18.3	17.8	19.0	22.8																						
4-Jul	17.5	17.1	16.4	15.7	15.5	15.5	15.4	15.4	15.3	15.2	15.0	15.0	15.1	16.0	16.5	17.1	18.3	18.8	18.5	17.9	17.9	17.6	17.3	16.8	16.5	18.8																						
5-Jul	16.4	16.1	15.7	15.4	15.1	15.0	15.4	16.6	17.7	17.9	17.3	17.0	16.9	18.8	20.3	20.9	22.4	22.9	18.6	16.8	16.6	16.3	15.8	15.4	17.4	22.9																						
6-Jul	15.6	16.1	15.2	15.0	14.6	14.6	15.0	15.2	15.8	15.7	16.6	17.8	18.4	18.5	16.3	16.6	17.4	18.0	18.7	18.5	17.1	16.3	15.6	15.1	16.4	18.7																						
7-Jul	14.5	13.8	13.0	12.7	12.4	12.2	12.3	12.8	13.5	14.2	15.4	16.3	17.6	16.5	16.1	17.3	18.3	18.6	18.6	18.0	17.1	15.8	14.8	14.0	15.2	18.6																						
8-Jul	13.3	13.2	12.9	12.6	12.3	12.7	13.3	14.1	15.0	16.2	17.6	19.0	20.2	21.1	21.4	22.3	22.3	21.7	21.3	20.9	20.7	19.9	19.4	18.7	17.6	22.3																						
9-Jul	18.2	17.8	17.4	17.0	16.6	16.3	16.0	15.9	16.3	16.9	18.1	19.2	20.5	21.8	24.1	24.4	25.1	24.8	23.8	22.7	22.3	21.3	20.4	19.3	19.8	25.1																						
10-Jul	18.4	17.6	17.2	16.4	15.8	15.6	16.1	17.3	18.4	20.0	21.9	22.8	23.5	24.0	23.8	24.9	24.7	23.9	21.6	20.7	19.8	19.0	17.7	16.8	19.9	24.9																						
11-Jul	16.1	15.8	15.7	15.7	15.7	15.5	16.5	17.9	20.0	21.9	23.3	24.2	25.0	24.3	25.7	25.1	24.5	24.2	24.8	24.3	23.9	21.7	20.4	19.5	20.9	25.7																						
12-Jul	19.0	18.2	17.6	16.7	16.2	16.3	16.7	18.1	19.8	21.0	22.2	22.8	23.0	23.9	24.6	24.4	24.8	24.6	23.1	22.4	21.1	20.0	18.8	17.9	20.5	24.8																						
13-Jul	17.3	16.6	15.8	15.1	14.7	15.3	16.0	17.1	18.2	19.0	20.3	21.3	22.0	22.8	23.1	22.9	22.7	22.9	22.4	21.3	20.2	19.0	17.8	16.7	19.2	23.1																						
14-Jul	15.2	14.5	13.6	12.5	12.1	13.2	14.6	16.0	17.5	18.7	20.1	21.1	22.6	23.4	24.3	24.8	25.0	24.7	24.0	23.0	21.7	20.1	18.2	16.8	19.1	25.0																						
15-Jul	16.0	14.6	13.6	12.8	12.4	13.0	14.7	17.0	19.8	22.9	25.1	26.1	26.5	27.1	27.9	28.0	26.6	27.7	27.3	26.4	24.6	23.2	21.2	20.0	21.4	28.0																						
16-Jul	19.0	18.1	16.4	15.6	14.7	15.3	17.2	17.7	19.9	22.4	24.7	25.6	25.2	26.1	23.2	20.7	23.1	24.2	18.6	18.7	19.0	19.4	19.4	19.3	20.1	26.1																						
17-Jul	18.5	17.5	16.4	15.4	14.8	14.6	14.9	15.7	17.0	18.0	18.9	19.9	20.9	21.8	22.6	23.1	M	M	M	23.0	21.5	19.4	17.1	15.5	18.4	23.1																						
18-Jul	14.6	13.3	12.5	11.9	11.1	10.9	12.0	14.0	16.8	20.2	23.0	25.8	26.4	27.4	27.9	28.5	28.5	28.6	28.4	27.5	26.1	23.2	22.6	21.3	20.9	28.6																						
19-Jul	20.7	20.0	19.3	18.3	16.9	17.4	19.2	21.2	23.4	25.3	26.7	27.7	28.7	29.5	30.2	30.5	28.2	24.9	22.1	22.5	22.0	21.4	20.8	19.9	23.2	30.5																						
20-Jul	19.3	18.8	18.2	18.3	18.5	18.6	18.6	18.5	18.8	19.0	19.2	17.7	18.6	19.4	19.6	20.6	21.4	22.3	22.2	21.6	20.2	19.4	18.7	17.9	19.4	22.3																						
21-Jul	17.2	16.6	16.2	16.1	16.2	16.6	17.0	17.6	18.0	18.8	19.9	21.2	22.2	19.2	18.3	20.6	19.5	15.4	15.5	14.6	13.3	11.8	10.8	9.9	16.8	22.2																						
22-Jul	9.2	8.7	8.0	7.2	6.4	5.7	6.7	10.2	12.8	16.6	20.5	22.6	24.6	24.9	24.2	24.0	23.9	24.5	24.1	24.4	23.4	21.0	19.8	19.1	17.2	24.9																						
23-Jul	18.5	18.3	17.8	16.8	15.9	15.4	16.2	18.0	18.9	19.7	20.9	21.9	19.8	20.0	20.5	19.3	17.3	17.6	17.8	17.2	17.4	16.6	16.0	15.0	18.0	21.9																						
24-Jul	14.2	13.5	12.8	12.7	12.9	14.3	15.6	16.9	19.3	20.8	22.0	23.1	24.2	24.7	25.4	24.3	22.9	19.5	17.1	18.0	17.1	15.9	15.1	14.6	18.2	25.4																						
25-Jul	14.7	15.1	15.1	14.2	13.7	13.7	14.9	15.5	16.2	17.1	18.2	19.3	20.3	21.5	22.1	23.0	23.4	23.8	23.8	22.8	20.8	19.3	17.9	16.4	18.4	23.8																						
26-Jul	16.3	15.9	15.3	14.8	14.1	14.2	15.4	17.4	19.5	21.9	24.2	25.7	26.3	27.4	28.0	24.5	26.6	27.6	28.1	27.5	25.3	23.0	22.0	20.9	21.7	28.1																						
27-Jul	19.6	18.8	17.8	16.9	16.0	16.5	17.2	17.7	19.3	21.5	23.0	24.2	25.3	26.4	27.4	27.4	27.1	26.5	25.8	25.7	24.3	23.4	22.5	21.5	22.2	27.4																						
28-Jul	20.6	20.2	19.8	19.2	18.6	18.0	17.7	18.3	18.9	20.7	20.9	21.5	23.3	24.8	25.5	26.7	27.1	26.4	24.3	20.9	20.9	20.4	19.8	19.5	21.4	27.1																						
29-Jul	19.2	18.5	18.1	17.8	17.3	17.3	17.8	18.9	20.6	22.6	24.5	25.9	27.0	27.9	27.5	27.4	26.0	27.1	27.6	26.0	24.2	22.2	21.2	20.6	22.6	27.9																						
30-Jul	20.0	18.8	17.7	17.5	18.0	17.8	17.1	16.6	17.5	18.9	20.9	23.4	25.4	24.0	24.1	26.6	25.2	23.7	24.5	23.4	21.8	20.9	19.8	18.9	20.9	26.6																						
31-Jul	18.2	17.6	16.9	16.6	16.8	17.2	16.8	16.4	15.8	15.8	16.2	16.3	17.2	18.3	18.3	18.2	18.6	18.8	19.1	17.8	16.9	16.4	16.2	16.0	17.2	19.1																						
																								17.4	16.7	16.1	15.4	15.0	15.2	15.9	17.0	18.4	19.7	20.8	21.7	22.5	23.0	23.3	23.4	23.5	23.2	22.5	21.8	20.9	19.6	18.7	17.8	Diurnal Average
																								21.2	20.2	19.8	19.2	18.6	18.6	19.2	21.2	23.9	25.5	26.7	27.7	28.7	29.5	30.2	30.5	29.4	29.3	28.7	27.9	26.9	23.5	22.6	21.5	Diurnal Maximum
M - Maintenance																																																





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Athabasca Valley - July 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	8	1.08	1.08
10 - 20	436	58.84	59.92
> 20	297	40.08	100.00

Total Number of Valid Hours: 741

Total Number of Hours: 744



Wood Buffalo Environmental Association
Summary of Hour Averages

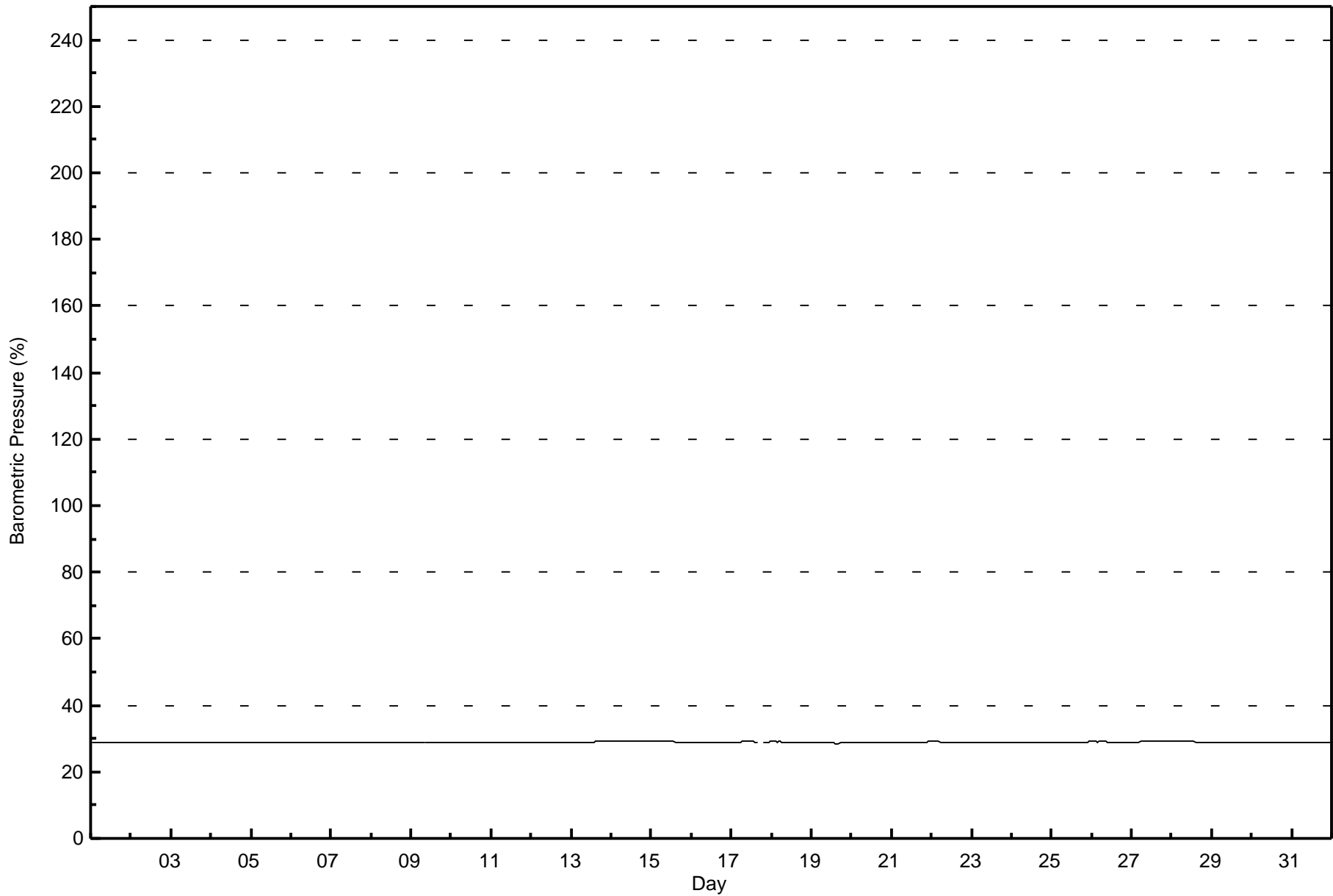
Barometric Pressure (BP) - %
Athabasca Valley - July 2016

Maximum Value: 29.2 % on Jul 14 07:00																						Hours in Service: 744													
Maximum Daily Average: 29.2 % on Jul 14																						Hours of Data: 741													
Minimum Value: 28.6 % on Jul 19 16:00																						Hours of Missing Data: 3													
Maximum Diurnal Average: 28.9 % at hour 7																						Hours of Calibration: 0													
Minimum Daily Average: 28.7 % on Jul 31																						Percent Operational Time: 99.6													
Minimum Diurnal Average: 28.8 % at hour 18																																			
Monthly Average: 28.86 %																																			
Percentiles: P ₁ = 28.6 P ₁₀ = 28.7 Q ₁ = 28.8 Median = 28.8 Q ₃ = 29.0 P ₉₀ = 29.1 P ₉₉ = 29.2																																			
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-Jul	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	29.0				
2-Jul	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.9	28.9				
3-Jul	28.8	28.8	28.8	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.6	28.6	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.8	28.8				
4-Jul	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8			
5-Jul	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8			
6-Jul	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8			
7-Jul	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.9	28.9	28.9	28.9	28.9	28.9	28.9			
8-Jul	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9			
9-Jul	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9			
10-Jul	28.9	28.9	28.9	28.8	28.9	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8			
11-Jul	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.8	28.8	28.8	28.8	28.8	28.8	28.8			
12-Jul	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9			
13-Jul	28.9	28.9	28.9	28.9	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1			
14-Jul	29.1	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.2	29.2	29.2	29.2	29.2			
15-Jul	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.1	29.1	29.1	29.1	29.1	29.1	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	28.9	28.9	28.9	28.9	28.9	29.1	29.2	29.2			
16-Jul	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9			
17-Jul	28.9	28.9	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	M	M	M	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0			
18-Jul	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	28.9	28.9	28.9	28.9	28.9	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.9		
19-Jul	28.8	28.8	28.8	28.8	28.8	28.8	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.7	28.7	28.7	28.7	28.7	28.8	28.8		
20-Jul	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7		
21-Jul	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.8	28.8	28.8	28.8	28.9	28.9	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0		
22-Jul	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	28.9	28.9	28.8	28.8	28.8	28.8	28.8	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.8	28.8	
23-Jul	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	
24-Jul	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.8	28.8	28.8	28.9	28.9	28.9	28.9	28.9	28.9	
25-Jul	28.9	28.9	28.9	28.9	28.9	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	
26-Jul	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	28.9	28.9	28.9	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	
27-Jul	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	
28-Jul	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	
29-Jul	29.0	29.0	28.9	28.9	29.0	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.9	29.0
30-Jul	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7
31-Jul	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7
28.9																								Diurnal Average											
29.2																								Diurnal Maximum											
M - Maintenance																																			



Wood Buffalo Environmental Association
Hourly Averages

Barometric Pressure (BP) - %
Athabasca Valley - July 2016

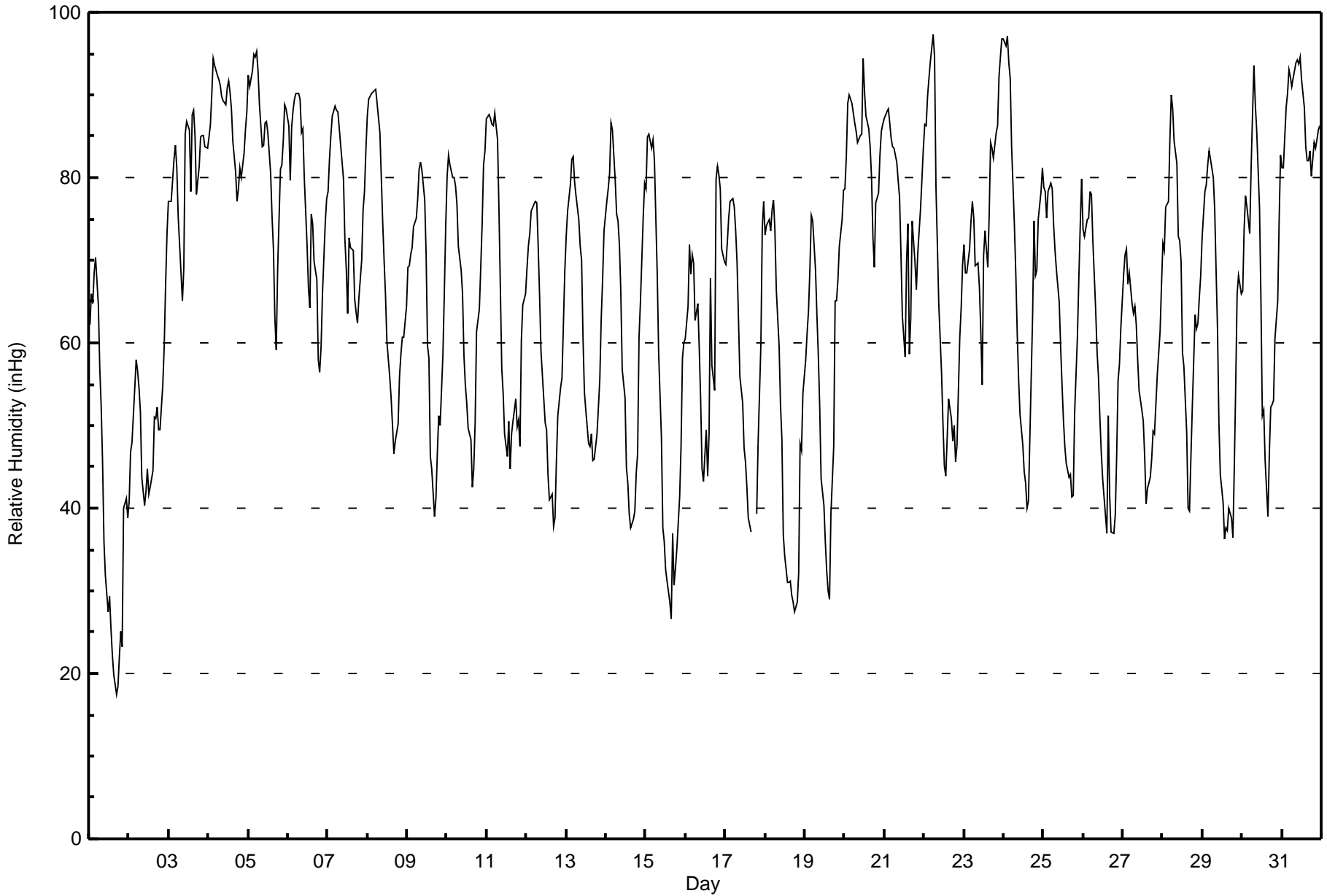




Wood Buffalo Environmental Association
Summary of Hour Averages

Relative Humidity (RH) - inHg
Athabasca Valley - July 2016

Maximum Value: 97 inHg on Jul 22 06:00																	Maximum Daily Average: 87.6 inHg on Jul 31																	Hours in Service: 744								
Minimum Value: 17 inHg on Jul 1 17:00																	Minimum Daily Average: 40.4 inHg on Jul 1																	Hours of Data: 741								
Maximum Diurnal Average: 81.7 inHg at hour 5																	Minimum Diurnal Average: 52.1 inHg at hour 16																	Hours of Missing Data: 3								
Monthly Average: 66.4 inHg																	Percentiles: P ₁ = 25 P ₁₀ = 41 Q ₁ = 52 Median = 69 Q ₃ = 81 P ₉₀ = 88 P ₉₉ = 95																	Hours of Calibration: 0								
																																		Percent Operational Time: 99.6								
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																		
1-Jul	62	66	65	69	70	65	57	52	46	36	32	27	29	25	22	20	17	19	22	25	23	40	41	39	40.4	70																
2-Jul	41	47	48	54	58	57	55	52	44	40	42	45	42	43	45	51	51	52	49	49	55	59	67	73	50.7	73																
3-Jul	77	77	80	82	84	81	75	69	65	69	85	87	86	78	88	88	85	78	81	85	85	85	84	84	80.7	88																
4-Jul	85	86	90	94	94	92	92	91	90	89	89	91	92	90	88	84	81	77	79	81	80	83	86	88	87.2	94																
5-Jul	92	91	93	95	95	95	93	89	84	84	87	87	86	80	75	71	63	59	69	81	82	84	89	88	83.8	95																
6-Jul	86	80	86	88	90	90	90	90	85	86	80	72	67	64	76	74	70	68	58	56	59	66	75	78	76.4	90																
7-Jul	78	82	85	88	89	88	88	86	84	80	73	69	64	73	72	71	65	64	62	65	70	76	78	83	76.3	89																
8-Jul	88	90	90	90	90	91	89	85	80	75	70	66	60	56	53	50	47	48	50	56	59	61	61	64	69.5	91																
9-Jul	69	69	71	72	74	75	77	81	82	81	77	71	60	58	46	45	39	41	47	51	50	59	66	74	63.9	82																
10-Jul	80	83	81	80	80	79	77	72	69	66	58	55	53	50	48	42	45	50	61	64	69	74	81	83	66.8	83																
11-Jul	87	88	87	86	86	88	85	76	67	57	54	49	46	50	45	49	50	53	50	51	48	60	65	66	64.3	88																
12-Jul	69	72	73	76	77	77	77	72	66	59	53	50	49	44	41	42	38	39	46	51	55	56	62	69	58.8	77																
13-Jul	73	76	79	82	82	79	78	75	72	70	61	54	52	48	48	49	46	46	49	52	56	63	68	74	63.7	82																
14-Jul	77	79	81	87	86	80	76	75	72	66	57	53	45	43	39	38	39	40	44	47	61	65	75	79	62.5	87																
15-Jul	79	85	85	83	85	82	75	68	59	48	38	36	33	31	29	27	37	31	33	35	41	47	58	60	53.5	85																
16-Jul	61	64	72	68	71	70	63	65	59	53	45	43	49	44	49	68	57	54	80	81	80	79	71	70	63.2	81																
17-Jul	70	72	75	77	77	76	74	70	63	56	53	47	46	43	39	37	M	M	M	39	48	60	74	77	60.6	77																
18-Jul	73	74	75	73	76	77	74	66	60	53	48	37	34	31	31	31	30	29	28	29	32	48	47	54	50.4	77																
19-Jul	58	61	64	69	75	75	69	63	59	52	44	40	36	32	30	29	39	47	65	65	68	72	75	78	56.9	78																
20-Jul	79	83	89	90	89	88	87	86	84	85	85	94	90	87	86	84	80	73	69	77	78	83	86	86	84.0	94																
21-Jul	87	88	88	87	85	84	84	82	80	78	71	63	58	70	74	59	63	75	70	66	71	74	76	84	75.6	88																
22-Jul	87	86	90	92	94	97	95	79	72	65	56	50	45	44	48	53	51	48	50	46	48	61	64	69	66.3	97																
23-Jul	72	68	69	71	75	77	75	69	70	67	61	55	70	74	69	76	84	84	82	85	86	92	95	97	76.0	97																
24-Jul	97	96	97	94	92	84	74	68	61	56	51	48	44	43	40	41	48	63	75	68	69	75	78	81	68.5	97																
25-Jul	79	78	75	78	79	79	74	71	69	65	60	55	51	47	45	44	44	41	42	51	61	68	74	80	62.9	80																
26-Jul	74	73	75	75	78	78	72	64	59	56	51	47	44	39	37	51	42	37	37	39	46	55	57	62	56.2	78																
27-Jul	68	71	71	67	68	65	64	64	62	58	54	52	50	46	40	42	44	46	49	49	53	56	61	67	57.1	71																
28-Jul	72	71	76	77	85	90	88	84	82	73	72	70	59	57	49	40	40	46	52	63	62	62	65	68	66.9	90																
29-Jul	73	78	79	81	83	82	80	76	69	62	50	44	41	36	38	37	40	39	37	45	55	66	68	66	59.4	83																
30-Jul	66	74	78	76	73	81	88	93	89	86	76	65	51	52	46	39	47	52	53	53	60	65	75	83	67.5	93																
31-Jul	81	81	88	90	93	92	91	92	94	94	94	95	92	89	84	82	82	83	80	84	83	85	86	86	87.6	95																
																	75.4	77.1	79.2	80.5	81.7	81.1	78.5	75.0	70.7	66.5	62.2	58.6	55.6	53.8	52.3	52.1	52.1	52.7	55.6	57.8	61.0	67.0	71.2	74.5	Diurnal Average	
																	97	96	97	95	95	97	95	93	94	94	94	95	92	90	88	88	85	84	82	85	86	92	95	97	Diurnal Maximum	
M - Maintenance																																										





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Speed (WS) - km/h
Athabasca Valley - July 2016

Maximum Speed: 24 km/h on Jul 21 16:00	Maximum Daily Speed Average: 15.5 km/h on Jul 12	Hours in Service: 744
Minimum Speed Value: 0 km/h on Jul 14 23:00	Minimum Daily Speed Average: 1.1 km/h on Jul 10	Hours of Data: 741
Maximum Diurnal Speed Average: 5.9 km/h at hour 18	Minimum Diurnal Speed Average: 0.2 km/h at hour 24	Hours of Missing Data: 3
Monthly Average Velocity: 2.3 km/h 320.3 deg	Percentiles: P ₁ = 1 P ₁₀ = 3 Q ₁ = 5 Median = 8 Q ₃ = 11 P ₉₀ = 15 P ₉₉ = 21	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-Jul	SSE3	ESE5	SE5	SE7	SE6	SE8	SE11	SE9	SE11	SSE20	SE17	SSE14	S11	SSE10	SSE10	SSE12	S14	S13	S15	S15	SSE8	SE5	SE6	SE7	SSE9.7	SSE20
2-Jul	SSE7	SE10	SE9	SE10	SE9	SE7	SE10	SE12	SE16	SSE17	SSE16	S16	SSE14	SSE15	SSE19	SSE20	SE18	ESE14	SE10	S11	SE9	SE9	SE9	SE7	SE11.8	SSE20
3-Jul	SE7	SSE8	SE7	SE6	SE7	SE8	SE9	SSE7	W2	W5	WSW8	SSW5	ESE6	S6	E2	WSW4	W3	NNE3	N2	S4	SSE4	S5	SW6	WSW6	S3.3	SE9
4-Jul	SW5	WSW10	WSW8	WSW10	WSW11	SW6	WSW9	WSW8	SW9	WSW11	SW10	SW8	SW9	SW10	SW12	SW13	WSW7	SE2	S4	SSW6	S5	SE5	NW0	N3	SW6.9	SW13
5-Jul	N4	NE3	N4	WNW4	NW6	NNW8	NNW10	N5	N12	NNW10	NE6	NNW8	NNW10	NNW9	NNW11	NNW9	NNW10	NE8	ENE9	W6	WNW4	SSW3	SE3	SW5	NNW5.0	N12
6-Jul	SW7	NNW13	NW3	SE5	S6	SSW4	NNW6	NNW10	N11	NNW15	NNW16	N14	N12	NNW12	N14	NE8	N7	NNW11	NE9	N10	N8	N5	N6	N7	N6.9	NNW16
7-Jul	NNW8	NNW11	NNW10	NNW13	NNW14	NNW12	NNW10	NNW11	N11	NNW9	NNW7	N6	N10	NNW16	NNW14	N10	NNW15	N15	N12	NNW14	NNW13	NNW11	NNW11	NNW9	NNW11.2	NNW16
8-Jul	N6	NNW7	NNE3	NE6	NE5	NE7	NNE7	N8	N10	NNW10	NNW9	NNW13	NNW15	NNW14	NNW13	NNW12	N10	N8	N7	NNW4	NNW6	NNW9	NNW10	N7	N8.3	NNW15
9-Jul	N8	N6	NNW7	NNW9	NNW6	NNW8	NNW10	NNW9	NNW9	NNW6	N4	NNW2	NW3	W5	WSW6	WNW5	ENE6	ENE8	ENE14	E9	E4	SW3	WSW2	W2	N3.7	ENE14
10-Jul	WSW3	N1	NNE3	SE6	SE7	SE5	SE3	NNE1	NW4	NNW8	NNW9	NNW9	N8	E14	ESE12	E7	SE12	W6	WNW17	NNW10	NNW5	W4	SW4	WSW7	N1.1	WNW17
11-Jul	SSE2	SSW7	SSW4	SW5	SW2	ESE5	N3	N8	NNW10	NNW13	NNW15	NNW16	NNW19	N15	NNW16	NNW19	N14	NNW11	NNW13	N9	NE6	NNW6	NNW8	NNW8	NNW7.7	NNW19
12-Jul	NNW12	NNW11	NNW12	N10	NNW13	NNW17	NNW16	N15	NNW17	NNW18	NNW15	N17	NNW19	NNW17	NNW17	NNW19	N18	NNW21	NNW24	NNW22	NNW19	NNW11	NNW5	NNW7	NNW15.5	NNW24
13-Jul	NW8	NNW8	NNW9	NNW9	NNW7	NNW9	N11	N11	N12	NNW15	NNW19	NNW18	N15	NNW16	NNW18	NNW20	NNE16	N12	NNW14	NNW15	NNW8	N6	N5	N5	NNW11.8	NNW20
14-Jul	NE4	N4	E4	E4	ESE3	E4	E5	NNW5	N6	NNW7	NNW8	NNW8	N8	NNW7	NNW7	NNW10	NNW10	N12	N10	NNW5	NW3	W3	NNE0	E1	N4.6	N12
15-Jul	NE0	ENE4	E3	ESE3	SE4	SE8	ESE5	ENE5	ENE4	ENE4	SW3	WSW3	NNW5	NW6	N3	W3	NNW11	N9	NNW11	NNW12	WNW6	NNW5	W5	WSW5	N1.9	NW12
16-Jul	SW9	SW7	SSE3	SE6	SE7	SE5	SE5	E6	S1	SSE3	WSW4	N6	N9	NNW11	NNE17	NNW8	N6	NNW8	N15	NW8	NNW3	NNW11	NNW16	NNW15	NNW3.9	NNE17
17-Jul	NNW12	NNW12	NNW9	NNW8	NNW9	NNW12	NNW14	N12	NNW11	NNW15	NNW15	NNW15	N12	N12	N12	NNW12	M	M	M	NNW6	NNW3	W4	W1	ESE3	NNW9.5	NNW15
18-Jul	SE2	ESE4	SE5	SE7	SE11	SE13	SE11	SE9	SE8	E6	NNE2	WSW4	W9	SW10	WSW12	WSW11	WSW12	WSW12	SW14	WSW10	SSW4	SSW4	SSW6	S6	SSW4.7	SW14
19-Jul	S8	S8	SSE9	SE5	SE7	ESE9	SE5	SW8	SW8	WSW8	SW14	WSW16	SW17	SW15	WSW13	W14	NNW22	NW22	WSW4	SSW6	SW3	NW3	WSW1	S3	SW5.4	NNW22
20-Jul	S3	NW7	NNW8	NNW7	NW7	NW9	NNW8	NNW8	NW5	WSW3	NNW8	NNW6	NW5	W3	WSW4	WSW4	SW6	WSW3	WSW5	SW14	SW10	SSE4	SSE5	ESE3	WNW3.4	WSW14
21-Jul	SSE4	SE5	SE6	SE9	SE8	SE4	S4	SW4	WSW13	WSW14	W12	W14	W20	NNW22	W17	WNW24	NNW17	N21	N19	N14	N11	NE9	E6	E3	WNW4.9	WNW24
22-Jul	SE4	SSE5	SE8	SE8	SE9	SSE8	SSE9	SSE9	SE10	SE8	S12	S13	SSW15	SW15	SSW12	SSW6	SW9	WNW12	NW11	W13	WNW13	NNW12	NW7	E1	SSW4.3	SSW15
23-Jul	WNW6	SW3	SW6	SW6	WSW7	WSW9	WSW7	N4	N7	N5	NW4	W5	ENE5	SE8	SSE7	SE4	SW4	ESE5	SW5	SSW6	S2	ESE3	SE6	SE5	SW2.0	WSW9
24-Jul	SE7	SE8	ESE10	SE11	SE8	SSW6	SSW10	SSW9	SW11	SW14	SW20	WSW21	WSW20	WSW15	WSW16	WNW14	NW15	NW21	WNW18	W8	WSW14	W19	W7	SW9	WSW8.4	WSW21
25-Jul	SW11	SW3	WNW4	SW4	WSW8	WSW8	WNW7	NW19	NNW14	N10	NNW11	NNW10	NNW13	N12	N10	NNE10	N8	NE8	NNE6	NNW5	NW4	NW2	ESE3	E4	NNW5.3	NW19
26-Jul	SE6	ESE6	SE5	SE5	SE5	SE6	SE10	SE12	SE8	ENE5	WSW7	WSW6	WSW5	SW8	WSW8	NNW7	SSW11	SW9	WSW4	SE9	SE8	S3	SE6	SE12	SSE4.4	SE12
27-Jul	SE12	SE9	SE8	SSE7	SSE6	SSE4	S4	SW6	E3	WNW4	NNW10	NNW12	NNW11	NNW11	N12	NNW15	NNW15	NNW12	N7	N6	N7	NNW7	NNW8	N7	N3.9	NNW15
28-Jul	N5	NW5	N1	NNW3	SSE3	N4	N5	NNE2	NW6	N8	NNW10	NNW10	NNW9	NNW8	NNW9	NNW8	NNW8	NW8	WSW17	SW12	SSW6	SSE9	SSE6	E2	NW3.4	WSW17
29-Jul	SSW3	SSW4	SSE6	S4	S5	SSW5	SSW6	WSW7	SW6	W4	WSW5	WSW7	SW7	SW7	WSW8	SW8	WSW14	SSW7	S9	S9	SSE5	SE3	SE7	SE10	SSW5.0	WSW14
30-Jul	SE8	S4	SE6	SE11	SSE6	WSW6	SSE6	SSW1	SE7	SE8	SE10	ESE10	SE11	N10	NNE7	ESE9	N11	NNW9	N7	N9	NNW11	NNW11	NNW6	NW1	ENE2.0	SE11
31-Jul	NNE3	NE6	NNW9	N9	NNW12	NW9	W9	WNW7	NNW5	WNW7	WNW4	WSW5	NW9	N9	NW13	WNW8	WNW7	NW8	NNW4	NNW13	W6	WNW6	WSW7	WSW8	NNW6.2	NNW13

SSW0.8	W0.4	E0.6	SE1.4	SE1.2	S0.2	NW0.3	NNW1.8	NNW2.5	NW3.2	NW3.8	NW4.3	NW4.7	NW4.7	NW4.5	NW5.1	NNW5.3	NNW5.9	NNW4.6	NW3.7	NW2.4	NW2.3	NW1.1	W0.2			Diurnal Average
SE12	WNW13	NNW12	NNW13	NNW14	NNW17	NNW16	NW19	NNW17	SSE20	SW20	WSW21	WSW20	WNW22	SSE19	WNW24	NNW22	NW22	NNW24	NNW22	NNW19	W19	NNW16	NNW15			Diurnal Maximum

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



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

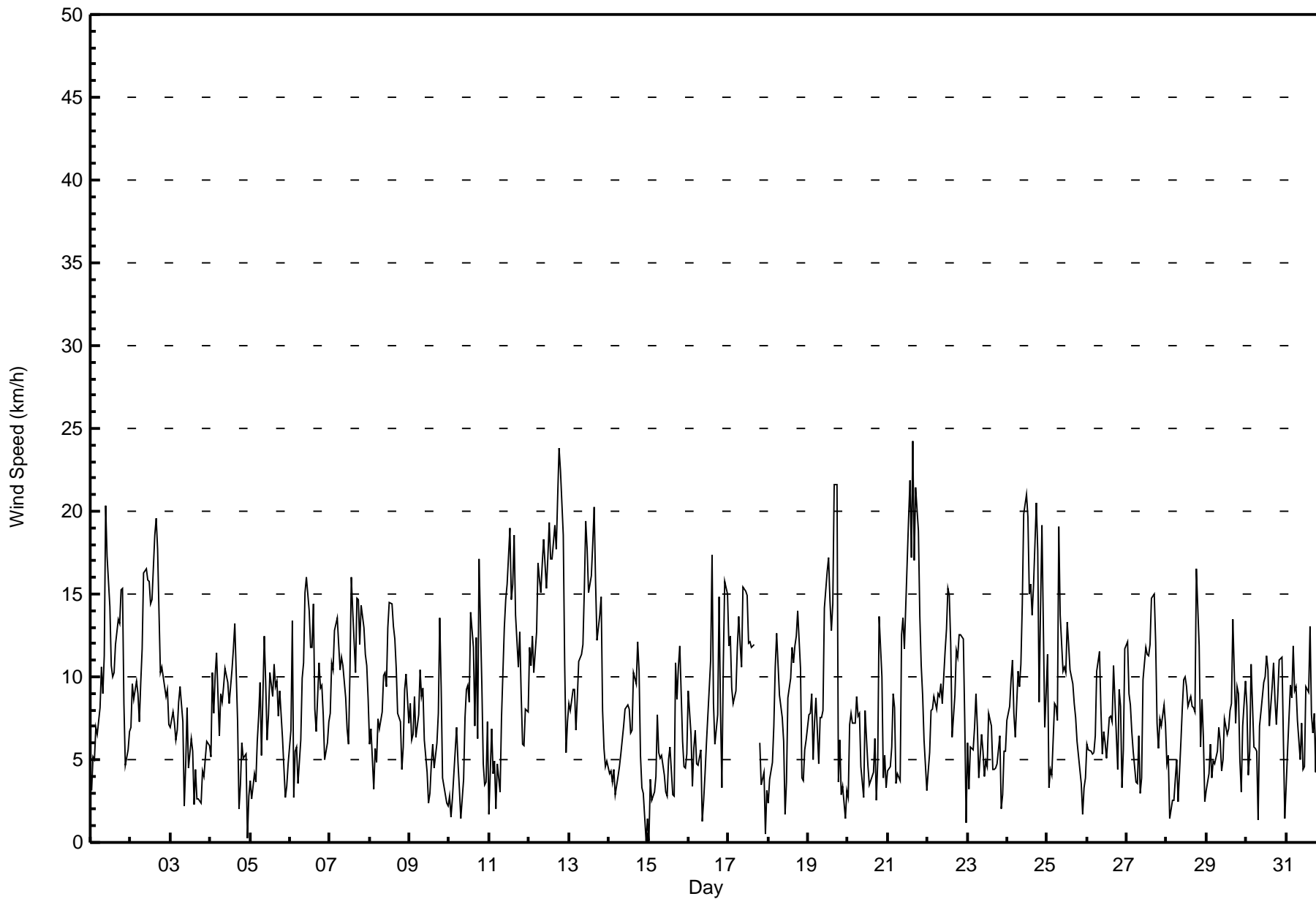
Wind Speed (WS) - km/h
Athabasca Valley - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 13 km/h on Jul 28 19:00 Minimum Value: 0 km/h on Jul 14 21:00 Percentiles: P ₁ = 1 P ₁₀ = 1 O ₁ = 2 Median = 2 O ₃ = 3 P ₉₀ = 4 P ₉₉ = 10																	Hours in Service: 744 Hours of Data: 741 Hours of Missing Data: 3 Hours of Calibration: 0 Percent Operational Time: 99.6									
Day	Hourly Period Ending At (MST)																								Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	1	2	2	2	2	3	3	2	5	6	5	5	4	5	4	5	4	4	4	4	3	2	2	2	6	
2-Jul	2	2	2	2	2	3	3	3	6	5	4	4	4	4	5	6	5	4	4	3	3	2	2	2	6	
3-Jul	2	2	2	2	2	2	2	2	2	12	5	3	3	4	2	1	3	1	2	1	1	2	4	2	12	
4-Jul	2	2	3	3	2	2	2	2	2	2	2	2	3	2	3	3	4	3	2	2	1	2	1	3	4	
5-Jul	2	1	2	2	2	1	2	2	5	2	2	2	3	2	3	3	3	6	6	4	4	2	2	2	6	
6-Jul	2	5	3	3	2	2	2	2	3	3	4	4	4	3	7	3	2	2	3	3	3	2	2	3	7	
7-Jul	3	2	2	3	2	2	2	2	2	2	3	2	4	4	5	3	3	3	3	2	2	2	2	3	5	
8-Jul	2	3	2	1	1	2	2	2	2	2	2	2	2	2	3	3	2	1	2	2	2	2	2	2	3	
9-Jul	2	1	2	2	2	2	2	2	2	2	1	1	1	1	2	1	3	3	2	2	2	1	2	2	3	
10-Jul	2	2	2	2	2	2	1	1	1	2	2	2	2	5	4	3	4	10	8	3	2	1	2	1	10	
11-Jul	2	2	2	1	2	2	2	1	2	3	2	2	5	4	6	5	3	2	5	3	3	1	3	2	6	
12-Jul	2	3	2	4	3	3	3	3	3	3	3	4	4	3	4	4	5	6	4	4	3	3	1	2	6	
13-Jul	1	2	2	2	2	2	2	3	3	3	5	4	4	4	5	4	5	4	4	4	3	1	1	2	5	
14-Jul	2	2	1	1	1	1	1	2	1	1	2	2	2	2	2	2	3	4	4	1	0	2	1	2	4	
15-Jul	1	1	1	1	2	1	1	1	1	1	2	3	2	3	3	2	4	2	3	2	3	2	1	3	4	
16-Jul	3	3	2	1	1	1	1	1	2	2	2	2	2	5	7	7	2	11	10	2	1	4	2	2	11	
17-Jul	2	2	2	1	2	2	2	3	4	3	4	4	3	3	3	3	M	M	M	2	1	1	2	2	4	
18-Jul	2	1	2	1	3	2	2	2	2	1	1	2	3	3	3	4	3	4	3	3	1	1	1	2	4	
19-Jul	2	2	2	2	2	3	3	3	3	2	4	4	4	4	4	5	6	10	6	3	4	3	2	2	10	
20-Jul	2	2	1	2	1	2	2	2	2	1	7	3	1	2	2	2	2	2	3	3	4	2	2	2	7	
21-Jul	2	1	2	2	2	1	2	2	3	3	3	8	5	12	5	10	6	6	6	4	3	3	2	1	12	
22-Jul	2	1	2	2	2	2	2	2	2	2	4	4	5	5	6	6	5	5	3	3	3	3	2	2	6	
23-Jul	4	2	2	2	2	2	3	2	2	1	1	1	4	3	2	2	4	3	2	4	2	1	1	2	4	
24-Jul	1	2	2	2	3	5	4	3	3	4	4	5	4	4	5	6	9	8	9	3	3	3	4	3	9	
25-Jul	3	3	3	2	1	3	5	4	4	3	3	4	4	3	3	3	3	3	2	1	1	1	1	1	5	
26-Jul	2	1	1	2	2	2	2	2	2	2	2	3	3	2	3	5	4	3	2	2	3	2	3	3	5	
27-Jul	2	3	2	1	1	2	2	2	1	1	4	2	2	2	3	4	3	3	2	2	1	2	2	3	4	
28-Jul	2	2	2	3	1	2	3	2	2	3	2	2	1	1	1	2	3	1	13	7	2	3	2	2	13	
29-Jul	2	3	1	1	1	2	2	2	2	2	2	2	2	3	3	4	6	2	2	2	2	1	3	2	6	
30-Jul	3	2	2	3	2	3	2	2	2	2	2	3	4	7	4	2	6	3	2	2	4	3	3	3	7	
31-Jul	2	4	4	4	3	4	3	4	4	3	3	2	3	2	3	4	2	2	2	3	3	2	2	2	4	
																	Diurnal Maximum									
M - Maintenance																										



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed (WS) - km/h
Athabasca Valley - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Athabasca Valley - July 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	200	26.99	26.99
6 - 11	369	49.80	76.79
12 - 19	156	21.05	97.84
20 - 28	16	2.16	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 741

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Athabasca Valley - July 2016**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	19	8	4	6	13	11	23	13	14	10	14	18	13	7	13	14	200
6 - 11	48	5	10	4	4	6	68	18	9	13	27	31	6	8	14	98	369
12 - 19	24	2	0	1	1	2	9	7	7	2	9	13	5	7	4	63	156
20 - 28	1	0	0	0	0	0	0	2	0	0	1	2	1	2	2	5	16
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	92	15	14	11	18	19	100	40	30	25	51	64	25	24	33	180	741

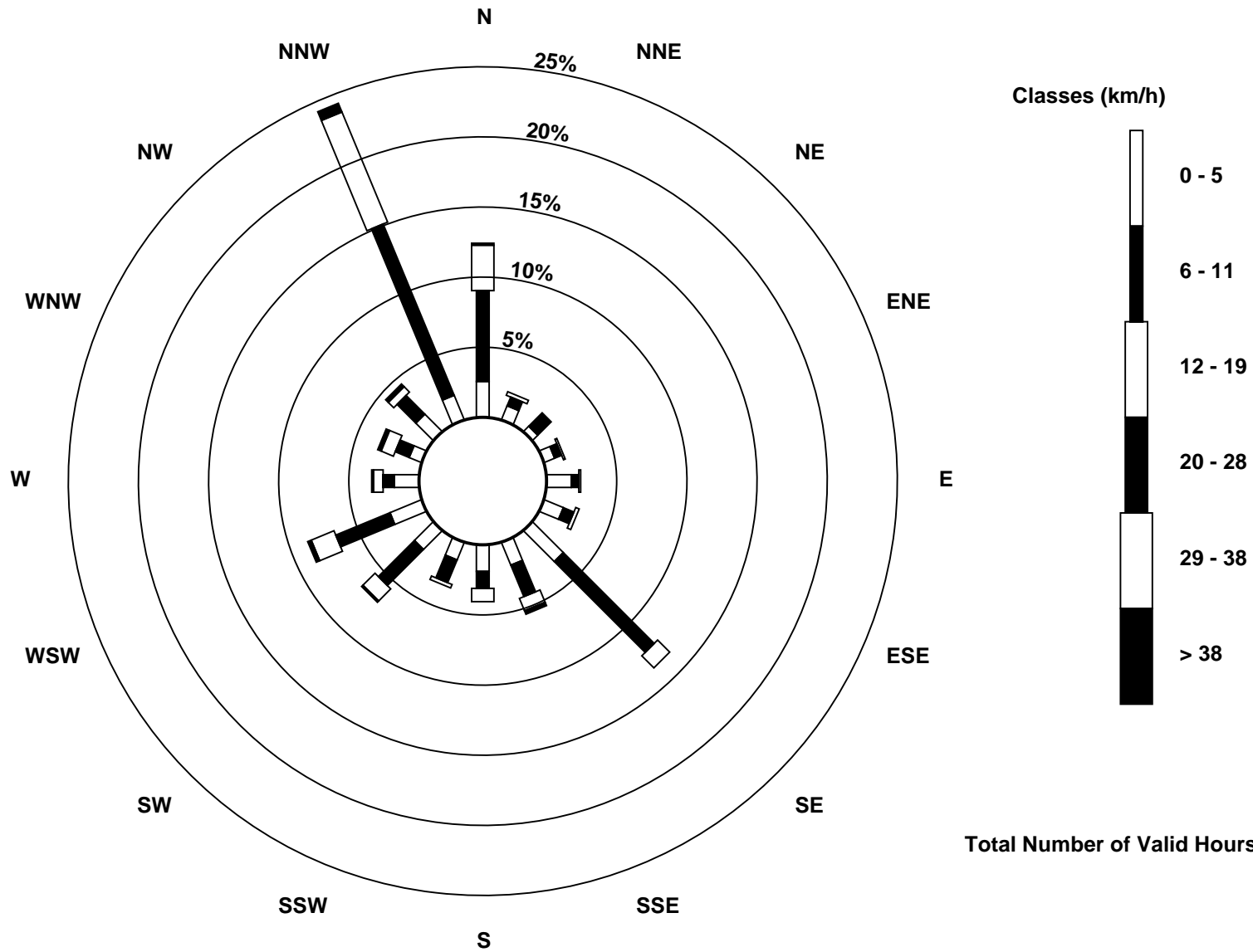
Total Number of Valid Hours: 741

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

Wind Speed (WS) - km/h
Athabasca Valley (AMS 7)





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Athabasca Valley - July 2016

Direction of Maximum Speed: 299 deg on Jul 21 16:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 344.0 deg on Jul 12	Hours of Data: 741
Direction of Minimum Speed: 33 deg on Jul 14 23:00	Hours of Missing Data: 3
Direction of Minimum Daily Speed Average: 1.1 deg on Jul 10	Percent Operational Time: 99.6
Monthly Average Direction: 314.6 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-Jul	154	123	134	133	133	141	131	135	130	150	145	164	179	167	154	162	173	174	180	170	160	136	139	143	154.3
2-Jul	152	141	142	138	136	128	141	141	136	164	156	170	159	156	150	149	134	118	145	176	132	138	138	130	146.1
3-Jul	130	148	144	140	142	136	143	160	278	279	254	205	114	171	88	240	265	30	7	176	153	187	233	237	169.1
4-Jul	215	242	242	241	237	230	241	242	228	241	229	231	232	220	228	236	249	125	175	198	185	145	304	359	229.4
5-Jul	355	49	2	291	324	329	335	359	3	336	56	348	341	331	340	339	337	48	63	261	294	209	146	216	345.3
6-Jul	227	294	314	131	174	199	329	336	1	339	337	350	357	348	7	39	6	345	34	353	359	1	351	2	348.9
7-Jul	338	335	340	340	337	329	326	335	352	343	344	357	6	342	348	349	344	350	355	340	337	331	334	346	342.1
8-Jul	349	345	13	39	39	34	30	4	353	343	337	340	334	339	343	343	352	359	0	348	347	338	338	351	351.0
9-Jul	6	352	348	346	344	340	342	344	334	333	354	327	318	281	239	295	73	64	77	88	99	221	246	271	356.7
10-Jul	242	0	21	130	133	133	132	30	311	348	335	348	351	90	103	79	137	263	291	327	330	271	225	237	3.3
11-Jul	158	206	201	216	235	121	5	350	344	341	341	343	342	351	347	345	351	345	348	359	44	346	336	339	344.4
12-Jul	332	343	342	350	343	338	345	352	346	344	348	349	346	346	348	345	350	347	342	342	339	331	335	334	344.0
13-Jul	326	338	339	339	336	343	352	350	355	345	344	343	356	348	346	345	14	358	348	343	343	354	359	8	348.0
14-Jul	49	6	79	83	113	91	81	344	360	347	346	344	4	339	342	341	340	2	352	346	312	263	33	97	359.3
15-Jul	50	76	98	102	125	129	111	74	74	72	216	244	346	320	353	277	344	5	335	321	299	335	262	243	353.1
16-Jul	234	221	149	140	142	125	133	92	177	156	245	349	354	332	13	348	353	341	8	322	347	337	341	338	348.7
17-Jul	327	333	334	333	334	337	339	349	344	345	343	347	353	359	358	347	M	M	M	337	333	269	271	104	342.2
18-Jul	131	122	136	131	140	143	136	137	130	86	17	245	259	229	239	246	256	243	227	239	209	203	192	189	196.6
19-Jul	184	177	168	136	126	121	124	219	228	243	234	237	222	234	257	261	333	315	250	213	216	304	243	175	235.6
20-Jul	185	313	330	328	312	314	336	335	321	240	346	341	321	271	244	237	226	249	237	236	230	148	160	108	287.6
21-Jul	156	141	130	136	135	137	185	221	242	245	281	271	273	290	263	299	332	9	353	352	11	36	84	95	302.2
22-Jul	130	155	143	145	141	148	150	151	145	146	170	171	201	225	211	203	234	302	325	281	291	335	310	82	199.4
23-Jul	282	230	224	232	247	245	241	2	355	353	314	266	61	133	158	138	235	110	221	210	184	122	140	141	215.6
24-Jul	146	132	120	136	125	199	211	213	234	228	224	242	238	244	257	298	313	326	288	259	256	263	278	230	245.1
25-Jul	236	219	287	226	240	256	300	323	343	354	341	345	337	353	9	16	5	45	25	348	322	311	107	94	335.0
26-Jul	131	119	129	146	134	138	138	144	132	78	251	239	239	220	239	331	210	227	241	143	146	182	143	142	167.0
27-Jul	142	142	143	150	156	157	176	223	95	294	343	342	348	347	352	348	348	347	352	8	350	348	339	354	354.7
28-Jul	5	320	359	328	156	5	353	17	325	355	344	346	339	334	340	338	330	310	244	226	211	155	164	99	319.4
29-Jul	202	207	156	184	170	196	213	239	236	268	247	241	236	235	252	234	239	203	179	180	158	141	124	139	206.7
30-Jul	145	180	130	139	149	245	164	201	137	132	129	115	133	5	22	107	354	345	349	353	344	335	335	317	75.8
31-Jul	12	44	340	353	348	316	269	295	338	302	294	245	321	358	319	288	297	325	342	330	262	292	254	241	314.5

212.1 266.6 94.7 126.2 144.1 172.2 324.1 331.8 343.0 323.0 309.7 306.5 314.8 313.7 319.6 320.2 327.6 342.4 330.9 305.2 311.6 314.9 311.5 277.3
 Diurnal Average

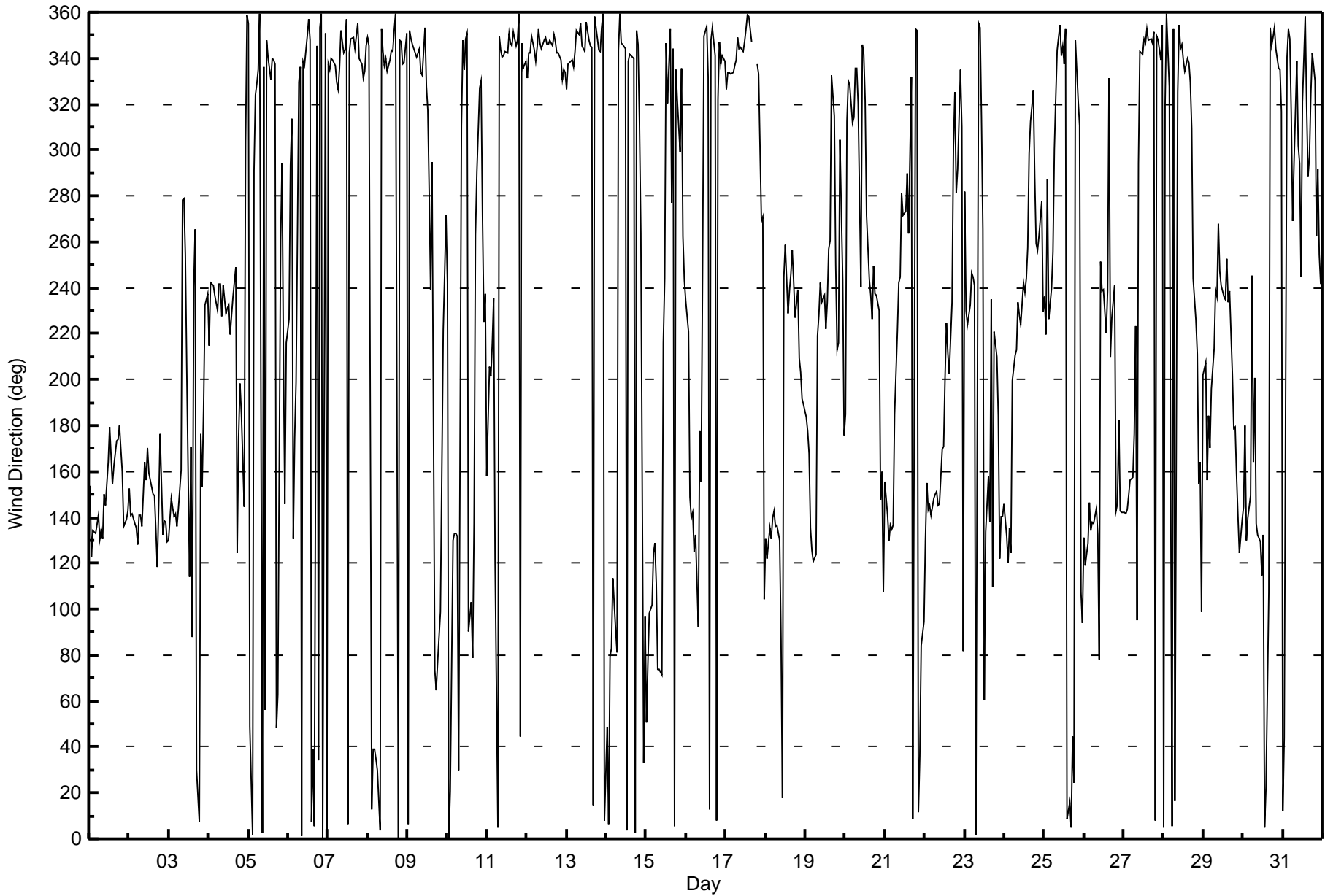
M - Maintenance
 All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
Athabasca Valley - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 96 deg on Jul 17 23:00 Minimum Value: 7 deg on Jul 28 13:00 Percentiles: P ₁ = 9 P ₁₀ = 13 Q ₁ = 16 Median = 22 Q ₃ = 34 P ₉₀ = 58 P ₉₉ = 87																	Hours in Service: 744 Hours of Data: 741 Hours of Missing Data: 3 Hours of Calibration: 0 Percent Operational Time: 99.6										
Day	Hourly Period Ending At (MST)																								Daily Maximum		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Jul	53	33	33	16	20	22	20	19	24	20	24	29	44	46	53	35	32	25	24	17	20	32	18	35	53		
2-Jul	20	14	14	15	18	26	19	15	21	20	23	22	25	24	19	17	21	22	35	19	20	18	16	21	35		
3-Jul	23	16	16	23	16	15	18	25	78	89	53	61	40	50	81	21	60	29	56	30	27	28	42	26	89		
4-Jul	18	14	24	15	12	24	13	15	19	15	16	23	16	17	14	21	80	57	28	26	33	95	54	95			
5-Jul	48	34	30	58	17	13	13	36	30	16	36	30	15	13	12	14	17	45	76	59	69	63	45	50	76		
6-Jul	26	27	68	64	27	44	34	17	24	12	12	21	22	21	24	30	34	17	25	32	28	26	27	23	68		
7-Jul	25	11	12	11	10	10	16	15	19	20	32	52	25	14	17	20	14	18	21	10	11	10	11	21	52		
8-Jul	24	27	58	19	22	20	28	24	19	12	16	11	13	12	12	12	18	19	15	22	19	12	9	27	58		
9-Jul	15	19	18	12	22	14	11	14	11	13	22	35	23	18	40	52	59	45	13	13	22	52	57	41	59		
10-Jul	69	66	43	23	16	32	42	67	20	14	13	18	16	39	27	29	28	87	17	27	27	32	61	11	87		
11-Jul	77	29	36	17	80	29	56	15	10	10	10	10	13	16	16	15	18	14	17	26	31	16	22	21	80		
12-Jul	11	15	12	25	16	10	14	18	15	13	16	16	16	15	16	14	17	17	12	12	9	13	21	16	25		
13-Jul	13	19	11	12	16	16	15	16	17	15	14	13	22	28	18	15	21	25	17	13	15	18	26	30	30		
14-Jul	38	34	13	11	42	19	20	28	23	14	14	15	30	20	23	13	18	20	18	14	16	51	94	82	94		
15-Jul	94	14	60	26	23	10	28	17	16	46	61	87	51	60	79	69	15	20	18	9	31	29	23	53	94		
16-Jul	11	52	56	21	16	26	27	19	94	78	54	42	18	19	28	43	24	15	28	15	35	11	10	10	94		
17-Jul	9	9	11	11	12	11	13	18	16	13	14	17	20	21	22	17	M	M	M	22	22	18	96	57	96		
18-Jul	55	29	23	18	14	10	11	14	18	30	75	75	32	20	16	27	17	21	16	13	27	30	17	19	75		
19-Jul	20	19	13	26	24	21	61	46	24	19	17	16	13	25	30	30	28	22	77	36	79	66	82	64	82		
20-Jul	54	23	12	13	15	20	17	16	25	55	30	31	20	46	35	50	20	60	28	10	43	49	39	65	65		
21-Jul	37	23	22	11	17	37	66	44	14	15	19	26	18	21	22	24	37	19	21	22	27	23	21	29	66		
22-Jul	20	23	15	16	14	17	20	19	17	22	30	27	29	29	37	48	23	24	20	17	14	15	17	73	73		
23-Jul	51	51	24	24	22	12	30	37	29	35	22	30	69	26	34	62	60	70	34	23	63	42	13	22	70		
24-Jul	13	15	15	11	28	63	27	24	25	23	14	18	15	19	21	48	32	24	26	22	15	11	46	21	63		
25-Jul	18	64	66	31	15	19	53	11	21	22	36	32	21	23	26	23	32	33	32	21	42	70	53	29	70		
26-Jul	25	23	25	25	23	17	15	15	20	38	40	47	35	21	31	60	28	28	40	23	30	66	29	13	66		
27-Jul	12	12	12	14	15	50	52	18	53	28	13	9	16	17	20	17	18	15	16	26	11	11	11	32	53		
28-Jul	61	62	77	81	56	52	45	66	21	31	14	11	7	8	10	11	17	11	24	37	35	23	23	75	81		
29-Jul	44	63	29	46	31	50	40	15	22	35	35	25	34	39	28	16	32	38	22	14	35	60	25	17	63		
30-Jul	20	55	37	16	37	53	33	91	20	17	18	24	32	61	50	29	61	24	23	21	16	14	58	88	91		
31-Jul	71	75	34	43	22	42	43	45	84	45	53	64	37	21	27	26	21	18	47	14	69	30	19	12	84		
																	94 75 77 81 80 63 66 91 94 89 75 87 69 61 81 69 61 87 77 59 79 70 96 88										
Diurnal Maximum																											
M - Maintenance																											





Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	July 5, 2016	Last Calibration	June 1, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Routine		
Start Time (MST)	6:48	End Time (MST)	11:23
Gas Cert Reference	S970259A	Station temp.	22 Deg C
Cal Gas Concentration	50 ppm	Cal Gas Exp Date	26/09/2017
Calibrator Make/Model	Sabio 4010	Serial Number	11021107
ZAG Make/Model	API 701	Serial Number	1864
DACS make/model	Campbell Scientific CR3000	DACS serial No.	5564

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-619	-619
Analyzer IP address	192.168.1.103		Lamp voltage	802	802
Calculated slope	0.996126	1.000049	Chamber temp	44.4	44.4
Calculated intercept	1.587468	2.037014	Pressure	689.9	689.9
Analyzer Background	18.4	18.1	Flow	0.477	0.477
Analyzer Coefficient	1.065	1.045	Intensity	43489	43489

Analyzer make Thermo 45C Analyzer serial # 630718530

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.4	----
as found span	5000	60.7	607.0	612.3	0.991
calibrator zero	5000	0.0	0.0	0.2	----
high point	5000	60.7	607.0	606.4	1.001
second point	5000	30.4	304.0	299.7	1.014
third point	5000	15.2	152.0	148.5	1.024
as left zero	5000	0.0	0.0	0.2	----
as left span	5000	60.7	607.0	604.3	1.004
Average Correction Factor					1.013

Corrected As found 612.7 Previous response 607.8 % change -0.8%

Notes:

no maintenance done, filter changed out, span adjusted

Calibration Performed By: Melissa Lemay



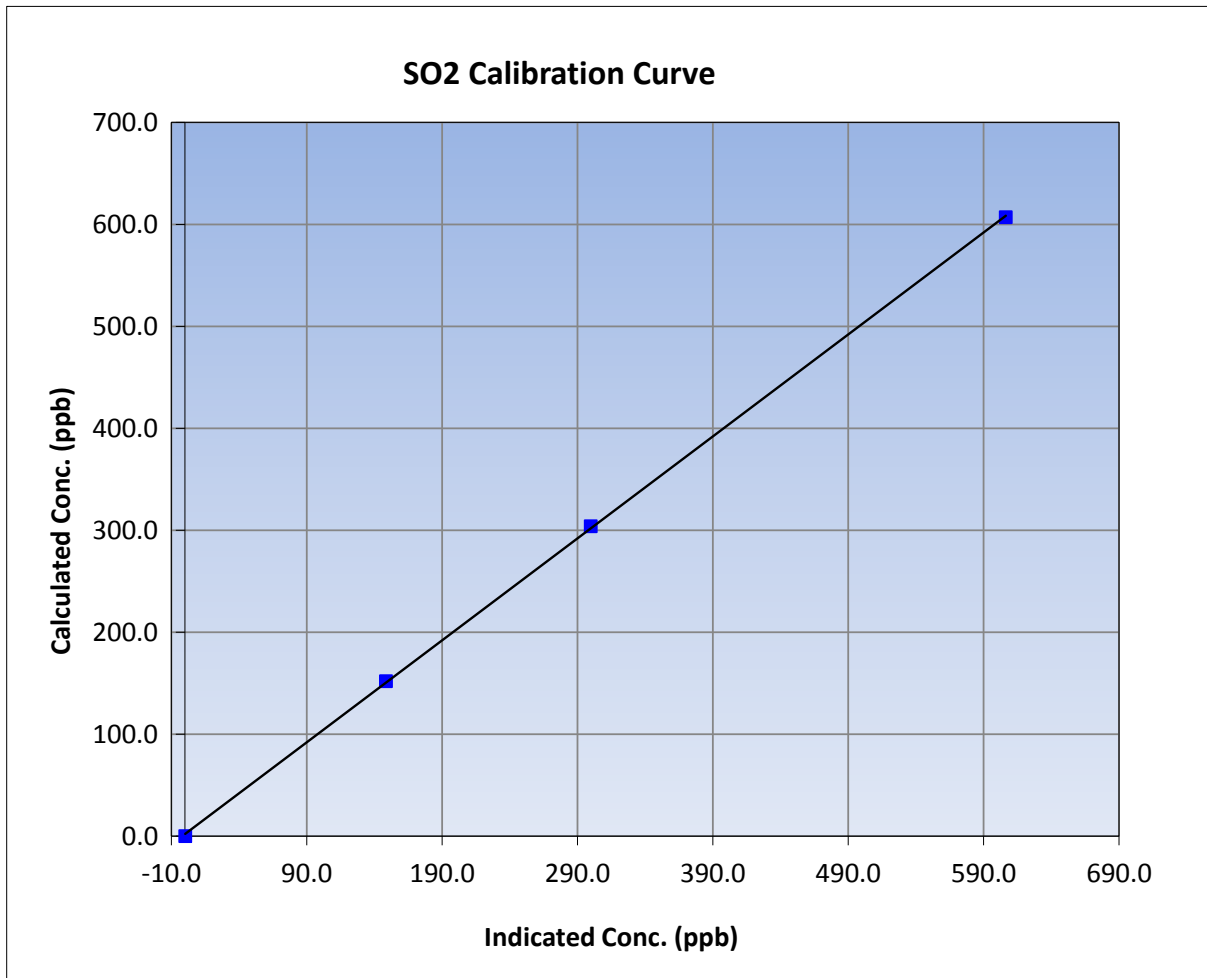
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	July 5, 2016	Previous Calibration	June 1, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	6:48	End Time (MST)	11:23
Analyzer make	Thermo 45C	Analyzer serial #	630718530

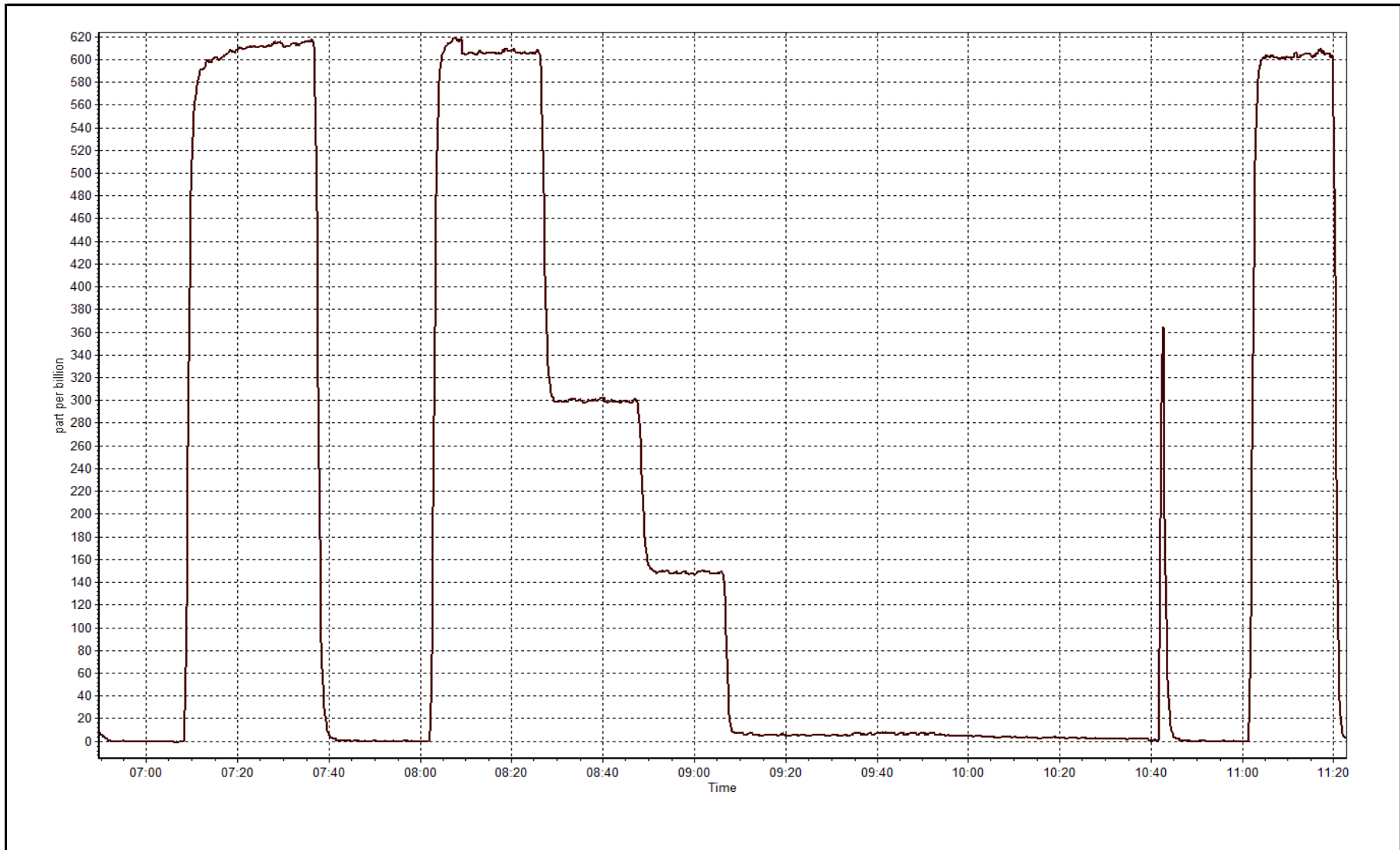
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	----	Correlation Coefficient	0.999929
607.0	606.4	1.0010		
304.0	299.7	1.0143	Slope	1.000049
152.0	148.5	1.0236		
			Intercept	2.037014



SO2 Calibration Plot

Date: July 5, 2016





Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	July 27, 2016	Last Calibration	July 5, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Routine		
Start Time (MST)	9:00	End Time (MST)	3:15
Gas Cert Reference	S970259A	Station temp.	22 Deg C
Cal Gas Concentration	50 ppm	Cal Gas Exp Date	9/26/2017
Calibrator Make/Model	API T700	Serial Number	2445
ZAG Make/Model	API 701	Serial Number	1864
DACS make/model	Campbell Scientific CR3000	DACS serial No.	8205

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-619	-618
Analyzer IP address	192.168.1.103		Lamp voltage	802	803
Calculated slope	1.000049	0.994697	Chamber temp	44.4	44.0
Calculated intercept	2.037014	1.396770	Pressure	689.9	693.1
Analyzer Background	18.1	18.9	Flow	0.477	0.467
Analyzer Coefficient	1.045	1.100	Intensity	43489	43551

Analyzer make Thermo 45C Analyzer serial # 630718530

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.1	----
as found span	5000	60.7	607.0	569.5	1.066
calibrator zero	5000	0.0	0.0	0.2	----
high point	5000	60.7	607.0	610.0	0.995
second point	5000	30.4	304.0	302.3	1.006
third point	5000	15.2	152.0	150.6	1.009
as left zero	5000	0.0	0.0	0.2	----
as left span	5000	60.7	607.0	607.8	0.999
Average Correction Factor					1.003

Corrected As found 569.6 Previous response 604.9 % change 6.2%

Notes:

Replaced pump for preventative maintenace. Adjusted span

Calibration Performed By: Asad Hidayat



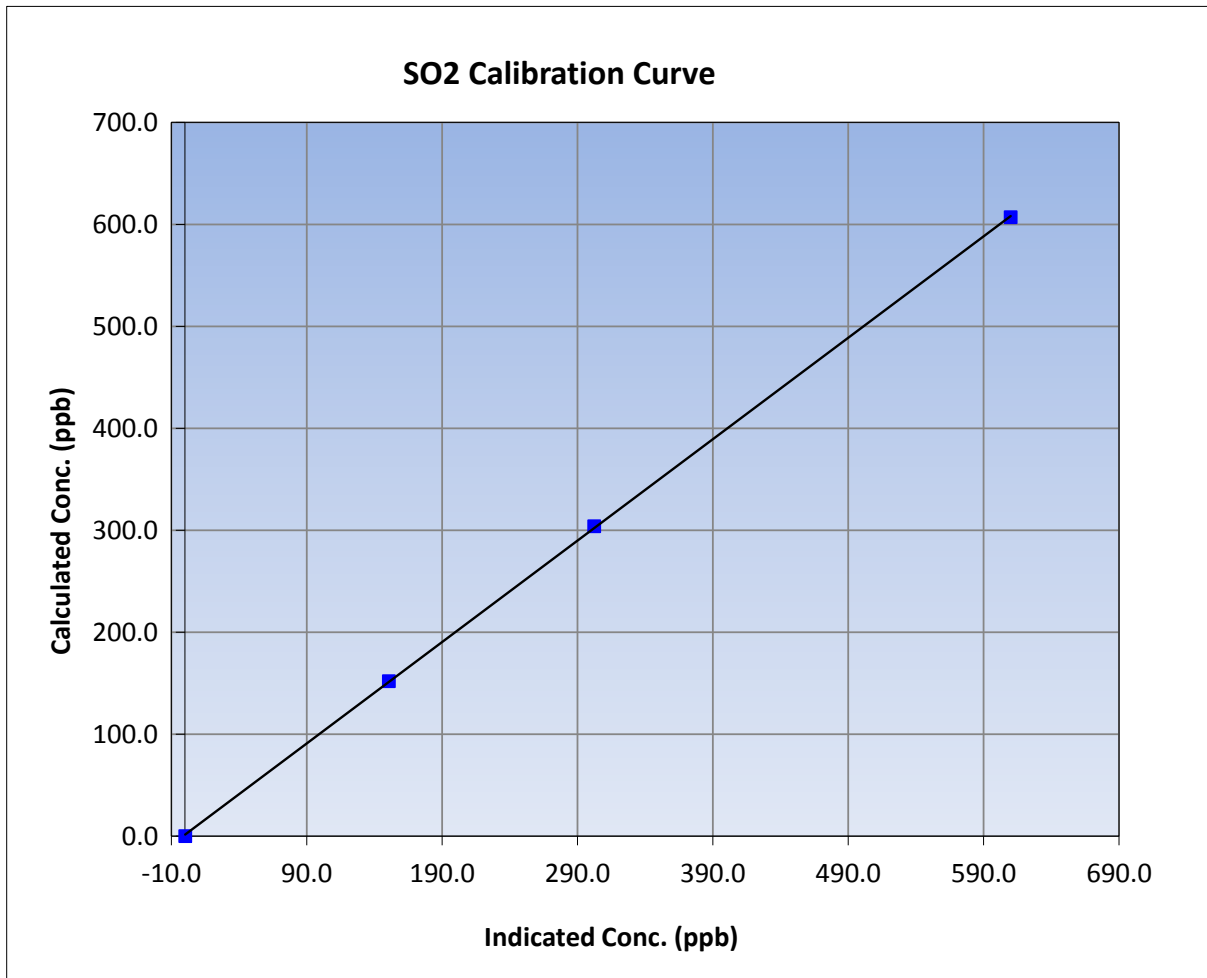
Wood Buffalo Environmental Association SO2 Calibration Report

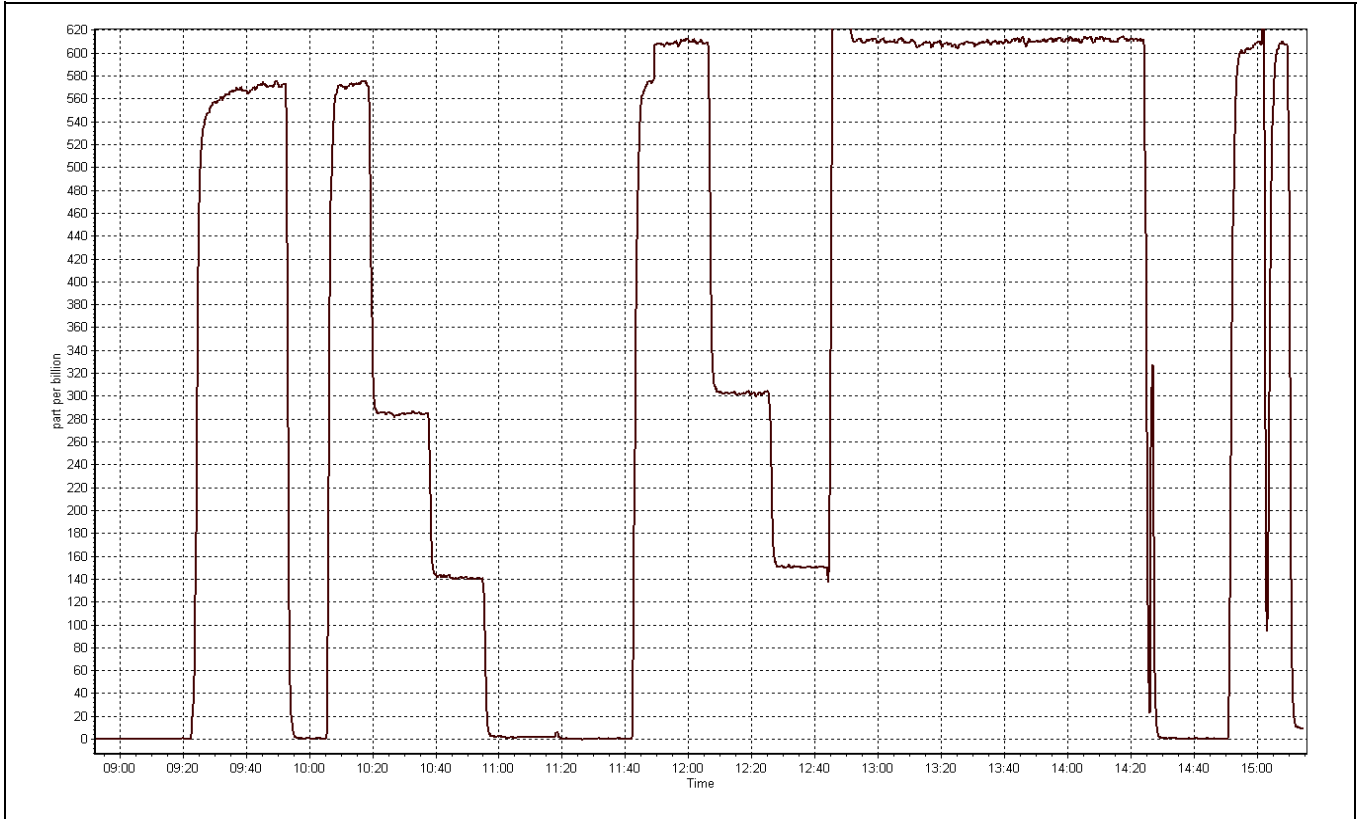
Station Information

Calibration Date	July 27, 2016	Previous Calibration	July 5, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	9:00	End Time (MST)	3:15
Analyzer make	Thermo 45C	Analyzer serial #	630718530

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	----	Correlation Coefficient	0.999960
607.0	610.0	0.9951		
304.0	302.3	1.0056	Slope	0.994697
152.0	150.6	1.0094		
			Intercept	1.396770







Wood Buffalo Environmental Association

TRS Calibration Report

Station Information

Calibration Date	July 7, 2016	Last Calibration	June 2, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Routine		
Start Time (MST)	7:07	End Time (MST)	9:49
Gas Cert Reference	ALM052589	Station temp.	22 Deg C
Cal Gas Concentration	5.02 ppm	Cal Gas Exp Date	09/09/2017
Calibrator Make/Model	Sabio 4010	Serial Number	11021107
Dil air Make/Model	API 701	Serial Number	1864
DACS make/model	Campbell Scientific CR3000	DACS serial No.	5564
SO2 gas concentration	50 ppm	SO2 gas cert/exp	S970259A 26/Sep/17

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-699	-699
Analyzer IP address	192.168.1.44		Lamp voltage	1100	1102
Calculated slope	0.987902	0.993770	Chamber temp	45	45
Calculated intercept	-0.140503	0.042843	Pressure	721.0	700.7
Analyzer Background	2.39	2.39	Flow	0.434	0.434
Analyzer Coefficient	1.067	1.067	Intensity	72	72
			Converter temp.	800	800
Analyzer make/model	Thermo 43i-LTE		Analyzer serial #	1507864683	
Converter make/model	CDN-101		Converter serial #	503	

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	6000	0.0	0.0	0.2	----
as found span	6000	89.6	75.0	75.2	0.997
SO2 scrubber check	5000	15.2	152.0	0.5	----
calibrator zero	6000	0.0	0.0	0.2	----
high point	6000	89.6	75.0	75.6	0.992
second point	6000	50.2	42.0	42.0	1.001
third point	6000	29.9	25.0	24.9	1.004
as left zero	6000	0.0	0.0	0.3	----
as left span	6000	89.6	75.0	74.6	1.004
Average Correction Factor					0.999

Corrected As found	75.0	Previous response	76.0	% change	1.4%
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Notes:

Inlet filter chagned out. No adjustments or maintenance done.

Calibration Performed By:

Melissa Lemay



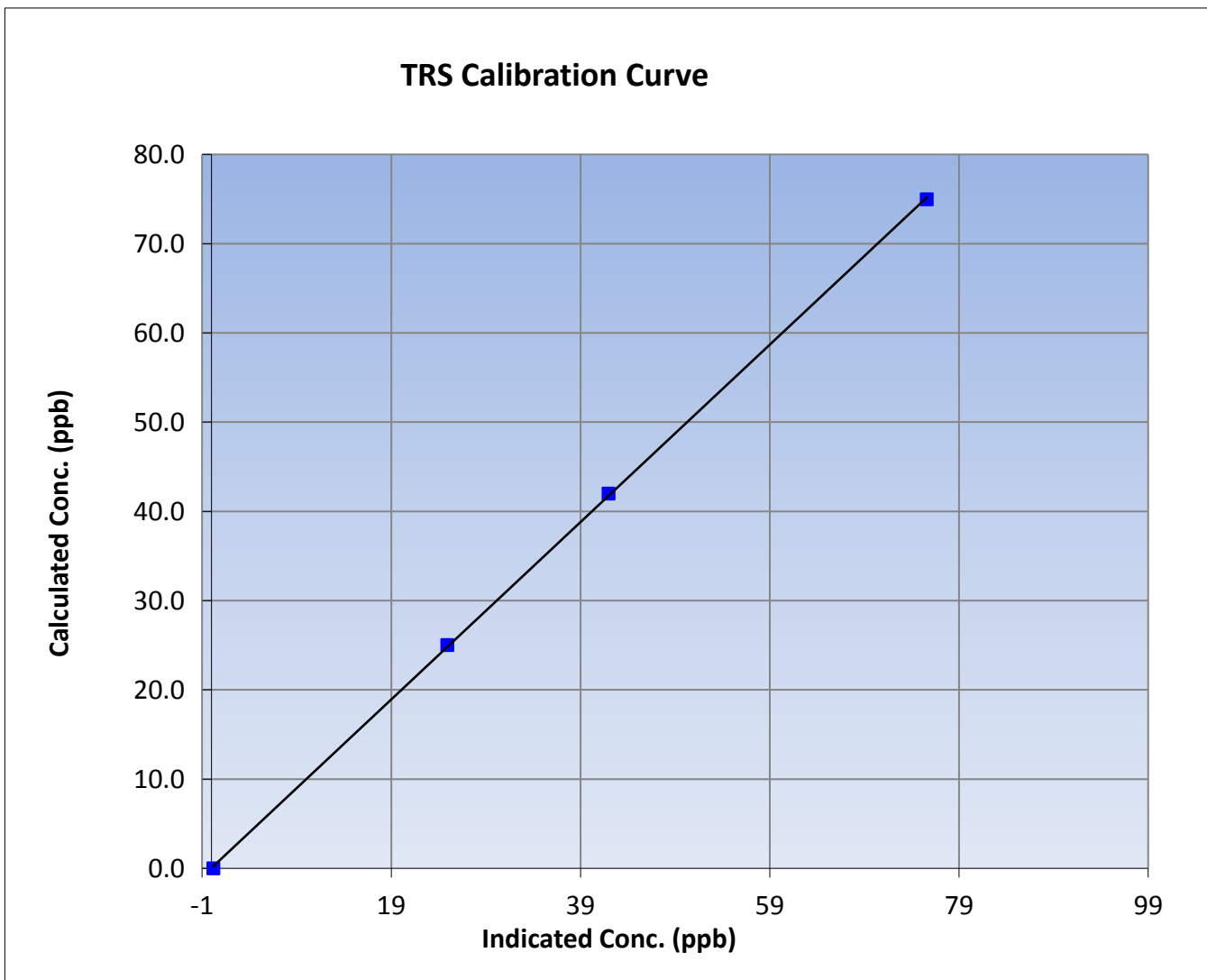
Wood Buffalo Environmental Association TRS Calibration Report

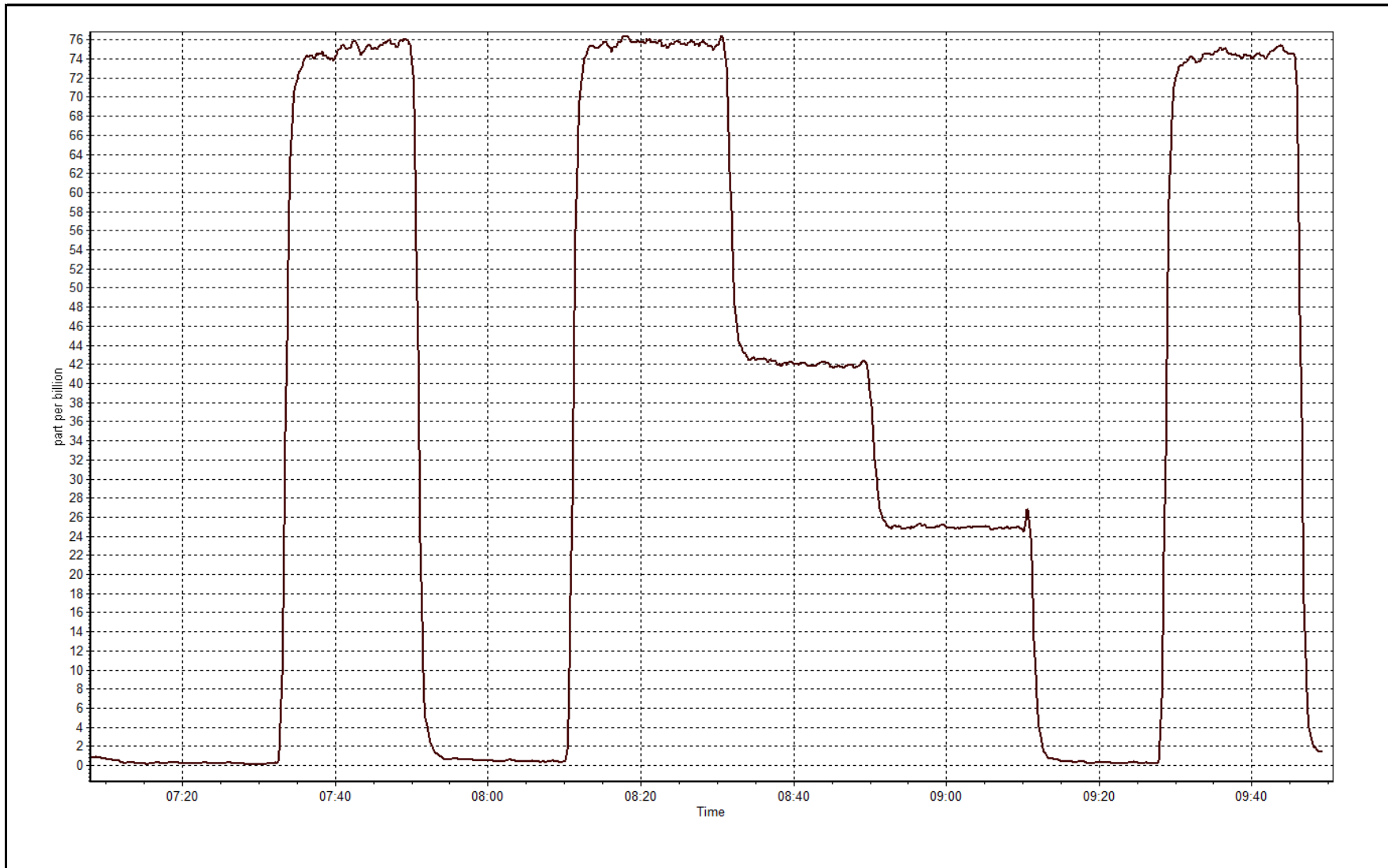
Station Information

Calibration Date	July 7, 2016	Previous Calibration	June 2, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	7:07	End Time (MST)	9:49
Analyzer make	Thermo 43i-LTE	Analyzer serial #	1507864683

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	----	Correlation Coefficient	0.999929
75.0	75.6	0.9916		
42.0	42.0	1.0007	Slope	0.993770
25.0	24.9	1.0039		
			Intercept	0.042843







Wood Buffalo Environmental Association TRS Calibration Report

Station Information

Calibration Date	July 21, 2016	Last Calibration	July 7, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Routine		
Start Time (MST)	9:25	End Time (MST)	11:46
Gas Cert Reference	ALM052589	Station temp.	22 Deg C
Cal Gas Concentration	5.02 ppm	Cal Gas Exp Date	9/9/2017
Calibrator Make/Model	Sabio 4010	Serial Number	11021107
Dil air Make/Model	API 701-H	Serial Number	198
DACS make/model	Campbell Scientific CR3000	DACS serial No.	8205
SO2 gas concentration	50 ppm	SO2 gas cert/exp	S970259A 26/Sep/17

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-699	-699
Analyzer IP address	192.168.1.44		Lamp voltage	1094	1102
Calculated slope	0.993770	1.060310	Chamber temp	45	45
Calculated intercept	0.042843	-0.414477	Pressure	705.3	700.7
Analyzer Background	2.39	2.39	Flow	0.436	0.434
Analyzer Coefficient	1.067	1.067	Intensity	71	72
			Converter temp.	800	800
Analyzer make/model	Thermo 43i-LTE		Analyzer serial #	1507864683	
Converter make/model	CDN-101		Converter serial #	503	

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	6000	0.0	0.0	0.2	----
as found span	6000	89.6	75.0	71.0	1.056
SO2 scrubber check	4900	9.1	92.9	0.6	----
calibrator zero	6000	0.0	0.0	0.2	----
high point	6000	89.6	75.0	71.0	1.056
second point	6000	50.2	42.0	40.0	1.050
third point	6000	29.9	25.0	24.3	1.031
as left zero					
as left span					
Average Correction Factor					1.046

Corrected As found	70.8	Previous response	75.4	% change	6.6%
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Notes:

TRS daily spans were low, came to verify the analyzers performance. As left zero spans were not completed.

Calibration Performed By:

Jayme Rycroft and
Gary Cross



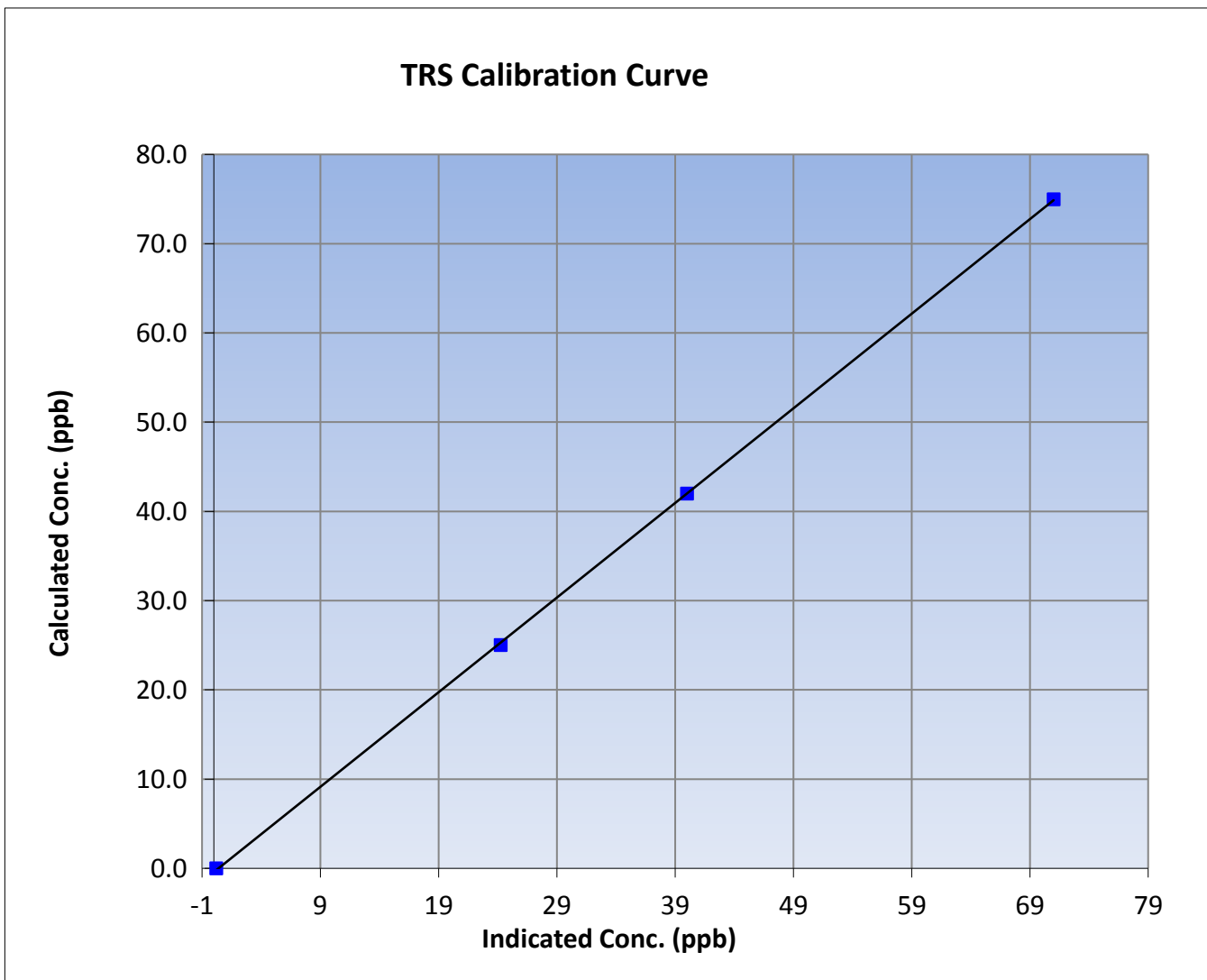
Wood Buffalo Environmental Association TRS Calibration Report

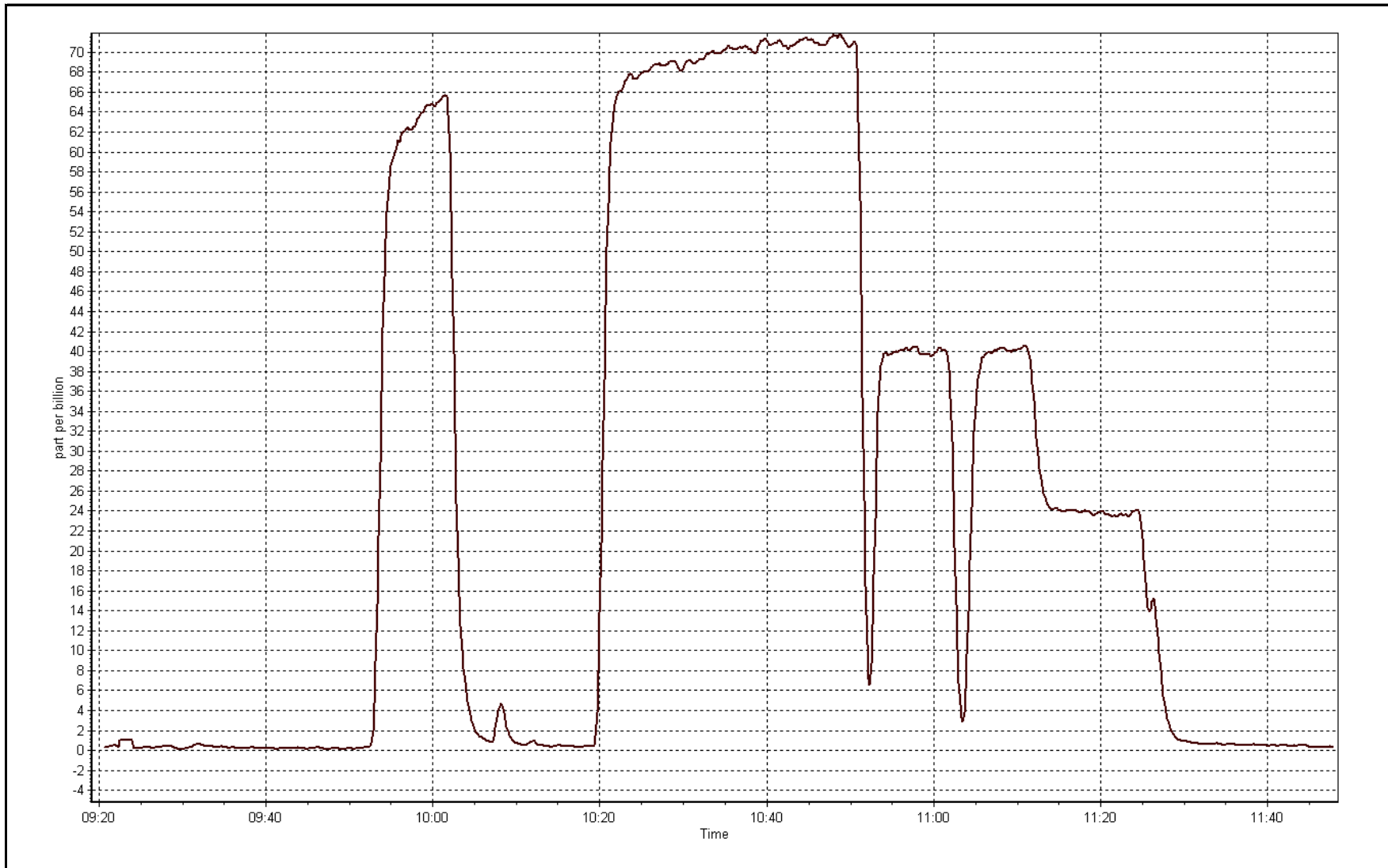
Station Information

Calibration Date	July 21, 2016	Previous Calibration	July 7, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	9:25	End Time (MST)	11:46
Analyzer make	Thermo 43i-LTE	Analyzer serial #	1507864683

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	----	Correlation Coefficient	0.999956
75.0	71.0	1.0558		
42.0	40.0	1.0500	Slope	1.060310
25.0	24.3	1.0312		
			Intercept	-0.414477







Wood Buffalo Environmental Association TRS Calibration Report

Station Information

Calibration Date	July 26, 2016	Last Calibration	July 21, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Other: <input type="text" value="Repair"/>		
Start Time (MST)	14:42	End Time (MST)	17:00
Gas Cert Reference	ALM052589	Station temp.	22 Deg C
Cal Gas Concentration	5.02 ppm	Cal Gas Exp Date	09/09/2017
Calibrator Make/Model	API T700	Serial Number	2445
Dil air Make/Model	API 701-H	Serial Number	198
DACS make/model	Campbell Scientific CR3000	DACS serial No.	8205
SO2 gas concentration	50 ppm	SO2 gas cert/exp	S970259A 26/Sep/17

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-699	-699
Analyzer IP address	192.168.1.44		Lamp voltage	1094	1102
Calculated slope	1.060310	1.004882	Chamber temp	45	45
Calculated intercept	-0.414477	0.076835	Pressure	796.0	701.0
Analyzer Background	2.39	2.91	Flow	0.000	0.431
Analyzer Coefficient	1.067	1.160	Intensity	71	72
			Converter temp.	800	800
Analyzer make/model	Thermo 43i-LTE		Analyzer serial #	1507864683	
Converter make/model	CDN-101		Converter serial #	503	

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
SO2 scrubber check	5000	10.0	100.0	0.0	----
calibrator zero	5000	0.0	0.0	-0.1	----
high point	5000	74.7	75.0	74.5	1.007
second point	5000	41.8	42.0	41.9	1.003
third point	5000	24.9	25.0	24.7	1.012
as left zero	5000	0.0	0.0	0.2	----
as left span	5000	75.0	75.3	74.6	1.009
Average Correction Factor					1.007

Corrected As found NA Previous response NA % change NA

Notes:

Pump failed, instrument exhibiting zero flow. New pump installed and instrument re-calibrated.

Calibration Performed By: Zach Eastman



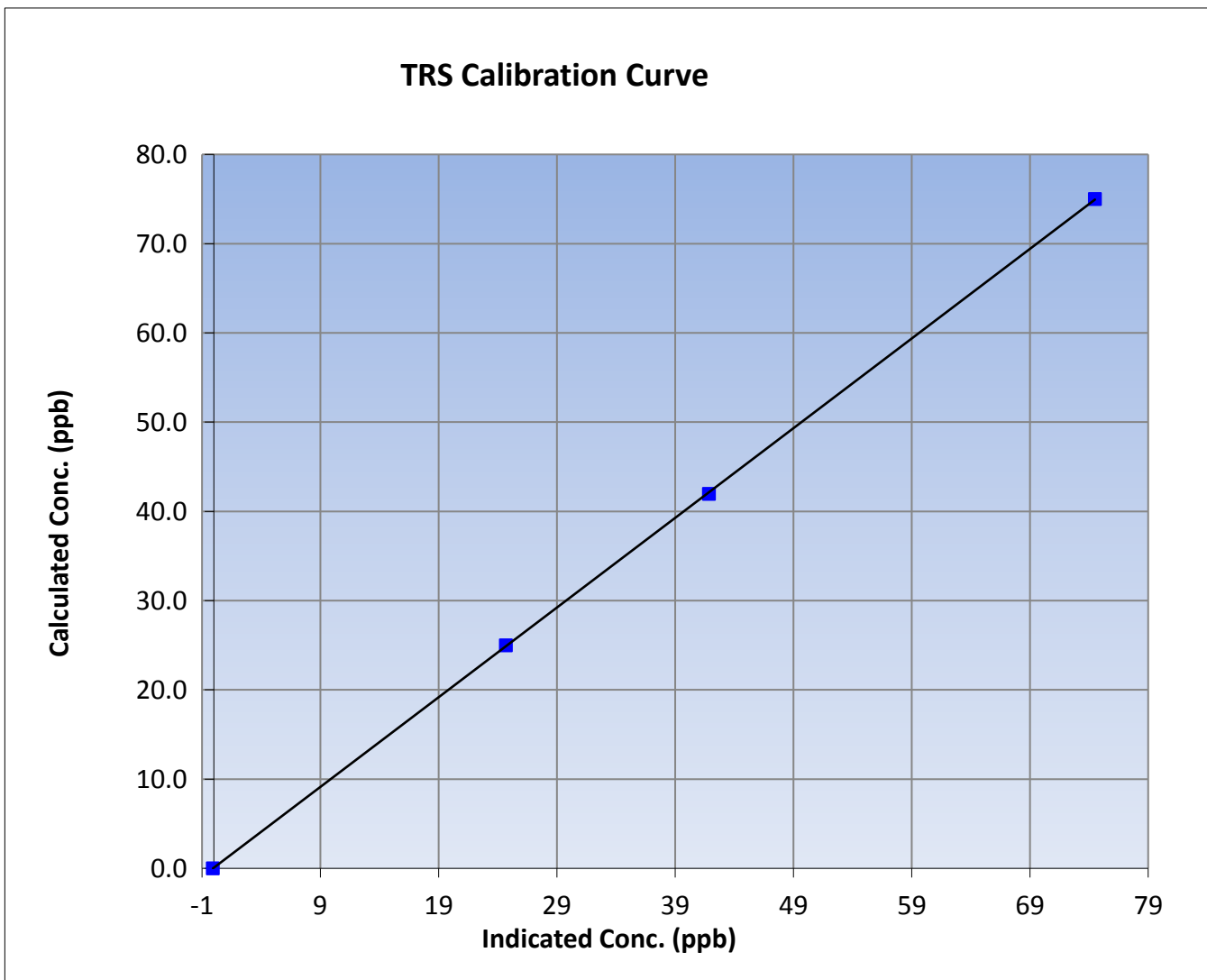
Wood Buffalo Environmental Association TRS Calibration Report

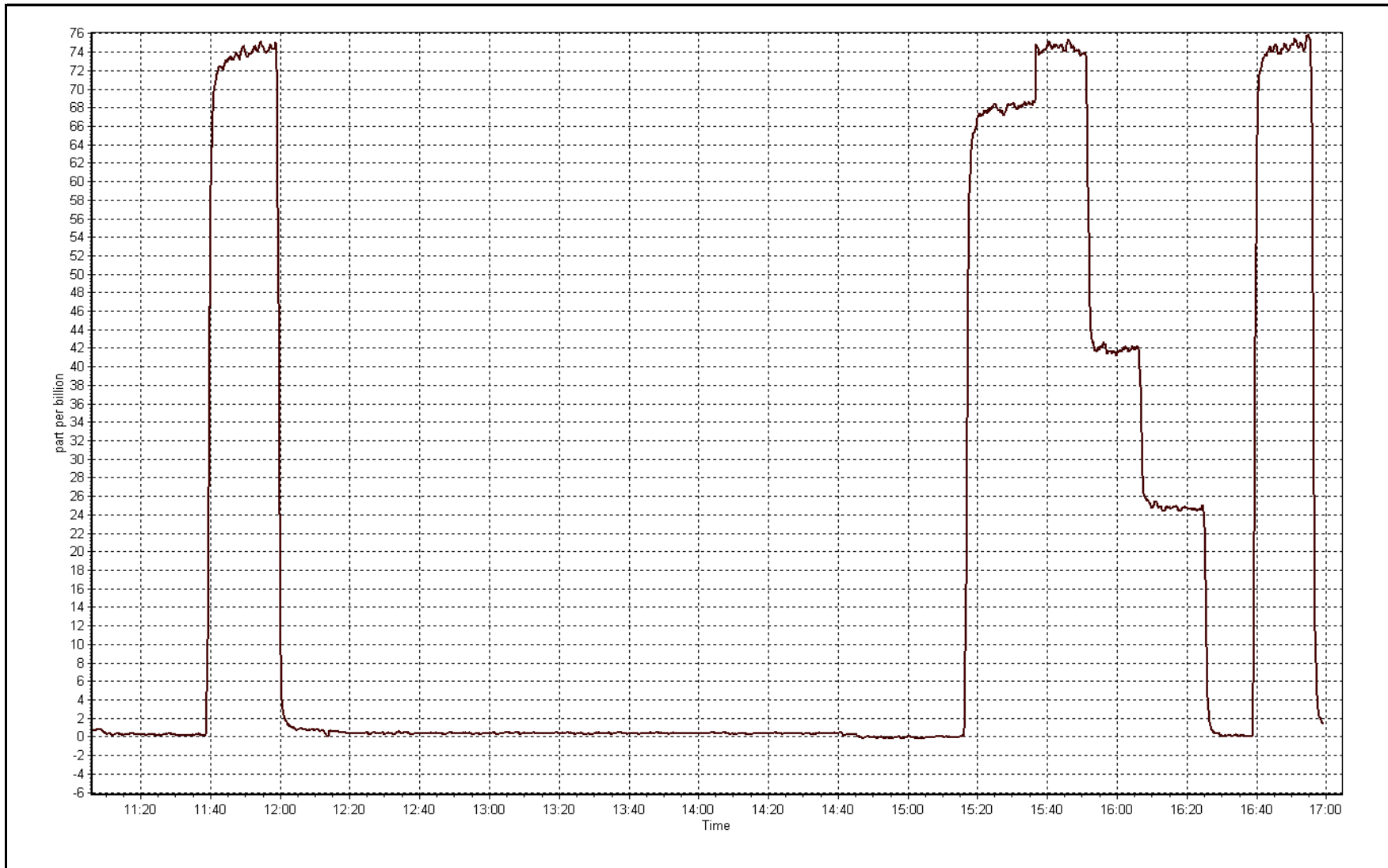
Station Information

Calibration Date	July 26, 2016	Previous Calibration	July 21, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	14:42	End Time (MST)	17:00
Analyzer make	Thermo 43i-LTE	Analyzer serial #	1507864683

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999986
75.0	74.5	1.0067		
42.0	41.9	1.0028	Slope	1.004882
25.0	24.7	1.0121		
			Intercept	0.076835







Wood Buffalo Environmental Association TRS Calibration Report

Station Information

Calibration Date	July 29, 2016	Last Calibration	July 26, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Other: <input type="checkbox"/> Repair / removal		
Start Time (MST)	7:45	End Time (MST)	12:10
Gas Cert Reference	ALM052589	Station temp.	22 Deg C
Cal Gas Concentration	5.02 ppm	Cal Gas Exp Date	09/09/2017
Calibrator Make/Model	API T700	Serial Number	2445
Dil air Make/Model	API 701-H	Serial Number	198
DACS make/model	Campbell Scientific CR3000	DACS serial No.	8205
SO2 gas concentration	50 ppm	SO2 gas cert/exp	S970259A 26/Sep/17

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-699	-699
Analyzer IP address	192.168.1.44		Lamp voltage	1095	1102
Calculated slope	1.004882	1.000071	Chamber temp	45	45
Calculated intercept	0.076835	-0.142717	Pressure	703.1	701.0
Analyzer Background	2.91	2.65	Flow	0.440	0.431
Analyzer Coefficient	1.16	1.053	Intensity	71	72
			Converter temp.	800	800

Analyzer make/model	Thermo 43i-LTE	Analyzer serial #	1507864683
Converter make/model	CDN-101	Converter serial #	503/460

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.1	----
as found span	5000	74.7	75.0	69.7	1.076
SO2 scrubber check	5000	20.3	203.0	0.5	----
calibrator zero	5000	0.0	0.0	0.4	----
high point	5000	74.7	75.0	75.3	0.996
second point	5000	40.0	40.2	40.1	1.001
third point	5000	20.0	20.1	20.0	1.004
as left zero	5000	0.0	0.0	0.1	----
as left span	5000	75.0	75.3	77.5	0.972
Average Correction Factor					1.000

Corrected As found	69.6	Previous response	74.6	% change	7.1%
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Notes:

Slow response to span, converter changed out, optic test done and passed, no delay in ticking of lamp, Scrubber test done before calibrator zero, during third point calibrator would switch to zero

Calibration Performed By: Melissa Lemay



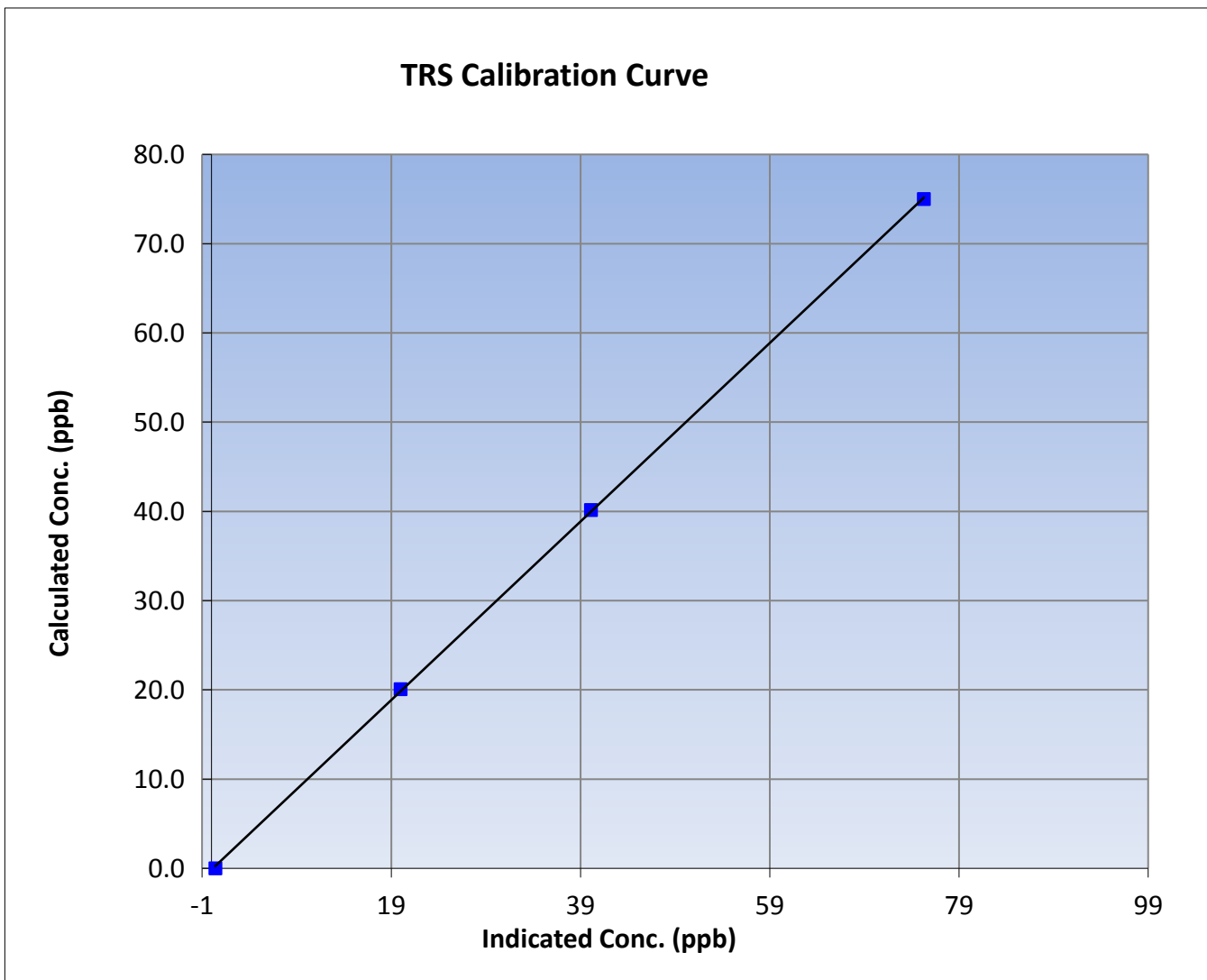
Wood Buffalo Environmental Association TRS Calibration Report

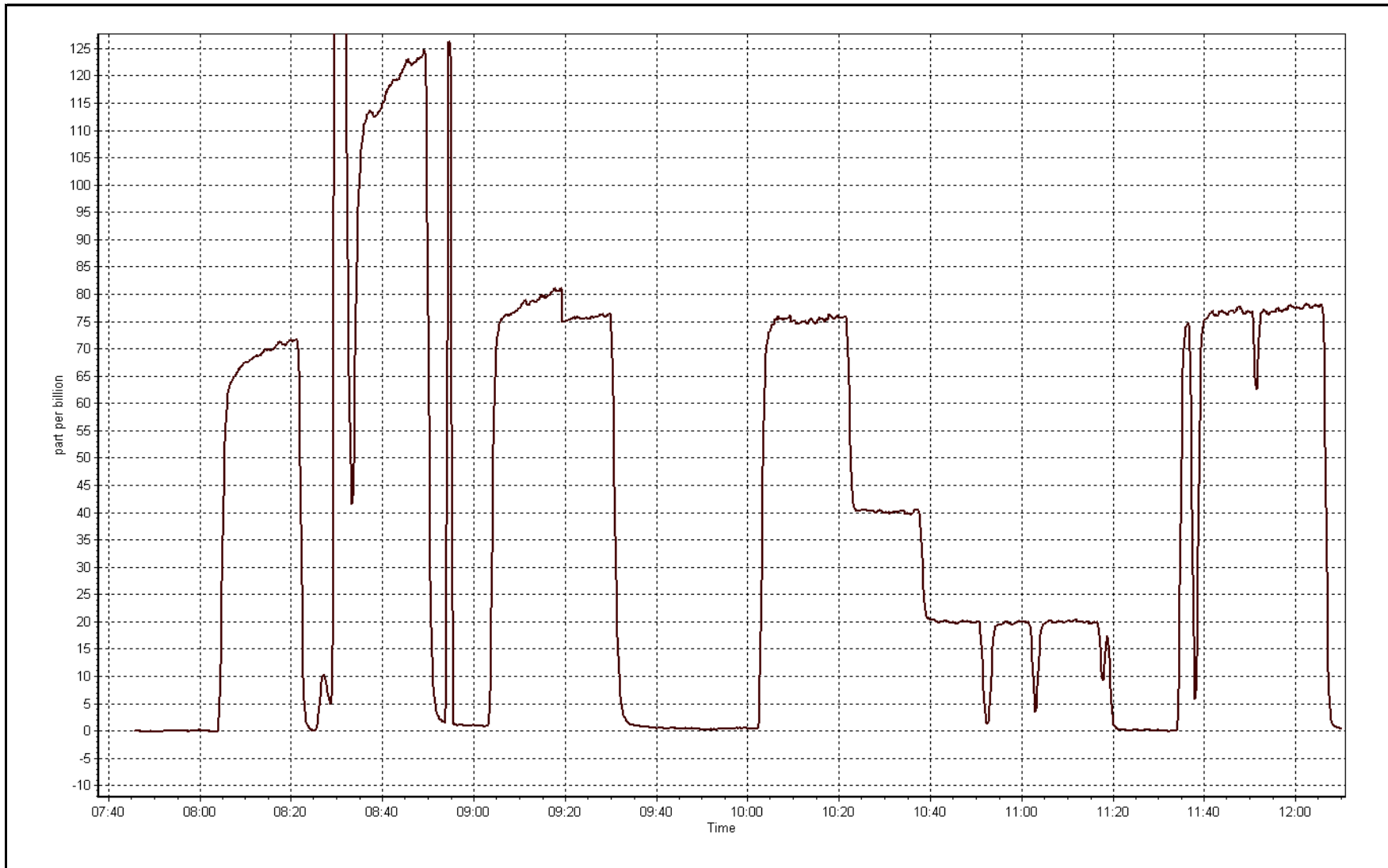
Station Information

Calibration Date	July 29, 2016	Previous Calibration	July 26, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	7:45	End Time (MST)	12:10
Analyzer make	Thermo 43i-LTE	Analyzer serial #	1507864683

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.4	----	Correlation Coefficient	0.999941
75.0	75.3	0.9960		
40.2	40.1	1.0015	Slope	1.000071
20.1	20.0	1.0040		
			Intercept	-0.142717







Wood Buffalo Environmental Association TRS Calibration Report

Station Information

Calibration Date	July 30, 2016	Last Calibration	
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Install		
Start Time (MST)	11:50	End Time (MST)	13:58
Gas Cert Reference	ALM052589	Station temp.	22 Deg C
Cal Gas Concentration	5.02 ppm	Cal Gas Exp Date	09/09/2017
Calibrator Make/Model	API T700	Serial Number	2445
Dil air Make/Model	API 701-H	Serial Number	198
DACS make/model	Campbell Scientific CR3000	DACS serial No.	8205
SO2 gas concentration	50 ppm	SO2 gas cert/exp	S970259A 26/Sep/17

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage		-609
Analyzer IP address	192.168.1.44		Lamp voltage		797
Calculated slope	0.998719		Chamber temp		45
Calculated intercept	0.177834		Pressure		710.0
Analyzer Background	22.4		Flow		0.453
Analyzer Coefficient	1.282		Intensity		91
			Converter temp.		800

Analyzer make/model	Thermo 43i	Analyzer serial #	1160290014
Converter make/model	CDN-101	Converter serial #	460

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero					
as found span					
SO2 scrubber check	5000	20.0	200.0	0.1	----
calibrator zero	5000	0.0	0.0	0.1	----
high point	5000	74.7	75.0	75.1	0.999
second point	5000	40.0	40.2	39.8	1.009
third point	5000	20.0	20.1	19.7	1.019
as left zero	5000	0.0	0.0	0.0	----
as left span	5000	74.7	75.0	76.5	0.980
Average Correction Factor					1.009

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

Installed to replace unstable 43i-LTE, filter replaced, scrubber test done before calibrator zero

Calibration Performed By: Melissa Lemay



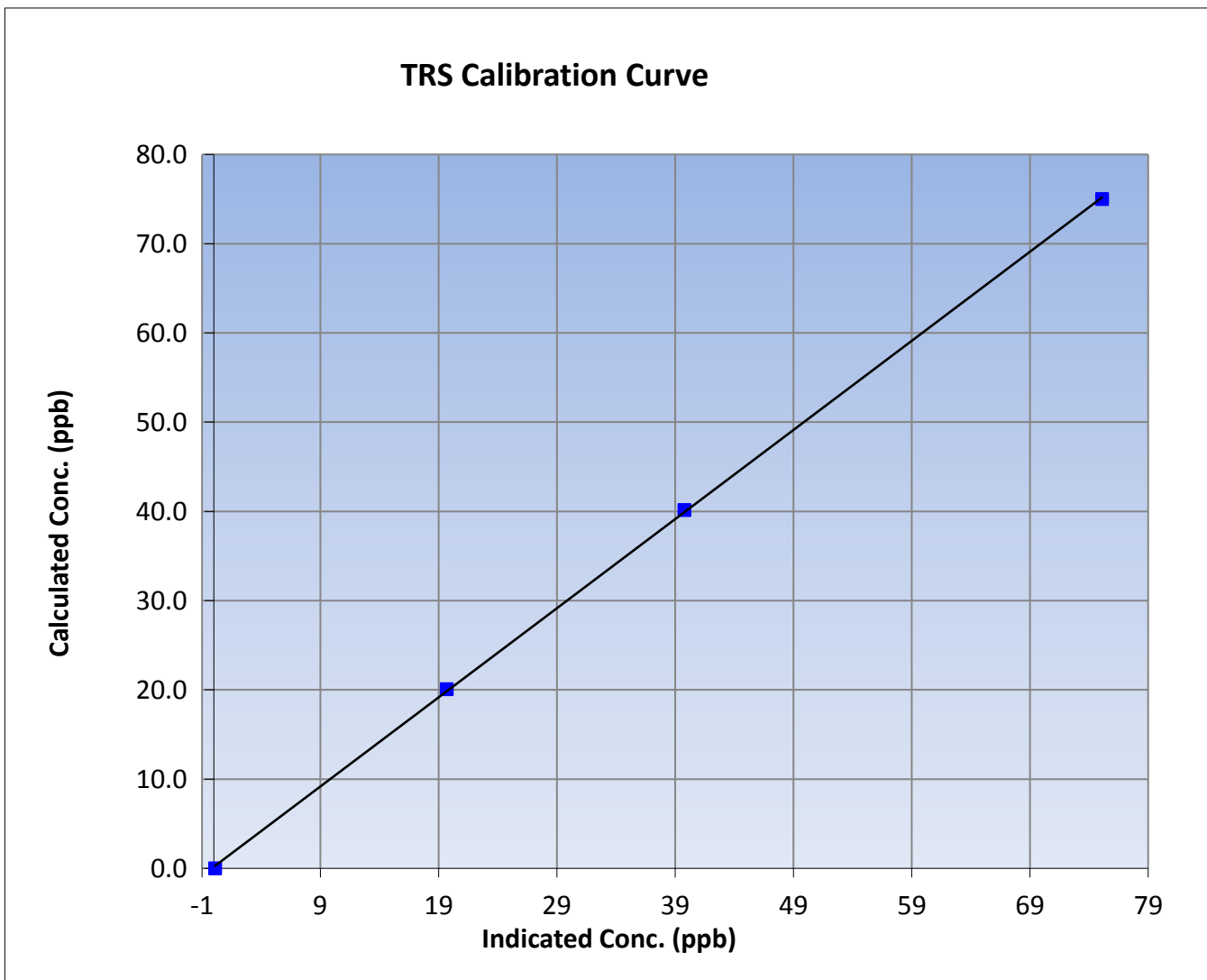
Wood Buffalo Environmental Association TRS Calibration Report

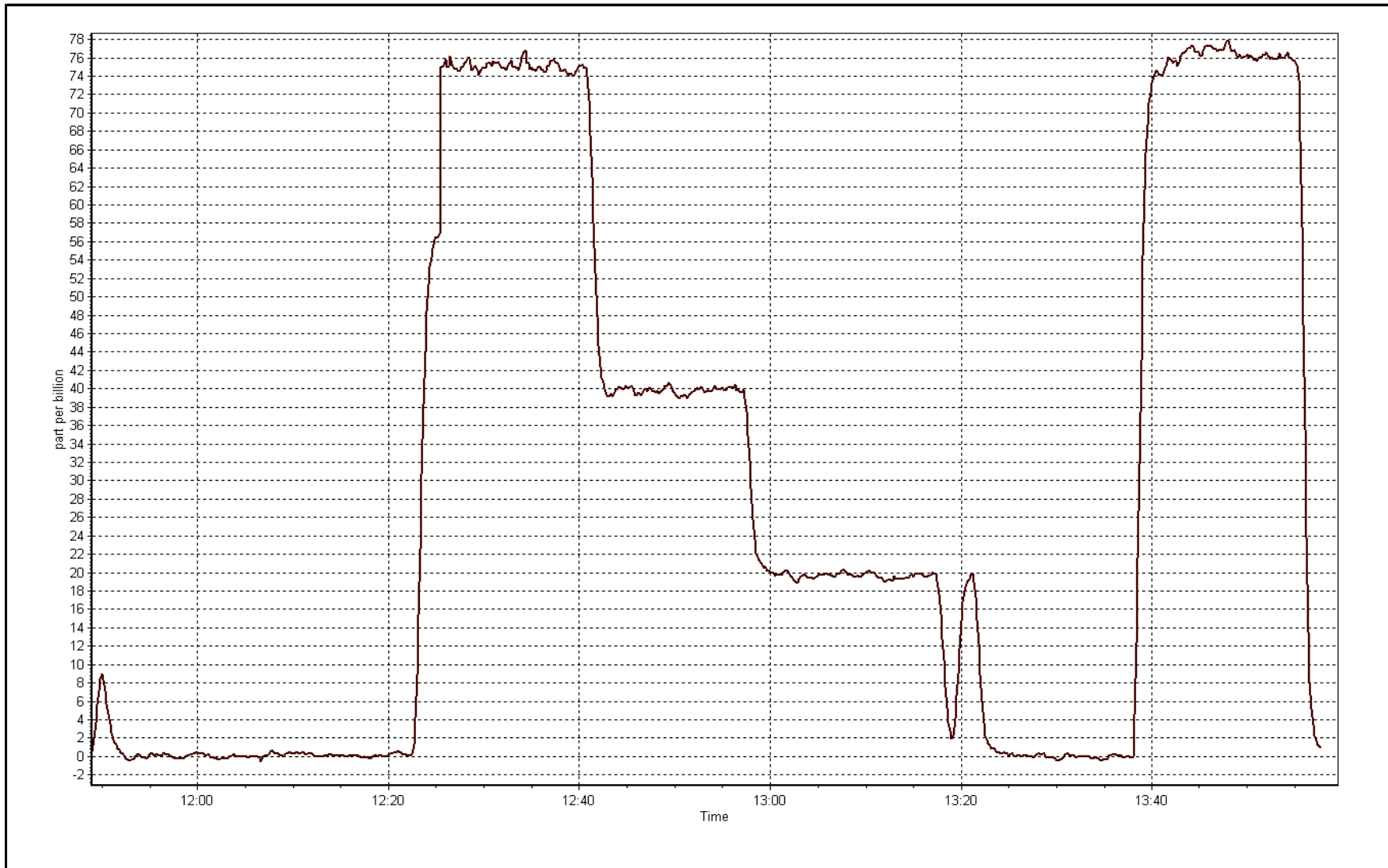
Station Information

Calibration Date	July 30, 2016	Previous Calibration	
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	11:50	End Time (MST)	13:58
Analyzer make	Thermo 43i	Analyzer serial #	1160290014

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999929
75.0	75.1	0.9987		
40.2	39.8	1.0090	Slope	0.998719
20.1	19.7	1.0193		
			Intercept	0.177834







Wood Buffalo Environmental Association THC / NMHC Calibration Report

Station Information

Calibration Date	July-05-16	Last Calibration	June-01-16
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Routine		
Start Time (MST)	6:48	End Time (MST)	11:22
Gas Cert Reference	S970259A	Cal Gas Expiry Date	9/26/2017
CH4 Cal Gas Conc.	490.0 ppm	CH4 Equiv Conc.	1040.0 ppm
C3H8 Cal Gas Conc.	200.0 ppm	Station temp.	22 Deg C
Calibrator Model	Sabio 4010	Serial Number	11021107
ZAG make/model	Teledyne API 701	Serial Number	1864
DACS make/model	Campbell Scientific CR3000	Serial Number	5564

Analyzer Information

	Before	After		Before	After
THC Range (ppm)	0 - 50 ppm		Column Temp	75.0	75.1
NMHC Range (ppm)	0 - 25 ppm		Detector Temp	175.0	175.0
Analyzer IP address	192.168.1.55		Flame Temp	384.7	387.8
THC Calc slope	1.002419	1.000936	Carrier Pressure	36.8	36.8
THC Calc intercept	0.024322	0.032460	Fuel Pressure	42.1	42.1
NMHC Calc slope	1.002930	1.001379	Air Pressure	32.2	32.2
NMHC Calc intercept	0.002218	0.004231			

Analyzer make Thermo 55i Analyzer serial # 1426262594

THC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	0.00	----
as found span	5000	60.7	12.63	12.63	1.000
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	60.7	12.63	12.61	1.001
second point	5000	30.4	6.32	6.23	1.015
third point	5000	15.2	3.16	3.12	1.013
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	60.7	12.63	12.57	1.004
Average Correction Factor					1.010

Corrected As found 12.63 Previous response 12.57 % change -0.5%

Notes:

no adjustments done, filter changed out, hydrogen changed

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Calibration Performed By: Melissa Lemay



Wood Buffalo Environmental Association THC / NMHC Calibration Report

NMHC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0	0.00	0.00	----
as found span	5000	60.7	6.68	6.68	1.000
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	60.7	6.68	6.67	1.001
second point	5000	30.4	3.34	3.32	1.007
third point	5000	15.2	1.67	1.67	1.001
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	60.7	6.68	6.66	1.003
Average Correction Factor					1.003

Corrected As found 6.68 Previous response 6.66 % change -0.4%

CH4 Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0	0.00	0.00	----
as found span	5000	60.7	5.95	5.95	1.000
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	60.7	5.95	5.94	1.001
second point	5000	30.4	2.98	2.91	1.024
third point	5000	15.2	1.49	1.46	1.020
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	60.7	5.95	5.91	1.007
Average Correction Factor					1.015

Corrected As found 5.95 Previous response 5.92 % change -0.6%



Wood Buffalo Environmental Association

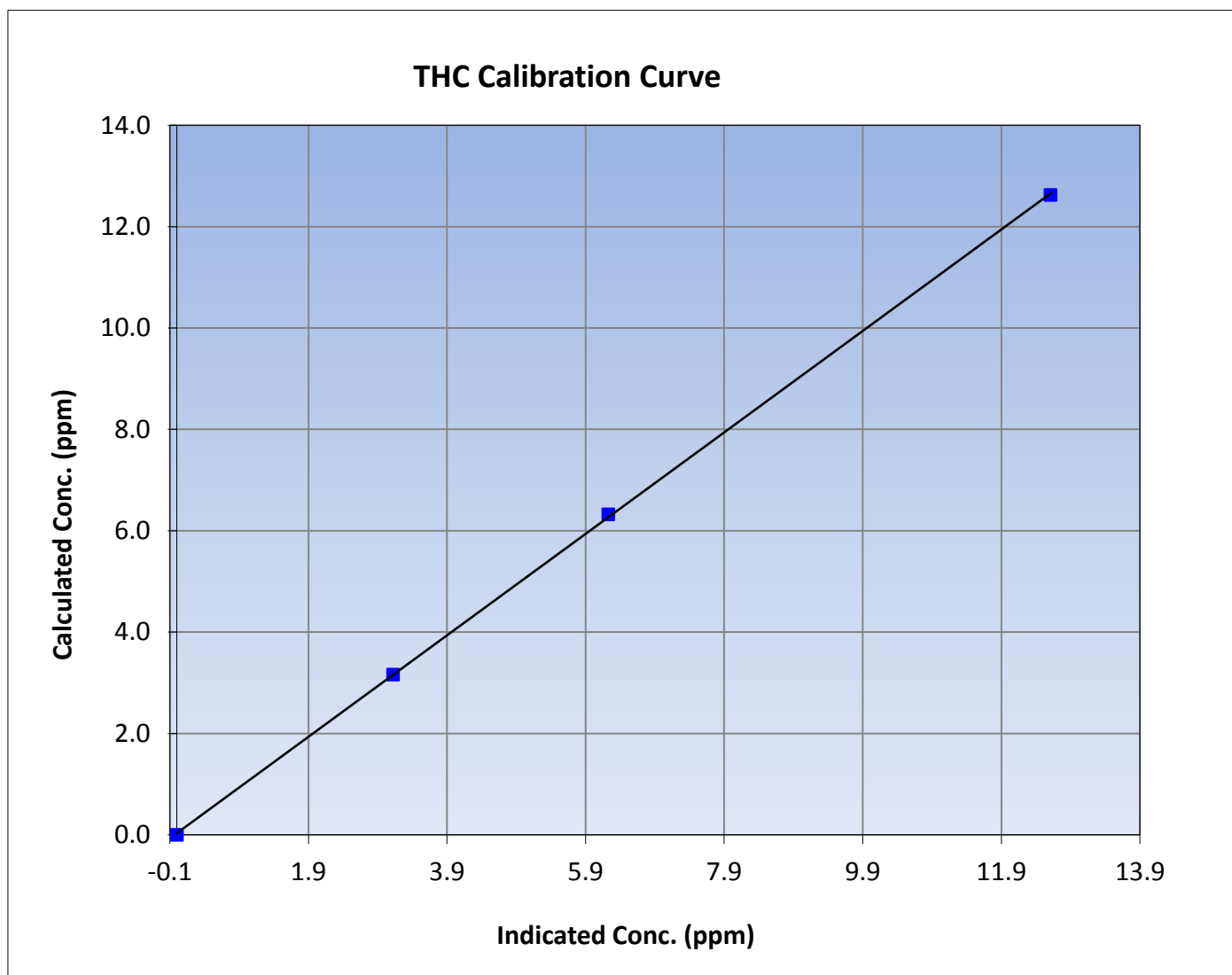
THC Calibration Summary

Station Information

Calibration Date	July 5, 2016	Previous Calibration	June 1, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	6:48	End Time (MST)	11:22
Analyzer make	Thermo 55i	Analyzer serial #	1426262594

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999943
12.63	12.61	1.0012		
6.32	6.23	1.0150	Slope	1.000936
3.16	3.12	1.0133		
			Intercept	0.032460





Wood Buffalo Environmental Association

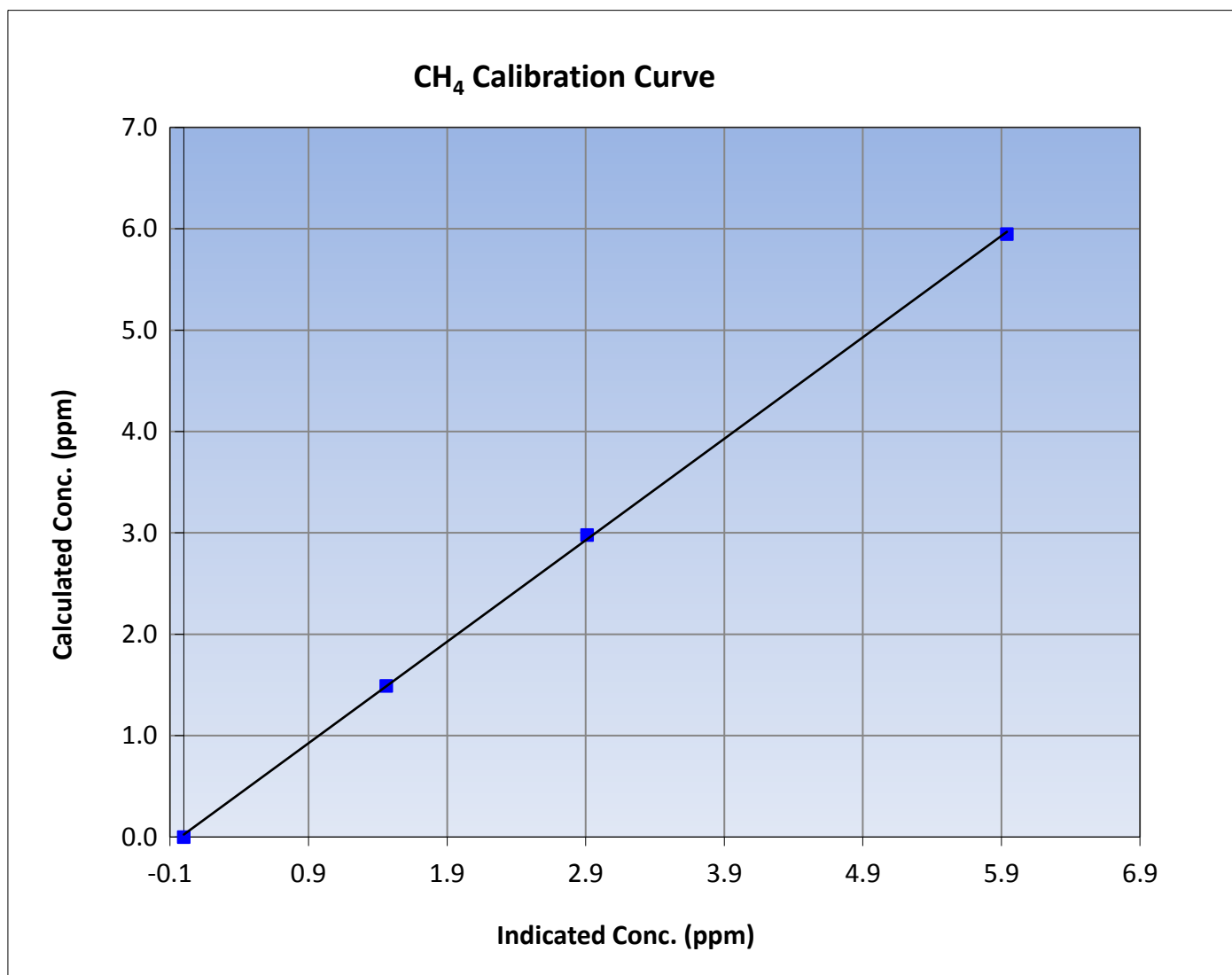
CH₄ Calibration Summary

Station Information

Calibration Date	July 5, 2016	Previous Calibration	June 1, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	6:48	End Time (MST)	11:22
Analyzer make	Thermo 55i	Analyzer serial #	1426262594

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999853
5.95	5.94	1.0014		
2.98	2.91	1.0238	Slope	1.000976
1.49	1.46	1.0203		
			Intercept	0.024334





Wood Buffalo Environmental Association

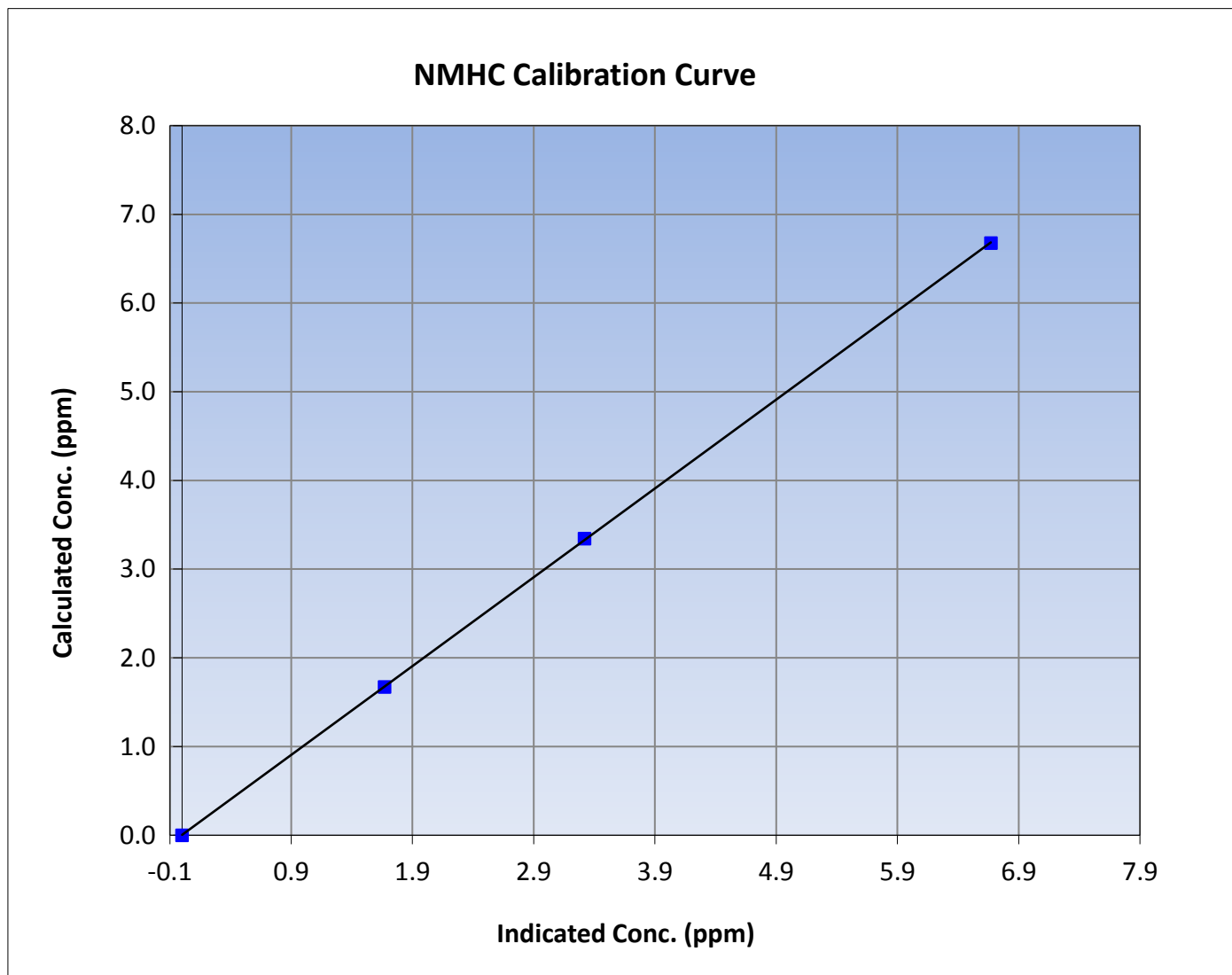
NMHC Calibration Summary

Station Information

Calibration Date	July 5, 2016	Previous Calibration	June 1, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	6:48	End Time (MST)	11:22
Analyzer make	Thermo 55i	Analyzer serial #	1426262594

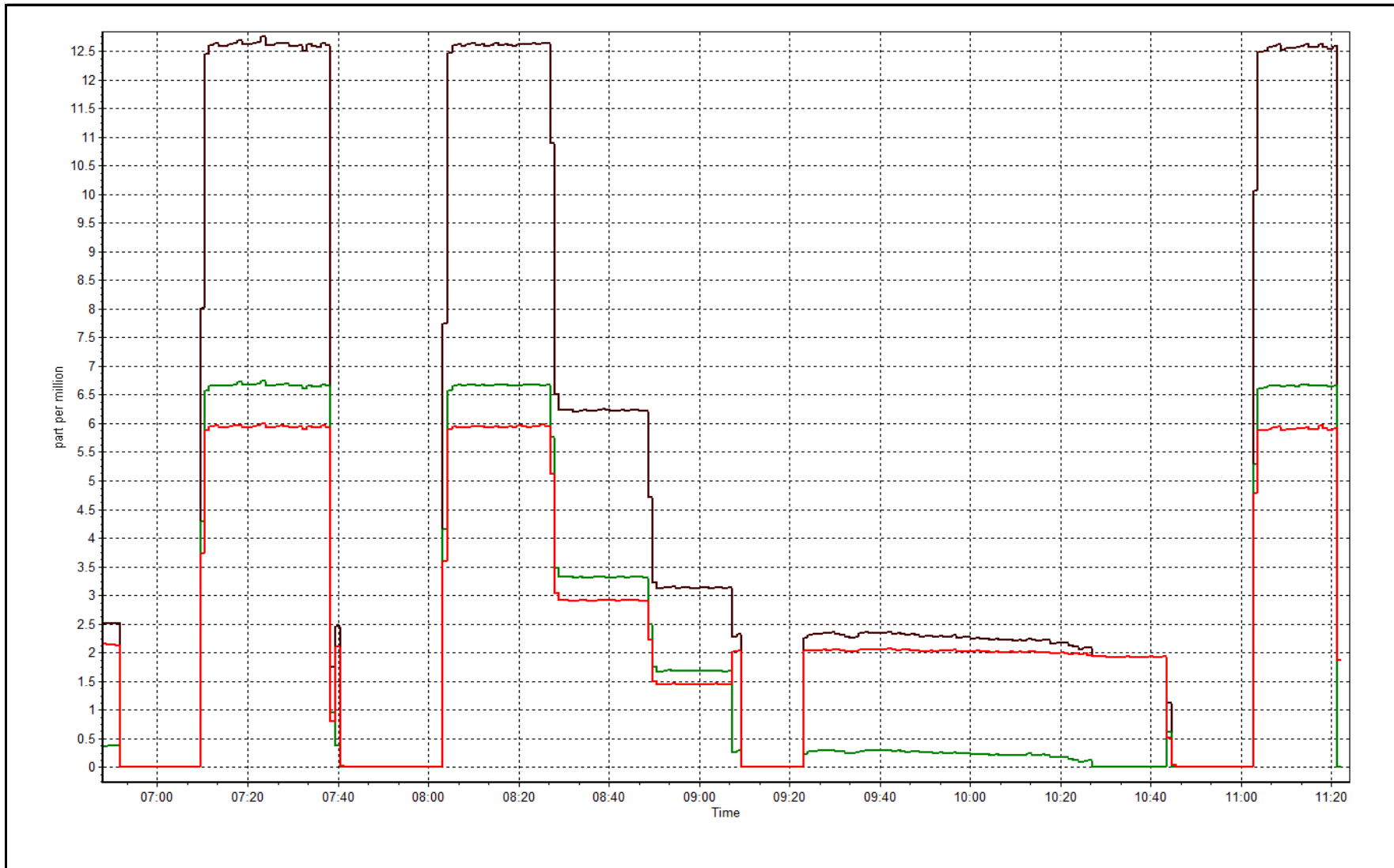
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999987
6.68	6.67	1.0010		
3.34	3.32	1.0072	Slope	1.001379
1.67	1.67	1.0012		
			Intercept	0.004231



THC Calibration Plot

Date: July 5, 2016





Wood Buffalo Environmental Association THC / NMHC Calibration Report

Station Information

Calibration Date	July-11-16	Last Calibration	July-05-16
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	<input type="checkbox"/> Other: <input checked="" type="checkbox"/> Maintenance		
Start Time (MST)	8:04	End Time (MST)	13:09
Gas Cert Reference	S970259A	Cal Gas Expiry Date	9/26/2017
CH4 Cal Gas Conc.	490.0 ppm	CH4 Equiv Conc.	1040.0 ppm
C3H8 Cal Gas Conc.	200.0 ppm	Station temp.	22 Deg C
Calibrator Model	Sabio 4010	Serial Number	11021107
ZAG make/model	Teledyne API 701	Serial Number	1864
DACS make/model	Campbell Scientific CR3000	Serial Number	5564

Analyzer Information

	Before	After		Before	After
THC Range (ppm)	0 - 50 ppm		Column Temp	75.0	75.1
NMHC Range (ppm)	0 - 25 ppm		Detector Temp	175.0	175.0
Analyzer IP address	192.168.1.55		Flame Temp	379.0	399.4
THC Calc slope	1.000936	1.000308	Carrier Pressure	36.8	36.8
THC Calc intercept	0.032460	0.028406	Fuel Pressure	42.1	46.0
NMHC Calc slope	1.001379	1.001536	Air Pressure	32.2	32.2
NMHC Calc intercept	0.004231	0.006276			

Analyzer make Thermo 55i Analyzer serial # 1426262594

THC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	0.00	----
as found span	5000	60.7	12.63	12.62	1.000
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	60.7	12.63	12.62	1.000
second point	5000	30.4	6.32	6.24	1.013
third point	5000	15.2	3.16	3.13	1.010
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	60.7	12.63	12.62	1.000
Average Correction Factor					1.008

Corrected As found 12.62 Previous response 12.58 % change -0.3%

Notes:

Optimized the gas pressure, span adjusted

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Calibration Performed By: Melissa Lemay



Wood Buffalo Environmental Association THC / NMHC Calibration Report

NMHC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0	0.00	0.00	----
as found span	5000	60.7	6.68	6.68	1.000
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	60.7	6.68	6.67	1.001
second point	5000	30.4	3.34	3.31	1.010
third point	5000	15.2	1.67	1.67	1.001
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	60.7	6.68	6.66	1.003
Average Correction Factor					1.004

Corrected As found 6.68 Previous response 6.66 % change -0.2%

CH4 Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0	0.00	0.00	----
as found span	5000	60.7	5.95	5.94	1.001
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	60.7	5.95	5.95	1.000
second point	5000	30.4	2.98	2.93	1.017
third point	5000	15.2	1.49	1.46	1.020
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	60.7	5.95	5.96	0.998
Average Correction Factor					1.012

Corrected As found 5.94 Previous response 5.92 % change -0.4%



Wood Buffalo Environmental Association

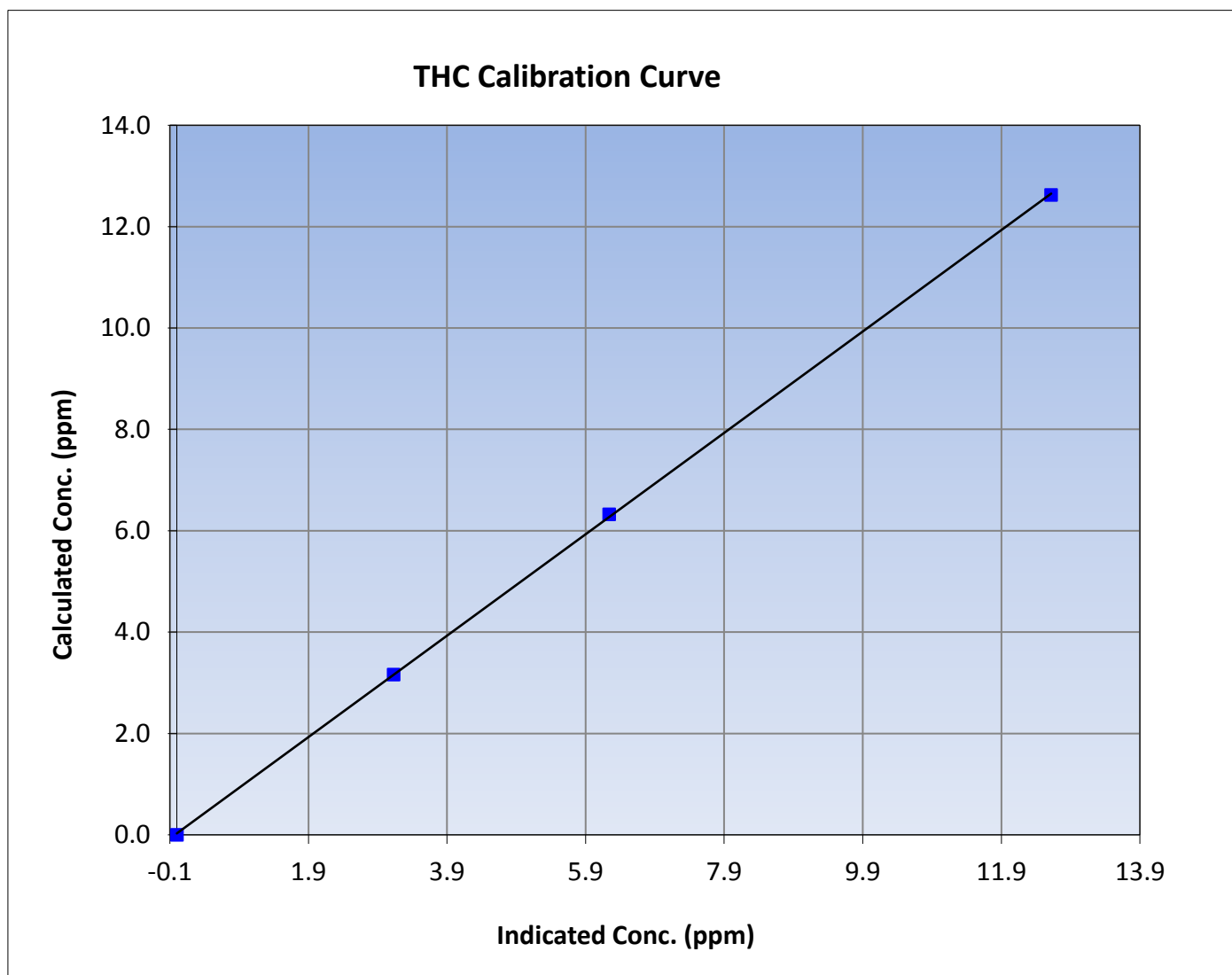
THC Calibration Summary

Station Information

Calibration Date	July 11, 2016	Previous Calibration	July 5, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	8:04	End Time (MST)	13:09
Analyzer make	Thermo 55i	Analyzer serial #	1426262594

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999950
12.63	12.62	1.0004		
6.32	6.24	1.0133	Slope	1.000308
3.16	3.13	1.0101		
			Intercept	0.028406





Wood Buffalo Environmental Association

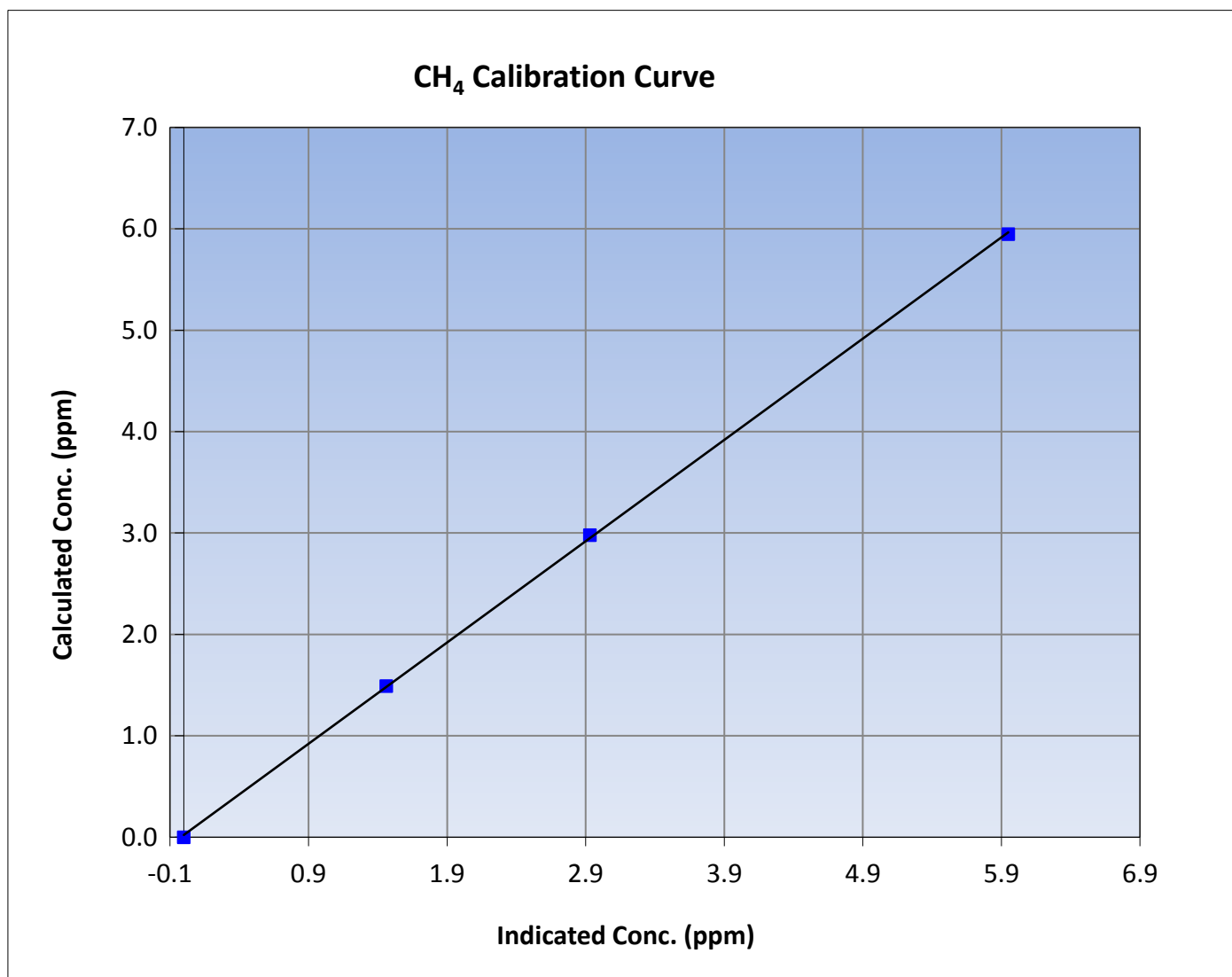
CH₄ Calibration Summary

Station Information

Calibration Date	July 11, 2016	Previous Calibration	July 5, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	8:04	End Time (MST)	13:09
Analyzer make	Thermo 55i	Analyzer serial #	1426262594

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999908
5.95	5.95	0.9998		
2.98	2.93	1.0168	Slope	0.998915
1.49	1.46	1.0203		
			Intercept	0.022155





Wood Buffalo Environmental Association

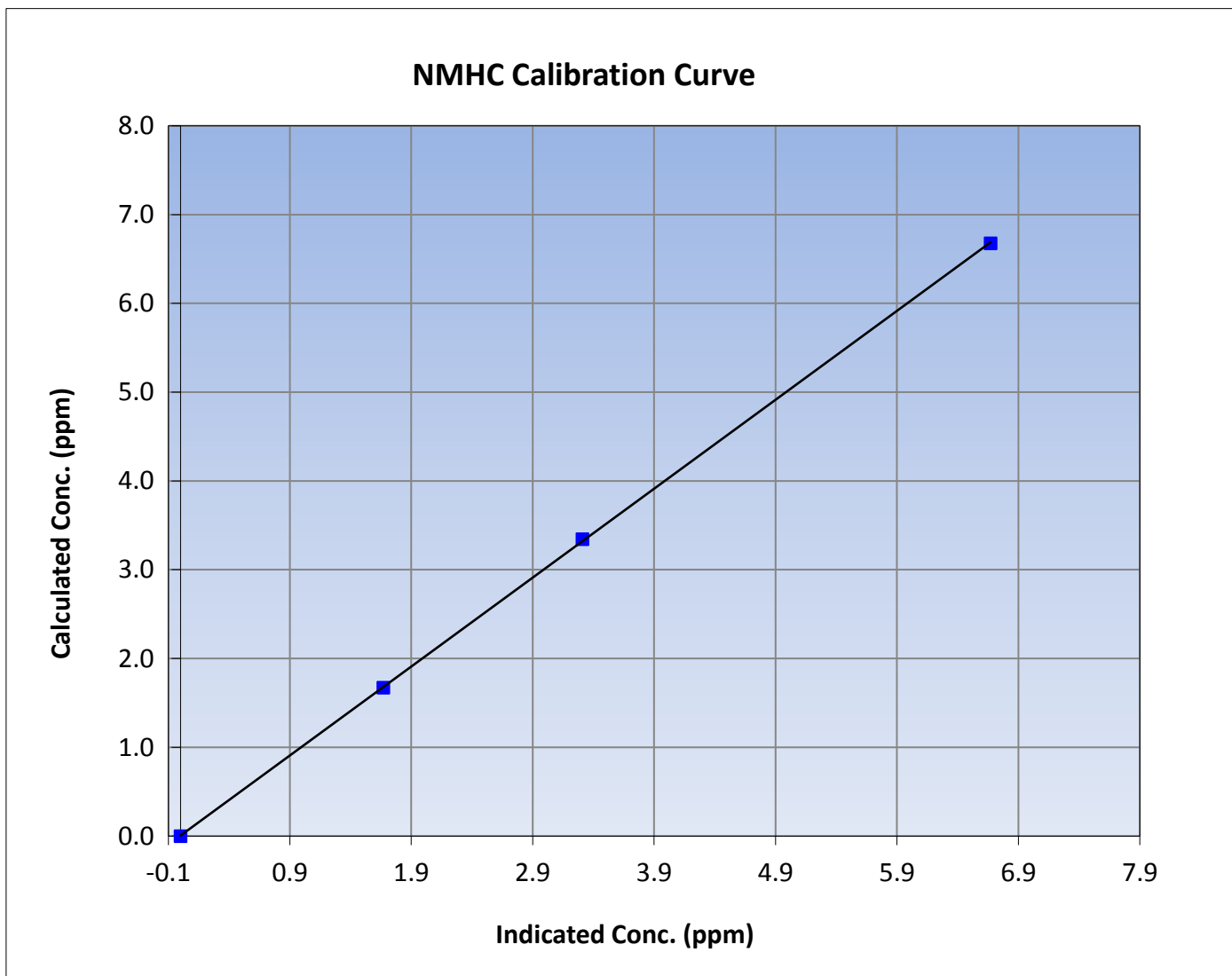
NMHC Calibration Summary

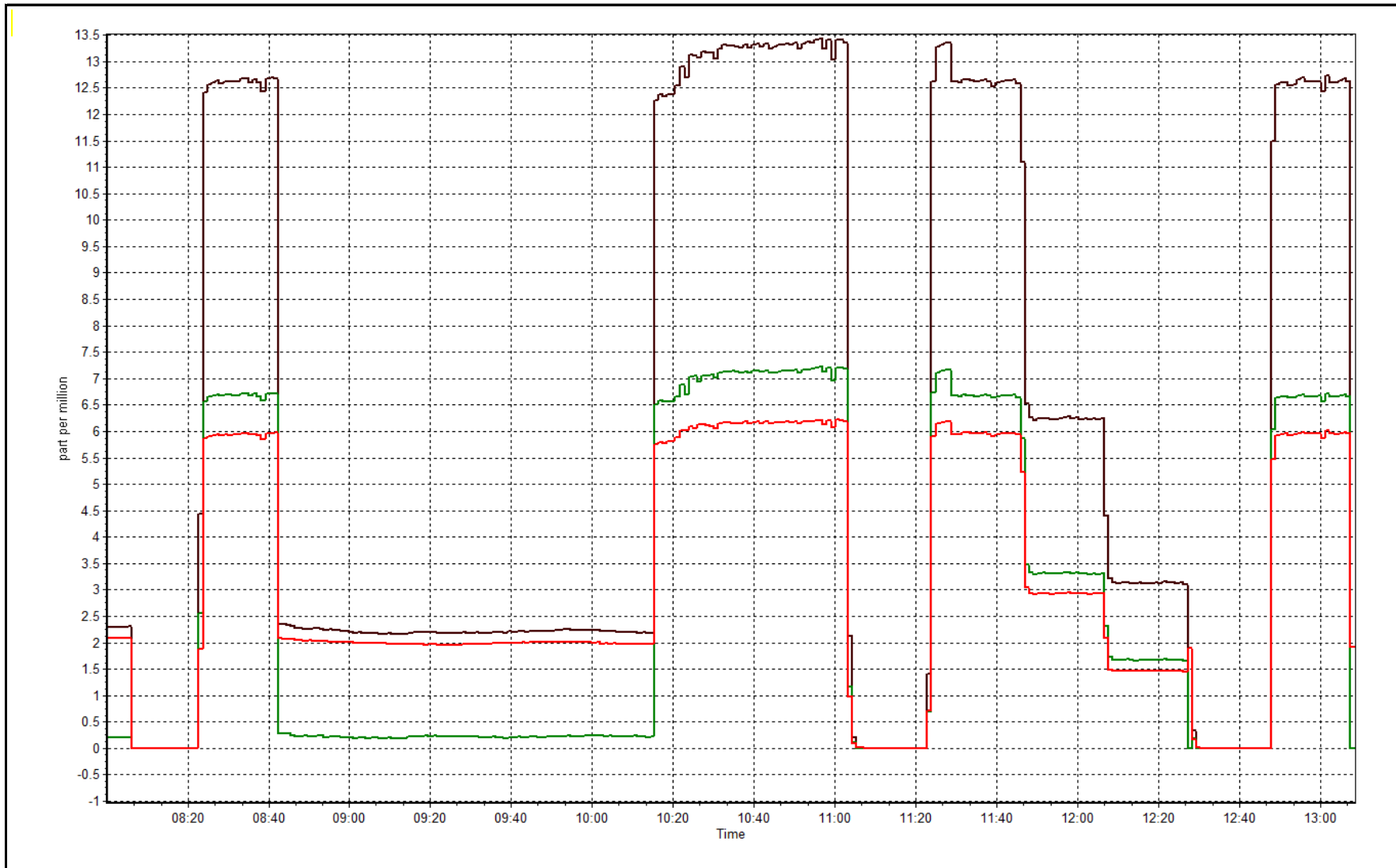
Station Information

Calibration Date	July 11, 2016	Previous Calibration	July 5, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	8:04	End Time (MST)	13:09
Analyzer make	Thermo 55i	Analyzer serial #	1426262594

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999972
6.68	6.67	1.0010		
3.34	3.31	1.0103	Slope	1.001536
1.67	1.67	1.0012		
			Intercept	0.006276







Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	July 6, 2016	Previous Calibration	June 2, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Routine		
Start Time (MST)	9:35	End Time (MST)	12:02
NO2 GPT Ref date	July-05-16	Transfer Standard	NOX GPT
Calibrator Make/Model	Sabio 4010	Station temp.	22 Deg C
ZAG make/model	Teledyne API 701	Serial Number	11021107
DACS make/model	Campbell Scientific CR3000	Serial Number	1864
		Serial Number	5564

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Bench temp.	27.0	29.0
Analyzer IP address	192.168.1.48		Lamp temp.	67.8	67.9
Calculated slope	1.005163	0.999712	Pressure	708.3	717.7
Calculated intercept	1.354446	1.061321	Flow cell A	0.754	0.761
Analyzer Background	-0.3	-0.3	Flow cell B	0.773	0.780
Analyzer Coefficient	0.943	0.915	Cell A Intensity	68773	68928
			Cell B Intensity	59885	60000

Analyzer make	TEI 49i	Analyzer serial #	1507964700
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Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator Lamp Intensity	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.00	0.0	0.3	----
as found span	5000	1.22	343.2	359.5	0.955
calibrator zero	5000	0.00	0.0	0.3	----
high point	5000	1.22	343.2	343.8	0.998
second point	5000	0.70	179.4	175.1	1.024
third point	5000	0.43	89.5	88.8	1.008
as left zero	5000	0.00	0.0	0.3	----
as left span	5000	1.22	343.2	338.5	1.014
Average Correction Factor					1.010

Corrected As found	359.2	Previous response	340.1	% change	-5.3%
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Notes:

Filter changed out, span was adjusted and no maintenance done.

Calibration Performed By: Melissa Lemay



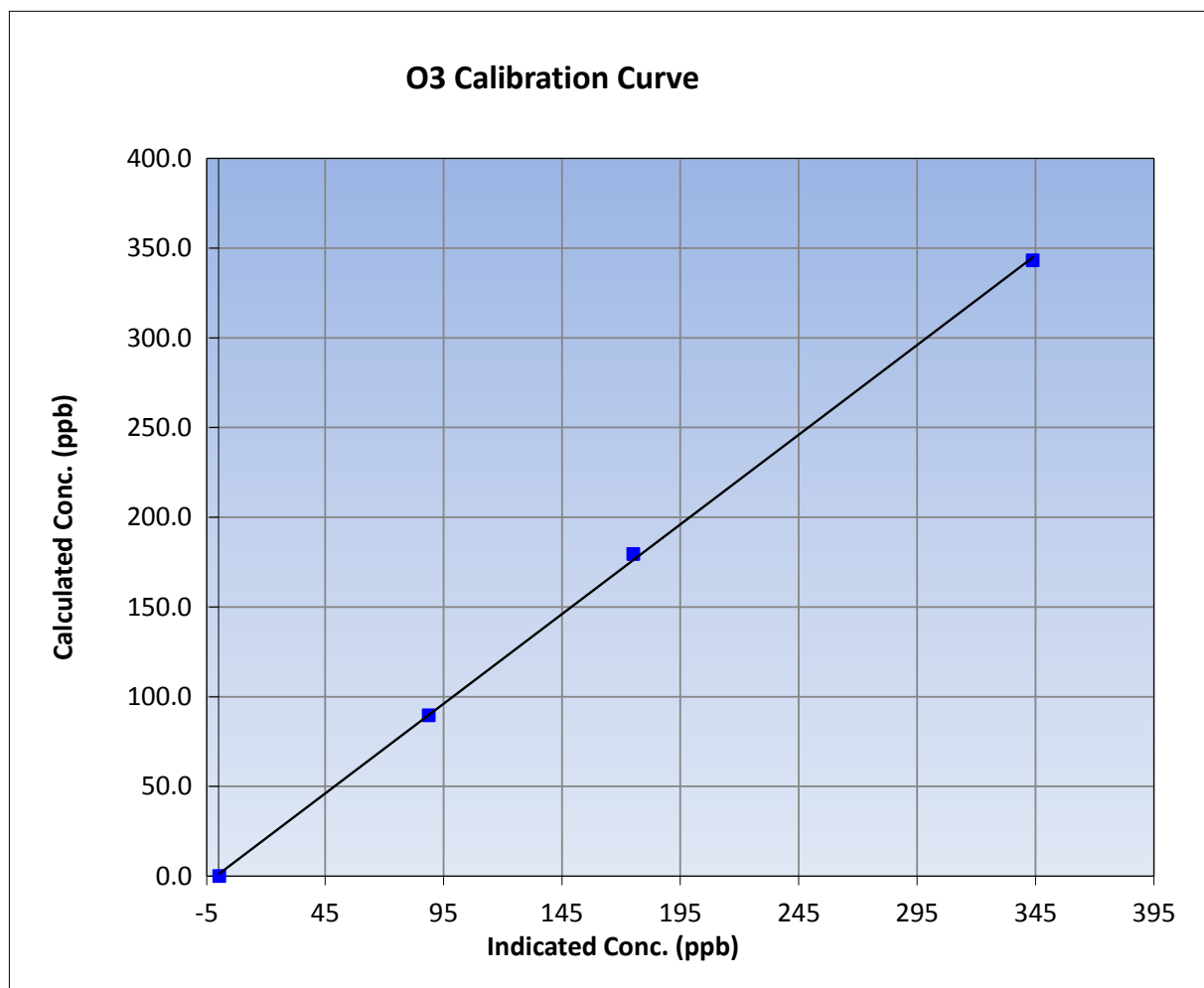
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	July-06-16	Previous Calibration	June 2, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	9:35	End Time (MST)	12:02
Analyzer make	TEI 49i	Analyzer serial #	1507964700

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	----	Correlation Coefficient	0.999763
343.2	343.8	0.9982		
179.4	175.1	1.0245	Slope	0.999712
89.5	88.8	1.0079		
			Intercept	1.061321



O3 Calibration Plot

Date: July 6, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	July 5, 2016	Previous Calibration	June 1, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	<input type="text" value="Routine"/>		
Start Time (MST)	6:48	End Time (MST)	13:43
NO Cal Gas Conc	49.4 ppm	Gas Cert Reference	S970259A
NOx Cal Gas Conc	49.4 ppm	Cal Gas Expiry Date	9/26/2017
Calibrator	Sabio 4010	Serial Number	11021107
Zero air Generator	Teledyne PAI T701	Serial Number	1864

DACs Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	5564
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.997927	0.997669	0.999175
	Data Offset	2.406507	2.481264	-0.341652
Current Calibration	Data Slope	0.994411	0.994899	1.008089
	Data Offset	2.895350	3.116093	-0.557326

Analyzer Information

Analyzer make/model	Thermo 42C	Analyzer serial #	601114773
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.103		192.168.1.103	
NO coefficient	1.244		1.244	
NOx coefficient	0.999		0.999	
NO2 coefficient	1.000		1.000	
NO bkgrnd	4.1		5.8	
NOx bkgrnd	4.8		5.9	
Chamber Temp	49.8	Deg C	49.8	Deg C
Moly Temp	323	Deg C	323	Deg C
PMT voltage	-784	V	-784	V
PMT Temp	-3	Deg C	-3.6	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	142	mmHg	141.1	mmHg
R Cell Press Nox	142.1	mmHg	141.1	mmHg
NO sample flow	0.882	lpm	0.882	lpm
Nox sample Flow	0.882	lpm	0.882	lpm

Notes:

Zero adjusted, GPT second high point used, re did GPT due to 1st GPT being unstable, noticed the PMt drifted approx 3 degrees during the calibration, likely the cause of unstable GPT. PMT temp stable at -3.6 for second GPT. filter changed out



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

July 5, 2016

Station Number:

AMS 7

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	1.2	0.6	1.2	----	----
as found span	5000	60.7	599.7	599.7	0.0	609.8	608.8	1.2	0.9835	0.9851
calibrator zero	5000	0.0	0.0	0.0	0.0	0.1	-0.1	0.3	----	----
high point	5000	60.7	599.7	599.7	0.0	602.2	601.7	0.6	0.9959	0.9967
second point	5000	30.4	300.4	300.4	0.0	295.9	295.5	0.5	1.0150	1.0164
third point	5000	15.2	150.2	150.2	0.0	146.3	146.0	0.5	1.0265	1.0286
as left zero	5000	0.0	0.0	0.0	0.0	-0.6	-1.0	0.3	----	----
as left span	5000	60.7	599.7	263.3	336.4	604.0	262.2	341.8	0.9929	1.0042
Average Correction Factor									1.0125	1.0139

Corrected As found
Previous Response

NO_x= 608.6
NO_x= 598.6

NO= 608.2
NO= 598.6

Percent Change

NO_x= -1.6%

NO= -1.6%

GPT Calibration Data

Dilution Flow (total) 5000 ccm Source Gas Flow 60.70 ccm NOx ref calc conc = 599.7 ppb NO ref calc conc = 599.7 ppb

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
1st NO ref point		0.0	606.5	606.5	0.3	0.9888	0.9888	----	----
1st NO2 (300)	263.3	343.2	603.8	263.3	340.7	0.9932	----	1.0073	99.3%
2nd NO2 (200)	427.1	179.4	606.0	427.1	179.1	0.9896	----	1.0017	99.8%
3rd NO2 (100)	517.0	89.5	606.5	517.0	89.3	0.9889	----	1.0022	99.8%
2nd NO ref point		0.0	603.3	602.9	0.6	0.9941	0.9947	----	----
Average Correction Factor						0.9915		1.0038	99.6%

Calibration Performed By: Melissa Lemay and Jayme Rycroft



Wood Buffalo Environmental Association

NO_x Calibration Summary

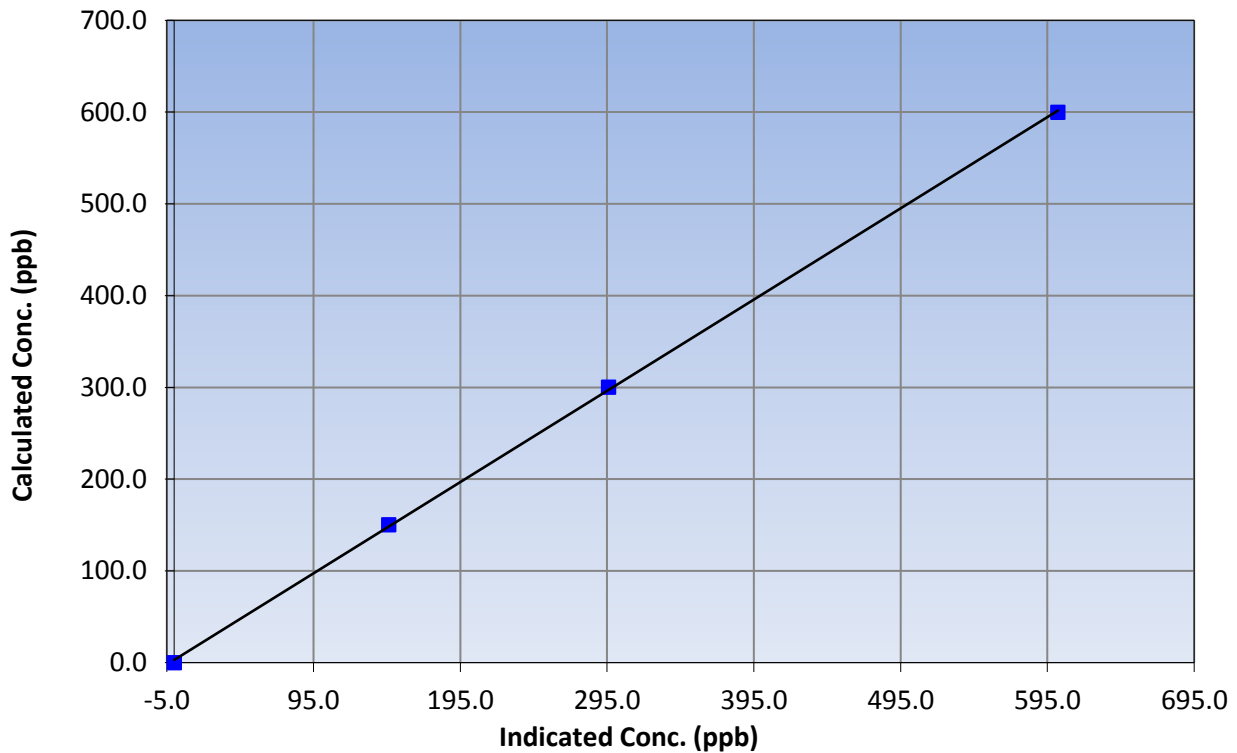
Station Information

Calibration Date	July 5, 2016	Previous Calibration	June 1, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	6:48	End Time (MST)	13:43
Analyzer make	Thermo 42C	Analyzer serial #	601114773

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999865
599.7	602.2	0.9959		
300.4	295.9	1.0150	Slope	0.994411
150.2	146.3	1.0265		
			Intercept	2.895350

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

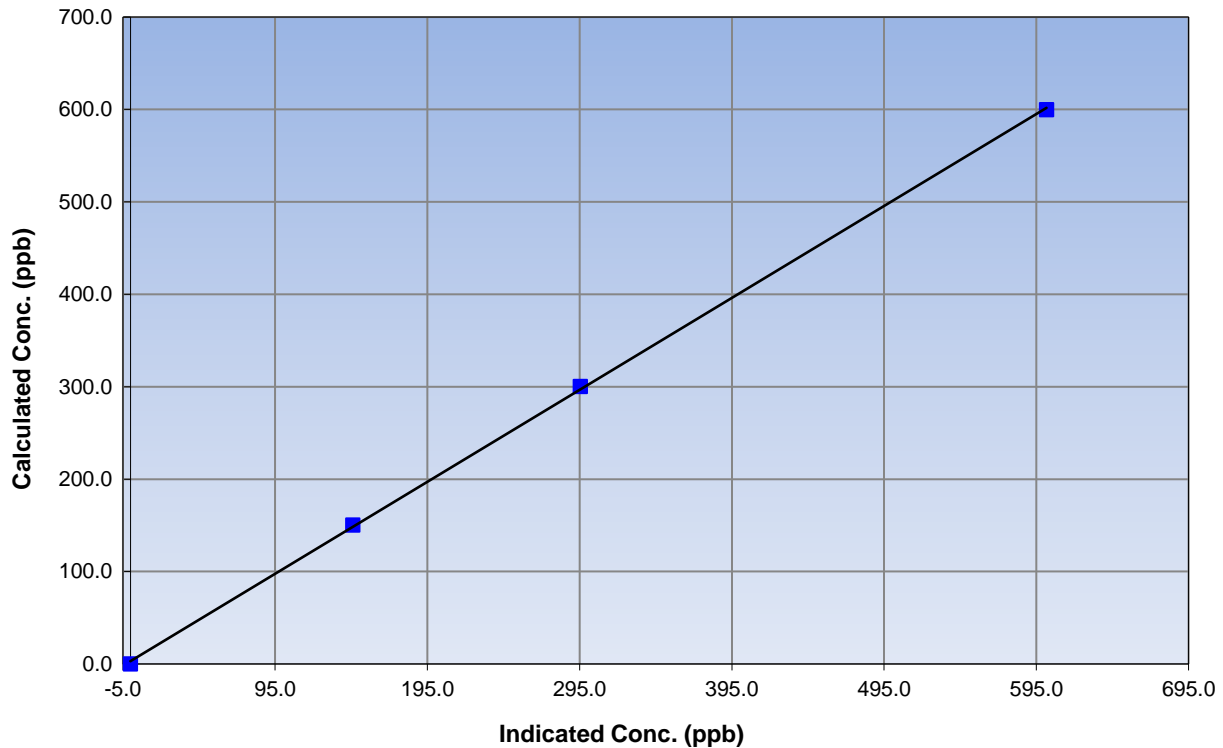
Station Information

Calibration Date	July 5, 2016	Previous Calibration	June 1, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	6:48	End Time (MST)	13:43
Analyzer make	Thermo 42C	Analyzer serial #	601114773

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999863
599.7	601.7	0.9967		
300.4	295.5	1.0164	Slope	0.994899
150.2	146.0	1.0286		
			Intercept	3.116093

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

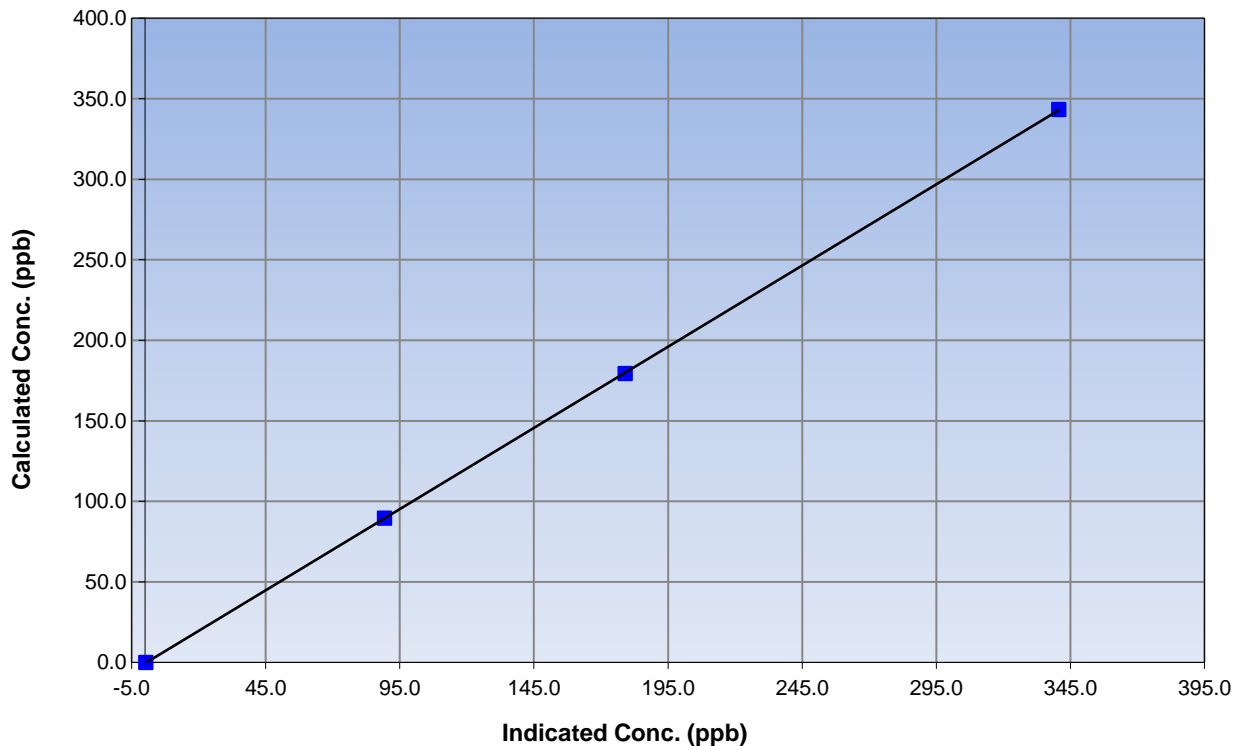
Station Information

Calibration Date	July 5, 2016	Previous Calibration	June 1, 2016
Station Number	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	6:48	End Time (MST)	13:43
Analyzer make	Thermo 42C	Analyzer serial #	601114773

Calibration Information

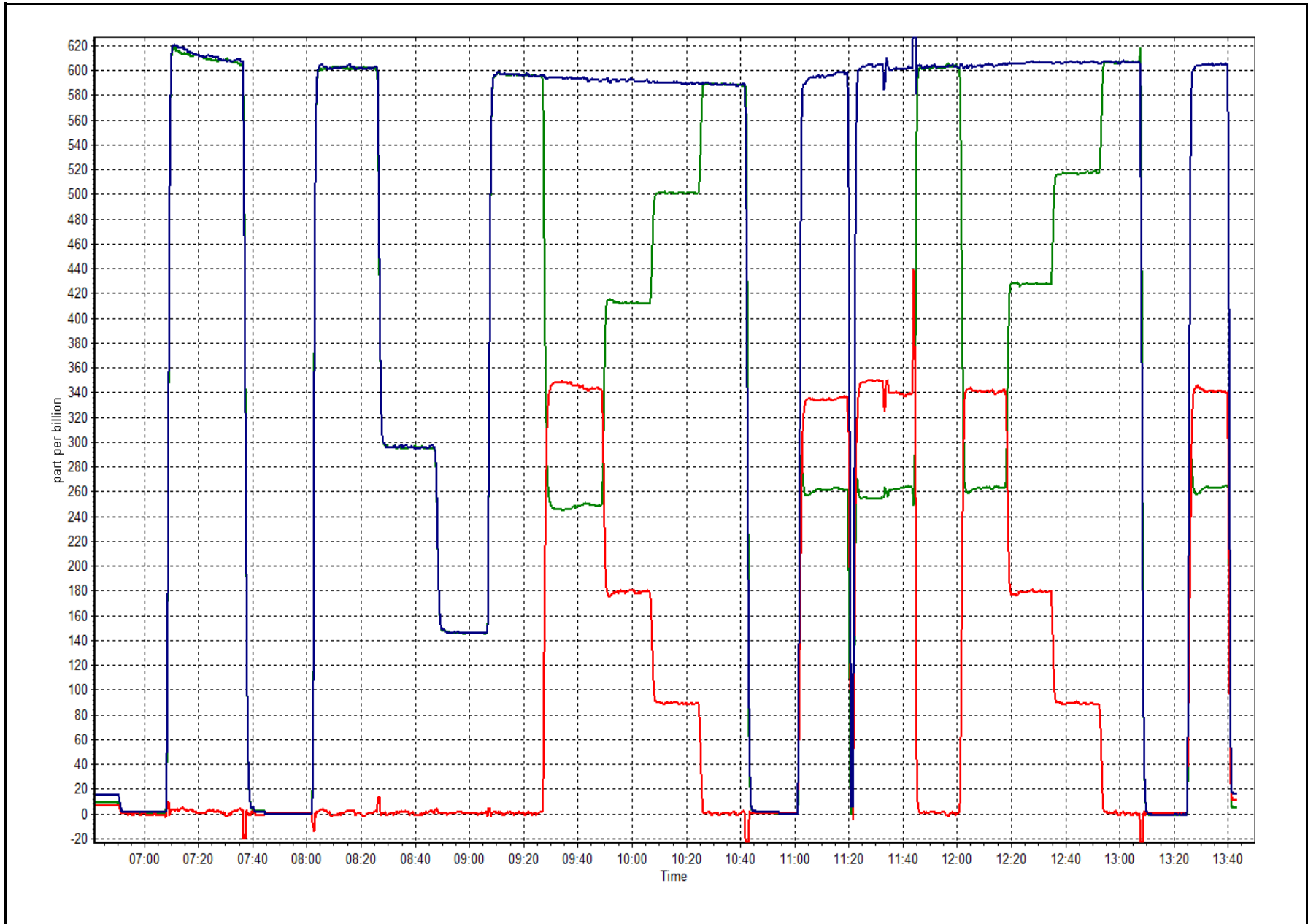
Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	N/A	Correlation Coefficient	0.999992
343.2	340.7	1.0073		
179.4	179.1	1.0017	Slope	1.008089
89.5	89.3	1.0022		
			Intercept	-0.557326

NO₂ Calibration Curve



NOX Calibration Plot

Date: July 5, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	July 27, 2016	Previous Calibration	July 5, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Routine		
Start Time (MST)	9:00	End Time (MST)	3:15
NO Cal Gas Conc	49.4 ppm	Gas Cert Reference	S970259A
NOX Cal Gas Conc	49.4 ppm	Cal Gas Expiry Date	9/26/2017
Calibrator	API T700	Serial Number	2445
Zero air Generator	Teledyne PAI T701	Serial Number	1864

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	8205
-------------------	----------------------------	-----------------	------

Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.994411	0.994899	1.008089
	Data Offset	2.895350	3.116093	-0.557326
Current Calibration	Data Slope	1.001062	1.000073	0.999770
	Data Offset	1.789347	1.894408	-0.002904

Analyzer Information

Analyzer make/model	Thermo 42C	Analyzer serial #	601114773
---------------------	------------	-------------------	-----------

Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.103		192.168.1.103	
NO coefficient	1.244		1.119	
NOX coefficient	0.999		1.000	
NO2 coefficient	1.000		1.000	
NO bkgnd	5.8		4.1	
NOX bkgnd	5.9		4.4	
Chamber Temp	49.8	Deg C	49.8	Deg C
Moly Temp	323	Deg C	323	Deg C
PMT voltage	-784	V	-784	V
PMT Temp	-3.6	Deg C	-3.6	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	141.1	mmHg	136	mmHg
R Cell Press Nox	141.1	mmHg	136	mmHg
NO sample flow	0.882	lpm	0.903	lpm
Nox sample Flow	0.882	lpm	0.903	lpm

Notes:

Replaced pump for preventative maintenance. Sample filter replaced after as found. Adjusted zero and span.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

July 27, 2016

Station Number:

AMS 7

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	-0.9	-1.0	0.3	----	----
as found span	5000	60.7	599.7	599.7	0.0	643.7	643.3	0.6	0.9316	0.9322
calibrator zero	5000	0.0	0.0	0.0	0.0	0.1	-0.1	0.3	----	----
high point	5000	60.7	599.7	599.7	0.0	598.5	598.9	-0.1	1.0020	1.0013
second point	5000	30.4	300.4	300.4	0.0	296.3	296.8	-0.2	1.0136	1.0119
third point	5000	15.2	150.2	150.2	0.0	147.0	146.9	0.3	1.0215	1.0223
as left zero	5000	0.0	0.0	0.0	0.0	0.1	-0.5	0.3	----	----
as left span	5000	60.7	599.7	208.9	390.8	589.1	207.9	380.2	1.0180	1.0048
Average Correction Factor									1.0124	1.0118

Corrected As found
Previous Response

NO_x= 644.6
NO_x= 600.2

NO= 644.3
NO= 599.7

Percent Change

NO_x= -6.9%

NO= -6.9%

GPT Calibration Data

Dilution Flow (total) 5000 ccm Source Gas Flow 60.70 ccm NOx ref calc conc = 599.7 ppb NO ref calc conc = 599.7 ppb

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
1st NO ref point		0.0	595.9	595.0	0.3	1.0064	1.0080	----	----
1st NO2 (300)	208.9	386.1	595.2	208.9	386.3	1.0076	----	0.9995	100.0%
2nd NO2 (200)	393.9	201.1	595.0	393.9	201.2	1.0080	----	0.9996	100.0%
3rd NO2 (100)	493.0	101.9	594.5	493.0	101.5	1.0088	----	1.0042	99.6%
2nd NO ref point		0.0	593.1	593.0	0.3	1.0112	1.0113	----	----
Average Correction Factor						1.0089		1.0011	99.9%

Calibration Performed By: Asad Hidayat



Wood Buffalo Environmental Association

NO_x Calibration Summary

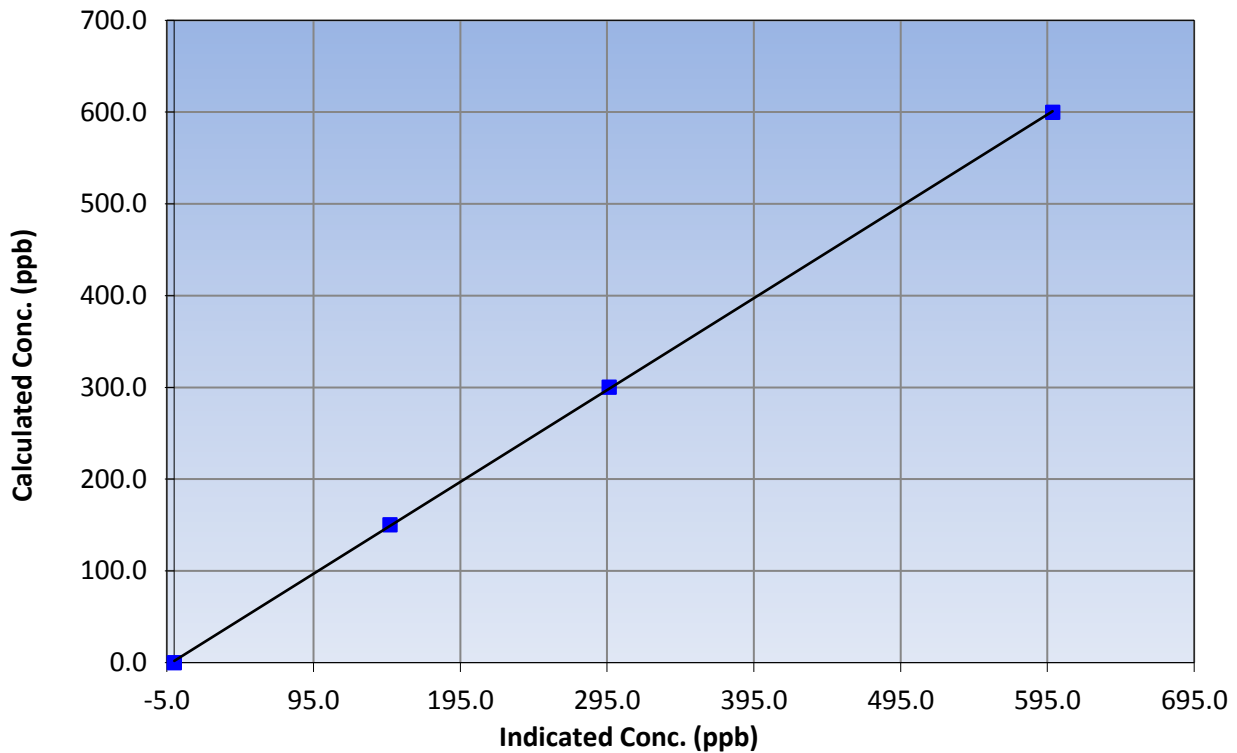
Station Information

Calibration Date	July 27, 2016	Previous Calibration	July 5, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	9:00	End Time (MST)	3:15
Analyzer make	Thermo 42C	Analyzer serial #	601114773

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999948
599.7	598.5	1.0020		
300.4	296.3	1.0136	Slope	1.001062
150.2	147.0	1.0215		
			Intercept	1.789347

NO_x Calibration Curve





Wood Buffalo Environmental Association

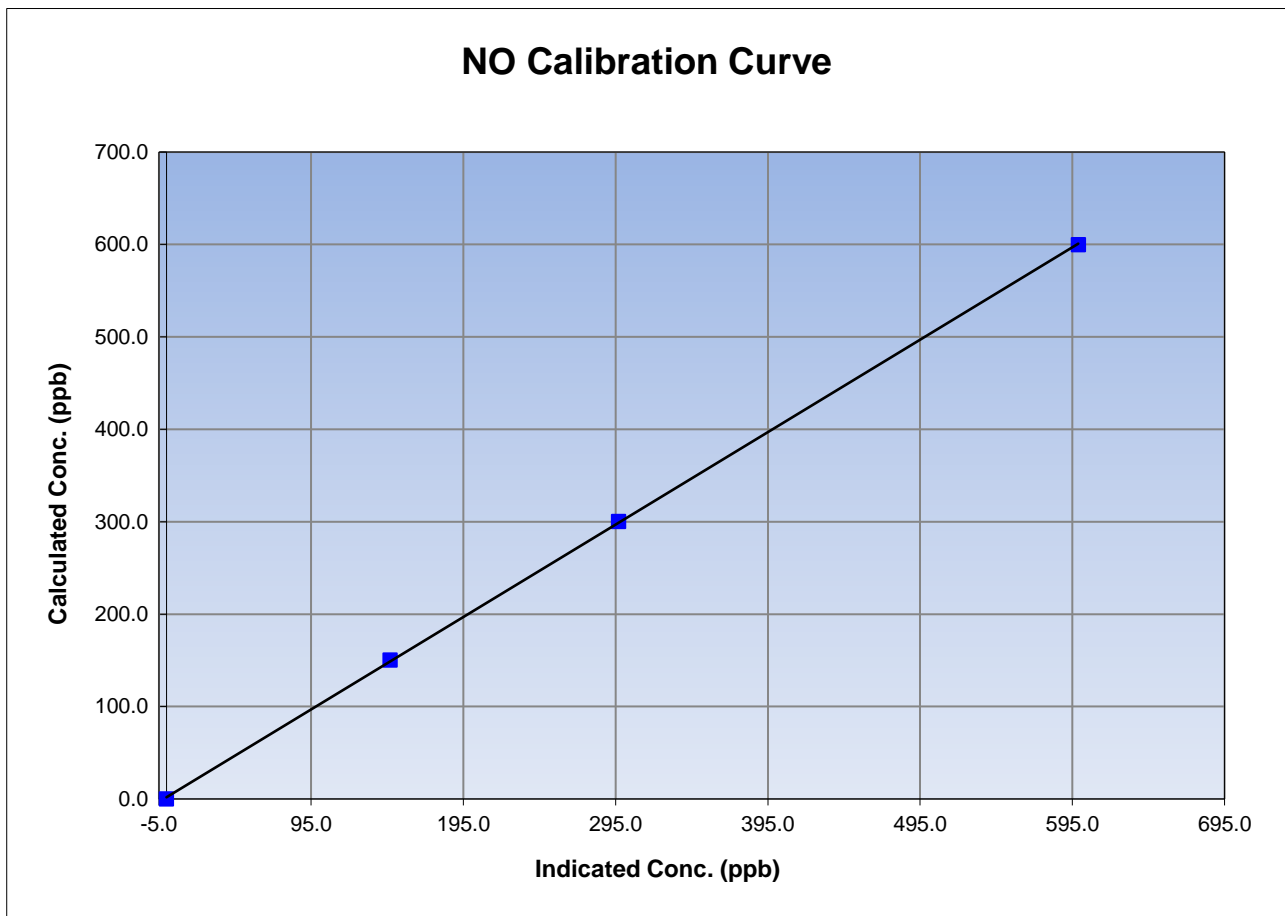
NO Calibration Summary

Station Information

Calibration Date	July 27, 2016	Previous Calibration	July 5, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	9:00	End Time (MST)	3:15
Analyzer make	Thermo 42C	Analyzer serial #	601114773

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999954
599.7	598.9	1.0013		
300.4	296.8	1.0119	Slope	1.000073
150.2	146.9	1.0223		
			Intercept	1.894408





Wood Buffalo Environmental Association

NO₂ Calibration Summary

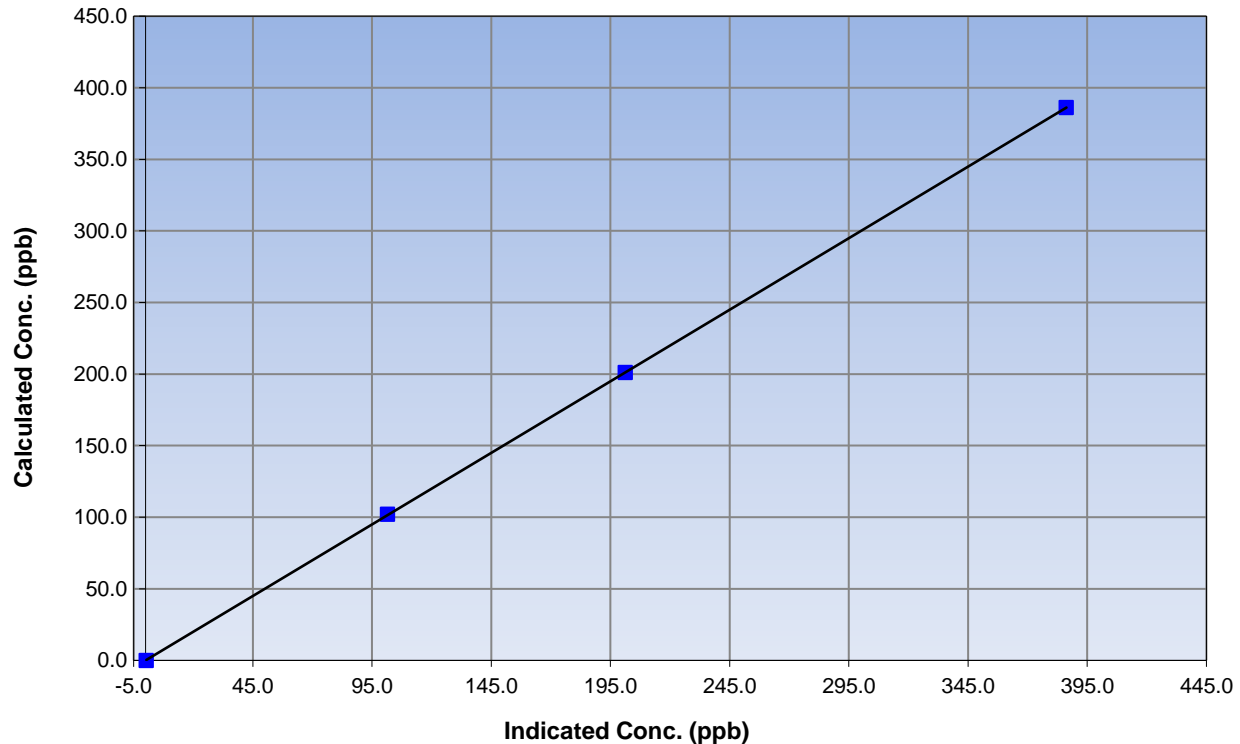
Station Information

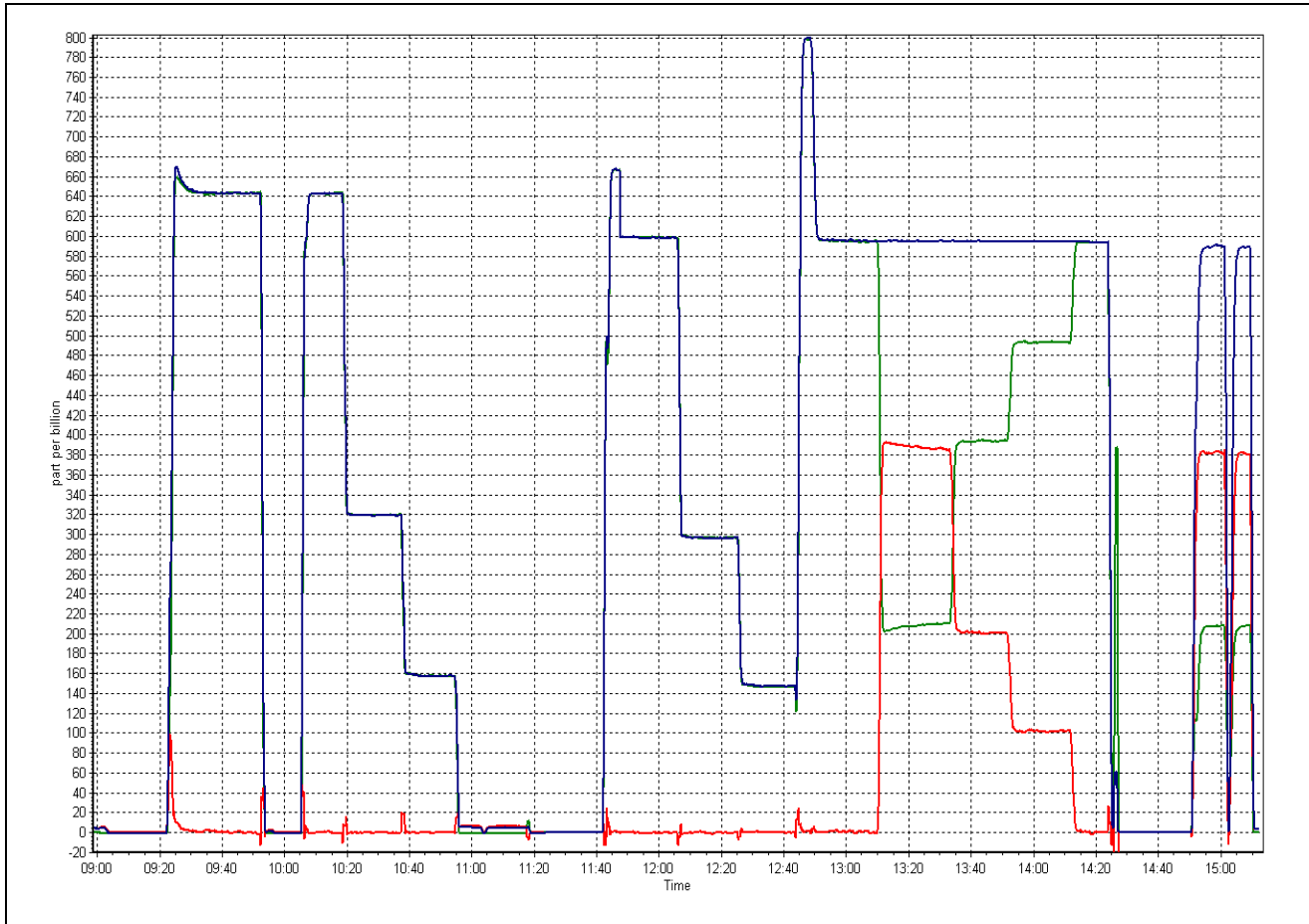
Calibration Date	July 27, 2016	Previous Calibration	July 5, 2016
Station Number	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	9:00	End Time (MST)	3:15
Analyzer make	Thermo 42C	Analyzer serial #	601114773

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	N/A	Correlation Coefficient	0.999996
386.1	386.3	0.9995		
201.1	201.2	0.9996	Slope	0.999770
101.9	101.5	1.0042		
			Intercept	-0.002904

NO₂ Calibration Curve







Wood Buffalo Environmental Association

SHARP CALIBRATION

STATION INFORMATION			
Calibration Date:	July 7, 2016	Previous Calibration:	02/06/16
Station Name:	Athabasca Valley	Station Number:	AMS 7
Start Time (MST):	7:36	End Time (MST):	8:35
Calibrator Make/Model:	Delta Cal	Calibrator Serial Number:	1097

SHARP INFORMATION			
Particulate Fraction:		PM2.5	
Make/Model:		Thermo / SHARP 5030	
Serial Number		E515	
C ₁₄ Source SN:		3256	
Confirmation of Time settings:		Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Parameters Checked:	T1 <input checked="" type="checkbox"/> T2 <input type="checkbox"/> T3 <input type="checkbox"/> T4 <input type="checkbox"/> P3 <input checked="" type="checkbox"/> Main Flow <input checked="" type="checkbox"/> Beta <input type="checkbox"/> Neph <input checked="" type="checkbox"/>		

CALIBRATION DATA				
Temperature (°C)				
Sensor	Indicated	Measured	Difference (Limit +/- 2.0°C)	Final Indicated
T1	11.0	13.0	2.0	13.0
T2	24.0	na	#VALUE!	24.0
T3	25.0	na	#VALUE!	25.0
T4	29.0	na	#VALUE!	29.0
RH (%)	37.0	na	#VALUE!	37.0

Pressure (Hpa)				
Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	981	977.0	-4.0	981

Main Flow (Lph)				
Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1000	1020	20	1000	1000

Nephelometer Calibration			
Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	238		242
Neph	10.7		-0.7
C14	-4.2		0.6
Indicated Concentration (ug/m3)	3.2	yes	-0.2
Offset 1	243		242.3
Offset 2	35		35.1

Leak Check (Quarterly)			
Leak Check Date:	June 2, 2016	Previous Leak Check Date:	April 22, 2016
	Measured		Difference LPM (Limit +/- 0.42 LPM)
Flow without adaptor (LPM):	16.67		0.02
*Flow with adaptor (LPM):	16.65		
<i>*Note - do not attach adaptor without shutting off the pump first</i>			

Mass Foil Calibration (Annually)			
Foil Calibration Date:	June 2, 2016	Previous Foil Calibration:	April 22, 2016
Zeroed?:	No		
Foil Mass:	1337		Mass foil set S/N: 5872
Previous Correction Factor:	6853		
New Correction Factor:	6895		

INSPECTION DATA		
Item	Condition	Date of install or rebuild
Cyclone	Good / cleaned	07/07/2016
Pump	Good	NA
Filter Tape	Good	NA
Mass Foil Cal Set	na	NA
HEPA filter	Good	15/04/2015

NOTES:

Cyclone head was cleaned, T1, flow and nephelometer adjusted

Calibration Performed By: Melissa Lemay



Wood Buffalo Environmental Association

SHARP CALIBRATION

STATION INFORMATION

Calibration Date:	<u>July 22, 2016</u>	Previous Calibration:	<u>July 7, 2016</u>
Station Name:	<u>Athabasca Valley</u>	Station Number:	<u>AMS 7</u>
Start Time (MST):	<u>9:30</u>	End Time (MST):	<u>11:05</u>
Calibrator Make/Model:	<u>Delta Cal</u>	Calibrator Serial Number:	<u>141229</u>

SHARP INFORMATION

Particulate Fraction:	<u>PM2.5</u>
Make/Model:	<u>Thermo / SHARP 5030</u>
Serial Number:	<u>E515</u>
C ₁₄ Source SN:	<u>3256</u>
Confirmation of Time settings:	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Parameters Checked:	T1 <input checked="" type="checkbox"/> T2 <input type="checkbox"/> T3 <input type="checkbox"/> T4 <input type="checkbox"/> P3 <input checked="" type="checkbox"/> Main Flow <input checked="" type="checkbox"/> Beta <input checked="" type="checkbox"/> Neph <input checked="" type="checkbox"/>

CALIBRATION DATA

Temperature (°C)				
Sensor	Indicated	Measured	Difference (Limit +/- 2.0°C)	Final Indicated
T1	19.0	19.1	0.1	19.0
T2	22.0	na	#VALUE!	22.0
T3	24.0	na	#VALUE!	24.0
T4	34.0	na	#VALUE!	34.0
RH (%)	42.0	na	#VALUE!	42.0

Pressure (Hpa)				
Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	982	981.0	-1.0	981

Main Flow (Lph)				
Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1000	975	-25	1000	1001

Nephelometer Calibration			
Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	245		245
Neph	4.2		-0.8
C14	361		223.3
Indicated Concentration (ug/m3)	1.2	YES	-0.2
Offset 1	239		246.4
Offset 2	35		36.6

Leak Check (Quarterly)

Leak Check Date:	<u>July 22, 2016</u>	Previous Leak Check Date:	<u>June 2, 2016</u>
------------------	----------------------	---------------------------	---------------------

	Measured	Difference LPM (Limit +/- 0.42 LPM)
Flow without adaptor (LPM):	16.67	
*Flow with adaptor (LPM):	16.36	0.31

*Note - do not attach adaptor without shutting off the pump first

Mass Foil Calibration (Annually)

Foil Calibration Date:	<u>July 22, 2016</u>	Previous Foil Calibration:	<u>June 2, 2016</u>
Zeroed?:	<u>No</u>		
Foil Mass:	<u>1337</u>		
Previous Correction Factor:	<u>6895</u>	Mass foil set S/N:	<u>2518</u>
New Correction Factor:	<u>6885</u>		

INSPECTION DATA

Item	Condition	Date of install or rebuild
Cyclone	Good / cleaned	07/07/2016
Pump	Good	NA
Filter Tape	Good	NA
Mass Foil Cal Set	na	NA
HEPA filter	Good	15/04/2015

NOTES:

Debris cleared from sample inlet system as well as NEPH and BETA chambers. Flow calibrated slightly, leak check passed. Beta and Neph calibrated, all cal criteria met, instrument passed calibration.

Calibration Performed By: **Zach Eastman**



Wood Buffalo Environmental Association

SHARP CALIBRATION

STATION INFORMATION			
Calibration Date:	July 28, 2016	Previous Calibration:	07/22/2016
Station Name:	Athabasca Valley	Station Number:	AMS 7
Start Time (MST):	7:45	End Time (MST):	8:55
Calibrator Make/Model:	Delta Cal	Calibrator Serial Number:	141229

SHARP INFORMATION			
Particulate Fraction:	PM2.5		
Make/Model:	Thermo / SHARP 5030		
Serial Number	E515		
C ₁₄ Source SN:	3256		
Confirmation of Time settings:	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Parameters Checked:	T1 <input checked="" type="checkbox"/>	T2 <input type="checkbox"/>	T3 <input type="checkbox"/>
	T4 <input type="checkbox"/>	P3 <input checked="" type="checkbox"/>	Main Flow <input checked="" type="checkbox"/>
		Beta <input checked="" type="checkbox"/>	Neph <input checked="" type="checkbox"/>

CALIBRATION DATA

Temperature (°C)				
Sensor	Indicated	Measured	Difference (Limit +/- 2.0°C)	Final Indicated
T1	18.0	18.2	0.2	18.0
T2	39.0	na	#VALUE!	39.0
T3	29.0	na	#VALUE!	29.0
T4	46.0	na	#VALUE!	46.0
RH (%)	39.0	na	#VALUE!	39.0

Pressure (Hpa)				
Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	990	989.0	-1.0	990

Main Flow (Lph)				
Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1000	1000	0	1000	1001

Nephelometer Calibration			
Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	238		238
Neph	-0.3		0.1
C14	-10.4		-16.9
Indicated Concentration (ug/m3)	-1	YES	0.2
Offset 1	240		240.2
Offset 2	34.5		34.9

Leak Check (Quarterly)

Leak Check Date:	July 22, 2016	Previous Leak Check Date:	June 2, 2016
	Measured		Difference LPM (Limit +/- 0.42 LPM)
Flow without adaptor (LPM):	16.67		0.31
*Flow with adaptor (LPM):	16.36		

*Note - do not attach adaptor without shutting off the pump first

Mass Foil Calibration (Annually)			
Foil Calibration Date:	July 22, 2016	Previous Foil Calibration:	June 2, 2016
Zeroed?:	No		
Foil Mass:	1337		Mass foil set S/N: 2518
Previous Correction Factor:	6895		
New Correction Factor:	6885		

INSPECTION DATA

Item	Condition	Date of install or rebuild
Cyclone	Good / cleaned	07/07/2016
Pump	Good	NA
Filter Tape	Good	NA
Mass Foil Cal Set	na	NA
HEPA filter	Good	15/04/2015

NOTES:

Nephelometer checked due to negative PM readings, T1, P3 and flow also checked. Nephelometer was adjusted. No other adjustments done

Calibration Performed By: Melissa Lemay



Wood Buffalo Environmental Association CO Calibration Report

Station Information

Calibration Date	July 7, 2016	Last Calibration	June 2, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Routine		
Start Time (MST)	9:45	End Time (MST)	12:23
Gas Cert Reference	CC101396	Station temp.	22 Deg C
Cal Gas Concentration	2970 ppm	Cal Gas Exp Date	02/02/2023
Calibrator Make/Model	Sabio 4010	Serial Number	11021107
ZAG Make/Model	API 701	Serial Number	5564
DACS make/model	Campbell Scientific CR3000	Serial Number	1864

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		Chamber temp.	48.1	48.3
Analyzer IP address	192.168.1.48		Pressure	728.9	73406.0
Calculated slope	1.003299	1.000861	Flow	0.492	0.496
Calculated intercept	0.031307	0.062058	Intensity	199470	199495
Analyzer Background	5.483	5.716	S/R ratio	1.171971	1.171337
Analyzer Coefficient	1.065	1.065			

Analyzer make Thermo 48i-TLE Analyzer serial # 1408761381

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.3	----
as found span	5000	69.7	41.4	42.2	0.982
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	69.7	41.4	41.3	1.001
second point	5000	35.2	20.9	20.8	1.007
third point	5000	15.2	9.0	8.9	1.011
as left zero	5000	0.0	0.0	0.0	----
as left span	5000	69.7	41.4	41.2	1.006
Average Correction Factor					1.006

Corrected As found 41.9 Previous response 41.2 % change -1.5%

Notes:

Filter changed out. Zero adjusted. Zero air switched after as founds.

Calibration Performed By: Melissa Lemay



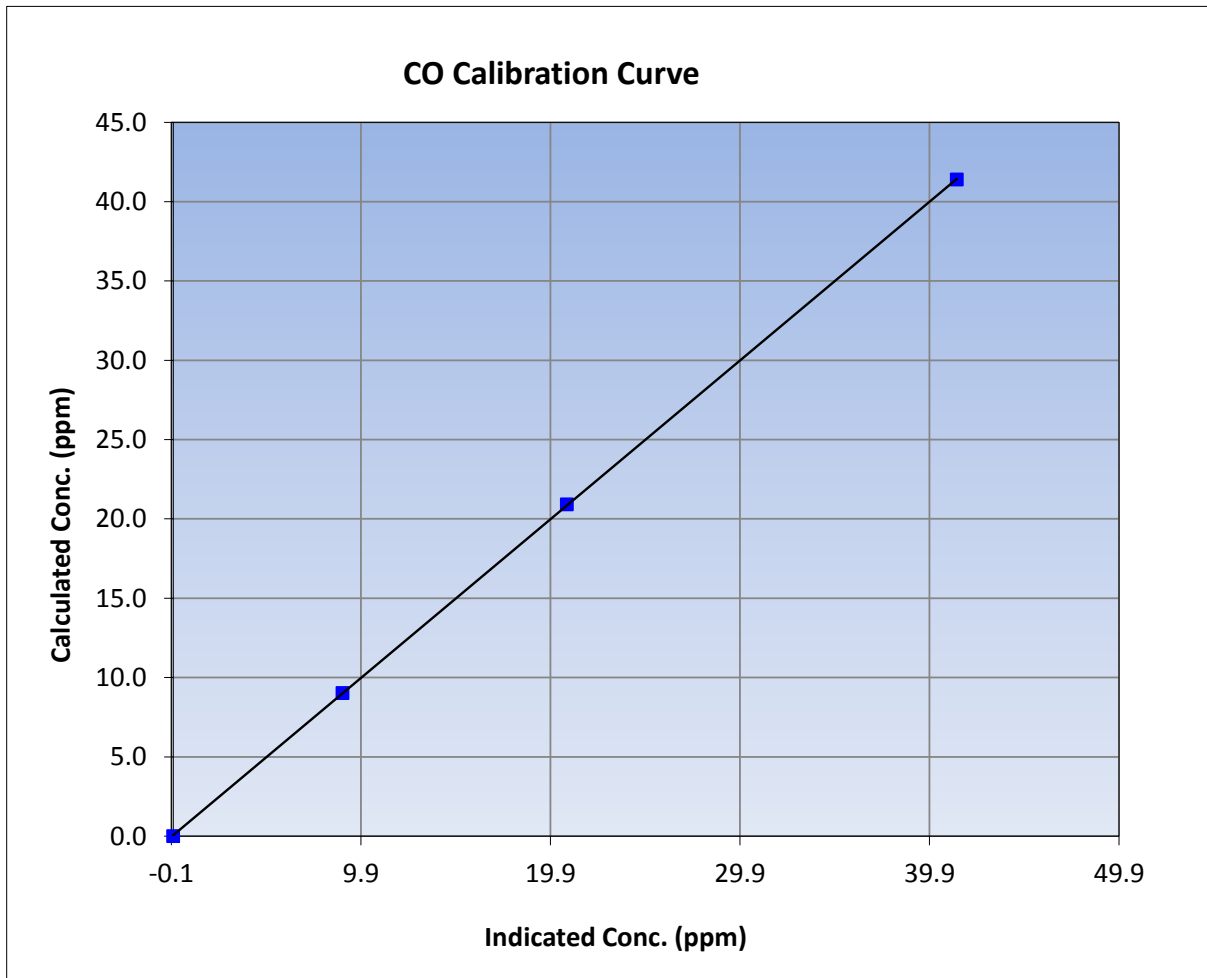
Wood Buffalo Environmental Association CO Calibration Report

Station Information

Calibration Date	July 7, 2016	Previous Calibration	June 2, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	9:45	End Time (MST)	12:23
Analyzer make	Thermo 48i-TLE	Analyzer serial #	1408761381

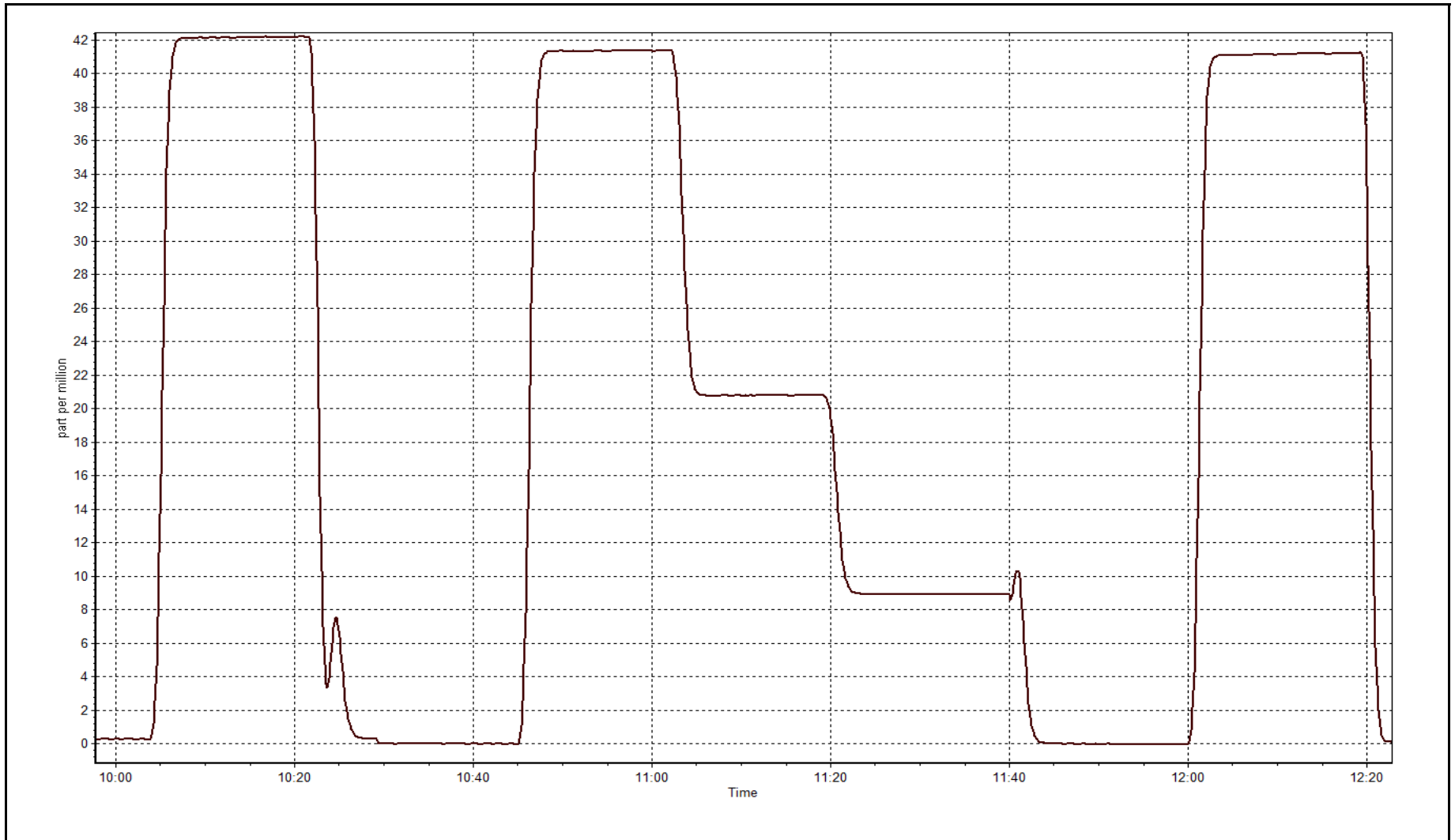
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999991
41.4	41.3	1.0015		
20.9	20.8	1.0067	Slope	1.000861
9.0	8.9	1.0111		
			Intercept	0.062058



CO Calibration Plot

Date: July 7, 2016





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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 8
FORT CHIPEWYAN
JULY 2016**

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

August 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT CHIPEWYAN (AMS 8)
 JULY 2016

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2(ppb) Average	705	37	39	99.73	13	0	2	0
O3(ppb) Average	701	33	43	98.66	50	0	41	-
NO2(ppb) Average	703	38	41	99.60	5	0	1	-
NO(ppb) Average	703	38	41	99.60	4	-	1	-
NOX(ppb) Average	703	38	41	99.60	9	-	2	-
PM2.5(ug/m3) Average	657	2	87	88.58	117.9	-	27.3	0
Wind Speed 10 m (km/h) Average	742	0	2	99.73	39	-	27	-
Wind Direction 10 m (deg) Average	742	0	2	99.73	-	-	-	-
Temperature 2 m (C) Average	742	0	2	99.73	28.8	-	23.8	-
Relative Humidity (%) Average	742	0	2	99.73	100	-	88	-
Precipitation (mm) Total	742	0	2	99.73	5.6	-	8.9	-
Leaf Wetness (% of range) Average	742	0	2	99.73	40	-	9	-
Global Solar Radiation (W/m2) Average	742	0	2	99.73	923	-	367	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT CHIPEWYAN (AMS 8)
 JULY 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile							
					Min	P10	Q1	Median	Q3	P90	Max	
SO2(ppb) Average	705	0.1	1	-	0	0	0	0	0	0	0	13
O3(ppb) Average	701	25.5	8	-	7	16	19	24	30	38	50	50
NO2(ppb) Average	703	0.4	0	-	0	0	0	0	0	1	5	5
NO(ppb) Average	703	0.1	0	-	0	0	0	0	0	0	4	4
NOX(ppb) Average	703	0.4	1	-	0	0	0	0	0	1	9	9
PM2.5(ug/m3) Average	657	7.38	11.2	-	0.2	1.5	2.5	4	7.7	17.2	117.9	117.9
Wind Speed 10 m (km/h) Average	742	13.7	7	-	0	6	9	12	18	24	39	39
Wind Direction 10 m (deg) Average	742	-	-	-	-	-	-	-	-	-	-	-
Temperature 2 m (C) Average	742	18.53	3.8	-	7.5	13.9	15.8	18.4	21.1	23.7	28.8	28.8
Relative Humidity (%) Average	742	71	15	-	26	51	61	72	82	91	100	100
Precipitation (mm) Total	742	-	-	44.7	-	-	-	-	-	-	-	-
Leaf Wetness (% of range) Average	742	1.3	5	-	-1	-1	-1	0	0	4	40	40
Global Solar Radiation (W/m2) Average	742	259.3	279	-	0	0	3	154	466	716	923	923

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT CHIPEWYAN (AMS 8)
JULY 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
ALL PARAMETERS	12 Jul 2016 11:00	12 Jul 2016 12:00	2	Maintenance - station wiring/data logger upgrade
O3	02 Jul 2016 09:00	02 Jul 2016 09:00	1	Unstable Operation
O3	09 Jul 2016 03:00	09 Jul 2016 03:00	1	Unstable Operation
O3	15 Jul 2016 22:00	15 Jul 2016 23:00	2	Unstable Operation
O3	25 Jul 2016 04:00	25 Jul 2016 05:00	2	Unstable Operation
O3	27 Jul 2016 09:00	27 Jul 2016 09:00	1	Unstable Operation
O3	31 Jul 2016 10:00	31 Jul 2016 10:00	1	Unstable Operation
NO2	28 Jul 2016 13:00	28 Jul 2016 13:00	1	Power spike followed by stabilization period
PM2.5	02 Jul 2016 01:00	05 Jul 2016 09:00	81	Analyzer Failure - filter tape break
PM2.5	05 Jul 2016 10:00	05 Jul 2016 11:00	2	Maintenance - repair filter tape



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

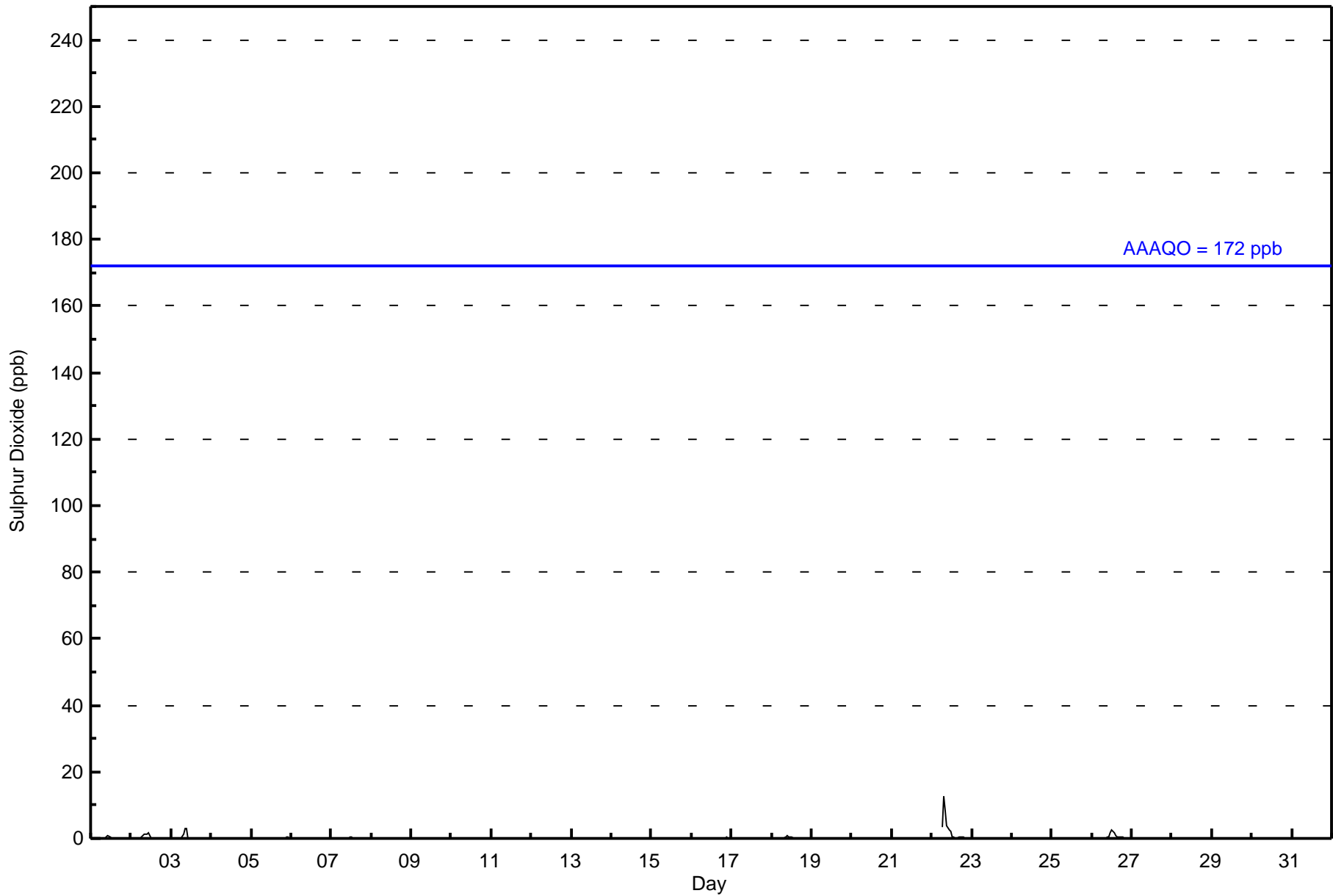
Fort Chipewyan - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																
Maximum Value: 13 ppb on Jul 22 08:00										Maximum Daily Average: 1.6 ppb on Jul 22										Hours of Data: 705						
Minimum Value: 0 ppb on Jul 3 19:00										Minimum Daily Average: 0.0 ppb on Jul 23										Hours of Missing Data: 39						
Maximum Diurnal Average: 0.5 ppb at hour 8										Minimum Diurnal Average: 0.0 ppb at hour 6										Hours of Calibration: 37						
Monthly Average: 0.1 ppb										Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 0 P ₉₀ = 0 P ₉₉ = 3										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-Jul	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
2-Jul	0	0	0	Z	0	0	0	1	1	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2
3-Jul	0	0	0	0	Z	0	0	1	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	3
4-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
5-Jul	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
6-Jul	0	Z	0	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-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
8-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
9-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
10-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
11-Jul	Z	0	0	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-Jul	0	Z	0	0	0	0	0	0	0	0	M	M	C	C	C	C	C	C	0	0	0	0	0	0	--	0
13-Jul	0	0	Z	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-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
15-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
16-Jul	0	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
17-Jul	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
18-Jul	0	Z	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
19-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
20-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
21-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
22-Jul	0	0	0	0	0	Z	3	13	8	4	3	2	0	0	0	0	0	1	0	0	0	0	0	0	1.6	13
23-Jul	Z	0	0	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-Jul	0	Z	0	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-Jul	0	0	Z	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-Jul	0	0	0	Z	0	0	0	0	0	0	2	2	2	1	1	1	0	0	0	0	0	0	0	0	0.4	2
27-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
28-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
29-Jul	Z	0	0	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-Jul	0	Z	0	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-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	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 0.5 0.4 0.3 0.2 0.2 0.1 0.1 0.1 0.0 0.1 0.1 0.0 0.0 0.0 0.0 0.0 0.0																								Diurnal Average		
0 0 0 0 0 0 3 13 8 4 3 2 2 2 1 1 1 1 1 0 0 0 0 0 0																								Diurnal Maximum		
Z - zerospan C - Calibration M - Maintenance																										
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb																										



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Fort Chipewyan - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Fort Chipewyan - July 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	704	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: 705

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Fort Chipewyan - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	65	18	36	55	146	44	21	41	23	15	27	31	56	43	34	49	704
11 - 20	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	65	18	36	55	146	44	21	41	23	16	27	31	56	43	34	49	705

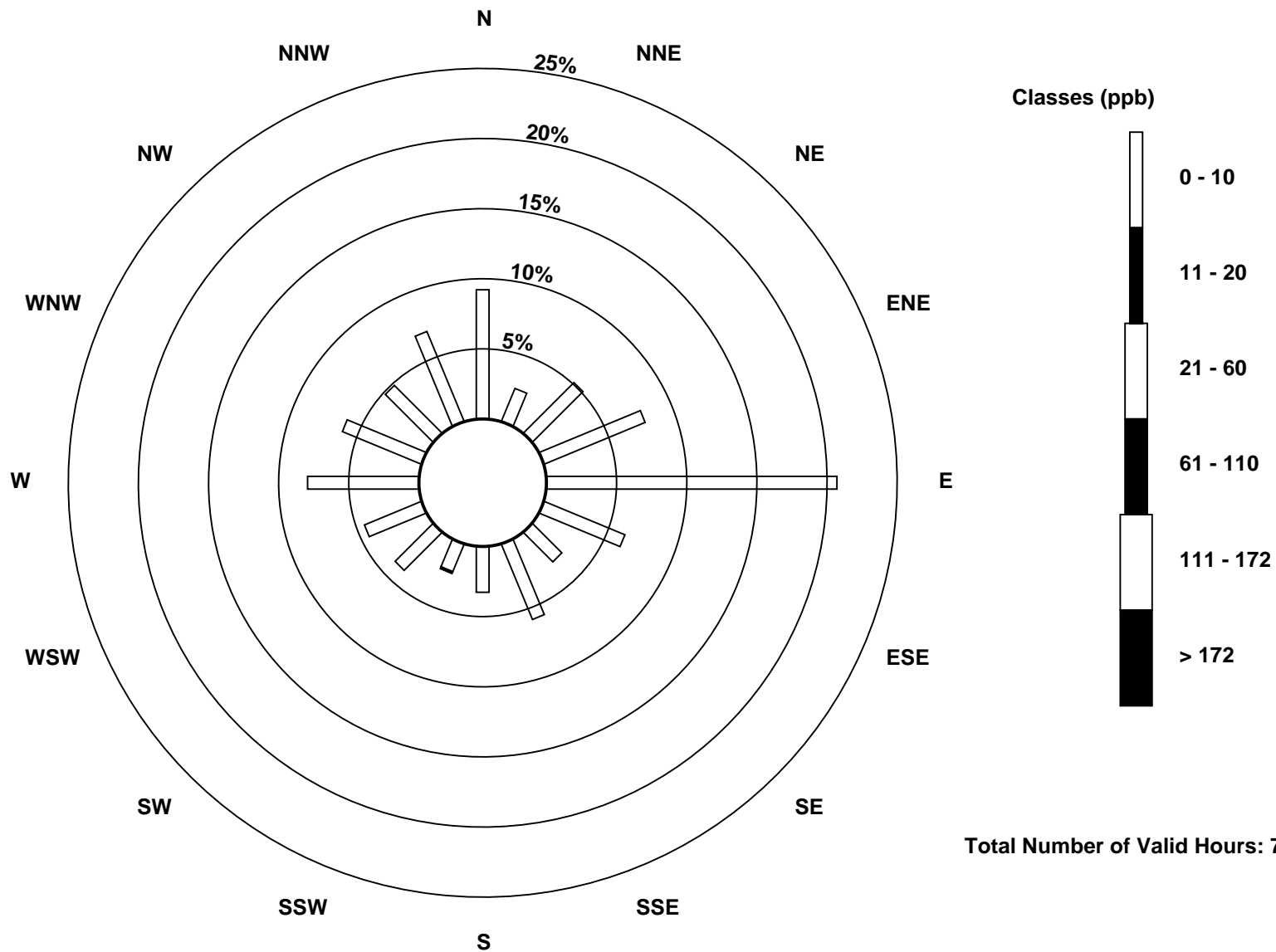
Total Number of Valid Hours: 705

Total Number of Hours: 744

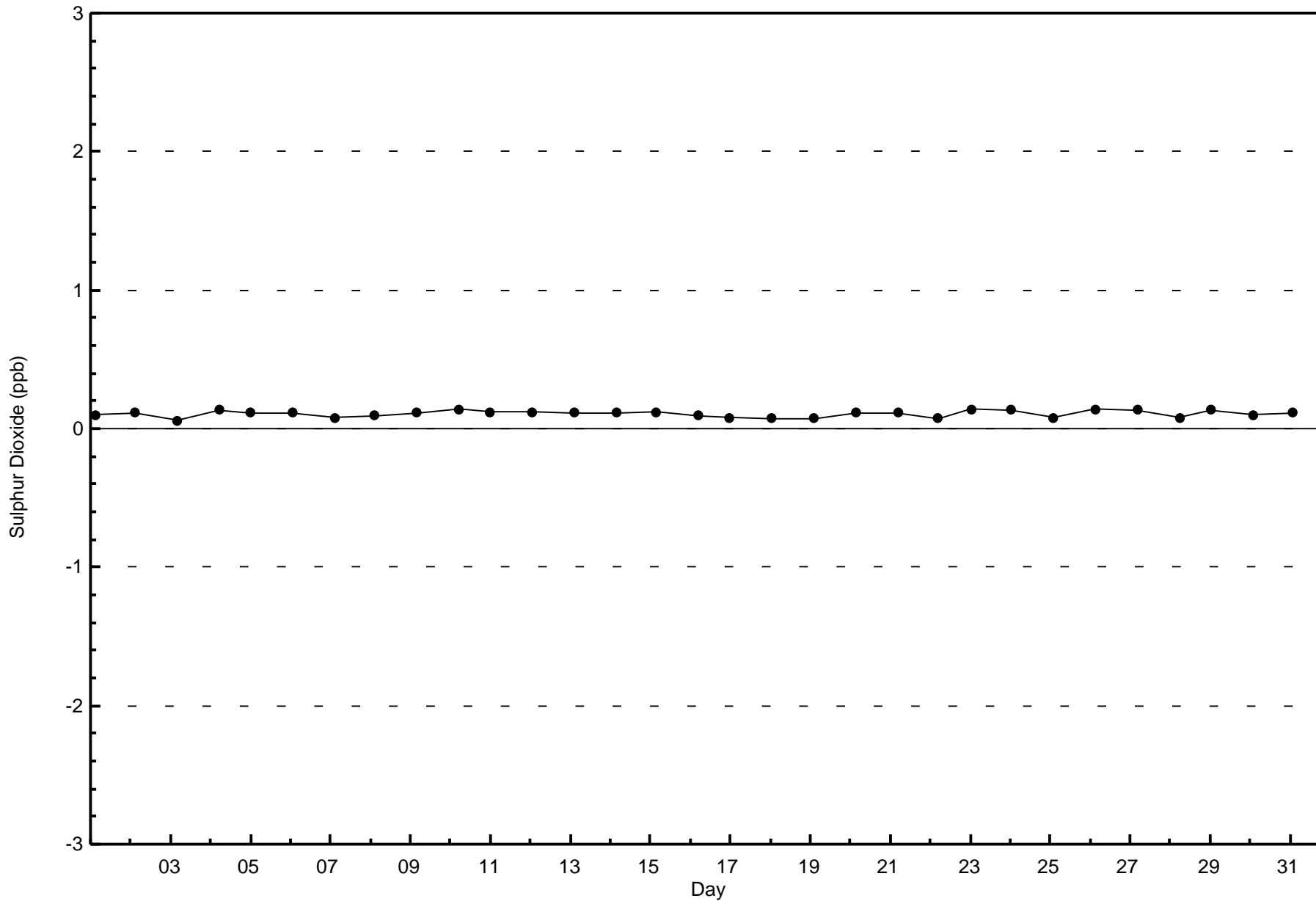


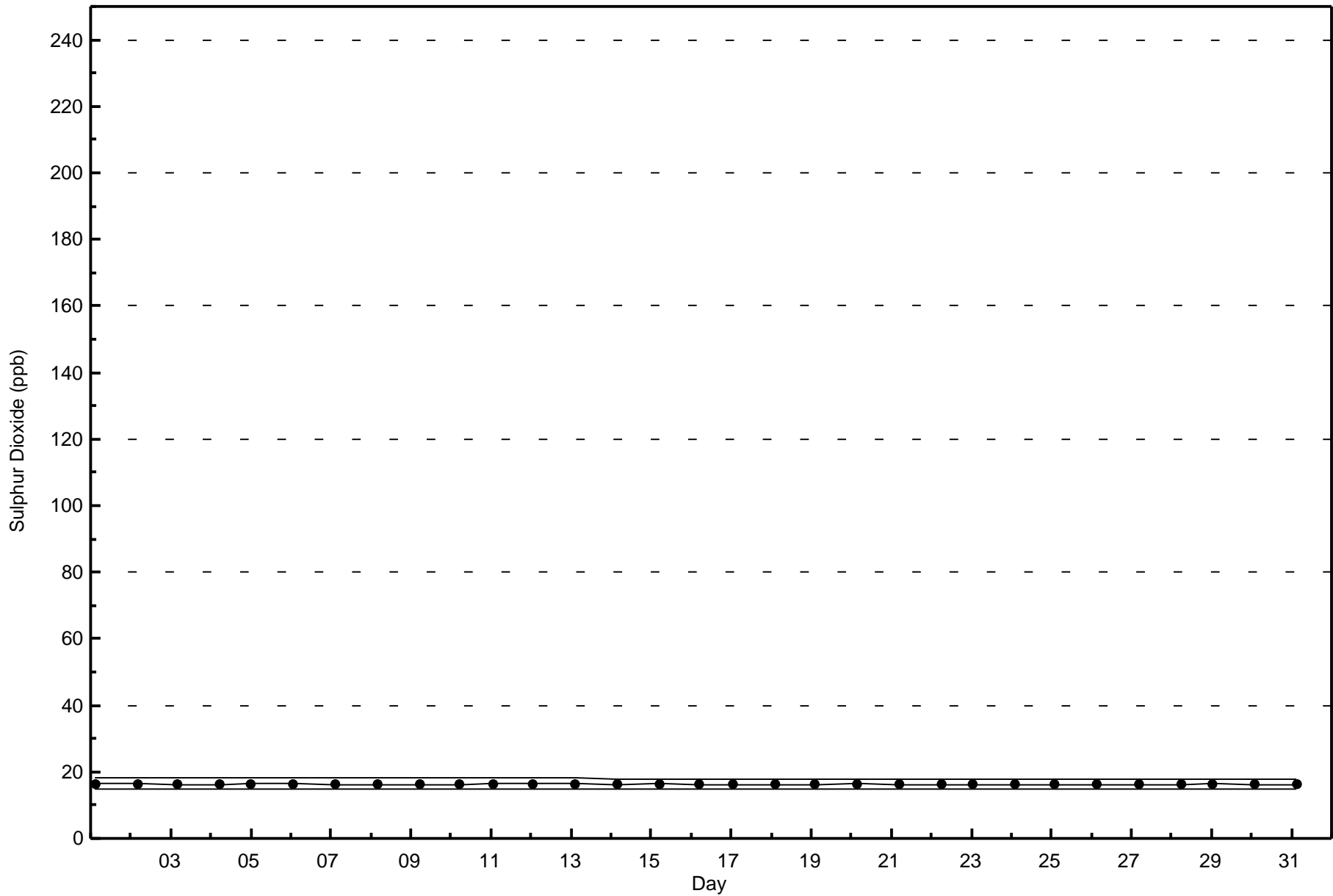
Wood Buffalo Environmental Association
Wind Rose Jul 2016

Sulphur Dioxide (SO₂) - ppb
Fort Chipewyan (AMS 8)



Total Number of Valid Hours: 705





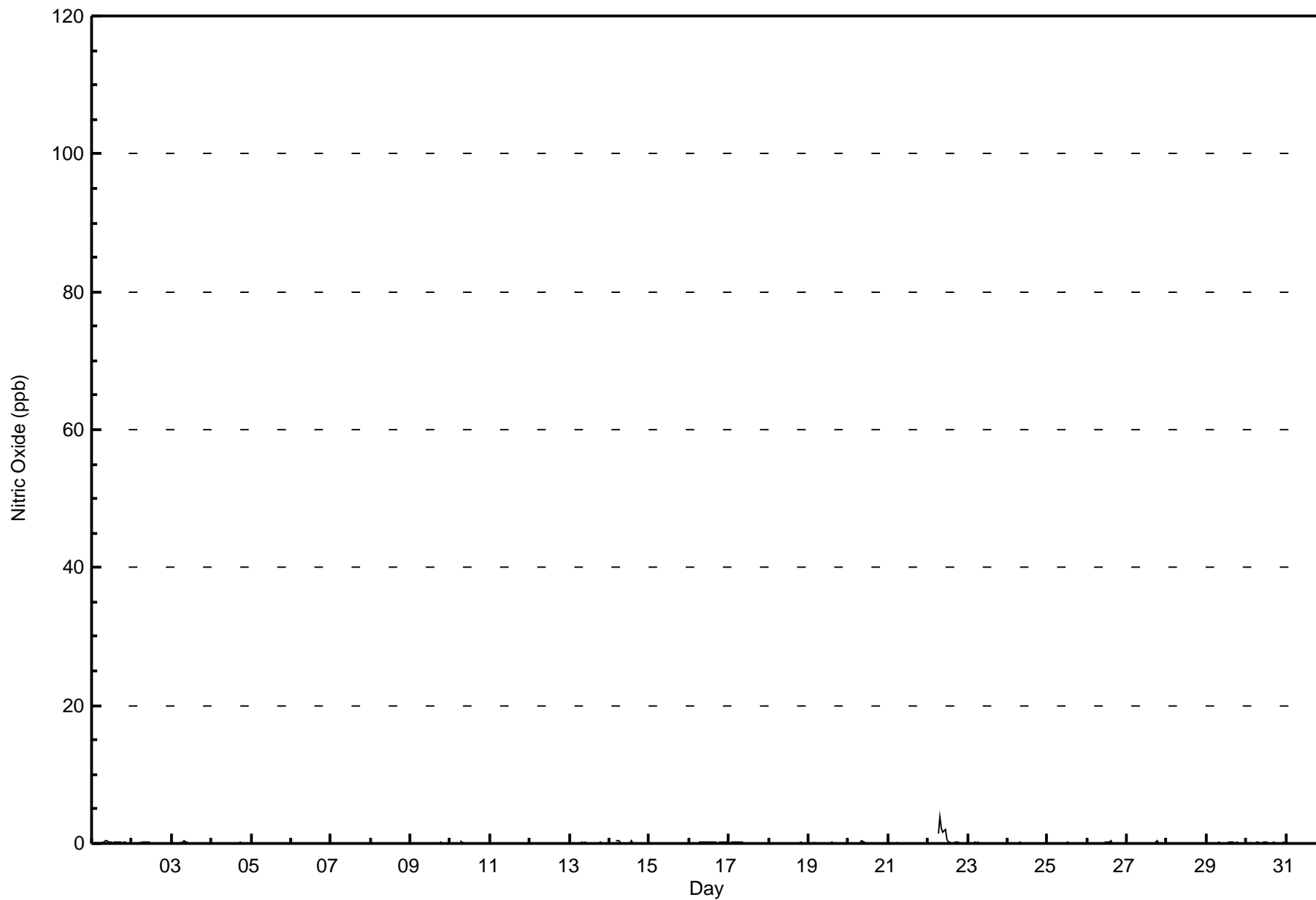


Maximum Value: 4 ppb on Jul 22 08:00																		Maximum Daily Average: 0.6 ppb on Jul 22						Hours in Service: 744		
Minimum Value: 0 ppb on Jul 3 15:00																		Minimum Daily Average: 0.0 ppb on Jul 6						Hours of Data: 703		
Maximum Diurnal Average: 0.2 ppb at hour 8																		Minimum Diurnal Average: 0.0 ppb at hour 24						Hours of Missing Data: 41		
Monthly Average: 0.1 ppb																		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 0						Hours of Calibration: 38		
																		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-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
2-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
3-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
4-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
5-Jul	Z	0	0	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-Jul	0	Z	0	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-Jul	0	0	Z	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-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
9-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
10-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
11-Jul	Z	0	0	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-Jul	0	Z	0	0	0	0	0	0	0	M	M	C	C	C	C	C	C	C	C	0	0	0	0	0	--	0
13-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
14-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
15-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
16-Jul	0	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
17-Jul	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
18-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
19-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
20-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
21-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
22-Jul	0	0	0	0	0	Z	1	4	2	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0.6	4
23-Jul	Z	0	0	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-Jul	0	Z	0	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-Jul	0	0	Z	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-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
27-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
28-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	PF	0	0	0	0	0	0	0	0	0	0	0	0.0	0
29-Jul	Z	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
30-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
31-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan																										
C - Calibration																										
M - Maintenance																										
PF - Power Failure																										



Wood Buffalo Environmental Association
Hourly Averages

Nitric Oxide (NO) - ppb
Fort Chipewyan - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb
Fort Chipewyan - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	703	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: 703

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitric Oxide (NO) - ppb
Fort Chipewyan - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	65	18	35	55	146	43	21	41	23	16	27	31	56	43	34	49	703
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	65	18	35	55	146	43	21	41	23	16	27	31	56	43	34	49	703

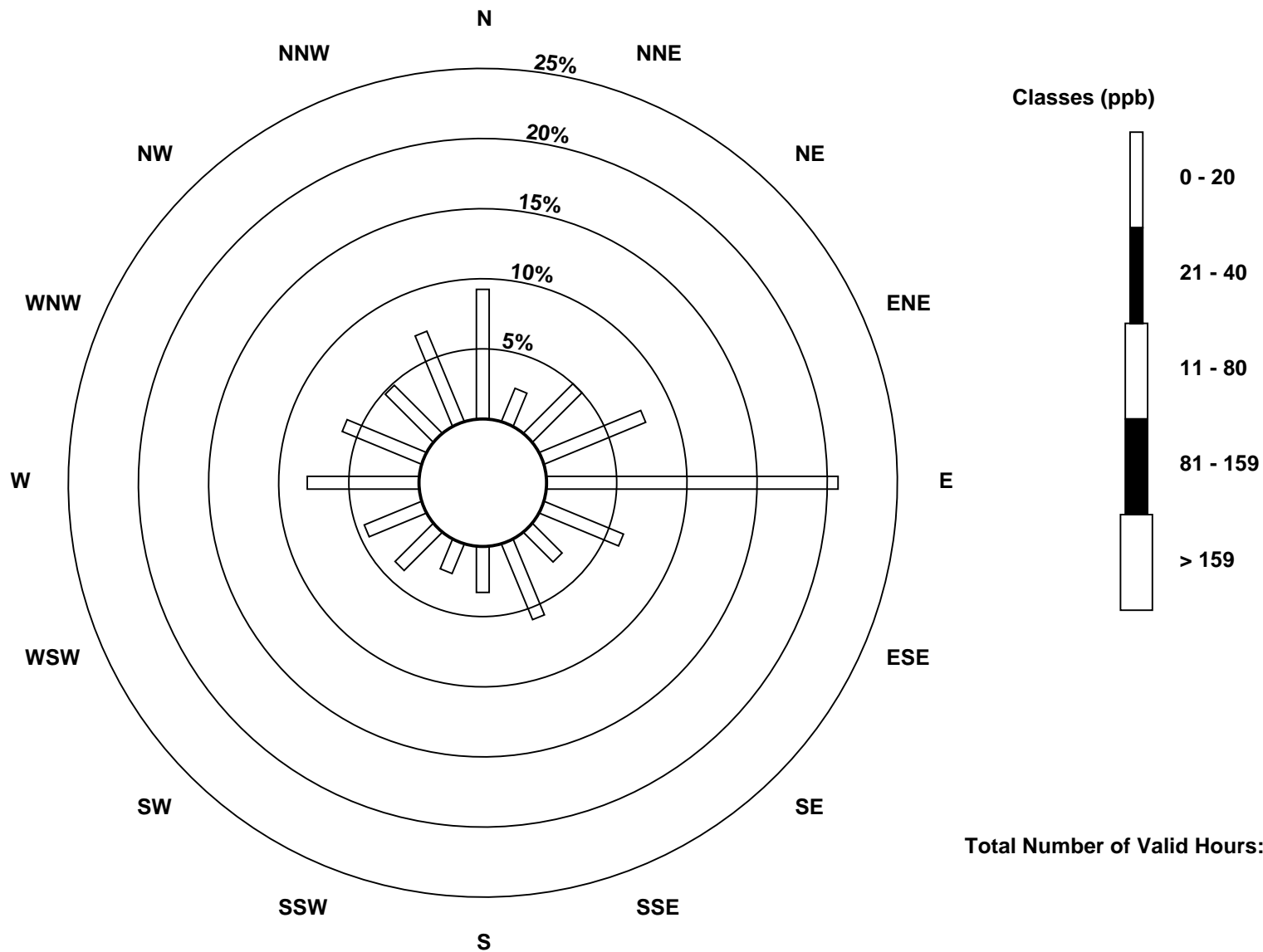
Total Number of Valid Hours: 703

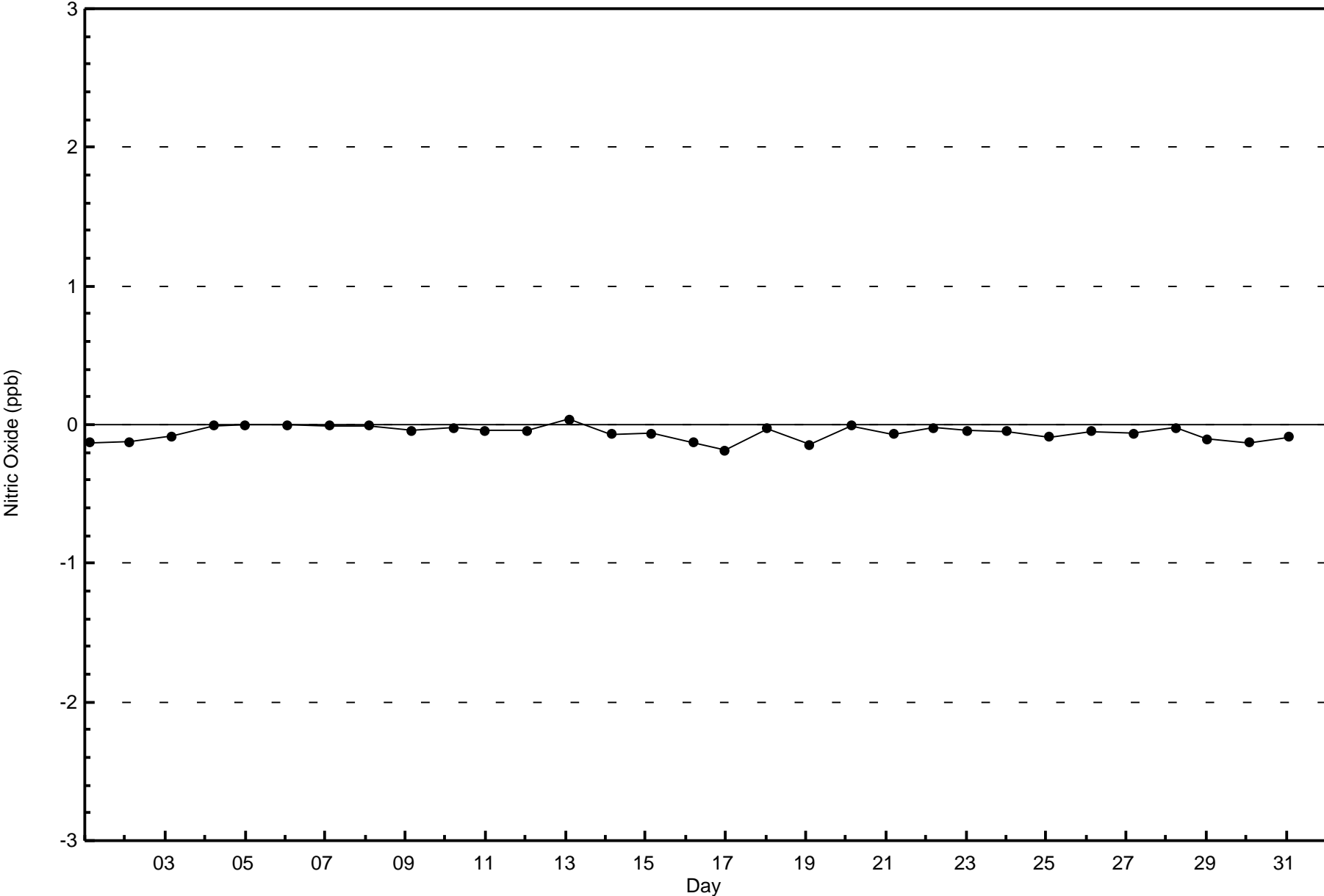
Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

Nitric Oxide (NO) - ppb
Fort Chipewyan (AMS 8)

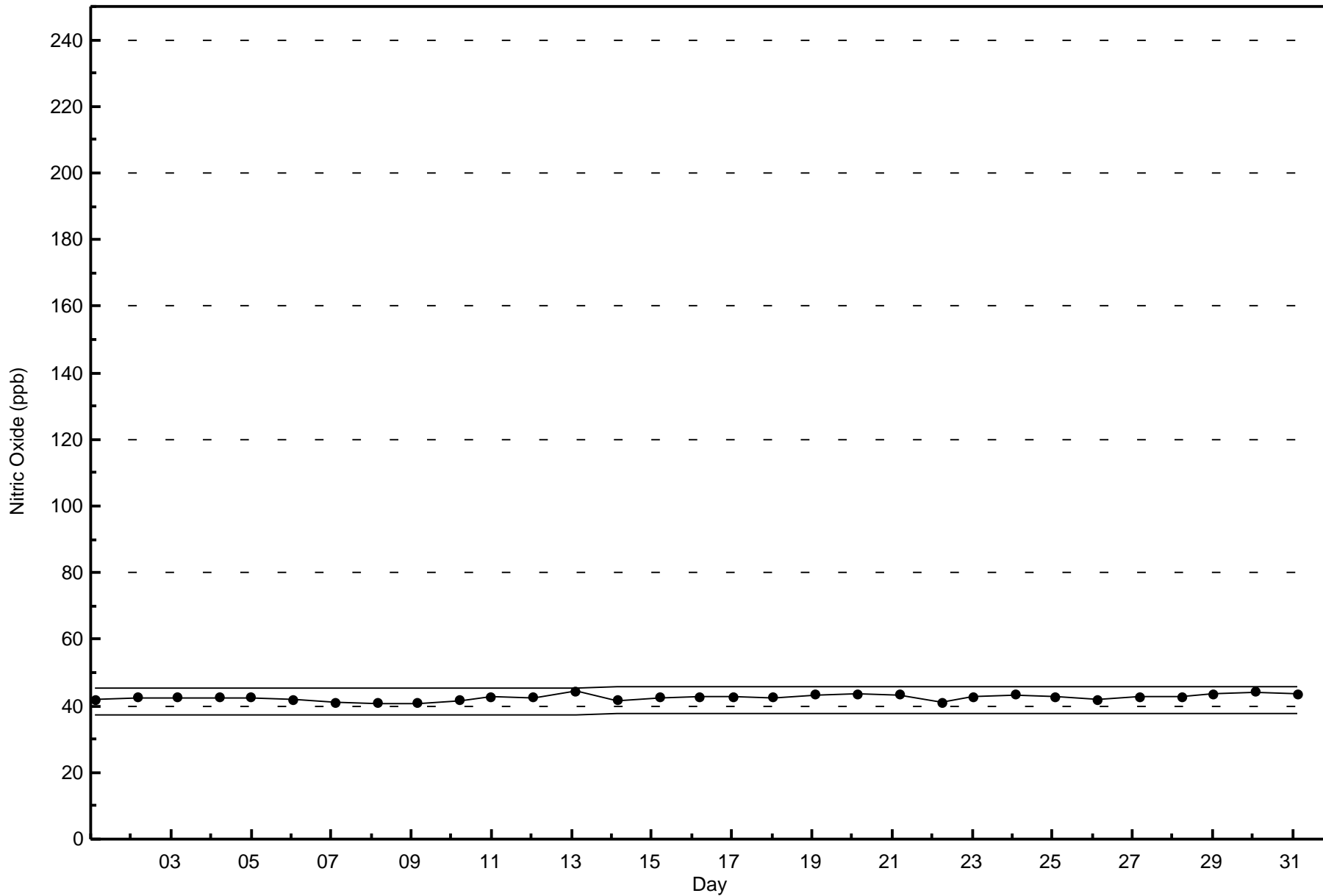






Wood Buffalo Environmental Association
Span Responses

Nitric Oxide (NO) - ppb
Fort Chipewyan - July 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

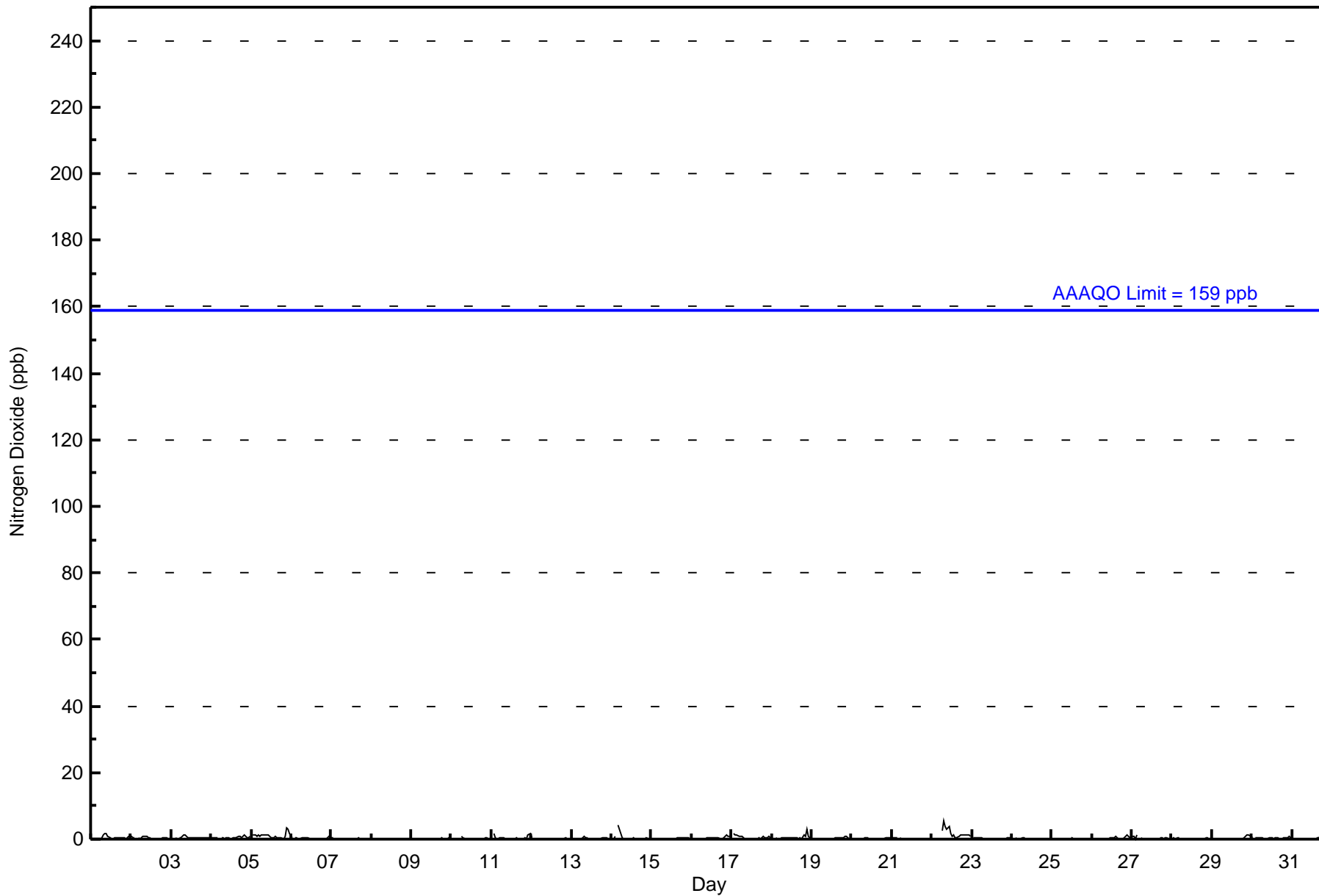
Fort Chipewyan - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0														Hours in Service: 744																													
Maximum Value: 5 ppb on Jul 22 08:00														Maximum Daily Average: 1.4 ppb on Jul 22																													
Minimum Value: 0 ppb on Jul 1 01:00														Minimum Daily Average: 0.1 ppb on Jul 8																													
Maximum Diurnal Average: 0.6 ppb at hour 22														Minimum Diurnal Average: 0.2 ppb at hour 13																													
Monthly Average: 0.4 ppb														Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 3																													
Hours of Data: 703														Hours of Missing Data: 41																													
Hours of Calibration: 38														Hours of Calibration: 38																													
Percent Operational Time: 99.6														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-Jul	0	0	Z	0	0	0	1	1	2	2	1	0	0	0	1	0	0	0	0	0	0	0	1	1	0.5	2																	
2-Jul	1	1	1	Z	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1																	
3-Jul	0	0	0	0	Z	0	0	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0.5	1																	
4-Jul	0	0	0	1	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0.5	1																	
5-Jul	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	3	3	2	1.1	3																	
6-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.3	1																	
7-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																	
8-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																	
9-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																	
10-Jul	0	0	0	0	0	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.2	1																	
11-Jul	Z	2	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0.3	2																	
12-Jul	0	Z	0	0	0	0	0	0	0	0	M	M	C	C	C	C	C	C	C	0	1	0	0	0	--	1																	
13-Jul	0	0	Z	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0.2	1																	
14-Jul	0	0	1	Z	4	2	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.5	4																	
15-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.2	1																	
16-Jul	0	0	0	0	0	Z	0	0	0	0	1	1	1	1	1	0	0	0	0	0	1	1	1	1	0.4	1																	
17-Jul	Z	2	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0.5	2																	
18-Jul	0	Z	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1	1	3	1	0.5	3																	
19-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0.2	1																	
20-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.2	1																	
21-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																	
22-Jul	0	0	0	0	0	Z	3	5	4	3	4	2	1	1	0	0	1	1	1	1	1	1	1	1	1.4	5																	
23-Jul	Z	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.2	1																	
24-Jul	0	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																	
25-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																	
26-Jul	0	0	0	Z	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	1	1	1	0	0.4	1																	
27-Jul	1	1	0	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0.3	1																	
28-Jul	0	0	0	1	1	Z	0	0	0	0	0	0	PF	0	0	0	0	0	0	0	0	1	0	0	0.2	1																	
29-Jul	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0.3	1																	
30-Jul	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0.3	1																	
31-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0.3	1																	
																								Diurnal Average																			
																								Diurnal Maximum																			
Z - zerospan														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 (NO₂) - ppb
Fort Chipewyan - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitrogen Dioxide (NO₂) - ppb
Fort Chipewyan - July 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	703	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: 703

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Fort Chipewyan - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	65	18	35	55	146	43	21	41	23	16	27	31	56	43	34	49	703
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	65	18	35	55	146	43	21	41	23	16	27	31	56	43	34	49	703

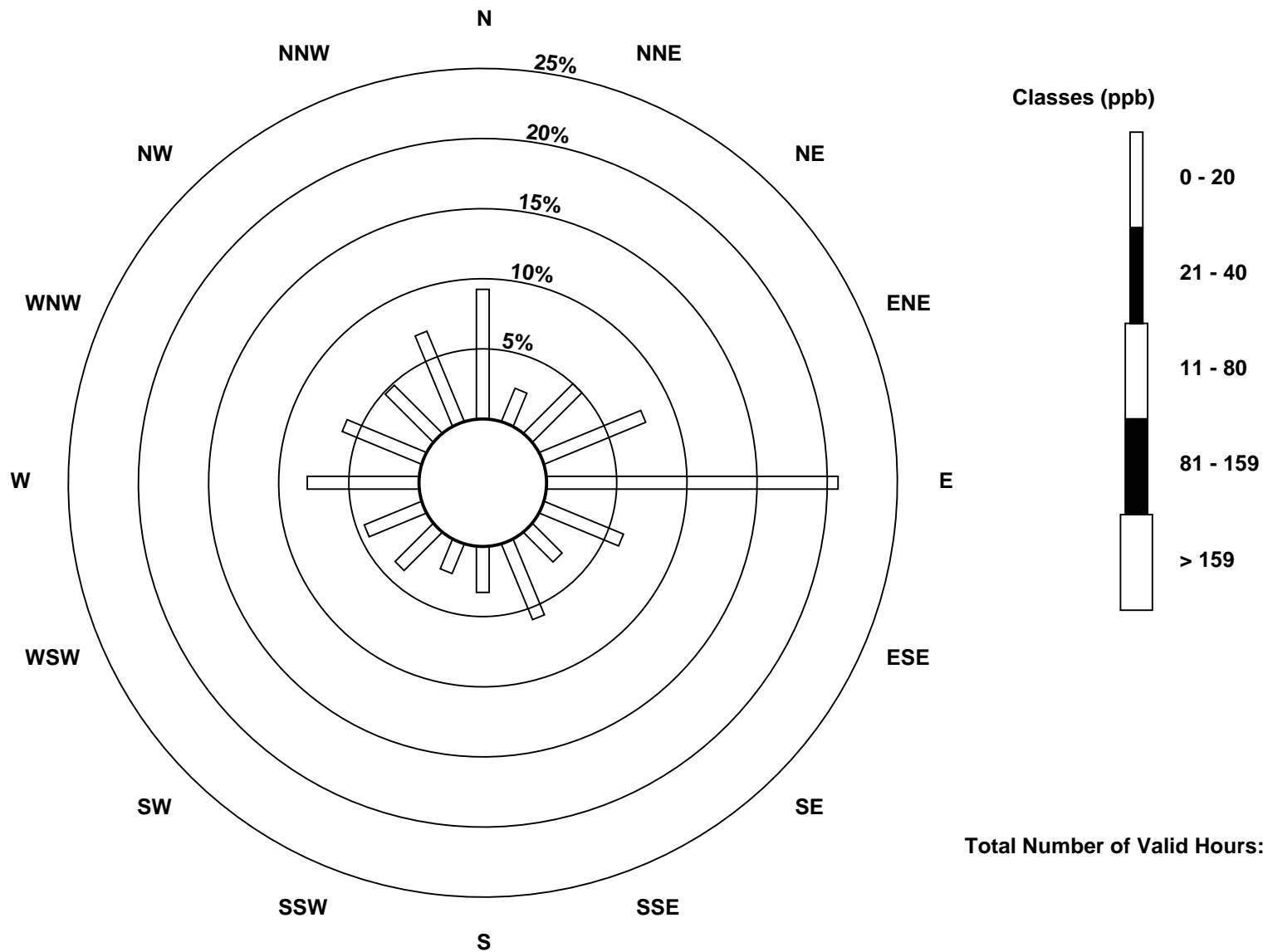
Total Number of Valid Hours: 703

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

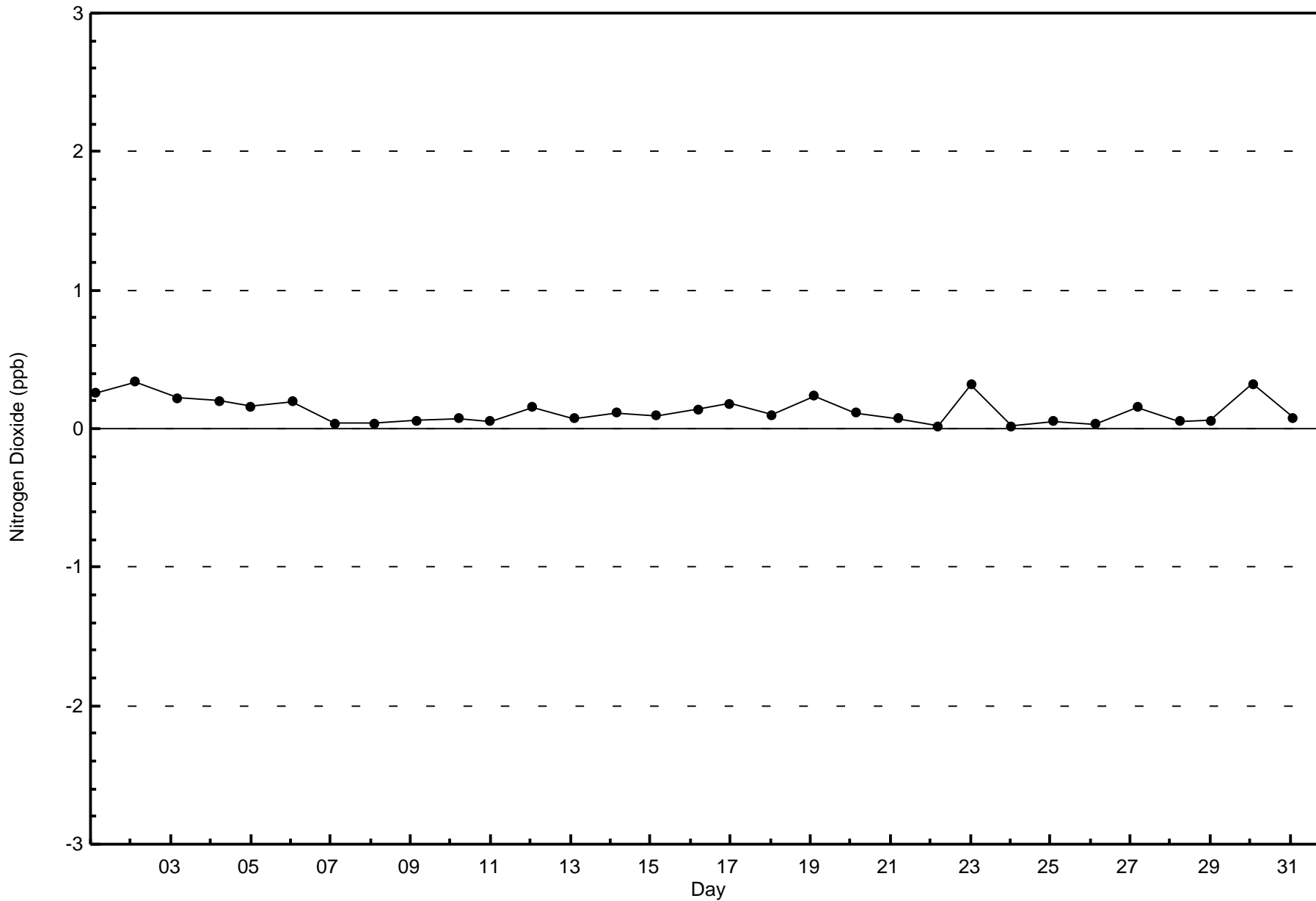
Nitrogen Dioxide (NO₂) - ppb
Fort Chipewyan (AMS 8)

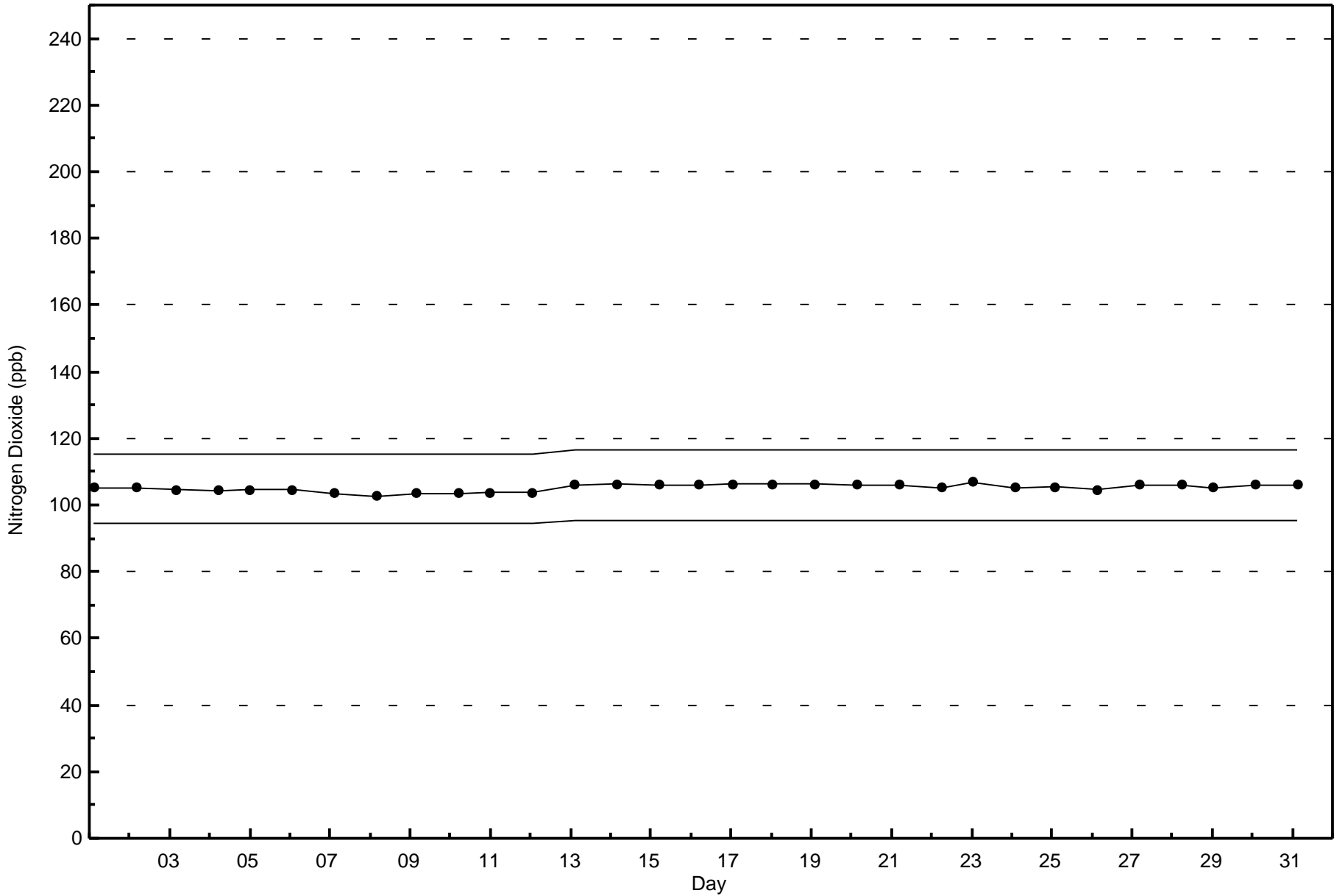




Wood Buffalo Environmental Association
Zero Responses

Nitrogen Dioxide (NO₂) - ppb
Fort Chipewyan - July 2016







Wood Buffalo Environmental Association
Summary of Hour Averages

Nitrogen Oxides (NO_x) - ppb
Fort Chipewyan - July 2016

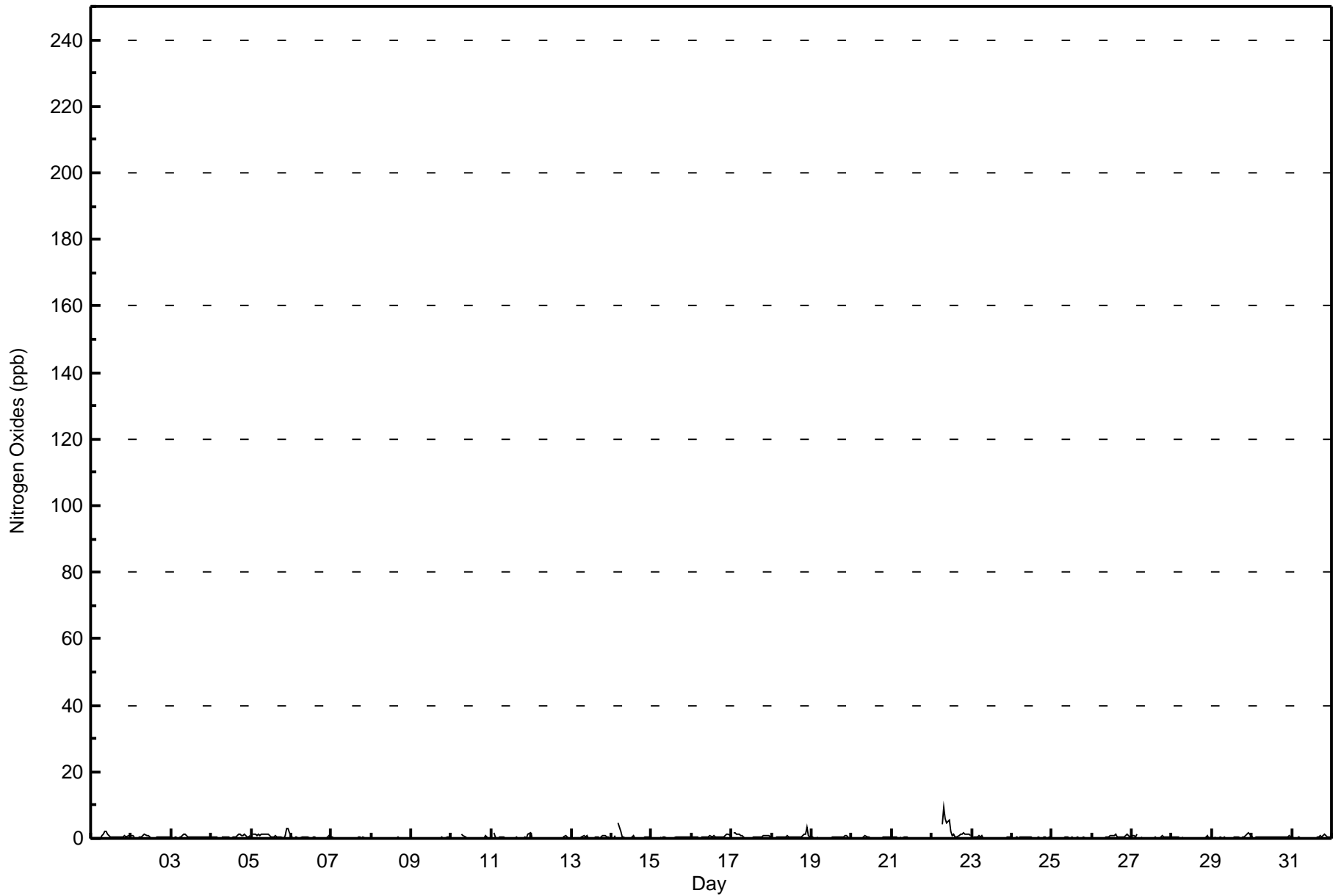
Maximum Value: 9 ppb on Jul 22 08:00		Maximum Daily Average: 2.0 ppb on Jul 22		Hours in Service: 744																							
Minimum Value: 0 ppb on Jul 10 15:00		Minimum Daily Average: 0.1 ppb on Jul 8		Hours of Data: 703																							
Maximum Diurnal Average: 0.7 ppb at hour 8		Minimum Diurnal Average: 0.3 ppb at hour 16		Hours of Missing Data: 41																							
Monthly Average: 0.4 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 3		Hours of Calibration: 38																							
				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-Jul	0	0	Z	0	0	0	1	1	2	2	1	0	0	0	1	1	0	0	0	0	1	0	1	1	0.7	2	
2-Jul	1	1	1	Z	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0.5	1	
3-Jul	0	0	0	0	Z	0	0	1	1	1	0	0	0	0	1	1	1	0	1	1	1	1	0	0	0.5	1	
4-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	0.5	1	
5-Jul	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	1	3	3	2	1.1	3	
6-Jul	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	0.3	1
7-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
8-Jul	0	0	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-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.1	1
10-Jul	0	0	0	0	0	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.2	1
11-Jul	Z	2	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0.3	2
12-Jul	0	Z	0	0	0	0	0	0	0	0	M	M	C	C	C	C	C	C	C	0	1	0	0	0	--	1	
13-Jul	0	0	Z	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0.3	1
14-Jul	0	0	1	Z	5	2	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.5	5
15-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.3	1
16-Jul	0	0	0	0	0	Z	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	0.5	1
17-Jul	Z	2	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0.6	2
18-Jul	0	Z	0	0	0	0	0	0	1	1	1	0	1	0	0	0	0	0	0	0	1	1	3	1	0	0.6	3
19-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0.3	1
20-Jul	0	0	0	Z	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
21-Jul	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	0.2	1
22-Jul	0	0	0	0	0	Z	4	9	6	5	6	2	1	1	0	0	1	1	1	1	1	1	1	1	1	2.0	9
23-Jul	Z	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
24-Jul	0	Z	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
25-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
26-Jul	0	0	0	Z	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	1	1	1	0	0.4	1
27-Jul	1	1	0	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0.3	1
28-Jul	0	0	0	0	1	Z	0	0	0	0	0	0	PF	0	0	0	0	0	0	0	0	0	1	0	0	0.2	1
29-Jul	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	1	0	0.4	2
30-Jul	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.4	1
31-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0.3	1
																								Diurnal Average			
																								Diurnal Maximum			

Z - zerospan C - Calibration M - Maintenance PF - Power Failure



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Fort Chipewyan - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Fort Chipewyan - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	703	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: 703

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Fort Chipewyan - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	65	18	35	55	146	43	21	41	23	16	27	31	56	43	34	49	703
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	65	18	35	55	146	43	21	41	23	16	27	31	56	43	34	49	703

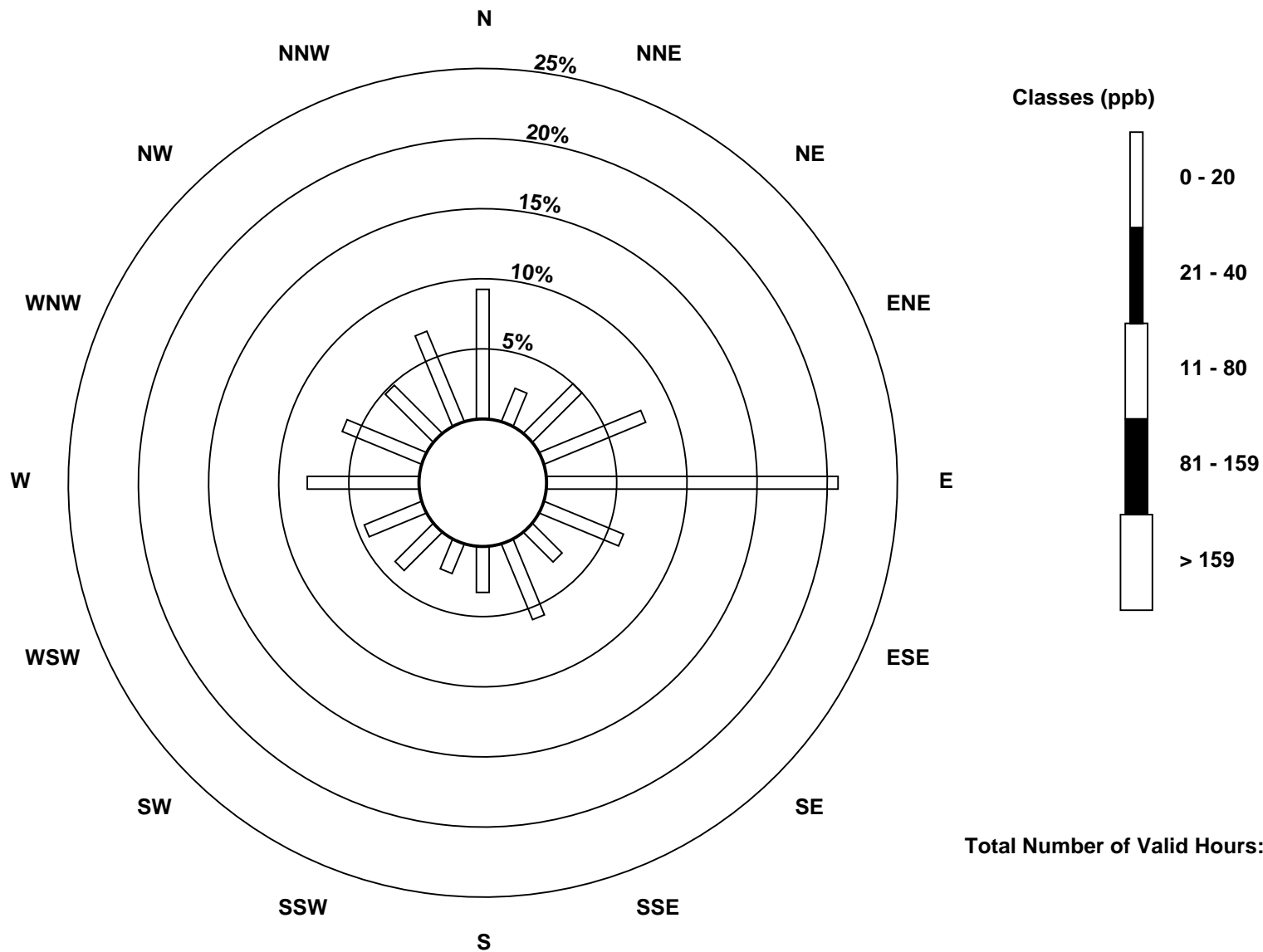
Total Number of Valid Hours: 703

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

Nitrogen Oxides (NO_x) - ppb
Fort Chipewyan (AMS 8)

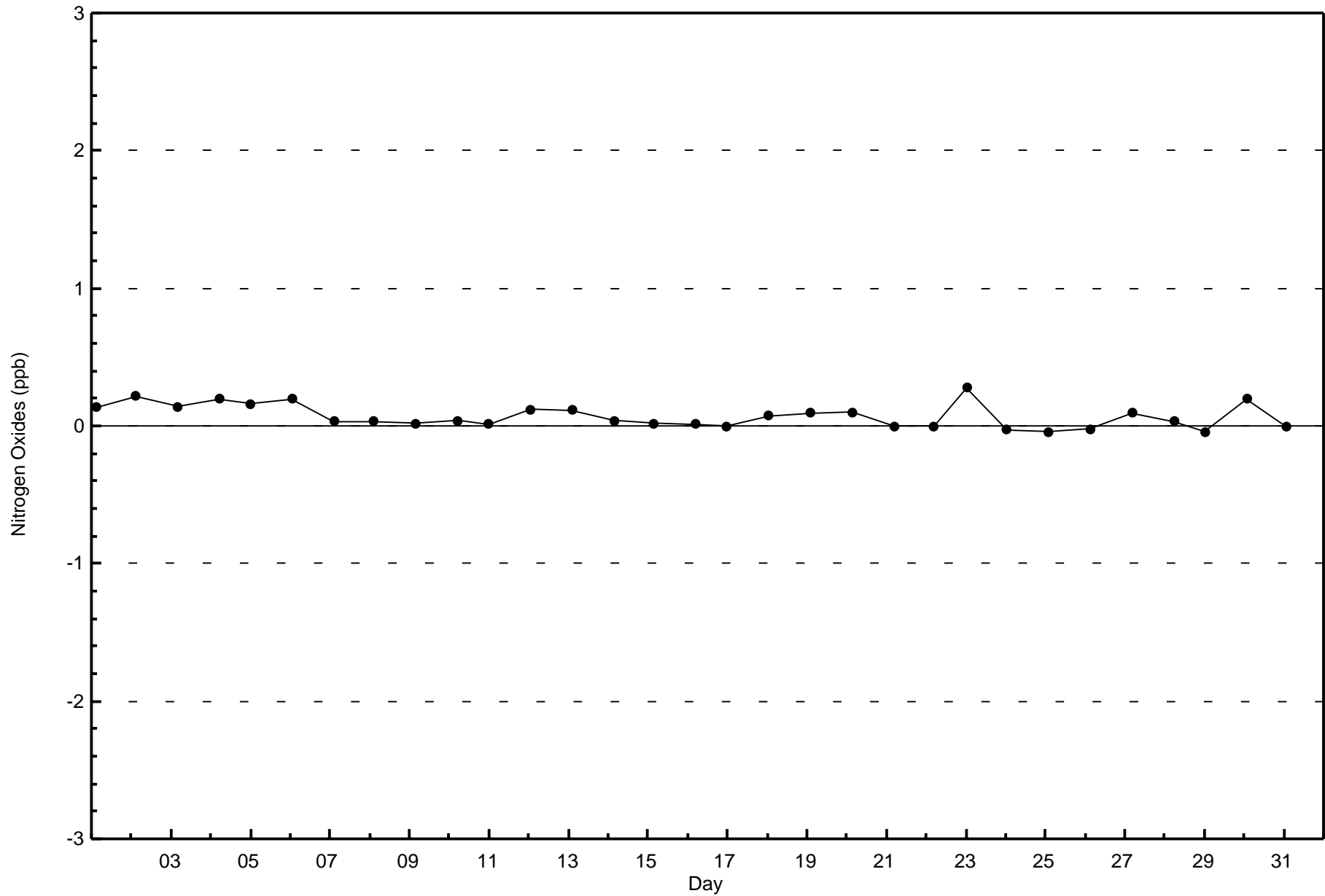


Total Number of Valid Hours: 703



Wood Buffalo Environmental Association
Zero Responses

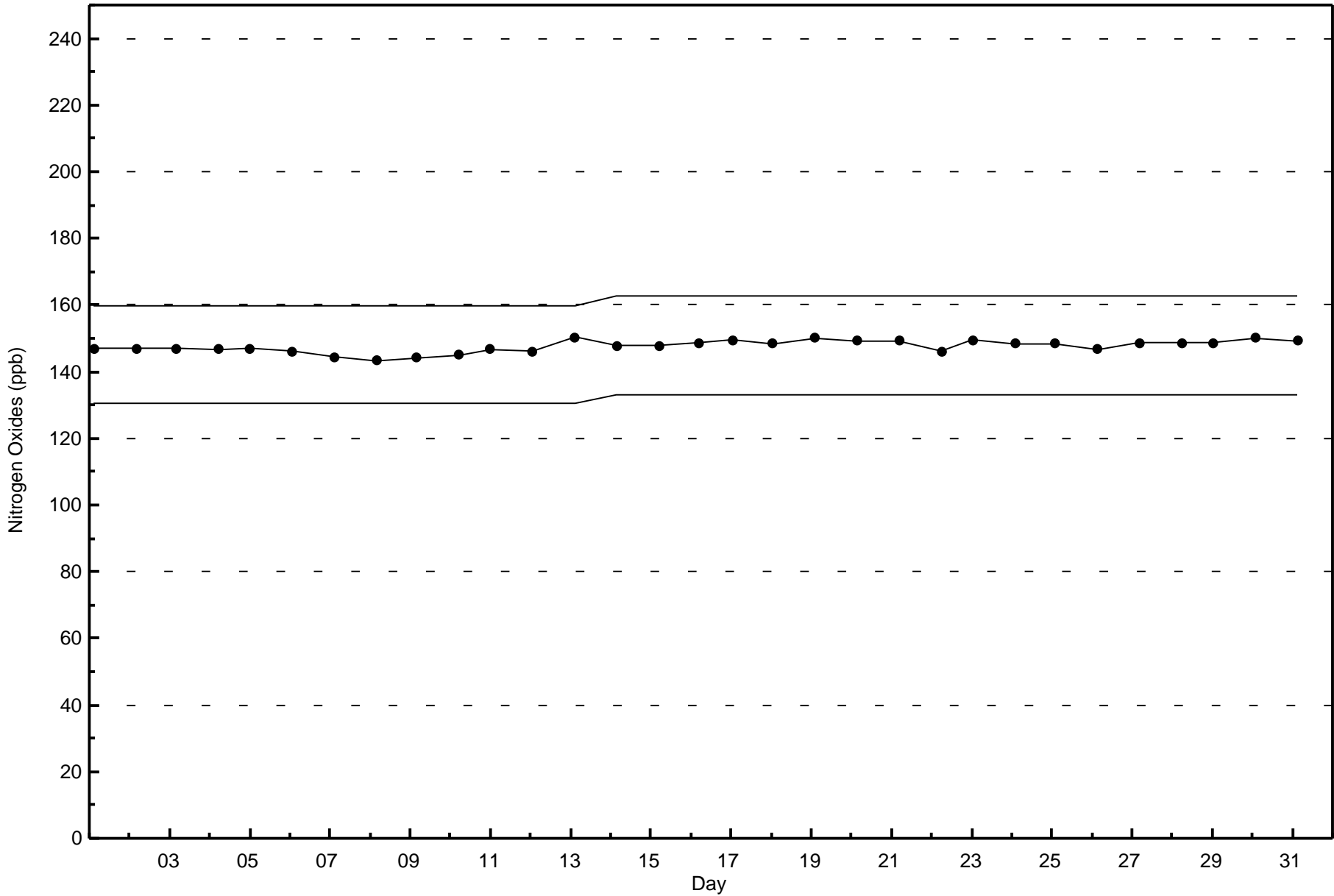
Nitrogen Oxides (NO_x) - ppb
Fort Chipewyan - July 2016





Wood Buffalo Environmental Association
Span Responses

Nitrogen Oxides (NO_x) - ppb
Fort Chipewyan - July 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O₃) - ppb

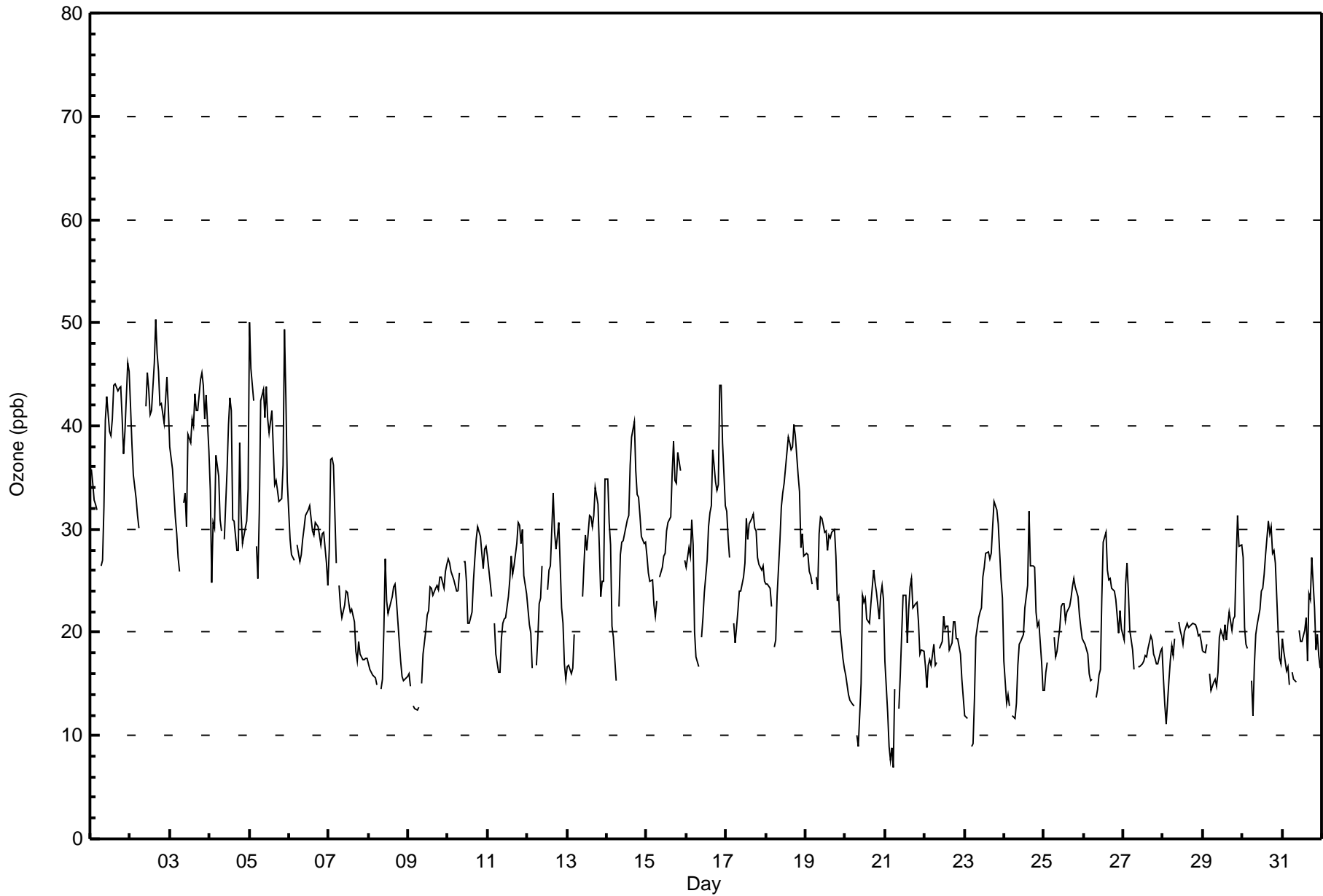
Fort Chipewyan - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																																							
Maximum Value: 50 ppb on Jul 2 16:00										Maximum Daily Average: 40.8 ppb on Jul 2										Hours of Data: 701																													
Minimum Value: 7 ppb on Jul 21 06:00										Minimum Daily Average: 17.7 ppb on Jul 21										Hours of Missing Data: 43																													
Maximum Diurnal Average: 29.3 ppb at hour 17										Minimum Diurnal Average: 18.7 ppb at hour 6										Hours of Calibration: 33																													
Monthly Average: 25.5 ppb										Percentiles: P ₁ = 10 P ₁₀ = 16 Q ₁ = 19 Median = 24 Q ₃ = 30 P ₉₀ = 38 P ₉₉ = 45										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-Jul	36	34	33	32	32	Z	26	27	32	41	43	39	39	41	44	44	43	44	44	41	37	39	46	45	38.4	46																							
2-Jul	42	38	35	33	31	30	Z	33	UO	42	45	43	41	41	46	50	47	45	42	42	40	42	45	42	40.8	50																							
3-Jul	38	36	33	31	30	27	26	Z	33	33	30	39	38	41	40	43	42	41	45	45	44	41	43	38	37.3	45																							
4-Jul	34	25	31	30	37	35	31	30	Z	29	36	40	43	41	31	31	28	28	38	31	29	30	31	34	32.7	43																							
5-Jul	50	46	42	Z	28	25	32	42	44	41	44	41	39	41	38	34	35	34	33	33	36	49	43	35	38.4	50																							
6-Jul	29	28	27	27	Z	28	27	28	29	30	31	32	32	31	30	29	31	30	29	28	30	30	27	24	29.0	32																							
7-Jul	28	37	37	36	27	Z	25	23	21	23	24	24	23	22	22	21	18	17	19	18	17	17	18	18	23.2	37																							
8-Jul	17	16	16	16	16	15	Z	15	15	20	27	23	22	23	24	24	25	23	19	17	16	15	15	16	18.9	27																							
9-Jul	16	15	UO	13	13	12	13	Z	15	18	20	22	22	24	24	24	24	25	24	25	25	24	26	27	20.5	27																							
10-Jul	27	27	26	25	24	24	24	26	Z	27	27	25	21	21	22	25	27	29	30	29	28	26	28	28	25.9	30																							
11-Jul	27	25	24	Z	21	18	16	16	19	21	21	21	24	25	27	26	26	29	31	30	29	30	26	24	24.2	31																							
12-Jul	22	21	20	17	Z	17	19	23	23	26	M	M	24	26	26	33	30	28	29	31	22	21	17	15	23.4	33																							
13-Jul	17	17	16	17	20	Z	25	C	C	23	27	29	28	31	31	30	31	34	32	28	24	25	25	35	25.9	35																							
14-Jul	35	31	28	21	20	15	Z	22	28	29	29	30	31	31	36	39	40	36	33	33	31	29	29	29	29.8	40																							
15-Jul	27	26	25	25	23	22	Z	Z	25	26	27	28	30	31	31	35	38	35	34	37	36	UO	UO	27	29.2	38																							
16-Jul	26	28	27	31	28	20	18	17	Z	20	21	24	27	30	32	32	38	35	34	34	44	44	38	32	29.6	44																							
17-Jul	32	29	27	Z	21	19	20	22	24	24	25	27	31	29	30	31	31	30	30	27	27	26	26	25	26.7	32																							
18-Jul	25	25	24	22	Z	19	19	24	29	32	34	34	36	39	38	38	38	40	39	35	34	28	30	27	30.8	40																							
19-Jul	28	28	26	25	25	Z	25	24	30	31	31	30	30	28	29	29	30	30	27	23	23	20	18	17	26.4	31																							
20-Jul	16	15	14	13	13	13	Z	10	9	15	24	23	23	21	21	23	24	26	25	24	21	24	24	23	19.3	26																							
21-Jul	17	12	9	8	9	7	14	Z	13	16	20	24	24	19	22	24	25	22	23	23	21	18	18	18	17.7	25																							
22-Jul	17	15	17	17	17	19	17	17	Z	18	19	22	20	21	21	18	19	21	21	19	19	18	15	14	18.3	22																							
23-Jul	12	12	12	Z	9	9	14	20	21	22	22	25	26	28	28	27	28	30	33	32	31	28	25	23	22.4	33																							
24-Jul	17	13	14	13	Z	12	12	13	17	19	19	20	22	23	25	32	26	26	26	22	21	21	17	14	19.3	32																							
25-Jul	14	16	17	UO	UO	Z	19	18	18	20	23	23	23	21	22	22	23	24	25	24	23	22	21	19	20.9	25																							
26-Jul	19	19	18	16	15	15	Z	14	15	16	16	23	29	30	26	25	25	24	24	23	22	20	22	20	20.7	30																							
27-Jul	19	25	27	24	20	18	16	Z	UO	17	17	17	17	18	18	18	20	19	18	18	17	17	18	18	18.9	27																							
28-Jul	16	13	11	15	17	19	18	19	Z	21	20	20	19	20	21	21	21	21	21	21	20	20	20	19	18.8	21																							
29-Jul	18	18	19	Z	16	14	15	15	15	16	20	20	19	21	19	21	22	20	21	22	27	31	28	28	20.3	31																							
30-Jul	27	20	19	18	Z	15	12	17	20	21	22	24	24	26	28	31	30	30	28	28	27	20	18	17	22.6	31																							
31-Jul	19	18	16	17	15	Z	16	15	15	UO	20	19	19	20	21	17	24	23	27	22	18	20	18	17	19.0	27																							
																								24.8	23.4	23.0	21.7	21.0	18.7	20.1	21.2	22.2	24.6	26.2	27.0	27.3	27.9	28.2	29.0	29.3	29.0	29.2	28.0	27.0	26.5	25.8	24.8	Diurnal Average	
																								50	46	42	36	37	35	32	42	44	42	45	43	43	41	46	50	47	45	45	45	44	49	46	45	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 (O₃) - ppb
Fort Chipewyan - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ozone (O₃) - ppb
Fort Chipewyan - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	217	30.96	30.96
21 - 50	484	69.04	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 701

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Ozone (O₃) - ppb
Fort Chipewyan - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	31	2	8	12	36	14	4	8	4	10	8	7	11	17	19	26	217
21 - 50	33	17	28	43	110	31	16	32	17	6	20	25	44	24	14	24	484
51 - 82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	64	19	36	55	146	45	20	40	21	16	28	32	55	41	33	50	701

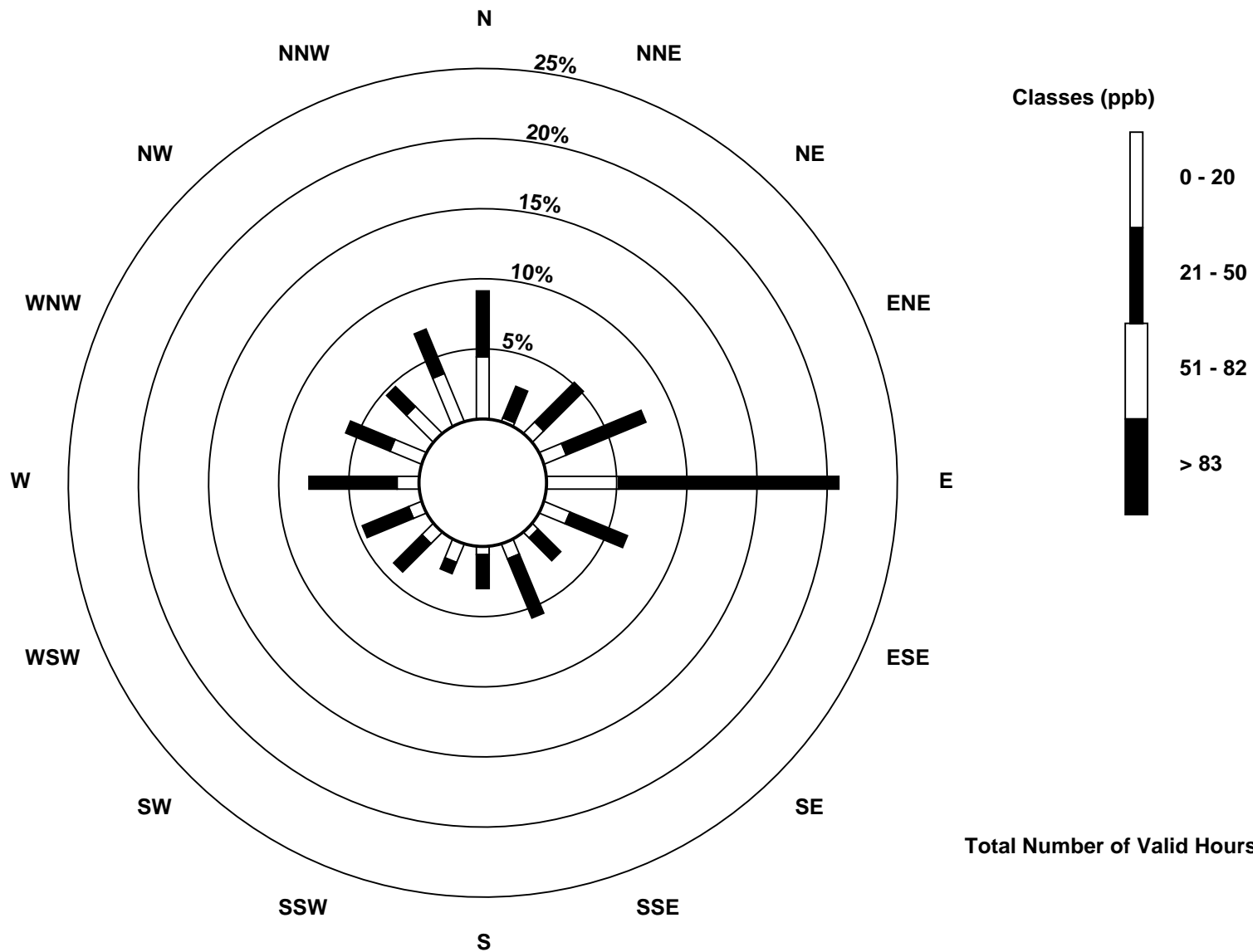
Total Number of Valid Hours: 701

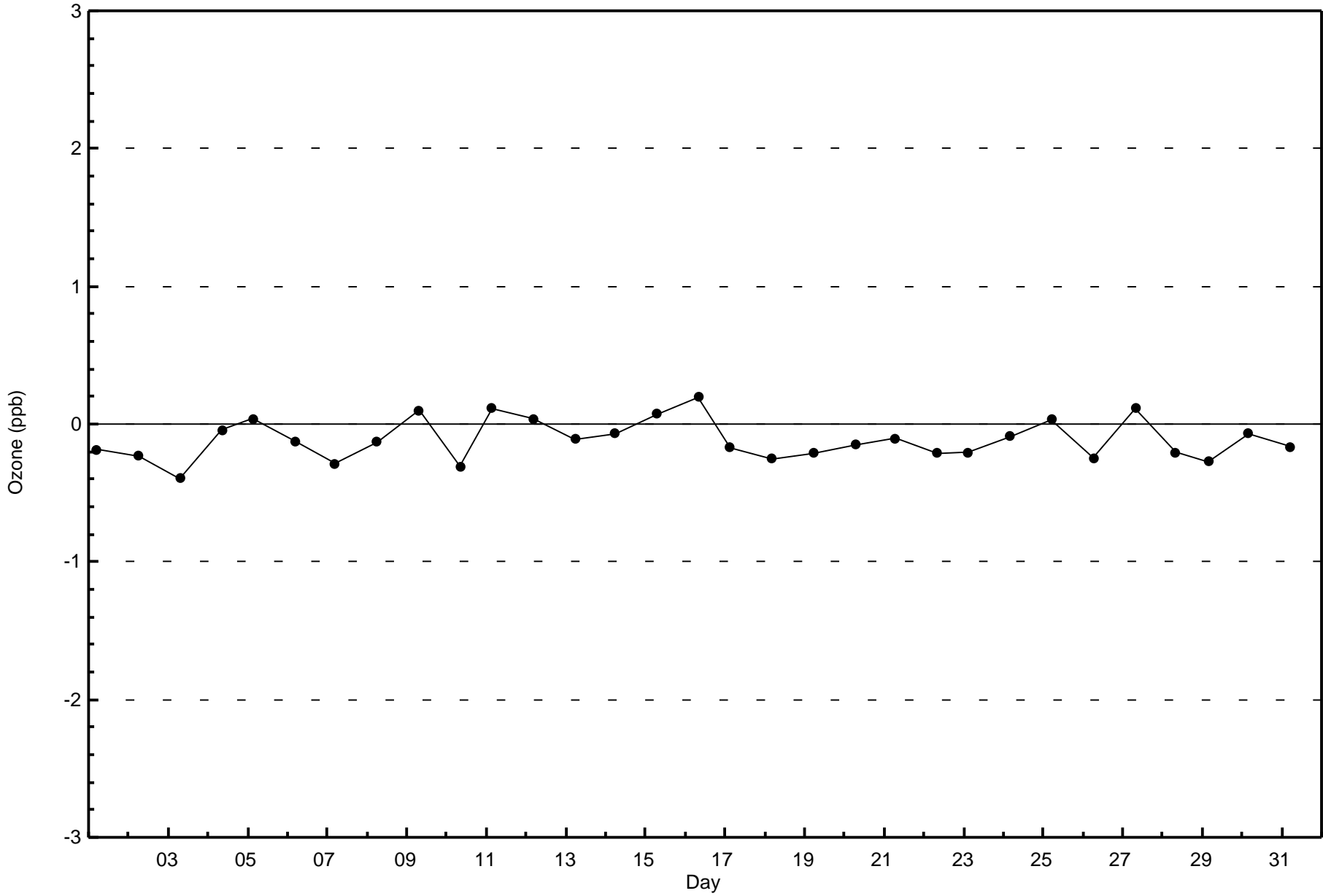
Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

Ozone (O₃) - ppb
Fort Chipewyan (AMS 8)

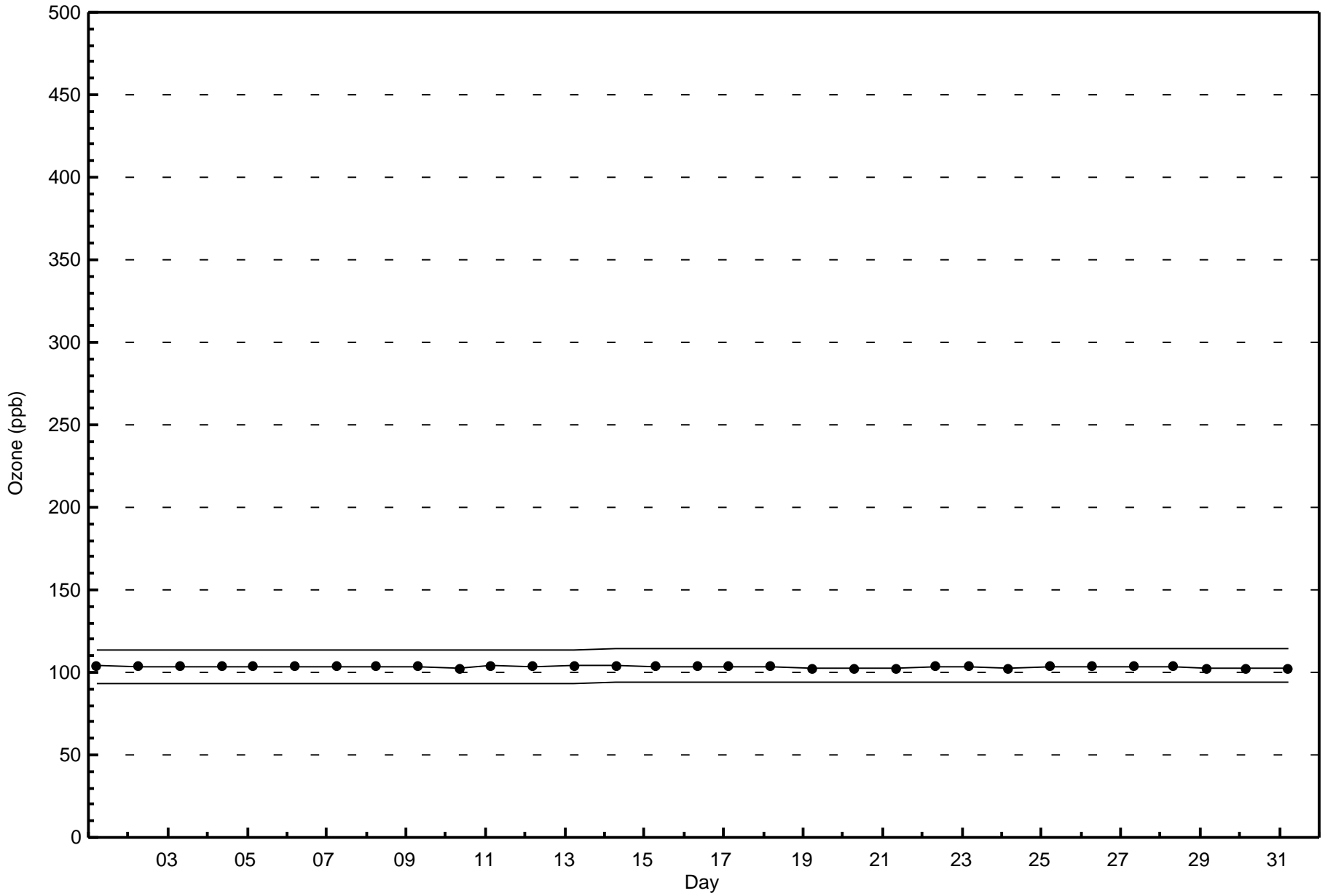






Wood Buffalo Environmental Association
Span Responses

Ozone (O₃) - ppb
Fort Chipewyan - July 2016





Summary of Hour Averages

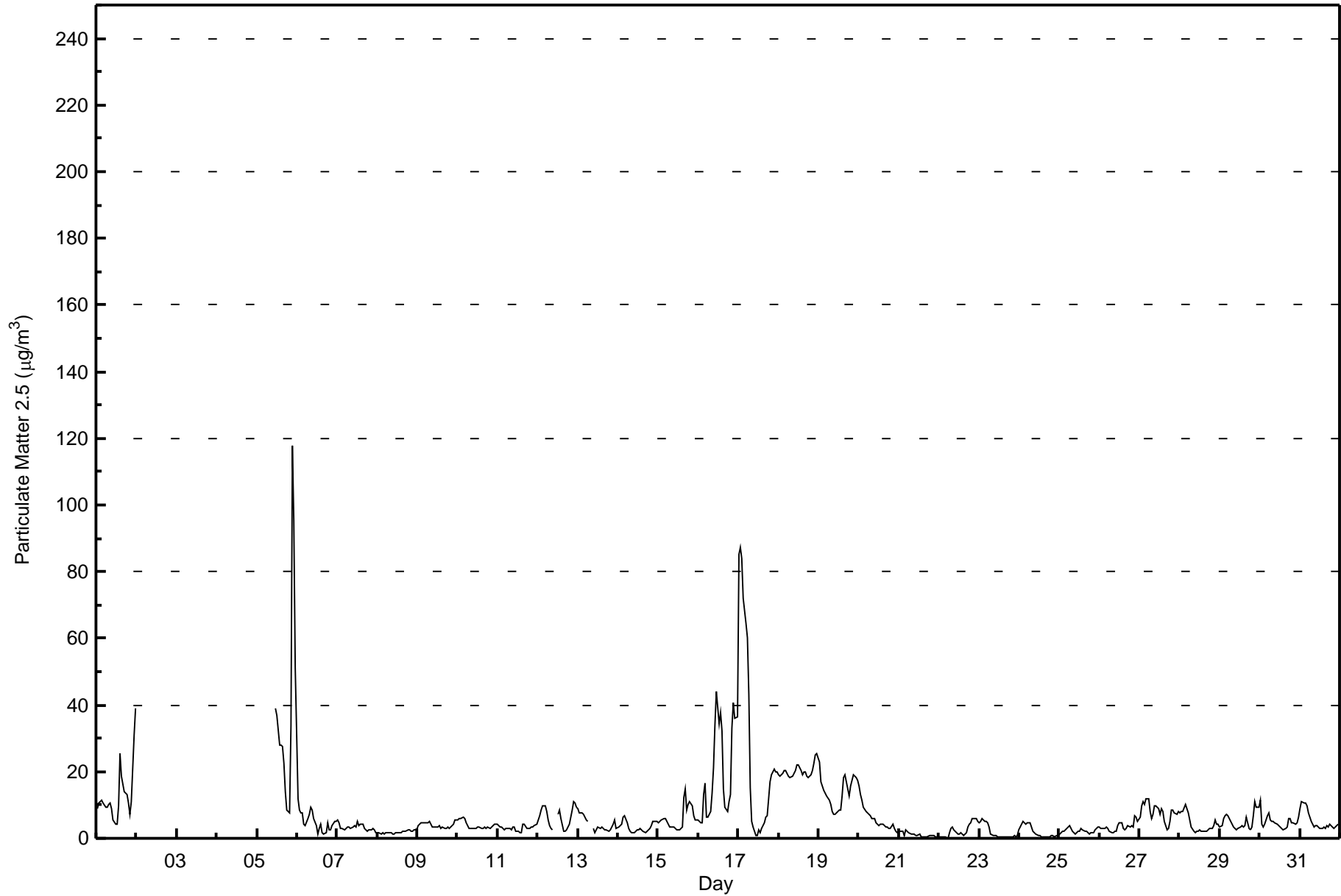
Fort Chipewyan - July 2016

Number of Exceedences (AAAQO):	24-hr: 0	Hours in Service:	744
Maximum Value: 117.9 µg/m ³ on Jul 5 22:00	Maximum Daily Average: 27.3 µg/m ³ on Jul 17	Hours of Data:	657
Minimum Value: 0.2 µg/m ³ on Jul 22 06:00	Minimum Daily Average: 1.1 µg/m ³ on Jul 21	Hours of Missing Data:	87
Maximum Diurnal Average: 11.8 µg/m ³ at hour 22	Minimum Diurnal Average: 4.9 µg/m ³ at hour 9	Hours of Calibration:	2
Monthly Average: 7.38 µg/m ³	Percentiles: P ₁ = 0.3 P ₁₀ = 1.5 Q ₁ = 2.5 Median = 4.0 Q ₃ = 7.7 P ₉₀ = 17.2 P ₉₉ = 64.1	Percent Operational Time:	88.6

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-Jul	8.9	10.4	10.9	11.5	10.4	9.1	9.1	10.0	10.5	8.8	5.4	4.1	4.1	9.6	25.5	18.6	14.0	13.5	13.3	10.4	7.1	11.0	31.1	38.8	12.8	38.8	
2-Jul	AF	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-Jul	AF	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-Jul	AF	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-Jul	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	M	M	39.1	37.0	28.0	27.8	27.5	22.6	13.8	8.5	7.8	33.7	117.9	95.4	51.3	--	117.9
6-Jul	11.7	8.5	7.5	7.4	4.2	4.0	6.1	7.0	9.3	8.7	6.0	3.7	1.4	3.2	4.3	1.8	1.3	1.7	4.7	2.4	2.6	3.7	5.0	4.9	5.0	11.7	
7-Jul	5.6	4.5	3.0	3.0	2.5	2.9	3.2	3.2	3.1	3.2	3.8	3.2	5.0	3.9	4.4	4.2	2.8	2.5	2.3	2.5	2.7	2.8	2.5	1.9	3.3	5.6	
8-Jul	1.8	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.4	1.4	1.5	1.8	1.7	1.9	1.9	2.1	2.2	2.6	2.7	2.3	2.0	2.5	2.6	1.8	2.7	
9-Jul	3.6	4.4	4.6	4.5	4.8	4.8	4.8	5.2	4.2	3.6	3.3	3.5	3.5	3.7	3.1	3.2	3.1	3.1	3.3	3.2	3.3	4.1	5.6	5.4	4.0	5.6	
10-Jul	5.4	5.7	6.1	6.3	5.8	4.5	3.6	3.0	3.0	3.0	2.9	3.0	3.6	3.5	2.9	2.8	3.2	3.1	3.2	2.9	3.2	3.8	4.1	4.4	3.9	6.3	
11-Jul	4.1	3.4	3.2	3.0	2.6	2.8	2.9	2.8	2.6	3.2	3.4	2.2	2.0	1.8	1.8	4.3	4.4	2.8	2.9	3.1	3.4	3.6	3.8	4.3	3.1	4.4	
12-Jul	5.4	6.7	8.3	9.8	9.9	7.9	5.5	3.9	3.1	2.4	M	M	7.3	8.3	5.7	2.3	2.3	2.7	3.2	4.4	8.4	11.0	10.8	9.4	6.3	11.0	
13-Jul	8.8	7.8	7.5	7.2	6.4	5.4	5.0	C	C	3.0	1.6	2.6	3.6	2.8	3.4	2.9	2.7	2.4	2.0	2.4	3.4	4.4	5.5	3.1	4.3	8.8	
14-Jul	3.4	3.9	4.3	6.3	6.7	4.6	3.0	2.2	1.5	1.6	1.9	2.4	2.5	3.0	2.6	2.1	1.7	2.0	2.4	3.2	4.0	4.9	5.2	5.2	3.4	6.7	
15-Jul	4.8	5.0	5.6	5.9	5.7	5.1	4.2	3.6	3.4	3.4	2.9	2.5	2.3	2.7	3.4	12.4	15.0	8.6	10.2	11.2	9.5	6.6	5.6	5.5	6.1	15.0	
16-Jul	5.3	4.7	4.7	13.2	16.6	6.1	6.3	7.9	13.5	21.3	33.9	44.0	34.3	37.6	32.4	14.8	9.2	7.9	10.8	13.2	33.1	40.7	36.0	36.6	20.2	44.0	
17-Jul	85.2	87.4	83.8	71.8	64.6	60.1	43.1	15.1	5.2	3.2	1.0	0.9	2.4	1.8	2.9	4.8	6.5	6.6	11.8	17.1	19.1	20.7	20.1	20.0	27.3	87.4	
18-Jul	19.1	18.5	19.5	20.3	20.5	19.5	18.8	18.1	18.6	19.3	20.3	22.0	21.9	20.3	19.1	19.9	19.7	18.8	18.3	19.1	20.3	22.2	25.1	25.6	20.2	25.6	
19-Jul	22.7	16.9	15.6	14.4	13.7	12.9	11.6	10.3	8.1	7.2	7.3	8.0	8.3	8.5	12.6	18.3	18.9	14.7	12.8	15.6	17.2	18.9	18.2	17.3	13.8	22.7	
20-Jul	15.6	13.2	11.5	9.2	8.0	7.6	7.1	6.6	6.0	6.0	4.8	4.2	3.6	4.1	4.1	3.8	3.3	3.3	2.8	3.1	4.3	3.0	2.1	1.9	5.8	15.6	
21-Jul	2.1	2.2	2.3	0.9	2.6	2.2	1.7	1.5	1.5	1.4	0.9	0.7	1.1	0.6	0.5	0.4	0.5	0.5	0.7	0.7	0.7	0.7	0.6	0.5	1.1	2.6	
22-Jul	0.4	0.4	0.3	0.3	0.2	0.2	1.8	3.1	3.6	2.7	1.6	1.2	1.3	1.6	1.1	0.7	1.8	3.4	4.3	4.8	5.8	6.1	6.0	4.9	2.4	6.1	
23-Jul	4.7	5.0	5.8	5.1	5.2	4.5	3.3	1.3	0.8	0.7	0.6	0.4	0.3	0.3	0.4	0.5	0.5	0.5	0.5	0.4	0.5	0.7	0.6	0.8	1.8	5.8	
24-Jul	2.5	4.4	5.2	4.7	4.2	4.7	4.8	3.4	2.2	1.6	1.3	1.0	0.7	0.6	0.5	0.5	0.3	0.3	0.5	0.6	0.7	0.6	0.7	0.7	1.9	5.2	
25-Jul	1.1	1.7	2.0	2.2	2.9	3.6	3.7	3.0	2.0	1.4	1.8	2.0	2.3	3.1	2.7	2.2	1.9	1.6	1.4	1.7	1.9	2.6	3.1	3.4	2.3	3.7	
26-Jul	3.2	3.1	2.9	3.0	3.3	3.0	2.1	1.8	1.8	2.1	2.1	4.0	4.8	4.6	3.1	2.6	3.1	3.7	3.2	3.8	3.5	6.7	6.1	5.1	3.4	6.7	
27-Jul	6.4	9.9	10.9	10.3	11.7	11.7	8.0	6.0	7.3	9.8	9.7	9.0	7.3	9.0	8.2	5.0	2.7	2.8	5.1	8.4	8.5	7.6	7.0	7.8	7.9	11.7	
28-Jul	7.7	7.9	7.9	10.1	8.9	7.8	5.3	3.3	2.2	1.9	1.9	2.1	2.4	2.3	2.3	2.2	2.3	2.4	2.8	2.8	3.8	5.5	4.3	4.1	4.4	10.1	
29-Jul	3.3	3.8	6.1	6.6	7.4	6.7	5.2	4.3	3.4	3.0	2.4	2.8	3.2	3.7	3.4	3.8	6.4	3.1	2.5	3.5	7.0	11.0	9.5	9.4	5.1	11.0	
30-Jul	11.4	4.1	3.4	4.4	6.8	7.5	5.5	5.3	5.1	4.5	4.2	3.9	3.3	2.8	2.7	2.8	3.2	5.8	5.9	4.6	4.7	4.3	4.7	6.5	4.9	11.4	
31-Jul	9.1	10.9	10.7	10.4	9.8	7.4	6.5	4.9	3.5	4.0	3.8	3.5	2.9	2.9	3.3	3.1	3.7	3.3	4.1	3.3	3.1	3.3	4.0	4.2	5.2	10.9	

9.8	9.5	9.4	9.4	9.1	8.1	6.8	5.3	4.9	4.9	5.0	6.6	6.2	6.3	6.7	6.0	5.7	4.9	5.2	5.7	7.8	11.8	11.6	10.2	Diurnal Average	
85.2	87.4	83.8	71.8	64.6	60.1	43.1	18.1	18.6	21.3	33.9	44.0	37.0	37.6	32.4	27.5	22.6	18.8	18.3	19.1	33.7	117.9	95.4	51.3	Diurnal Maximum	

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Fort Chipewyan - July 2016**

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	376	57.23	57.23
6 - 15	158	24.05	81.28
16 - 25	44	6.70	87.98
26 - 80	23	3.50	91.48
> 81.0	5	0.76	92.24

Total Number of Valid Hours: 657

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Fort Chipewyan - July 2016

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	27	12	26	39	99	22	8	14	10	8	7	11	30	23	25	15	376
6 - 15	27	5	5	12	21	11	7	5	2	1	4	4	18	11	3	22	158
16 - 25	5	1	2	0	2	0	0	0	2	3	16	10	0	2	0	1	44
26 - 80	5	0	1	2	3	1	0	2	0	0	0	1	0	2	3	3	23
> 81.0	3	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	5
Totals	67	18	34	53	127	34	15	21	14	12	27	26	48	38	31	41	606

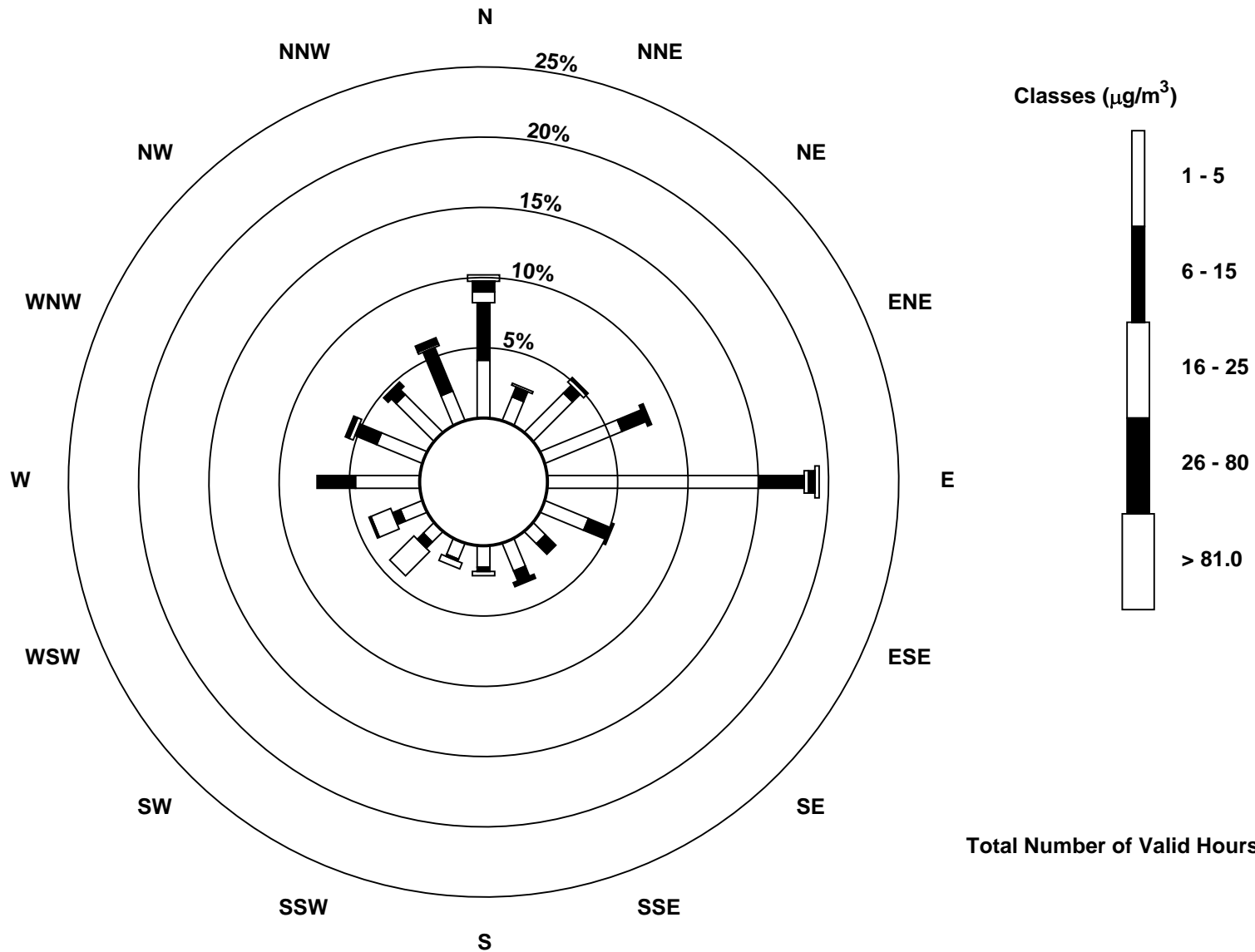
Total Number of Valid Hours: 657

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Fort Chipewyan (AMS 8)



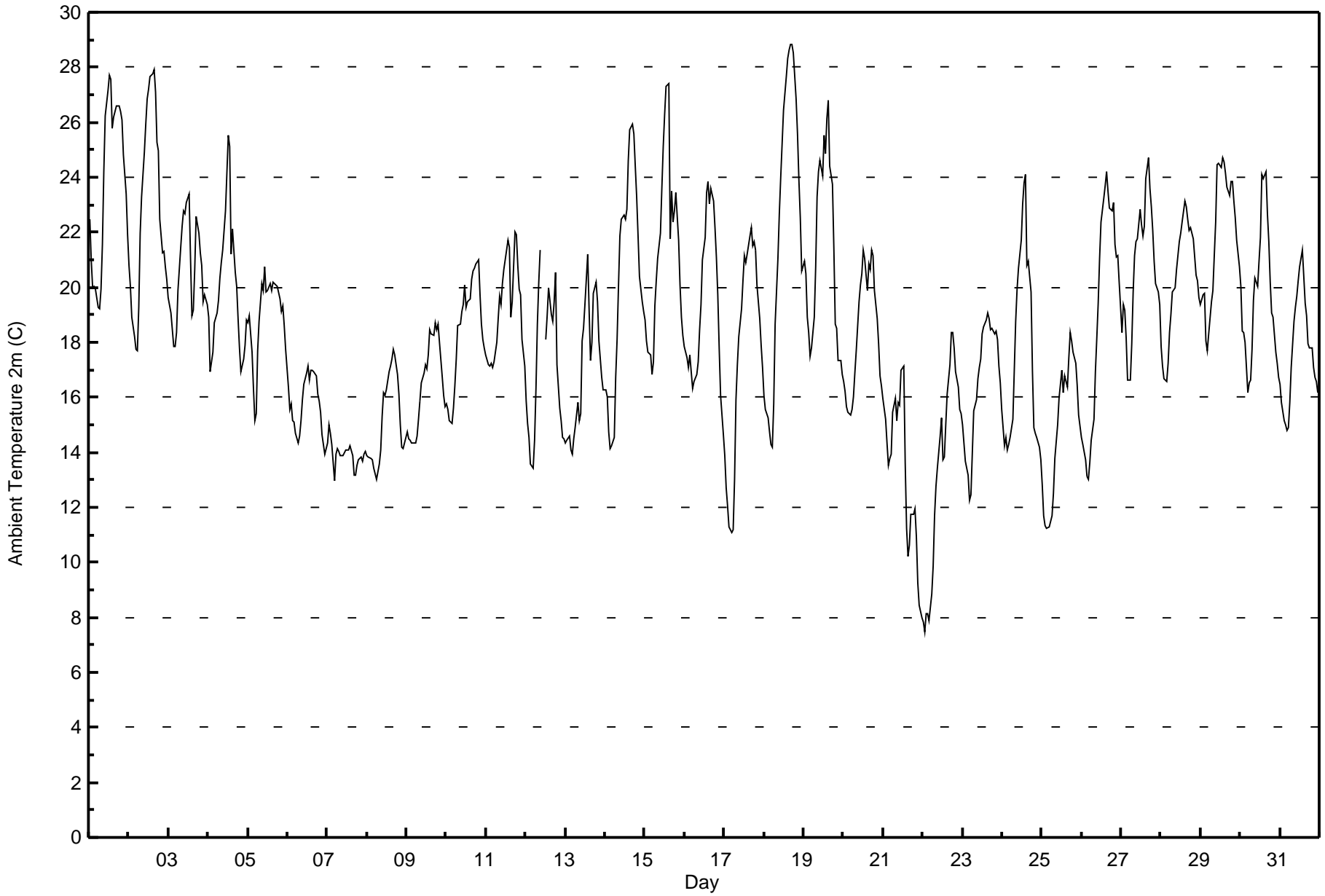


Maximum Value: 28.8 C on Jul 18 17:00 Minimum Value: 7.5 C on Jul 22 02:00 Maximum Diurnal Average: 21.3 C at hour 14 Monthly Average: 18.53 C		Maximum Daily Average: 23.8 C on Jul 1 Minimum Daily Average: 13.2 C on Jul 21 Minimum Diurnal Average: 15.0 C at hour 5 Percentiles: P ₁ = 8.8 P ₁₀ = 13.9 Q ₁ = 15.8 Median = 18.4 Q ₃ = 21.1 P ₉₀ = 23.7 P ₉₉ = 27.7		Hours in Service: 744 Hours of Data: 742 Hours of Missing Data: 2 Hours of Calibration: 0 Percent Operational Time: 99.7																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	22.5	21.0	20.0	20.0	19.9	19.2	19.2	19.9	21.5	24.2	26.2	27.1	27.7	27.6	25.8	26.2	26.6	26.6	26.6	26.4	26.1	24.8	23.4	21.9	23.8	27.7
2-Jul	20.8	20.0	18.9	18.2	17.8	17.7	19.3	21.9	23.3	24.9	25.9	26.9	27.2	27.7	27.8	27.9	27.1	25.3	25.0	22.5	21.3	21.3	20.7	20.3	22.9	27.9
3-Jul	19.6	19.0	18.5	17.8	17.8	18.4	19.9	21.5	22.2	22.8	22.7	23.1	23.4	21.0	18.9	19.2	20.6	22.6	21.9	21.3	20.8	19.5	19.7	19.4	20.5	23.4
4-Jul	18.9	16.9	17.3	17.7	18.7	19.1	19.5	20.4	20.9	21.4	22.8	24.1	25.5	25.1	21.2	22.1	20.5	20.0	18.9	17.8	16.9	17.4	17.9	18.8	20.0	25.5
5-Jul	18.7	18.9	17.6	16.3	15.2	15.4	17.7	18.7	20.2	19.9	20.8	19.8	19.9	20.1	19.9	20.2	20.1	20.1	20.0	19.6	19.1	19.3	18.6	17.8	18.9	20.8
6-Jul	16.4	15.5	15.7	15.1	15.1	14.7	14.4	14.6	15.2	15.9	16.5	16.9	17.1	16.6	17.0	17.0	16.9	16.8	16.1	15.9	15.5	14.6	13.9	14.1	15.7	17.1
7-Jul	14.3	15.0	14.7	14.3	12.9	13.9	14.2	14.0	13.9	13.9	14.0	14.1	14.1	14.1	14.2	13.9	13.2	13.1	13.5	13.7	13.8	13.7	13.9	14.0	13.9	15.0
8-Jul	13.9	13.8	13.8	13.8	13.4	13.2	13.0	13.6	14.1	15.3	16.1	16.0	16.3	16.9	17.2	17.4	17.7	17.5	16.8	16.1	15.0	14.2	14.1	14.5	15.2	17.7
9-Jul	14.7	14.5	14.4	14.3	14.3	14.4	14.6	15.2	15.9	16.5	16.9	17.2	17.0	17.5	18.4	18.3	18.2	18.7	18.5	18.6	18.0	16.7	16.1	15.7	16.4	18.7
10-Jul	15.8	15.6	15.2	15.0	15.6	16.4	17.4	18.6	18.7	19.1	19.4	20.1	19.3	19.5	19.6	20.3	20.6	20.7	20.9	21.0	19.7	18.6	18.1	17.8	18.4	21.0
11-Jul	17.6	17.2	17.1	17.3	17.1	17.3	18.0	18.9	19.7	19.4	20.1	20.6	21.3	21.7	21.4	18.9	19.5	22.0	21.9	20.8	19.9	19.7	18.1	17.1	19.3	22.0
12-Jul	15.9	15.1	14.5	13.6	13.4	14.5	16.3	18.7	20.2	21.3	M	M	18.1	19.0	20.0	19.0	18.8	19.5	20.5	17.2	15.6	15.2	14.5	14.5	17.1	21.3
13-Jul	14.3	14.4	14.6	14.1	13.9	14.5	14.9	15.8	15.2	15.4	18.0	18.5	19.4	21.2	19.2	17.3	18.0	19.8	20.2	19.5	18.1	17.4	16.7	16.3	16.9	21.2
14-Jul	16.3	16.0	14.8	14.1	14.2	14.5	16.7	18.1	20.0	21.9	22.5	22.6	22.5	22.8	24.6	25.7	25.9	25.6	24.4	23.3	21.9	20.4	19.4	19.1	20.3	25.9
15-Jul	18.8	18.1	17.6	17.6	16.8	17.3	19.3	20.3	21.1	21.9	23.6	25.1	26.3	27.3	27.4	21.8	23.5	22.4	22.8	23.4	21.7	20.1	18.9	18.3	21.3	27.4
16-Jul	17.9	17.4	17.1	17.5	16.9	16.3	16.6	16.9	17.3	18.4	19.4	21.0	21.8	23.5	23.9	23.1	23.6	23.1	22.2	21.1	19.7	17.8	16.1	14.7	19.3	23.9
17-Jul	13.9	12.7	12.1	11.3	11.1	11.2	13.0	15.9	17.2	18.2	19.2	20.3	21.2	20.9	21.2	21.9	22.2	21.5	21.7	21.4	20.1	18.9	17.9	17.1	17.6	22.2
18-Jul	16.1	15.6	15.3	14.7	14.3	14.2	15.8	18.7	21.1	22.7	24.0	25.2	26.4	27.7	28.3	28.6	28.8	28.8	28.5	26.9	25.6	23.9	22.5	20.6	22.3	28.8
19-Jul	20.9	20.5	18.9	18.4	17.5	17.8	18.9	20.7	23.3	24.2	24.6	24.1	25.5	24.8	26.1	26.8	24.4	23.7	21.4	18.7	18.5	17.4	17.3	16.8	21.3	26.8
20-Jul	16.6	16.2	15.6	15.5	15.3	15.5	16.0	16.9	17.7	19.5	20.1	20.5	21.4	21.1	19.9	20.8	20.6	21.4	21.1	19.9	18.9	17.9	16.8	16.4	18.4	21.4
21-Jul	16.0	15.2	14.3	13.5	13.8	13.9	15.5	16.0	15.1	15.8	15.7	17.0	17.1	13.6	11.2	10.2	10.6	11.8	11.8	11.9	10.9	9.2	8.4	8.0	13.2	17.1
22-Jul	7.8	7.5	8.1	8.1	7.9	8.9	9.9	11.7	12.8	13.4	14.6	15.2	13.7	13.8	15.0	16.1	17.2	18.4	18.4	17.8	17.0	16.4	15.6	15.4	13.4	18.4
23-Jul	15.0	14.3	13.7	13.2	12.3	12.4	14.0	15.5	15.9	16.7	17.1	17.4	18.3	18.6	18.8	19.1	18.9	18.4	18.5	18.3	18.4	18.1	17.1	16.5	16.5	19.1
24-Jul	15.6	14.3	14.5	14.1	14.3	14.6	15.2	17.0	18.7	19.9	20.7	21.7	23.0	23.8	24.1	20.8	21.0	19.8	17.0	14.9	14.7	14.6	14.2	13.8	17.6	24.1
25-Jul	12.8	11.7	11.4	11.2	11.3	11.5	11.7	12.5	13.8	15.0	16.0	16.5	17.0	16.2	16.8	16.4	17.5	18.4	18.0	17.6	17.2	16.4	15.3	15.0	14.9	18.4
26-Jul	14.6	14.3	13.7	13.1	13.0	13.6	14.4	15.2	16.9	18.2	19.4	21.1	22.4	23.2	23.7	24.2	23.5	22.9	22.8	23.1	21.6	21.1	21.2	20.2	19.1	24.2
27-Jul	18.4	19.4	19.2	18.2	16.6	16.6	17.9	19.8	21.2	21.7	21.8	22.9	22.3	21.9	22.2	24.0	24.7	23.6	22.9	22.1	21.0	20.1	19.8	19.4	20.7	24.7
28-Jul	17.8	17.2	16.7	16.6	17.2	18.4	19.0	19.8	20.0	20.6	21.1	21.7	22.0	22.4	23.1	22.9	22.5	22.1	22.2	21.8	21.1	20.4	20.2	19.6	20.3	23.1
29-Jul	19.3	19.7	19.8	18.0	17.7	18.3	19.5	19.9	21.2	22.4	24.5	24.5	24.4	24.7	24.6	24.2	23.6	23.4	23.9	23.9	23.2	22.5	21.7	20.8	21.9	24.7
30-Jul	20.0	18.4	18.4	18.0	16.2	16.5	16.6	17.7	19.5	20.4	20.1	20.9	21.8	24.1	23.9	24.2	22.7	21.7	20.2	19.1	18.9	17.7	17.3	16.7	19.6	24.2
31-Jul	16.5	15.8	15.1	15.0	14.8	14.9	15.8	17.1	18.7	19.3	19.7	20.3	20.8	21.4	20.4	19.4	19.0	18.0	17.8	17.8	17.1	16.7	16.6	16.2	17.7	21.4
																								Diurnal Average		
																								Diurnal Maximum		
M - Maintenance																										



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature 2m (AT 2m) - C
Fort Chipewyan - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature 2m (AT 2m) - C
Fort Chipewyan - July 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	10	1.35	1.35
10 - 20	479	64.56	65.90
> 20	253	34.10	100.00

Total Number of Valid Hours: 742

Total Number of Hours: 744



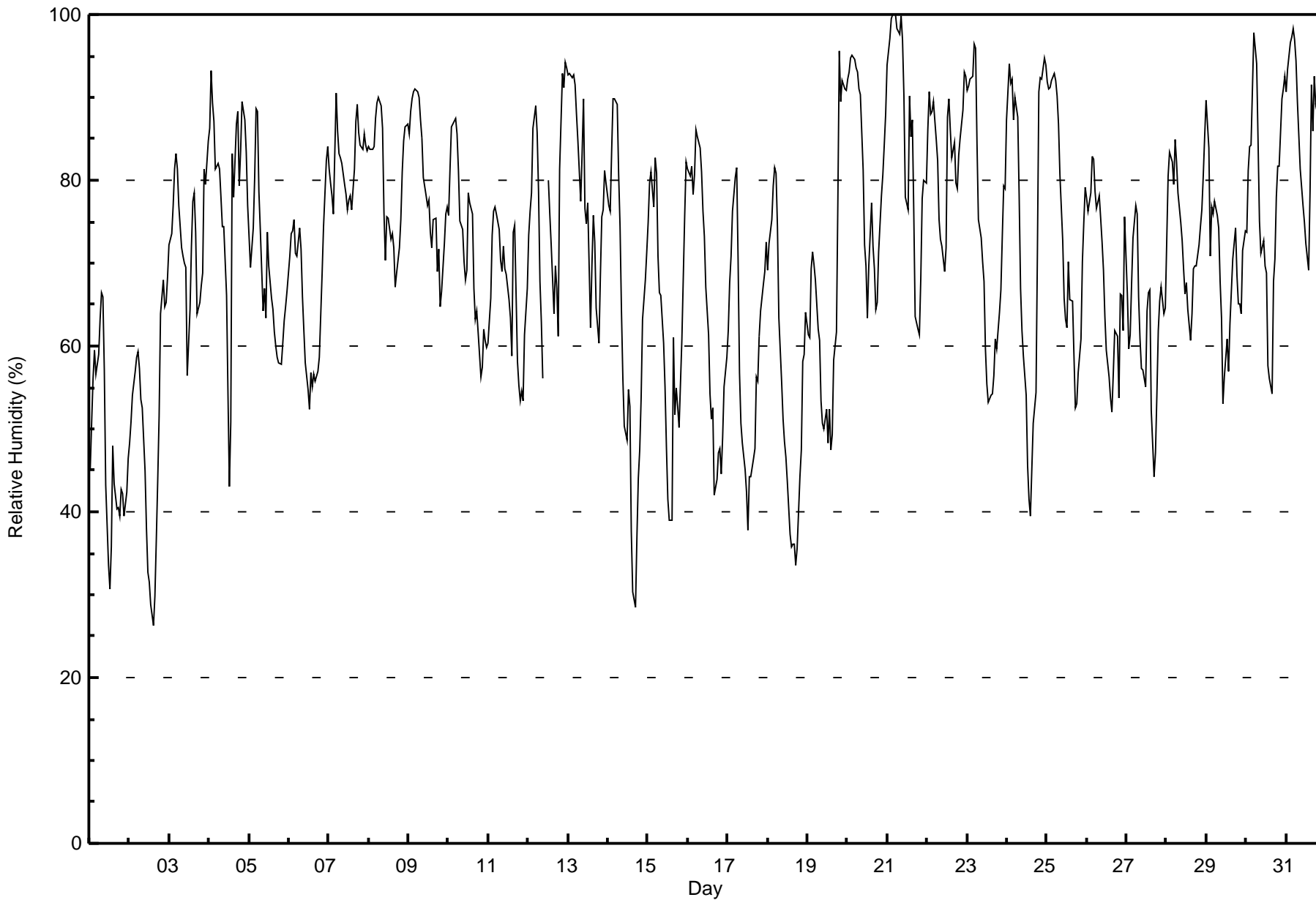
Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

Fort Chipewyan - July 2016

Maximum Value: 100 % on Jul 21 05:00		Maximum Daily Average: 88.4 % on Jul 31		Hours in Service: 744																							
Minimum Value: 26 % on Jul 2 15:00		Minimum Daily Average: 47.8 % on Jul 1		Hours of Data: 742																							
Maximum Diurnal Average: 84.1 % at hour 5		Minimum Diurnal Average: 60.6 % at hour 14		Hours of Missing Data: 2																							
Monthly Average: 71.0 %		Percentiles: P ₁ = 33 P ₁₀ = 51 Q ₁ = 61 Median = 72 Q ₃ = 82 P ₉₀ = 91 P ₉₉ = 98		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-Jul	45	51	56	59	57	59	63	66	66	57	43	34	31	36	48	43	40	40	39	43	42	40	42	46	47.8	66	
2-Jul	48	51	54	57	59	59	57	54	53	45	38	33	31	29	26	30	37	44	51	64	68	65	65	68	49.4	68	
3-Jul	72	74	77	81	83	81	77	72	71	70	70	56	64	72	78	78	74	64	65	67	69	81	79	85	73.4	85	
4-Jul	86	93	89	87	81	82	81	78	74	74	66	54	43	51	83	78	87	88	79	84	89	87	83	77	78.2	93	
5-Jul	73	69	74	80	89	88	79	74	64	67	63	74	70	66	64	62	60	59	58	58	60	63	65	67	68.6	89	
6-Jul	71	74	74	75	71	71	74	72	66	62	58	55	52	57	55	57	56	57	59	64	69	74	82	84	66.2	84	
7-Jul	81	80	78	76	90	86	83	83	82	80	78	76	78	78	76	81	87	89	86	84	84	86	84	83	82.1	90	
8-Jul	84	84	84	84	87	89	90	89	86	76	70	76	75	73	74	72	67	69	72	75	81	85	86	87	79.8	90	
9-Jul	86	88	90	91	91	91	90	87	85	80	78	77	78	74	72	75	75	69	72	65	67	72	76	77	79.4	91	
10-Jul	76	81	86	87	87	86	81	75	74	70	68	69	78	77	76	67	63	64	62	56	57	62	61	60	71.9	87	
11-Jul	60	66	73	76	77	76	74	70	69	72	69	69	66	63	59	74	75	58	55	53	55	53	61	67	66.3	77	
12-Jul	73	76	78	86	89	86	79	68	63	56	M	M	80	76	72	64	70	67	61	81	93	91	94	94	77.1	94	
13-Jul	93	93	92	93	92	88	85	77	83	90	77	75	77	62	70	76	73	65	60	68	76	76	81	80	79.2	93	
14-Jul	77	76	83	90	90	89	81	74	64	56	50	49	55	53	38	30	28	37	44	47	54	63	68	71	61.2	90	
15-Jul	75	80	81	77	83	81	71	66	66	60	55	48	42	39	39	61	52	55	53	50	61	68	76	82	63.3	83	
16-Jul	81	80	82	78	81	86	85	84	81	76	73	67	61	54	51	53	42	44	47	48	45	49	55	59	65.1	86	
17-Jul	62	68	71	76	80	81	70	57	51	48	45	42	38	44	44	46	48	56	56	61	64	67	69	73	59.1	81	
18-Jul	69	72	75	79	81	81	74	63	56	51	48	47	44	37	36	36	36	34	36	44	47	58	59	64	55.4	81	
19-Jul	61	61	69	71	70	68	62	61	53	51	50	52	48	52	48	49	58	62	78	96	90	92	91	91	66.0	96	
20-Jul	92	93	95	95	95	94	93	91	90	81	72	70	63	70	77	72	69	64	65	71	78	81	84	88	81.0	95	
21-Jul	94	97	100	100	100	100	98	98	100	97	90	78	76	90	85	87	76	64	62	61	68	78	80	80	85.8	100	
22-Jul	86	91	88	88	90	85	82	75	73	72	69	72	88	90	86	83	85	80	79	83	85	88	93	92	83.4	93	
23-Jul	91	91	92	93	96	96	84	75	73	70	68	60	55	53	54	54	56	61	60	64	67	73	79	79	72.7	96	
24-Jul	87	94	92	92	87	90	88	78	67	62	59	54	46	41	40	45	51	54	72	91	92	92	95	94	73.4	95	
25-Jul	92	91	91	92	93	92	90	87	81	73	66	63	62	70	66	65	59	52	53	57	61	70	75	79	74.2	93	
26-Jul	78	76	79	83	83	79	77	78	75	73	69	64	59	56	54	52	57	62	61	54	66	66	62	76	68.2	83	
27-Jul	66	60	61	67	73	77	76	66	61	57	57	55	64	66	67	52	44	47	54	62	65	67	64	65	62.3	77	
28-Jul	73	81	83	82	79	85	82	79	75	73	69	66	68	64	61	64	69	70	70	72	74	76	81	85	74.2	85	
29-Jul	90	84	71	77	76	77	76	74	68	63	53	56	61	57	63	67	71	74	68	65	65	64	71	74	69.3	90	
30-Jul	74	81	84	84	98	96	94	85	75	71	73	70	69	58	56	54	68	70	78	82	82	90	91	93	78.1	98	
31-Jul	91	93	97	97	98	97	94	90	81	79	77	75	72	69	79	92	86	93	89	91	94	95	96	97	88.4	98	
		77.0	79.0	80.7	82.5	84.1	83.7	80.4	75.7	71.8	68.2	64.1	61.1	61.1	60.6	61.1	61.9	61.9	61.7	62.7	66.5	69.9	73.4	75.8	77.9	Diurnal Average	
		94	97	100	100	100	100	98	98	100	97	90	78	88	90	86	92	87	93	89	96	94	95	96	97	Diurnal Maximum	
M - Maintenance																											





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Relative Humidity (RH) - %
Fort Chipewyan - July 2016**

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	26	3.50	3.50
40 - 60	148	19.95	23.45
60 - 80	342	46.09	69.54
80 - 100	224	30.19	99.73

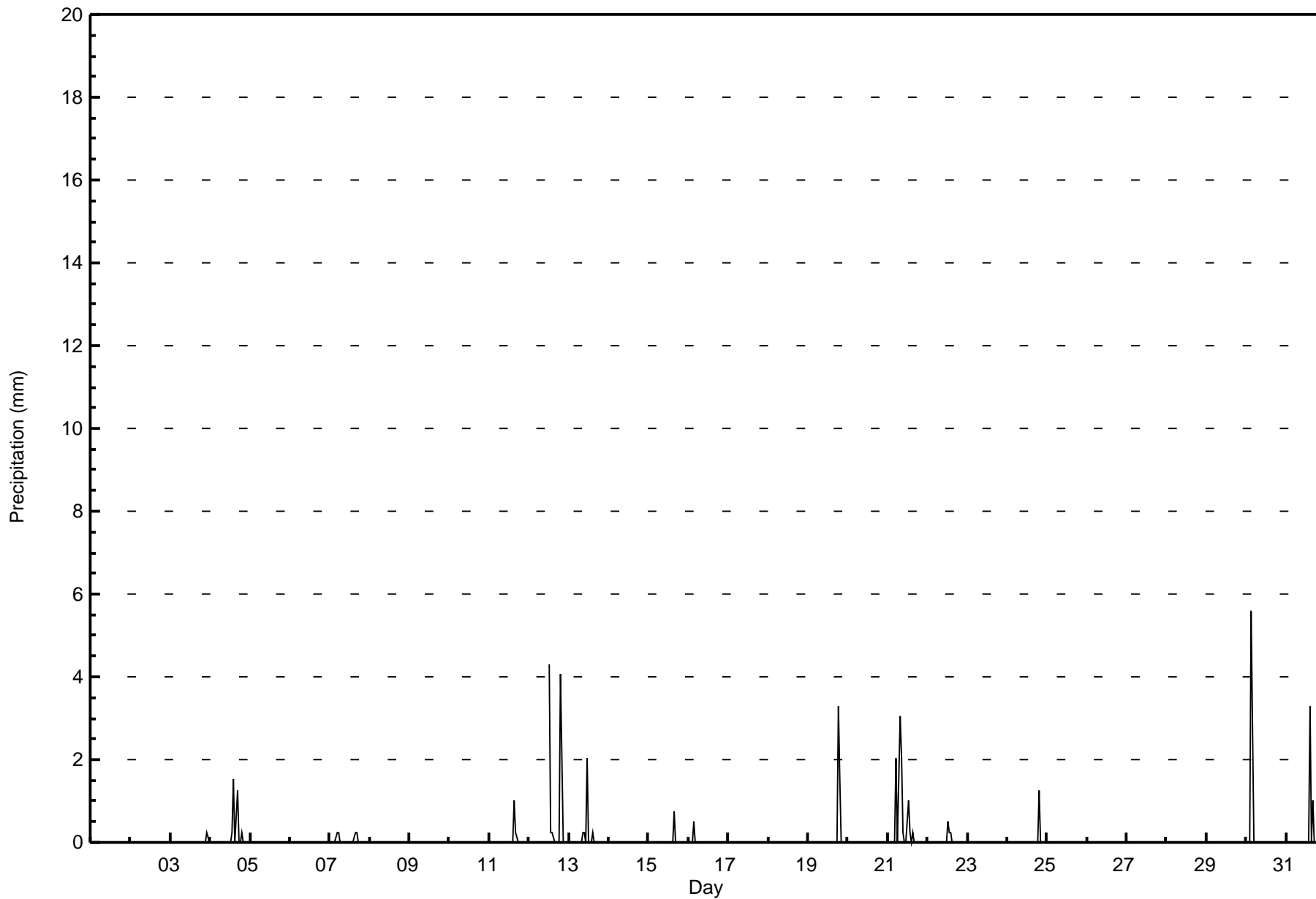
Total Number of Valid Hours: 742

Total Number of Hours: 744



Wood Buffalo Environmental Association
Hourly Averages

Precipitation (PC) - mm
Fort Chipewyan - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Precipitation (PC) - mm
Fort Chipewyan - July 2016**

Concentration Ranges (mm)	Number of Hours	%	Cumulative %
0 - 0.3	723	97.44	97.44
0.4 - 0.5	2	0.27	97.71
0.6 - 0.7	0	0.00	97.71
0.8 - 1.4	6	0.81	98.52
1.5 - 10	11	1.48	100.00
> 10	0	0.00	100.00

Total Number of Valid Hours: 742

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

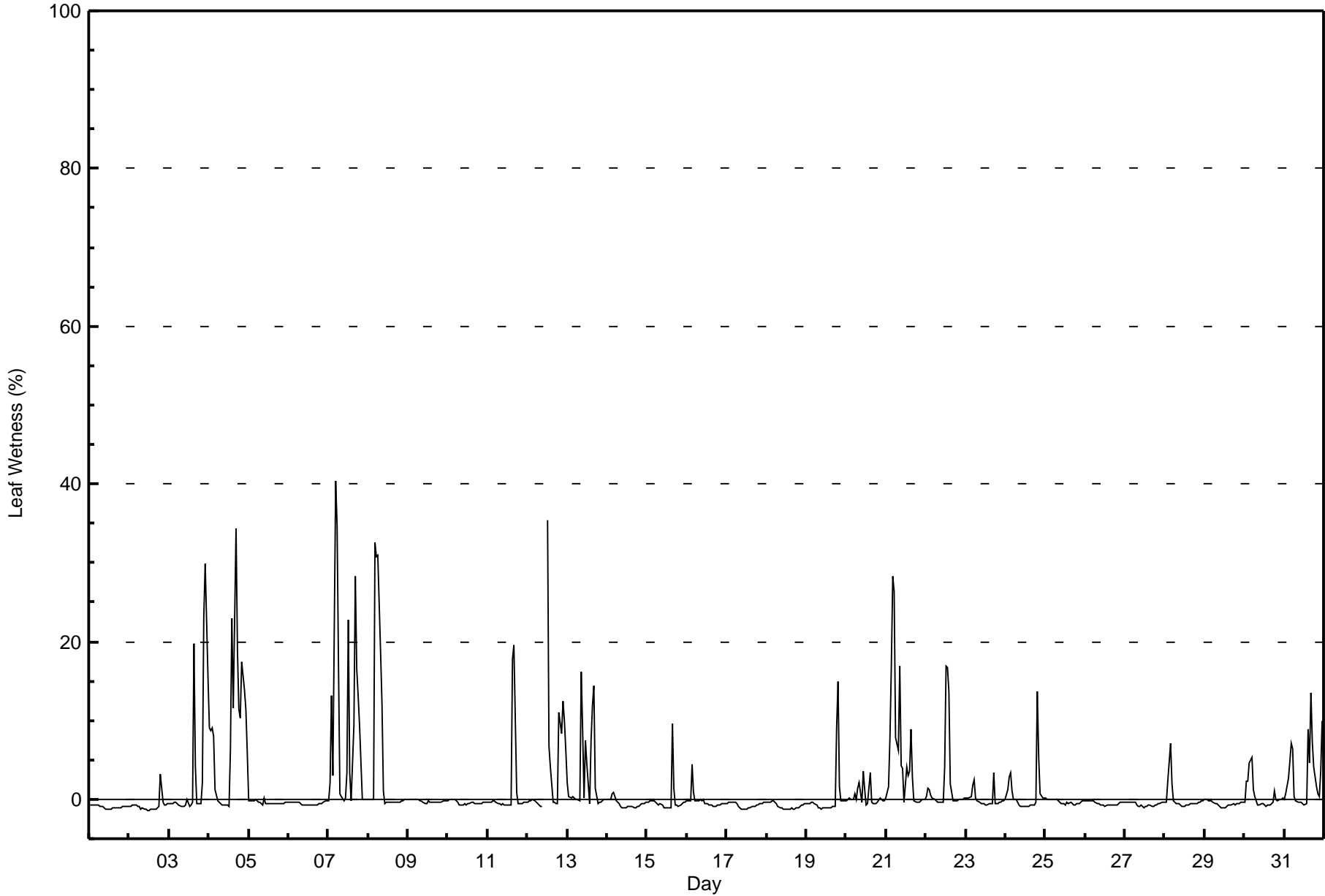
Leaf Wetness (SW) - %
Fort Chipewyan - July 2016

Maximum Value: 40 % on Jul 7 05:00																	Maximum Daily Average: 9.0 % on Jul 7																	Hours in Service: 744			
Minimum Value: -1 % on Jul 2 12:00																	Minimum Daily Average: -1.0 % on Jul 1																	Hours of Data: 742			
Maximum Diurnal Average: 3.8 % at hour 5																	Minimum Diurnal Average: -0.4 % at hour 11																	Hours of Missing Data: 2			
Monthly Average: 1.3 %																	Percentiles: P ₁ = -1 P ₁₀ = -1 Q ₁ = -1 Median = 0 Q ₃ = 0 P ₉₀ = 4 P ₉₉ = 31																	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-Jul	-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											
2-Jul	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	3	0	-1	-1	-1	-0.8	3											
3-Jul	-1	-1	-1	0	0	-1	-1	-1	-1	-1	-1	0	-1	-1	0	20	4	-1	-1	-1	2	23	30	15	3.5	30											
4-Jul	9	9	9	8	1	0	0	-1	-1	-1	-1	-1	-1	6	23	12	34	19	11	10	17	14	11	6	8.2	34											
5-Jul	0	0	0	0	0	0	0	0	-1	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	0	-0.4	0											
6-Jul	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	0	-0.5	0											
7-Jul	0	2	13	3	40	35	17	1	0	0	0	3	23	3	0	9	28	17	13	9	0	0	0	0	9.0	40											
8-Jul	0	0	0	0	32	31	31	19	12	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5.1	32											
9-Jul	0	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-Jul	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	0	0	-1	-1	0	-1	0	0	0	0	-0.4	0											
11-Jul	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	18	20	1	-1	-1	-1	-1	-1	0	0	1.1	20											
12-Jul	0	0	0	0	0	0	0	-1	-1	-1	M	M	35	7	4	0	0	0	-1	11	8	13	10	6	4.0	35											
13-Jul	2	0	0	0	0	0	0	0	16	9	0	8	4	-1	7	12	14	1	0	0	0	0	0	0	3.0	16											
14-Jul	0	0	0	1	1	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	-0.6	1											
15-Jul	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	10	1	-1	-1	-1	-1	-1	-1	0	0	-0.1	10											
16-Jul	0	0	0	4	1	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-0.2	4											
17-Jul	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	-0.8	0											
18-Jul	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-0.9	0											
19-Jul	-1	-1	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	9	15	2	0	0	0	0.4	15											
20-Jul	0	0	0	0	0	1	0	1	2	0	4	1	-1	-1	3	0	-1	-1	-1	0	0	0	0	0	0.3	4											
21-Jul	0	2	8	17	28	26	8	6	17	4	4	0	4	3	4	9	3	0	0	0	0	0	0	0	5.9	28											
22-Jul	0	1	1	1	0	0	0	0	0	0	0	4	17	17	14	2	0	0	0	0	0	0	0	0	2.3	17											
23-Jul	0	0	0	0	2	2	0	0	0	-1	-1	-1	-1	-1	-1	0	3	-1	0	0	0	0	0	0	0.0	3											
24-Jul	0	1	3	3	1	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	14	5	1	0	0	0.8	14											
25-Jul	0	0	0	0	0	0	0	0	0	0	-1	-1	-1	-1	0	-1	-1	-1	-1	-1	-1	0	0	0	-0.3	0											
26-Jul	0	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	-0.5	0											
27-Jul	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	-0.6	0											
28-Jul	0	0	2	7	2	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	0.0	7											
29-Jul	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	-0.6	0											
30-Jul	0	2	2	5	5	1	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	1	0	0	0	0	0	0.4	5											
31-Jul	0	1	3	5	7	6	0	0	0	0	0	-1	-1	-1	9	5	14	7	4	2	1	0	4	10	3.0	14											
																								Diurnal Average													
																								Diurnal Maximum													
0.1 0.4 1.2 1.6 3.8 3.1 1.5 0.4 1.0 -0.2 -0.4 -0.2 2.0 0.5 1.5 2.6 3.3 1.0 0.7 1.6 0.8 1.3 1.5 1.0																																					
9 9 13 17 40 35 31 19 17 9 4 8 35 17 23 20 34 19 13 15 17 23 30 15																																					
M - Maintenance																																					



Wood Buffalo Environmental Association
Hourly Averages

Leaf Wetness (SW) - %
Fort Chipewyan - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Leaf Wetness (SW) - %
Fort Chipewyan - July 2016

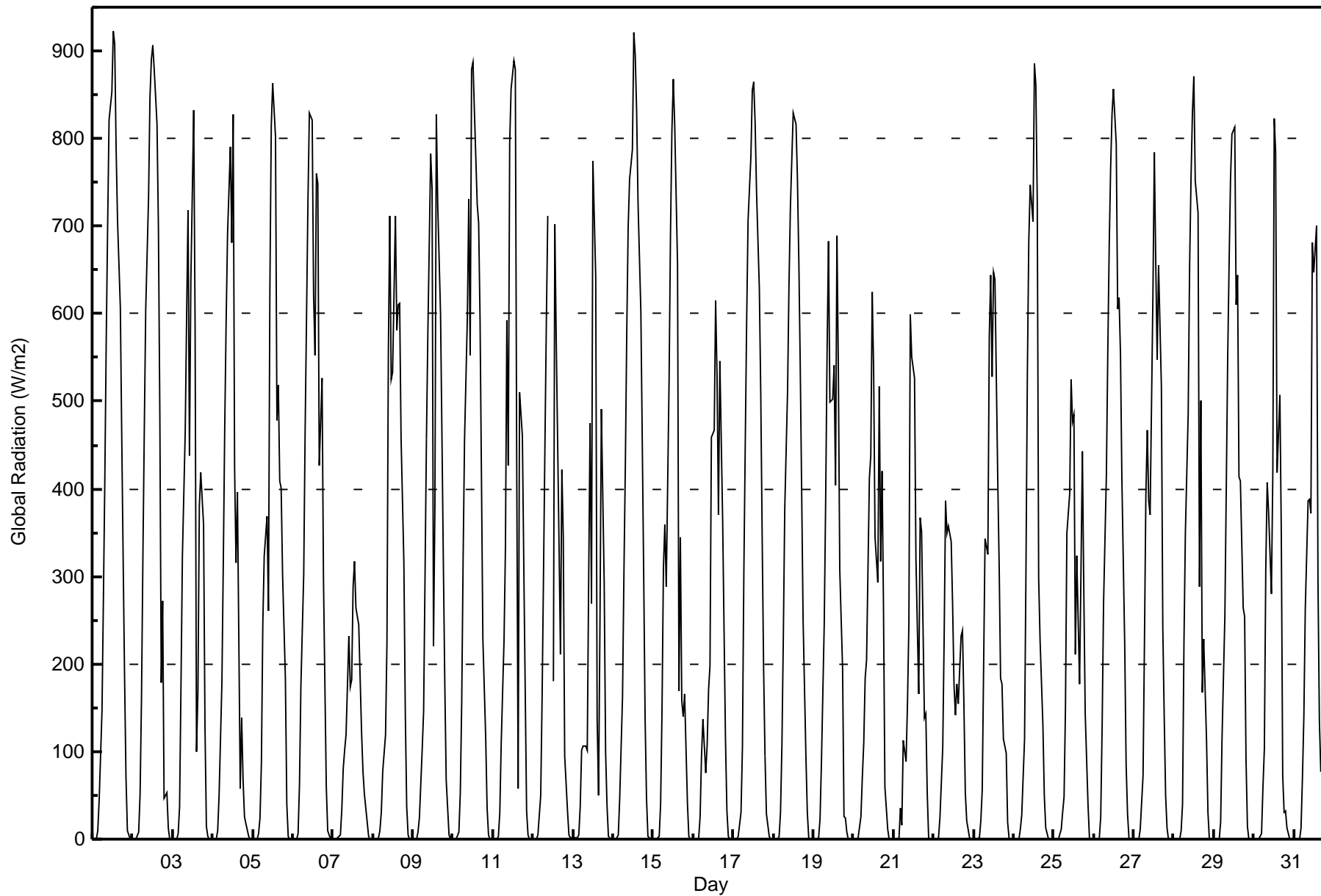
Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 0.3	48	26.09	26.09
0.4 - 0.5	2	1.09	27.17
0.6 - 0.7	5	2.72	29.89
0.8 - 1.4	14	7.61	37.50
1.5 - 10	68	36.96	74.46
> 10	45	24.46	98.91

Total Number of Valid Hours: 184

Total Number of Hours: 744



Maximum Value: 923 W/m2 on Jul 1 13:00		Maximum Daily Average: 367.2 W/m2 on Jul 1		Hours in Service: 744																							
Minimum Value: 0 W/m2 on Jul 1 01:00		Minimum Daily Average: 104.1 W/m2 on Jul 7		Hours of Data: 742																							
Maximum Diurnal Average: 686.7 W/m2 at hour 13		Minimum Diurnal Average: 0.1 W/m2 at hour 1		Hours of Missing Data: 2																							
Monthly Average: 259.3 W/m2		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 3 Median = 154 Q ₃ = 466 P ₉₀ = 716 P ₉₉ = 888		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-Jul	0	0	0	9	46	146	276	410	570	701	821	853	923	909	790	708	608	459	319	185	71	10	0	0	367.2	923	
2-Jul	0	0	0	8	51	160	324	470	605	733	846	891	906	878	816	697	485	179	273	47	53	12	0	0	351.4	906	
3-Jul	0	0	0	6	38	178	323	466	598	718	838	639	832	582	100	169	380	418	359	129	15	3	0	0	266.3	832	
4-Jul	0	0	0	10	49	179	317	469	591	691	791	680	827	423	315	395	58	138	67	26	18	3	0	0	252.1	827	
5-Jul	0	0	0	6	25	86	246	324	369	260	626	815	864	802	479	518	409	401	303	184	40	3	0	0	281.6	864	
6-Jul	0	0	0	7	62	175	303	467	597	730	829	821	621	552	759	749	426	526	298	177	60	10	0	0	340.3	829	
7-Jul	0	0	0	2	5	34	80	102	119	232	173	181	288	316	263	244	184	122	78	52	19	3	0	0	104.1	316	
8-Jul	0	0	0	1	10	31	77	118	224	555	711	525	532	712	582	609	611	459	315	145	37	4	0	0	260.9	712	
9-Jul	0	0	0	8	24	103	146	301	457	578	783	742	221	380	828	724	599	458	315	179	68	5	0	0	288.3	828	
10-Jul	0	0	0	7	53	156	321	456	595	730	552	879	888	830	724	703	595	413	229	116	36	4	0	0	345.3	888	
11-Jul	0	0	0	4	31	109	226	333	593	427	793	856	889	878	425	58	510	461	313	172	33	6	0	0	296.6	889	
12-Jul	0	0	0	5	50	163	305	450	590	712	M	M	180	702	570	336	210	421	344	95	32	6	2	2	235.2	712	
13-Jul	2	2	2	5	37	102	107	106	101	297	475	269	774	642	138	50	246	491	293	100	38	4	1	1	178.4	774	
14-Jul	1	1	1	5	47	163	305	427	580	699	754	787	921	896	830	726	603	454	302	139	47	3	0	0	362.2	921	
15-Jul	0	0	0	3	40	148	311	359	289	523	690	808	868	815	656	169	345	158	140	166	41	4	0	0	272.2	868	
16-Jul	0	0	0	2	25	95	137	75	108	171	198	459	467	615	529	371	546	362	235	112	33	3	0	0	189.4	615	
17-Jul	0	0	0	4	30	105	303	451	592	707	779	855	865	818	740	628	507	345	197	95	29	3	0	0	335.6	865	
18-Jul	0	0	0	3	31	108	233	376	513	633	722	776	830	817	754	659	537	397	252	95	31	2	0	0	323.6	830	
19-Jul	0	0	0	2	23	87	247	386	553	683	499	502	541	404	689	537	307	194	26	25	8	0	0	0	238.1	689	
20-Jul	0	0	0	2	25	70	110	183	205	412	438	625	537	344	293	517	317	421	264	60	11	1	0	0	201.5	625	
21-Jul	0	0	0	2	36	17	113	89	155	247	599	550	527	321	242	166	367	352	138	144	52	2	0	0	171.6	599	
22-Jul	0	0	0	2	24	104	230	387	349	357	340	267	175	141	178	154	233	239	155	52	22	1	0	0	142.1	387	
23-Jul	0	0	0	2	21	56	199	342	326	575	643	529	647	640	410	313	183	177	115	98	19	1	0	0	220.6	647	
24-Jul	0	0	0	1	11	27	115	308	534	683	747	705	885	862	730	297	227	130	50	13	6	1	0	0	263.8	885	
25-Jul	0	0	0	1	12	30	49	150	349	394	525	477	485	211	323	177	306	443	284	143	39	1	0	0	183.2	525	
26-Jul	0	0	0	1	26	129	270	416	556	676	766	828	857	794	605	618	554	411	222	86	30	1	0	0	326.8	857	
27-Jul	0	0	0	0	11	73	226	394	467	387	370	621	783	659	548	655	518	242	140	49	13	1	0	0	256.6	783	
28-Jul	0	0	0	1	10	40	224	349	486	654	753	829	872	752	715	288	500	168	228	112	30	1	0	0	292.2	872	
29-Jul	0	0	0	0	20	116	254	400	548	657	753	805	814	611	643	414	409	264	254	91	14	0	0	0	294.4	814	
30-Jul	0	0	0	0	6	60	104	308	408	373	280	420	822	784	418	507	349	72	30	32	12	0	0	0	207.7	822	
31-Jul	0	0	0	0	12	71	141	262	387	388	372	681	647	701	296	135	78	91	152	69	7	0	0	0	187.1	701	
		0.1	0.1	0.1	3.4	28.8	100.6	213.5	327.0	432.7	535.0	602.3	655.9	686.7	638.4	528.7	428.9	393.7	318.2	215.7	102.8	31.1	3.1	0.1	0.1	Diurnal Average	
		2	2	2	10	62	179	324	470	605	733	846	891	923	909	830	749	611	526	359	185	71	12	2	2	Diurnal Maximum	
M - Maintenance																											





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Global Radiation (GR) - W/m2
Fort Chipewyan - July 2016

Concentration Ranges (W/m2)	Number of Hours	%	Cumulative %
0 - 20	239	32.21	32.21
21 - 100	88	11.86	44.07
101 - 300	130	17.52	61.59
301 - 600	162	21.83	83.42
601 - 900	119	16.04	99.46
> 900	4	0.54	100.00

Total Number of Valid Hours: 742

Total Number of Hours: 744



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Speed (WS) - km/h
Fort Chipewyan - July 2016

Maximum Speed: 39 km/h on Jul 7 07:00	Maximum Daily Speed Average: 26.3 km/h on Jul 7	Hours in Service: 744
Minimum Speed Value: 0 km/h on Jul 4 03:00	Minimum Daily Speed Average: 3.1 km/h on Jul 30	Hours of Data: 742
Maximum Diurnal Speed Average: 8.0 km/h at hour 14	Minimum Diurnal Speed Average: 2.1 km/h at hour 2	Hours of Missing Data: 2
Monthly Average Velocity: 3.9 km/h 83.8 deg	Percentiles: P ₁ = 2 P ₁₀ = 6 Q ₁ = 9 Median = 12 Q ₃ = 18 P ₉₀ = 24 P ₉₉ = 34	Percent Operational Time: 99.7

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	SSE15	S11	SE7	ESE12	ESE15	SE12	SE11	SE11	E10	ESE9	S20	S26	S27	SSE21	E21	E19	E19	E19	E16	ESE12	SE18	SSE23	SSE20	SSE21	SE13.8	S27
2-Jul	SSE20	SSE21	SSE21	SSE22	SSE21	SSE21	S15	S13	SSE17	SSE20	SSE25	S22	SSE25	SSE26	SSE27	S26	S27	S19	SE17	SSW20	SSW18	S19	SSE16	SSE18	SSE20.1	S27
3-Jul	SSE18	SSE20	SSE21	SSE19	SSE17	SSE15	SSE13	SE9	ESE10	E17	E20	E17	E32	SE34	SE20	SE21	SSE15	SSE17	SE20	ESE16	ESE10	ENE13	ESE14	E9	SE14.7	SE34
4-Jul	NE5	W7	W0	E8	ESE13	ESE16	ESE14	ESE12	E14	E21	E21	E21	E24	ENE18	WSW12	WNW12	NNW6	WSW10	SW15	N7	NNW12	N12	NNE14	ENE17	ENE6.3	E24
5-Jul	ENE25	ESE24	SE15	E2	NNW6	NNW7	NE8	E12	WSW2	NNW5	E9	E26	E30	E29	ENE28	ENE26	NE23	NE23	NE24	NE21	NE20	E34	E33	ESE31	E17.1	E34
6-Jul	ESE31	ESE26	E28	E29	E28	E26	E25	E26	ENE25	ENE26	ENE25	E25	E26	ENE29	ENE26	ENE24	ENE19	ENE25	ENE22	NE21	NE18	NE17	NNE14	NE10	ENE22.4	ESE31
7-Jul	ESE9	E24	E24	NE14	ENE20	E37	E39	E37	E34	E34	E31	ENE31	E34	ENE31	ENE28	ENE27	ENE24	NE22	ENE23	ENE24	ENE25	ENE23	E25	E27	E26.3	E39
8-Jul	E24	E22	E18	E16	E15	SE12	SSE8	ESE7	ESE13	E16	E20	E23	E23	E24	E27	E28	ENE23	ENE24	NE22	NE19	NE19	NE21	NE21	ENE21	E18.0	E28
9-Jul	ENE22	ENE22	E24	E22	E17	ENE15	ENE17	ENE17	E21	E19	E22	E21	E18	E17	E22	E24	E25	E23	E22	E17	ENE12	ENE9	ENE8	NE8	E18.1	E25
10-Jul	NE10	ENE12	ENE11	ENE13	ENE8	E7	E8	ESE7	ESE11	ESE14	ESE12	ESE16	E23	E22	E20	E20	E22	E22	E18	ENE12	NNE8	N7	N11	N11	E11.8	E23
11-Jul	NNE13	NNE11	NE11	ENE11	NE10	NE6	N6	N7	E14	E18	E19	E20	E23	E26	E25	NW5	E9	NE10	ENE14	ENE17	NE12	NE13	NNE7	NNE9	ENE11.3	E26
12-Jul	N8	NNW10	N11	NNW8	NNW13	N12	N12	N11	NNW12	NNW15	M	M	E18	ENE9	NE9	NNE15	NNW9	N9	NE11	ENE10	N9	N10	NNW11	NNW11	N9.2	E18
13-Jul	NNW12	NNW11	N12	NNW11	N12	N12	NNE11	NE11	NNE8	NW8	NNW8	N9	NNW6	ENE9	ENE8	NNE10	NE7	ENE13	NNE9	N5	N7	NNE5	NNE5	NE7	NNE7.6	ENE13
14-Jul	NE5	ENE3	NW4	NNW5	NW5	NW7	NW4	W6	NNW5	NW3	NNW3	S1	ESE14	ESE13	NE1	NNW6	NW9	NNW11	W14	W12	W10	W10	W10	W13	WNW4.0	W14
15-Jul	W13	W11	W11	W12	W11	W11	W14	W14	W14	W16	W15	W15	W17	WSW20	W18	NW8	W16	W12	N10	WNW10	W12	W11	W12	W13	W12.5	WSW20
16-Jul	W13	W13	W11	NNW15	NNW12	W12	NNW11	NNW11	W11	NNW14	NNW14	NNW16	NW18	NW16	NW18	NNW18	N21	NNW18	N15	N14	N12	N8	N10	N11	NW11.8	N21
17-Jul	N10	N10	N10	NNW9	NNW10	NNW10	N9	NNE7	N7	N7	NNW11	NNW11	N11	E7	ESE10	E8	E9	E12	SE4	SW6	S10	SSW10	SSW6	SW9	N3.3	E12
18-Jul	SW13	SW11	SW7	SW9	SW12	SW10	SW10	SW10	SW14	WSW16	WSW16	SW19	SW19	SW19	WSW19	WSW19	WSW17	WSW14	WSW10	SW5	SSW6	S6	SW9	WSW12	SW12.3	WSW19
19-Jul	WSW13	WSW13	WSW8	WSW9	SW7	SSW8	SW9	SW9	WSW14	W15	W15	W13	W14	NNW11	NNW9	N12	N16	NNE13	N10	NNE7	NE15	N9	N9	N8	WNW5.7	N16
20-Jul	NNW8	N9	NNW10	N11	N9	NNW7	NNW5	N5	NNW3	S4	SW5	WSW7	SW6	SSE12	S17	SSW16	SW16	WSW14	W12	W9	WNW7	WNW8	WNW9	WNW9	W4.2	S17
21-Jul	WNW9	WNW7	WNW4	WSW4	N2	NW6	ESE8	NW5	W4	NW10	N13	NNW13	NNW14	NNW22	NNW24	NNW18	NNW19	NNW15	NW13	NW10	WNW9	WNW9	W8	W8	NW9.0	NNW24
22-Jul	WSW9	WSW10	SW11	SSW16	SSW18	SSW23	SSW21	SSW25	S23	S24	S22	S27	S19	SE12	SE18	SE13	S11	WSW10	WNW9	WNW7	WNW9	W8	NNW10	NW10	SSW11.4	S27
23-Jul	NW9	NNW8	NNW8	N6	NNW5	SW1	ENE6	E10	E13	ESE11	E14	E16	E15	E18	E16	E13	E13	E12	E9	E11	ESE9	ESE5	S5	S10	E7.3	E18
24-Jul	SSW12	SW10	SSW8	SSW8	SSE7	SSW11	SSW14	SW16	SW21	WSW23	WSW28	WSW25	W28	W28	W26	NW20	NW13	NNW17	W24	W18	W15	W17	NNW15	NW14	WSW14.6	W28
25-Jul	NW14	NW11	NW14	NW11	NNW12	NNW12	NW12	NW9	NNW11	NNW10	NNW13	NNW13	W13	W13	W13	NNW11	NNW7	E5	ESE10	SE10	SE9	SSE10	SSE10	SSE10	WNW5.7	NW14
26-Jul	SSE12	SSE15	SSE17	SSE19	SSE17	SSE17	SE9	ESE13	E15	E16	E19	E18	E16	E17	E19	E17	E18	E16	E10	E6	E4	E4	ESE5	ENE7	ESE11.9	E19
27-Jul	NNE11	ENE12	ENE10	NNE10	NNW7	NNW9	N15	N13	N11	NNE10	N8	NNW4	E12	ESE15	ESE12	WNW3	NNW10	W12	W10	W7	WNW6	WNW6	WNW4	W5	N4.6	ESE15
28-Jul	NW8	WSW3	NNW8	NE10	E7	SE13	E7	E10	E13	ESE13	ESE12	ESE14	ESE16	E16	E17	E17	E22	E20	E18	E14	E14	E11	E10	E11	E10.9	E22
29-Jul	E11	E11	ESE10	SSE7	E4	E6	ESE7	ESE10	ESE9	E10	SE8	ESE13	E14	E15	E17	E16	E17	E13	E13	ENE9	ENE6	E6	E7	E7	E9.9	E17
30-Jul	S6	W13	NNW12	NW9	NNW6	SW2	W9	NW10	NW6	WSW8	WSW12	SSE5	SE9	WNW9	NNW8	WSW3	ESE14	E13	W4	WNW5	N4	N8	NNW8	N8	WNW3.1	ESE14
31-Jul	N10	N5	NNW8	N8	N11	N11	N13	N11	N9	N10	N11	NNW13	NNW14	NNW13	N8	N2	NE10	ENE15	NE9	N4	NNW6	N6	NNW6	NW7	N8.5	ENE15

ENE2.3	ESE2.1	E2.4	ENE2.3	E2.5	ESE2.8	E2.8	E3.3	E3.7	E3.7	ESE4.2	ESE5.1	E7.8	ESE8.0	E7.1	ENE6.2	ENE5.9	ENE6.0	ENE5.5	NE4.3	NE3.4	NE3.3	NE2.7	ENE2.6	Diurnal Average	
ESE31	ESE26	E28	E29	E28	E37	E39	E37	E34	E34	E31	ENE31	E34	SE34	ENE28	E28	S27	ENE25	NE24	ENE24	ENE25	E34	E33	ESE31	Diurnal Maximum	

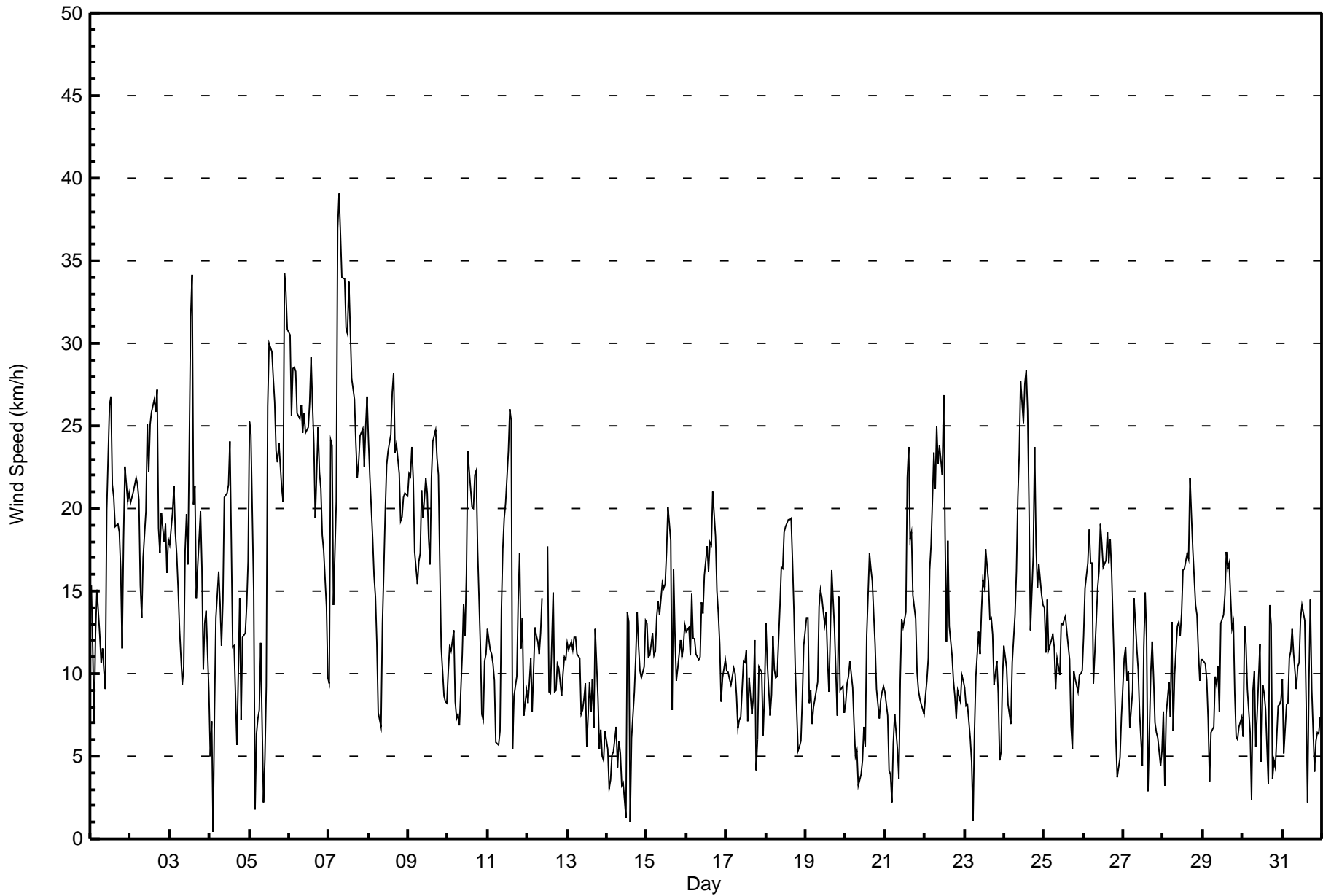
M - Maintenance
 All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Fort Chipewyan - July 2016

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Fort Chipewyan - July 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	55	7.41	7.41
6 - 11	280	37.74	45.15
12 - 19	258	34.77	79.92
20 - 28	130	17.52	97.44
29 - 38	18	2.43	99.87
> 38	1	0.13	100.00

Total Number of Valid Hours: 742

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Fort Chipewyan - July 2016**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	7	2	3	1	5	2	1	2	2	0	4	4	4	6	6	6	55
6 - 11	47	13	16	14	28	16	9	6	6	7	15	9	19	24	20	31	280
12 - 19	15	5	8	16	58	24	9	18	6	6	9	15	32	13	9	15	258
20 - 28	1	0	10	23	48	2	3	18	9	4	1	4	4	0	1	2	130
29 - 38	0	0	0	3	12	2	1	0	0	0	0	0	0	0	0	0	18
> 38	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Totals	70	20	37	57	152	46	23	44	23	17	29	32	59	43	36	54	742

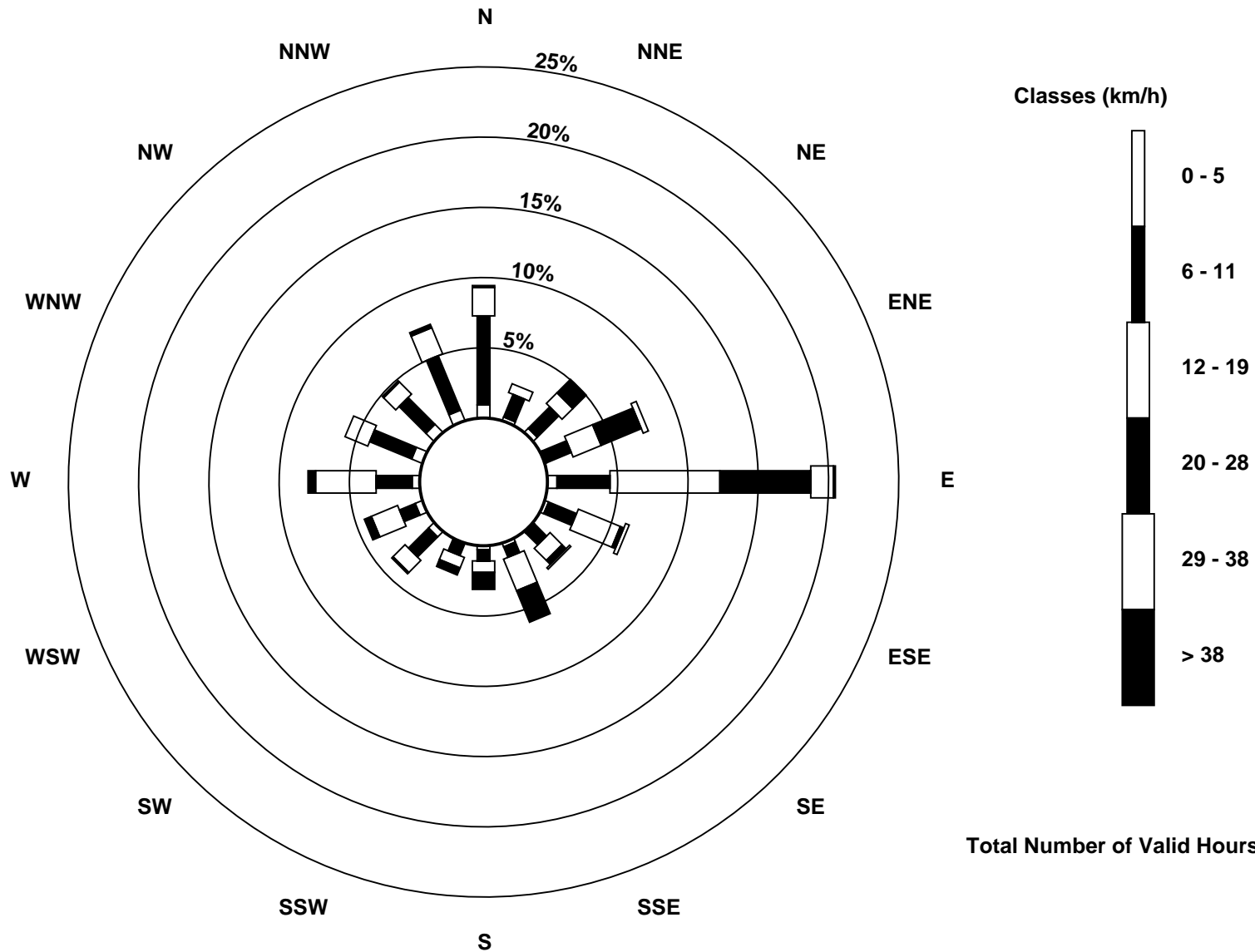
Total Number of Valid Hours: 742

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

Wind Speed (WS) - km/h
Fort Chipewyan (AMS 8)





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Fort Chipewyan - July 2016

Direction of Maximum Speed: 93 deg on Jul 7 07:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 78.9 deg on Jul 7	Hours of Data: 742
Direction of Minimum Speed: 265 deg on Jul 4 03:00	Hours of Missing Data: 2
Direction of Minimum Daily Speed Average: 3.1 deg on Jul 30	Percent Operational Time: 99.7
Monthly Average Direction: 310.9 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Jul	167	175	145	114	121	138	137	127	101	120	169	178	173	167	90	88	87	86	81	113	143	156	160	160	136.8
2-Jul	156	158	161	162	162	161	172	173	154	154	165	177	165	156	156	173	187	182	135	200	201	176	166	161	167.1
3-Jul	156	162	165	163	165	161	166	145	105	91	82	79	81	130	144	135	148	168	130	117	105	72	104	99	129.0
4-Jul	55	278	265	90	108	121	122	110	91	85	84	82	80	76	251	294	332	247	225	4	348	0	15	60	74.1
5-Jul	75	117	138	96	345	348	56	97	241	345	98	93	90	82	76	68	54	55	55	48	56	90	95	107	79.2
6-Jul	116	113	100	93	93	91	85	86	76	67	77	85	79	71	69	73	70	78	57	53	48	40	28	36	78.2
7-Jul	107	95	92	54	62	88	93	87	85	85	83	78	82	77	70	66	61	56	64	67	75	76	84	88	78.9
8-Jul	85	84	84	87	85	143	155	114	113	91	92	86	88	91	90	85	64	65	49	45	45	47	55	69	78.9
9-Jul	76	77	83	82	79	73	69	72	86	89	98	98	93	92	98	98	95	89	93	80	71	60	61	55	84.7
10-Jul	49	57	59	61	67	93	100	122	110	109	102	103	93	93	95	97	94	93	89	67	17	4	10	358	81.8
11-Jul	25	32	49	57	53	36	10	11	89	94	100	98	96	93	82	306	79	56	76	72	53	44	18	16	68.3
12-Jul	360	348	350	336	348	354	359	3	341	341	M	M	84	69	54	31	343	4	48	64	356	356	345	344	8.3
13-Jul	345	344	349	348	351	359	24	36	26	321	332	355	347	77	76	13	44	76	31	9	5	14	25	50	12.8
14-Jul	43	77	312	339	310	312	311	279	294	325	288	171	110	121	37	296	309	286	267	270	270	264	265	263	284.8
15-Jul	273	279	277	279	273	271	273	267	269	270	262	266	266	244	267	319	259	278	2	290	260	272	267	272	271.5
16-Jul	279	275	278	286	290	280	283	291	277	283	293	298	312	310	326	346	349	346	358	355	354	350	358	6	315.3
17-Jul	6	357	358	342	345	347	354	13	358	357	341	330	358	88	105	79	90	95	145	220	183	193	212	227	9.7
18-Jul	229	226	226	224	223	226	223	227	233	242	242	234	219	226	237	240	245	247	246	231	207	172	220	243	231.7
19-Jul	240	253	244	240	235	206	216	223	251	259	260	275	268	289	302	354	10	19	355	28	40	5	6	353	290.8
20-Jul	339	350	348	351	351	348	346	354	342	169	230	253	221	168	181	192	216	241	259	261	293	286	284	288	267.1
21-Jul	296	299	282	254	355	312	113	315	273	308	349	339	328	337	343	339	333	335	317	304	287	285	280	268	321.1
22-Jul	241	248	215	203	196	195	196	195	188	183	177	181	176	140	133	140	190	242	283	293	283	271	289	304	198.1
23-Jul	323	329	339	351	340	233	68	91	99	107	93	94	95	93	91	87	85	82	95	94	105	122	172	169	87.8
24-Jul	204	226	202	197	162	195	213	221	235	243	245	251	264	264	271	318	309	291	276	276	268	274	288	306	257.8
25-Jul	321	306	320	313	299	303	309	317	309	308	289	283	273	272	276	307	298	82	116	131	140	153	163	156	291.6
26-Jul	161	164	160	161	153	148	135	116	98	92	91	92	97	100	91	92	93	96	95	89	101	96	109	77	113.8
27-Jul	16	66	63	30	345	339	356	4	8	15	8	346	92	104	106	293	295	268	275	279	291	299	284	279	1.5
28-Jul	310	251	337	37	89	128	93	97	101	109	107	103	104	98	99	94	89	90	89	86	85	81	83	80	91.5
29-Jul	80	98	114	152	99	96	104	103	111	100	124	106	99	95	96	95	95	93	88	71	69	98	91	84	97.6
30-Jul	190	262	297	321	338	223	263	312	319	253	238	160	138	283	332	254	115	89	279	286	0	350	344	353	295.5
31-Jul	352	359	348	353	352	356	352	352	355	352	352	346	343	339	351	355	52	58	45	353	333	355	334	315	356.4

78.4	107.3	88.8	78.0	79.4	115.8	100.2	93.1	96.5	92.4	110.9	108.1	100.0	102.7	91.4	72.8	71.1	69.7	63.7	54.2	45.7	53.9	51.0	60.9
Diurnal Average																							

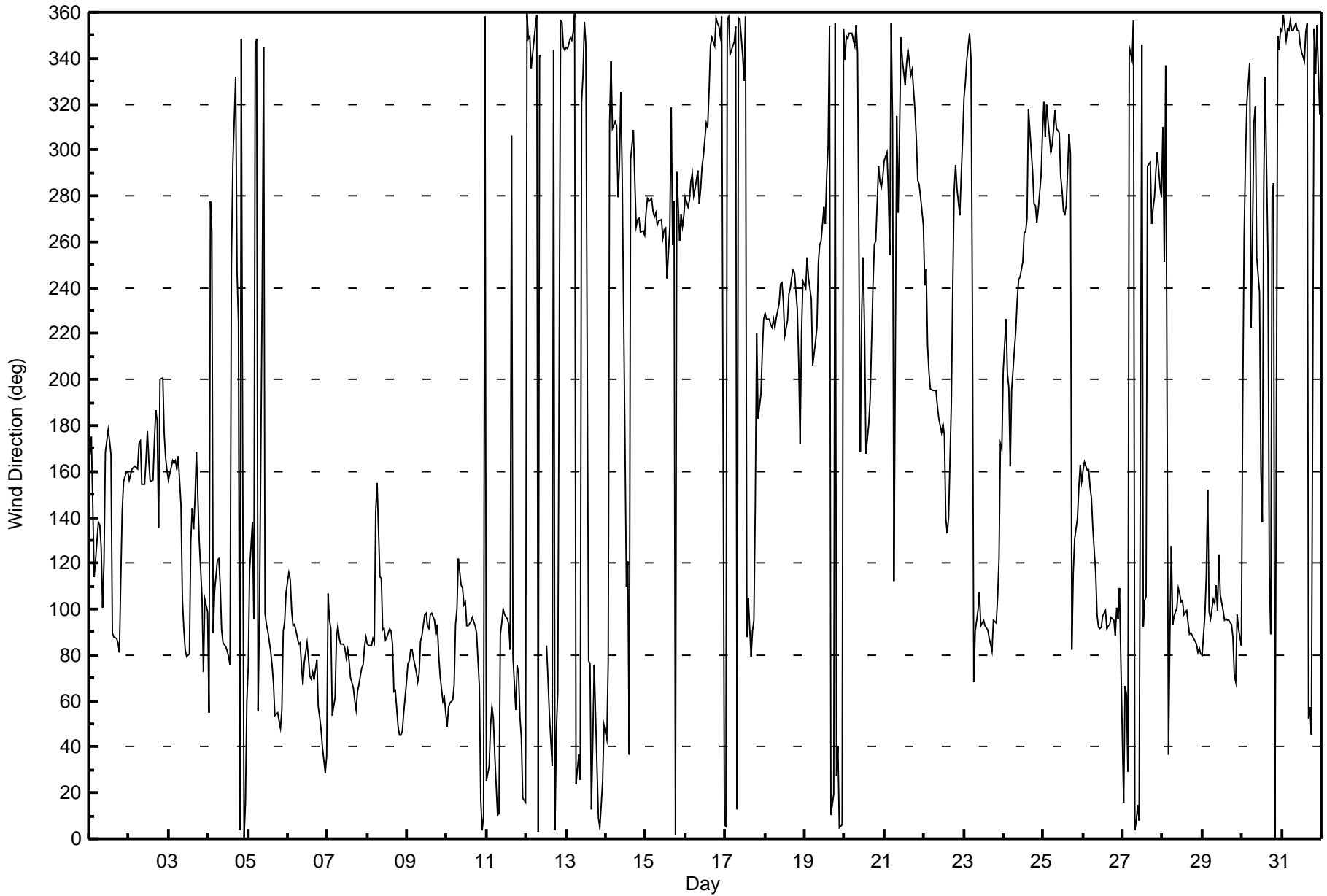
M - Maintenance
 All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
Fort Chipewyan - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 96 deg on Jul 4 03:00																	Hours in Service: 744 Hours of Data: 742 Hours of Missing Data: 2 Hours of Calibration: 0 Percent Operational Time: 99.7								
Minimum Value: 5 deg on Jul 9 16:00																									
Percentiles: P ₁ = 5 P ₁₀ = 7 Q ₁ = 10 Median = 15 Q ₃ = 23 P ₉₀ = 35 P ₉₉ = 78																									
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-Jul	11	12	40	10	13	16	16	13	8	36	27	16	15	31	10	9	8	8	7	27	7	8	7	8	40
2-Jul	6	6	5	5	6	6	11	10	11	12	15	18	20	15	14	16	17	13	12	39	10	8	10	8	39
3-Jul	8	9	8	7	8	8	16	29	11	6	10	15	11	28	11	13	19	13	11	11	15	17	20	27	29
4-Jul	66	19	96	46	14	6	6	13	8	8	10	9	13	29	41	33	58	37	36	56	23	21	18	29	96
5-Jul	10	13	12	79	16	19	32	27	73	81	19	7	6	9	10	10	14	12	12	12	19	8	7	11	81
6-Jul	7	7	12	8	10	9	8	8	14	15	13	12	13	12	13	12	17	15	12	13	12	12	13	24	24
7-Jul	54	8	7	30	22	8	7	8	8	8	9	11	8	10	11	18	14	11	12	11	11	10	9	8	54
8-Jul	8	8	10	9	15	18	17	25	24	10	7	10	9	7	7	9	12	12	14	12	11	11	9	10	25
9-Jul	8	8	8	8	11	10	15	15	9	14	5	6	6	8	6	5	5	5	6	11	12	8	8	10	15
10-Jul	9	6	6	5	6	21	11	14	11	6	9	8	5	5	6	6	6	5	8	18	20	20	18	18	21
11-Jul	17	12	9	7	9	25	24	29	34	6	5	5	5	5	11	78	30	34	23	10	10	8	41	15	78
12-Jul	24	18	18	48	17	16	20	24	26	25	M	M	23	38	33	21	24	27	31	35	20	14	14	15	48
13-Jul	14	17	17	16	18	19	22	16	39	25	29	29	48	43	57	33	29	23	23	24	14	19	35	18	57
14-Jul	24	48	62	10	17	11	29	24	47	88	78	93	11	15	90	65	42	31	16	15	11	12	13	14	93
15-Jul	12	10	12	11	11	12	15	13	14	14	18	18	18	16	27	51	16	23	25	25	12	15	13	14	51
16-Jul	12	12	15	16	12	14	15	17	15	16	17	20	18	24	24	26	24	26	25	24	21	17	18	14	26
17-Jul	15	14	23	29	18	17	18	31	45	49	43	36	35	46	32	59	32	14	59	20	10	21	16	18	59
18-Jul	12	12	23	13	9	11	9	11	13	14	16	13	11	15	15	15	16	15	13	11	20	25	19	14	25
19-Jul	11	13	16	13	17	11	10	14	20	21	24	18	22	18	32	34	23	21	36	23	15	19	16	14	36
20-Jul	14	16	15	17	20	33	48	23	36	39	50	50	55	16	14	9	24	17	21	15	13	15	14	12	55
21-Jul	12	13	21	33	62	59	24	57	57	24	25	27	27	25	23	25	25	26	23	23	13	11	13	12	62
22-Jul	21	12	17	9	8	7	9	9	9	8	10	8	12	18	7	10	26	27	19	14	14	13	13	20	27
23-Jul	16	16	18	18	17	73	35	9	11	12	7	6	6	8	7	9	9	11	11	8	12	35	18	11	73
24-Jul	11	10	15	18	29	19	13	12	14	15	14	17	17	17	24	21	23	18	17	18	14	15	14	19	29
25-Jul	19	17	19	18	16	16	20	23	20	27	20	23	20	15	22	17	44	49	7	7	8	7	7	6	49
26-Jul	6	5	6	5	7	8	20	8	9	7	6	6	6	8	7	6	7	8	9	12	17	12	14	16	20
27-Jul	29	11	14	31	59	30	20	21	25	26	31	76	61	5	12	88	26	14	14	12	13	8	30	27	88
28-Jul	16	71	43	29	11	11	44	11	7	8	7	6	6	7	8	9	7	6	7	7	8	9	12	9	71
29-Jul	7	15	10	17	36	18	23	10	8	8	35	17	10	8	5	6	9	8	8	12	21	18	17	17	36
30-Jul	54	15	16	22	61	69	24	17	30	25	16	58	20	49	37	71	21	12	71	59	44	18	17	17	71
31-Jul	19	48	20	18	14	16	17	20	30	26	25	26	25	26	34	54	35	11	20	28	21	17	14	16	54
																	66 71 96 79 62 73 48 57 73 88 78 93 61 49 90 88 58 49 71 59 44 35 41 29								
Diurnal Maximum																									
M - Maintenance																									





Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	July 12, 2016	Last Calibration	June 14, 2016
Station Name	Fort Chipewyan	Station Number	AMS 8
Reason:	Routine		
Start Time (MST)	12:25	End Time (MST)	18:05
Gas Cert Reference	LL79696	Station temp.	22 Deg C
Cal Gas Concentration	2.35 ppm	Cal Gas Exp Date	2/13/16
Calibrator Make/Model	Teledyne API T700	Serial Number	747
ZAG Make/Model	Teledyne API T701	Serial Number	4698
DACS make/model	Campbell Scientific CR3000	DACS serial No.	11039

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-826	-827
Analyzer IP address	192.168.1.43		Lamp voltage	997	988
Calculated slope	1.003688	1.009511	Chamber temp	45.3	44.9
Calculated intercept	-0.119590	-0.075333	Pressure	698.5	712.8
Analyzer Background	1.20	1.18	Flow	0.429	0.438
Analyzer Coefficient	1.067	1.062	Intensity	90	90

Analyzer make Thermo 43i-TLE Analyzer serial # 1136451241

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	6123	0.0	0.0	0.1	----
as found span	6090	44.8	17.3	17.4	0.991
calibrator zero	6000	0.0	0.0	0.1	----
high point	6000	44.8	17.5	17.5	1.002
second point	6000	29.9	11.7	11.6	1.009
third point	6000	15.0	5.9	5.8	1.008
as left zero	6000	0.0	0.0	0.1	----
as left span	6000	44.8	17.5	17.1	1.024
Average Correction Factor					1.006

Corrected As found 17.3 Previous response 17.3 % change 0.1%

Notes:

Inlet filter changed after as founds. Span adjusted.

Calibration Performed By: Devin Russell



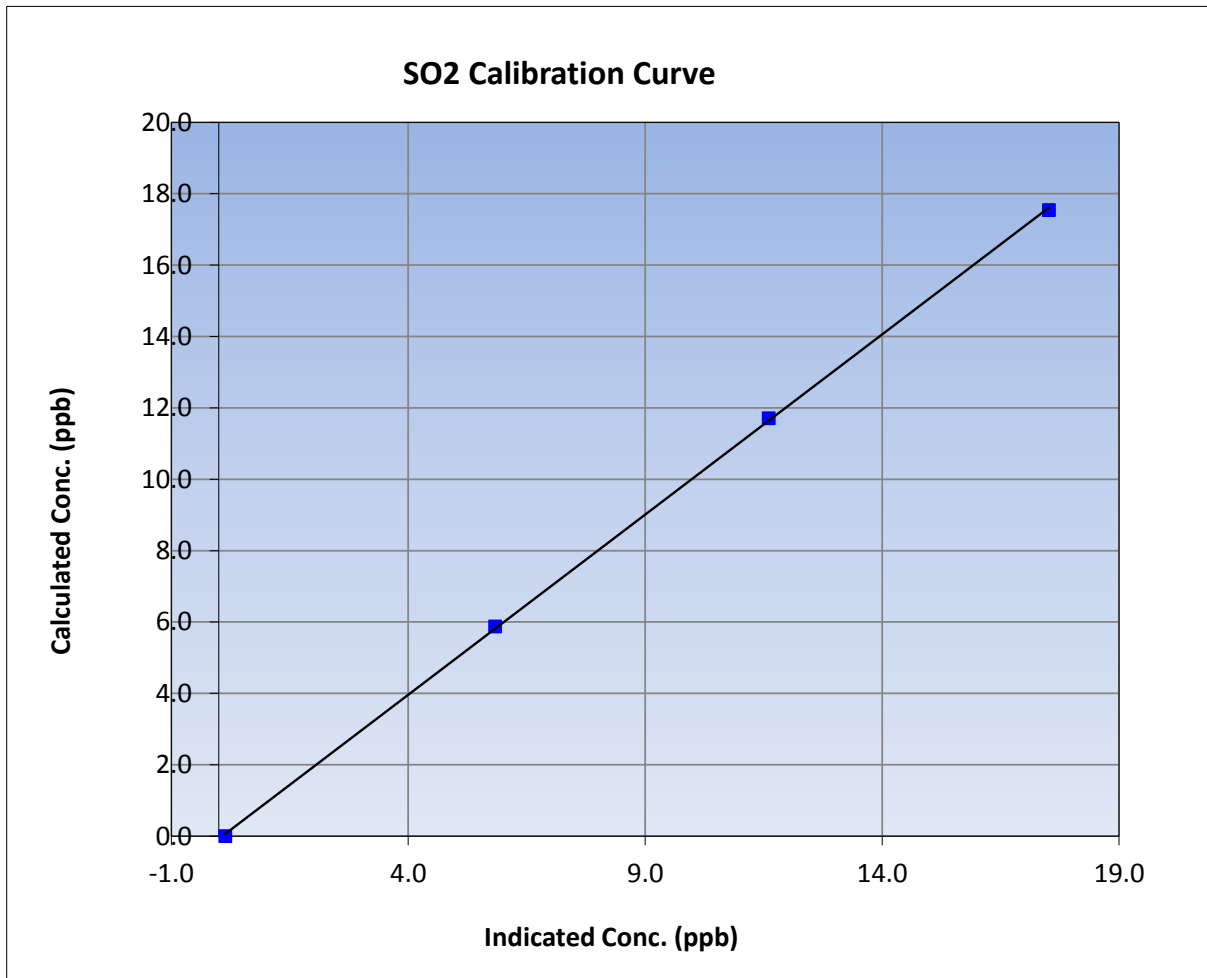
Wood Buffalo Environmental Association SO2 Calibration Report

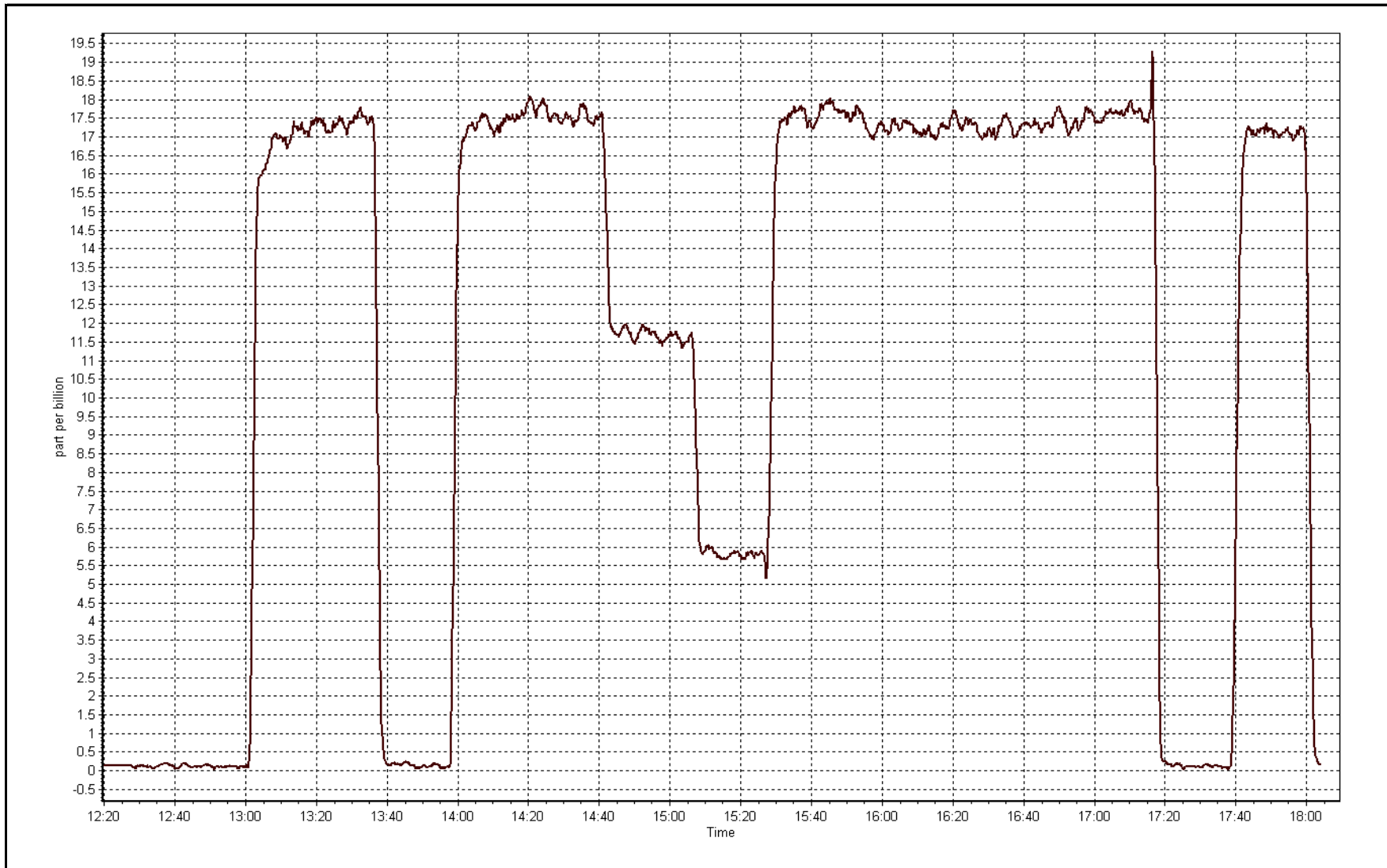
Station Information

Calibration Date	July 12, 2016	Previous Calibration	June 14, 2016
Station Name	Fort Chipewyan	Station Number	AMS 8
Start Time (MST)	12:25	End Time (MST)	18:05
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1136451241

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999900
17.5	17.5	1.0015		
11.7	11.6	1.0087	Slope	1.009511
5.9	5.8	1.0077		
			Intercept	-0.075333







Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	July 13, 2016	Previous Calibration	June 14, 2016
Station Name	Fort Chipewyan	Station Number	AMS 8
Reason:	Routine		
Start Time (MST)	6:48	End Time (MST)	9:15
NO2 GPT Ref date	July-12-16	Transfer Standard	NO2
		Station temp.	23 Deg C
Calibrator Make/Model	Teledyne API 700	Serial Number	735
ZAG make/model	Teledyne API 701	Serial Number	4698
DACS make/model	Campbell Scientific CR3000	Serial Number	11039

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Bench temp.	38.3	38.8
Analyzer IP address	192.168.1.79		Lamp temp.	58.0	58.0
Calculated slope	0.993372	0.995375	Pressure	26.9	27.3
Calculated intercept	-0.050648	-0.003244	Flow cell A	764	778
Analyzer Background	-0.4	-0.4	Flow cell B	763	777
Analyzer Coefficient	1.026	1.026	Cell A Intensity	NA	NA
			Cell B Intensity	NA	NA
Analyzer make	Teledyne API T400		Analyzer serial #	1107	

Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator O3 generator reference voltage - generator drive voltage (ppb of O3 called from from calibrator)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
As found zero	6000	0.00	0.0	0.1	----
As found span	6000	237.0 - 830.8 (100ppb)	103.6	103.8	0.998
calibrator zero	6000	0.00	0.0	0.1	----
high point	6000	237.0 - 830.8 (100ppb)	103.6	104.0	0.996
second point	6000	190.8-799.1 (80 ppb)	83.7	84.3	0.993
third point	6000	115.2-733.3 (50 ppb)	53.1	53.2	0.999
as left zero	6000	237.0 - 830.8 (100ppb)	0.0	0.0	----
as left span	6000	0.00	103.6	104.2	0.994
Average Correction Factor					0.996
Corrected As found	103.7	Previous response	104.3	% change	0.6%

Notes:

Inlet filter changed after as founds. No adjustments made.

Calibration Performed By:

Devin Russell



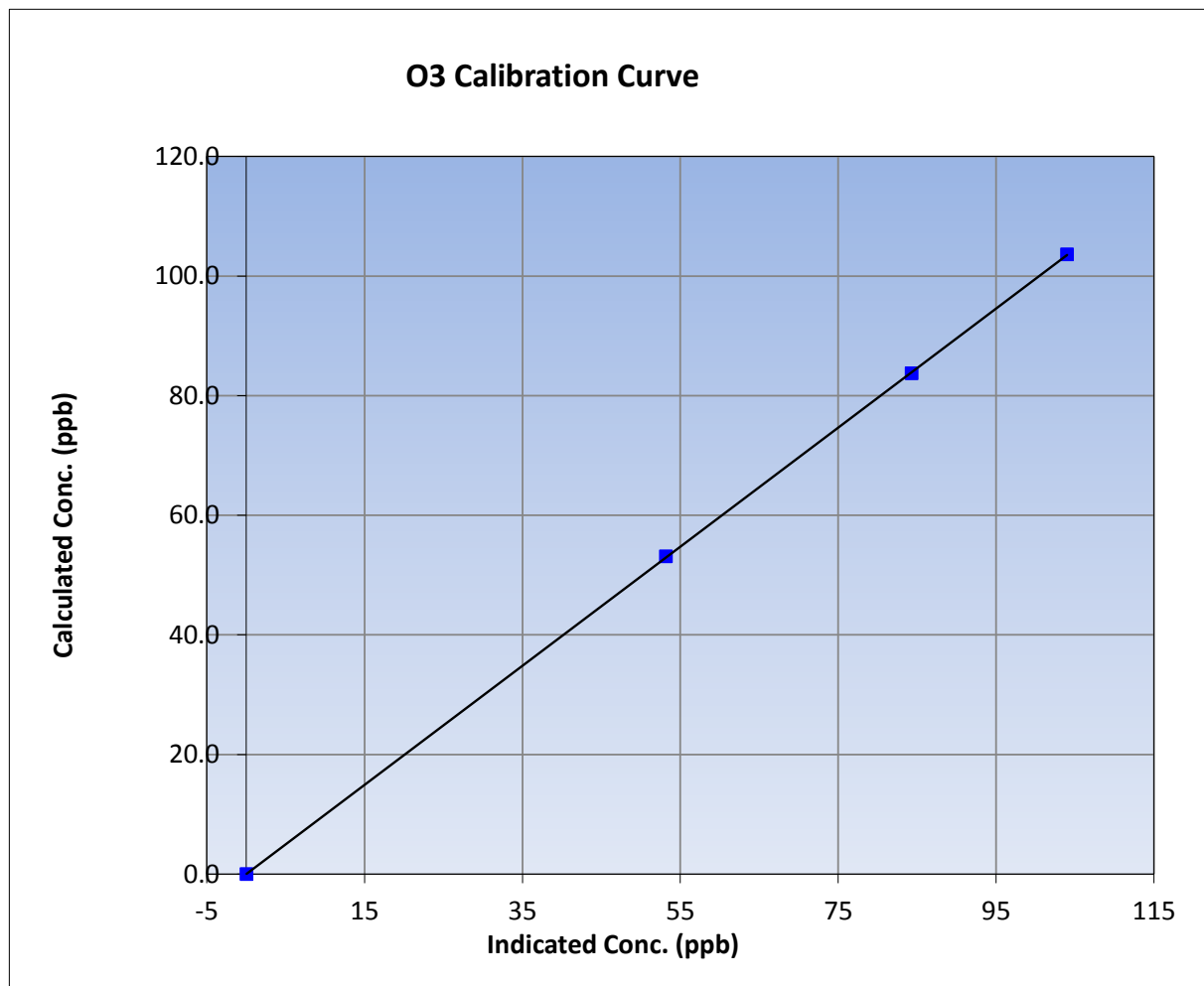
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	July-13-16	Previous Calibration	June 14, 2016
Station Name	Fort Chipewyan	Station Number	AMS 8
Start Time (MST)	6:48	End Time (MST)	9:15
Analyzer make	Teledyne API T400	Analyzer serial #	1107

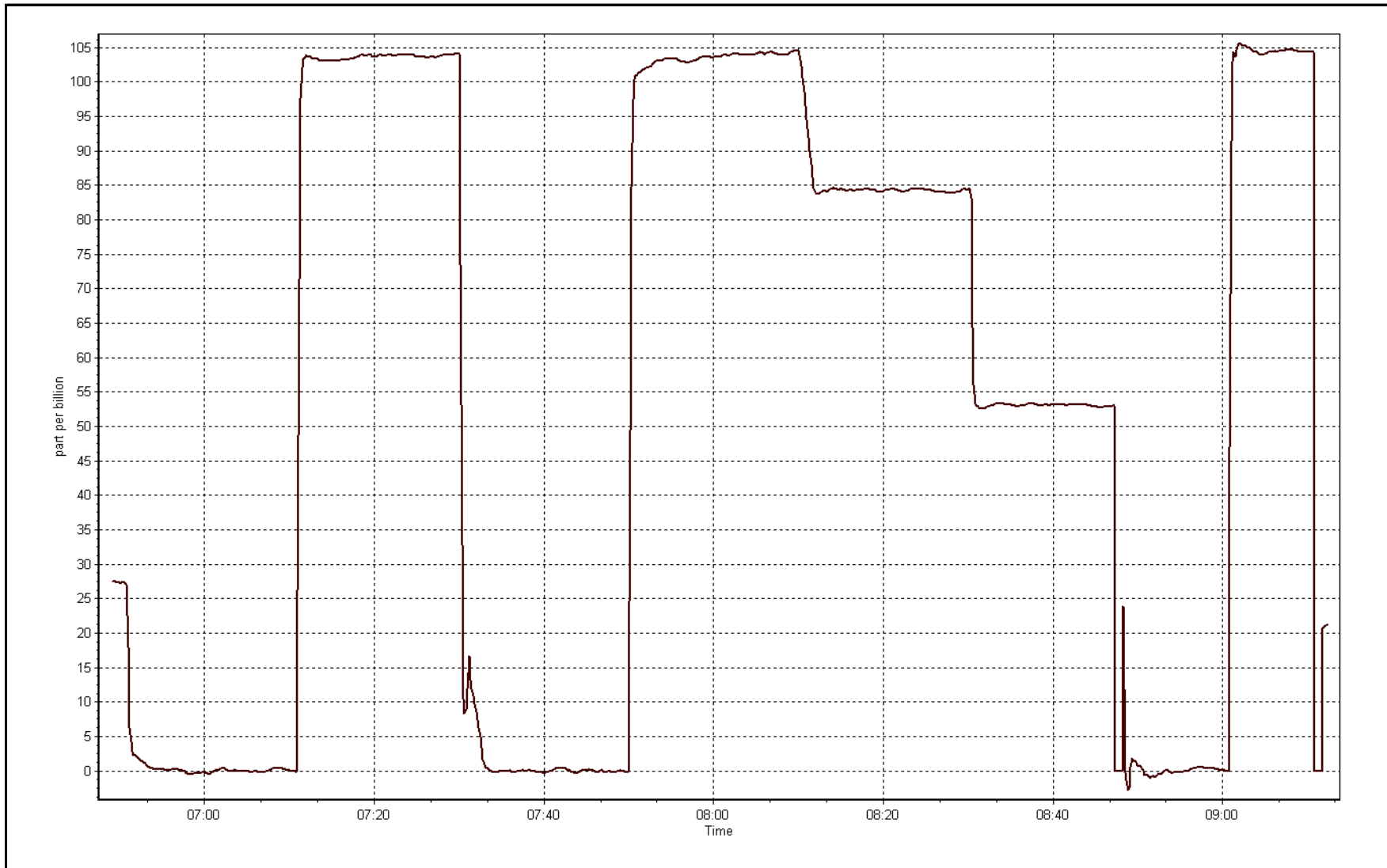
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999986
103.6	104.0	0.9962		
83.7	84.3	0.9928	Slope	0.995375
53.1	53.2	0.9987		
			Intercept	-0.003244



O3 Calibration Plot

Date: July 13, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	July 12, 2016	Previous Calibration	June 14, 2016
Station Name	Fort Chipewyan	Station Number	AMS 8
Reason:	Routine		
Start Time (MST)	12:25	End Time (MST)	18:05
NO Cal Gas Conc	20.1 ppm	Gas Cert Reference	LL79696
NOx Cal Gas Conc	20.1 ppm	Cal Gas Expiry Date	2/13/18
Calibrator	Teledyne API T700	Serial Number	747
Zero air Generator	Teledyne API 701	Serial Number	4698

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	11039
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.999197	1.000619	1.001742
	Data Offset	0.815978	0.922876	0.028589
Current Calibration	Data Slope	0.996952	0.994845	1.003647
	Data Offset	0.923083	0.945587	-0.038413

Analyzer Information

Analyzer make/model	Teledyne API T200u	Analyzer serial #	172
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Test Point	before		after	
		ppb		ppb
Concentration range	0-200		0-200	
Analyzer IP	192.168.1.72		192.168.1.72	
NO coefficient	1.218		1.239	
NOx coefficient	1.229		1.249	
NO2 coefficient	1.000		1.000	
NO bkgrnd	0.1		0.1	
NOx bkgrnd	0.2		0.2	
Chamber Temp	40	Deg C	40	Deg C
Moly Temp	315.3	Deg C	314.1	Deg C
PMT voltage	502	V	502	V
PMT Temp	5.1	Deg C	5.1	Deg C
O3 flow	88	ccm	88	ccm
R Cell press NO	3.7	mmHg	3.7	mmHg
R Cell Press Nox	3.7	mmHg	3.7	mmHg
NO sample flow	1.109	lpm	1.085	lpm
Nox sample Flow	1.109	lpm	1.085	lpm

Notes:

Inlet filter changed after as founds. Span adjusted.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

July 12, 2016

Station Number:

AMS 8

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	6123	0.0	0.0	0.0	0.0	0.0	0.0	0.0	----	----
as found span	6090	44.8	147.9	147.9	0.0	148.2	148.3	-0.2	0.9979	0.9968
calibrator zero	6000	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	----	----
high point	6000	44.8	150.1	150.1	0.0	150.2	150.5	-0.3	0.9990	0.9970
second point	6000	29.9	100.2	100.2	0.0	99.1	99.3	-0.2	1.0111	1.0091
third point	6000	15.0	50.3	50.3	0.0	48.5	48.6	-0.1	1.0352	1.0340
as left zero	6000	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	----	----
as left span	6000	44.8	150.1	45.8	104.3	149.6	46.1	103.5	1.0029	0.9933
Average Correction Factor									1.0151	1.0134

Corrected As found

NO_x= 148.2

NO= 148.4

Percent Change

NO_x= -0.7%

NO= -1.0%

Previous Response

NO_x= 147.2

NO= 146.8

GPT Calibration Data

Dilution Flow (total) 6000 ccm

Source Gas Flow 44.80 ccm

NOx ref calc conc = 150.1 ppb

NO ref calc conc = 150.1 ppb

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
1st NO ref point		0.0	149.2	149.4	0.0	1.0059	1.0046	----	----
1st NO2 (100)	45.8	103.6	149.0	45.8	103.1	1.0074	----	1.0041	99.6%
2nd NO2 (80)	65.7	83.7	149.2	65.7	83.5	1.0058	----	1.0022	99.8%
3rd NO2 (50)	96.3	53.1	149.3	96.3	52.9	1.0055	----	1.0025	99.8%
2nd NO ref point	----	0.0	149.2	149.4	-0.3	1.0061	1.0045	----	----
Average Correction Factor						1.0062		1.0029	99.7%

Calibration Performed By:

Devin Russell



Wood Buffalo Environmental Association

NO_x Calibration Summary

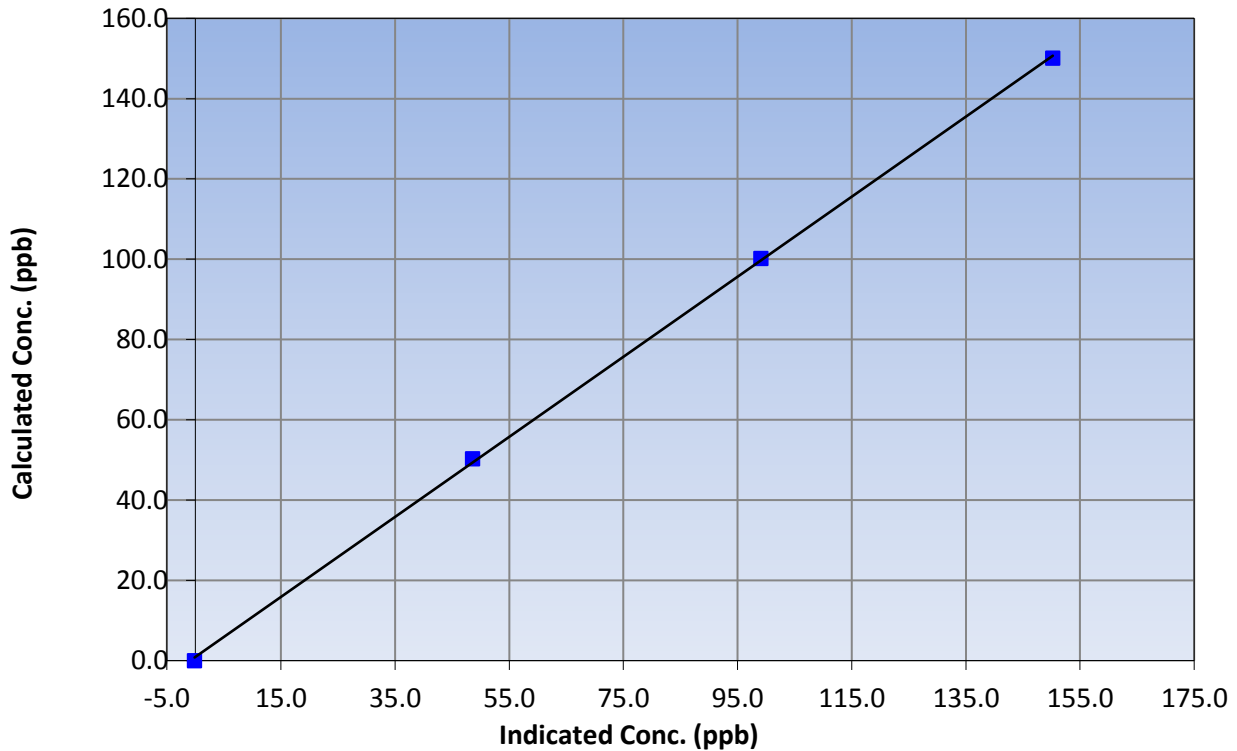
Station Information

Calibration Date	July 12, 2016	Previous Calibration	June 14, 2016
Station Name	Fort Chipewyan	Station Number	AMS 8
Start Time (MST)	12:25	End Time (MST)	18:05
Analyzer make	Teledyne API T200u	Analyzer serial #	172

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999832
150.1	150.2	0.9990		
100.2	99.1	1.0111	Slope	0.996952
50.3	48.5	1.0352		
			Intercept	0.923083

NO_x Calibration Curve





Wood Buffalo Environmental Association

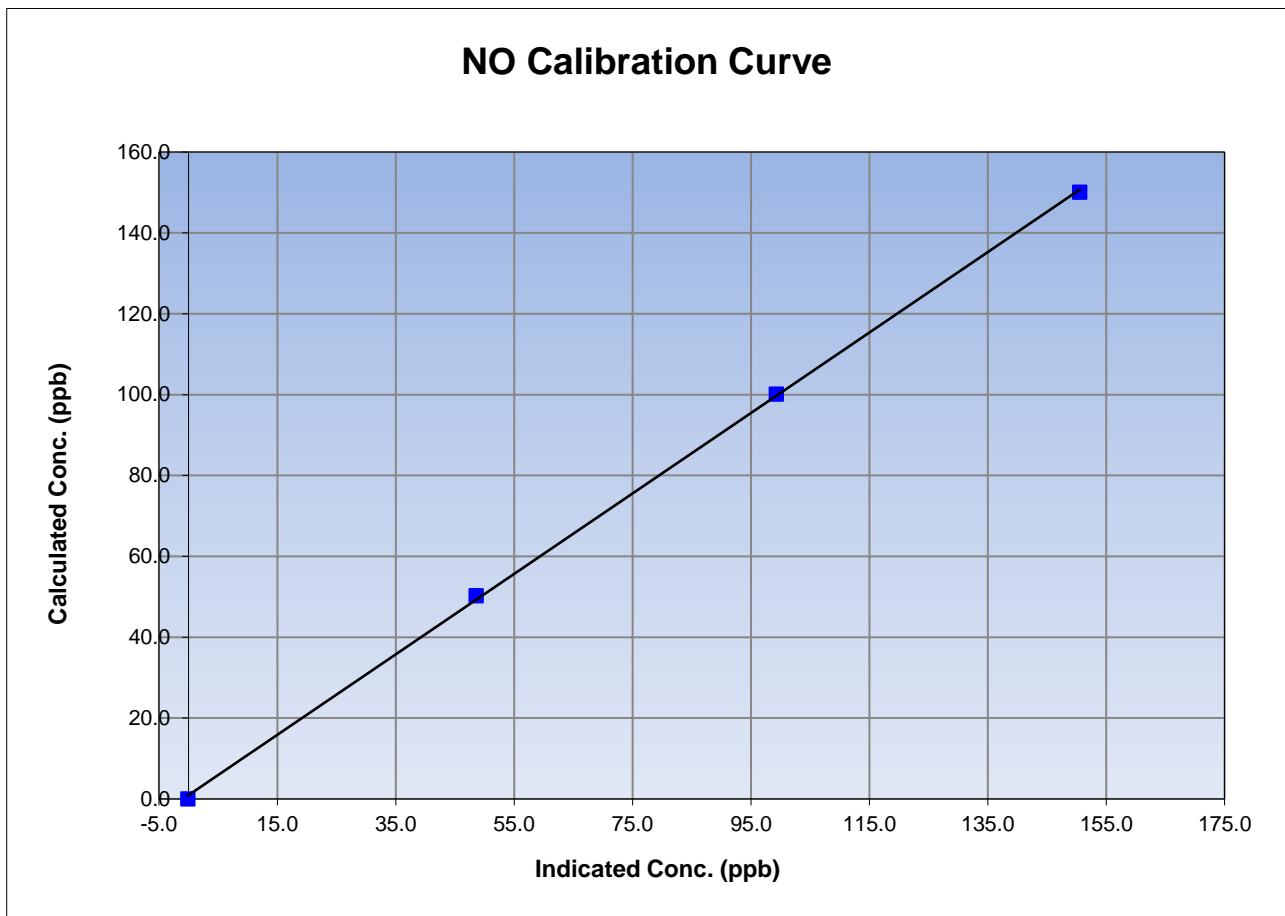
NO Calibration Summary

Station Information

Calibration Date	July 12, 2016	Previous Calibration	June 14, 2016
Station Name	Fort Chipewyan	Station Number	AMS 8
Start Time (MST)	12:25	End Time (MST)	18:05
Analyzer make	Teledyne API T200u	Analyzer serial #	172

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999827
150.1	150.5	0.9970		
100.2	99.3	1.0091	Slope	0.994845
50.3	48.6	1.0340		
			Intercept	0.945587





Wood Buffalo Environmental Association

NO₂ Calibration Summary

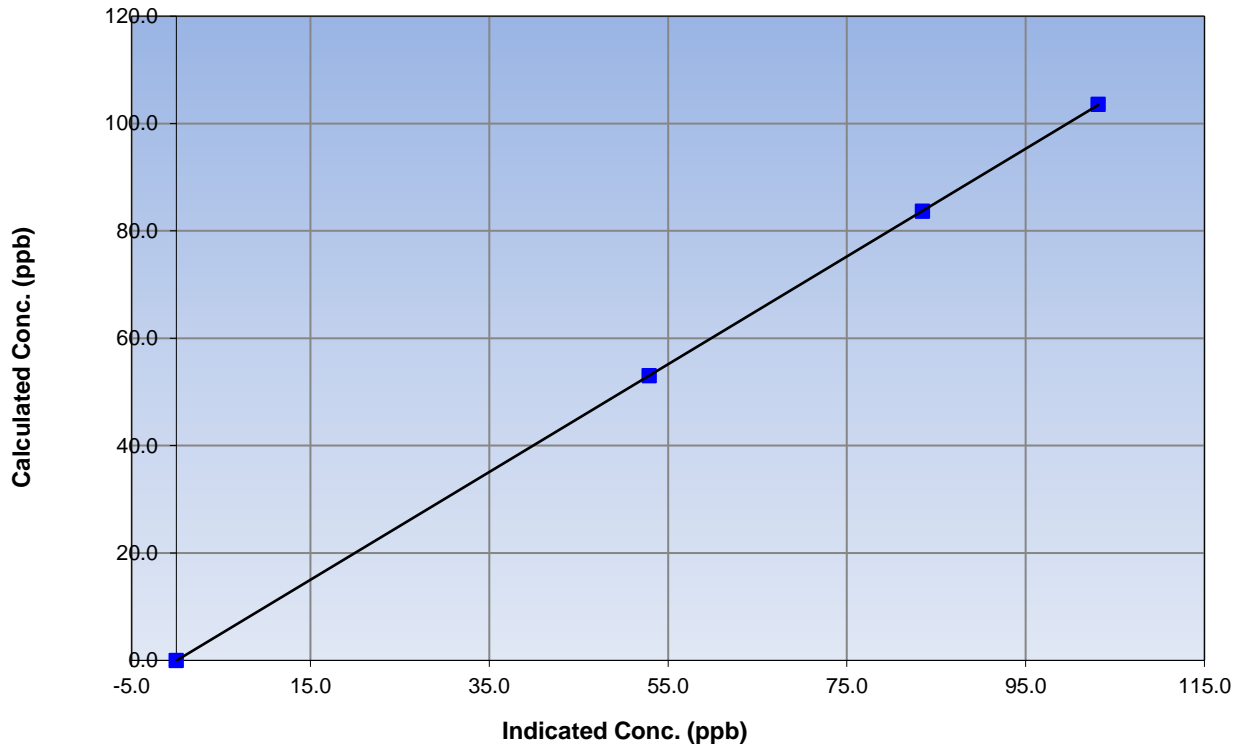
Station Information

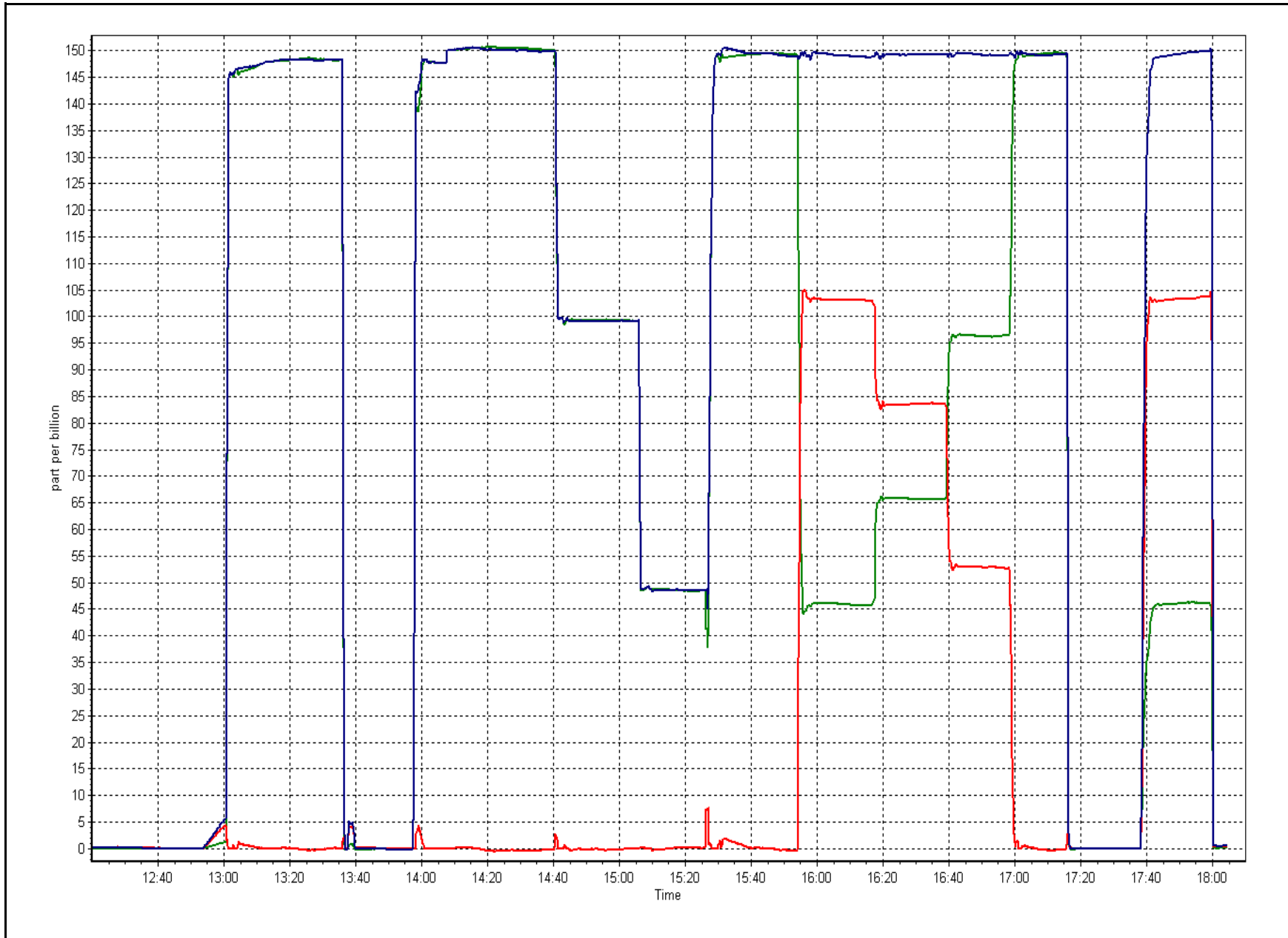
Calibration Date	July 12, 2016	Previous Calibration	June 14, 2016
Station Number	Fort Chipewyan	Station Number	AMS 8
Start Time (MST)	12:25	End Time (MST)	18:05
Analyzer make	Teledyne API T200u	Analyzer serial #	172

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	N/A	Correlation Coefficient	0.999997
103.6	103.1	1.0041		
83.7	83.5	1.0022	Slope	1.003647
53.1	52.9	1.0025		
			Intercept	-0.038413

NO₂ Calibration Curve







Wood Buffalo Environmental Association

SHARP CALIBRATION

STATION INFORMATION

Calibration Date:	July 13, 2016	Previous Calibration:	June 15, 2016
Station Name:	Fort Chipewyan	Station Number:	AMS 8
Start Time (MST):	6:51	End Time (MST):	8:20
Calibrator Make/Model:	Delta Cal	Calibrator Serial Number:	141228

SHARP INFORMATION

Particulate Fraction:	PM2.5
Make/Model:	Thermo / SHARP 5030
Serial Number:	E-2025
C ₁₄ Source SN:	7414
Confirmation of Time settings:	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Parameters Checked:	T1 <input checked="" type="checkbox"/> T2 <input type="checkbox"/> T3 <input type="checkbox"/> T4 <input type="checkbox"/> P3 <input checked="" type="checkbox"/> Main Flow <input checked="" type="checkbox"/> Beta <input type="checkbox"/> Neph <input checked="" type="checkbox"/>

CALIBRATION DATA

Temperature (°C)

Sensor	Indicated	Measured	Difference (Limit +/- 2.0°C)	Final Indicated
T1	15.0	15.4	0.4	15.0
T2	23.0	na	na	23.0
T3	21.0	na	na	21.0
T4	27.0	na	na	27.0
RH (%)	53.0	na	na	53.0

Pressure (Hpa)

Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	984	985.9	1.9	984

Main Flow (Lph)

Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1000	1010	10	1003	1000

Nephelometer Calibration

Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	142		142
Neph	0.1		0.1
C14	21.6		21.6
Indicated Concentration (ug/m3)	0.1	no	0.1
Offset 1	201.3		201.3
Offset 2	32.9		32.9

Leak Check (Quarterly)

Leak Check Date: _____ Previous Leak Check Date: March 10, 2016

Measured

Difference LPM (Limit +/- 0.42 LPM)

Flow without adaptor (LPM): _____ 0.00

*Flow with adaptor (LPM): _____

**Note - do not attach adaptor without shutting off the pump first*

Mass Foil Calibration (Annually)

Foil Calibration Date:	Previous Foil Calibration:
Zeroed?:	<u>April 5, 2016</u>
Foil Mass:	<u>Mass foil set S/N:</u>
Previous Correction Factor:	
New Correction Factor:	

INSPECTION DATA

Item	Condition	Date of install or rebuild
Cyclone	Good/Cleaned	13/07/2016
Pump	Good	NA
Filter Tape	Good	NA
Mass Foil Cal Set	Good	05/04/2016
HEPA filter	Good	15/06/2016

NOTES:

Nephelometer zero checked. T1 and P3 checked. Flow was adjusted.

Calibration Performed By: Devin Russell



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 9
BARGE LANDING
JULY 2016**

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

August 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BARGE LANDING (AMS 9)
 JULY 2016

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
TRS(ppb) Average	707	36	37	99.87	6	0	1	0
THC(ppm) Average	706	36	38	99.73	3.4	-	2.4	-
Temperature (C) Average	743	0	1	99.87	31.3	-	23.2	-
Relative Humidity (%) Average	743	0	1	99.87	99	-	94	-
Wind Speed 10 m (km/h) Average	743	0	1	99.87	16	-	9	-
Wind Direction 10 m (deg) Average	743	0	1	99.87	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BARGE LANDING (AMS 9)
 JULY 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile							
					Min	P10	Q1	Median	Q3	P90	Max	
TRS(ppb) Average	707	0.3	0	-	0	0	0	0	0	0	0	6
THC(ppm) Average	706	2.22	0.2	-	2	2.1	2.1	2.2	2.3	2.4	2.4	3.4
Temperature (C) Average	743	19.05	4.9	-	4.3	13.4	15.6	18.3	22.9	25.8	25.8	31.3
Relative Humidity (%) Average	743	68.3	20	-	22	40	51	71	86	94	94	99
Wind Speed 10 m (km/h) Average	743	5.4	3	-	0	2	4	5	7	9	9	16
Wind Direction 10 m (deg) Average	743	-	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BARGE LANDING (AMS 9)
JULY 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
ALL PARAMETERS	19 Jul 2016 11:00	19 Jul 2016 11:00	1	Maintenance - wiring/data logger upgrades
THC	26 Jul 2016 13:00	26 Jul 2016 14:00	2	Maintenance - sample manifold cleaned



Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 6 ppb on Jul 3 09:00	Maximum Daily Average: 0.8 ppb on Jul 3		Hours of Data:	707
Minimum Value: 0 ppb on Jul 4 17:00	Minimum Daily Average: 0.2 ppb on Jul 4		Hours of Missing Data:	37
Maximum Diurnal Average: 0.6 ppb at hour 9	Minimum Diurnal Average: 0.2 ppb at hour 16		Hours of Calibration:	36
Monthly Average: 0.3 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 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-Jul	0	0	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
2-Jul	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
3-Jul	0	0	0	0	0	Z	0	1	6	5	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.8	6
4-Jul	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
5-Jul	0	Z	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
6-Jul	0	0	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
7-Jul	0	0	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
8-Jul	0	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-Jul	1	1	0	0	1	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
10-Jul	0	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
11-Jul	0	Z	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
12-Jul	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
13-Jul	0	0	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
14-Jul	0	0	0	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
15-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
16-Jul	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
17-Jul	0	Z	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
18-Jul	0	0	Z	0	0	0	1	2	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.5	2
19-Jul	0	0	0	Z	0	0	1	0	0	0	M	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
20-Jul	0	1	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
21-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
22-Jul	0	0	0	0	1	1	Z	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
23-Jul	0	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
24-Jul	0	0	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
25-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
26-Jul	0	0	0	0	Z	1	0	1	1	C	C	C	C	C	0	0	0	0	0	0	0	0	0	1	0.4	1
27-Jul	1	1	1	1	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.4	1
28-Jul	1	2	2	1	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	2
29-Jul	0	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
30-Jul	0	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
31-Jul	0	1	1	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1

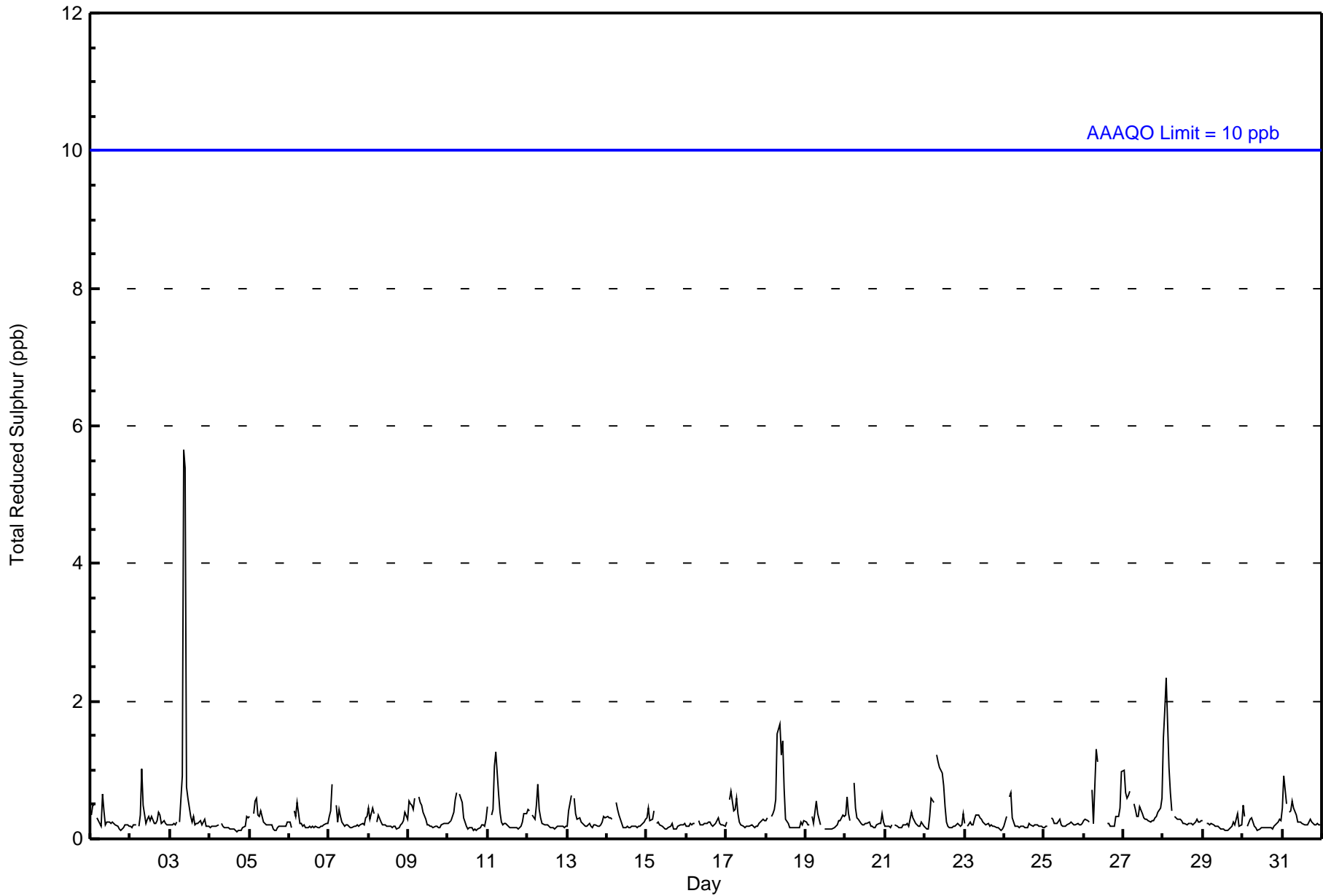
0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.6	0.5	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	Diurnal Average
1	2	2	1	1	1	1	1	2	6	5	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	Diurnal Maximum	

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 - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Reduced Sulphur (TRS) - ppb
Barge Landing - July 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	705	99.72	99.72
3 - 4	0	0.00	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: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb
Barge Landing - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	94	47	31	27	20	19	41	44	39	38	53	49	36	21	45	101	705
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	1	0	0	0	0	0	1	0	0	2
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	94	47	31	27	20	19	41	45	39	38	53	49	36	22	45	101	707

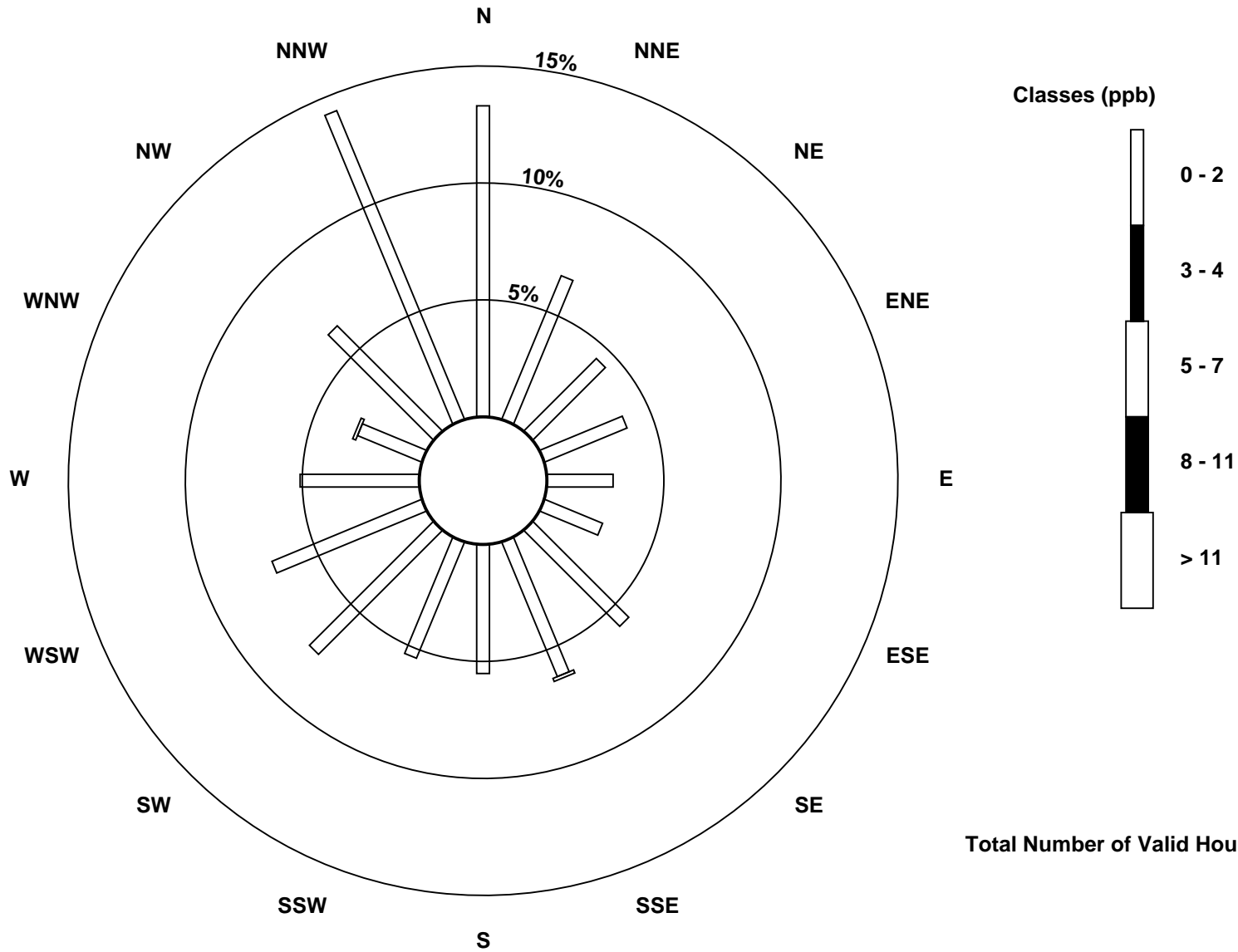
Total Number of Valid Hours: 707

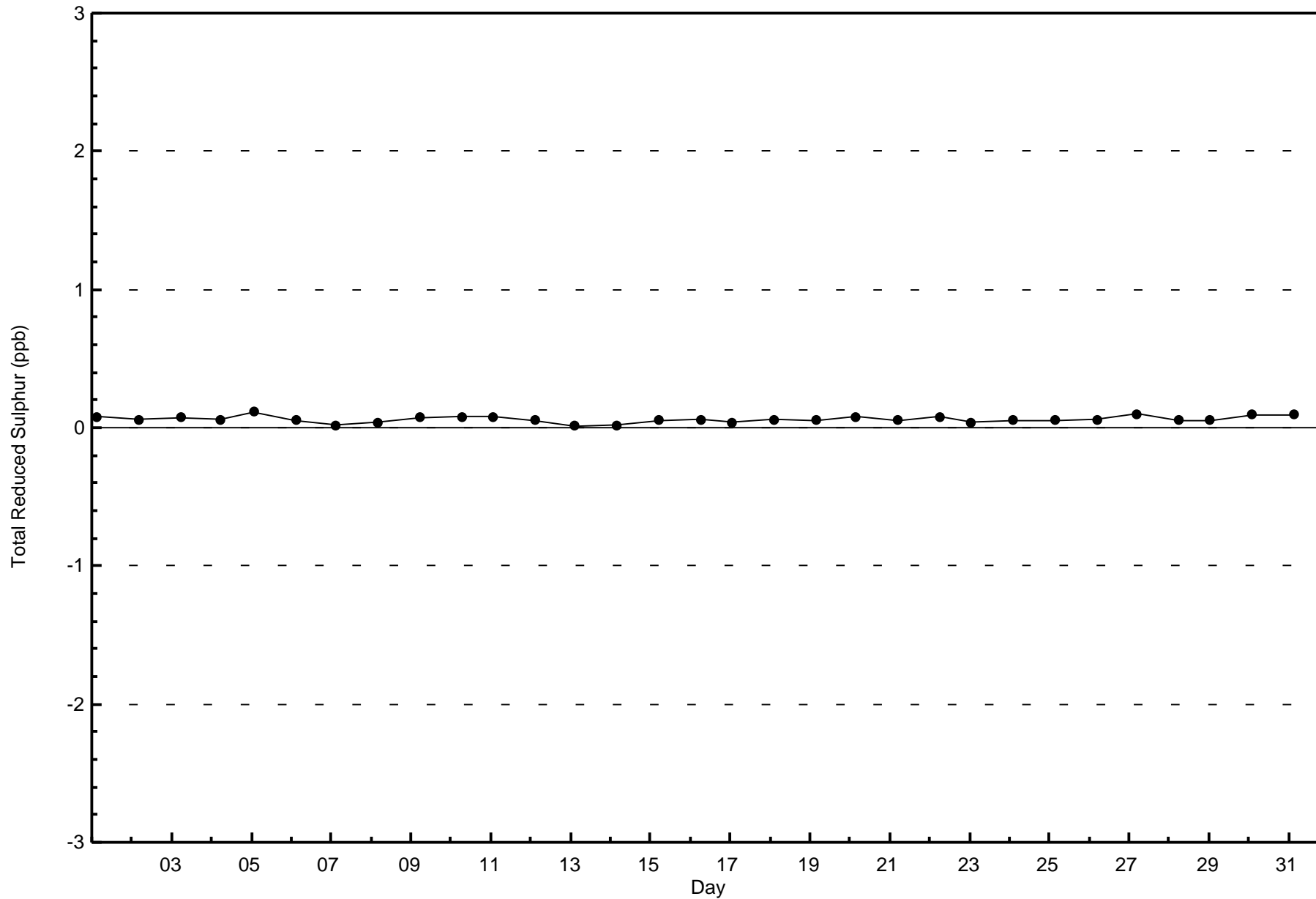
Total Number of Hours: 744

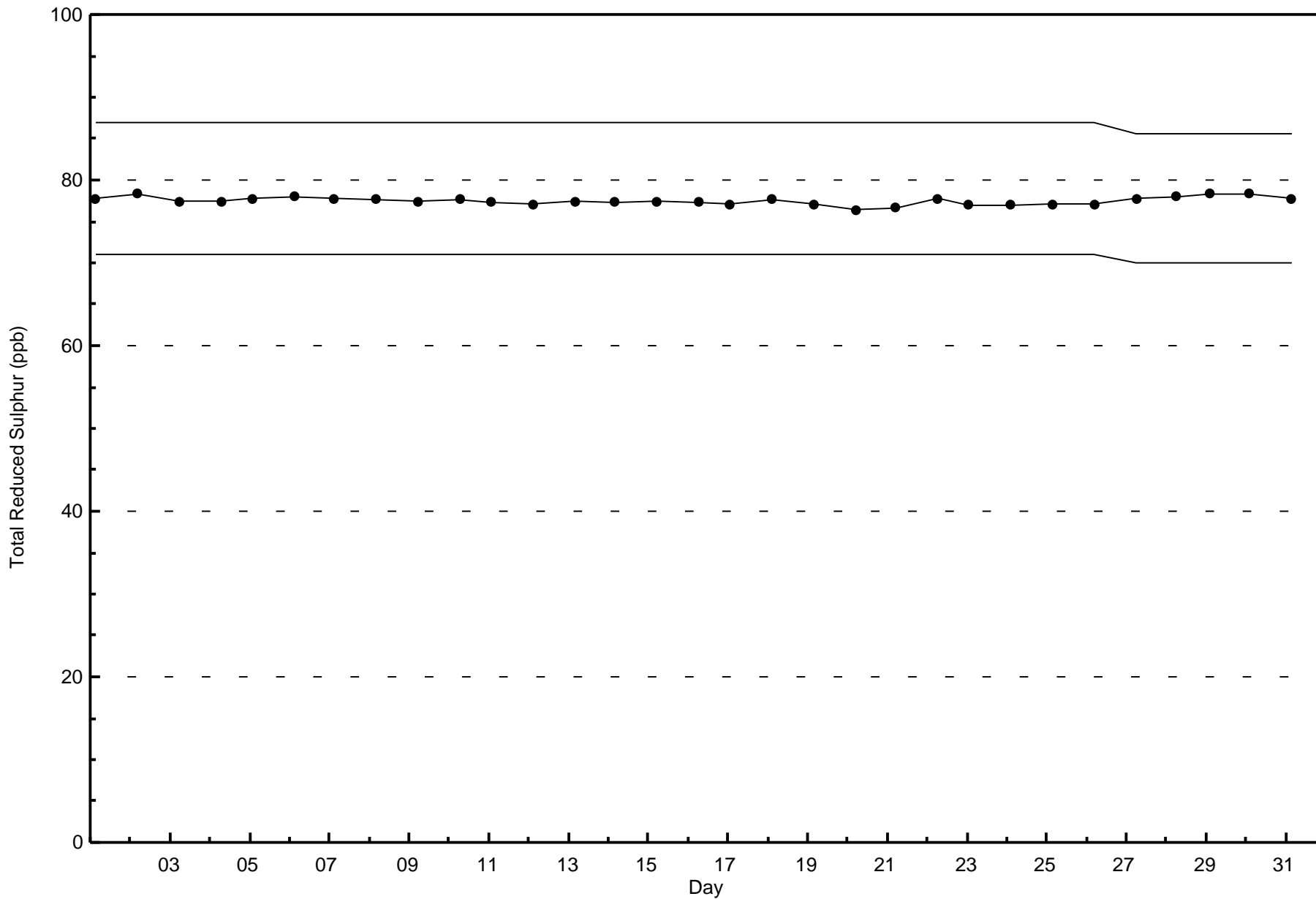


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Total Reduced Sulphur (TRS) - ppb
Barge Landing (AMS 9)









Wood Buffalo Environmental Association

Summary of Hour Averages

Total Hydrocarbons (THC) - ppm

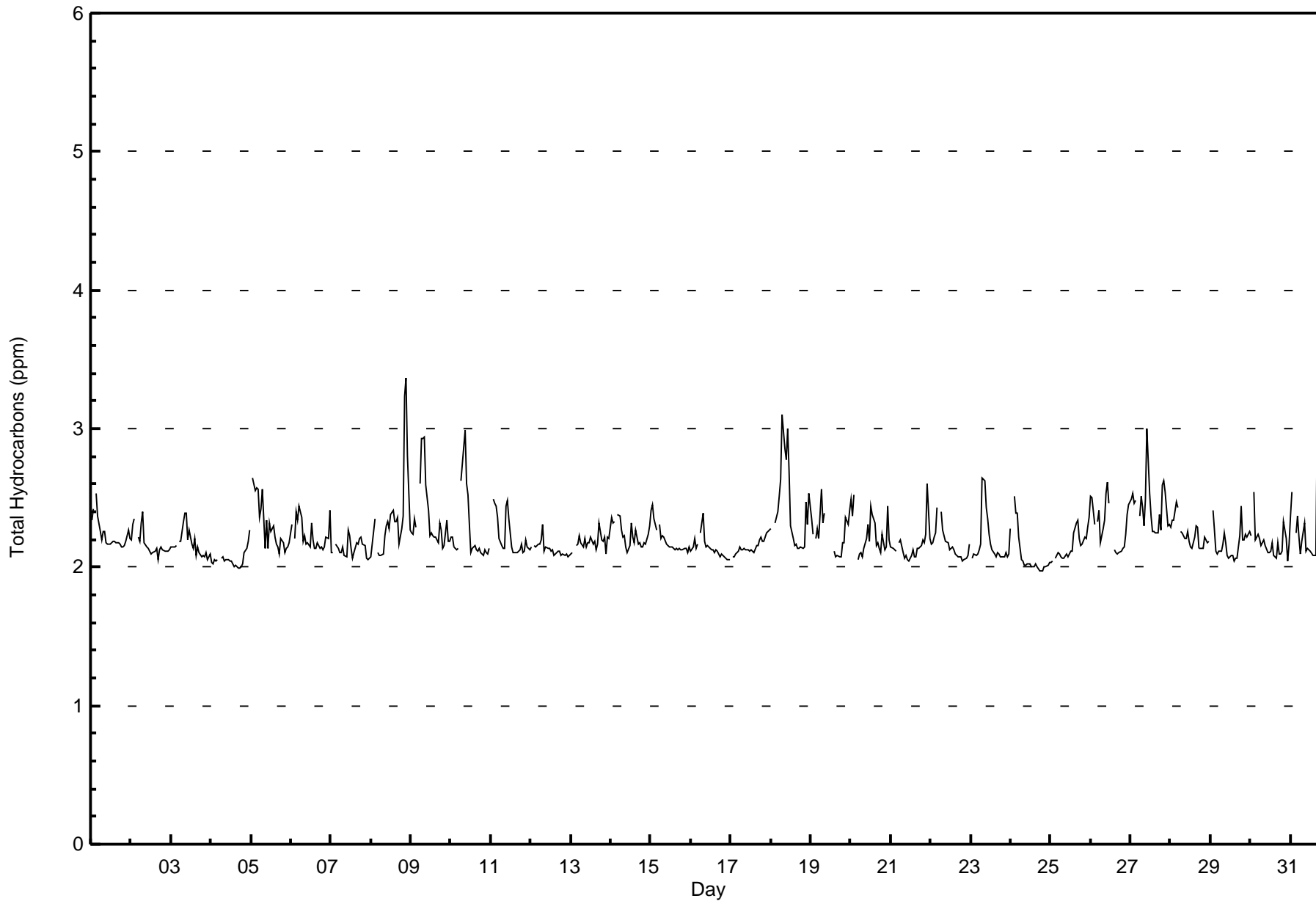
Barge Landing - July 2016

Maximum Value: 3.4 ppm on Jul 8 22:00																	Maximum Daily Average: 2.4 ppm on Jul 27										Hours in Service: 744	
Minimum Value: 2.0 ppm on Jul 24 20:00																	Minimum Daily Average: 2.1 ppm on Jul 4										Hours of Data: 706	
Maximum Diurnal Average: 2.3 ppm at hour 8																	Minimum Diurnal Average: 2.1 ppm at hour 16										Hours of Missing Data: 38	
Monthly Average: 2.22 ppm																	Percentiles: P ₁ = 2.0 P ₁₀ = 2.1 Q ₁ = 2.1 Median = 2.2 Q ₃ = 2.3 P ₉₀ = 2.4 P ₉₉ = 3.0										Hours of Calibration: 36	
																											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-Jul	2.3	2.4	Z	2.5	2.4	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	2.1	2.1	2.2	2.2	2.3	2.2	2.2	2.5		
2-Jul	2.2	2.3	Z	Z	2.2	2.2	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	2.1	2.1	2.1	2.1	2.1	2.4		
3-Jul	2.1	2.1	2.1	2.2	Z	2.2	2.2	2.3	2.4	2.4	2.2	2.3	2.2	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.4		
4-Jul	2.0	2.0	2.1	2.0	2.1	Z	2.1	2.1	2.0	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.2	2.3	2.3		
5-Jul	Z	2.6	2.6	2.6	2.6	2.4	2.4	2.6	2.1	2.3	2.1	2.3	2.3	2.2	2.2	2.2	2.2	2.1	2.2	2.2	2.1	2.1	2.1	2.2	2.6			
6-Jul	2.3	Z	2.2	2.4	2.3	2.4	2.4	2.2	2.2	2.2	2.2	2.1	2.3	2.2	2.1	2.1	2.2	2.1	2.1	2.1	2.1	2.2	2.2	2.4	2.4			
7-Jul	2.1	2.1	Z	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.3	2.2	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.3			
8-Jul	2.1	2.2	2.3	Z	2.1	2.1	2.1	2.1	2.2	2.3	2.3	2.3	2.4	2.4	2.3	2.3	2.4	2.2	2.3	2.4	3.2	3.4	2.8	2.3	3.4			
9-Jul	2.2	2.2	2.3	2.3	Z	2.6	2.9	2.9	2.9	2.6	2.4	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.1	2.2	2.3	2.2	2.9			
10-Jul	2.2	2.2	2.1	2.1	2.1	Z	2.6	2.7	3.0	2.6	2.5	2.3	2.1	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	3.0			
11-Jul	Z	2.5	2.5	2.4	2.4	2.2	2.2	2.1	2.1	2.4	2.5	2.4	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.2	2.1	2.5			
12-Jul	2.1	Z	2.2	2.1	2.2	2.2	2.2	2.3	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.3			
13-Jul	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	2.2	2.2	2.1	2.2	2.3	2.2	2.2	2.2	2.1	2.2	2.2	2.3			
14-Jul	2.4	2.3	2.3	Z	2.4	2.4	2.3	2.2	2.2	2.1	2.1	2.2	2.3	2.2	2.2	2.3	2.2	2.2	2.2	2.1	2.1	2.2	2.2	2.3	2.4			
15-Jul	2.4	2.5	2.3	2.3	Z	2.3	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.5			
16-Jul	2.1	2.1	2.2	2.1	2.2	Z	2.2	2.4	2.2	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.4			
17-Jul	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	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3			
18-Jul	2.3	Z	2.3	2.4	2.4	2.5	2.6	3.1	2.9	2.8	3.0	2.7	2.3	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.5	2.3	2.5	3.1			
19-Jul	2.3	2.2	Z	2.2	2.3	2.2	2.6	2.3	2.4	C	C	C	C	C	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.4	2.3	2.4	2.6			
20-Jul	2.5	2.4	2.5	Z	2.1	2.1	2.1	2.1	2.1	2.2	2.3	2.2	2.4	2.4	2.3	2.2	2.2	2.2	2.1	2.1	2.2	2.1	2.1	2.4	2.5			
21-Jul	2.1	2.1	2.1	2.1	Z	2.2	2.2	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.6	2.6			
22-Jul	2.2	2.2	2.2	2.2	2.4	Z	2.4	2.3	2.2	2.2	2.2	2.1	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.1	2.4			
23-Jul	Z	2.1	2.1	2.1	2.1	2.1	2.2	2.6	2.6	2.4	2.4	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	2.6			
24-Jul	2.3	Z	2.5	2.4	2.4	2.2	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.5			
25-Jul	2.0	2.0	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.3	2.3	2.2	2.2	2.2	2.2	2.3	2.4	2.4	2.4			
26-Jul	2.5	2.5	2.3	Z	2.3	2.4	2.2	2.3	2.3	2.5	2.6	2.5	M	M	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.4	2.5	2.6			
27-Jul	2.5	2.5	2.5	2.5	Z	2.4	2.5	2.4	2.3	2.5	3.0	2.5	2.4	2.3	2.3	2.2	2.3	2.4	2.3	2.6	2.6	2.5	2.3	2.3	3.0			
28-Jul	2.3	2.3	2.3	2.5	2.4	Z	2.3	2.2	2.2	2.2	2.3	2.2	2.1	2.1	2.2	2.3	2.3	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.5			
29-Jul	Z	2.4	2.3	2.1	2.1	2.1	2.1	2.2	2.3	2.2	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.2	2.4	2.2	2.2	2.2	2.2	2.3	2.4			
30-Jul	2.2	Z	2.5	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.2	2.1	2.1	2.2	2.1	2.1	2.1	2.3	2.2	2.0	2.2	2.5			
31-Jul	2.4	2.5	Z	2.2	2.4	2.2	2.1	2.2	2.3	2.1	2.1	2.1	2.1	2.1	2.1	2.1	3.0	2.9	2.4	2.1	2.1	2.0	2.0	2.0	3.0			
																								Diurnal Average				
																								Diurnal Maximum				
Z - zerospan C - Calibration M - Maintenance																												



Wood Buffalo Environmental Association
Hourly Averages

Total Hydrocarbons (THC) - ppm
Barge Landing - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Barge Landing - July 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	40	5.67	5.67
2.1 - 3.0	663	93.91	99.58
3.1 - 10.0	3	0.42	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
Barge Landing - July 2016**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	1	0	0	0	0	0	0	2	0	2	5	12	9	4	3	2	40
2.1 - 3.0	93	46	29	27	20	16	40	46	39	36	49	35	25	18	43	101	663
3.1 - 10.0	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	3
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	94	46	31	27	20	16	40	48	40	38	54	47	34	22	46	103	706

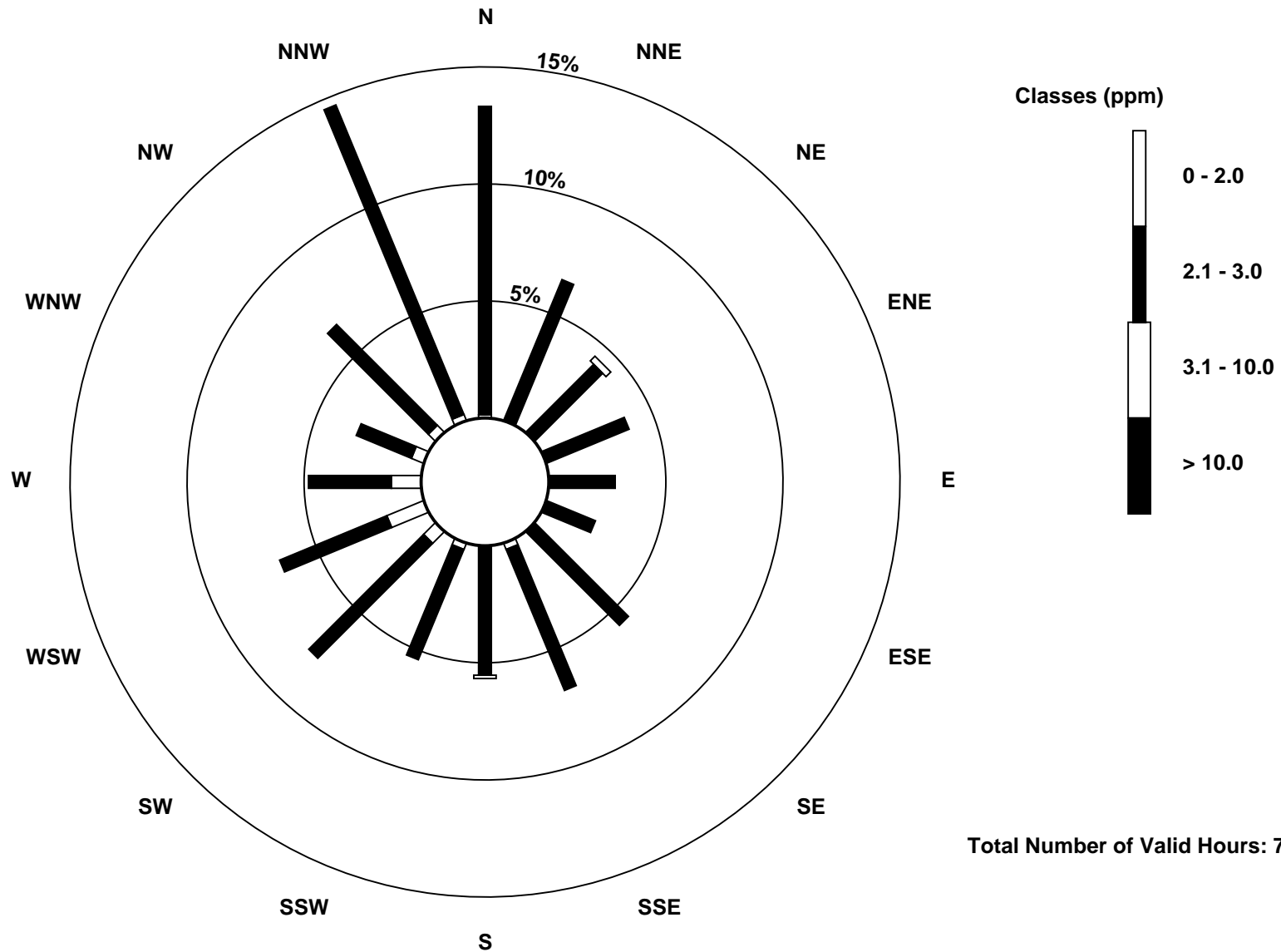
Total Number of Valid Hours: 706

Total Number of Hours: 744

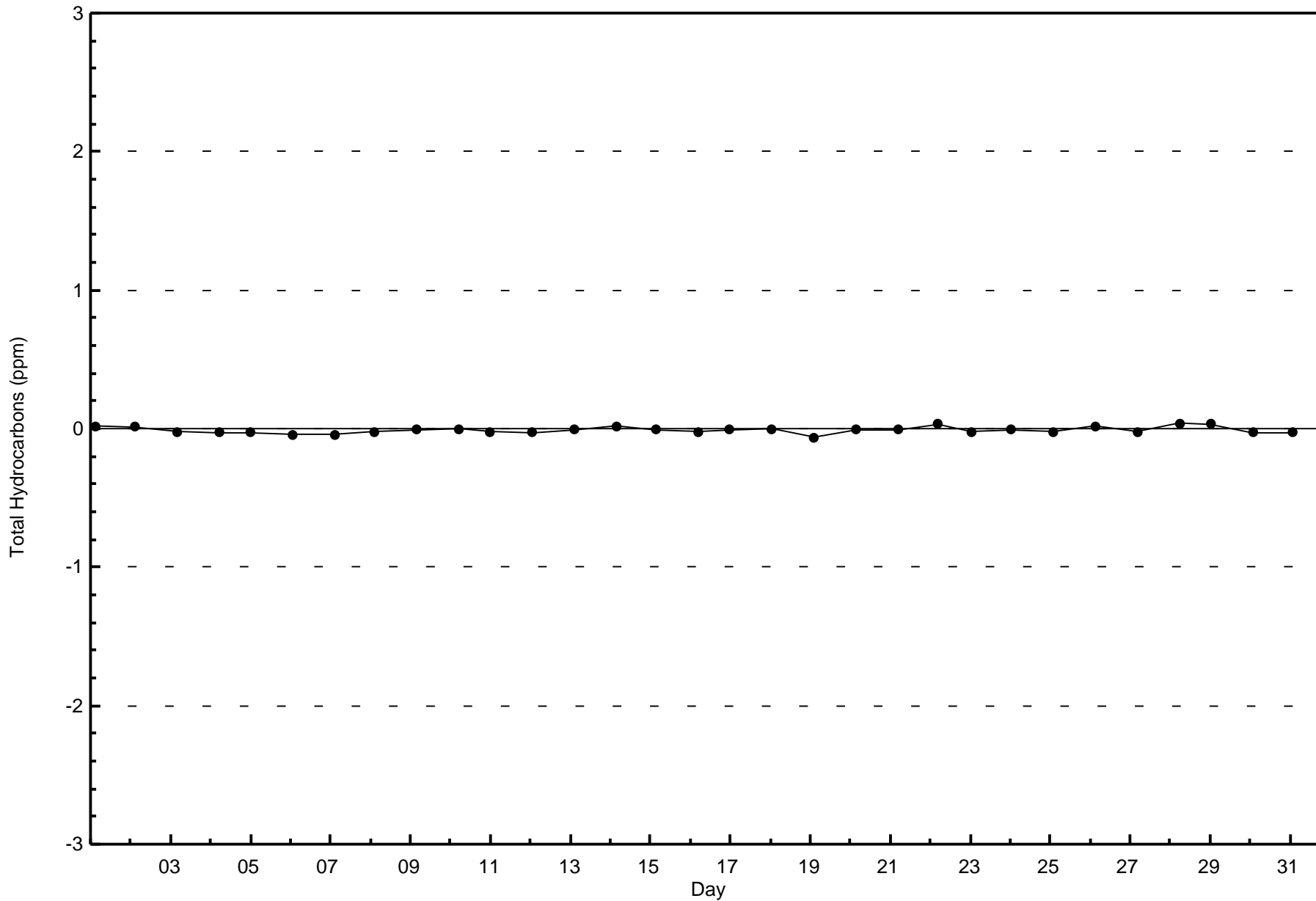


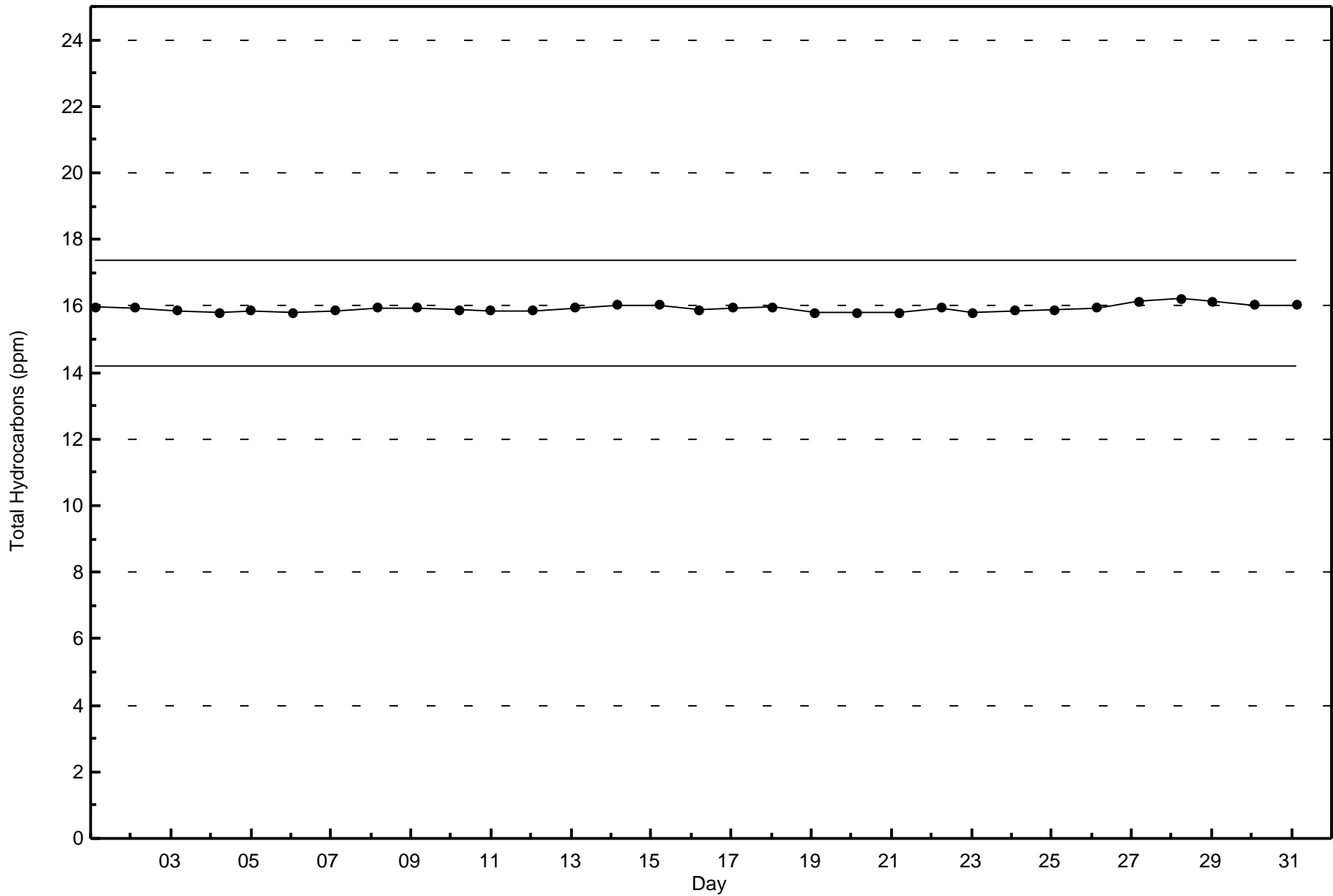
Wood Buffalo Environmental Association
Wind Rose Jul 2016

Total Hydrocarbons (THC) - ppm
Barge Landing (AMS 9)



Total Number of Valid Hours: 706







Wood Buffalo Environmental Association

Summary of Hour Averages

Ambient Temperature (AT) - C

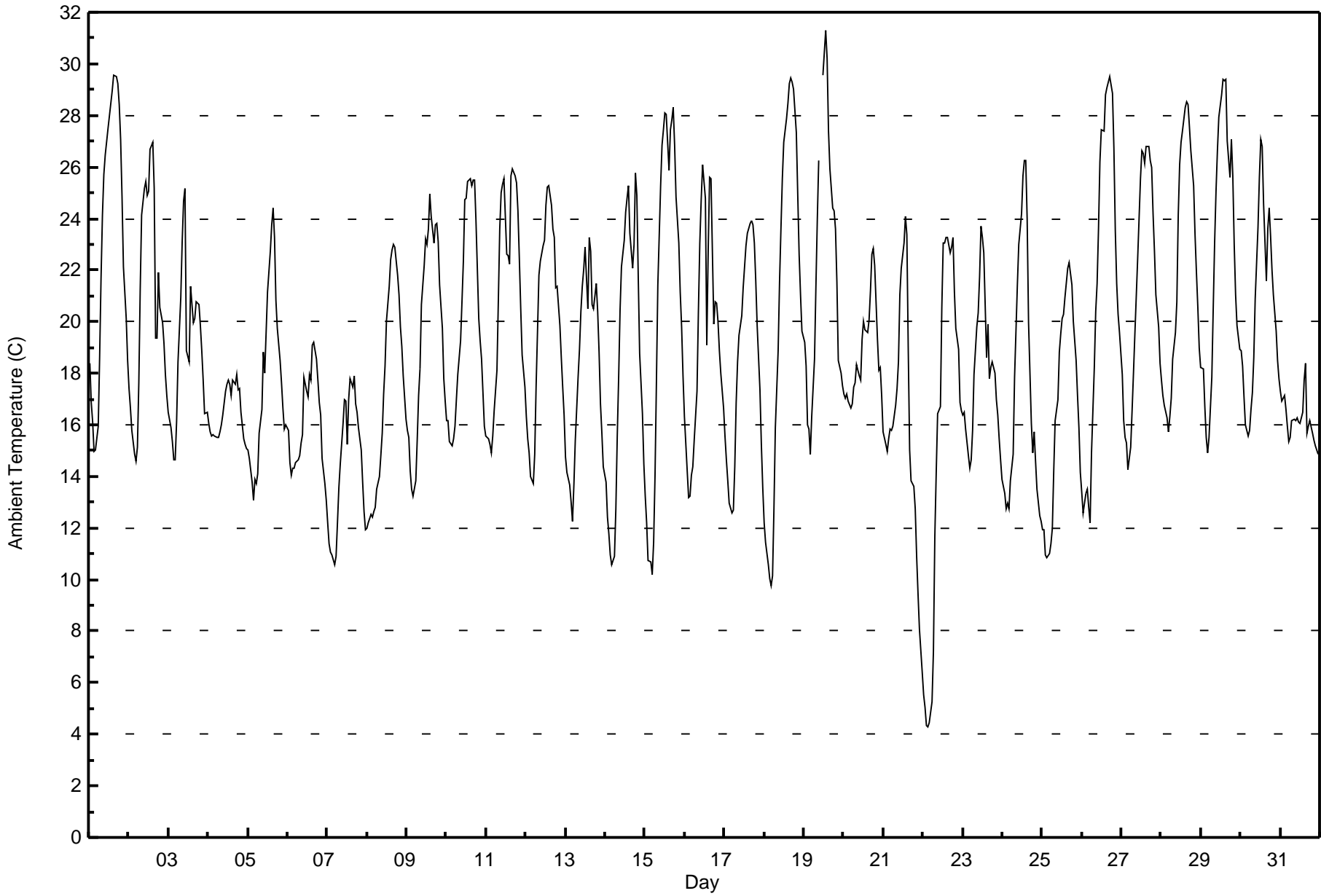
Barge Landing - July 2016

Maximum Value: 31.3 C on Jul 19 14:00		Maximum Daily Average: 23.2 C on Jul 1		Hours in Service: 744																							
Minimum Value: 4.3 C on Jul 22 04:00		Minimum Daily Average: 14.4 C on Jul 7		Hours of Data: 743																							
Maximum Diurnal Average: 23.9 C at hour 15		Minimum Diurnal Average: 13.5 C at hour 5		Hours of Missing Data: 1																							
Monthly Average: 19.05 C		Percentiles: P ₁ = 7.2 P ₁₀ = 13.4 Q ₁ = 15.6 Median = 18.3 Q ₃ = 22.9 P ₉₀ = 25.8 P ₉₉ = 29.5		Hours of Calibration: 0																							
				Percent Operational Time: 99.9																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Jul	18.4	16.9	16.1	15.0	15.0	16.0	18.7	21.7	24.1	25.7	26.5	27.5	28.0	28.5	29.0	29.6	29.5	29.2	28.4	27.1	24.8	22.1	20.1	18.5	23.2	29.6	
2-Jul	17.4	16.7	15.8	14.8	14.6	15.1	17.6	21.2	24.1	25.2	25.4	24.9	25.0	26.7	27.0	25.2	19.4	19.4	21.9	20.6	19.9	19.2	17.9	17.1	20.5	27.0	
3-Jul	16.5	15.9	15.4	14.6	14.6	16.1	18.4	20.9	23.1	24.7	25.2	18.9	18.5	21.4	20.7	20.0	20.1	20.8	20.7	19.9	18.9	17.8	16.5	16.5	19.0	25.2	
4-Jul	16.1	15.7	15.6	15.6	15.5	15.5	15.5	15.7	16.0	16.4	17.3	17.6	17.7	17.5	17.1	17.7	17.6	18.0	17.4	17.4	16.5	15.4	15.2	15.1	16.5	18.0	
5-Jul	15.0	14.7	13.8	13.1	13.9	13.7	14.1	15.7	16.6	18.8	18.0	19.6	21.2	22.7	23.8	24.4	23.3	20.8	19.8	18.5	17.6	16.6	15.8	16.0	17.8	24.4	
6-Jul	15.8	14.5	14.0	14.3	14.3	14.5	14.6	14.8	15.3	15.6	17.8	17.3	17.1	18.0	17.7	19.1	19.2	18.6	17.8	16.9	16.4	14.7	13.7	13.0	16.0	19.2	
7-Jul	12.2	11.4	11.1	11.0	10.6	10.9	12.2	13.6	14.5	16.1	17.0	16.9	15.3	16.9	17.8	17.5	17.9	16.8	16.5	15.9	15.0	13.8	12.7	11.9	14.4	17.9	
8-Jul	12.0	12.2	12.5	12.4	12.6	12.8	13.5	14.0	14.8	15.7	17.2	18.3	20.0	21.4	22.4	22.8	23.0	22.9	21.8	21.0	19.8	19.0	17.9	16.2	17.3	23.0	
9-Jul	15.8	15.5	14.2	13.5	13.2	13.8	15.4	17.1	18.2	20.7	22.2	23.2	23.0	23.6	25.0	24.1	23.0	23.8	23.8	23.1	21.4	19.7	17.8	16.9	19.5	25.0	
10-Jul	16.1	16.2	15.4	15.2	15.5	16.0	17.0	17.9	19.2	20.8	22.4	24.7	24.8	25.4	25.5	25.3	25.5	25.5	23.9	20.1	19.2	18.5	17.2	16.0	20.1	25.5	
11-Jul	15.6	15.5	15.3	14.9	15.6	16.5	18.1	20.8	23.6	25.0	25.3	25.5	22.6	22.6	22.2	25.7	25.9	25.6	25.4	24.3	22.4	20.5	18.7	17.5	21.1	25.9	
12-Jul	16.3	15.5	14.9	14.0	13.7	14.8	17.5	19.7	21.8	22.4	22.9	23.2	24.5	25.2	25.3	24.5	23.6	23.3	21.3	21.4	19.9	18.6	17.5	16.4	19.9	25.3	
13-Jul	14.8	14.2	13.7	13.0	12.2	13.6	15.4	17.8	19.0	20.4	21.4	22.0	22.9	20.5	23.3	22.7	20.7	20.5	21.5	20.4	18.8	16.8	15.7	14.4	18.1	23.3	
14-Jul	13.8	12.4	11.8	11.0	10.6	10.9	12.7	15.5	17.9	20.4	22.1	23.2	24.3	24.8	25.3	23.4	22.1	23.0	25.8	24.9	21.8	18.7	16.4	14.5	18.6	25.8	
15-Jul	13.3	12.2	10.7	10.7	10.2	11.4	14.0	17.7	21.4	25.3	26.9	27.4	28.1	28.0	25.9	27.5	27.8	28.3	26.8	24.9	23.1	21.2	19.8	17.9	20.8	28.3	
16-Jul	16.3	14.2	13.2	13.3	14.0	14.4	15.4	17.3	20.4	23.0	24.7	26.1	24.8	19.1	22.8	25.6	25.6	19.9	20.8	20.7	20.0	18.9	18.0	16.6	19.4	26.1	
17-Jul	15.6	14.6	13.8	13.0	12.6	12.7	14.4	16.8	18.4	19.5	20.2	21.3	22.1	22.9	23.4	23.8	23.9	23.8	23.0	21.6	19.8	17.4	15.3	13.5	18.5	23.9	
18-Jul	12.2	11.5	10.6	10.0	9.8	10.1	12.8	15.9	18.9	21.5	23.6	25.5	27.0	27.9	28.5	29.2	29.4	29.3	29.0	27.3	24.9	22.6	21.0	19.6	20.8	29.4	
19-Jul	19.2	18.3	16.0	15.8	14.9	16.3	18.6	21.4	24.0	26.2	M	29.5	30.4	31.3	30.2	27.4	26.0	24.4	24.3	23.6	21.5	18.5	18.0	17.5	22.3	31.3	
20-Jul	17.2	17.0	17.2	16.9	16.7	16.8	17.5	17.6	18.3	17.9	17.7	19.3	20.0	19.7	19.6	20.1	21.2	22.6	22.9	22.2	19.3	18.1	18.2	17.1	18.8	22.9	
21-Jul	15.7	15.2	14.9	15.4	15.9	15.8	15.9	16.8	17.4	18.4	21.1	22.1	23.0	24.1	23.4	18.9	15.0	13.9	13.6	12.7	10.9	9.4	8.1	6.4	16.0	24.1	
22-Jul	5.5	5.0	4.3	4.3	4.5	5.3	7.2	11.7	14.2	16.5	16.7	20.5	23.1	23.1	23.3	23.3	22.6	22.9	23.3	21.2	19.8	18.9	16.9	16.5	15.4	23.3	
23-Jul	16.4	16.5	15.8	14.8	14.3	14.6	15.8	17.9	19.8	20.3	21.8	23.7	23.2	22.7	18.6	19.9	17.8	18.2	18.5	18.0	17.0	16.4	15.5	14.7	18.0	23.7	
24-Jul	13.9	13.3	12.8	12.9	12.7	13.8	14.9	17.8	19.7	21.4	23.0	24.2	25.6	26.3	26.2	24.0	19.9	16.1	14.9	15.7	14.6	13.5	12.5	12.3	17.6	26.3	
25-Jul	11.9	12.0	11.0	10.9	11.0	11.4	12.0	14.2	16.1	17.0	18.8	19.5	20.1	20.3	21.0	22.1	22.3	21.9	21.4	20.0	18.5	17.1	15.9	14.1	16.7	22.3	
26-Jul	13.4	12.6	13.3	13.5	12.8	12.2	14.9	18.2	20.4	21.5	23.6	26.2	27.4	27.4	28.8	29.1	29.3	29.5	28.8	26.7	23.5	21.5	20.3	19.6	21.4	29.5	
27-Jul	17.9	16.2	15.5	15.3	14.2	15.1	16.5	18.0	19.5	21.0	22.5	25.5	26.6	26.5	26.1	26.8	26.8	26.2	26.0	24.2	22.7	21.0	19.8	18.4	21.2	26.8	
28-Jul	17.7	17.1	16.7	16.3	15.7	16.4	17.0	18.6	19.6	20.8	24.2	26.1	27.0	27.4	28.3	28.5	28.4	27.6	26.7	25.3	23.4	21.9	20.5	19.0	22.1	28.5	
29-Jul	18.2	18.2	16.7	15.5	14.9	15.5	17.8	20.5	23.1	25.1	26.6	27.9	28.8	29.4	29.3	29.4	27.0	25.6	27.1	25.7	23.0	21.0	19.8	18.9	22.7	29.4	
30-Jul	18.9	18.3	17.1	16.0	15.6	15.8	16.6	17.2	18.6	20.9	23.7	25.6	27.0	26.8	24.6	21.6	23.6	24.4	23.3	22.0	21.0	19.6	18.5	17.8	20.6	27.0	
31-Jul	17.3	16.9	17.1	16.6	16.0	15.4	15.5	16.1	16.2	16.2	16.3	16.1	16.1	16.5	17.8	18.4	15.7	15.9	16.2	15.7	15.4	15.2	15.0	14.9	16.2	18.4	
		15.4	14.7	14.1	13.7	13.5	14.0	15.4	17.4	19.2	20.7	21.7	22.9	23.4	23.7	23.9	23.8	23.0	22.5	22.3	21.3	19.7	18.2	17.0	16.0	Diurnal Average	
		19.2	18.3	17.2	16.9	16.7	18.7	21.7	24.1	26.2	26.9	29.5	30.4	31.3	30.2	29.6	29.5	29.5	29.0	27.3	24.9	22.6	21.0	19.6	Diurnal Maximum		
M - Maintenance																											



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature (AT) - C
Barge Landing - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Barge Landing - July 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	11	1.48	1.48
10 - 20	438	58.95	60.43
> 20	294	39.57	100.00

Total Number of Valid Hours: 743

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

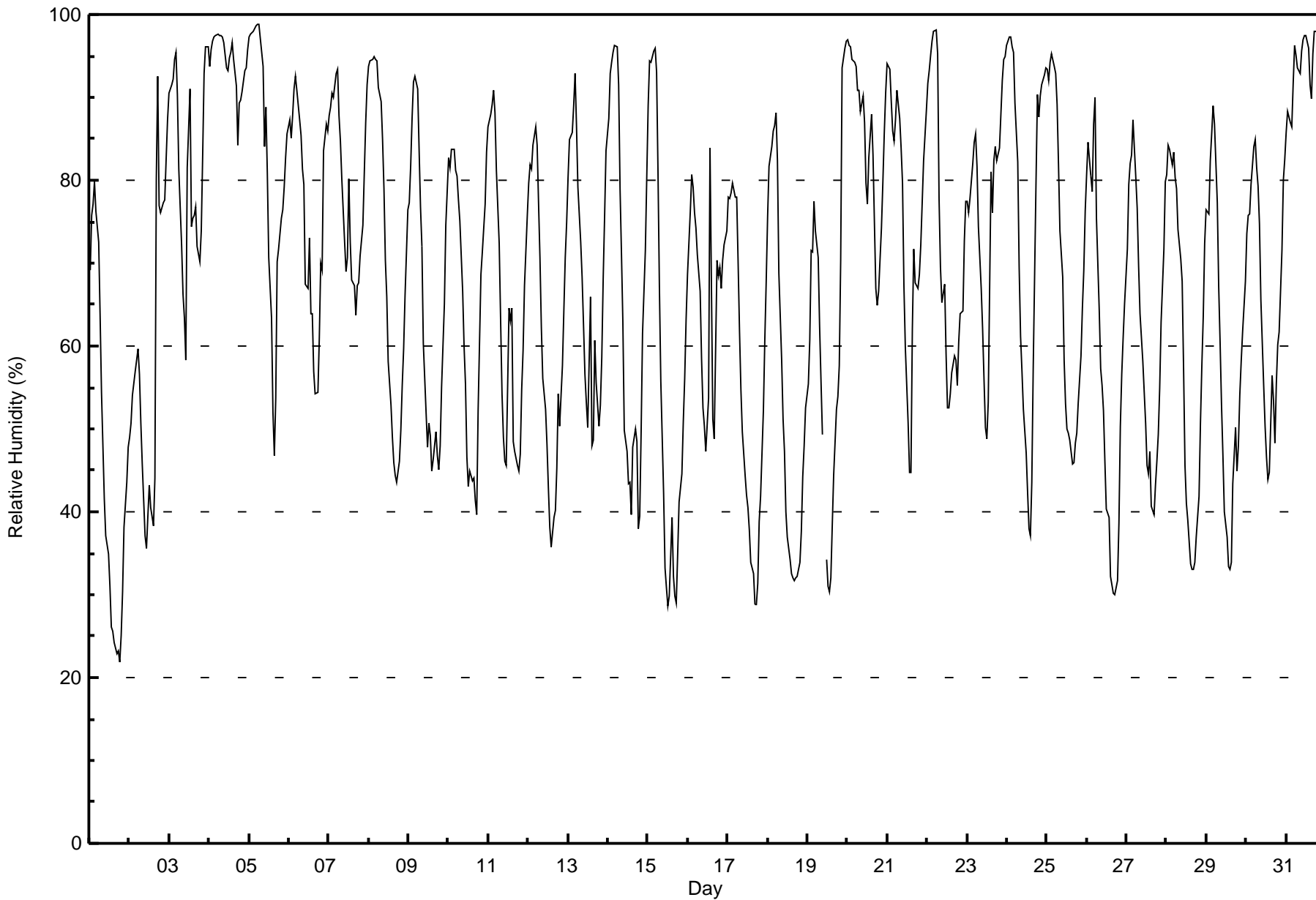
Barge Landing - July 2016

Maximum Value: 99 % on Jul 5 07:00		Maximum Daily Average: 94.3 % on Jul 4		Hours in Service: 744																								
Minimum Value: 22 % on Jul 1 19:00		Minimum Daily Average: 45.4 % on Jul 1		Hours of Data: 743																								
Maximum Diurnal Average: 88.1 % at hour 5		Minimum Diurnal Average: 50.6 % at hour 16		Hours of Missing Data: 1																								
Monthly Average: 68.3 %		Percentiles: P ₁ = 29 P ₁₀ = 40 Q ₁ = 51 Median = 71 Q ₃ = 86 P ₉₀ = 94 P ₉₉ = 98		Hours of Calibration: 0																								
				Percent Operational Time: 99.9																								
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24				
1-Jul	69	76	77	80	76	73	64	54	48	41	37	35	31	26	26	24	23	23	22	25	30	38	44	48	45.4	80		
2-Jul	49	51	54	57	58	60	57	51	46	37	36	40	43	41	38	44	80	93	77	76	77	78	82	87	58.8	93		
3-Jul	91	92	92	95	95	90	81	72	66	63	58	81	91	74	75	76	77	72	70	74	83	93	96	96	81.5	96		
4-Jul	94	96	97	97	98	98	98	97	97	97	94	93	95	95	97	95	91	84	89	90	91	93	94	96	94.3	98		
5-Jul	97	98	98	98	99	99	99	99	97	94	84	89	81	71	63	52	47	54	70	72	75	76	79	83	86	81.7	99	
6-Jul	87	85	88	91	93	91	87	85	81	79	67	67	73	64	64	57	54	54	61	70	69	84	87	86	76.1	93		
7-Jul	88	89	90	90	93	93	88	85	80	73	69	71	80	73	68	67	64	67	68	71	75	81	87	92	79.2	93		
8-Jul	94	94	95	95	95	94	91	90	85	79	70	66	58	53	49	46	44	44	46	50	55	60	66	76	70.6	95		
9-Jul	77	82	87	92	93	91	84	77	72	60	52	48	51	49	45	46	50	47	45	48	55	65	75	79	65.3	93		
10-Jul	83	81	84	84	81	81	78	75	67	60	55	47	43	45	44	44	41	40	52	69	71	74	77	83	64.9	84		
11-Jul	86	88	89	91	88	81	72	63	54	49	46	46	65	63	65	49	47	46	45	47	55	59	67	76	64.1	91		
12-Jul	80	82	81	84	86	84	77	71	62	56	52	48	43	38	36	39	40	45	54	50	58	64	71	75	61.6	86		
13-Jul	80	85	86	89	93	87	79	73	68	62	57	53	50	66	48	49	61	56	50	53	59	68	76	84	67.9	93		
14-Jul	88	93	94	95	96	96	92	79	71	63	50	47	43	44	40	48	50	48	38	40	50	61	72	80	65.7	96		
15-Jul	89	94	94	96	96	93	81	67	56	42	33	31	29	30	39	32	30	29	35	41	45	51	56	63	56.4	96		
16-Jul	69	76	81	79	76	74	71	67	58	53	50	47	54	84	68	51	49	70	68	69	67	70	72	74	66.6	84		
17-Jul	78	78	78	80	78	78	70	62	55	50	44	42	41	38	34	33	29	29	31	39	42	52	61	68	53.6	80		
18-Jul	76	82	84	86	87	88	82	69	58	51	47	40	37	34	33	32	32	32	32	34	38	44	48	53	54.1	88		
19-Jul	55	61	71	71	77	74	71	62	56	49	M	34	31	30	32	38	44	52	54	58	70	93	96	97	60.0	97		
20-Jul	97	96	96	95	94	94	91	91	88	90	87	80	77	83	88	83	75	67	65	67	74	80	86	91	84.7	97		
21-Jul	94	93	90	86	85	87	91	88	84	80	67	60	51	45	45	62	72	68	67	69	72	77	82	88	75.1	94		
22-Jul	92	93	95	97	98	98	95	78	70	65	67	59	53	52	54	57	59	58	55	61	64	64	73	78	72.3	98		
23-Jul	77	76	78	82	85	86	82	74	67	62	56	50	49	53	81	76	82	84	82	84	88	92	95	95	76.5	95		
24-Jul	96	97	97	96	95	89	82	69	61	57	52	47	42	38	37	44	57	80	90	88	90	91	93	94	74.4	97		
25-Jul	93	92	94	95	94	93	89	82	74	68	58	53	50	49	49	46	46	48	49	53	59	65	69	76	68.6	95		
26-Jul	81	84	81	79	87	90	75	64	57	55	52	46	40	39	32	31	30	30	32	39	50	57	61	65	56.6	90		
27-Jul	72	79	82	83	87	80	77	70	64	61	58	51	46	45	47	41	40	43	46	49	55	63	72	80	62.1	87		
28-Jul	81	84	84	82	83	80	79	74	70	68	57	46	41	39	34	33	33	34	37	42	51	58	64	72	59.4	84		
29-Jul	76	76	82	86	89	87	77	67	60	53	47	40	37	33	33	34	43	50	45	48	54	58	62	68	58.6	89		
30-Jul	74	76	76	80	84	85	82	79	75	66	55	50	47	44	45	56	53	48	55	60	62	71	80	83	66.1	85		
31-Jul	86	88	87	86	92	96	95	94	93	96	97	97	97	96	92	90	95	98	98	98	98	97	97	97	94.2	98		
		82.2	84.5	85.9	87.0	88.1	86.8	81.8	75.0	69.0	63.5	58.8	54.7	53.5	52.5	51.2	50.6	53.1	55.2	55.9	59.2	64.0	70.4	75.5	80.1	Diurnal Average		
		97	98	98	98	99	99	99	97	97	97	97	97	97	96	97	95	95	98	98	98	98	97	97	97	97	Diurnal Maximum	
M - Maintenance																												



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity (RH) - %
Barge Landing - July 2016





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Speed (WS) - km/h
Barge Landing - July 2016

Maximum Speed: 16 km/h on Jul 24 14:00	Maximum Daily Speed Average: 7.8 km/h on Jul 1	Hours in Service: 744
Minimum Speed Value: 0 km/h on Jul 14 05:00	Minimum Daily Speed Average: 0.1 km/h on Jul 28	Hours of Data: 743
Maximum Diurnal Speed Average: 2.6 km/h at hour 17	Minimum Diurnal Speed Average: 0.3 km/h at hour 3	Hours of Missing Data: 1
Monthly Average Velocity: 0.8 km/h 316.9 deg	Percentiles: P ₁ = 1 P ₁₀ = 2 Q ₁ = 4 Median = 5 Q ₃ = 7 P ₉₀ = 9 P ₉₉ = 14	Percent Operational Time: 99.9

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	S3	ESE3	SE4	ESE5	ESE5	SE6	SE7	SSE8	SSE10	S14	SSE13	SSE13	S10	S11	S10	S9	S8	SSE10	SE11	SE10	SSE7	SE7	SE8	SE8	SSE7.8	S14
2-Jul	SE8	SE7	SE6	SE5	SE5	SE5	SSE5	SSE5	SE7	SSE14	S13	SSE12	SSE12	S12	S12	S11	SSE11	SE5	SE7	SE5	ESE5	SE8	SSE7	SE7	SSE7.7	SSE14
3-Jul	SE6	SE6	SE5	ESE1	ESE3	SE4	SSE4	SSE6	SSE3	WNW4	SSE4	S11	NNW4	E5	E6	E5	ESE7	SE7	ESE6	SE3	SSE3	SE4	SSE4	SW3	SE3.5	S11
4-Jul	W4	WNW4	SW3	SW4	SW5	WSW5	WSW4	WSW3	SSW3	WSW7	W5	W4	SW4	W5	W6	W9	SW10	WSW5	SSE4	SSE5	SSE5	SE5	SE4	E1	SW3.6	SW10
5-Jul	N1	NE1	WSW2	NNW2	NNW4	W4	NW3	N6	NNW2	N3	NNW4	E5	ENE3	NNE6	NNE7	NE6	N7	NNW5	NNW7	NW6	NW7	NW6	NW1	NNW6	NNW3.4	NNW7
6-Jul	NNE5	NE5	N3	NE4	NNW4	N5	NNE7	N9	NNE9	NNE7	NE8	NE6	NE5	NE8	ENE10	ENE9	ENE8	ENE7	N4	NW2	N5	NNW4	NNW4	NNW5	NNE5.1	ENE10
7-Jul	N5	NNW5	NNW6	N6	N5	NNW6	N6	N6	N6	NNW6	NE8	NNE9	N8	N10	NNE8	NNE8	N9	NNE7	NNE7	N6	N7	N7	N6	N5	N6.5	N10
8-Jul	NNW4	N5	NNW4	N4	NNW5	NNW5	N5	N5	NNE4	NNE4	NE6	NNE6	NNE6	NE3	NNW6	NNE5	NNE5	N6	NE6	NE7	NE6	NE6	N5	NNW5	N4.7	NE7
9-Jul	N5	N5	N4	N5	N5	N4	NNE4	NNE5	NE5	NNE5	NW4	NW3	W6	WNW4	NW5	SE4	ENE5	NE5	NE6	E4	ENE3	NNW3	N4	NNW4	N3.1	NE6
10-Jul	NNW5	N5	NNW4	NNW4	N4	NNE1	NNW2	NNW4	ENE3	ENE3	NE1	ENE2	E4	ESE8	E7	ESE8	E5	ESE3	NW5	W7	W5	NW5	NNW6	NNW5	NNE1.8	ESE8
11-Jul	NW3	NNW3	NNW2	NNW3	NNW4	N5	NNW4	NW4	NNW3	NNW5	NE5	N4	WSW8	NW6	NW6	NNW8	NNW7	N10	N9	N8	N7	N6	NNW6	NNW6	NNW4.9	N10
12-Jul	NNW6	NNW6	NNW6	NNW3	NW3	NW3	N6	NNW7	NNW8	N8	N8	NNE10	N10	N9	NNW11	NNW9	N9	N12	N10	N8	N8	NNW8	NNW7	NNW6	N7.5	N12
13-Jul	NNW4	NNW6	NNW6	NNW5	NW3	WNW1	NNW5	N7	NNE9	N9	N10	NNE10	NNE12	NNE7	NE11	NE9	ENE9	NE7	NNE7	N6	N5	N5	NNW4	ENE1	NNE6.0	NNE12
14-Jul	NW2	W1	SE1	W3	NW0	SSW2	WSW3	W2	WSW4	NW1	NNW1	NE4	WNW3	NW6	WNW5	NE7	SE5	NW4	NW4	NW4	NW4	NW2	WNW2	SE1	NW1.6	NE7
15-Jul	W2	WSW1	SW2	WSW3	SSW3	SSW4	SW4	SW5	SW5	WSW5	SW3	SW5	SW4	WSW2	NNW11	NNW7	NNW7	WNW6	NNW4	NNW7	NW3	WNW3	NW4	W4	W2.8	NNW11
16-Jul	WSW5	SSW2	SSE3	SSW4	SSW5	SSW5	SW5	SW6	WSW6	WSW5	WSW4	SW6	NW5	SE4	S5	WSW5	NNW5	NNW9	N8	N8	N9	NNW7	NNW7	NNW6	WNW2.2	NNW9
17-Jul	NNW5	N6	NNW6	NNW6	NNW6	NNW5	NNW6	NNW7	N7	N8	N8	NNE7	N7	NNE7	N8	NNE8	NNE8	NNE7	NE6	ENE5	E2	WSW1	SSE2	SSE2	N5.1	N8
18-Jul	S2	ESE2	SSE2	SSE4	SSE3	SE3	SSE4	S6	SSW6	SSW6	S8	SSW8	SW9	SSW9	WSW8	SW6	SW8	SW9	SW8	SW7	SSW6	SSW5	S5	S6	SSW5.3	SW9
19-Jul	S5	SSW4	WSW2	S4	S2	SSW5	S7	SW8	SSW9	SW8	M	WSW11	WSW12	SW11	W11	W8	WNW9	NNW8	S2	SW3	N4	ESE2	NNW2	N1	WSW4.0	WSW12
20-Jul	N4	N3	NNW3	N6	N4	N4	NNW4	N4	NNW4	N4	E2	NE4	N3	NNW5	NNW5	NNW4	NNW2	NNE1	SE1	ESE2	ESE5	S5	SW6	W3	N2.0	N6
21-Jul	S2	WSW2	S2	SSW4	SSW4	SSW5	S4	SW5	WSW5	WSW5	WSW7	WNW7	WNW8	NW9	NNW12	N14	N14	NNE12	NNE10	NNE9	NNE6	N4	E2	SSE5	NNW2.6	N14
22-Jul	SSE5	SE4	S3	E1	SE3	SE2	SSE5	S9	S9	SSE10	SSE11	SSE13	S12	SSW7	SSW6	WNW5	NW4	SSW4	W5	NNW4	NW6	NNW4	SE1	WSW4	S3.3	SSE13
23-Jul	SW5	WSW6	W6	WNW4	NW5	WNW3	WNW3	N4	NNE3	NNE5	N3	W6	SSW2	NNW3	SW6	SSW4	NW5	SW2	SW7	SW6	SW4	SW4	SW5	S4	W2.4	SW7
24-Jul	SSE4	SSE4	SSE6	S7	SSE5	S8	SSW8	SW9	WSW12	WSW12	WSW12	WSW15	WSW14	WSW16	WSW16	W9	NW15	WNW10	W8	WSW7	W4	NW3	WSW2	SSW4	WSW6.7	WSW16
25-Jul	WSW3	WSW2	SSW2	SW6	WSW5	SW5	WSW6	W6	NNW4	NNW4	NW6	NW7	NNW6	N5	NE6	ENE6	ENE6	ENE6	ENE6	ENE5	ENE6	NE3	ENE3		N1.5	NW7
26-Jul	ENE1	ENE2	E4	ESE3	N3	ESE3	SE6	S7	S9	SSW7	SW5	SW9	SSW8	SSW7	SW8	SW7	SW9	SW7	SW5	S5	SSE6	SSE6	SSE5	S5	S4.2	SW9
27-Jul	S2	SE4	SSW4	SSW3	S4	S4	SSW2	WSW2	W2	NW3	NW4	NNW4	NNE8	NNE8	N8	N9	N7	NE4	NNE6	NE6	N2	NNW3	NNW3	NNW3	N2.0	N9
28-Jul	NNW4	NW3	NW3	NW2	W4	W2	SSW2	SW3	WSW3	SSE3	SSE4	SE5	E4	NNE2	N2	ENE3	ENE5	E4	E4	E2	SW2	NW5	SW2	SSW4	S0.1	SE5
29-Jul	SW7	SW4	WSW3	SSW3	SSW4	SSW4	SW5	SW6	SSW7	SSW8	SSW6	SW8	SW9	SSW10	SW7	SW7	NNW5	N3	NE2	E3	SE5	SE6	SSE7	NNE2	SSW3.8	SSW10
30-Jul	N5	ESE4	SSE5	N1	WSW4	W3	SW3	WSW4	NNW3	NNW4	ESE1	W2	WSW3	WNW4	NNW10	SSE4	ENE7	ENE6	E4	NNE5	N6	NNW5	N4	NE2	N1.4	NNW10
31-Jul	NNW3	NE2	N1	NW1	WNW1	N6	N7	N6	NNW4	NNW3	SSW3	WNW3	WSW8	W7	W5	W3	NE2	WSW2	W5	WSW4	W6	W5	WNW6	NW3	WNW2.9	WSW8
WNW0.8 N0.5 W0.3WNW0.6WNW0.8WSW0.8WSW0.7 W1.4WSW1.0 W1.1 SW0.6WSW1.2 W1.8WNW1.4 NW2.4 N1.5 N2.6 N2.3 N1.9 N1.4 N1.4 N1.2NNW0.7 NW0.6																								Diurnal Average		
SSE8 SE7 NNW6 S7 NNW6 S8 SSW8 SW9WSW12 SSE14 S13WSW15WSW14WSW16WSW16 N14 NW15 NNE12 SE11 SE10 N9 SE8 SE8 SE8																								Diurnal Maximum		

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



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Barge Landing - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 6 km/h on Jul 24 17:00	Hours of Data: 743
Minimum Value: 0 km/h on Jul 27 22:00	Hours of Missing Data: 1
Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 2 P ₉₀ = 3 P ₉₉ = 5	Hours of Calibration: 0
	Percent Operational Time: 99.9

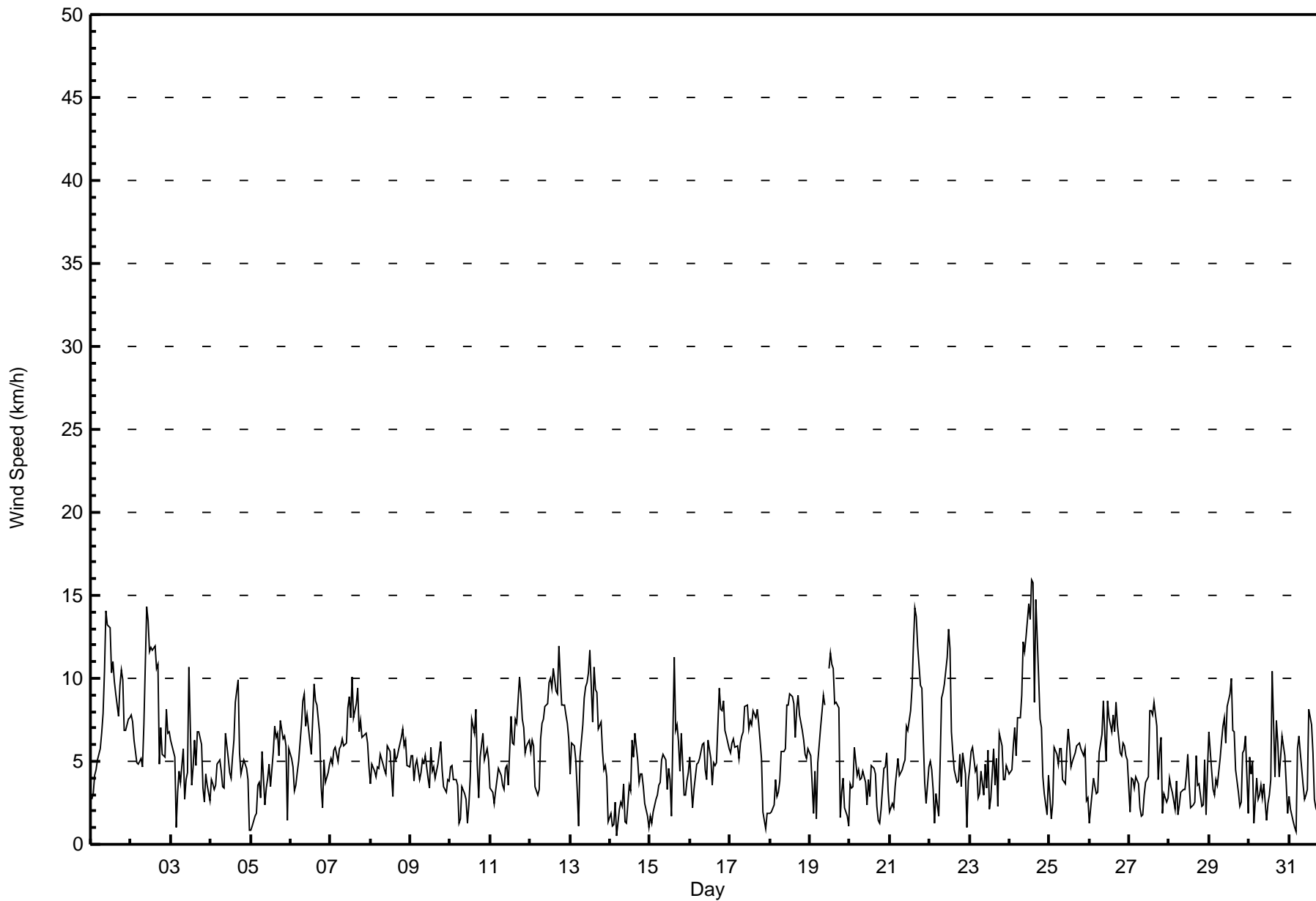
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Jul	1	1	1	1	1	1	2	3	4	6	6	5	4	5	4	4	3	4	4	3	2	1	1	2	6
2-Jul	1	1	1	1	1	1	2	2	5	5	5	5	5	5	5	4	5	2	2	1	1	2	1	1	5
3-Jul	1	1	1	1	1	1	1	2	2	2	3	6	2	4	2	2	2	2	2	1	1	2	3	1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

M - Maintenance



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed (WS) - km/h
Barge Landing - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Barge Landing - July 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	431	58.01	58.01
6 - 11	286	38.49	96.50
12 - 19	26	3.50	100.00
20 - 28	0	0.00	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 743

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Barge Landing - July 2016**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	47	15	16	15	19	15	25	29	19	28	29	33	23	16	35	67	431
6 - 11	49	30	16	12	1	5	18	14	17	16	29	10	13	6	11	39	286
12 - 19	3	2	0	0	0	0	0	6	5	0	0	8	0	0	1	1	26
20 - 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	99	47	32	27	20	20	43	49	41	44	58	51	36	22	47	107	743

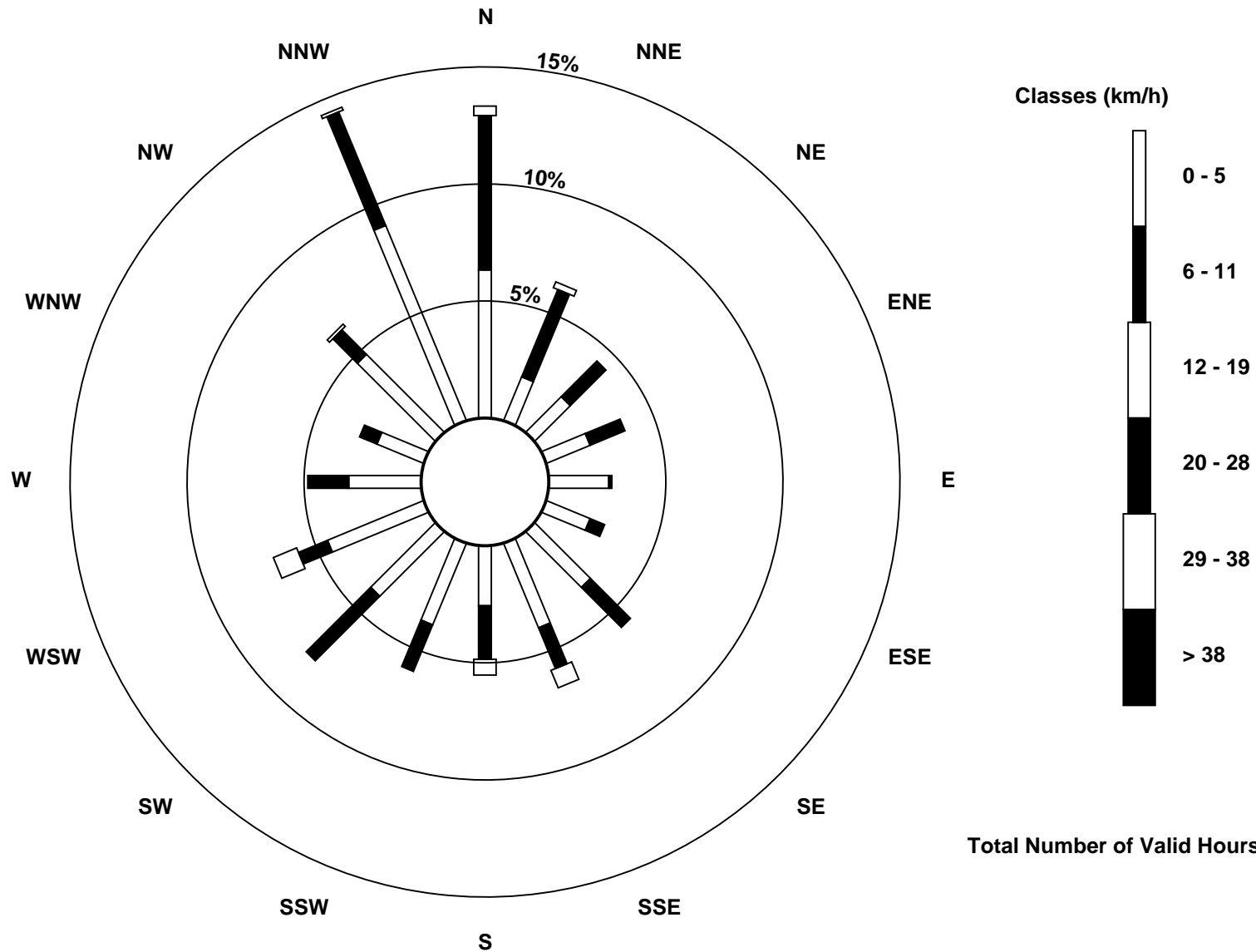
Total Number of Valid Hours: 743

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

Wind Speed (WS) - km/h
Barge Landing (AMS 9)



Total Number of Valid Hours: 743



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Barge Landing - July 2016

Direction of Maximum Speed: 245 deg on Jul 24 14:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 155.6 deg on Jul 1	Hours of Data: 743
Direction of Minimum Speed: 320 deg on Jul 14 05:00	Direction of Minimum Daily Speed Average: 0.1 deg on Jul 28
Direction of Minimum Speed: 320 deg on Jul 14 05:00	Hours of Missing Data: 1
Monthly Average Direction: 299.4 deg	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-Jul	186	119	128	121	121	129	141	162	157	170	168	147	170	169	188	183	178	162	144	143	148	138	136	136	155.6
2-Jul	146	142	135	132	132	143	148	147	139	153	171	166	160	174	184	181	160	142	138	136	123	133	148	143	153.6
3-Jul	138	137	129	108	115	124	155	157	167	292	168	185	346	92	101	96	102	124	121	135	149	132	152	235	135.5
4-Jul	260	286	222	228	232	253	256	258	200	246	264	266	217	271	269	268	232	258	162	163	164	139	142	101	235.7
5-Jul	357	48	250	329	326	272	324	356	348	356	336	85	75	23	24	34	2	336	327	320	318	310	326	341	348.1
6-Jul	21	56	7	35	339	351	14	9	22	20	50	40	38	51	67	69	58	74	10	325	6	334	347	346	29.3
7-Jul	351	346	346	2	352	330	350	3	0	345	38	24	6	10	22	19	11	20	14	358	357	355	354	349	4.1
8-Jul	346	351	346	354	343	338	351	350	12	31	34	22	27	45	337	18	20	351	39	39	46	38	8	347	11.1
9-Jul	349	3	355	354	358	357	20	29	41	31	326	308	264	290	320	146	73	49	38	87	61	341	354	343	7.6
10-Jul	345	350	342	345	1	23	335	347	63	71	34	59	90	113	97	109	93	114	322	260	276	322	334	333	17.0
11-Jul	320	344	332	327	343	351	337	324	335	340	44	356	251	323	318	337	338	352	3	351	358	355	342	335	340.3
12-Jul	340	338	338	333	316	324	350	346	340	4	2	19	357	350	346	334	3	357	355	1	352	348	347	345	350.7
13-Jul	339	336	337	334	324	299	331	1	21	4	11	20	26	15	39	40	60	38	15	360	353	355	341	71	11.3
14-Jul	324	280	139	259	320	198	250	261	257	316	336	43	289	306	301	45	129	314	309	317	315	315	292	144	307.3
15-Jul	280	237	226	237	202	202	214	234	233	239	224	228	227	247	341	344	308	300	330	332	321	298	319	259	278.7
16-Jul	245	207	155	202	196	195	217	228	240	237	244	233	312	138	182	240	332	347	350	349	350	347	346	344	281.3
17-Jul	340	349	338	339	342	338	343	342	358	356	2	13	11	12	4	32	13	20	34	73	79	255	155	157	4.1
18-Jul	184	122	165	154	168	143	150	187	193	209	182	202	224	211	238	223	219	230	231	221	210	196	188	178	203.2
19-Jul	188	194	246	191	170	194	184	218	210	223	M	238	249	229	273	281	288	342	172	219	2	107	336	353	237.6
20-Jul	356	8	348	355	1	355	347	351	344	355	95	42	2	333	337	337	337	27	135	113	123	176	218	275	354.4
21-Jul	185	237	191	208	207	207	177	214	240	243	246	288	294	323	334	6	10	17	23	16	17	8	85	156	330.7
22-Jul	149	126	169	98	129	138	147	173	180	167	161	164	184	205	207	302	325	202	275	343	318	328	124	258	183.0
23-Jul	233	246	265	302	318	301	300	8	31	28	356	260	199	333	235	208	319	223	219	222	225	216	222	176	259.6
24-Jul	163	158	162	176	162	190	204	233	248	248	254	248	255	245	246	281	315	290	271	256	263	307	242	199	244.4
25-Jul	237	251	212	232	255	235	254	271	348	343	309	318	347	3	84	44	58	63	71	65	61	63	35	69	3.0
26-Jul	64	75	96	123	358	110	129	187	187	204	226	223	211	200	219	215	217	223	222	175	148	153	167	170	189.7
27-Jul	179	144	197	204	190	186	206	239	266	304	325	328	14	12	352	8	3	42	26	39	352	348	331	332	356.8
28-Jul	344	320	312	306	263	260	202	226	240	148	168	131	95	21	5	61	59	85	90	97	231	323	234	210	174.3
29-Jul	229	225	247	202	210	207	220	227	204	207	209	226	220	199	232	220	338	0	56	89	131	143	153	28	208.7
30-Jul	5	114	153	354	241	259	222	254	330	332	112	269	255	297	337	147	68	76	87	22	3	341	357	55	2.4
31-Jul	345	39	9	305	289	352	357	351	328	329	210	294	254	271	274	260	35	257	276	249	274	272	286	309	296.9

303.3	7.6	277.3	289.2	285.0	247.0	257.5	271.7	256.7	268.4	231.8	238.6	268.0	288.4	310.7	354.2	7.2	4.8	9.1	7.8	359.7	353.3	328.7	307.7	
Diurnal Average																								

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



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

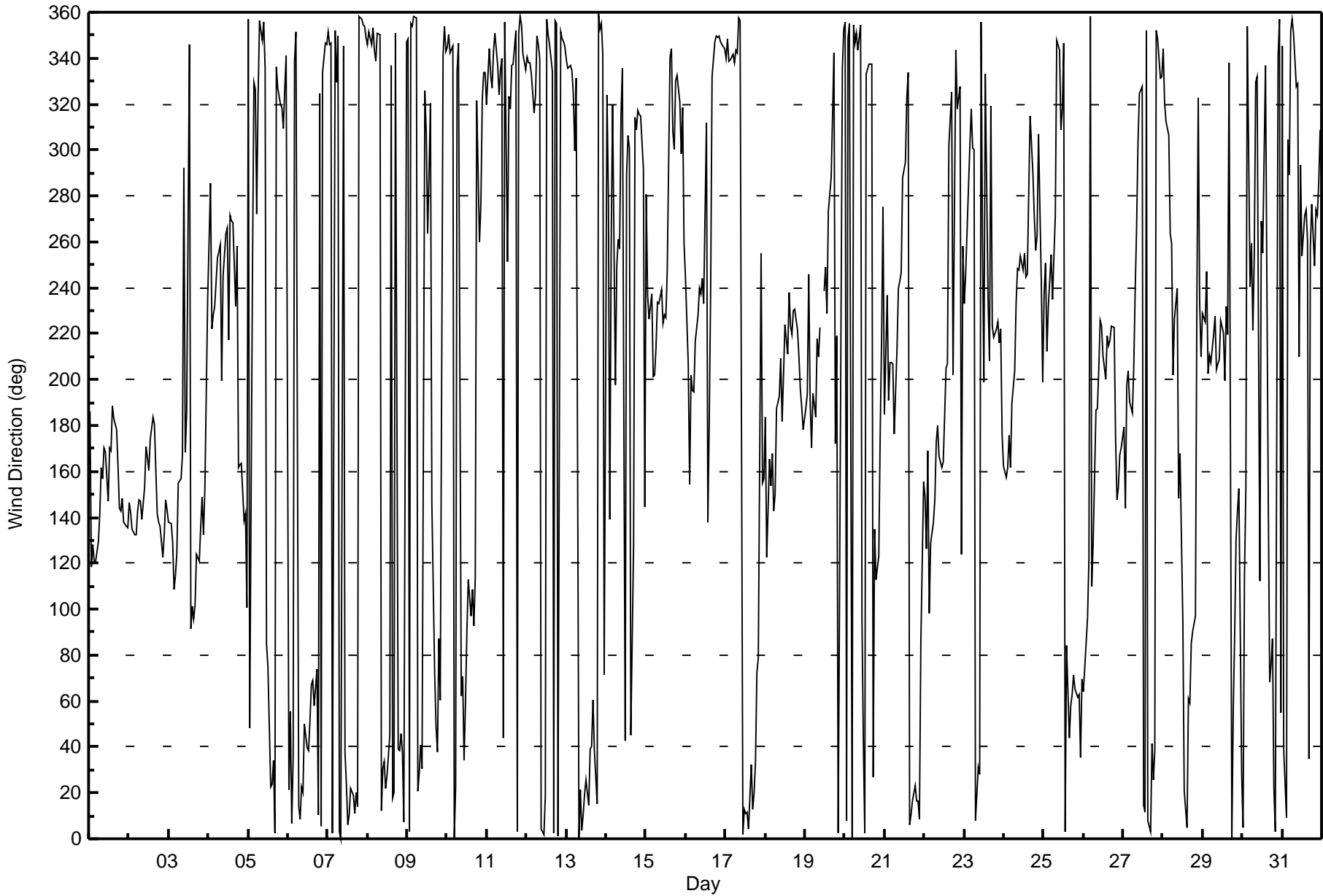
Wind Direction (WD) - deg
Barge Landing - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 105 deg on Jul 30 11:00	Hours of Data: 743
Minimum Value: 8 deg on Jul 26 21:00	Hours of Missing Data: 1
Percentiles: P ₁ = 10 P ₁₀ = 18 Q ₁ = 24 Median = 30 Q ₃ = 42 P ₉₀ = 62 P ₉₉ = 88	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-Jul	36	16	12	9	10	14	23	26	29	30	34	29	45	36	39	43	46	35	22	16	13	9	11	15	46
2-Jul	10	9	8	18	13	15	29	38	50	27	35	32	33	37	35	32	27	21	17	12	10	13	13	10	50
3-Jul	9	10	14	67	19	16	44	33	77	56	77	40	50	64	28	26	25	22	23	21	48	22	58	49	77
4-Jul	33	35	31	19	20	24	27	33	31	29	31	40	34	41	35	36	25	53	33	24	36	16	42	62	62
5-Jul	74	59	49	44	22	32	44	27	77	61	20	38	57	38	31	32	33	26	17	17	18	15	93	22	93
6-Jul	46	27	39	43	18	22	22	23	25	28	36	26	49	29	26	28	27	27	43	25	36	24	21	27	49
7-Jul	20	18	19	18	27	22	25	26	29	32	29	29	28	29	32	29	28	29	26	22	21	20	21	18	32
8-Jul	24	21	19	20	20	24	21	27	31	37	33	36	46	80	36	46	41	34	25	23	21	21	29	20	80
9-Jul	17	18	19	18	19	19	33	33	27	35	46	63	35	46	60	51	31	34	29	24	20	27	18	24	63
10-Jul	17	16	17	14	19	38	36	32	47	64	89	80	63	42	32	23	31	78	53	30	36	22	16	15	89
11-Jul	29	34	23	17	14	17	28	40	54	44	54	55	27	39	34	24	24	26	24	22	21	18	16	16	55
12-Jul	19	18	13	64	59	52	23	24	26	31	32	32	30	29	27	29	28	27	25	23	21	20	21	19	64
13-Jul	13	15	15	11	21	87	24	32	30	29	26	25	27	27	28	38	24	26	25	23	18	17	16	67	87
14-Jul	45	68	66	34	90	42	37	31	39	78	95	58	87	54	51	58	44	30	31	25	19	21	45	45	95
15-Jul	36	49	32	28	22	25	31	23	32	40	77	66	80	87	25	28	31	33	21	28	20	34	21	19	87
16-Jul	24	67	33	27	25	26	27	25	23	30	43	28	71	56	33	30	48	28	23	24	21	20	21	17	71
17-Jul	15	17	16	16	17	19	22	27	30	32	33	44	42	46	37	34	29	31	30	24	25	74	44	46	74
18-Jul	54	38	37	15	36	18	28	27	33	40	34	35	32	36	39	54	38	29	25	26	25	21	22	22	54
19-Jul	25	38	67	25	82	32	33	30	31	29	M	29	32	32	42	39	39	26	71	66	51	61	72	63	82
20-Jul	19	26	33	22	19	20	22	25	25	33	39	52	64	22	27	43	68	78	87	83	13	26	33	27	87
21-Jul	44	52	52	47	37	34	30	37	27	39	34	41	37	35	27	25	25	24	25	24	26	24	38	15	52
22-Jul	18	10	29	86	20	58	31	30	33	30	26	28	34	33	33	39	30	56	50	24	27	32	75	33	86
23-Jul	29	22	19	24	19	29	33	34	65	36	66	53	89	42	39	49	63	82	26	25	22	28	30	31	89
24-Jul	19	25	19	22	19	23	30	28	24	28	27	26	28	25	24	46	28	33	37	29	48	35	79	53	79
25-Jul	76	86	52	18	25	30	27	36	48	61	42	41	48	40	39	50	35	28	25	22	21	22	55	32	86
26-Jul	40	33	20	58	49	36	22	42	30	43	45	37	48	48	55	52	37	35	32	30	8	12	15	15	58
27-Jul	57	36	26	27	31	26	40	47	60	30	34	51	31	31	30	30	30	51	42	22	31	15	28	15	60
28-Jul	15	28	22	43	28	68	55	33	41	49	62	45	74	84	84	86	39	53	28	26	85	24	87	21	87
29-Jul	22	40	27	41	27	29	29	30	36	33	51	43	41	43	54	50	60	43	62	24	18	23	17	72	72
30-Jul	32	34	31	77	31	56	62	44	41	43	105	92	88	66	28	86	26	27	23	40	22	18	38	56	105
31-Jul	21	46	64	71	93	37	22	26	34	46	55	40	25	35	44	74	82	72	33	30	32	32	28	39	93
	76	86	67	86	93	87	62	47	77	78	105	92	89	87	84	86	82	82	87	83	85	74	93	72	

Diurnal Maximum

M - Maintenance





Wood Buffalo Environmental Association

TRS Calibration Report

Station Information

Calibration Date	July 26, 2016	Last Calibration	June 16, 2016
Station Name	Barge Landing	Station Number	AMS 9
Reason:	Routine		
Start Time (MST)	9:10	End Time (MST)	10:15
Gas Cert Reference	CC62993	Station temp.	22 Deg C
Cal Gas Concentration	4.77 ppm	Cal Gas Exp Date	10/06/2014
Calibrator Make/Model	Sabio 4010	Serial Number	11071107
Dil air Make/Model	API 701	Serial Number	4888
DACS make/model	Campbell Scientific CR3000	DACS serial No.	6466
SO2 gas concentration	47.8 ppm	SO2 gas cert/exp	LL104180 12/Feb/18

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-690	-690
Analyzer IP address	192.168.1.42		Lamp voltage	1005	1003
Calculated slope	0.995017	1.026781	Chamber temp	45	45
Calculated intercept	-0.275464	-0.102678	Pressure	681.5	686.0
Analyzer Background	1.94	1.94	Flow	0.432	0.437
Analyzer Coefficient	1.065	1.065	Intensity	91	91
			Converter temp.	800	800
Analyzer make/model	Thermo 43i-TLE		Analyzer serial #	1218153461	
Converter make/model	CDN-101		Converter serial #	519	

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.1	----
as found span	5000	83.8	79.9	78.0	1.025
SO2 scrubber check	5000	15.4	147.2	0.3	----
calibrator zero	5000	0.0	0.0	0.1	----
high point	5000	83.8	79.9	78.0	1.025
second point					
third point					
as left zero					
as left span					
Average Correction Factor					1.025

Corrected As found	77.9	Previous response	80.6	% change	3.5%
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Notes:

As Finds before the H2S cylinder change and calibration.

Calibration Performed By:

Evan Magill



Wood Buffalo Environmental Association TRS Calibration Report

Station Information

Calibration Date	July 26, 2016	Last Calibration	June 16, 2016
Station Name	Barge Landing	Station Number	AMS 9
Reason:	Routine		
Start Time (MST)	10:15	End Time (MST)	13:40
Gas Cert Reference	LL29997	Station temp.	22 Deg C
Cal Gas Concentration	5.18 ppm	Cal Gas Exp Date	12/02/2019
Calibrator Make/Model	Sabio 4010	Serial Number	11071107
Dil air Make/Model	API 701	Serial Number	4888
DACS make/model	Campbell Scientific CR3000	DACS serial No.	5564
SO2 gas concentration	47.8 ppm	SO2 gas cert/exp	LL104180 12/Feb/18

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-690	-690
Analyzer IP address	192.168.1.42		Lamp voltage	1005	1003
Calculated slope	1.026781	1.002268	Chamber temp	45	45
Calculated intercept	-0.102678	-0.339048	Pressure	681.5	686.0
Analyzer Background	1.94	1.89	Flow	0.432	0.437
Analyzer Coefficient	1.065	1.041	Intensity	91	91
			Converter temp.	800	800
Analyzer make/model	Thermo 43i-TLE		Analyzer serial #	1218153461	
Converter make/model	CDN-101		Converter serial #	519	

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.1	----
as found span	5000	77.2	80.0	78.0	1.026
SO2 scrubber check	5000	15.4	147.2	0.4	----
calibrator zero	5000	0.0	0.0	0.1	----
high point	5000	77.2	80.0	80.0	1.000
second point	5000	38.6	40.0	40.5	0.988
third point	5000	19.3	20.0	20.4	0.978
as left zero	6000	0.0	0.0	0.1	----
as left span	5000	77.2	80.0	79.8	1.002
Average Correction Factor					0.989

Corrected As found	77.9	Previous response	78.0	% change	0.2%
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Notes:

As Finds in separate calibration sheet. Changed inlet filter and scrubber check done after as founds. H2S gas cylinder changed after as founds. Allowed the span some time to saturate the system with H2S.

Calibration Performed By:

Evan Magill



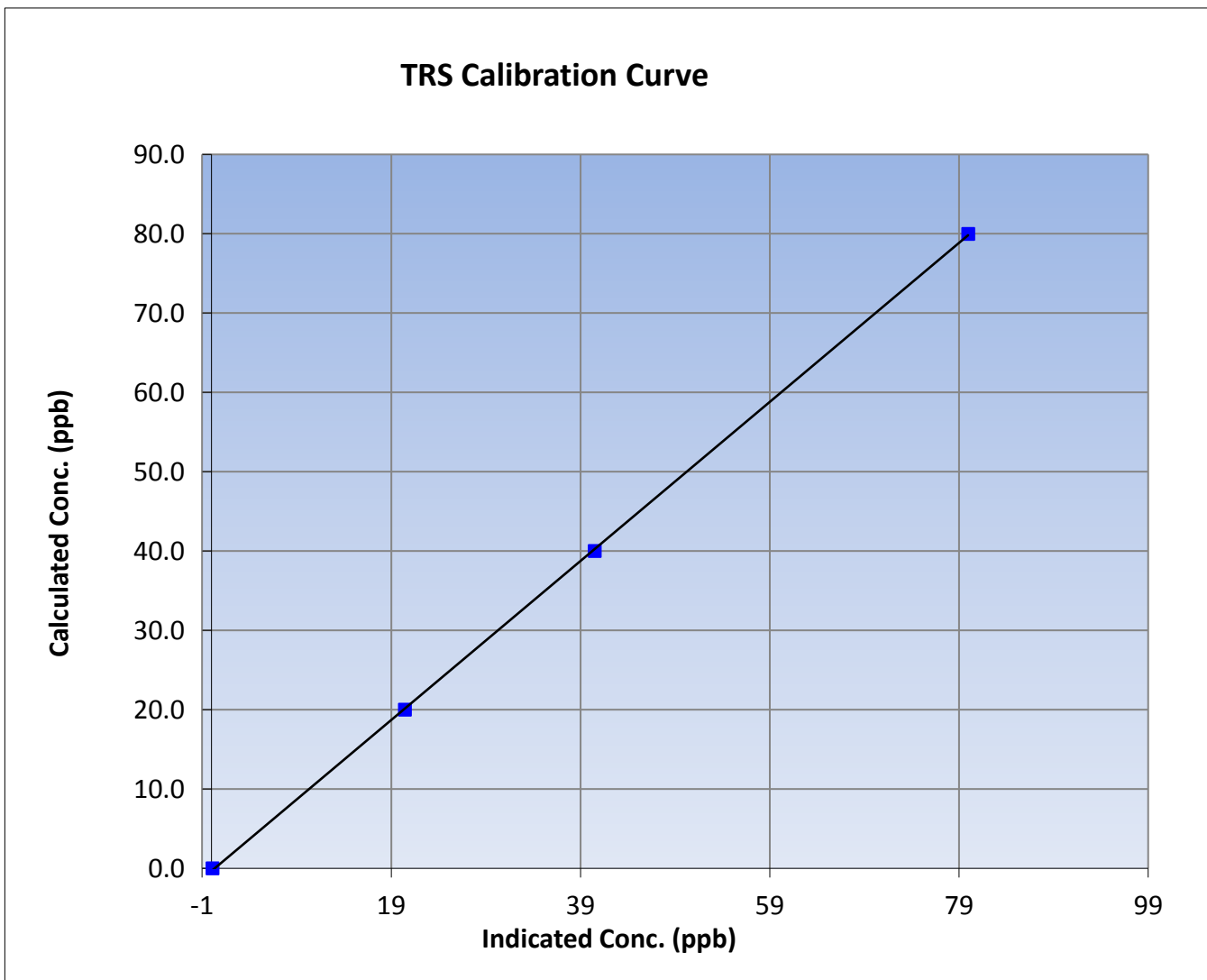
Wood Buffalo Environmental Association TRS Calibration Report

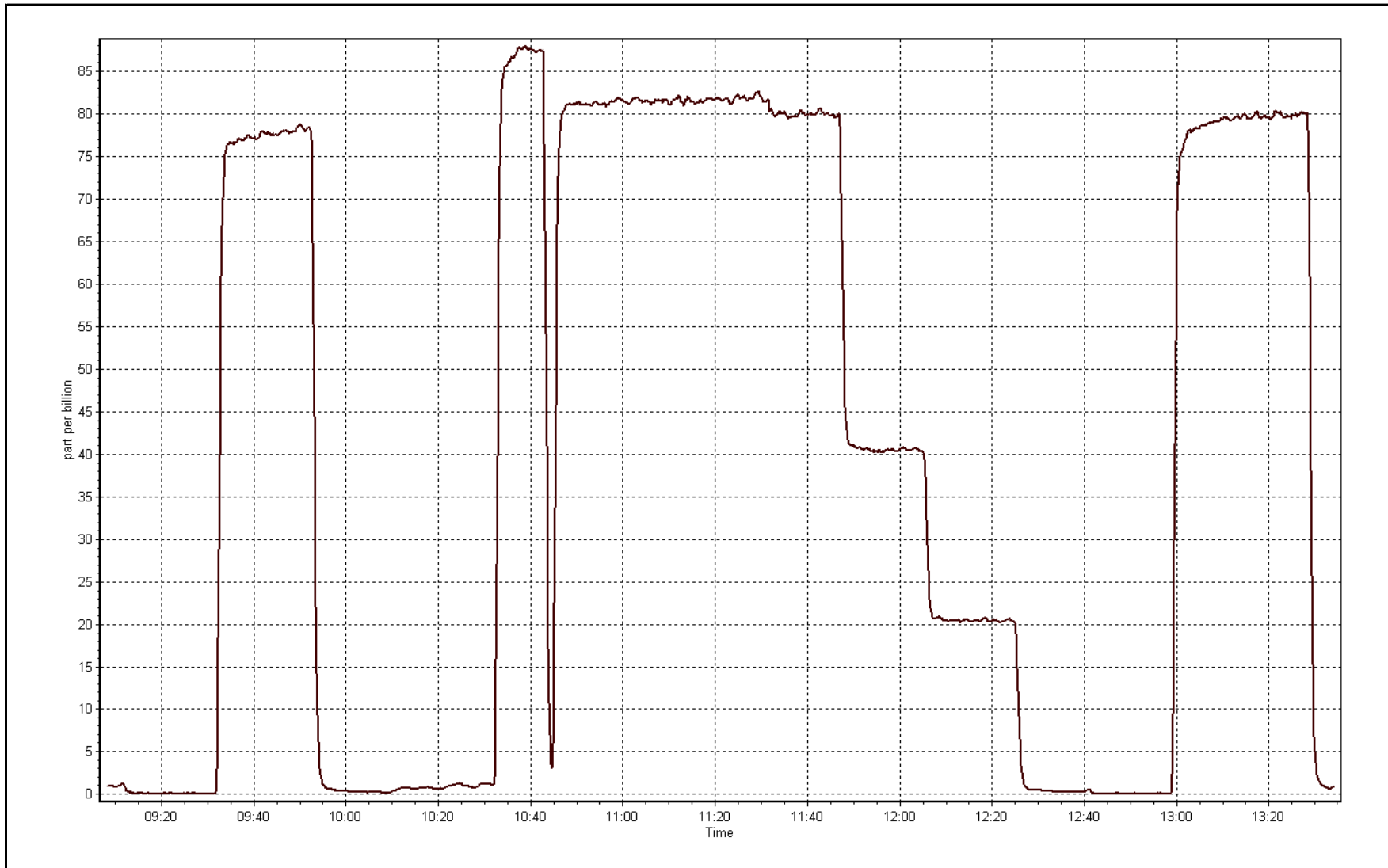
Station Information

Calibration Date	July 26, 2016	Previous Calibration	June 16, 2016
Station Name	Barge Landing	Station Number	AMS 9
Start Time (MST)	10:15	End Time (MST)	13:40
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1218153461

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999951
80.0	80.0	1.0001		
40.0	40.5	0.9876	Slope	1.002268
20.0	20.4	0.9782		
			Intercept	-0.339048







Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	July-19-16	Last Calibration	June-13-16
Station Name	Barge Landing	Station Number	AMS 9
Reason:	Routine		
Start Time (MST)	9:03	End Time (MST)	13:35
Gas Cert Reference	LL104180	Cal Gas Expiry Date	12/02/2018
CH4 Cal Gas Conc.	490 ppm	CH4 Equiv Conc.	1023.5 ppm
C3H8 Cal Gas Conc.	194 ppm	Station temp.	22 Deg C
Calibrator Make/Model	Sabio 4010	Serial Number	11071107
ZAG make/model	Teledyne API 701	Serial Number	4888
DACS make/model	Campbell Scientific CR3000	Serial Number	6466

Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 50 ppm		Sample Pressure	9.1	9.1
Analyzer IP address	192.168.1.51		Air or Bypass Press	34.7	34.7
Calculated slope	1.000402	0.995375	Fuel Pressure	24.1	24.1
Calculated intercept	-0.043863	-0.004438	Analyzer Coeff	4.354	4.342
			Analyzer BKG	5.60	5.54

Analyzer make	Thermo 51i-LT	Analyzer serial #	1327059296
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Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	-0.08	----
as found span	5000	76.7	15.70	15.76	0.996
calibrator zero	5000	0.0	0.00	-0.01	----
high point	5000	76.7	15.70	15.76	0.996
second point	5000	41.0	8.39	8.47	0.991
third point	5000	15.4	3.15	3.17	0.994
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	76.7	15.70	15.76	0.996
Average Correction Factor					0.994

Corrected As found	15.84	Previous response	15.74	% change	-0.6%
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Notes:

Changed inlet filter after as founds. Hydrogen cylinder changed after as founds. No change in span response, flame stayed lit.
Installed ZAG pressure sensor and new integrated card after as founds. Adjusted zero.

Calibration Performed By: Evan Magill



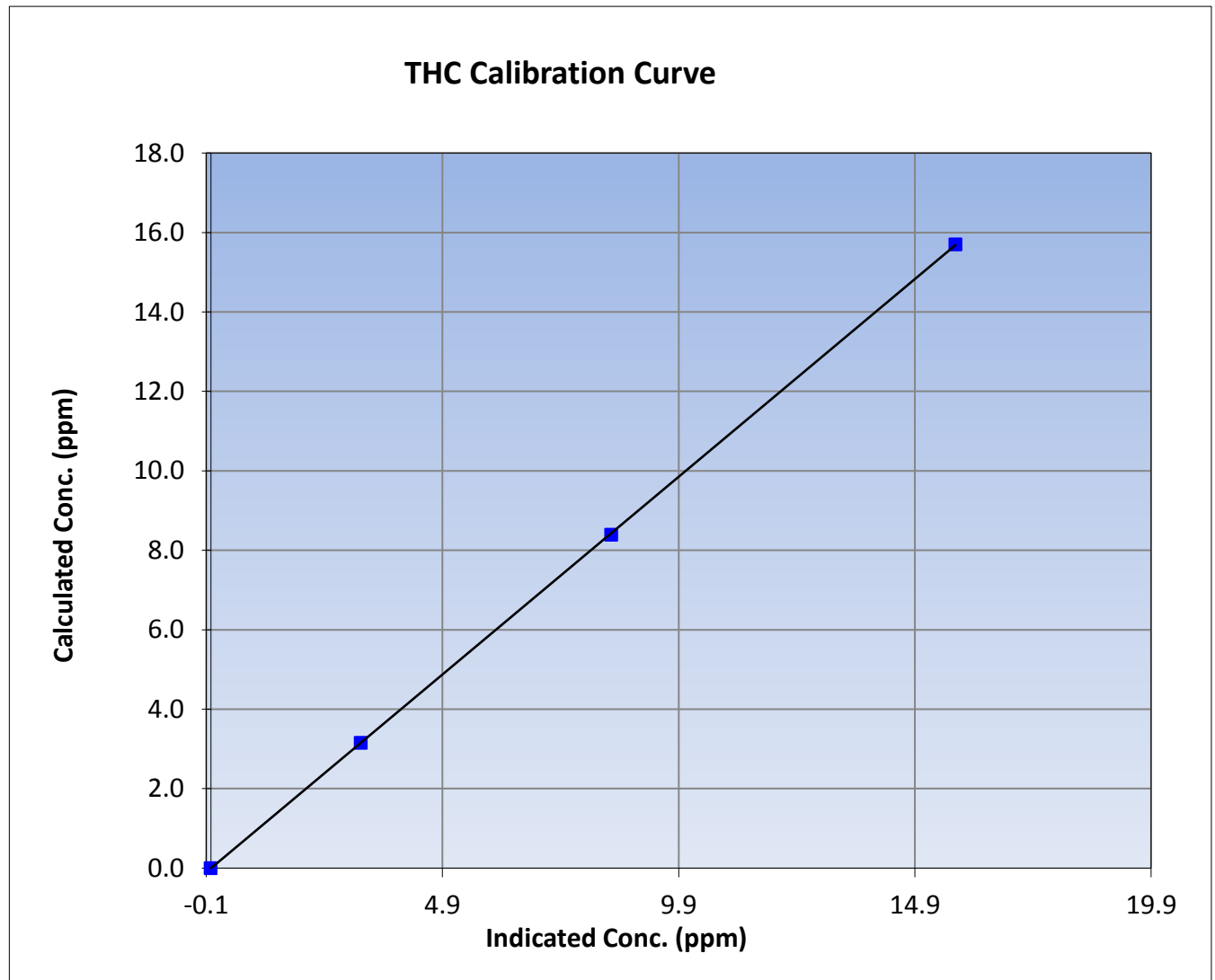
Wood Buffalo Environmental Association THC Calibration Report

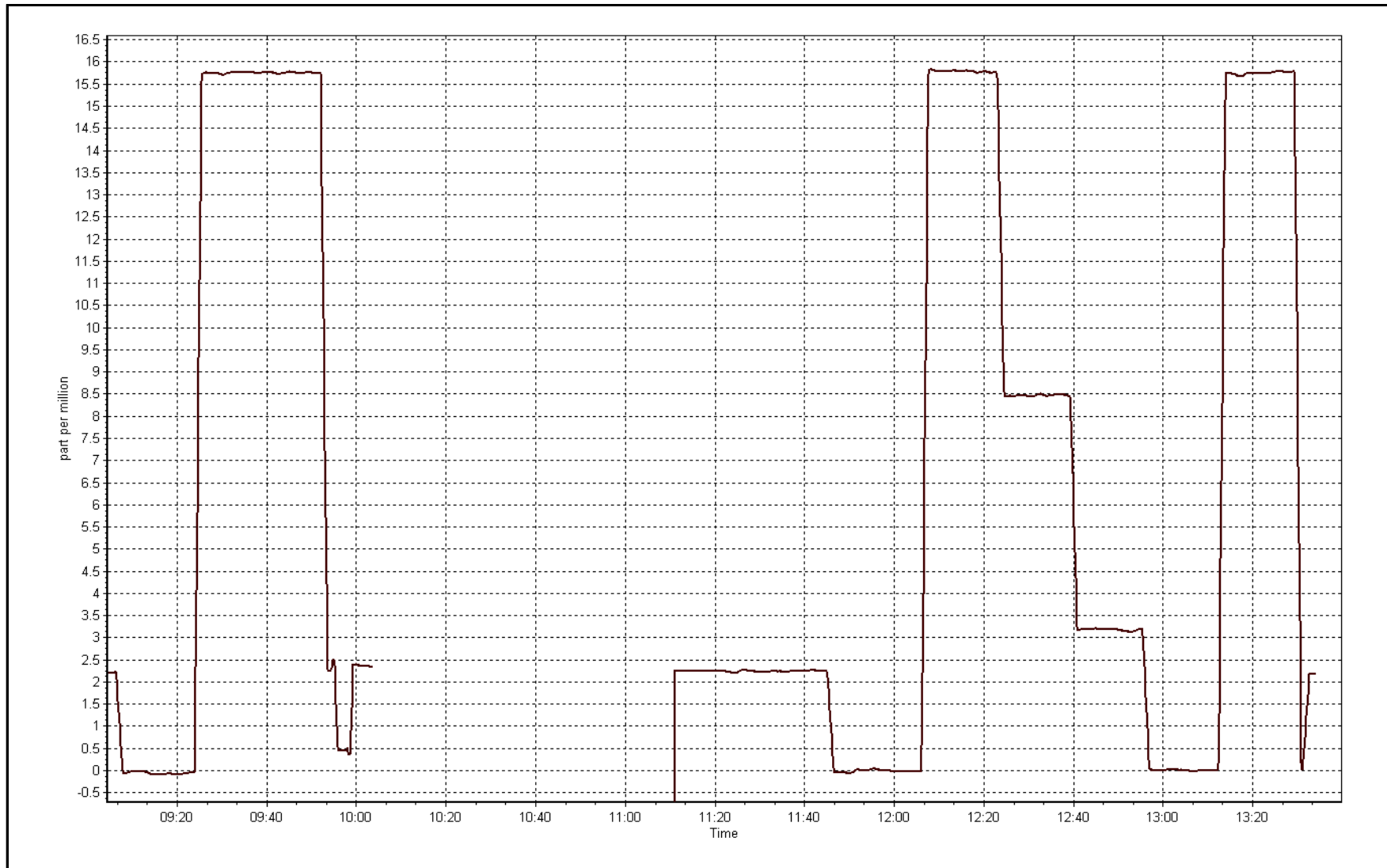
Station Information

Calibration Date	July 19, 2016	Previous Calibration	June 13, 2016
Station Name	Barge Landing	Station Number	AMS 9
Start Time (MST)	9:03	End Time (MST)	13:35
Analyzer make	Thermo 51i-LT	Analyzer serial #	1327059296

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	-0.01	----	Correlation Coefficient	0.999988
15.70	15.76	0.9962		
8.39	8.47	0.9909	Slope	0.995375
3.15	3.17	0.9944		
			Intercept	-0.004438







WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY MONITORING PROGRAM MONTHLY REPORT

AMS 11 LOWER CAMP JULY 2016

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

August 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - LOWER CAMP (AMS 11)
 JULY 2016

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	706	36	38	99.73	95	0	14	0
H2S (ppb) Average	707	35	37	99.73	9	0	2	0
THC (ppm) Average	704	36	40	99.46	5.6	-	2.7	-
Temperature (C) Average	742	0	2	99.73	31.2	-	24	-
Relative Humidity (%) Average	742	0	2	99.73	99	-	93	-
Wind Speed 10 m (km/h) Average	742	0	2	99.73	25	-	16	-
Wind Direction 10 m (deg) Average	742	0	2	99.73	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - LOWER CAMP (AMS 11)
 JULY 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	706	3.6	9	-	0	0	0	0	2	10	95
H2S (ppb) Average	707	0.6	1	-	0	0	0	0	1	1	9
THC (ppm) Average	704	2.32	0.3	-	2	2.1	2.1	2.2	2.4	2.6	5.6
Temperature 2 m (C) Average	742	19.38	4.4	-	7.2	14.3	16.3	18.7	22.5	25.5	31.2
Relative Humidity (%) Average	742	69.5	19	-	24	42	54	72	85	93	99
Wind Speed 10 m (km/h) Average	742	7.7	5	-	0	3	4	7	10	14	25
Wind Direction 10 m (deg) Average	742	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - LOWER CAMP (AMS 11)
JULY 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
ALL PARAMETERS	27 Jul 2016 12:00	27 Jul 2016 13:00	2	Maintenance - wiring/data logger upgrades
THC	27 Jul 2016 11:00	27 Jul 2016 14:00	4	Maintenance - add diagnostic equipment to zero air generator



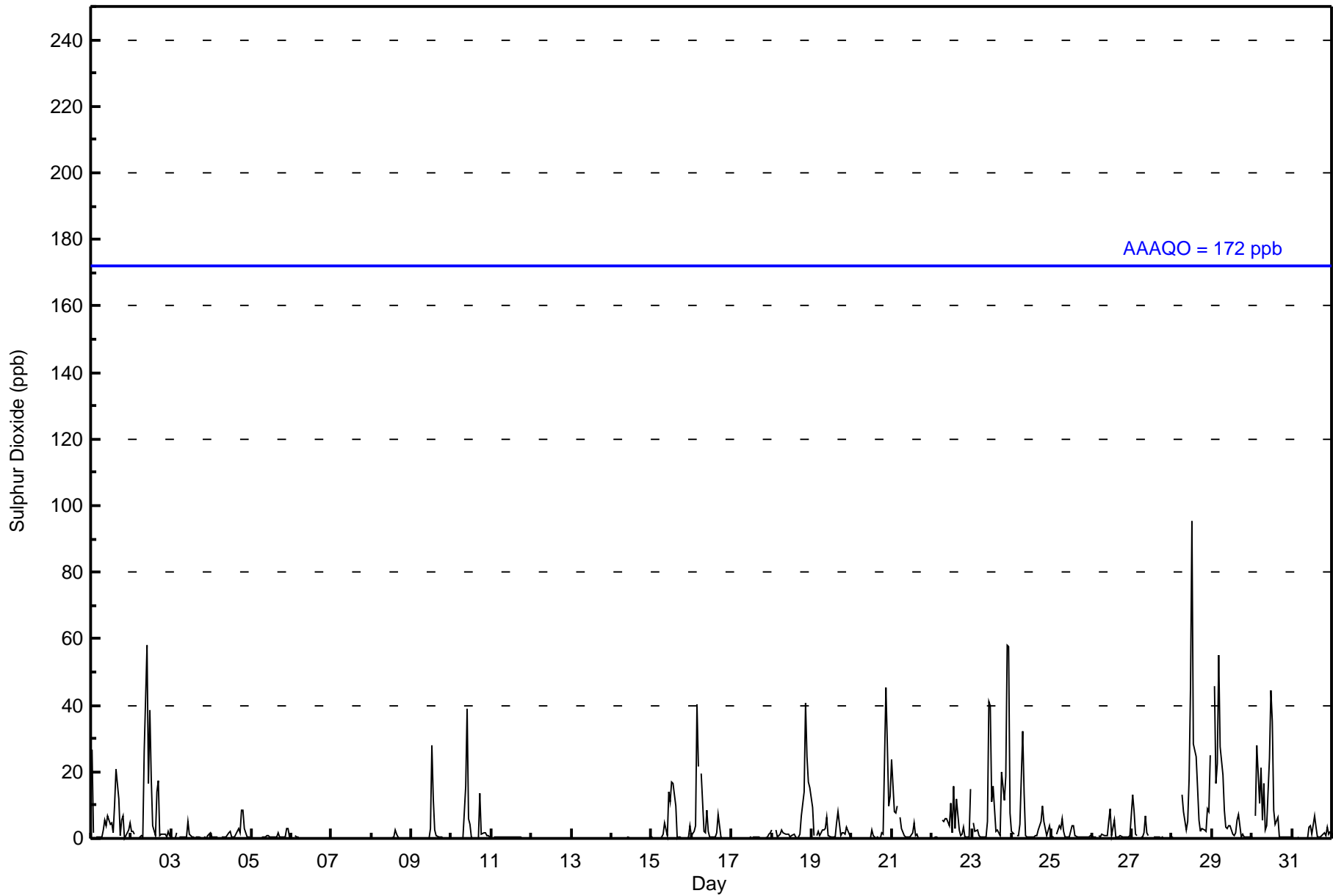
Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

Lower Camp - July 2016

Number of Exceedences (AAQO): 1-hr: 0 24-hr: 0																	Hours in Service: 744																															
Maximum Value: 95 ppb on Jul 28 13:00																	Maximum Daily Average: 13.6 ppb on Jul 28							Hours of Data: 706																								
Minimum Value: 0 ppb on Jul 7 23:00																	Minimum Daily Average: 0.0 ppb on Jul 13							Hours of Missing Data: 38																								
Maximum Diurnal Average: 7.9 ppb at hour 12																	Minimum Diurnal Average: 1.0 ppb at hour 18							Hours of Calibration: 36																								
Monthly Average: 3.6 ppb																	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 2 P ₉₀ = 10 P ₉₉ = 45							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-Jul	27	2	Z	0	0	0	1	3	6	4	7	4	5	2	10	21	12	1	5	7	0	1	2	5	5.4	27																						
2-Jul	2	2	1	Z	0	0	1	0	26	58	16	39	18	4	1	14	18	1	1	1	1	0	2	1	9.1	58																						
3-Jul	0	0	0	2	Z	0	1	0	0	0	5	1	0	0	0	0	0	0	0	0	0	1	2	0.7	5																							
4-Jul	0	0	0	0	0	Z	0	0	0	0	2	2	0	0	0	1	3	2	8	8	3	1	0	0	1.5	8																						
5-Jul	Z	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2	1	0	0	1	3	3	0	0.6	3																						
6-Jul	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1																						
7-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																						
8-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0.2	2																						
9-Jul	0	0	0	0	Z	0	0	0	0	0	3	28	12	3	1	0	0	0	0	0	0	0	0	0	2.1	28																						
10-Jul	0	0	0	0	0	Z	0	0	16	39	6	4	0	0	0	0	0	13	1	2	2	1	1	1	3.8	39																						
11-Jul	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
12-Jul	0	Z	0	0	0	0	0	0	0	C	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0.1	0																						
13-Jul	0	0	Z	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-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0																						
15-Jul	0	0	0	0	Z	0	0	1	5	1	14	11	17	17	10	0	0	0	0	0	0	0	0	4	3.5	17																						
16-Jul	1	2	4	40	21	Z	19	2	2	8	2	0	0	1	2	7	0	0	0	0	0	0	0	0	4.9	40																						
17-Jul	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0.3	2																						
18-Jul	2	Z	3	0	1	1	3	2	1	1	1	0	1	1	0	0	0	1	7	14	41	24	17	15	6.1	41																						
19-Jul	9	1	Z	1	2	1	3	2	3	6	1	0	0	0	5	8	1	2	2	1	3	1	1	1	2.4	9																						
20-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	3	1	0	0	0	0	2	1	45	28	10	13	4.5	45																						
21-Jul	24	8	8	10	Z	7	3	1	1	1	1	1	2	5	1	1	0	0	0	0	0	0	0	0	3.1	24																						
22-Jul	0	0	0	0	0	Z	5	5	6	6	4	11	2	16	3	12	3	1	1	3	0	0	15	4.1	16																							
23-Jul	Z	4	2	3	1	0	0	0	0	5	41	40	11	16	2	3	2	1	20	11	19	58	58	7	13.3	58																						
24-Jul	2	1	Z	1	1	4	32	14	1	1	0	0	0	1	1	3	5	10	5	3	1	4	1	3.9	32																							
25-Jul	0	0	Z	1	4	3	6	2	0	0	0	2	4	4	1	0	0	0	0	0	0	0	1	1.4	6																							
26-Jul	1	0	0	Z	1	1	1	1	1	1	5	9	1	6	1	0	0	1	0	0	0	0	1	1	1.4	9																						
27-Jul	13	8	1	1	Z	1	0	2	7	2	1	M	M	0	0	0	0	0	0	0	0	0	0	1.8	13																							
28-Jul	0	0	0	0	0	Z	13	8	2	5	18	45	95	29	24	15	5	2	3	3	2	9	8	25	13.6	95																						
29-Jul	Z	46	17	22	55	28	19	9	3	3	4	4	1	1	2	5	7	1	1	1	0	0	0	0	10.0	55																						
30-Jul	1	Z	7	28	10	21	5	16	3	4	24	45	35	9	4	6	0	0	0	0	0	0	0	0	9.6	45																						
31-Jul	0	0	Z	0	0	0	0	0	0	0	3	4	1	7	4	1	1	0	1	2	1	4	1	2	1.4	7																						
																								3.2	2.9	1.9	4.3	3.8	2.6	3.7	2.3	2.7	4.9	5.2	7.9	7.8	4.4	2.3	2.9	2.4	1.0	2.1	2.0	3.9	4.4	3.6	3.1	Diurnal Average
																								27	46	17	40	55	28	32	16	26	58	41	45	95	29	24	21	18	13	20	14	45	58	58	25	Diurnal Maximum
Z - zerospan C - Calibration M - Maintenance																																																
Alberta Ambient Air Quality Objectives (AAQO): 1-hr 172 ppb 24-hr 48 ppb																																																





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Lower Camp - July 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	639	90.51	90.51
11 - 20	34	4.82	95.33
21 - 60	32	4.53	99.86
61 - 110	1	0.14	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 706

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Lower Camp - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	62	34	16	12	19	28	78	27	11	7	10	43	51	66	75	100	639
11 - 20	1	2	0	0	0	2	7	2	4	1	9	1	2	1	1	1	34
21 - 60	0	1	0	0	3	2	4	5	5	6	2	1	1	1	1	0	32
61 - 110	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	63	37	16	12	22	32	90	34	20	14	21	45	54	68	77	101	706

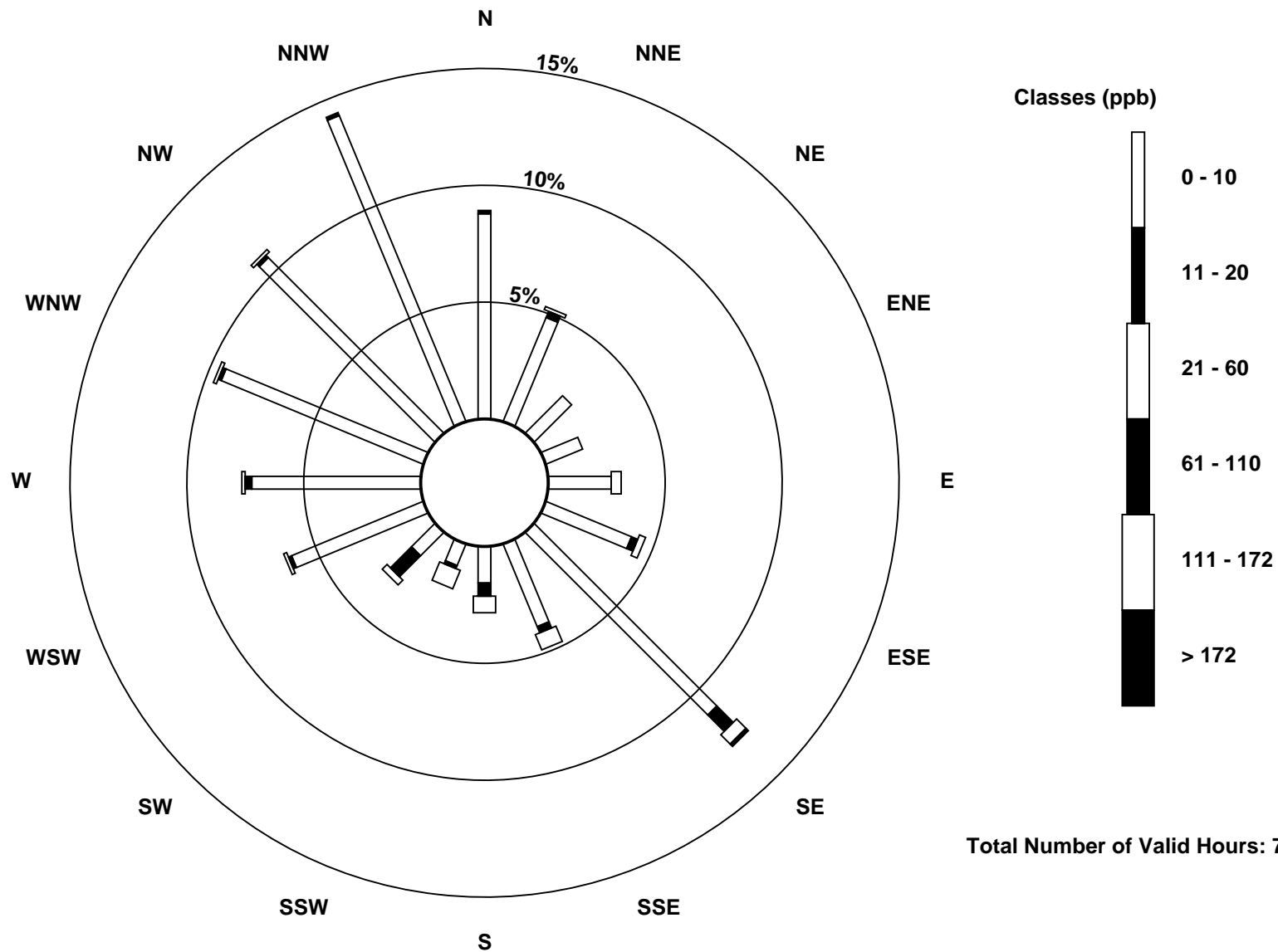
Total Number of Valid Hours: 706

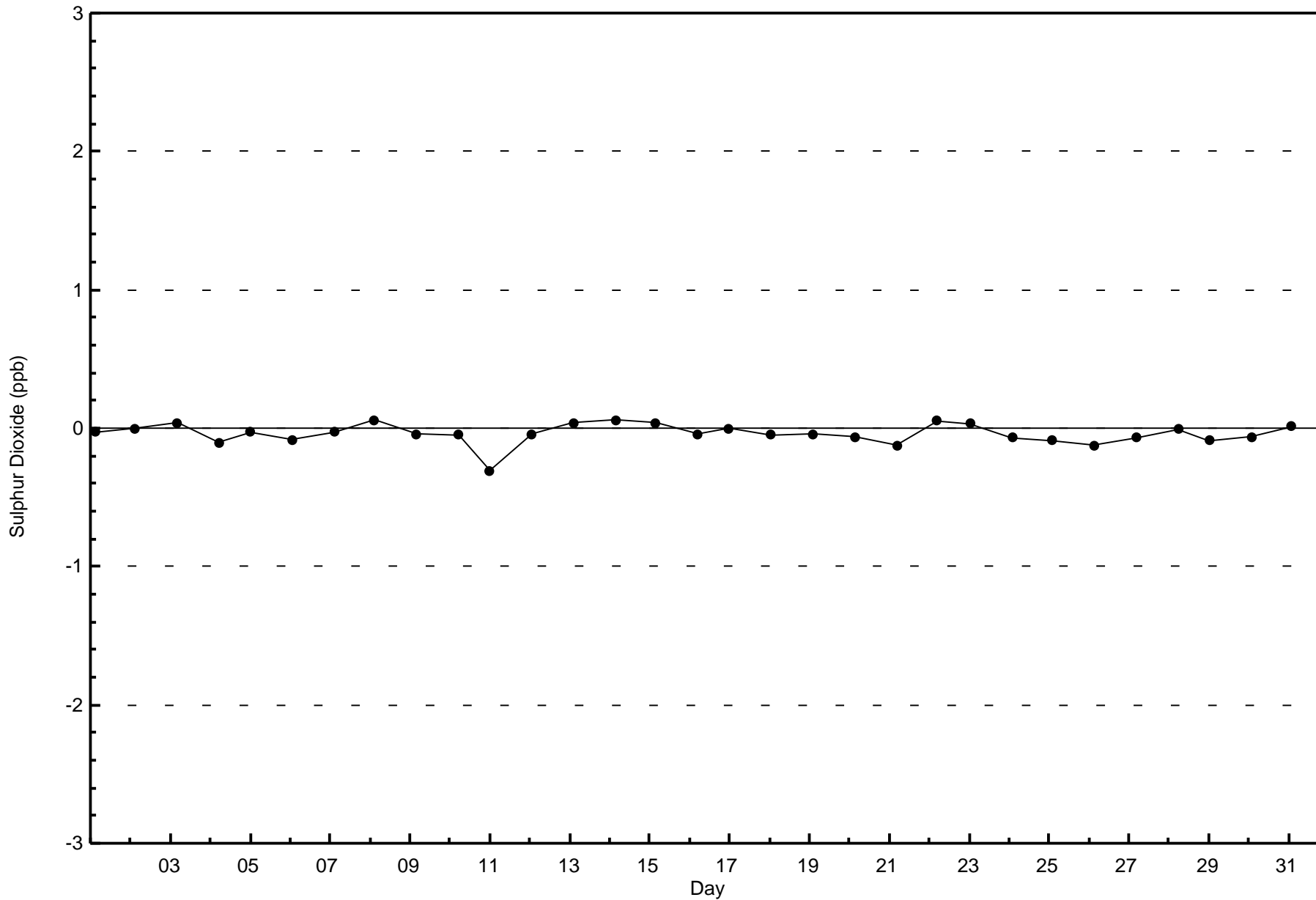
Total Number of Hours: 744

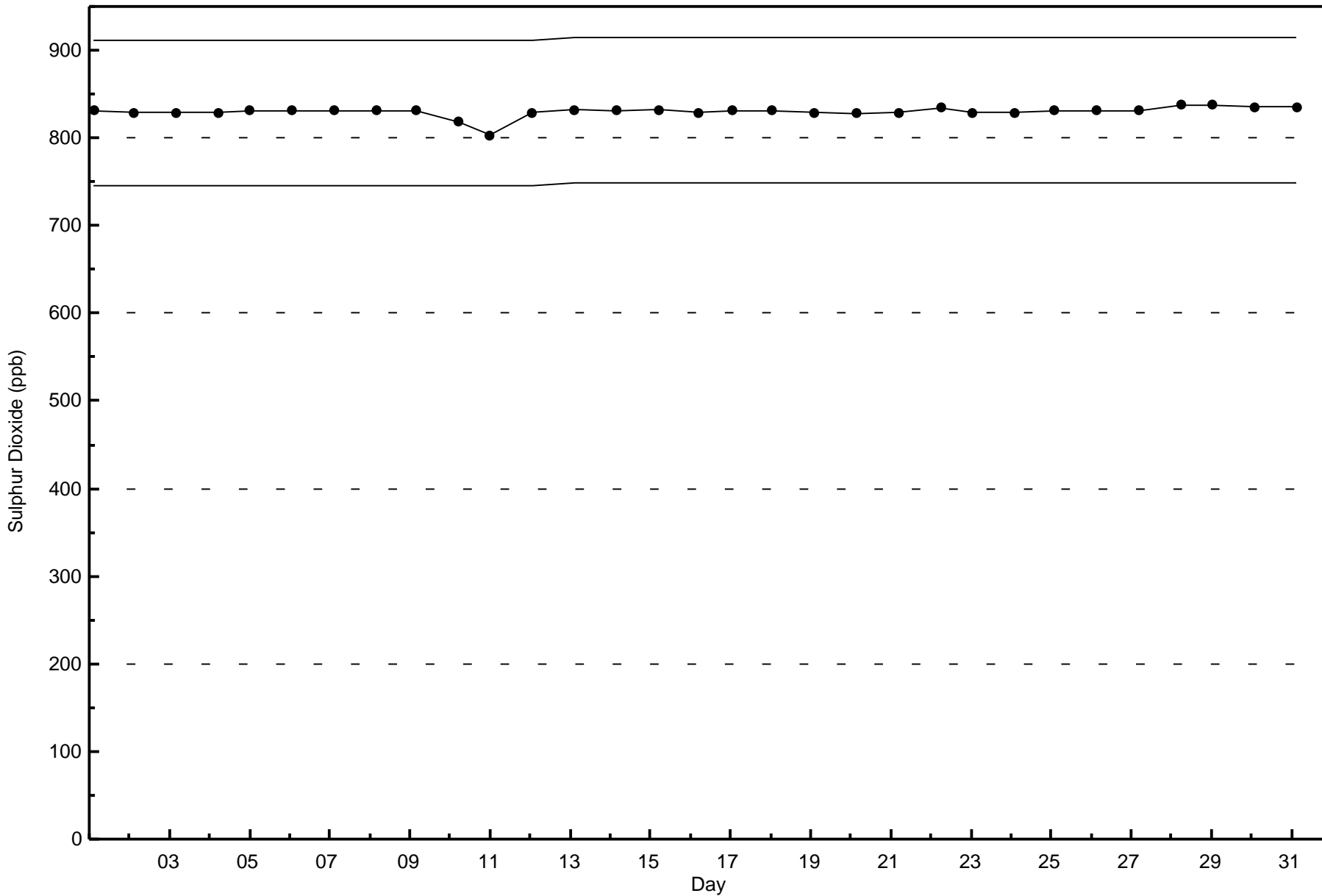


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Sulphur Dioxide (SO₂) - ppb
Lower Camp (AMS 11)

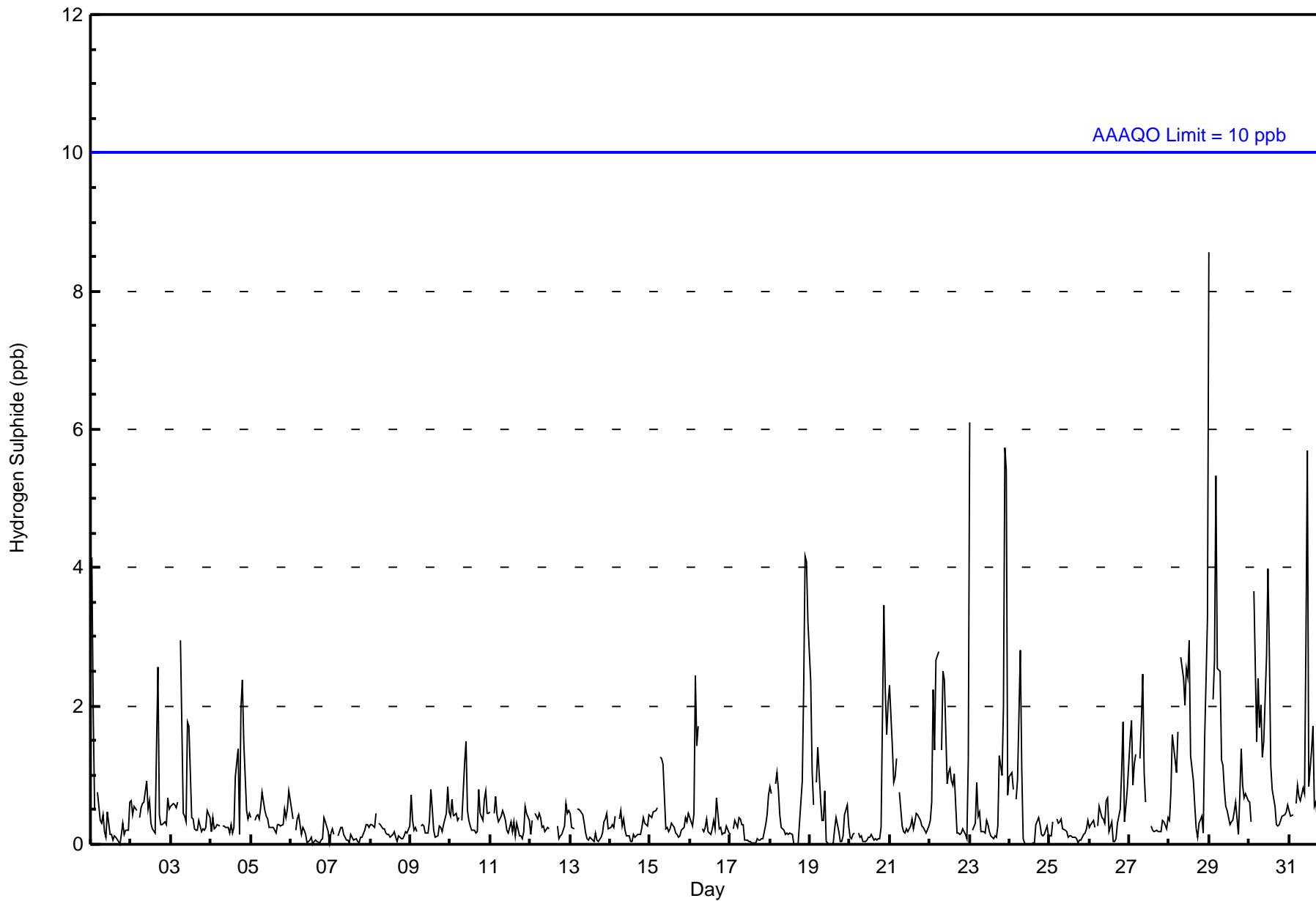








Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 9 ppb on Jul 29 01:00 Maximum Daily Average: 1.5 ppb on Jul 29														Hours in Service: 744 Hours of Data: 707 Hours of Missing Data: 37 Hours of Calibration: 35 Percent Operational Time: 99.7												
Minimum Value: 0 ppb on Jul 1 18:00 Minimum Daily Average: 0.1 ppb on Jul 7 Maximum Diurnal Average: 1.1 ppb at hour 1 Minimum Diurnal Average: 0.2 ppb at hour 18 Monthly Average: 0.6 ppb Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 1 P ₉₉ = 4																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	4	2	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.5	4
2-Jul	1	0	1	0	Z	0	1	1	1	1	1	1	0	0	0	1	3	0	0	0	0	0	1	1	0.6	3
3-Jul	1	1	1	1	1	Z	3	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0.6	3	
4-Jul	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	1	0	2	2	1	0	0	0.6	2	
5-Jul	0	Z	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.4	1	
6-Jul	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	
7-Jul	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-Jul	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-Jul	1	0	0	0	0	Z	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0.3	1	
10-Jul	0	1	0	0	0	0	Z	0	1	1	0	0	0	0	0	0	0	1	0	0	1	1	0	0.5	1	
11-Jul	0	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.3	1	
12-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	C	C	C	C	0	0	0	0	0	1	0	0.3	1	
13-Jul	0	0	0	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
14-Jul	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-Jul	0	0	0	0	1	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
16-Jul	0	0	0	2	1	2	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.5	2	
17-Jul	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	1	
18-Jul	1	1	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	4	4	0.9	4	
19-Jul	2	1	1	Z	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0.5	2	
20-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	2	0.5	3	
21-Jul	2	1	1	1	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	2	
22-Jul	0	1	2	1	3	3	Z	1	2	2	1	1	1	1	1	1	0	0	0	0	0	0	1	1.1	3	
23-Jul	6	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	6	5	1.2	6	
24-Jul	1	1	1	Z	1	1	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	3	
25-Jul	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-Jul	0	0	0	0	Z	0	1	0	0	0	1	1	0	0	0	0	0	0	1	1	2	0	1	0.4	2	
27-Jul	2	2	1	1	1	Z	1	2	2	1	1	M	M	0	0	0	0	0	0	0	0	0	0	0.8	2	
28-Jul	0	1	2	1	1	2	Z	3	2	2	3	2	3	1	1	1	0	0	0	0	2	2	3	1.4	3	
29-Jul	9	Z	2	3	5	3	3	1	1	1	1	0	0	0	0	0	1	0	1	1	1	1	1	1.5	9	
30-Jul	1	0	Z	4	1	2	2	2	1	1	3	4	3	1	1	1	0	0	0	0	0	0	1	1.3	4	
31-Jul	0	0	0	Z	1	1	1	1	1	1	3	6	1	1	2	1	1	0	0	1	0	1	0	1.0	6	
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan C - Calibration M - Maintenance Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb 24-hr 3 ppb																										





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Lower Camp - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	679	96.04	96.04
3 - 4	22	3.11	99.15
5 - 7	5	0.71	99.86
8 - 11	1	0.14	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Lower Camp - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	64	37	16	11	23	30	83	33	13	9	17	43	54	67	77	102	679
3 - 4	0	0	0	0	2	1	5	2	6	3	1	1	0	1	0	0	22
5 - 7	0	0	0	0	0	0	0	0	1	1	3	0	0	0	0	0	5
8 - 11	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	64	37	16	11	25	31	88	35	20	13	22	44	54	68	77	102	707

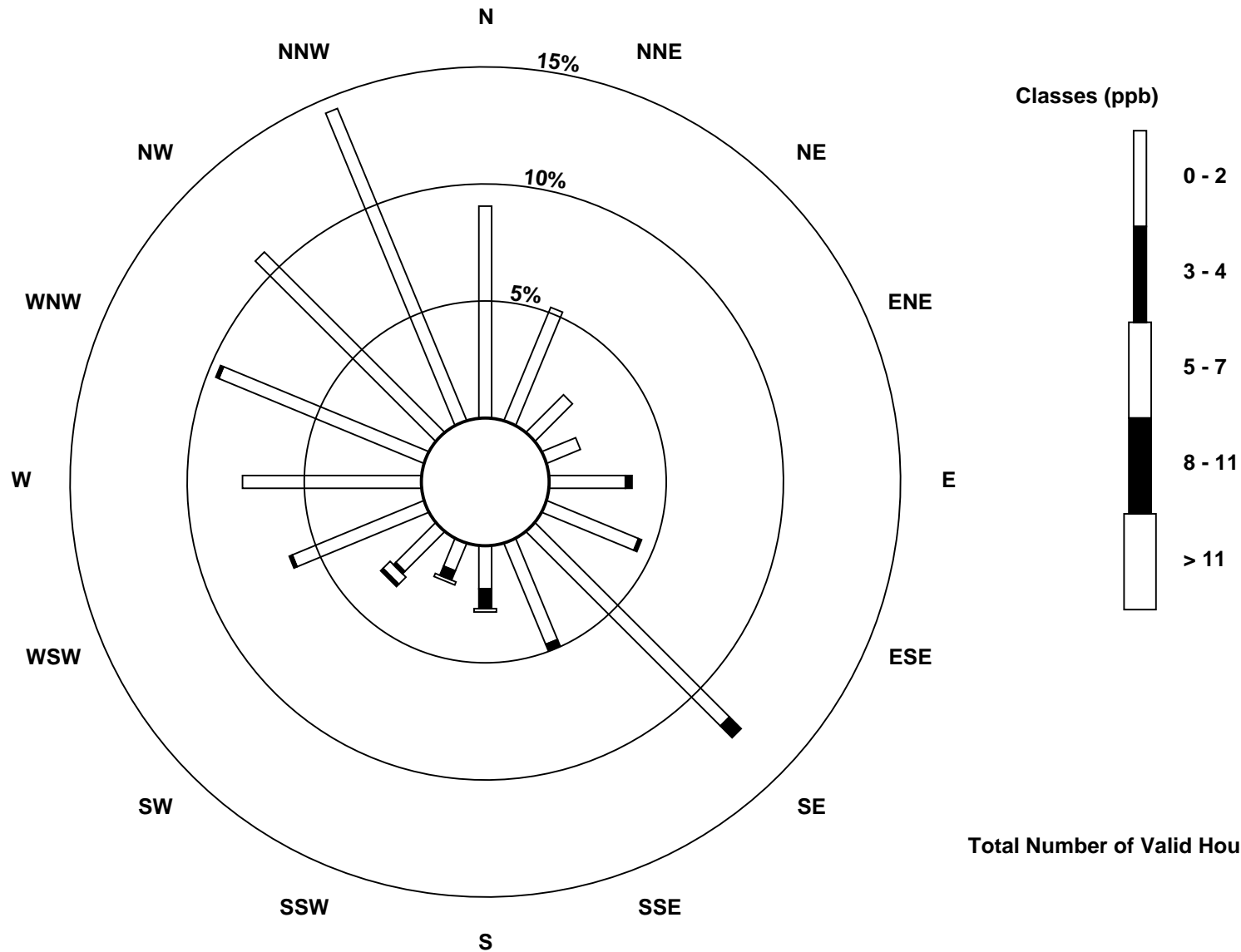
Total Number of Valid Hours: 707

Total Number of Hours: 744

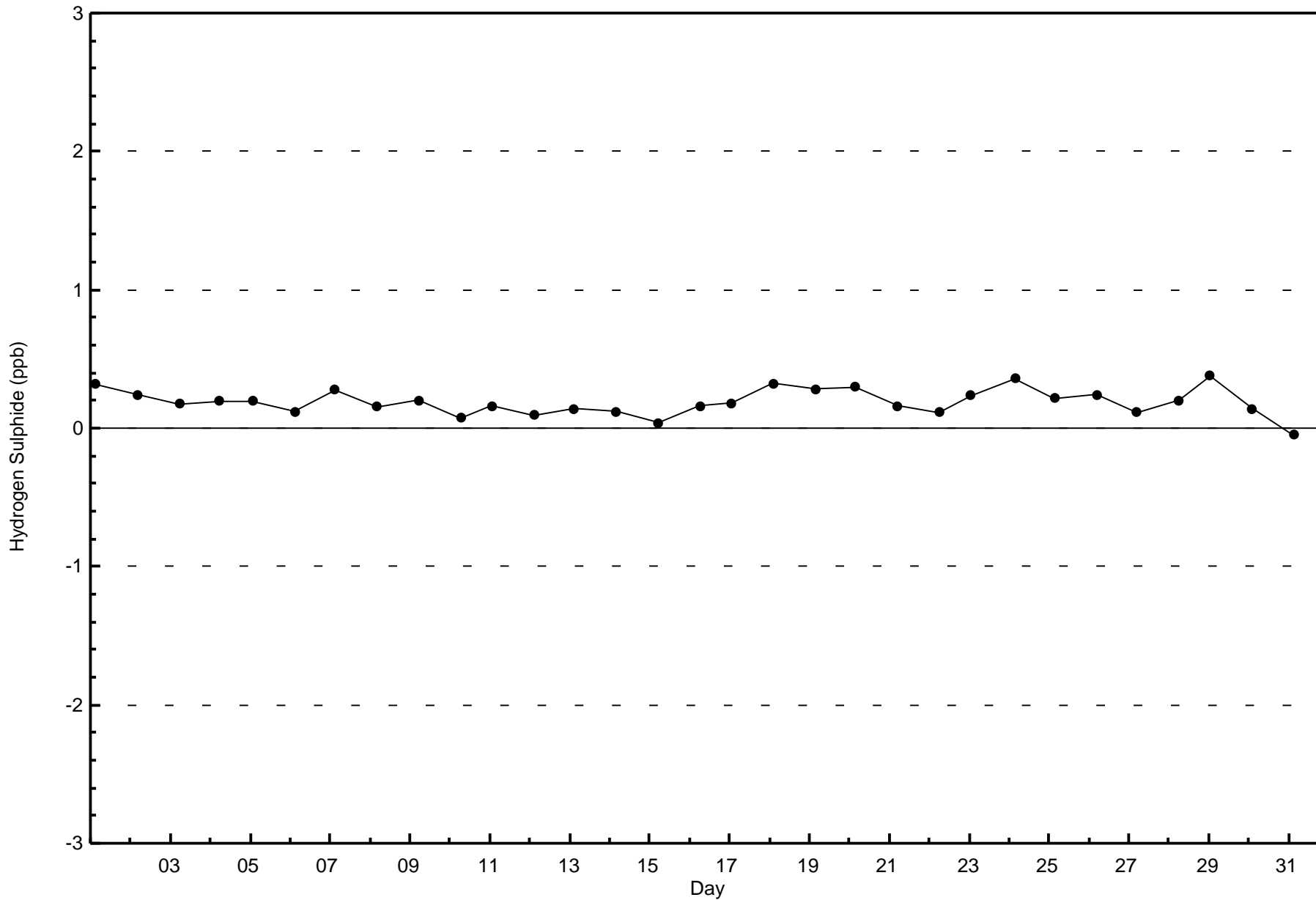


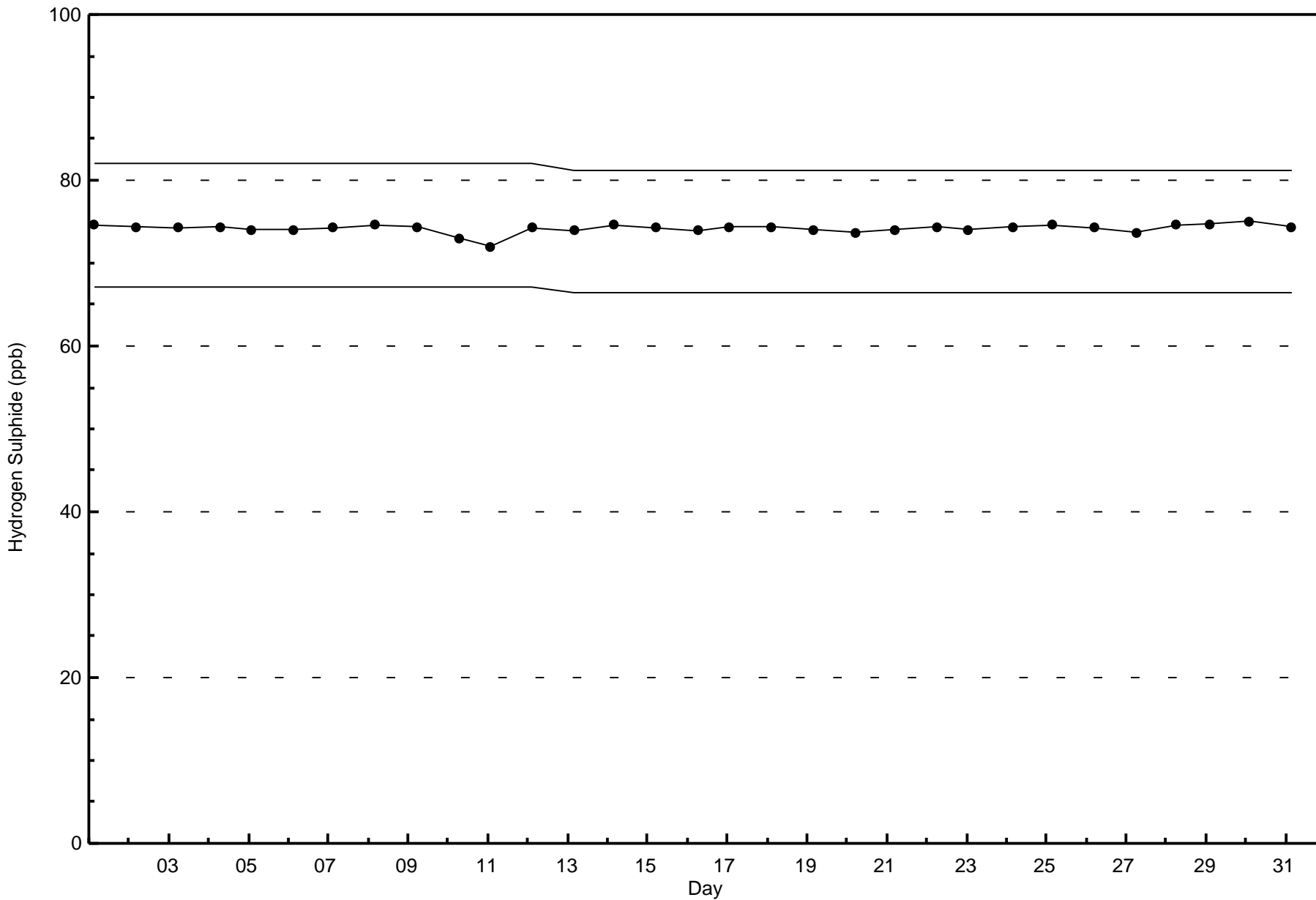
Wood Buffalo Environmental Association
Wind Rose Jul 2016

Hydrogen Sulphide (H₂S) - ppb
Lower Camp (AMS 11)



Total Number of Valid Hours: 707







Wood Buffalo Environmental Association

Summary of Hour Averages

Total Hydrocarbons (THC) - ppm

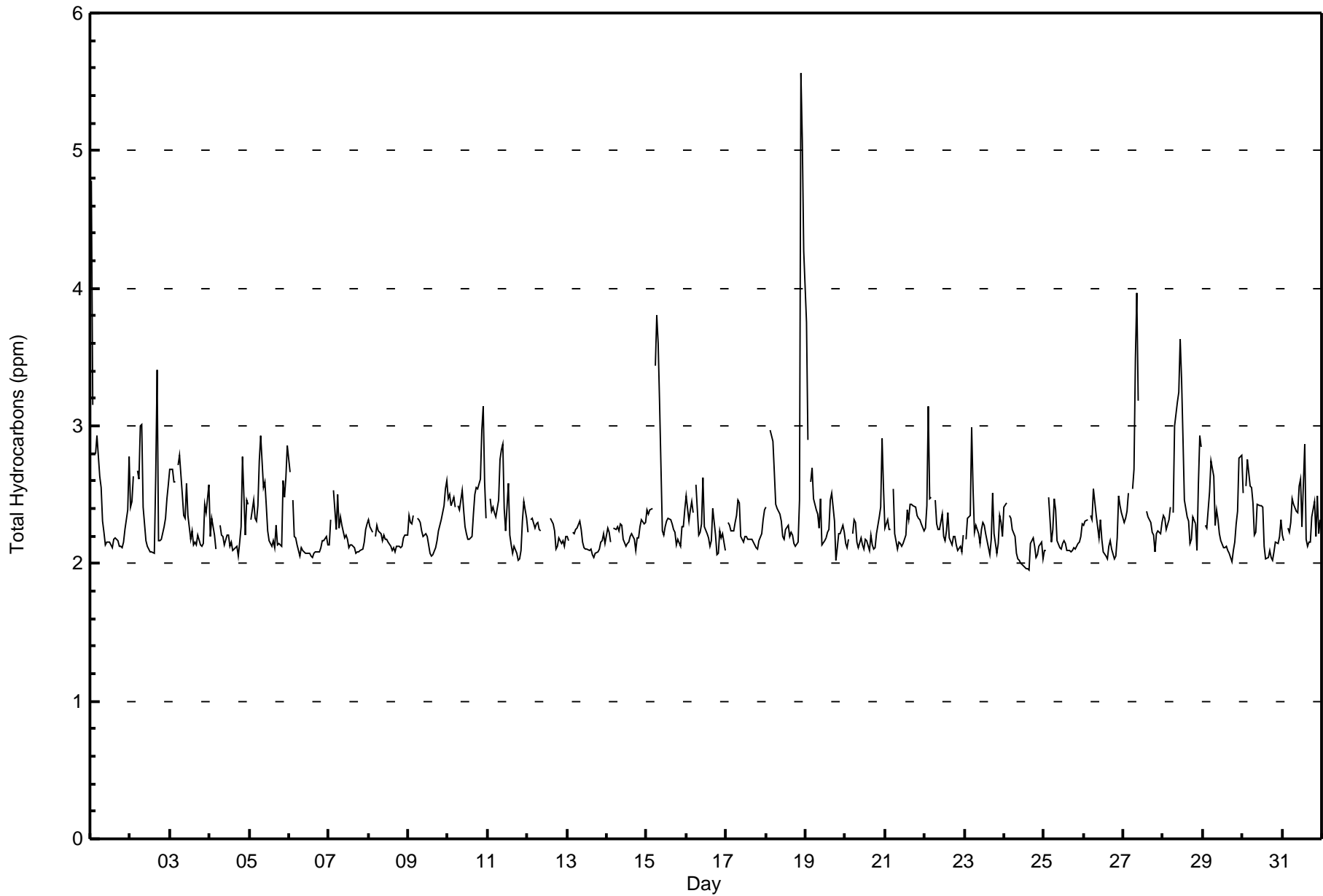
Lower Camp - July 2016

Maximum Value: 5.6 ppm on Jul 18 22:00																								Maximum Daily Average: 2.7 ppm on Jul 18																								Hours in Service: 744	
Minimum Value: 2.0 ppm on Jul 24 16:00																								Minimum Daily Average: 2.1 ppm on Jul 24																								Hours of Data: 704	
Maximum Diurnal Average: 2.5 ppm at hour 1																								Minimum Diurnal Average: 2.2 ppm at hour 19																								Hours of Missing Data: 40	
Monthly Average: 2.32 ppm																								Percentiles: P ₁ = 2.0 P ₁₀ = 2.1 Q ₁ = 2.1 Median = 2.2 Q ₃ = 2.4 P ₉₀ = 2.6 P ₉₉ = 3.7																								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-Jul	4.8	3.2	Z	2.8	2.9	2.6	2.6	2.3	2.2	2.1	2.2	2.2	2.1	2.1	2.2	2.2	2.2	2.1	2.1	2.1	2.2	2.3	2.4	2.8	2.5	4.8																							
2-Jul	2.4	2.4	2.6	Z	2.7	2.6	3.0	3.0	2.4	2.2	2.1	2.1	2.1	2.1	2.1	2.6	3.4	2.2	2.2	2.2	2.3	2.3	2.5	2.6	2.4	3.4																							
3-Jul	2.7	2.7	2.6	2.6	Z	2.7	2.8	2.5	2.3	2.3	2.6	2.3	2.2	2.2	2.1	2.2	2.1	2.2	2.1	2.1	2.1	2.4	2.4	2.6	2.4	2.8																							
4-Jul	2.2	2.3	2.3	2.2	2.1	Z	2.3	2.2	2.2	2.1	2.2	2.2	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.2	2.3	2.8	2.2	2.5	2.4	2.2	2.8																						
5-Jul	Z	2.3	2.5	2.3	2.3	2.4	2.7	2.9	2.5	2.6	2.4	2.2	2.2	2.1	2.2	2.1	2.3	2.1	2.1	2.1	2.6	2.5	2.6	2.9	2.4	2.9																							
6-Jul	2.7	Z	2.5	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.1	2.1	2.7																							
7-Jul	2.1	2.3	Z	2.5	2.2	2.5	2.3	2.3	2.3	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.3	2.2	2.5																							
8-Jul	2.3	2.3	2.2	Z	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.3																							
9-Jul	2.4	2.3	2.3	2.3	Z	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.3	2.3	2.4	2.5	2.6	2.3	2.6																						
10-Jul	2.5	2.5	2.4	2.5	2.4	Z	2.4	2.4	2.5	2.4	2.3	2.2	2.2	2.2	2.2	2.4	2.5	2.6	2.5	2.6	3.0	3.1	2.6	2.3	2.5	3.1																							
11-Jul	Z	2.5	2.4	2.4	2.4	2.3	2.5	2.8	2.8	2.9	2.4	2.2	2.6	2.2	2.1	2.1	2.1	2.1	2.0	2.0	2.1	2.3	2.5	2.3	2.3	2.9																							
12-Jul	2.2	Z	2.3	2.3	2.3	2.3	2.3	2.2	2.2	C	C	C	C	C	2.3	2.3	2.2	2.1	2.1	2.2	2.1	2.2	2.1	2.2	2.2	2.3																							
13-Jul	2.2	2.2	Z	2.2	2.2	2.3	2.3	2.3	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.1	2.2	2.2	2.2	2.1	2.2	2.3																							
14-Jul	2.3	2.2	2.2	Z	2.3	2.2	2.3	2.2	2.3	2.3	2.2	2.1	2.1	2.2	2.2	2.2	2.2	2.1	2.2	2.2	2.3	2.3	2.3	2.3	2.2	2.3																							
15-Jul	2.4	2.4	2.4	2.4	Z	3.4	3.8	3.6	3.2	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.1	2.2	2.1	2.3	2.3	2.4	2.5	3.8																							
16-Jul	2.5	2.3	2.4	2.5	2.4	Z	2.6	2.2	2.2	2.3	2.6	2.3	2.2	2.2	2.1	2.2	2.4	2.2	2.1	2.1	2.2	2.2	2.2	2.1	2.3	2.6																							
17-Jul	Z	2.3	2.3	2.2	2.2	2.3	2.4	2.5	2.4	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.2	2.2	2.3	2.4	2.2	2.5																						
18-Jul	2.4	Z	3.0	2.9	2.9	2.7	2.4	2.4	2.4	2.3	2.2	2.2	2.2	2.3	2.2	2.2	2.2	2.2	2.1	2.1	2.2	2.5	5.6	5.1	4.3	2.7	5.6																						
19-Jul	3.8	2.9	Z	2.6	2.7	2.5	2.4	2.4	2.3	2.5	2.1	2.2	2.2	2.2	2.2	2.5	2.5	2.3	2.0	2.1	2.2	2.2	2.3	2.2	2.4	3.8																							
20-Jul	2.1	2.1	2.2	Z	2.2	2.3	2.3	2.2	2.1	2.2	2.1	2.1	2.2	2.2	2.1	2.2	2.1	2.1	2.1	2.2	2.3	2.4	2.9	2.6	2.2	2.9																							
21-Jul	2.3	2.3	2.2	2.2	Z	2.5	2.2	2.1	2.2	2.1	2.1	2.1	2.2	2.4	2.3	2.4	2.4	2.4	2.4	2.4	2.3	2.3	2.3	2.2	2.3	2.5																							
22-Jul	2.3	2.4	3.1	2.5	2.5	Z	2.5	2.3	2.2	2.2	2.4	2.2	2.2	2.2	2.4	2.2	2.1	2.2	2.2	2.1	2.1	2.1	2.1	2.2	2.3	3.1																							
23-Jul	Z	2.2	2.3	2.4	3.0	2.5	2.2	2.3	2.2	2.1	2.2	2.3	2.3	2.2	2.1	2.1	2.2	2.5	2.2	2.1	2.1	2.4	2.3	2.2	2.3	3.0																							
24-Jul	2.4	2.4	Z	2.3	2.3	2.2	2.2	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.2	2.2	2.1	2.0	2.1	2.1	2.2	2.0	2.1	2.4																							
25-Jul	2.1	2.1	Z	2.5	2.2	2.3	2.5	2.4	2.2	2.1	2.1	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.3	2.2	2.5																							
26-Jul	2.3	2.3	2.3	Z	2.3	2.3	2.5	2.4	2.3	2.2	2.3	2.2	2.1	2.1	2.0	2.1	2.2	2.1	2.0	2.1	2.2	2.5	2.4	2.4	2.2	2.5																							
27-Jul	2.3	2.3	2.4	2.5	Z	2.5	2.7	3.5	4.0	3.2	M	M	M	M	2.4	2.3	2.3	2.2	2.2	2.1	2.2	2.2	2.2	2.3	2.5	4.0																							
28-Jul	2.4	2.3	2.3	2.3	2.4	Z	2.4	3.0	3.2	3.2	3.6	3.3	2.9	2.5	2.3	2.3	2.2	2.2	2.3	2.3	2.1	2.6	2.9	2.8	2.6	3.6																							
29-Jul	Z	2.3	2.3	2.4	2.5	2.7	2.6	2.3	2.4	2.3	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.2	2.3	2.4	2.8	2.8	2.3	2.8																						
30-Jul	2.5	Z	2.6	2.8	2.6	2.5	2.4	2.2	2.2	2.4	2.4	2.4	2.4	2.1	2.0	2.0	2.1	2.0	2.0	2.1	2.2	2.1	2.2	2.3	2.3	2.8																							
31-Jul	2.2	2.2	Z	2.3	2.2	2.3	2.5	2.4	2.4	2.4	2.6	2.6	2.3	2.9	2.2	2.1	2.2	2.2	2.3	2.5	2.2	2.5	2.2	2.3	2.3	2.9																							
																								Diurnal Average																									
																								Diurnal Maximum																									
Z - zerospan C - Calibration M - Maintenance																																																	



Wood Buffalo Environmental Association
Hourly Averages

Total Hydrocarbons (THC) - ppm
Lower Camp - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Lower Camp - July 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	23	3.27	3.27
2.1 - 3.0	661	93.89	97.16
3.1 - 10.0	20	2.84	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
Lower Camp - July 2016**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	3	3	1	0	0	0	1	1	0	0	1	11	0	1	0	1	23
2.1 - 3.0	59	34	15	12	20	28	83	33	15	14	20	34	54	66	77	97	661
3.1 - 10.0	1	0	0	0	2	4	6	0	5	0	0	0	0	1	0	1	20
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	63	37	16	12	22	32	90	34	20	14	21	45	54	68	77	99	704

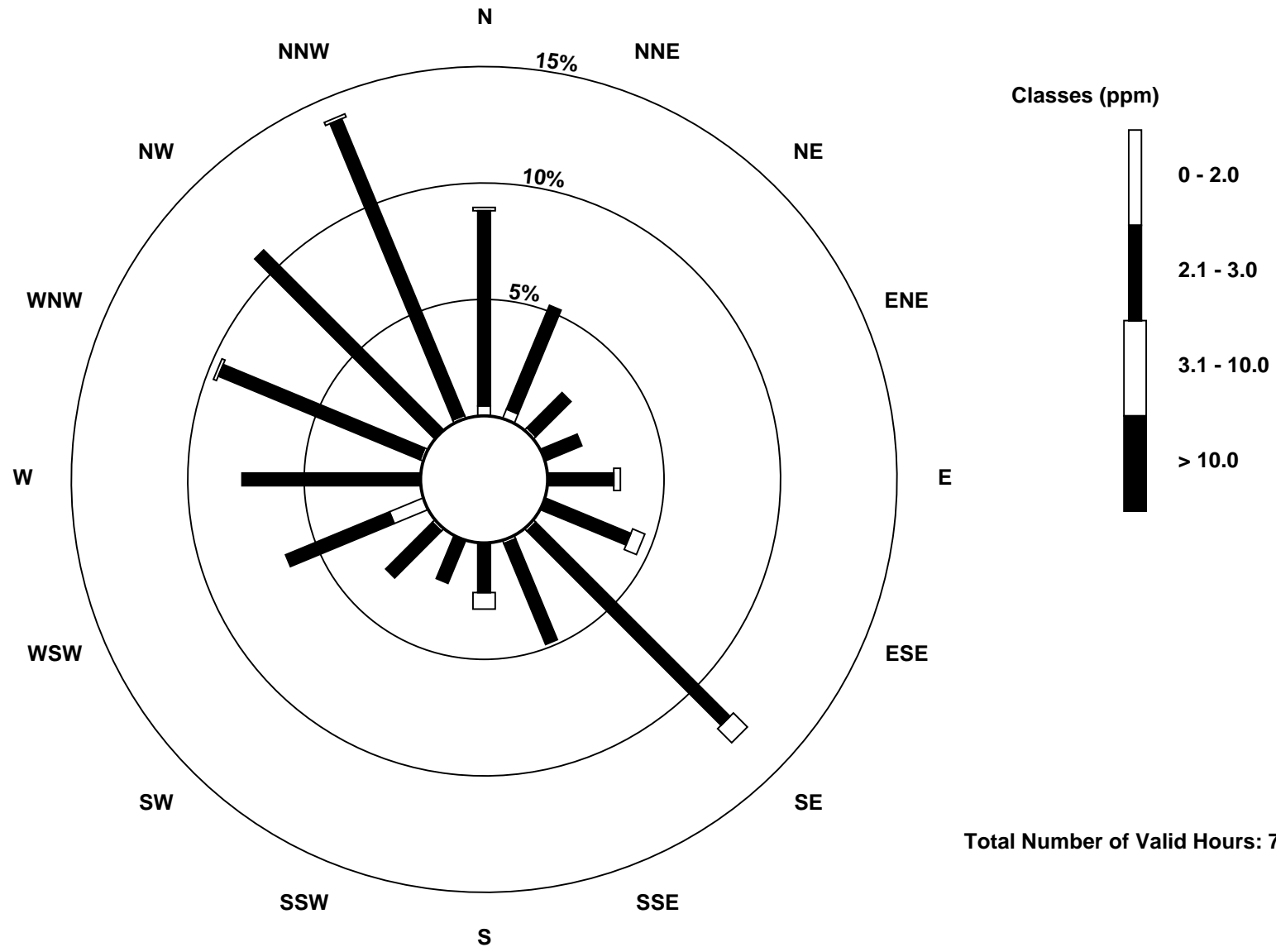
Total Number of Valid Hours: 704

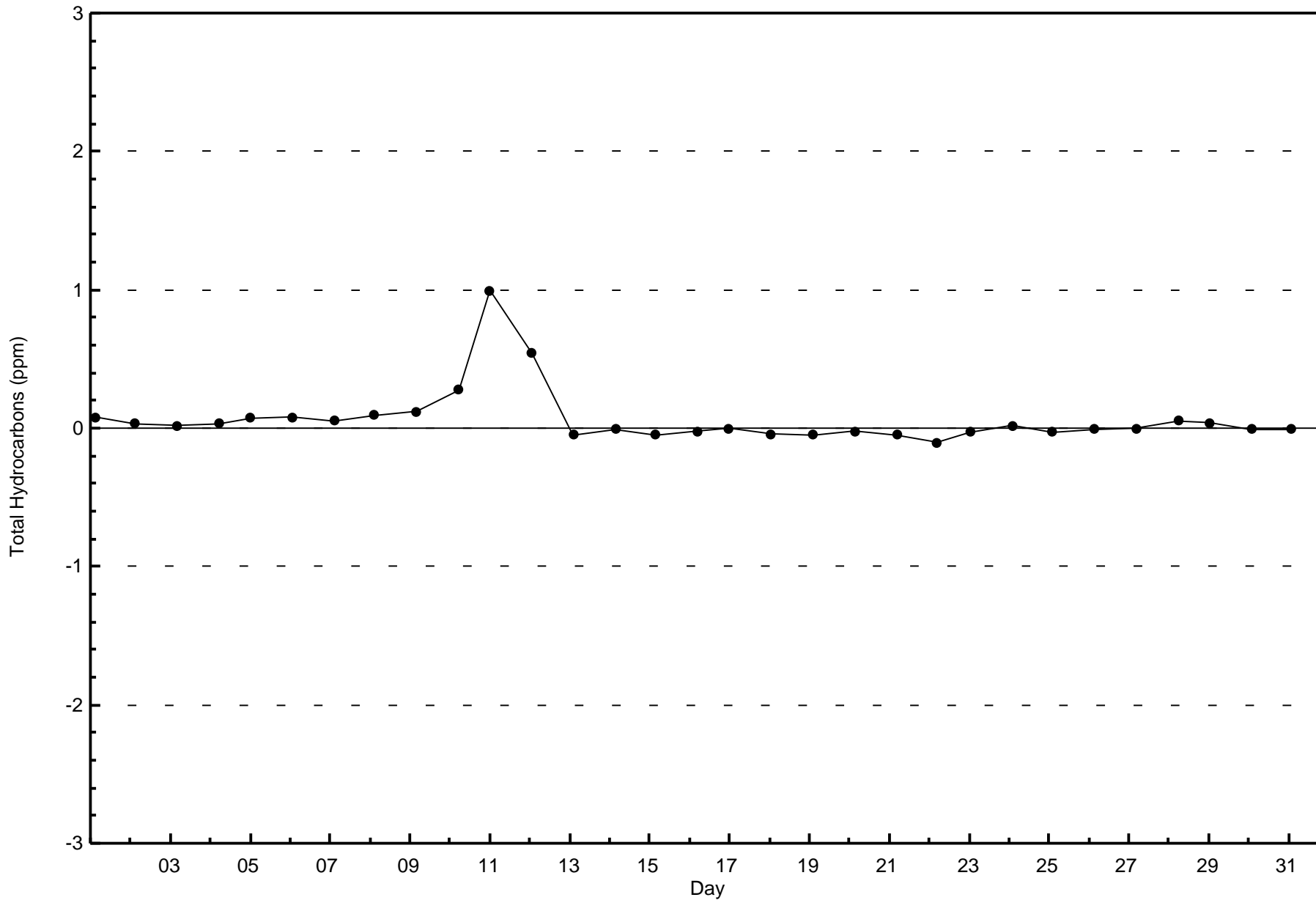
Total Number of Hours: 744

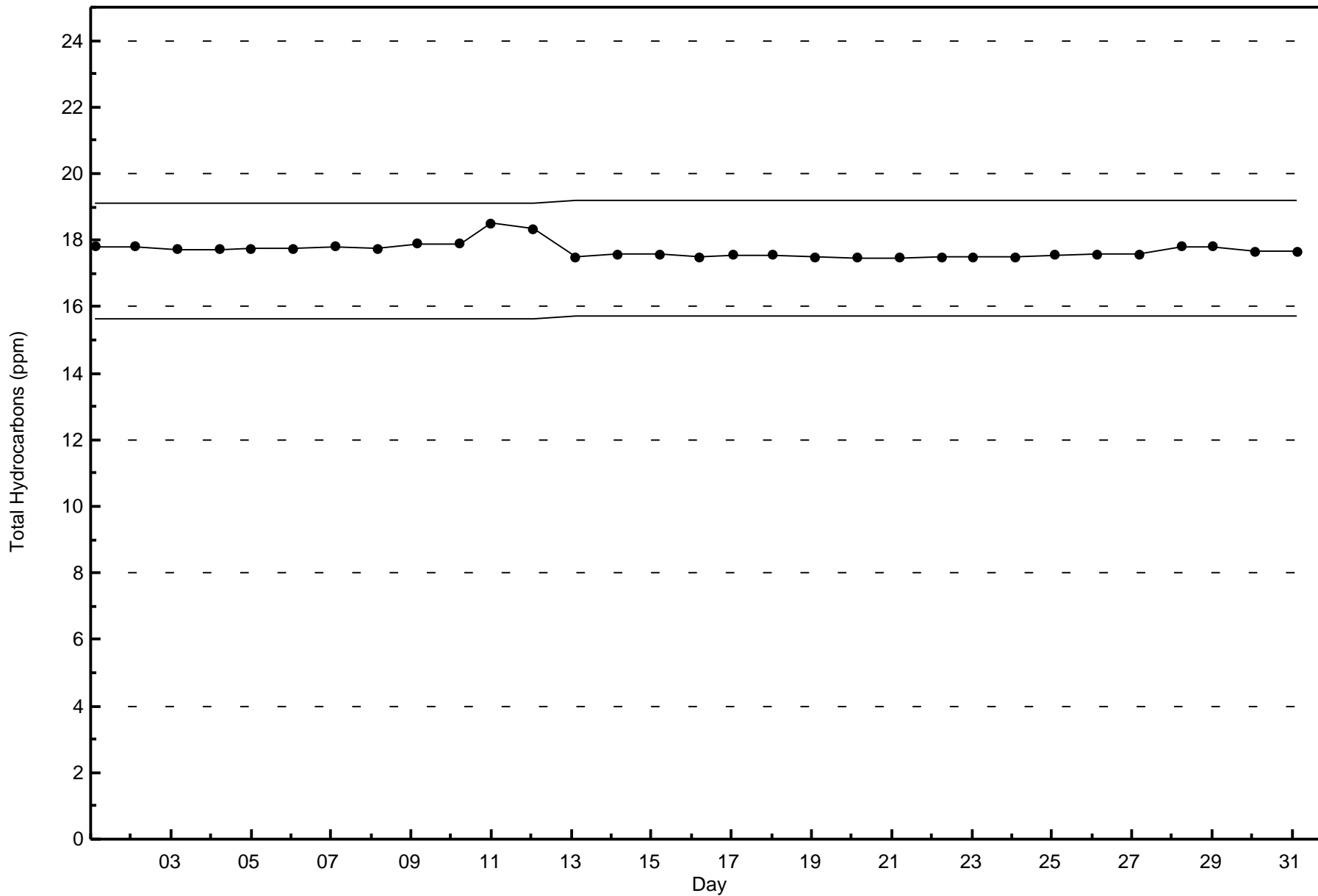


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Total Hydrocarbons (THC) - ppm
Lower Camp (AMS 11)









Wood Buffalo Environmental Association

Summary of Hour Averages

Ambient Temperature (AT) - C

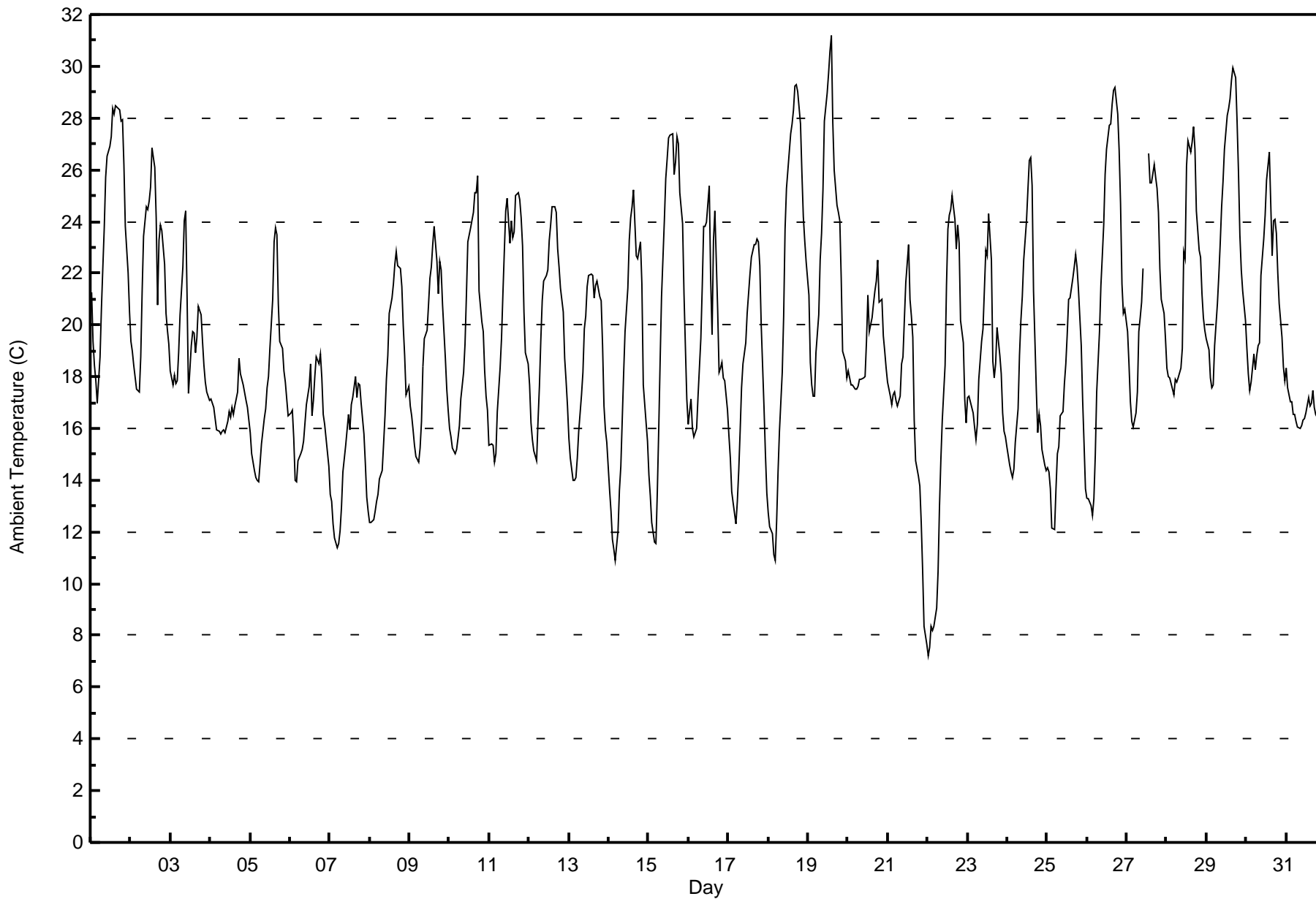
Lower Camp - July 2016

Maximum Value: 31.2 C on Jul 19 15:00		Maximum Daily Average: 24.0 C on Jul 1		Hours in Service: 744																						
Minimum Value: 7.2 C on Jul 22 01:00		Minimum Daily Average: 14.8 C on Jul 7		Hours of Data: 742																						
Maximum Diurnal Average: 23.5 C at hour 15		Minimum Diurnal Average: 14.8 C at hour 5		Hours of Missing Data: 2																						
Monthly Average: 19.38 C		Percentiles: P ₁ = 8.9 P ₁₀ = 14.3 Q ₁ = 16.3 Median = 18.7 Q ₃ = 22.5 P ₉₀ = 25.5 P ₉₉ = 29.1		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-Jul	21.3	19.3	18.5	17.8	17.0	18.8	20.7	22.2	23.7	25.7	26.5	26.9	27.3	28.4	28.1	28.5	28.4	28.3	27.9	27.9	26.2	23.8	22.0	20.5	24.0	28.5
2-Jul	19.4	19.0	18.4	17.5	17.5	17.4	18.8	21.3	23.4	24.6	24.5	24.8	25.3	26.8	26.1	24.1	20.8	23.3	23.8	23.6	22.4	20.5	19.8	19.2	21.8	26.8
3-Jul	18.2	17.7	18.1	17.7	17.9	18.9	20.4	22.2	24.0	24.4	21.1	17.3	19.2	19.8	19.7	18.9	19.6	20.7	20.4	19.3	18.5	17.8	17.4	17.1	19.4	24.4
4-Jul	17.1	17.0	16.8	16.4	16.0	15.9	15.8	15.9	16.0	15.8	16.3	16.6	16.4	16.8	16.5	16.9	17.4	18.7	18.1	17.9	17.7	17.1	16.8	16.3	16.8	18.7
5-Jul	15.8	15.0	14.4	14.1	14.0	13.9	14.7	15.4	16.4	16.7	17.6	18.0	19.1	21.0	23.2	23.7	23.5	20.8	19.3	19.1	18.2	17.8	17.2	16.5	17.7	23.7
6-Jul	16.6	16.7	15.6	14.0	13.9	14.8	15.0	15.2	15.5	16.2	16.9	17.6	18.5	16.5	17.1	18.0	18.8	18.5	18.9	18.0	16.5	16.1	15.1	14.5	16.4	18.9
7-Jul	13.5	13.2	12.3	11.8	11.4	11.6	12.0	13.0	14.3	15.3	15.9	16.6	16.0	16.9	17.2	18.0	17.2	17.8	17.7	17.0	15.8	14.6	13.3	12.8	14.8	18.0
8-Jul	12.4	12.4	12.5	12.8	13.2	13.5	14.1	14.4	15.4	16.5	17.9	18.8	20.4	21.0	21.6	22.3	22.8	22.3	22.2	21.5	20.0	18.8	17.3	17.6	17.6	22.8
9-Jul	16.9	16.5	16.0	15.4	14.9	14.7	15.2	16.3	18.4	19.4	19.8	20.8	21.8	22.2	23.1	23.8	22.5	21.2	22.5	22.2	20.8	18.7	17.5	16.7	19.0	23.8
10-Jul	16.0	15.7	15.2	15.0	15.2	15.6	16.1	17.1	18.2	19.3	21.2	23.2	23.5	23.8	24.4	25.1	25.1	25.8	21.3	20.1	19.7	18.2	17.2	16.7	19.5	25.8
11-Jul	15.3	15.4	15.4	14.7	15.0	16.6	18.4	19.5	21.2	22.8	24.4	24.9	23.1	24.0	23.4	23.6	25.0	25.1	24.9	24.1	23.1	20.5	18.9	18.5	20.7	25.1
12-Jul	17.7	16.2	15.6	15.1	14.7	16.3	17.7	19.4	20.9	21.7	21.9	22.1	23.3	23.9	24.6	24.6	24.3	22.9	22.2	21.4	20.5	18.7	17.8	16.9	20.0	24.6
13-Jul	15.6	14.8	14.0	14.0	14.1	14.9	15.9	17.3	18.2	19.9	20.4	21.5	21.9	22.0	21.9	21.1	21.5	21.7	21.1	21.0	19.2	16.9	15.9	15.4	18.3	22.0
14-Jul	13.6	12.8	11.7	11.4	10.9	12.1	13.6	14.5	16.3	18.1	19.8	21.4	23.3	24.1	24.6	25.2	22.7	22.6	22.9	23.2	21.6	17.7	16.2	15.5	18.2	25.2
15-Jul	14.2	13.4	12.4	11.6	11.5	13.6	15.9	18.6	21.1	24.1	25.6	26.4	27.2	27.3	27.4	25.8	26.3	27.3	27.0	25.1	23.9	21.2	19.1	17.1	21.0	27.4
16-Jul	16.1	17.1	16.0	15.7	15.8	16.0	17.3	19.5	21.5	23.8	23.8	24.0	25.4	21.8	19.6	23.3	24.4	20.6	18.2	18.3	18.6	17.9	17.9	16.7	19.5	25.4
17-Jul	15.7	14.8	13.5	13.1	12.3	13.2	14.4	15.9	17.6	18.5	19.3	20.4	21.2	21.9	22.6	23.1	23.1	23.3	23.2	22.3	20.0	16.8	15.0	13.5	18.1	23.3
18-Jul	12.8	12.2	11.9	11.1	10.9	12.4	14.3	15.9	18.2	20.3	23.7	25.3	26.0	27.4	27.8	28.3	29.2	29.3	29.0	27.7	25.8	24.2	23.3	22.4	21.2	29.3
19-Jul	21.2	18.6	17.7	17.2	17.2	18.9	20.4	22.5	23.6	25.2	27.9	29.0	29.7	30.6	31.2	27.8	26.0	24.6	24.3	24.1	21.8	19.0	18.6	18.0	23.1	31.2
20-Jul	18.2	17.9	17.7	17.7	17.5	17.5	17.6	17.9	17.9	17.9	18.0	19.4	21.1	19.7	20.3	20.8	21.3	21.7	22.5	20.9	21.0	19.6	19.0	18.3	19.2	22.5
21-Jul	17.8	17.2	16.9	17.3	17.4	17.1	16.9	17.2	18.5	18.8	20.2	21.6	23.1	21.0	20.3	19.5	16.3	14.7	14.2	13.8	12.4	10.5	8.4	7.7	16.6	23.1
22-Jul	7.2	7.5	8.4	8.2	8.3	9.0	10.5	12.9	14.8	16.3	18.4	21.5	23.7	24.2	24.5	25.0	24.1	22.9	23.9	23.2	20.2	19.3	17.2	16.2	17.0	25.0
23-Jul	17.2	17.2	17.0	16.6	16.0	15.5	16.2	17.9	19.3	19.9	21.4	22.9	22.7	24.3	22.5	18.6	17.9	18.5	19.9	18.8	18.1	16.6	15.9	15.7	18.6	24.3
24-Jul	15.3	14.6	14.3	14.1	14.5	15.5	16.8	18.8	20.2	21.1	22.5	24.0	25.2	26.4	26.5	25.4	21.3	17.5	15.8	16.5	16.1	15.2	14.6	14.4	18.6	26.5
25-Jul	14.5	14.3	13.7	12.2	12.1	13.7	15.0	15.3	16.5	16.6	17.8	18.5	19.6	21.0	21.0	21.8	22.2	22.7	22.2	21.4	19.2	17.1	15.4	13.7	17.4	22.7
26-Jul	13.3	13.3	13.0	12.7	13.3	15.0	17.4	19.7	21.6	22.7	23.9	25.8	26.8	27.7	27.8	28.5	29.1	29.2	28.1	26.7	24.7	21.6	20.5	20.6	21.8	29.2
27-Jul	19.7	18.5	17.1	16.3	16.0	16.6	17.4	19.7	20.3	20.9	22.2	M	M	26.6	25.5	25.5	26.2	25.7	25.3	24.4	22.2	21.0	20.4	19.4	21.2	26.6
28-Jul	18.3	18.0	18.0	17.5	17.3	17.9	17.8	18.0	18.3	19.1	22.8	22.6	26.1	27.1	26.7	27.1	27.6	26.8	24.4	22.9	22.6	21.2	20.3	19.8	21.6	27.6
29-Jul	19.5	19.0	17.9	17.6	17.7	19.2	20.8	21.9	23.2	24.6	25.5	26.8	28.1	28.4	28.7	29.4	29.9	29.6	27.9	25.9	23.5	22.2	21.3	20.2	23.7	29.9
30-Jul	19.1	18.1	17.5	17.8	18.9	18.3	18.8	19.2	19.3	21.9	23.3	24.2	25.6	26.1	26.7	22.7	24.0	24.1	23.6	22.0	20.8	19.5	18.4	17.9	21.2	26.7
31-Jul	18.3	17.6	17.0	17.0	16.5	16.6	16.3	16.0	16.0	16.1	16.3	16.4	16.6	17.2	16.9	17.0	17.5	16.8	16.6	16.3	16.3	16.0	16.0	15.8	16.6	18.3
																								Diurnal Average		
																								Diurnal Maximum		
M - Maintenance																										



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature (AT) - C
Lower Camp - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Lower Camp - July 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	8	1.08	1.08
10 - 20	434	58.49	59.57
> 20	300	40.43	100.00

Total Number of Valid Hours: 742

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

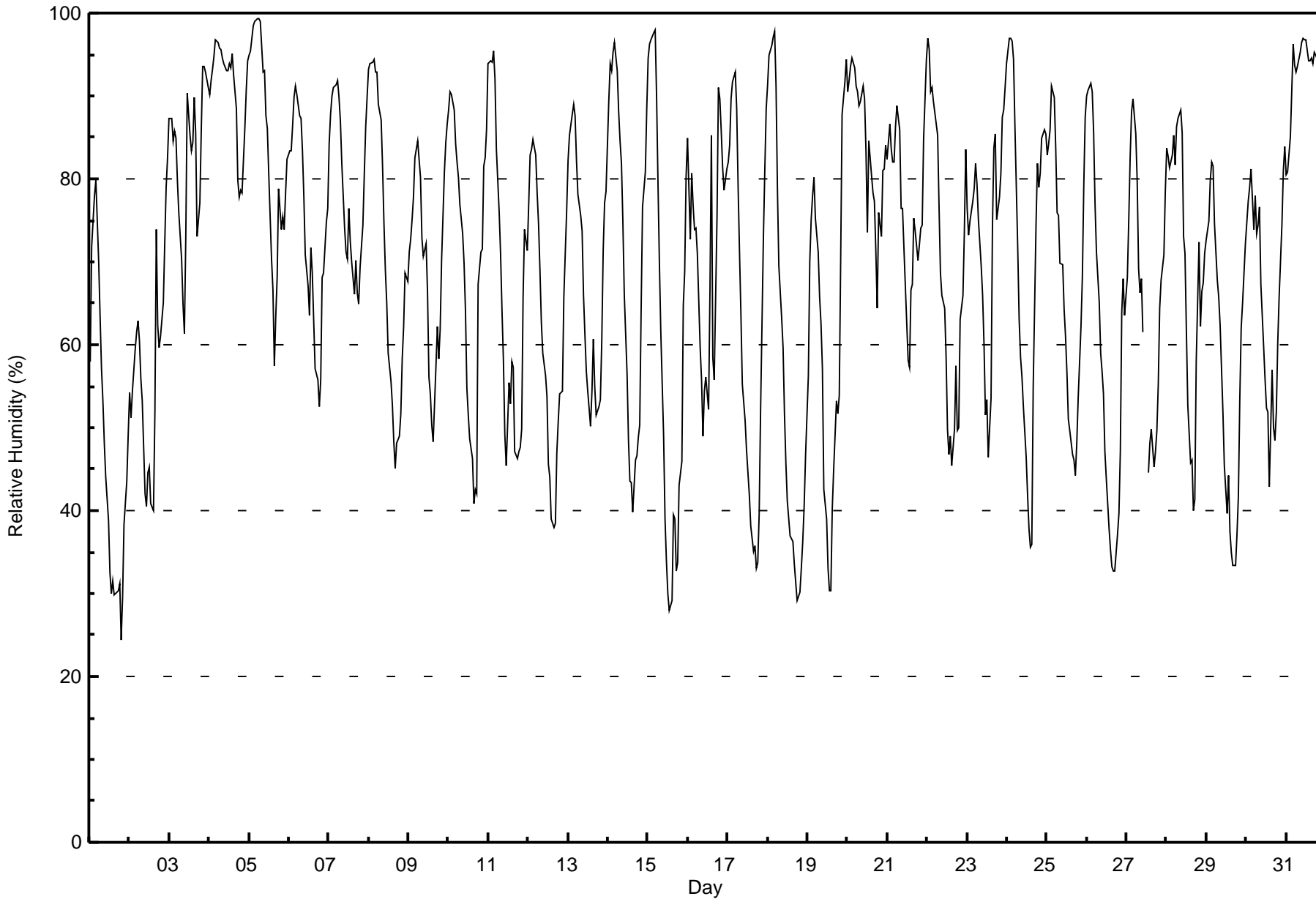
Lower Camp - July 2016

Maximum Value: 99 % on Jul 5 07:00																		Maximum Daily Average: 92.8 % on Jul 31																		Hours in Service: 744	
Minimum Value: 24 % on Jul 1 20:00																		Minimum Daily Average: 47.4 % on Jul 1																		Hours of Data: 742	
Maximum Diurnal Average: 87.5 % at hour 4																		Minimum Diurnal Average: 53.4 % at hour 16																		Hours of Missing Data: 2	
Monthly Average: 69.5 %																		Percentiles: P ₁ = 30 P ₁₀ = 42 Q ₁ = 54 Median = 72 Q ₃ = 85 P ₉₀ = 93 P ₉₉ = 97																		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-Jul	58	72	75	78	80	70	63	57	53	48	44	39	32	30	32	30	30	30	31	24	29	38	44	49	47.4	80											
2-Jul	54	51	54	60	61	63	61	56	53	42	40	45	45	41	40	52	74	62	60	61	65	72	79	83	57.2	83											
3-Jul	87	87	85	86	85	80	76	70	65	61	73	90	85	83	84	90	86	73	77	86	93	94	93	91	82.6	94											
4-Jul	90	92	93	95	97	97	96	96	95	94	93	93	94	93	95	93	89	80	78	79	78	86	91	94	90.8	97											
5-Jul	95	95	98	99	99	99	99	99	99	93	93	88	86	81	70	67	57	63	68	79	74	75	74	78	82	83.9	99										
6-Jul	83	83	86	90	91	90	88	87	83	78	71	67	63	72	69	63	57	56	53	56	68	69	75	76	73.9	91											
7-Jul	84	88	90	91	91	92	90	87	82	74	71	70	76	72	70	66	70	66	65	69	74	81	86	90	79.1	92											
8-Jul	93	94	94	94	93	93	89	87	82	75	69	65	59	56	53	48	45	48	49	52	58	62	69	68	70.6	94											
9-Jul	71	73	75	78	83	85	82	80	73	71	72	66	56	54	50	48	57	62	58	62	70	81	84	87	70.0	87											
10-Jul	88	90	90	88	84	82	80	77	73	70	64	55	51	49	46	41	43	42	67	71	72	81	83	86	69.8	90											
11-Jul	94	94	94	95	92	84	76	71	64	58	49	45	55	53	58	57	47	46	47	48	50	66	74	71	66.2	95											
12-Jul	77	83	84	85	83	78	75	69	63	59	56	54	46	44	39	38	38	47	51	54	54	66	71	76	62.0	85											
13-Jul	82	85	88	89	88	82	78	76	74	66	61	57	54	50	54	61	55	52	53	53	61	71	77	79	68.5	89											
14-Jul	89	94	93	95	97	93	88	85	82	75	66	56	49	44	43	40	46	47	49	50	64	77	81	88	70.4	97											
15-Jul	95	96	97	98	98	90	79	70	62	49	39	34	30	28	29	40	39	33	34	43	46	65	69	80	60.0	98											
16-Jul	85	73	81	77	74	74	71	60	56	49	54	56	52	67	85	59	56	76	91	90	86	81	79	81	71.3	91											
17-Jul	82	84	90	92	93	89	79	71	64	55	51	47	45	42	38	35	36	33	34	40	52	73	81	88	62.2	93											
18-Jul	91	95	96	97	98	91	79	70	63	60	52	46	41	37	37	36	34	31	29	30	33	36	40	47	57.0	98											
19-Jul	56	70	75	78	80	75	71	66	63	57	43	39	33	30	30	40	45	53	52	54	70	88	92	94	60.6	94											
20-Jul	91	92	94	94	93	91	91	89	89	91	90	83	74	85	80	78	77	71	64	76	73	81	81	84	83.9	94											
21-Jul	82	87	84	82	82	86	89	86	76	76	72	67	58	57	67	67	75	74	70	72	74	74	85	94	76.5	94											
22-Jul	97	96	90	91	89	87	85	77	69	66	64	59	50	47	49	45	50	57	50	50	63	66	74	84	68.9	97											
23-Jul	77	73	75	77	79	82	79	75	69	66	60	52	53	46	54	74	84	85	75	78	81	87	88	91	73.4	91											
24-Jul	94	97	97	97	94	86	71	63	58	56	53	46	42	38	36	36	55	74	82	79	81	85	86	85	70.5	97											
25-Jul	83	84	86	91	90	84	76	76	70	70	64	61	57	51	50	47	46	44	48	54	62	68	79	87	67.8	91											
26-Jul	90	91	92	91	86	77	71	65	59	57	54	47	44	38	35	33	33	33	37	40	47	64	68	64	58.9	92											
27-Jul	68	75	83	88	90	85	80	69	66	68	62	M	M	45	48	50	45	47	50	55	64	68	71	78	66.1	90											
28-Jul	84	83	81	83	85	82	86	87	88	86	73	71	62	53	46	46	40	41	58	72	62	66	67	71	69.8	88											
29-Jul	73	75	80	82	82	75	68	66	62	57	52	45	40	44	37	35	33	33	37	42	53	62	65	72	57.1	82											
30-Jul	75	77	79	81	74	78	73	74	77	67	60	56	52	52	43	57	50	48	52	60	66	75	81	84	66.3	84											
31-Jul	81	81	85	91	96	94	93	94	95	96	97	97	97	94	94	95	94	95	95	94	92	93	92	93	92.8	97											
																		82.2 84.2 85.9 87.5 87.3 84.3 80.1 75.9 71.6 67.4 63.1 59.8 55.9 53.7 53.5 53.4 54.6 55.2 57.2 60.2 65.1 72.6 76.8 80.6																		Diurnal Average	
																		97 97 98 99 99 99 99 99 99 95 96 97 97 97 94 95 95 94 95 95 94 93 94 93 94																		Diurnal Maximum	
M - Maintenance																																					



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity (RH) - %
Lower Camp - July 2016





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Speed (WS) - km/h
Lower Camp - July 2016

Maximum Speed: 25 km/h on Jul 24 17:00	Maximum Daily Speed Average: 12.2 km/h on Jul 24	Hours in Service: 744
Minimum Speed Value: 0 km/h on Jul 28 09:00	Minimum Daily Speed Average: 1.5 km/h on Jul 28	Hours of Data: 742
Maximum Diurnal Speed Average: 5.4 km/h at hour 17	Minimum Diurnal Speed Average: 0.2 km/h at hour 7	Hours of Missing Data: 2
Monthly Average Velocity: 2.1 km/h 304.7 deg	Percentiles: P ₁ = 1 P ₁₀ = 3 Q ₁ = 4 Median = 7 Q ₃ = 10 P ₉₀ = 14 P ₉₉ = 23	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-Jul	S4	ESE3	SE5	SE4	NE1	E6	SE10	SE10	ESE13	SE19	SE18	SE16	SE14	SE10	ESE14	ESE13	ESE14	ESE13	SE13	SSE9	S8	SSE7	SE6	SE5	SE9.5	SE19
2-Jul	SE7	SE8	SE8	SE6	SE6	SE6	E6	SE7	SE14	SE16	SSE10	SSE11	SSE11	SSE11	SSE10	S11	S5	SE16	ESE16	SE9	SSE4	SE6	SE7	SE7	SE8.5	SE16
3-Jul	ESE7	SE7	ESE6	ESE3	E5	E6	SE8	SE9	SE8	ESE11	SSE10	SW11	N2	E9	E8	E6	ESE4	SE5	E4	E4	SE5	ESE12	S5	WNW9	ESE4.9	ESE12
4-Jul	W9	WNW4	WSW7	WSW8	WSW12	W12	WSW9	WSW10	WSW9	WSW14	W13	WSW13	WSW15	WSW17	SW17	SW17	WSW12	W11	SSW7	SSW6	S5	SE5	ESE5	NNW2	WSW8.8	SW17
5-Jul	N2	WNW3	W3	WNW4	WNW5	WNW7	NNW3	NNW8	NN5	WNW1	E1	SE4	NNE3	N3	SE7	ESE4	SE6	NNW6	NNW7	WNW4	W11	W11	WNW7	NNW4	NW2.6	W11
6-Jul	W9	W11	WNW11	NW11	NW8	NNW8	N7	N10	N14	NNE15	NE12	NNE11	NNE12	NNE13	NE15	ENE13	NE10	ENE13	NE11	N8	NNW6	NNW8	NNW10	NNW9	N7.4	NE15
7-Jul	NNW8	NNW7	NW5	NW7	NNW6	NW8	NW8	NW7	NNW9	NNW10	NNW8	N9	N9	NNW10	NNE11	N11	NNE13	NNE12	N13	NNE10	NNW8	NNW7	NW6	N4	NNW8.0	NNE13
8-Jul	NW4	NNW3	NW1	NW5	NNE5	NW5	NNW7	NNW6	NNW7	NNW7	NNW8	N9	NNW8	N8	N8	N7	NNW7	NNW8	N9	NNE9	NNE7	NNE7	WNW5	NNW5	NNW6.1	NNE9
9-Jul	NW6	N8	NNE8	N6	N8	NNW6	N5	N2	NW2	NW3	NNW4	N3	NNE3	N5	N8	NNE7	NNE5	ENE3	NNE6	ENE5	NNW1	WSW1	WNW3	NNW4	N4.0	N8
10-Jul	W3	NW3	NNW2	WNW3	NE3	NNE2	N4	N4	NNW5	NW4	NW4	NNW4	ENE11	ENE12	ENE13	NE10	E7	SE6	WSW21	WSW17	NW4	WNW5	WNW6	NW3	NNW1.8	WSW21
11-Jul	NW2	W1	NNE1	NW3	WNW3	NW3	ENE3	N3	NNW4	NW6	NNW8	NNW10	NNW13	NNW13	NW12	NNW9	NNW10	N11	N14	NNW12	NNW7	WNW5	NW6	NNW8	NNW6.5	N14
12-Jul	NNW7	NW6	NW6	NW6	WNW7	NNW7	NW8	NNW10	NNW11	NNW12	NNW11	NNW13	N17	NNW16	NNW16	NW17	NW18	N16	NNW17	NNW14	NNW11	NW7	NW8	NW7	NNW10.7	NW18
13-Jul	NW6	WNW6	WNW6	NW7	NW8	NW8	NW11	NW12	NNW12	NNW14	N15	NNW16	N15	N19	N18	NNE10	NNE13	N16	N9	N10	NNW5	WNW4	NW3	NNW3	NNW9.4	N19
14-Jul	W4	NE1	NNE2	NW2	NE1	NE2	NNW3	NNE3	NNE3	NNE3	N6	N5	NW5	NNW7	NW10	NW9	NNW14	NNW5	NW8	WNW4	NNW2	WNW4	W4	WNW3	NNW3.9	NNW14
15-Jul	ENE1	NE1	ENE1	E2	E3	ESE6	ESE7	SE6	E3	W7	WSW8	W8	W7	NW6	NNW10	NNW13	NNW8	NW12	NW8	NW6	NW7	NW2	NW1	N1	NW2.8	NNW13
16-Jul	NW1	W5	SSE1	SSE3	S1	SSE4	SE5	WSW11	WSW11	W8	N6	N7	N5	NNW8	S3	SSW1	WSW2	NNW13	W2	WNW6	NW8	WNW9	NW9	WNW7	WNW3.5	NNW13
17-Jul	WNW8	NW6	WNW5	NW4	WNW3	NW5	NW6	NW8	NNW9	NNW13	NNW13	NNW11	NNW10	NNW11	NNW12	NNW12	N11	N10	NNW9	N7	N2	NNE1	NNW1	E2	NNW6.9	NNW13
18-Jul	NE1	E1	WNW2	W4	WSW2	ESE3	ESE9	ESE12	SE9	ESE10	SE9	ESE7	NE2	S3	NW8	WNW12	W11	WSW13	SW13	SW12	SSW8	S7	S7	S7	SSW3.1	SW13
19-Jul	SE3	E6	SE5	SE5	SE3	SE6	SE9	SE9	ESE8	E2	WSW13	W16	W17	W16	W17	WNW18	WNW22	W16	WSW11	W6	W11	SSE3	WNW3	NNW4	WSW5.1	WNW22
20-Jul	NNW4	NE4	NNW3	NW7	NW8	NNW7	N8	NNW7	N6	NW3	WNW6	WNW4	NW4	NW7	N6	NNW9	N10	N6	NW3	SSE1	SW5	SSE2	SSE5	ESE2	NNW3.7	N10
21-Jul	SSW4	SSE5	SSW4	SSE3	SSE5	SSE3	SW8	WSW16	W15	WSW14	WSW13	WSW20	WSW20	W22	WSW23	WNW15	N23	N23	N16	N16	NNE14	NNE5	SSE1	SE3	WNW6.0	N23
22-Jul	ESE4	SE3	SE7	SSE6	SSE7	SE8	SE12	SE12	SE11	SSE10	SE10	SE13	SSE10	SW11	S8	SW14	W11	WNW5	W12	WNW12	NW6	WNW8	W3	SE1	S4.3	SW14
23-Jul	SW4	WSW12	WSW14	W8	NW6	WNW5	NW5	N4	NNW4	NNE5	WNW6	W7	NNE5	WNW5	WNW12	NW6	W11	ESE2	SW8	SW3	SW5	SW3	S3	SSE4	W4.1	WSW14
24-Jul	SSE5	SE7	SE10	SE11	SE10	SE6	SSW10	SW16	WSW18	WSW18	WSW19	WSW21	WSW23	WSW24	WSW23	WSW23	WNW25	WNW22	W19	WSW15	W17	W15	W10	WSW15	WSW12.2	WNW25
25-Jul	W18	W15	WNW8	W4	WSW7	W8	W15	WNW15	WNW12	NNW6	N5	NE3	ENE4	NNW4	NNE8	N7	N6	NNW5	NE6	NE8	NNW3	WNW4	NNW1	W4	NNW5.0	W18
26-Jul	W4	WNW5	W6	W5	SE4	E4	ESE11	SE11	SE10	SE9	ESE6	SSW7	SE10	S6	WNW8	WNW10	WNW10	SW4	SSE8	SSE7	SSE6	SE7	SE7	SSE8	SSE3.3	SE11
27-Jul	SE6	SE6	SE5	SE4	SE5	SE5	SE6	SE5	E3	N6	NNW7	M	M	NNW11	NNW10	NNW10	NNW10	N9	N7	NNE7	NNW2	NW3	NW2	WNW1	NNE2.2	NNW11
28-Jul	WNW3	W5	WNW4	NW3	NW2	WSW3	SW6	SE4	NNW0	ESE5	SE7	SE6	SE7	SE6	E3	NNE4	SE6	N3	NW2	SSW1	WSW17	SSE6	SSE5	SSE4	S1.5	WSW17
29-Jul	SW9	SSW3	SW4	WSW6	SSW4	S5	SSW5	S4	SE5	SE5	E5	SW4	S6	SE11	S6	SSW7	SW10	SW8	SE4	SSE7	SE6	SE8	SE6	SE2	S4.4	SE11
30-Jul	NW4	E3	SE3	SSW2	W8	SSE4	S4	SE6	ESE3	ESE6	ESE5	E4	E5	SE11	SE13	N13	NNE14	N12	NNE6	NNW8	NNW7	NW5	NNW2	NNW6	NE1.6	NNE14
31-Jul	NNE3	E4	SE1	W2	NNE2	NNW9	NNW5	WNW8	WNW7	W7	WNW6	SW6	W14	WNW11	WSW15	W15	WNW8	NW7	WNW9	WSW10	W13	WNW7	W11	WNW11	W6.6	W15

W2.1	W1.2	WSW1.4	W1.6	WNW1.1	NW0.8	SW0.2	W0.9	NW1.2	NNW1.0	NW1.6	WNW2.6	NNW2.5	NW3.4	NW3.2	NW4.8	NNW5.4	NNW4.7	NW3.5	NW2.8	WNW3.4	W1.6	W1.8	WNW1.9	Diurnal Average
W18	W15	WSW14	SE11	WSW12	W12	W15	SW16	WSW18	SE19	WSW19	WSW21	WSW23	WSW24	WSW23	WSW23	WNW25	N23	WSW21	WSW17	W17	W15	W11	WSW15	Diurnal Maximum

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



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Lower Camp - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 13 km/h on Jul 24 17:00	Hours in Service: 744 Hours of Data: 742 Hours of Missing Data: 2 Hours of Calibration: 0 Percent Operational Time: 99.7
Minimum Value: 1 km/h on Jul 14 23:00	
Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 2 Q ₃ = 3 P ₉₀ = 4 P ₉₉ = 6	

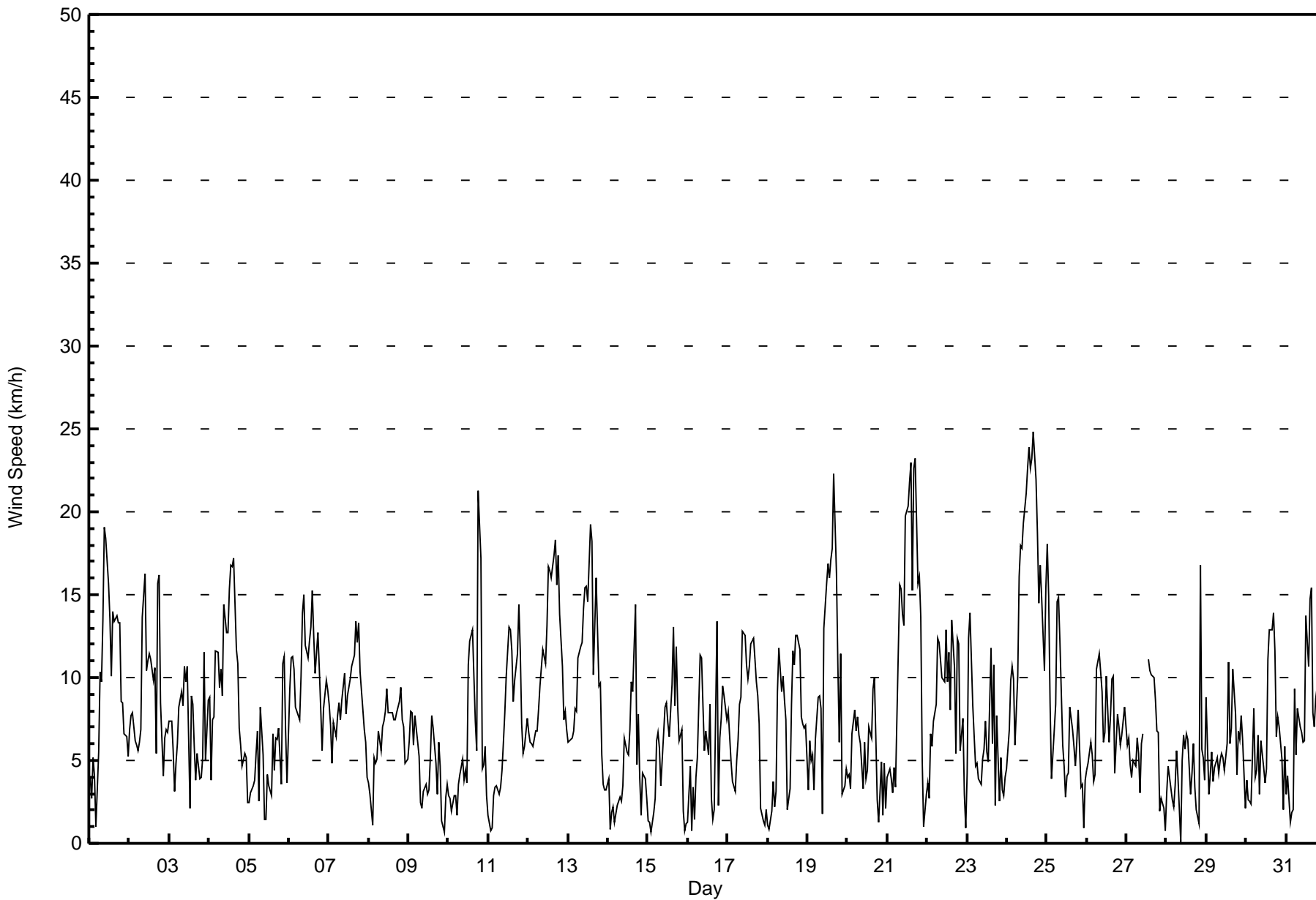
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Jul	2	1	1	1	1	3	3	3	5	6	6	6	6	5	6	5	5	5	5	3	3	2	2	2	6
2-Jul	2	2	2	3	2	3	2	2	4	6	4	5	5	4	4	5	5	5	6	3	2	2	3	2	6
3-Jul	2	2	3	2	3	2	2	3	2	3	5	5	3	4	3	1	2	2	2	1	4	3	4	3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

M - Maintenance



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed (WS) - km/h
Lower Camp - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Lower Camp - July 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	267	35.98	35.98
6 - 11	336	45.28	81.27
12 - 19	124	16.71	97.98
20 - 28	15	2.02	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 742

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Lower Camp - July 2016**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	18	17	9	7	18	12	28	18	11	8	8	4	15	31	36	27	267
6 - 11	32	13	5	1	8	12	57	18	9	6	9	12	23	29	42	60	336
12 - 19	14	8	2	4	0	8	12	0	0	0	6	21	18	8	5	18	124
20 - 28	2	0	0	0	0	0	0	0	0	0	0	9	1	3	0	0	15
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	66	38	16	12	26	32	97	36	20	14	23	46	57	71	83	105	742

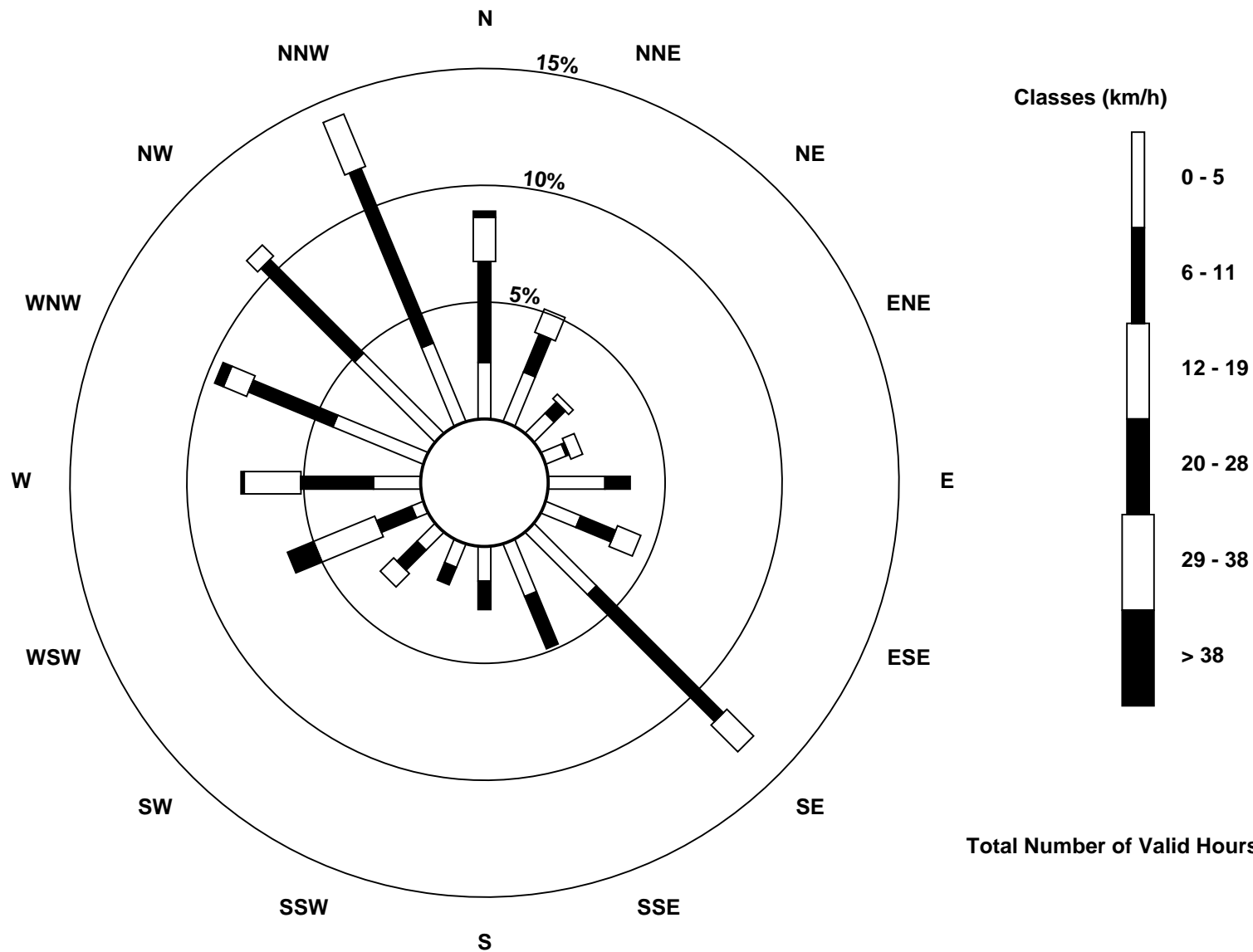
Total Number of Valid Hours: 742

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

Wind Speed (WS) - km/h
Lower Camp (AMS 11)





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Direction (WD) - deg

Lower Camp - July 2016

Direction of Maximum Speed: 294 deg on Jul 24 17:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 251.6 deg on Jul 24	Hours of Data: 742
Direction of Minimum Speed: 338 deg on Jul 28 09:00	Hours of Missing Data: 2
Direction of Minimum Daily Speed Average: 1.5 deg on Jul 28	Percent Operational Time: 99.7
Monthly Average Direction: 305.1 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-Jul	182	123	140	143	49	100	126	129	123	127	129	129	133	139	122	123	122	122	131	163	173	153	139	145	131.9
2-Jul	137	146	146	125	130	124	93	126	125	138	159	154	153	163	163	185	190	125	121	136	164	129	133	131	141.1
3-Jul	117	135	118	118	98	95	128	128	126	112	162	227	3	85	96	86	113	129	93	81	130	111	189	283	122.0
4-Jul	266	299	253	243	237	261	255	251	245	250	259	245	244	245	235	228	246	263	208	201	179	145	118	333	242.6
5-Jul	355	287	281	292	292	297	314	330	325	293	93	133	30	6	130	116	133	333	333	292	273	266	301	333	306.1
6-Jul	275	263	288	304	316	347	11	350	5	28	42	20	33	24	56	64	53	77	40	358	328	328	328	342	6.4
7-Jul	334	343	319	312	328	311	308	311	322	341	337	354	349	338	17	7	19	14	6	23	342	340	321	357	346.3
8-Jul	316	339	320	320	23	320	334	347	332	337	347	351	330	358	350	349	342	343	358	13	12	14	287	338	345.8
9-Jul	320	352	12	349	350	346	352	355	321	304	348	10	12	360	354	24	23	76	33	59	334	251	294	289	357.1
10-Jul	264	318	344	293	38	24	1	355	333	326	324	333	76	60	74	55	89	129	248	256	304	298	289	313	342.8
11-Jul	323	276	27	310	286	309	63	2	336	320	347	338	301	333	325	343	327	354	350	345	344	300	320	328	333.0
12-Jul	337	305	319	316	290	329	325	346	334	339	346	344	352	346	335	325	317	354	339	346	333	315	309	307	333.2
13-Jul	308	299	293	311	325	317	321	321	339	348	355	347	349	4	353	21	33	9	350	358	336	297	306	340	344.8
14-Jul	275	54	29	322	56	42	333	19	19	18	10	5	316	344	325	318	348	341	304	295	346	290	279	282	334.0
15-Jul	78	52	57	90	83	105	120	129	92	274	256	264	267	314	328	340	342	314	320	325	319	321	309	9	319.6
16-Jul	323	272	157	164	173	156	145	248	252	262	353	360	8	329	171	198	243	332	274	284	304	302	306	286	290.5
17-Jul	290	305	286	316	285	315	326	321	333	342	348	332	327	337	339	336	359	349	339	10	8	22	336	81	334.4
18-Jul	52	89	283	279	250	112	118	118	125	123	130	121	44	173	306	297	271	247	227	223	204	187	184	187	192.4
19-Jul	139	98	127	131	131	139	129	132	123	97	243	260	266	261	261	294	291	259	245	278	280	157	294	295	252.6
20-Jul	347	50	331	312	310	335	349	339	1	304	292	291	313	321	355	341	1	1	314	147	220	149	151	119	334.1
21-Jul	192	150	206	161	150	154	230	249	264	256	251	249	252	263	250	303	1	5	359	7	14	25	161	134	284.5
22-Jul	118	129	145	151	151	146	125	130	143	158	144	145	165	220	170	222	274	291	268	287	305	301	267	143	181.2
23-Jul	219	246	253	278	319	299	310	354	339	12	290	270	14	288	296	320	272	117	216	224	222	222	174	158	274.8
24-Jul	158	145	127	129	130	137	212	232	250	252	255	257	257	255	254	244	294	293	279	257	260	260	269	252	251.6
25-Jul	266	272	291	264	249	274	271	288	300	341	360	34	61	334	14	1	9	337	38	40	328	298	330	281	306.7
26-Jul	272	286	277	269	125	100	113	129	128	128	113	201	140	181	282	297	289	235	163	164	153	137	133	148	164.1
27-Jul	139	134	135	144	137	133	127	135	94	358	330	M	M	343	341	343	342	350	354	32	343	305	310	289	15.2
28-Jul	295	269	291	307	321	251	235	128	338	112	134	126	132	129	86	17	126	356	308	200	247	166	168	165	181.4
29-Jul	224	202	234	244	212	181	206	177	142	125	92	221	172	136	173	206	217	234	130	164	139	131	145	129	177.9
30-Jul	323	82	138	195	267	150	180	141	110	121	102	81	91	129	144	356	24	4	18	334	331	315	335	297	43.8
31-Jul	27	89	146	262	22	335	332	290	295	271	283	232	265	284	243	262	282	321	283	257	268	296	275	283	279.1

274.0 270.2 258.3 274.5 287.1 321.6 231.4 265.4 314.3 329.0 311.6 282.2 298.3 311.2 308.4 317.4 331.0 340.4 318.7 317.9 288.4 279.9 269.0 283.2
Diurnal Average

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



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

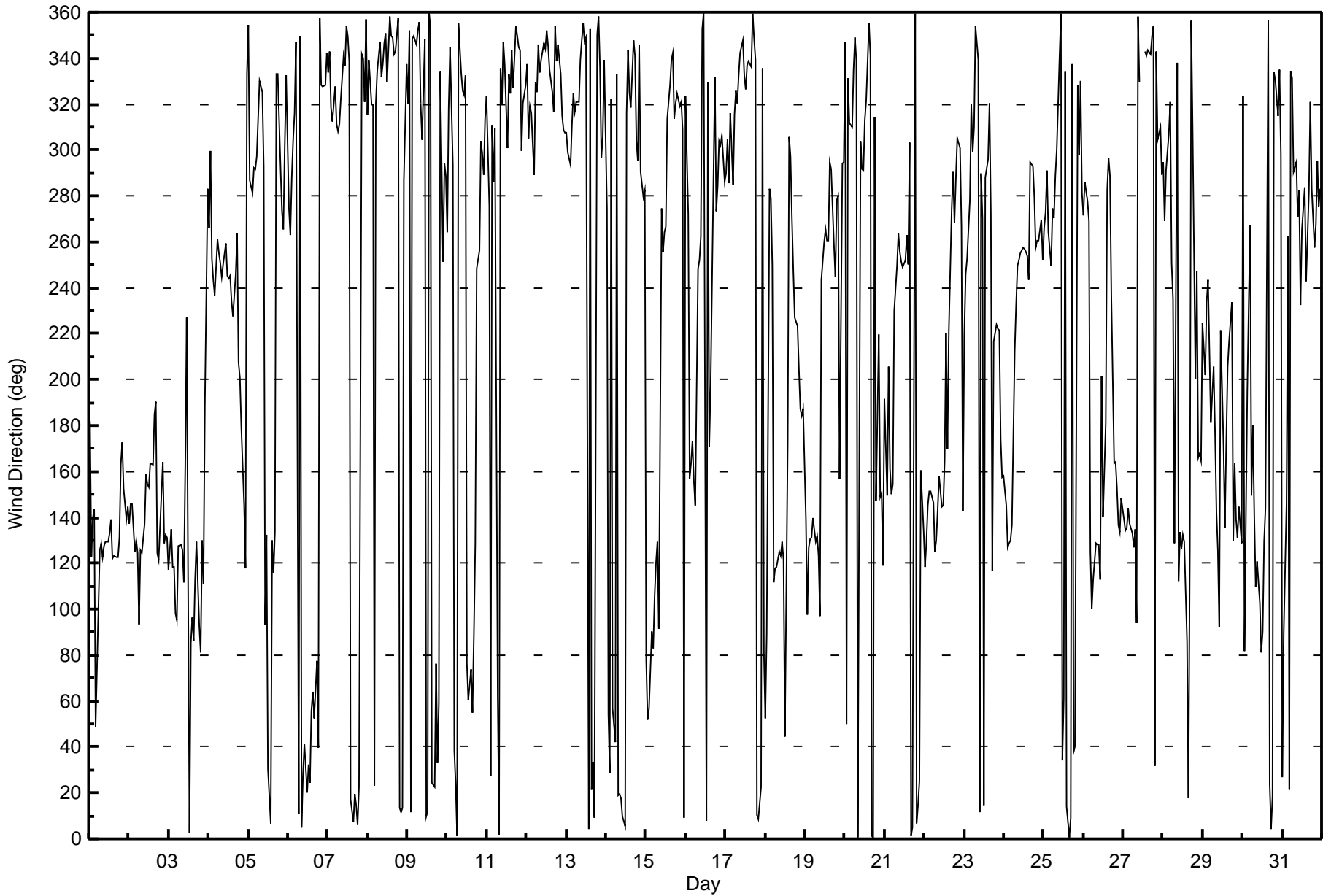
Wind Direction (WD) - deg
Lower Camp - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0																Hours in Service: 744									
Maximum Value: 101 deg on Jul 1 05:00																Hours of Data: 742									
Minimum Value: 9 deg on Jul 4 05:00																Hours of Missing Data: 2									
Percentiles: P ₁ = 11 P ₁₀ = 16 Q ₁ = 21 Median = 28 Q ₃ = 42 P ₉₀ = 63 P ₉₉ = 87																Hours of Calibration: 0									
																Percent Operational Time: 99.7									
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Jul	34	51	21	32	101	46	25	31	27	20	24	28	34	44	25	25	24	25	27	33	29	29	30	31	101
2-Jul	31	22	25	47	43	68	42	27	27	32	37	41	36	42	36	37	69	24	25	36	37	30	38	35	69
3-Jul	24	35	52	71	55	41	27	26	24	19	45	49	75	29	24	27	49	29	48	54	57	20	54	21	75
4-Jul	17	33	20	19	9	13	14	13	18	13	12	14	11	12	11	17	35	17	27	30	31	23	63	82	82
5-Jul	67	46	31	22	19	20	57	31	37	87	70	32	64	73	20	39	30	80	19	75	17	12	26	41	87
6-Jul	17	13	16	15	14	27	17	21	21	21	25	28	23	16	25	23	29	18	19	25	24	17	13	23	29
7-Jul	25	25	34	26	35	19	17	17	21	26	28	37	32	24	27	42	20	24	20	19	19	17	25	35	42
8-Jul	46	44	78	32	31	31	24	40	27	33	28	22	28	18	22	23	22	21	20	12	12	21	41	30	78
9-Jul	12	22	16	24	21	25	22	48	57	41	33	41	29	15	24	44	53	70	30	20	51	101	48	22	101
10-Jul	40	37	85	36	28	47	37	27	24	32	36	45	42	21	21	31	41	26	47	14	30	21	23	43	85
11-Jul	59	85	80	36	20	40	46	46	36	30	28	25	25	21	16	20	18	24	21	19	20	24	19	12	85
12-Jul	25	18	18	22	21	26	26	22	20	21	22	22	21	23	21	21	15	20	20	20	18	15	15	17	26
13-Jul	17	21	17	17	13	16	14	14	22	23	24	23	22	21	20	46	27	20	24	25	27	29	45	44	46
14-Jul	16	81	46	48	57	51	44	46	56	35	12	27	55	44	31	37	20	34	13	16	29	10	11	56	81
15-Jul	68	71	76	47	49	21	18	21	48	34	37	37	47	36	42	20	29	21	19	23	20	71	98	65	98
16-Jul	78	46	97	58	93	42	35	21	15	22	27	15	32	73	62	72	76	27	61	13	14	11	14	11	97
17-Jul	14	17	27	31	32	23	25	18	25	22	23	28	31	36	27	24	28	29	22	29	33	38	58	36	58
18-Jul	79	61	47	30	23	83	25	17	19	20	26	35	82	89	36	18	28	20	18	16	21	25	31	38	89
19-Jul	76	33	18	27	72	43	32	27	21	77	21	18	17	16	16	32	15	30	12	32	38	62	54	32	77
20-Jul	42	33	45	26	22	26	23	26	21	52	17	60	40	21	19	24	12	15	50	72	25	82	44	85	85
21-Jul	47	38	44	50	29	45	35	15	14	12	16	14	15	22	13	44	21	18	22	20	15	59	88	30	88
22-Jul	39	67	37	32	37	37	26	32	32	34	34	32	41	32	38	34	40	51	14	34	23	17	56	89	89
23-Jul	52	17	11	30	21	20	19	40	52	24	56	35	35	77	42	33	40	67	42	83	24	42	38	32	83
24-Jul	24	22	22	23	24	50	27	20	16	15	16	15	15	14	15	14	29	18	21	15	13	13	29	17	50
25-Jul	12	12	15	37	21	26	15	17	28	36	60	67	35	71	26	30	33	40	37	13	50	45	82	19	82
26-Jul	27	16	12	22	56	70	34	25	24	23	45	70	38	61	34	19	19	68	34	34	28	20	32	28	70
27-Jul	36	25	40	36	16	29	21	21	43	15	26	M	M	23	18	20	23	18	15	21	56	40	60	90	90
28-Jul	46	24	29	64	68	63	62	40	94	35	27	25	30	19	52	38	27	61	62	82	23	33	44	55	94
29-Jul	16	67	30	26	47	34	32	61	54	46	37	83	70	35	66	64	36	55	58	31	20	21	23	76	83
30-Jul	81	90	68	69	39	44	49	41	44	35	36	40	53	31	32	53	24	20	39	20	19	24	63	29	90
31-Jul	66	55	72	73	84	30	53	14	21	30	42	42	24	22	21	15	44	24	11	19	12	34	16	23	84
81 90 97 73 101 83 62 61 94 87 70 83 82 89 66 72 76 80 62 83 57 101 98 90																									
Diurnal Maximum																									
M - Maintenance																									



Wood Buffalo Environmental Association
Hourly Averages

Wind Direction (WD) - deg
Lower Camp - July 2016





Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	July 12, 2016	Last Calibration	June 14, 2016
Station Name	Lower Camp	Station Number	AMS 11
Reason:	Routine		
Start Time (MST)	9:40	End Time (MST)	12:20
Gas Cert Reference	LL110099	Station temp.	20 Deg C
Cal Gas Concentration	51.3 ppm	Cal Gas Exp Date	25/03/2016
Calibrator Make/Model	Sabio 4010	Serial Number	11051107
ZAG Make/Model	API 701	Serial Number	3411
DACS make/model	Campbell Scientific CR3000	DACS serial No.	3492

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-675	-675
Analyzer IP address	192.168.1.43		Lamp voltage	798	796
Calculated slope	0.996666	0.997131	Chamber temp	44.9	45.0
Calculated intercept	0.227235	0.577954	Pressure	699.3	705.7
Analyzer Background	11.6	11.5	Flow	0.476	0.481
Analyzer Coefficient	1.028	1.028	Intensity	91	91

Analyzer make TEI 43i Analyzer serial # 100841398

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.0	----
as found span	5000	80.9	830.0	832.0	0.998
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	80.9	830.0	832.0	0.998
second point	5000	40.9	419.6	420.5	0.998
third point	5000	20.5	210.3	209.5	1.004
as left zero	5000	0.0	0.0	0.1	----
as left span	5000	80.9	830.0	829.5	1.001
Average Correction Factor					1.000

Corrected As found 832.0 Previous response 832.6 % change 0.1%

Notes:

Inlet filter changed after as founds. No adjustments.

Calibration Performed By:

Evan Magill



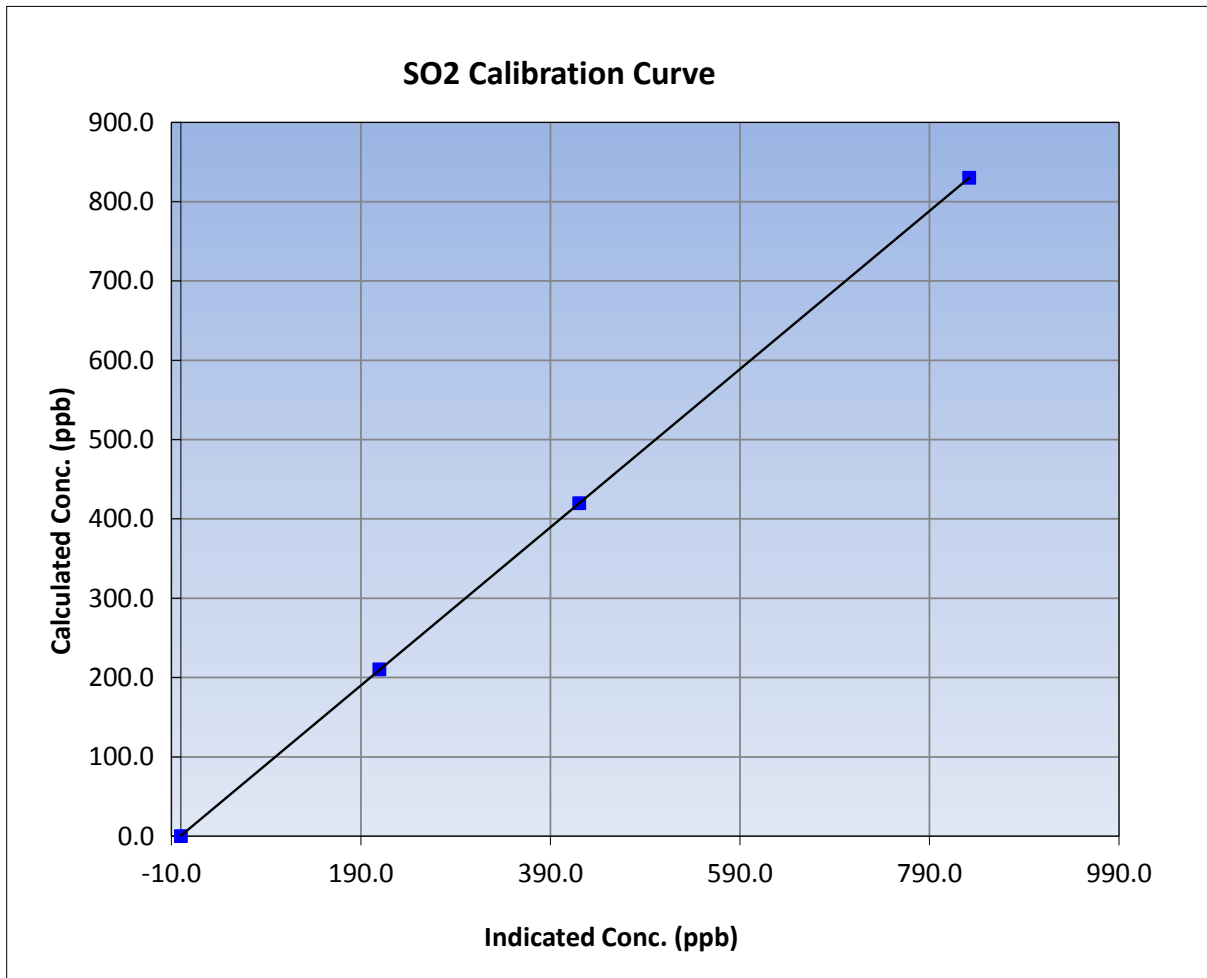
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	July 12, 2016	Previous Calibration	June 14, 2016
Station Name	Lower Camp	Station Number	AMS 11
Start Time (MST)	9:40	End Time (MST)	12:20
Analyzer make	TEI 43i	Analyzer serial #	100841398

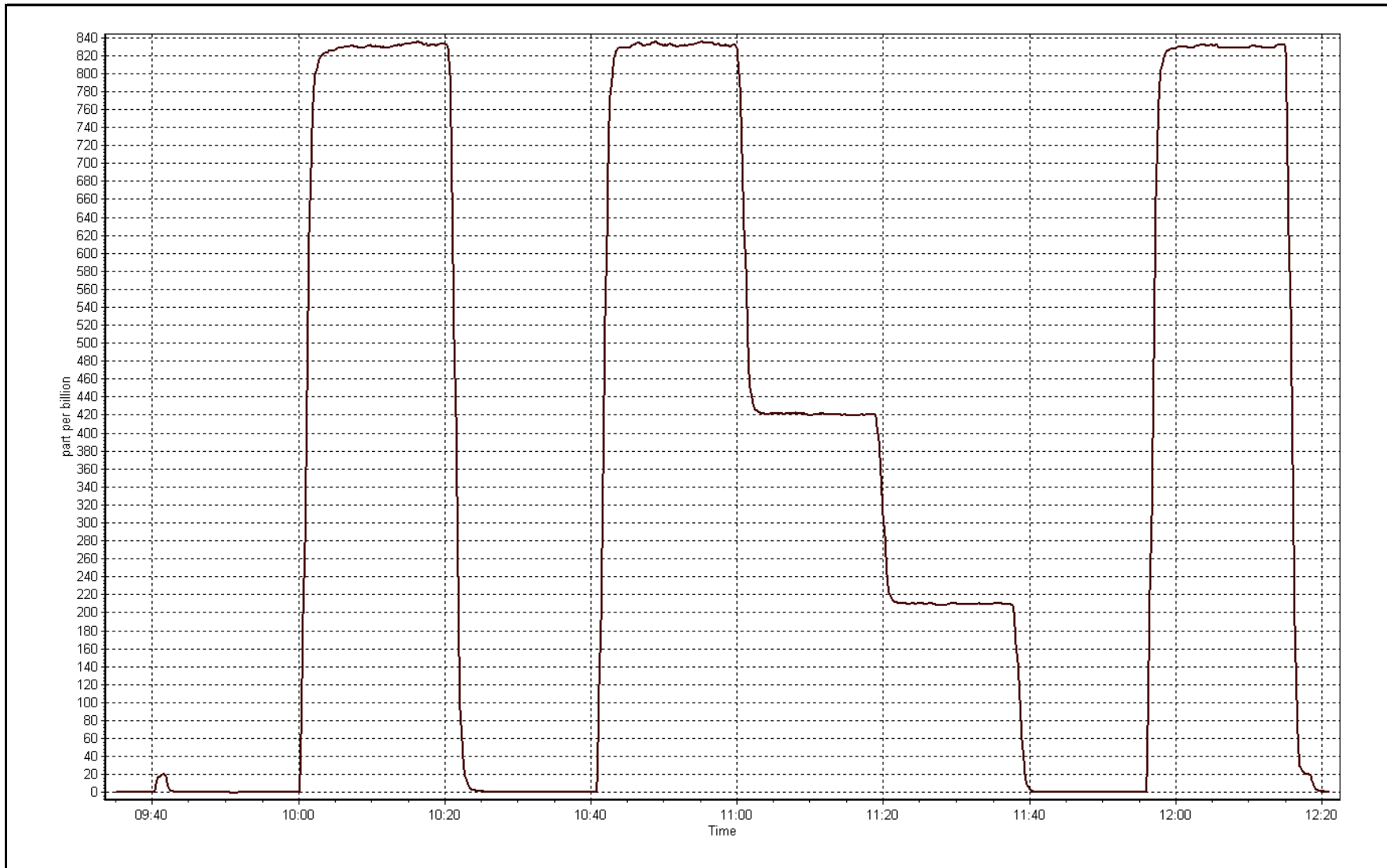
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999997
830.0	832.0	0.9977		
419.6	420.5	0.9980	Slope	0.997131
210.3	209.5	1.0041		
			Intercept	0.577954



SO2 Calibration Plot

Date: July 12, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	July 12, 2016	Last Calibration	June 14, 2016
Station Name	Lower Camp	Station Number	AMS 11
Reason:	Routine		
Start Time (MST)	12:20	End Time (MST)	15:45
Gas Cert Reference	ALM061435	Station temp.	22 Deg C
Cal Gas Concentration	5.15 ppm	Cal Gas Exp Date	09/09/2017
Calibrator Make/Model	Sabio 4010	Serial Number	11051107
ZAG air Make/Model	API 701	Serial Number	3411
DACS make/model	Campbell Scientific CR3000	Serial Number	3492
SO2 gas concentration	51.4 ppm	SO2 gas cert/exp	LL110099 25/03/2016

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-671	-671
Analyzer IP address	192.168.1.42		Lamp voltage	794	791
Calculated slope	1.003381	1.008723	Chamber temp	45	45
Calculated intercept	-0.264540	-0.178249	Pressure	569.3	563.0
Analyzer Background	10.9	10.9	Flow	1.029	1.018
Analyzer Coefficient	1.178	1.178	Intensity	90	90
			Converter temp.	325	324

Analyzer make/model	Thermo 450i	Analyzer serial #	1410661328
Converter make/model	NA	Converter serial #	NA

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.0	----
as found span	5000	72.8	75.0	74.3	1.009
SO2 scrubber check	5000	20.5	210.7	1.3	----
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	72.8	75.0	74.3	1.009
second point	5000	38.8	40.0	40.2	0.994
third point	5000	19.4	20.0	19.9	1.003
as left zero	5000	0.0	0.0	0.2	----
as left span	5000	72.8	75.0	74.6	1.005
Average Correction Factor					1.002

Corrected As found	74.3	Previous response	75.0	% change	1.0%
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Notes:

Inlet filter changed after as founds. Scrubber check done after as founds. No adjustments.

Calibration Performed By: Evan Magill



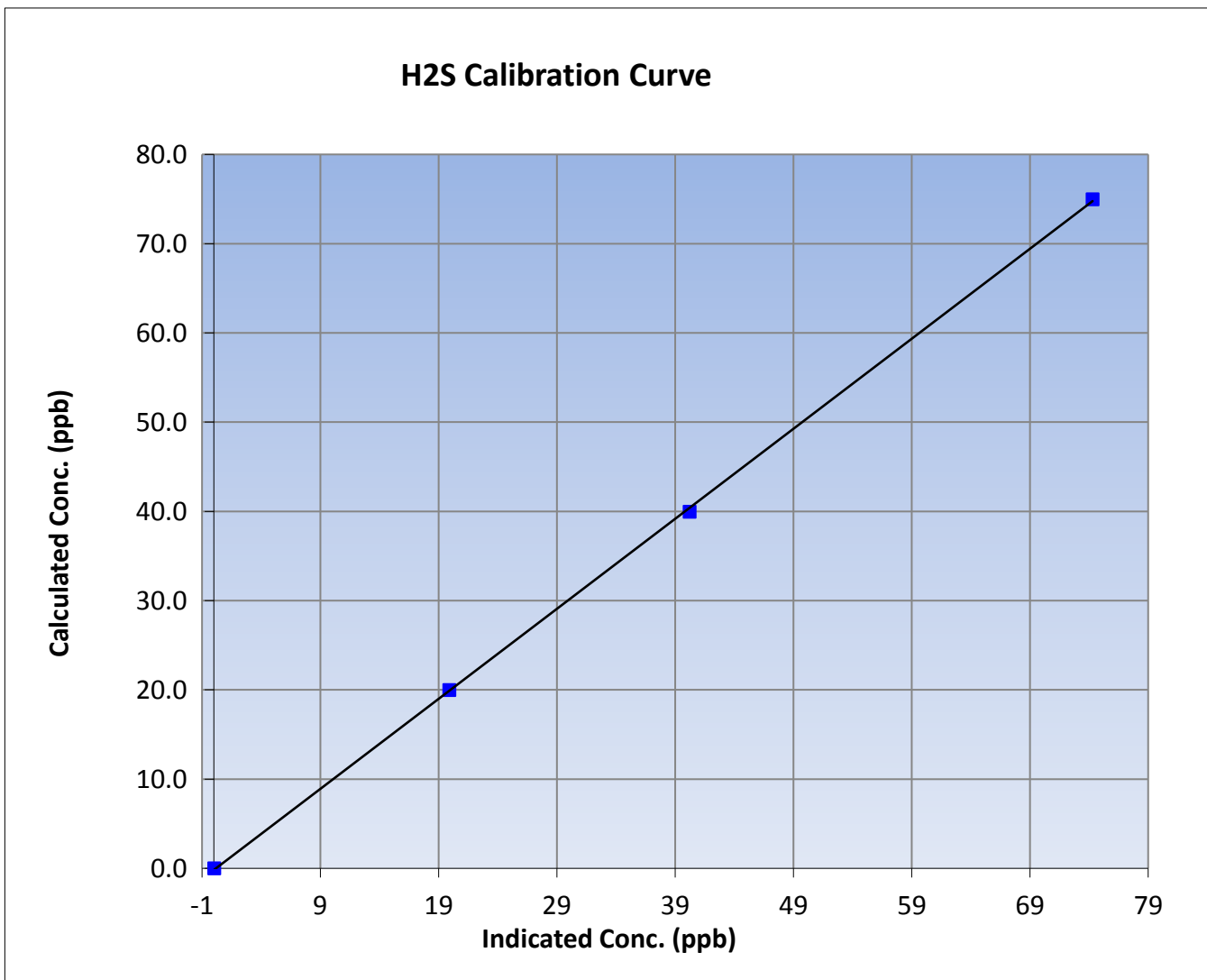
Wood Buffalo Environmental Association H2S Calibration Report

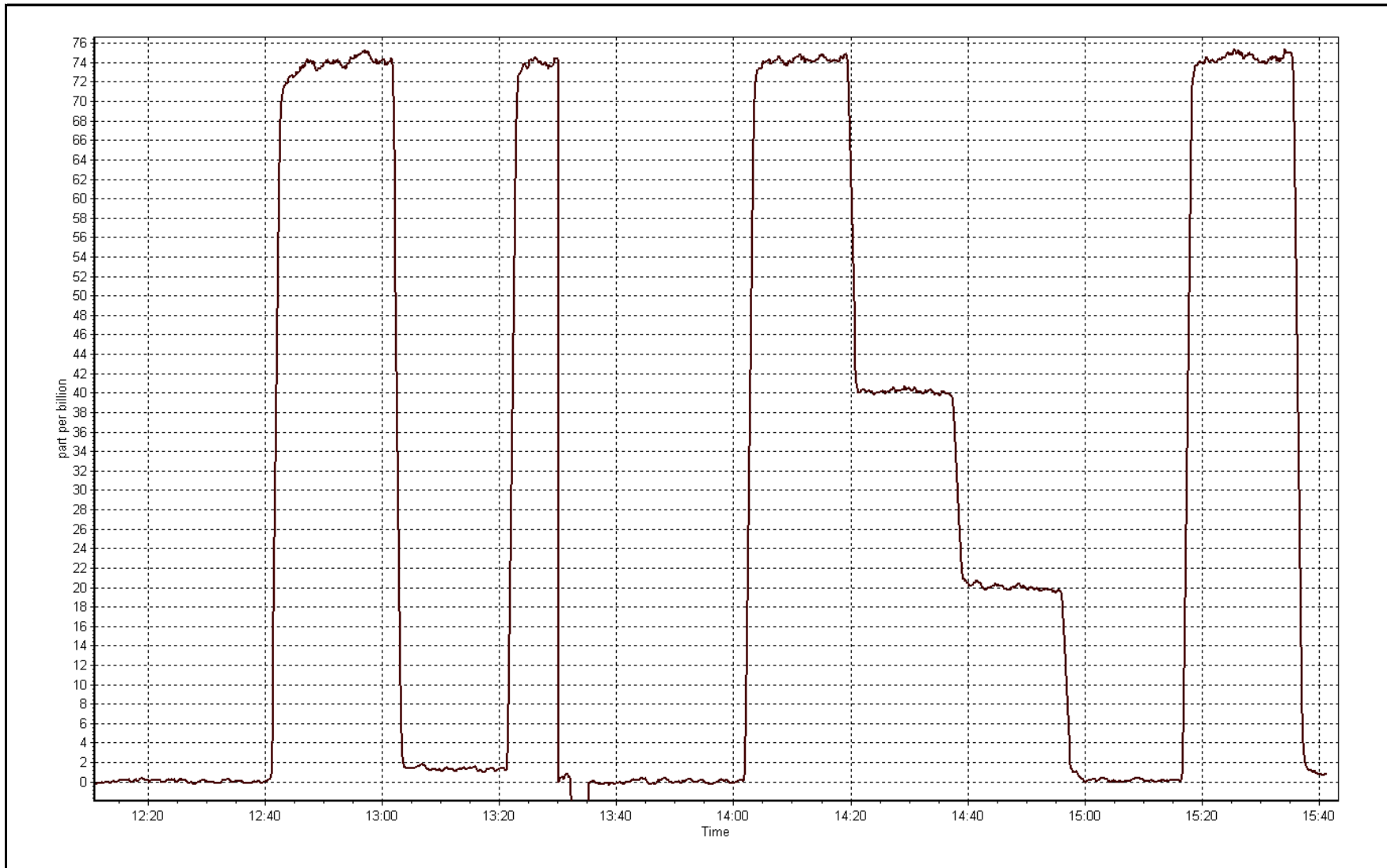
Station Information

Calibration Date	July 12, 2016	Previous Calibration	June 14, 2016
Station Name	Lower Camp	Station Number	AMS 11
Start Time (MST)	12:20	End Time (MST)	15:45
Analyzer make	Thermo 450i	Analyzer serial #	1410661328

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999917
75.0	74.3	1.0092		
40.0	40.2	0.9936	Slope	1.008723
20.0	19.9	1.0031		
			Intercept	-0.178249







Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	July-12-16	Last Calibration	June-14-16
Station Name	Lower Camp	Station Number	AMS 11
Reason:	Routine		
Start Time (MST)	9:40	End Time (MST)	12:20
Gas Cert Reference	LL110099	Cal Gas Expiry Date	25/03/2016
CH4 Cal Gas Conc.	515 ppm	CH4 Equiv Conc.	1070.5 ppm
C3H8 Cal Gas Conc.	202 ppm	Station temp.	22 Deg C
Calibrator Make/Model	Sabio 4010	Serial Number	11051107
ZAG make/model	Teledyne API 701	Serial Number	3411
DACS make/model	Campbell Scientific CR3000	Serial Number	3492

Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 50 ppm		Sample Pressure	7.8	7.8
Analyzer IP address	192.168.1.51		Air or Bypass Press	40.2	40.2
Calculated slope	0.998911	0.997055	Fuel Pressure	25.1	25.1
Calculated intercept	0.024887	-0.020836	Analyzer Coeff	4.642	4.570
			Analyzer BKG	2.59	3.15

Analyzer make 51i-LT Analyzer serial # 1218153353

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	0.57	----
as found span	5000	80.9	17.32	18.25	0.949
calibrator zero	5000	0.0	0.00	0.01	----
high point	5000	80.9	17.32	17.38	0.997
second point	5000	40.9	8.76	8.83	0.992
third point	5000	20.5	4.39	4.42	0.993
as left zero	5000	0.0	0.00	0.06	----
as left span	5000	80.9	17.32	17.51	0.989
Average Correction Factor					0.994

Corrected As found 17.68 Previous response 17.31 % change -2.1%

Notes:

Inlet filter changed after as founds. Adjusted zero and span.

Calibration Performed By:

Evan Magill



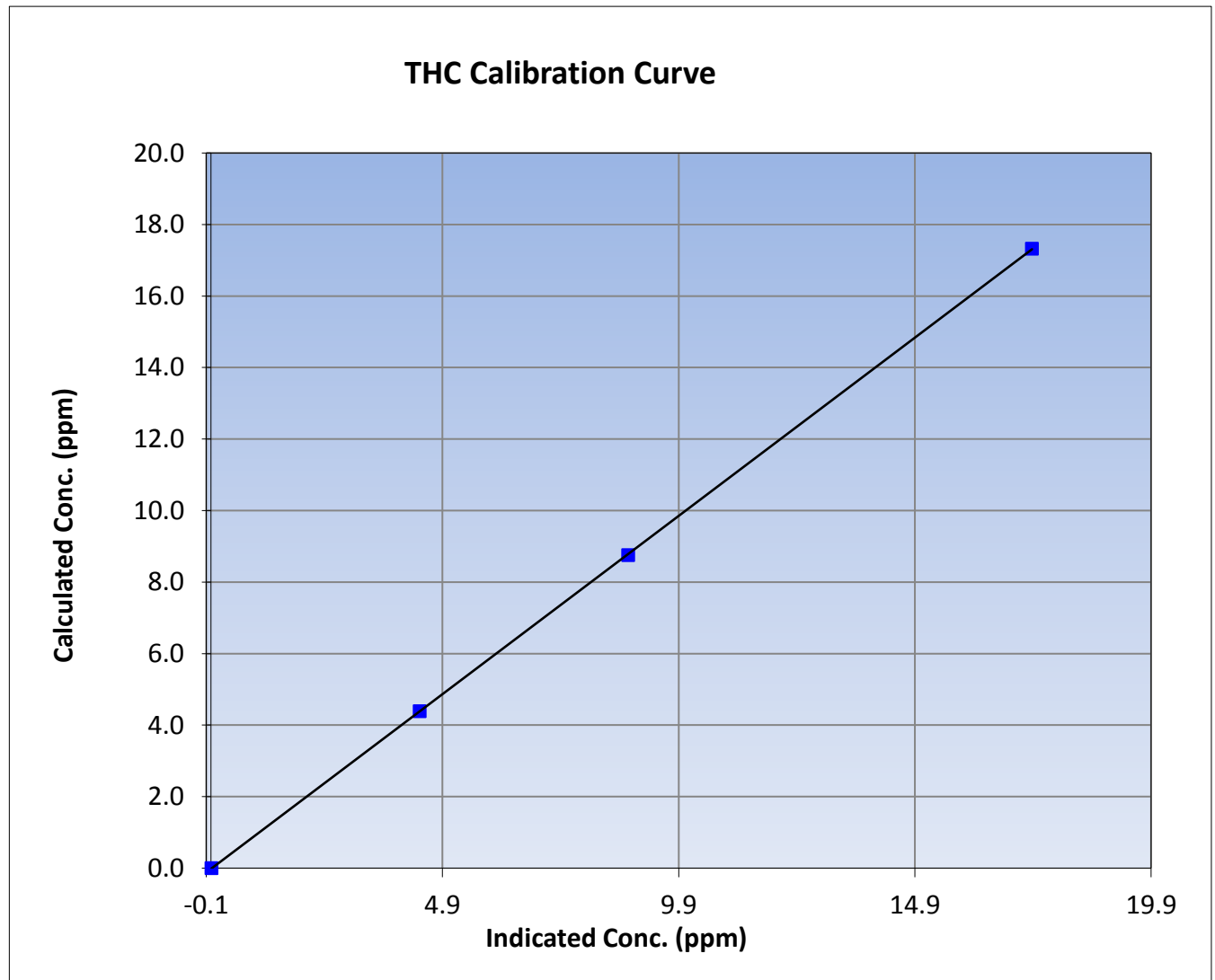
Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	July 12, 2016	Previous Calibration	June 14, 2016
Station Name	Lower Camp	Station Number	AMS 11
Start Time (MST)	9:40	End Time (MST)	12:20
Analyzer make	51i-LT	Analyzer serial #	1218153353

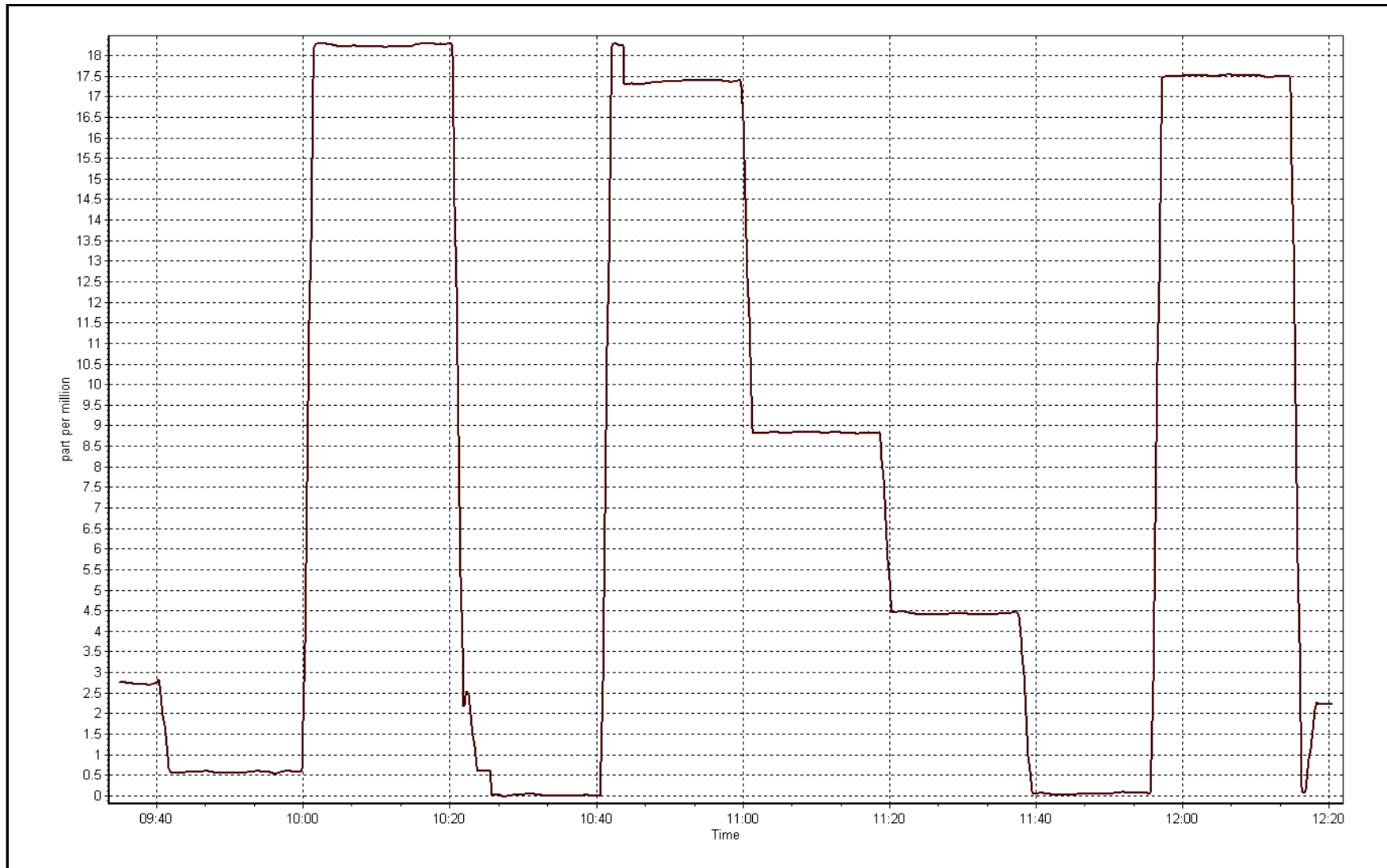
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.01	----	Correlation Coefficient	0.999994
17.32	17.38	0.9966		
8.76	8.83	0.9917		
4.39	4.42	0.9930		
			Slope	0.997055
			Intercept	-0.020836



THC Calibration Plot

Date: July 12, 2016





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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

AMS 13
FORT MCKAY SOUTH
JULY 2016

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

August 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT MCKAY SOUTH (AMS 13)
 JULY 2016

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2(ppb) Average	707	36	37	99.87	37	0	4	0
TRS(ppb) Average	708	34	36	99.73	3	0	0	0
THC(ppm) Average	707	36	37	99.87	3.9	-	2.6	-
O3(ppb) Average	708	34	36	99.73	51	0	29	-
NO2(ppb) Average	707	36	37	99.87	24	0	5	-
NO(ppb) Average	707	36	37	99.87	21	-	3	-
NOX(ppb) Average	707	36	37	99.87	34	-	8	-
PM2.5(ug/m3) Average	741	2	3	99.87	53.6	-	23.6	0
ET(C) Average	743	0	1	99.87	30.5	-	22.2	-
RH(%) Average	743	0	1	99.87	98	-	94	-
WS(km/h) Average	743	0	1	99.87	25	-	12	-
WD(deg) Average	743	0	1	99.87	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT MCKAY SOUTH (AMS 13)
 JULY 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2(ppb) Average	707	0.6	3	-	0	0	0	0	0	1	37
TRS(ppb) Average	708	0.2	0	-	0	0	0	0	0	0	3
THC(ppm) Average	707	2.25	0.2	-	2	2.1	2.1	2.2	2.3	2.5	3.9
O3(ppb) Average	708	20.5	12	-	1	5	10	20	30	37	51
NO2(ppb) Average	707	2.4	3	-	0	0	1	2	3	5	24
NO(ppb) Average	707	0.7	2	-	0	0	0	0	0	2	21
NOX(ppb) Average	707	3.1	4	-	0	0	1	2	4	7	34
PM2.5(ug/m3) Average	741	6.4	5.6	-	0.9	1.9	3	5	7.4	12.6	53.6
Temperature 2 m (C) Average	743	18.51	5.2	-	2.1	12.2	15.1	17.9	22.4	25.5	30.5
Relative Humidity (%) Average	743	68.8	20	-	20	40	52	72	87	94	98
Wind Speed 10 m (km/h) Average	743	7.1	4	-	0	2	3	6	9	13	25
Wind Direction 10 m (deg) Average	743	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION -FORT McKAY SOUTH (AMS 13)
JULY 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
ALL PARAMETERS	15 Jul 2016 14:00	15 Jul 2016 14:00	1	Maintenance - wiring/data logger upgrades
TRS, O3	26 Jul 2016 12:00	26 Jul 2016 12:00	1	Maintenance - cleaned glass manifold



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

Fort McKay South - July 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 37 ppb on Jul 3 09:00	Maximum Daily Average: 4.5 ppb on Jul 2		Hours of Data:	707
Minimum Value: 0 ppb on Jul 4 02:00	Minimum Daily Average: 0.0 ppb on Jul 31		Hours of Missing Data:	37
Maximum Diurnal Average: 4.2 ppb at hour 9	Minimum Diurnal Average: 0.1 ppb at hour 4		Hours of Calibration:	36
Monthly Average: 0.6 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 13		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-Jul	0	0	Z	0	0	0	1	5	23	12	1	1	3	2	3	7	11	5	1	3	0	0	0	0	3.5	23
2-Jul	1	1	1	Z	1	0	1	34	36	14	1	2	2	1	5	3	0	1	0	0	0	0	0	0	4.5	36
3-Jul	0	0	0	0	Z	0	1	5	37	24	4	3	1	1	2	1	1	1	2	2	0	0	0	3.7	37	
4-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
5-Jul	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
6-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
7-Jul	0	0	Z	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-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
9-Jul	0	0	0	0	Z	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0.2	1
10-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0.1	1
11-Jul	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
12-Jul	0	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
13-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
14-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
15-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	M	0	0	0	0	0	0	0	0	0	0	0	0.0	0
16-Jul	Z	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
17-Jul	0	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-Jul	0	0	Z	0	0	0	0	1	4	6	7	3	0	0	0	0	0	0	0	0	0	0	0	0	1.0	7
19-Jul	0	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
20-Jul	0	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
21-Jul	0	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
22-Jul	Z	0	0	0	0	0	0	14	16	11	7	6	7	2	1	1	1	0	0	0	0	0	0	0	3.0	16
23-Jul	0	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
24-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
25-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
26-Jul	0	0	0	0	Z	0	1	5	9	C	C	C	C	C	0	0	0	0	0	2	1	0	0	1	1.1	9
27-Jul	0	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
28-Jul	Z	0	0	0	0	0	0	0	0	0	3	2	3	1	0	0	0	0	0	0	1	0	0	1	0.6	3
29-Jul	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
30-Jul	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
31-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0

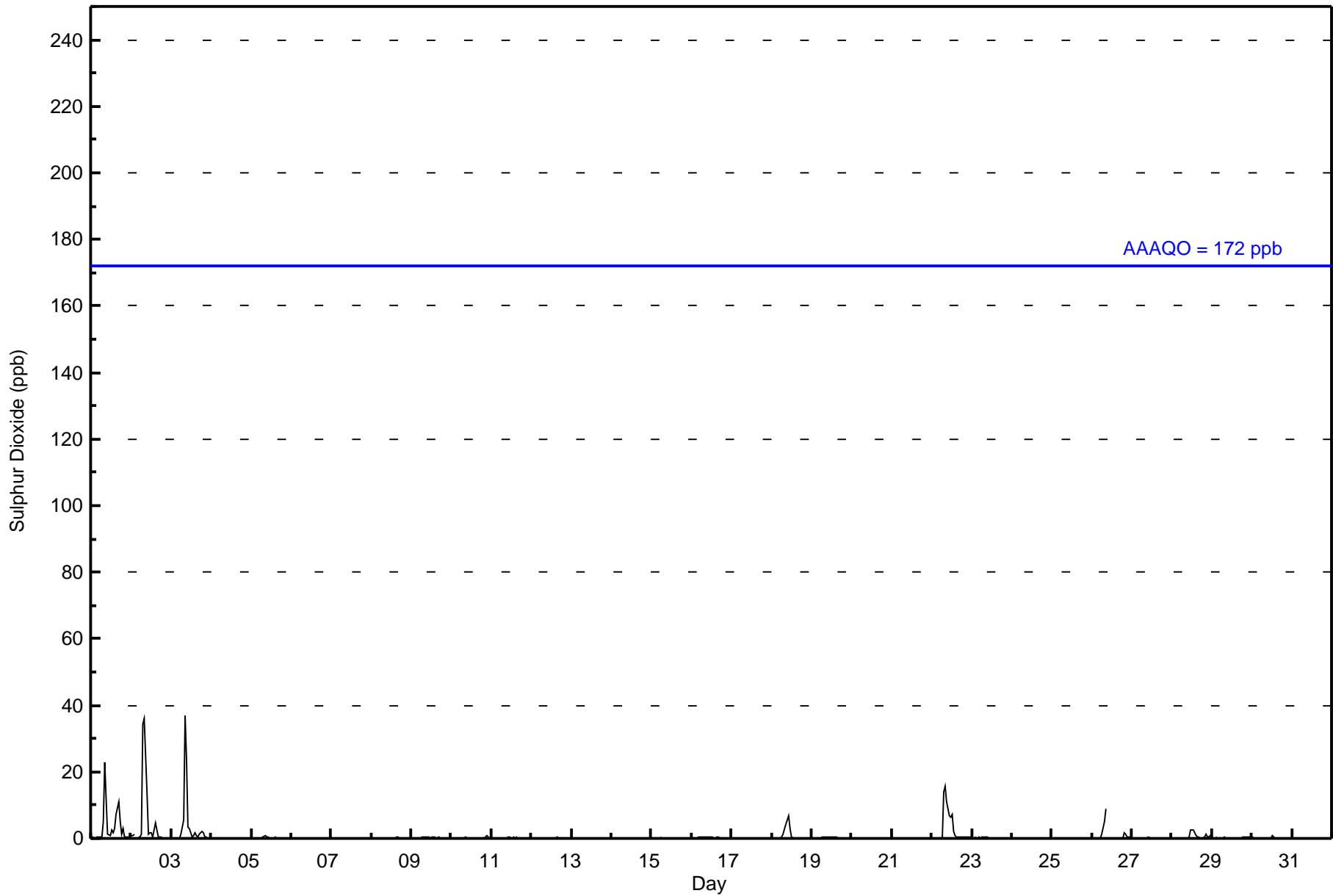
0.1	0.1	0.1	0.1	0.1	0.1	0.3	2.2	4.2	2.3	0.8	0.7	0.6	0.4	0.5	0.5	0.5	0.3	0.2	0.3	0.2	0.1	0.1	0.1	Diurnal Average
1	1	1	0	1	0	1	34	37	24	7	6	7	3	5	7	11	5	2	3	1	1	1	1	Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Fort McKay South - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Fort McKay South - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	696	98.44	98.44
11 - 20	6	0.85	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: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Fort McKay South - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	82	69	26	8	6	8	17	34	40	63	59	47	46	43	59	89	696
11 - 20	0	0	0	0	0	0	2	4	0	0	0	0	0	0	0	0	6
21 - 60	0	0	0	0	0	0	4	1	0	0	0	0	0	0	0	0	5
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	82	69	26	8	6	8	23	39	40	63	59	47	46	43	59	89	707

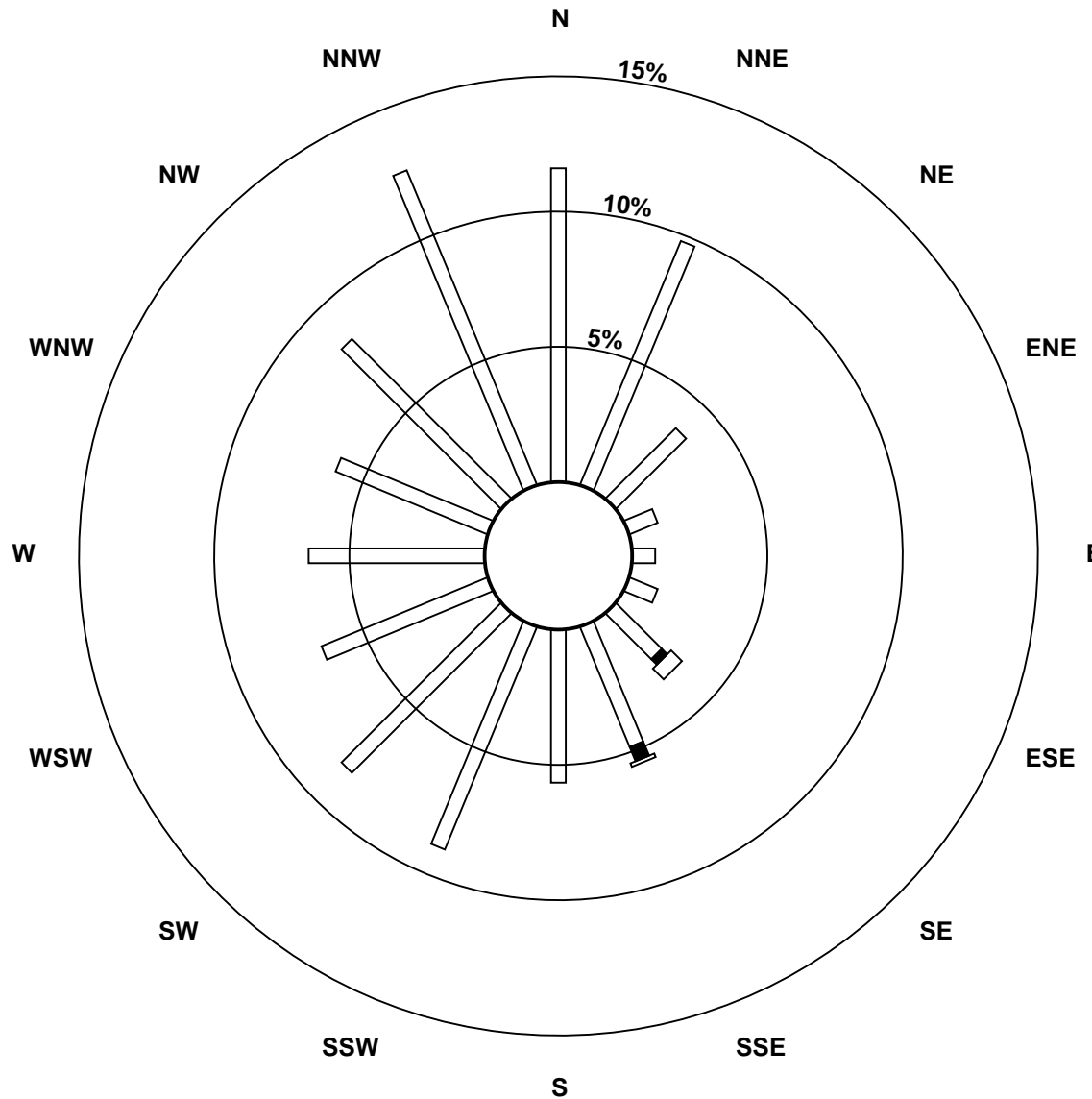
Total Number of Valid Hours: 707

Total Number of Hours: 744

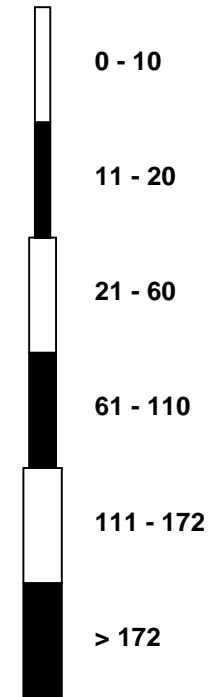


Wood Buffalo Environmental Association
Wind Rose Jul 2016

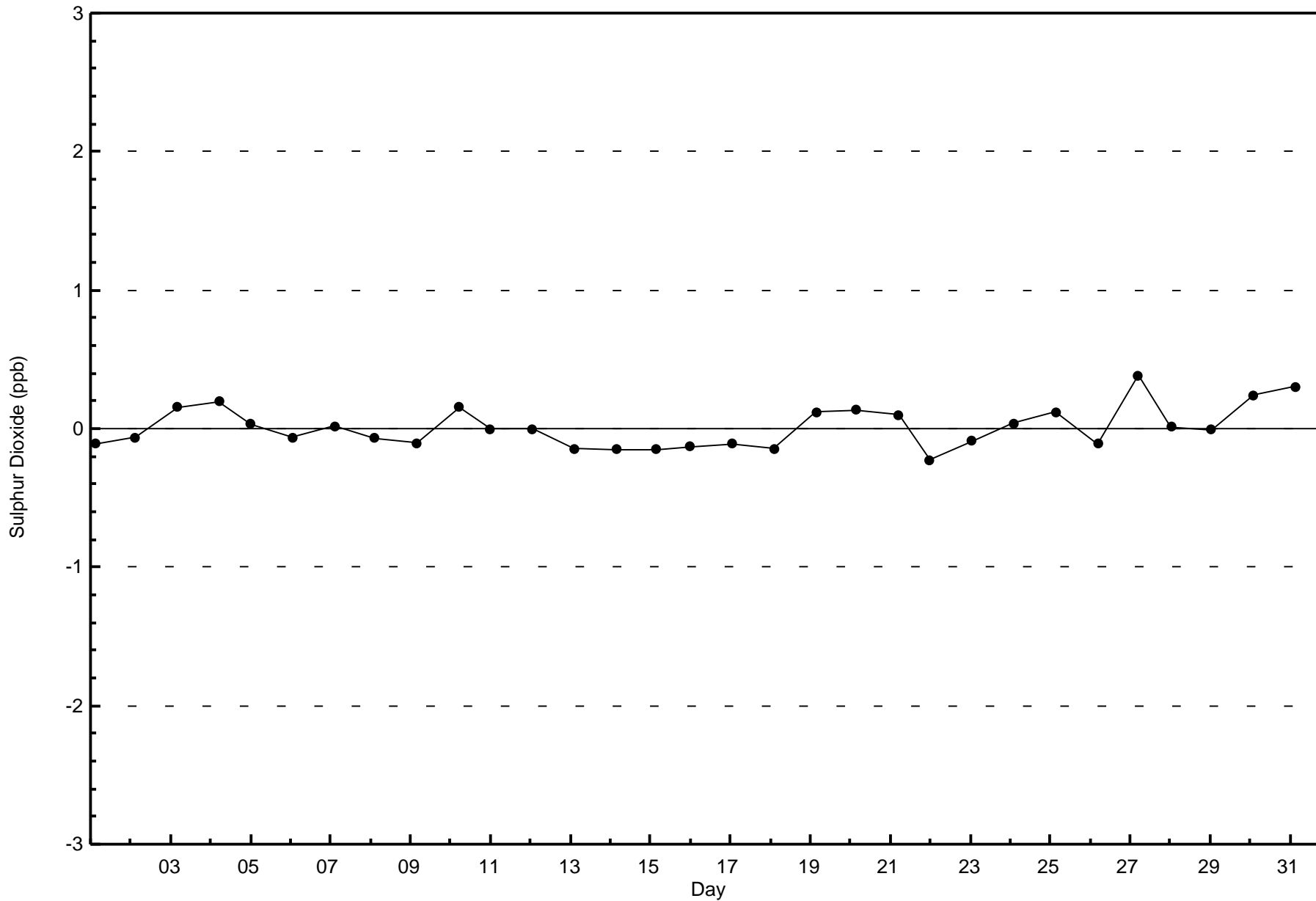
Sulphur Dioxide (SO₂) - ppb
Fort McKay South (AMS 13)



Classes (ppb)



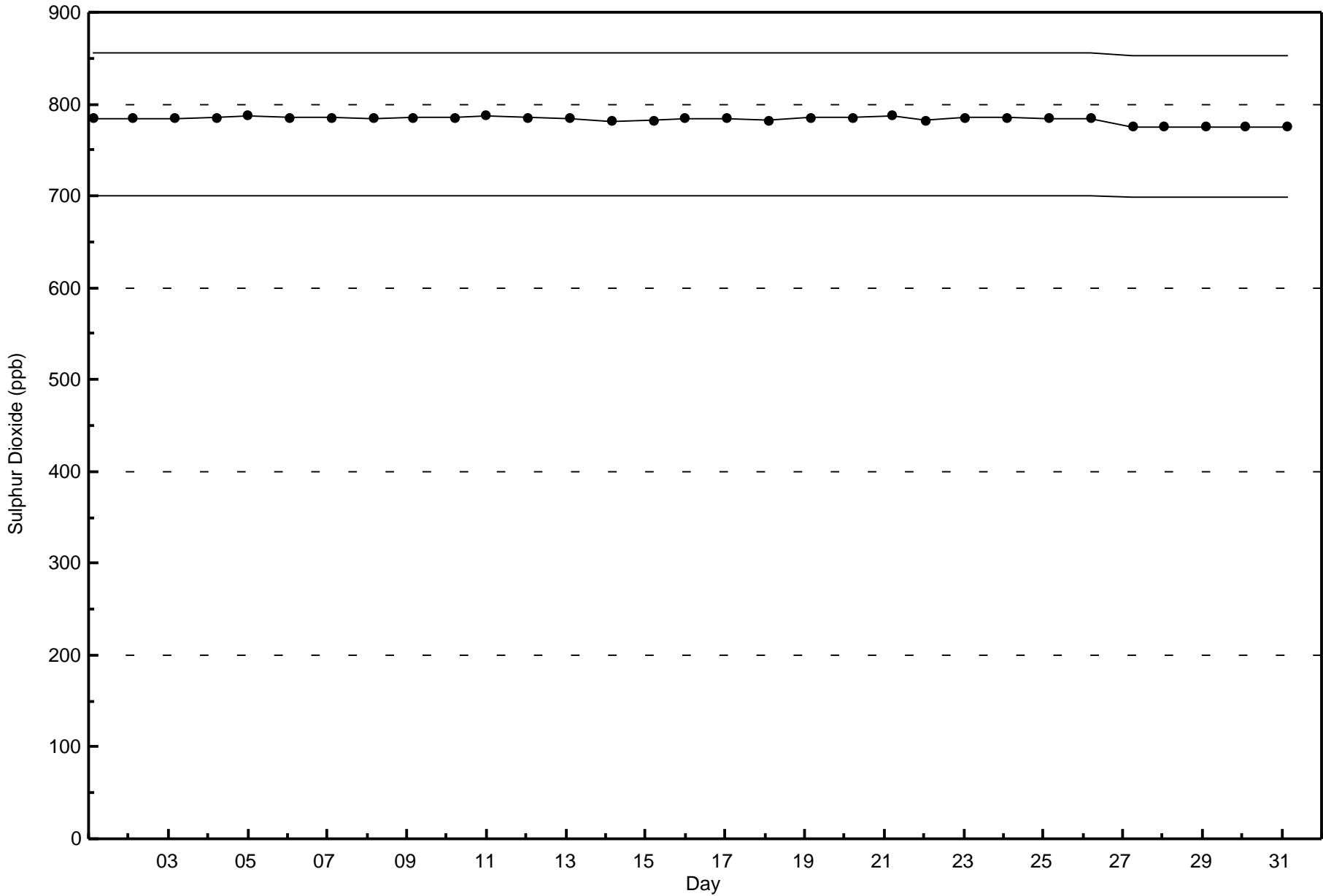
Total Number of Valid Hours: 707





Wood Buffalo Environmental Association
Span Responses

Sulphur Dioxide (SO₂) - ppb
Fort McKay South - July 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Total Reduced Sulphur (TRS) - ppb

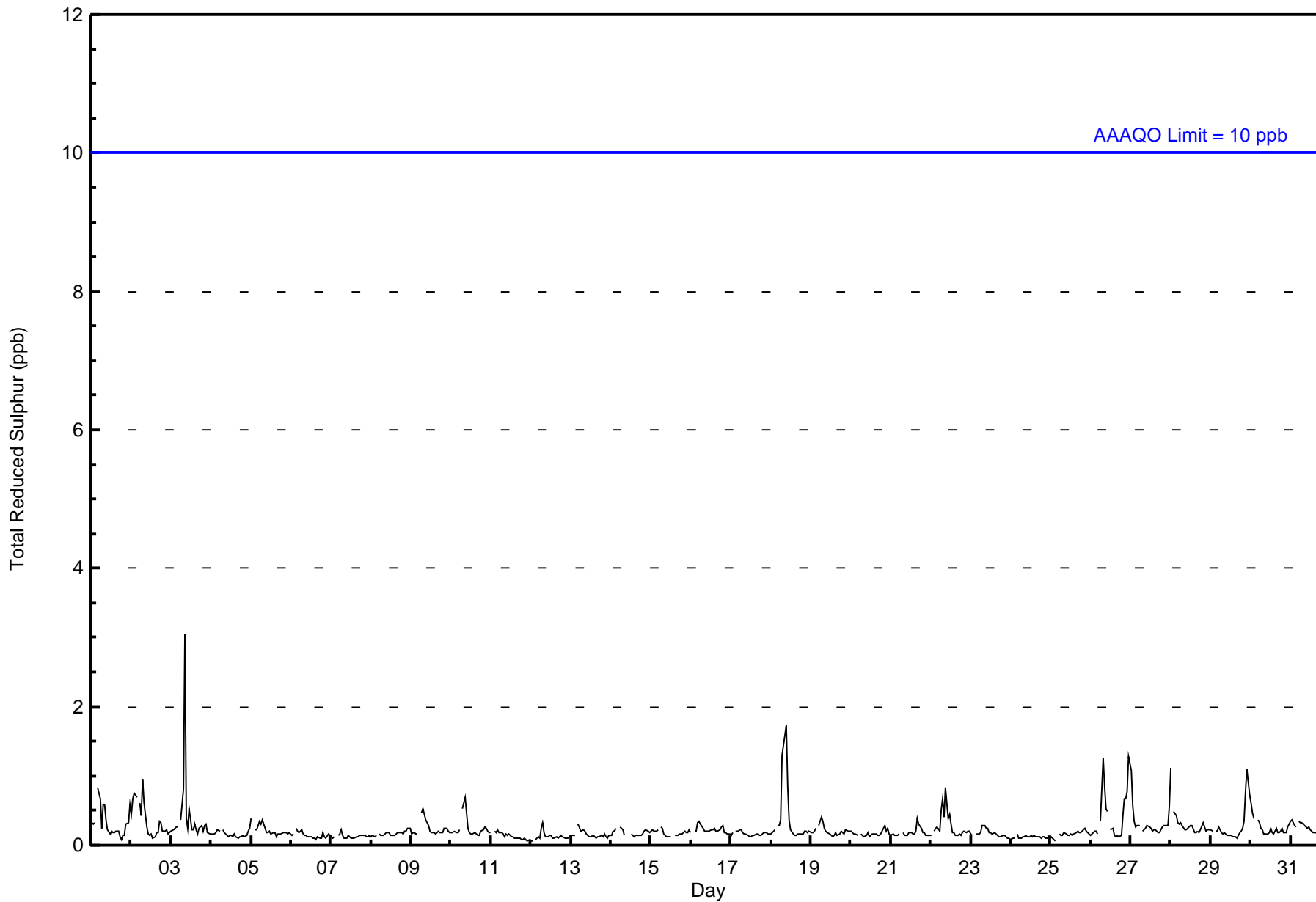
Fort McKay South - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																
Maximum Value: 3 ppb on Jul 3 09:00										Maximum Daily Average: 0.4 ppb on Jul 26										Hours of Data: 708						
Minimum Value: 0 ppb on Jul 25 04:00										Minimum Daily Average: 0.1 ppb on Jul 24										Hours of Missing Data: 36						
Maximum Diurnal Average: 0.4 ppb at hour 9										Minimum Diurnal Average: 0.2 ppb at hour 16										Hours of Calibration: 34						
Monthly Average: 0.2 ppb										Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 1										Percent Operational Time: 99.7						
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-Jul	0	0	0	Z	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.3	1
2-Jul	0	1	1	1	Z	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
3-Jul	0	0	0	0	0	Z	0	1	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.4	3
4-Jul	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
5-Jul	0	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
6-Jul	0	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
7-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
8-Jul	0	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-Jul	0	0	0	0	0	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
10-Jul	0	0	0	0	0	0	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
11-Jul	0	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
12-Jul	0	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-Jul	0	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-Jul	0	0	0	0	Z	0	0	0	0	0	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0.2	0
15-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	M	0	0	0	0	0	0	0	0	0	0	0.2	0
16-Jul	0	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-Jul	0	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-Jul	0	0	0	Z	0	0	0	1	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2
19-Jul	0	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-Jul	0	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-Jul	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
22-Jul	0	Z	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
23-Jul	0	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-Jul	0	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-Jul	0	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-Jul	0	0	0	0	0	Z	0	1	1	1	0	M	0	0	0	0	0	0	0	0	1	1	1	1	0.4	1
27-Jul	1	1	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.3	1
28-Jul	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
29-Jul	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
30-Jul	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
31-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
0.3 0.2 0.2 0.2 0.2 0.3 0.3 0.4 0.4 0.3 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.3																								Diurnal Average		
1 1 1 1 1 1 1 1 1 3 2 1 1 0 0 0 0 0 0 0 0 0 0 0 0																								Diurnal Maximum		
Z - zerospan C - Calibration M - Maintenance																										
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb 24-hr 3 ppb																										



Wood Buffalo Environmental Association
Hourly Averages

Total Reduced Sulphur (TRS) - ppb
Fort McKay South - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb
Fort McKay South - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	707	99.86	99.86
3 - 4	1	0.14	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 McKay South - July 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	81	69	25	7	6	7	22	38	42	69	60	47	45	42	59	88	707
3 - 4	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	81	69	25	7	6	7	23	38	42	69	60	47	45	42	59	88	708

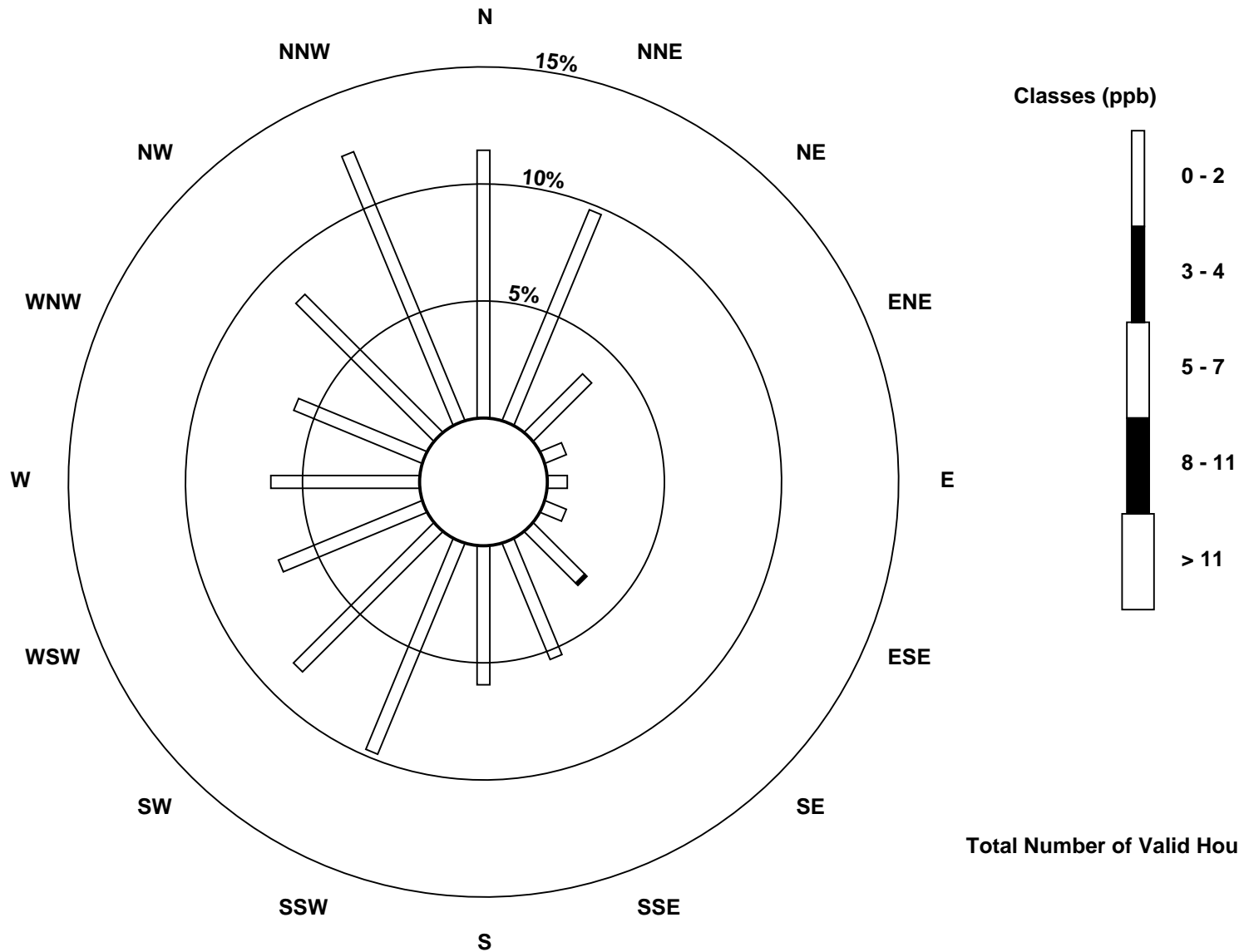
Total Number of Valid Hours: 708

Total Number of Hours: 744

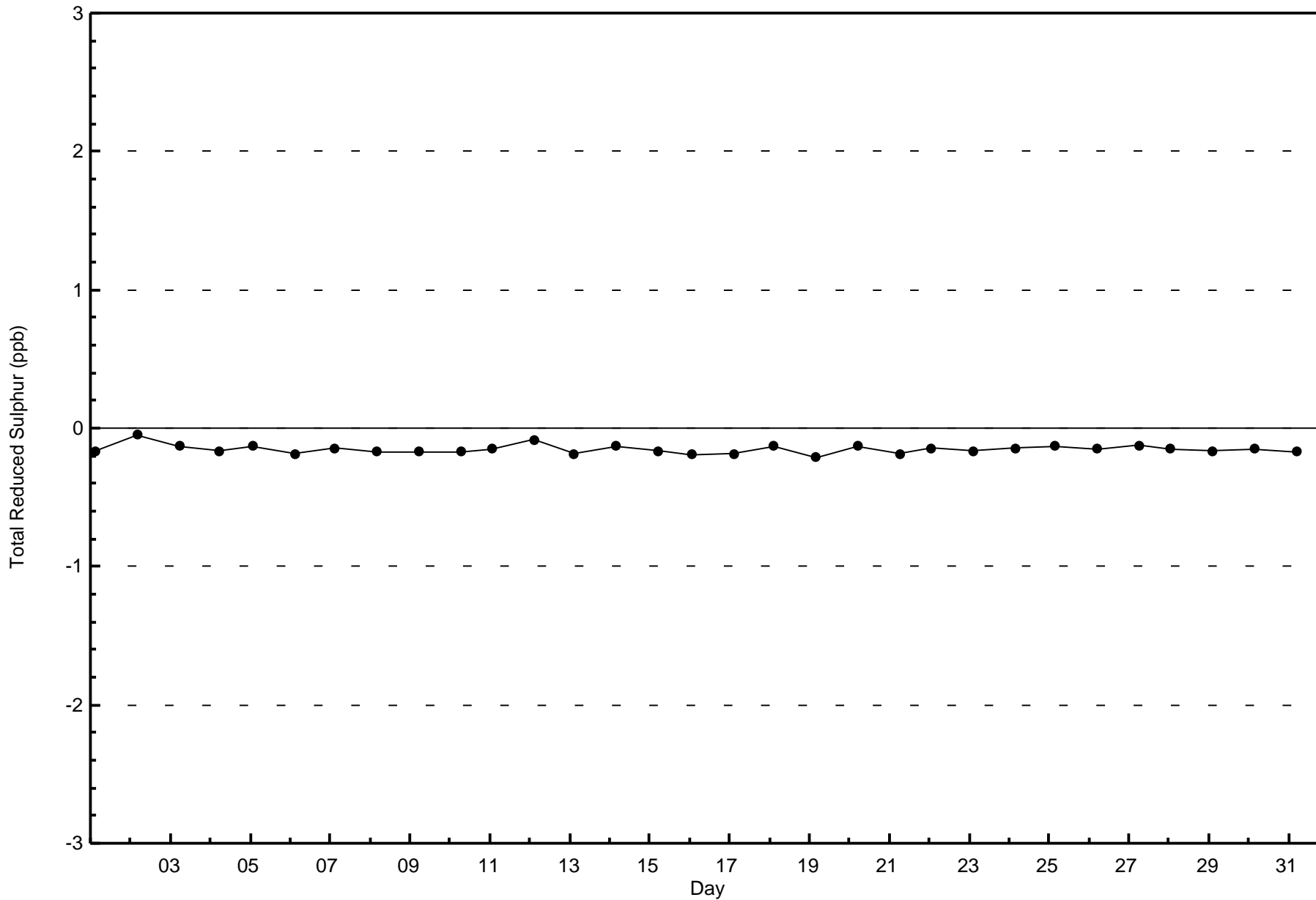


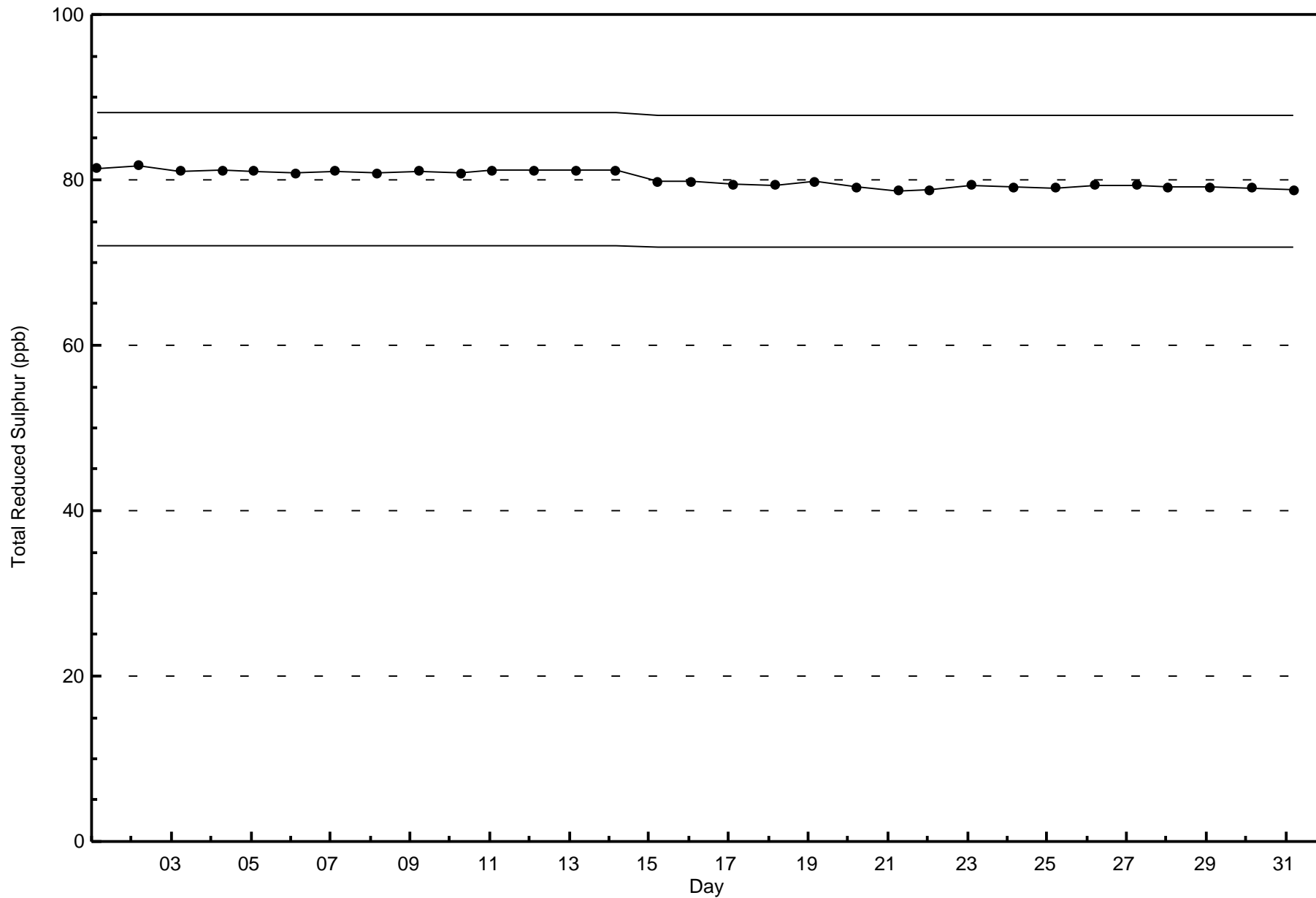
Wood Buffalo Environmental Association
Wind Rose Jul 2016

Total Reduced Sulphur (TRS) - ppb
Fort McKay South (AMS 13)



Total Number of Valid Hours: 708







Wood Buffalo Environmental Association
Summary of Hour Averages

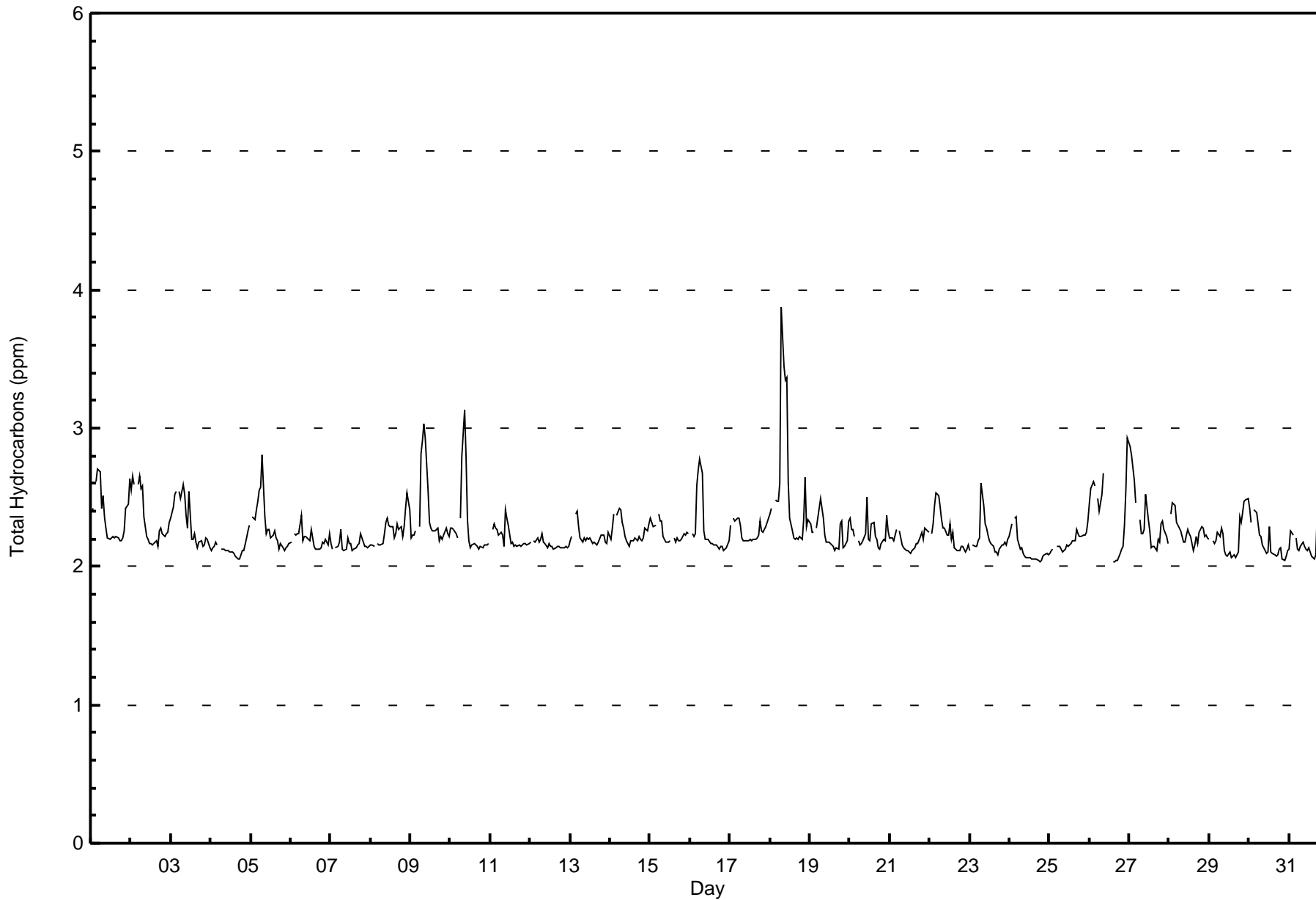
Total Hydrocarbons (THC) - ppm
Fort McKay South - July 2016

Maximum Value: 3.9 ppm on Jul 18 08:00		Maximum Daily Average: 2.6 ppm on Jul 18		Hours in Service: 744																						
Minimum Value: 2.0 ppm on Jul 31 23:00		Minimum Daily Average: 2.1 ppm on Jul 24		Hours of Data: 707																						
Maximum Diurnal Average: 2.4 ppm at hour 8		Minimum Diurnal Average: 2.2 ppm at hour 16		Hours of Missing Data: 37																						
Monthly Average: 2.25 ppm		Percentiles: P ₁ = 2.0 P ₁₀ = 2.1 Q ₁ = 2.1 Median = 2.2 Q ₃ = 2.3 P ₉₀ = 2.5 P ₉₉ = 2.9		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-Jul	2.4	2.4	Z	2.6	2.7	2.7	2.4	2.5	2.4	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.4	2.5	2.6	2.4	2.7
2-Jul	2.6	2.7	2.6	Z	2.6	2.7	2.6	2.6	2.4	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.3	2.3	2.2	2.2	2.2	2.2	2.3	2.3	2.7
3-Jul	2.3	2.4	2.5	2.5	Z	2.5	2.5	2.6	2.5	2.4	2.3	2.5	2.2	2.2	2.2	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.3	2.6
4-Jul	2.1	2.1	2.1	2.2	2.2	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.3	2.3	2.1	2.3
5-Jul	Z	2.4	2.3	2.4	2.5	2.6	2.6	2.8	2.4	2.2	2.3	2.3	2.2	2.2	2.3	2.2	2.2	2.1	2.2	2.1	2.1	2.1	2.1	2.2	2.3	2.8
6-Jul	2.2	Z	2.2	2.2	2.2	2.2	2.4	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.4
7-Jul	2.2	2.1	Z	2.1	2.1	2.2	2.3	2.1	2.1	2.1	2.2	2.2	2.2	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.2	2.3
8-Jul	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.3	2.4	2.3	2.3	2.3	2.2	2.2	2.3	2.3	2.3	2.2	2.3	2.4	2.5	2.4	2.3	2.5
9-Jul	2.2	2.2	2.2	2.3	Z	2.3	2.8	2.9	3.0	2.9	2.6	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.3	2.2	2.2	3.0	
10-Jul	2.3	2.3	2.3	2.2	2.2	Z	2.3	2.8	3.1	2.8	2.3	2.2	2.1	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.3	3.1
11-Jul	Z	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.4	2.3	2.3	2.2	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.4
12-Jul	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2
13-Jul	2.2	2.2	Z	2.4	2.4	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.4
14-Jul	2.2	2.3	2.4	Z	2.4	2.4	2.4	2.3	2.3	2.2	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.4
15-Jul	2.4	2.3	2.3	2.3	Z	2.4	2.3	2.3	2.2	2.2	2.2	2.2	2.2	M	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.4
16-Jul	Z	2.2	2.2	2.2	2.6	2.7	2.8	2.7	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.8
17-Jul	2.3	Z	2.3	2.3	2.4	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.2	2.3	2.4	2.4
18-Jul	2.4	2.4	Z	2.5	2.5	2.5	2.6	3.9	3.4	3.3	3.4	2.6	2.4	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.6	2.3	2.3	2.6	3.9
19-Jul	2.3	2.2	2.2	Z	2.3	2.3	2.5	2.4	2.3	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.3	2.3	2.1	2.1	2.2	2.3	2.2	2.5
20-Jul	2.3	2.3	2.3	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.5	2.2	2.2	2.3	2.3	2.2	2.2	2.1	2.1	2.2	2.2	2.2	2.4	2.3	2.2	2.5
21-Jul	2.2	2.2	2.2	2.2	2.3	Z	2.3	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.2	2.3
22-Jul	Z	2.2	2.3	2.4	2.5	2.5	2.4	2.3	2.3	2.3	2.2	2.2	2.3	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.5
23-Jul	2.1	Z	2.2	2.2	2.1	2.2	2.2	2.6	2.4	2.3	2.3	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.6
24-Jul	2.2	2.3	Z	2.4	2.4	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.4
25-Jul	2.1	2.1	2.1	Z	2.1	2.2	2.1	2.1	2.1	2.1	2.2	2.1	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.3
26-Jul	2.5	2.6	2.6	2.6	Z	2.5	2.4	2.5	2.7	C	C	C	C	C	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.3	2.6	2.9	2.4	2.9
27-Jul	2.9	2.8	2.7	2.6	2.5	Z	2.3	2.2	2.2	2.3	2.5	2.3	2.3	2.1	2.1	2.1	2.1	2.2	2.2	2.3	2.3	2.3	2.2	2.2	2.3	2.9
28-Jul	Z	2.4	2.5	2.4	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.3	2.2	2.2	2.1	2.2	2.2	2.2	2.2	2.3	2.3	2.2	2.2	2.2	2.3	2.5
29-Jul	2.2	Z	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	2.4	2.3	2.4	2.5	2.5	2.2	2.5
30-Jul	2.4	2.3	Z	2.4	2.4	2.3	2.2	2.2	2.2	2.1	2.1	2.1	2.3	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.2	2.4
31-Jul	2.1	2.3	2.2	Z	2.2	2.1	2.1	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.4	2.2	2.1	2.0	2.0	2.0	2.1	2.4
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan C - Calibration M - Maintenance																										



Wood Buffalo Environmental Association
Hourly Averages

Total Hydrocarbons (THC) - ppm
Fort McKay South - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Fort McKay South - July 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	12	1.70	1.70
2.1 - 3.0	690	97.60	99.29
3.1 - 10.0	5	0.71	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
Fort McKay South - July 2016

Concentration Ranges (ppm)	Wind Direction																Totals	
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW		
0 - 2.0	0	0	0	0	0	0	0	0	0	0	4	0	1	6	0	0	1	12
2.1 - 3.0	81	69	26	8	6	8	22	37	39	59	59	46	40	43	59	88	690	
3.1 - 10.0	1	0	0	0	0	0	1	2	1	0	0	0	0	0	0	0	5	
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Totals	82	69	26	8	6	8	23	39	40	63	59	47	46	43	59	89	707	

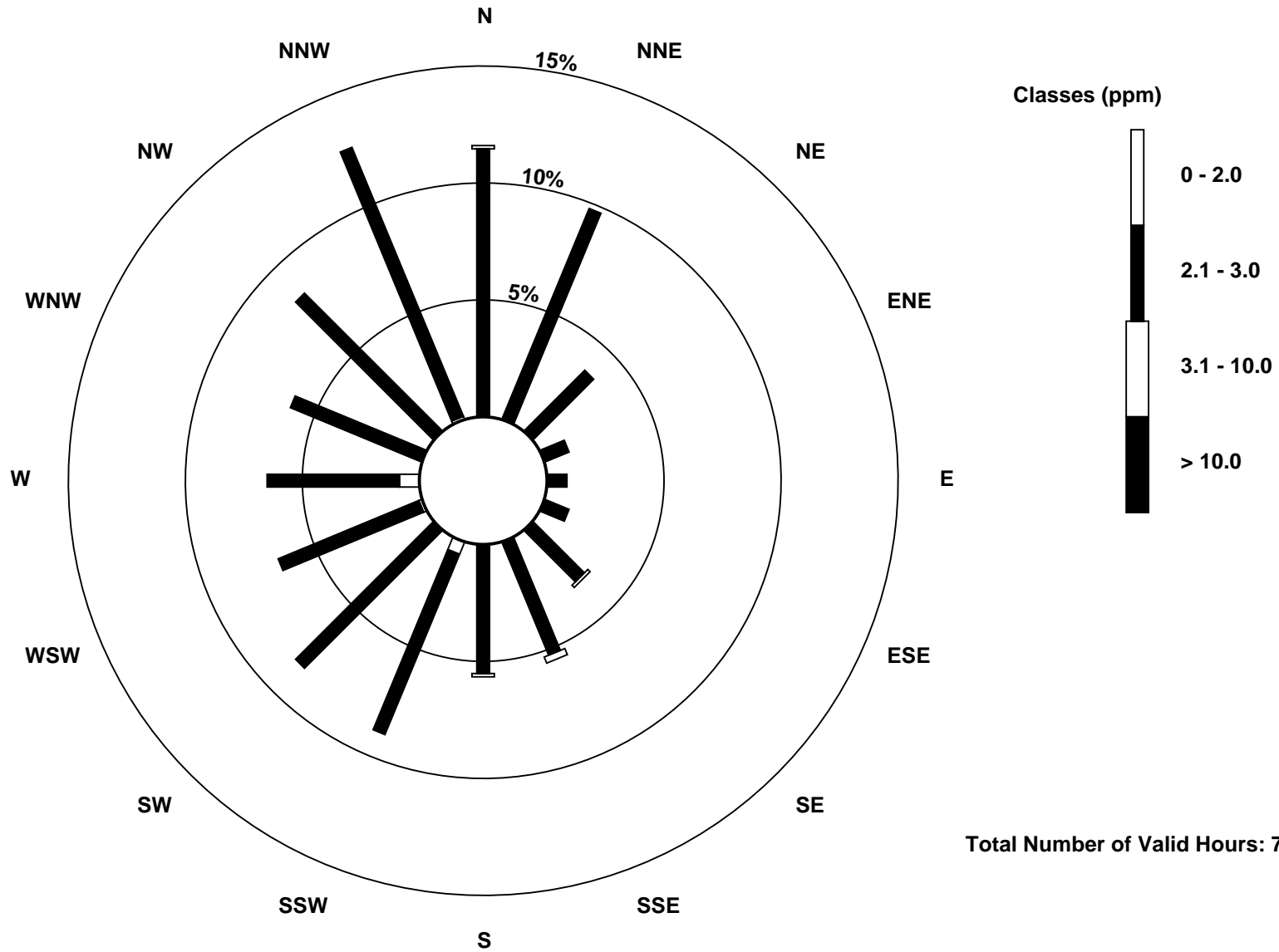
Total Number of Valid Hours: 707

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

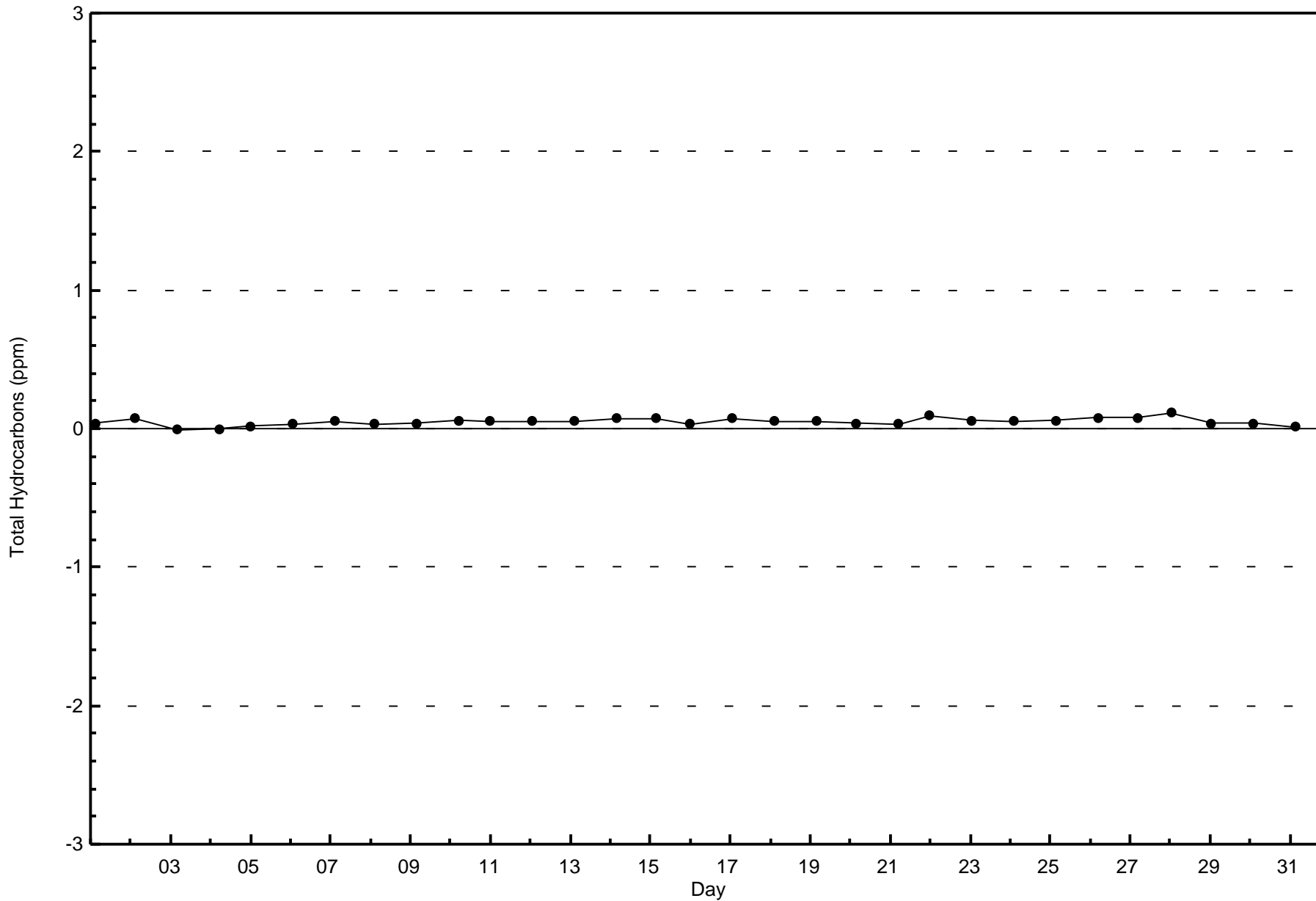
Total Hydrocarbons (THC) - ppm
Fort McKay South (AMS 13)

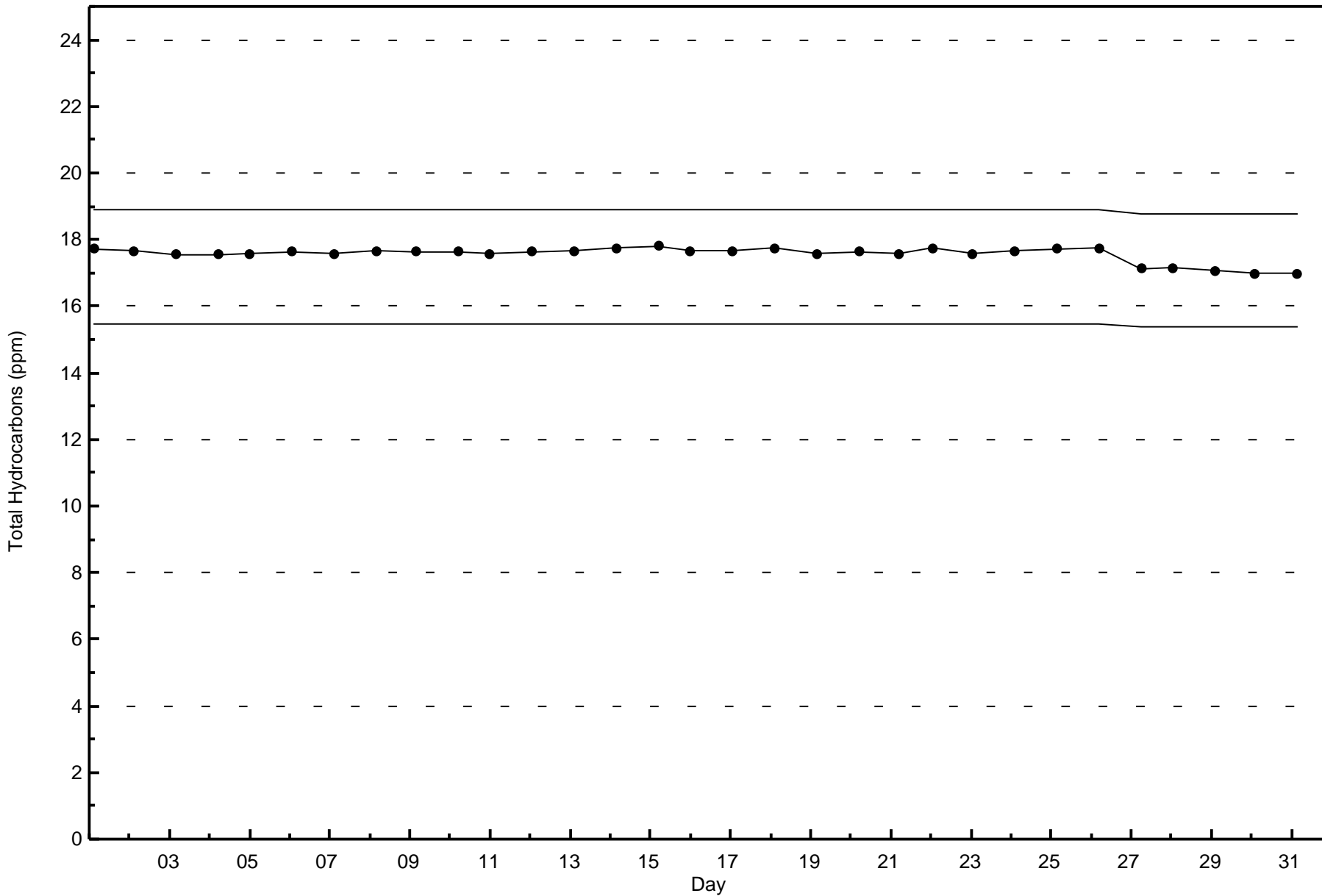




Wood Buffalo Environmental Association
Zero Responses

Total Hydrocarbons (THC) - ppm
Fort McKay South - July 2016







Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O₃) - ppb

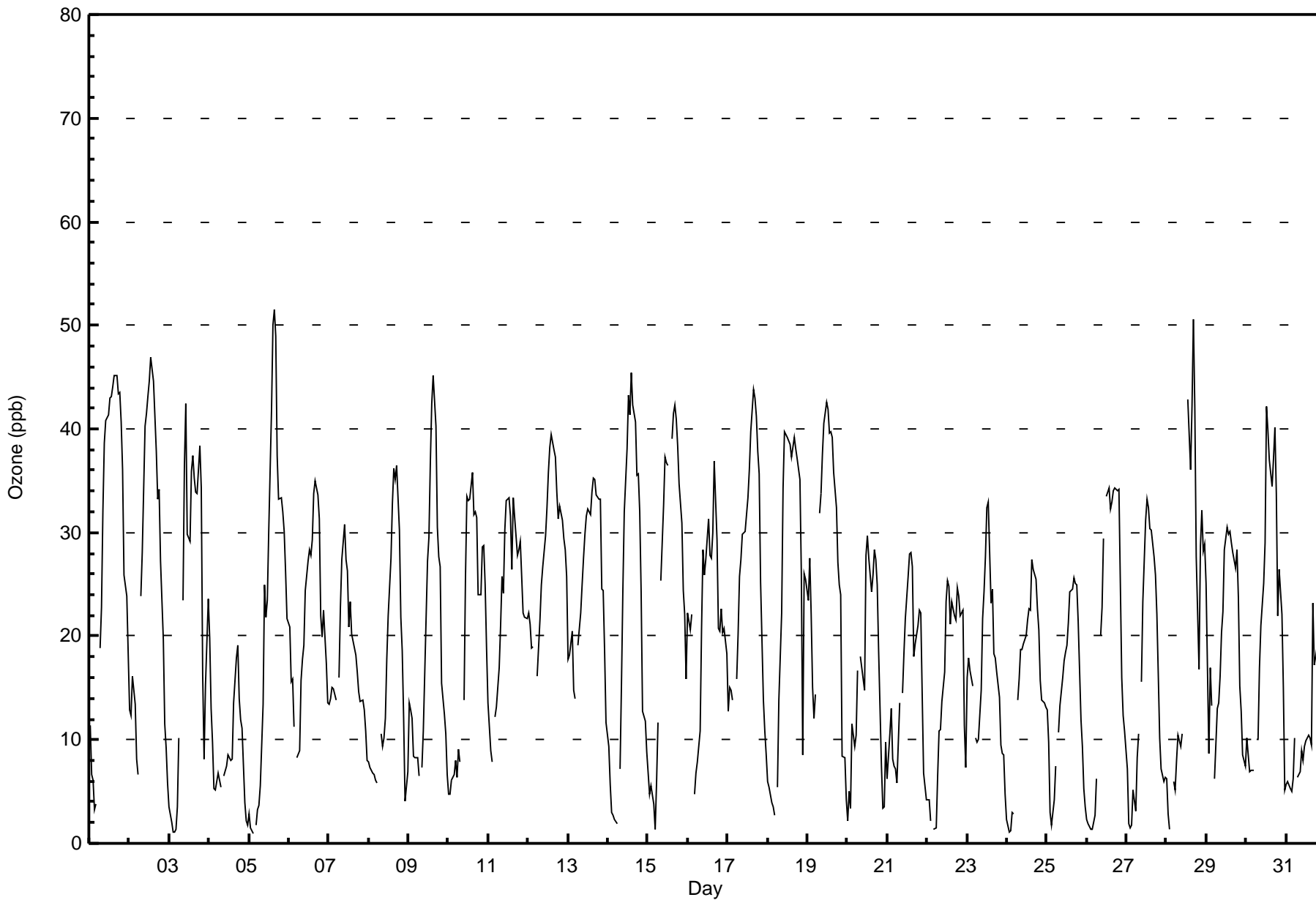
Fort McKay South - July 2016

Number of Exceedences (AAAQO):		1-hr: 0 24-hr: 0		Hours in Service:		744																				
Maximum Value: 51 ppb on Jul 5 16:00		Maximum Daily Average: 29.5 ppb on Jul 1		Hours of Data:		708																				
Minimum Value: 1 ppb on Jul 5 03:00		Minimum Daily Average: 9.3 ppb on Jul 4		Hours of Missing Data:		36																				
Maximum Diurnal Average: 33.1 ppb at hour 17		Minimum Diurnal Average: 6.0 ppb at hour 5		Hours of Calibration:		34																				
Monthly Average: 20.5 ppb		Percentiles: P ₁ = 1 P ₁₀ = 5 Q ₁ = 10 Median = 20 Q ₃ = 30 P ₉₀ = 37 P ₉₉ = 45		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-Jul	11	7	6	3	4	Z	19	23	32	39	41	41	43	43	44	45	45	43	44	41	36	26	24	18	29.5	45
2-Jul	13	12	16	13	8	7	Z	24	28	40	41	43	45	47	45	41	38	33	34	27	20	11	9	6	26.2	47
3-Jul	4	2	1	1	1	3	10	Z	23	37	42	30	29	36	37	35	34	34	38	34	16	8	15	24	21.6	42
4-Jul	20	13	10	5	5	7	6	5	Z	6	7	9	8	8	8	14	18	19	14	12	11	4	2	2	9.3	20
5-Jul	3	2	1	Z	2	3	4	6	13	25	22	23	30	42	50	51	49	37	33	33	32	30	26	22	23.5	51
6-Jul	21	16	16	11	Z	8	9	16	18	19	24	27	28	28	29	34	35	34	31	22	20	23	17	14	21.7	35
7-Jul	13	14	15	15	14	Z	16	23	27	31	27	26	21	23	20	19	18	16	15	14	14	13	11	8	18.0	31
8-Jul	8	7	7	7	6	6	Z	11	9	10	12	18	22	27	33	36	35	36	30	22	19	12	4	7	16.7	36
9-Jul	13	13	12	8	8	8	6	Z	7	11	22	27	30	37	42	45	40	31	28	27	15	13	11	7	20.1	45
10-Jul	5	5	6	7	8	6	9	8	Z	14	26	34	33	33	36	32	32	31	24	24	29	29	25	19	20.6	36
11-Jul	14	9	8	Z	12	13	17	21	26	24	30	33	33	32	27	33	32	28	28	29	26	22	22	22	23.5	33
12-Jul	22	21	19	19	Z	16	19	22	25	27	30	32	36	38	40	38	37	34	31	33	31	29	28	26	28.4	40
13-Jul	18	18	21	15	14	Z	19	22	25	27	30	32	32	32	34	35	35	34	33	33	25	24	19	12	25.6	35
14-Jul	9	6	3	3	2	2	Z	7	15	24	32	38	43	41	45	42	41	36	36	32	24	13	12	9	22.4	45
15-Jul	7	5	6	4	1	6	12	Z	25	33	37	37	36	M	39	42	42	41	38	35	31	24	22	16	24.5	42
16-Jul	22	21	22	Z	5	7	8	11	21	28	26	27	31	28	28	30	37	29	21	20	23	20	21	18	21.9	37
17-Jul	13	15	15	14	Z	16	20	26	27	30	30	32	33	36	40	44	43	41	38	36	25	14	11	9	26.4	44
18-Jul	6	5	4	3	3	Z	5	14	22	34	40	40	39	38	37	38	39	38	37	35	26	9	26	26	24.6	40
19-Jul	23	28	22	15	12	14	Z	32	34	38	41	43	42	40	40	39	36	32	27	25	24	8	8	4	27.2	43
20-Jul	2	5	3	11	9	10	17	Z	18	16	15	28	30	28	24	26	28	27	25	19	8	3	4	10	15.9	30
21-Jul	6	11	13	8	8	7	6	14	Z	14	18	22	26	28	28	27	18	19	21	23	22	14	7	4	15.8	28
22-Jul	4	4	2	Z	1	2	7	11	11	14	16	23	25	25	21	23	22	21	25	24	22	23	11	7	15.0	25
23-Jul	16	18	17	15	Z	10	10	10	15	22	24	28	32	33	23	25	18	18	17	14	10	9	9	5	17.2	33
24-Jul	2	1	1	3	3	Z	14	16	19	19	19	20	22	23	22	27	26	26	23	21	16	14	14	13	15.7	27
25-Jul	13	10	3	2	4	7	Z	11	13	16	18	18	19	21	24	25	26	25	25	21	12	9	5	3	14.4	26
26-Jul	2	2	1	1	2	3	6	Z	20	23	29	M	34	34	32	33	34	34	34	34	25	16	12	11	19.3	34
27-Jul	7	2	1	2	5	3	8	11	Z	16	23	31	33	32	30	30	28	26	22	16	10	7	6	6	15.5	33
28-Jul	6	3	1	Z	6	5	8	10	9	11	C	C	C	43	36	42	51	42	28	17	29	32	28	29	21.8	51
29-Jul	25	9	17	13	Z	6	13	14	16	20	22	28	31	30	30	29	28	27	28	24	15	13	9	7	19.7	31
30-Jul	10	9	7	7	7	Z	10	10	17	21	25	29	42	40	37	34	37	40	34	22	26	22	15	5	22.0	42
31-Jul	6	6	5	5	6	10	Z	6	7	9	8	9	10	10	10	9	23	17	18	20	20	18	18	18	11.8	23
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan C - Calibration M - Maintenance																										
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb																										



Wood Buffalo Environmental Association
Hourly Averages

Ozone (O₃) - ppb
Fort McKay South - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ozone (O₃) - ppb
Fort McKay South - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	357	50.42	50.42
21 - 50	349	49.29	99.72
51 - 82	2	0.28	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 (O₃) - ppb
Fort McKay South - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	34	9	1	0	0	2	5	17	32	33	38	40	30	19	41	56	357
21 - 50	46	57	24	8	6	5	15	20	11	31	23	9	16	23	20	35	349
51 - 82	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	81	67	25	8	6	7	20	37	43	64	61	49	46	42	61	91	708

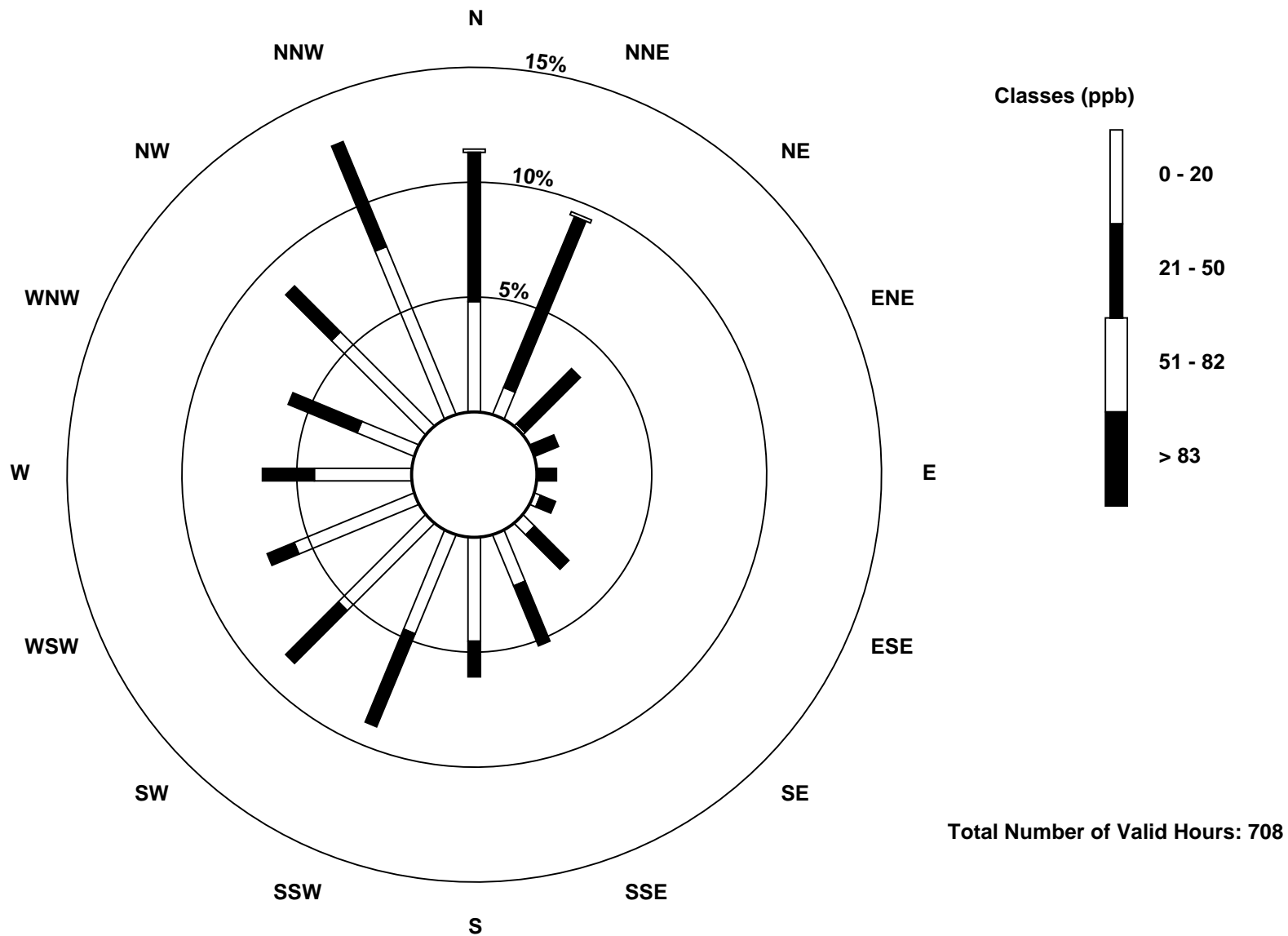
Total Number of Valid Hours: 708

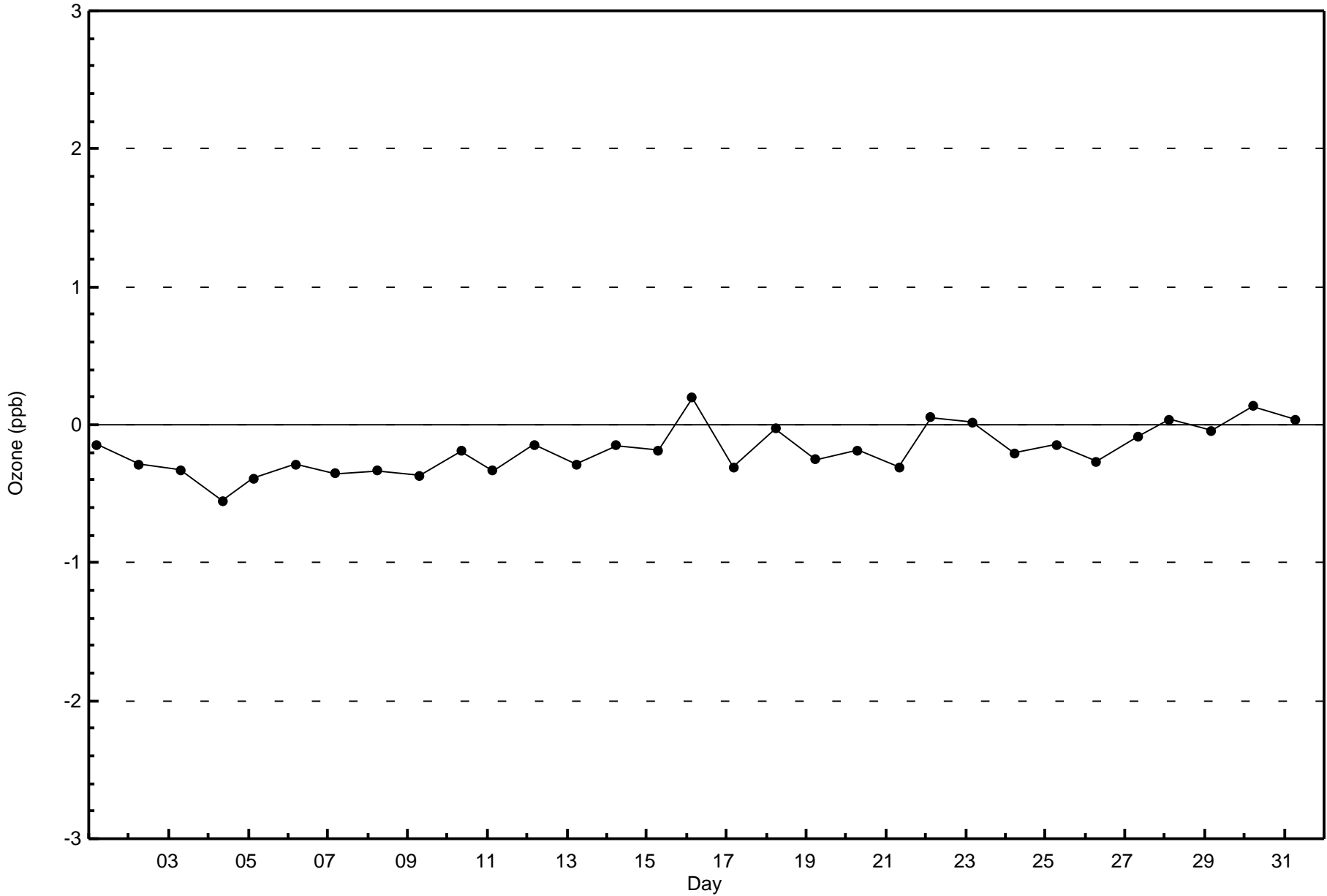
Total Number of Hours: 744

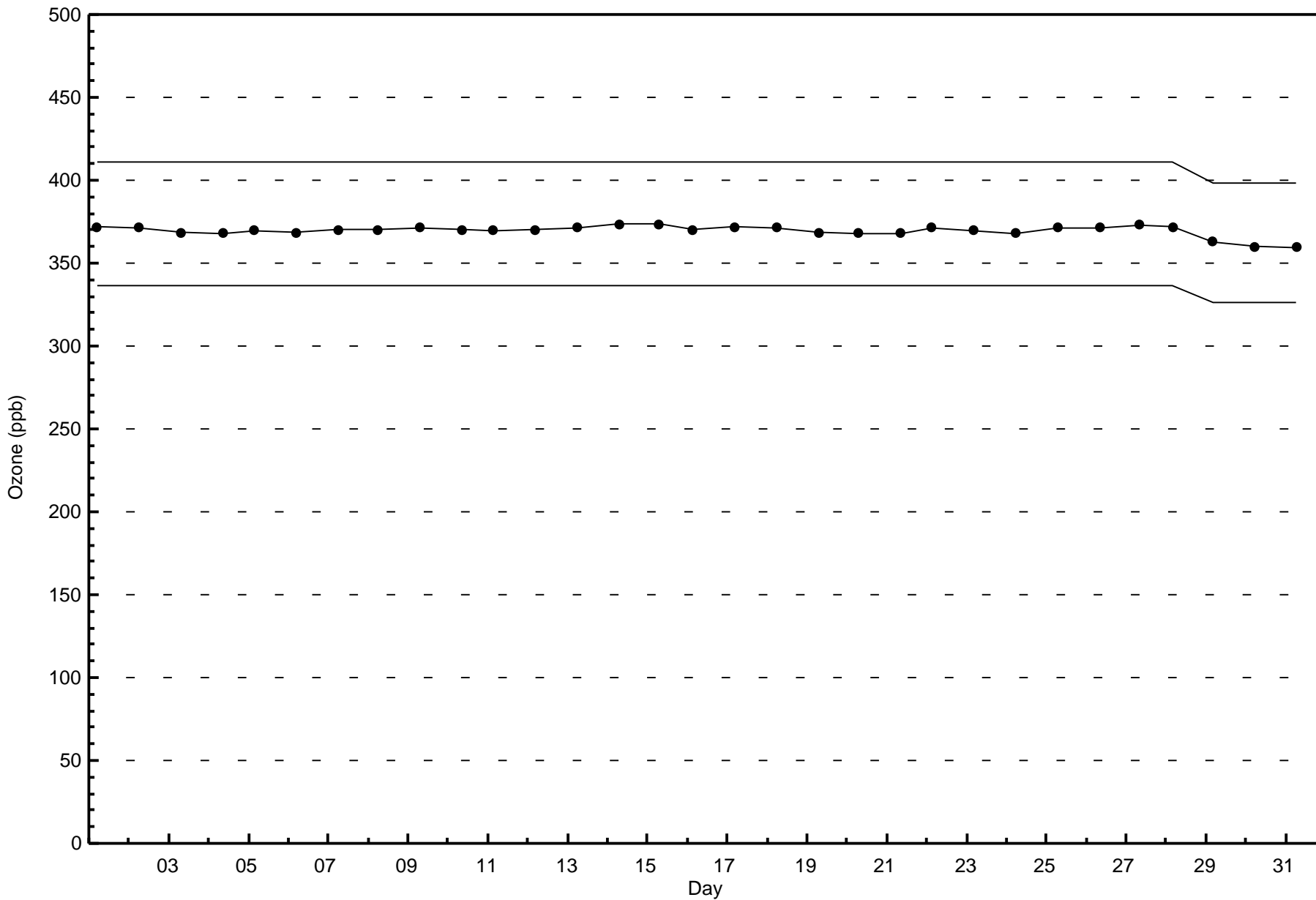


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Ozone (O₃) - ppb
Fort McKay South (AMS 13)







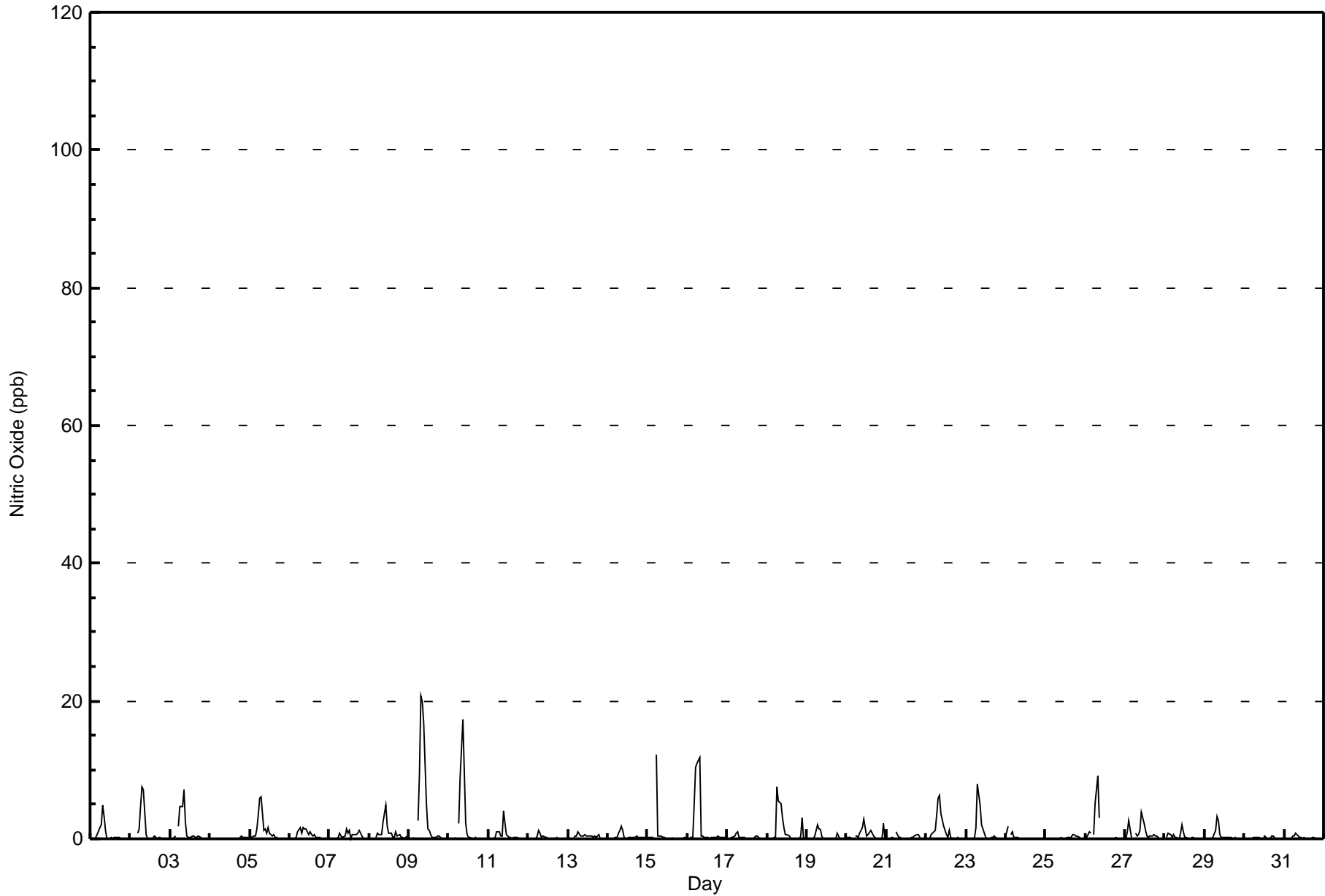


Maximum Value: 21 ppb on Jul 9 08:00		Maximum Daily Average: 3.5 ppb on Jul 9		Hours in Service: 744																							
Minimum Value: 0 ppb on Jul 1 21:00		Minimum Daily Average: 0.1 ppb on Jul 4		Hours of Data: 707																							
Maximum Diurnal Average: 3.4 ppb at hour 8		Minimum Diurnal Average: 0.1 ppb at hour 1		Hours of Missing Data: 37																							
Monthly Average: 0.7 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 2 P ₉₉ = 10		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-Jul	0	0	Z	0	1	2	2	5	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	5	
2-Jul	0	0	0	Z	1	1	5	8	7	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.0	8	
3-Jul	0	0	0	0	Z	2	5	5	7	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.0	7	
4-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
5-Jul	Z	0	0	0	1	3	6	6	1	1	1	2	1	0	1	0	0	0	0	0	0	0	0	0	1.1	6	
6-Jul	0	Z	0	0	0	1	2	1	2	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0.5	2	
7-Jul	0	0	Z	0	0	0	1	0	0	0	1	1	1	0	1	1	1	1	1	1	1	0	0	0	0.5	1	
8-Jul	0	0	0	Z	0	1	1	1	2	4	5	2	1	1	0	0	1	0	1	0	0	0	0	0	0.9	5	
9-Jul	0	0	0	0	Z	3	10	21	20	17	5	1	1	1	0	0	0	0	0	0	0	0	0	0	3.5	21	
10-Jul	0	0	0	0	0	Z	2	9	17	10	2	1	0	0	0	0	0	0	0	0	0	0	0	0	1.8	17	
11-Jul	Z	0	0	0	0	1	1	0	0	4	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0.5	4	
12-Jul	0	Z	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
13-Jul	0	0	Z	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0.3	1	
14-Jul	0	0	0	Z	0	0	1	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	2	
15-Jul	0	0	0	0	Z	12	0	0	0	0	0	0	0	M	0	0	0	0	0	0	0	0	0	0	0.7	12	
16-Jul	Z	0	0	0	5	10	11	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.8	12	
17-Jul	0	Z	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
18-Jul	0	0	Z	0	0	0	7	6	5	3	2	1	1	0	0	0	0	0	0	0	1	3	0	0	1.3	7	
19-Jul	0	0	0	Z	0	0	2	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.3	2	
20-Jul	0	0	0	0	Z	0	0	0	1	2	3	2	0	1	1	1	0	0	0	0	0	0	2	0	0.6	3	
21-Jul	0	0	0	0	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0.2	1	
22-Jul	Z	0	0	1	1	1	3	6	6	4	2	1	1	0	1	0	0	0	0	0	0	0	0	0	1.2	6	
23-Jul	0	Z	0	0	0	0	2	8	5	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.9	8	
24-Jul	0	2	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	2	
25-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0.2	1	
26-Jul	0	0	1	1	Z	1	5	9	3	C	C	C	C	C	0	0	0	0	0	0	0	0	0	0	1.1	9	
27-Jul	0	1	3	2	0	Z	1	0	1	1	4	2	1	0	0	0	0	0	1	0	0	0	0	0	0.8	4	
28-Jul	Z	0	1	1	0	1	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3	2	
29-Jul	0	Z	0	0	0	0	1	3	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	3	
30-Jul	0	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-Jul	0	0	0	Z	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
		0.1	0.2	0.3	0.3	0.5	1.6	2.3	3.4	2.9	2.0	1.1	0.6	0.4	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.1	0.1	0.1	0.1	Diurnal Average	
		0	2	3	2	5	12	11	21	20	17	5	2	1	1	1	1	1	1	1	1	1	3	2	0	Diurnal Maximum	
Z - zerospan		C - Calibration			M - Maintenance																						



Wood Buffalo Environmental Association
Hourly Averages

Nitric Oxide (NO) - ppb
Fort McKay South - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb
Fort McKay South - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	706	99.86	99.86
21 - 40	1	0.14	100.00
11 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitric Oxide (NO) - ppb
Fort McKay South - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	82	68	26	8	6	8	23	39	40	63	59	47	46	43	59	89	706
21 - 40	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	82	69	26	8	6	8	23	39	40	63	59	47	46	43	59	89	707

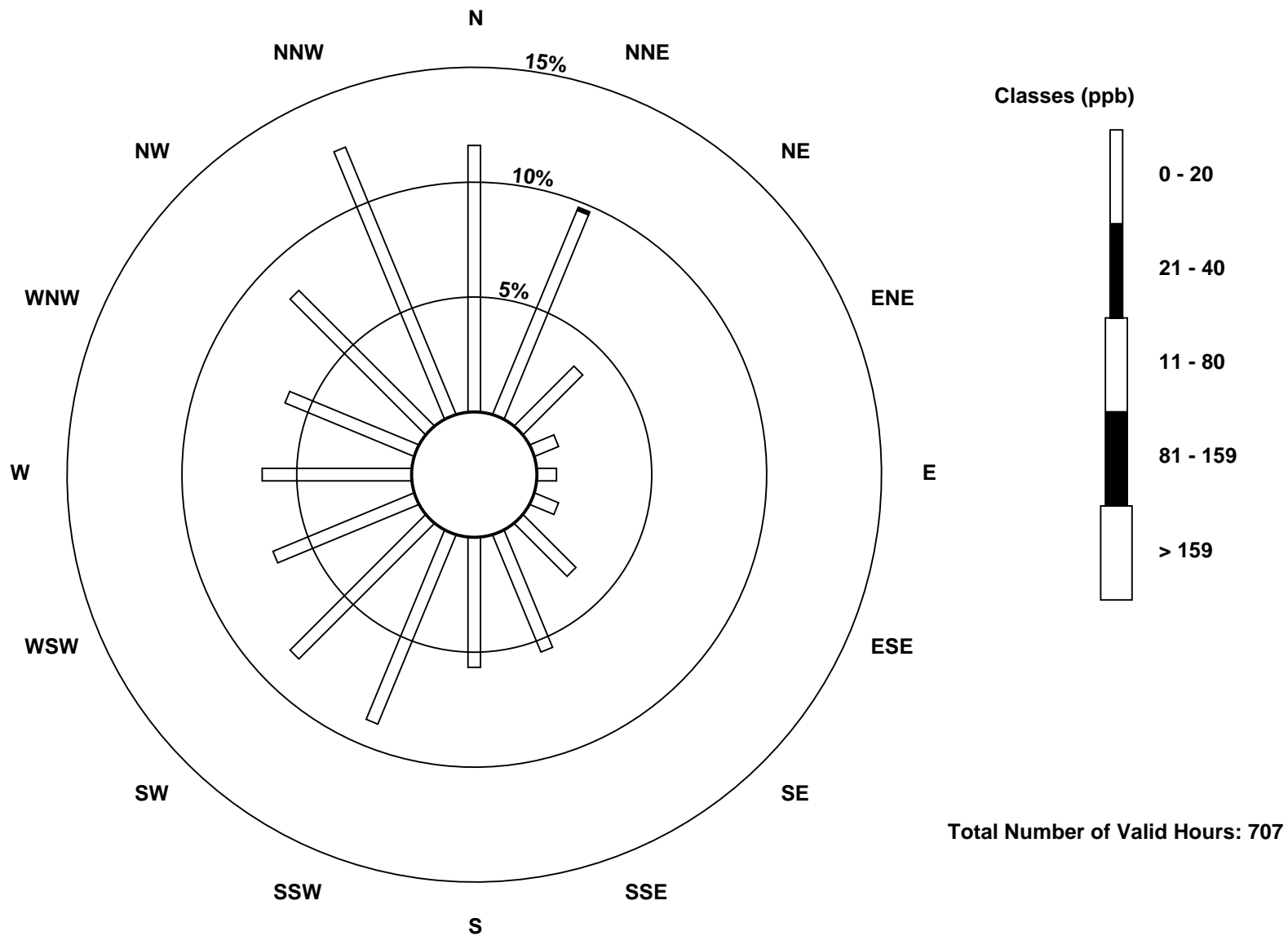
Total Number of Valid Hours: 707

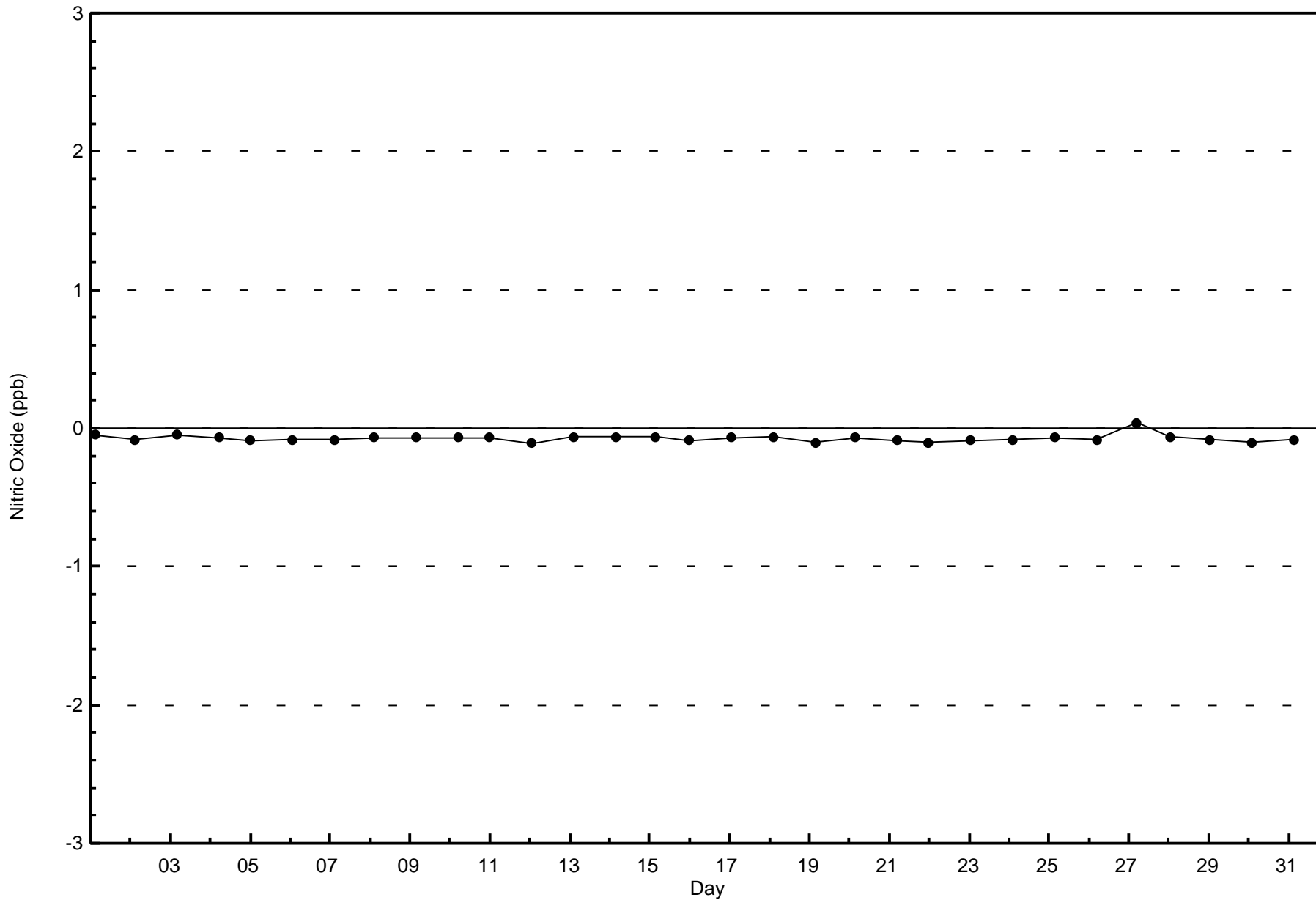
Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

Nitric Oxide (NO) - ppb
Fort McKay South (AMS 13)

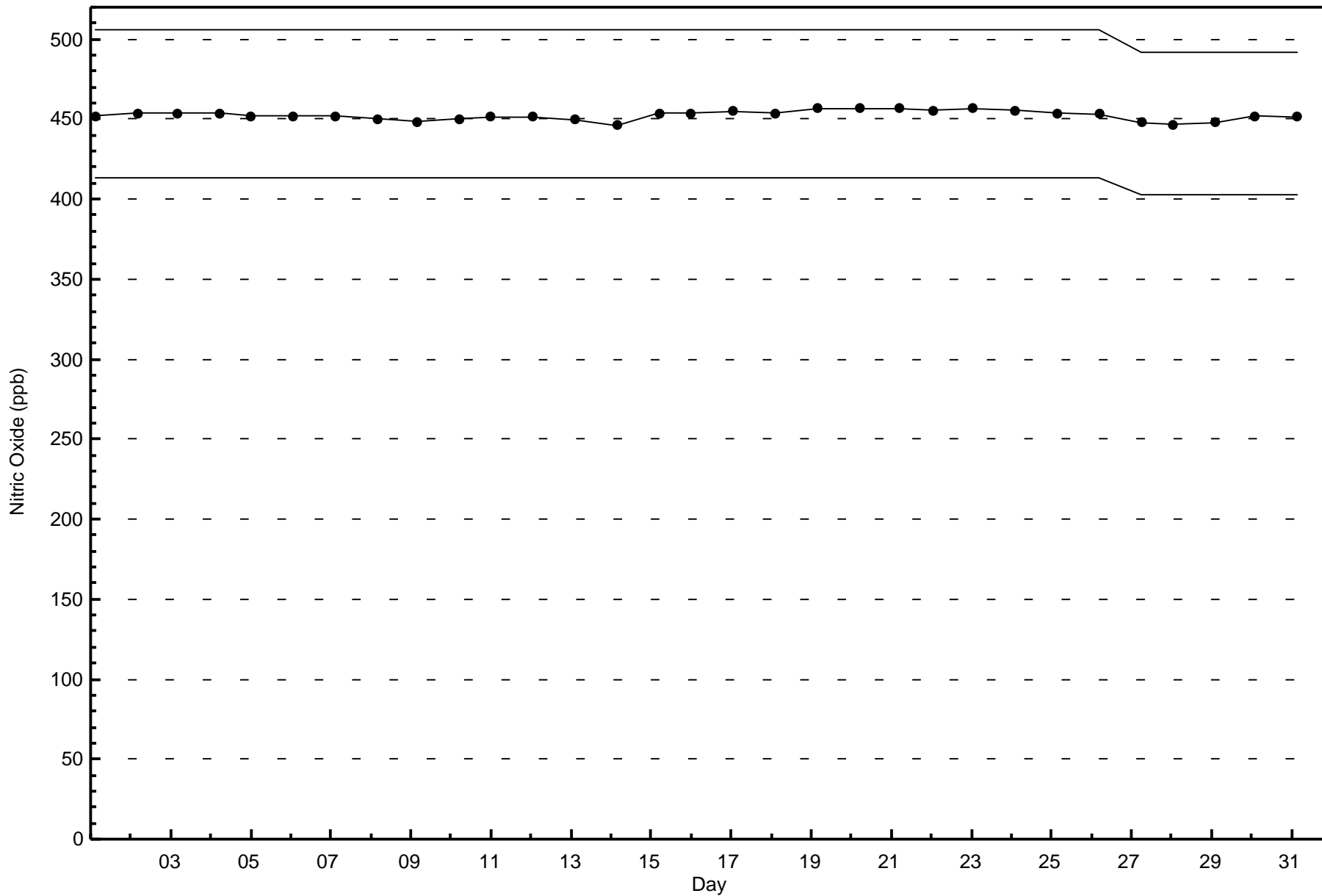






Wood Buffalo Environmental Association
Span Responses

Nitric Oxide (NO) - ppb
Fort McKay South - July 2016





Wood Buffalo Environmental Association
Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb
Fort McKay South - July 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 24 ppb on Jul 18 22:00	Maximum Daily Average: 4.9 ppb on Jul 9		Hours of Data:	707
Minimum Value: 0 ppb on Jul 4 09:00	Minimum Daily Average: 0.7 ppb on Jul 4		Hours of Missing Data:	37
Maximum Diurnal Average: 4.3 ppb at hour 8	Minimum Diurnal Average: 1.3 ppb at hour 16		Hours of Calibration:	36
Monthly Average: 2.4 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 2 O ₃ = 3 P ₉₀ = 5 P ₉₉ = 13		Percent Operational Time:	99.9

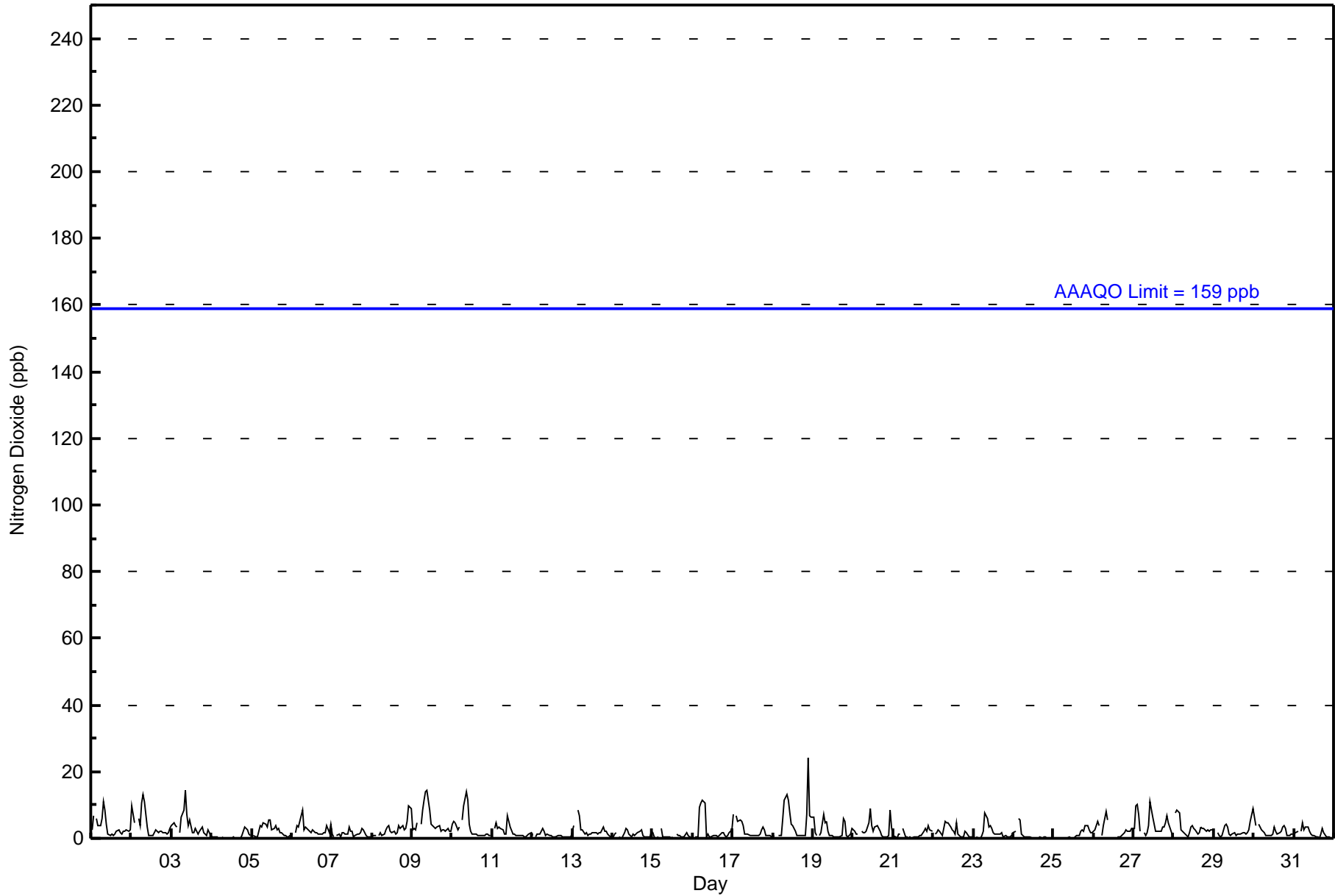
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	3	7	Z	6	4	4	6	11	9	4	1	1	1	1	1	2	2	2	1	2	2	3	2	3	3.4	11
2-Jul	10	7	5	Z	6	4	11	13	11	3	1	1	1	1	2	2	2	2	2	2	2	1	2	3	4.1	13
3-Jul	4	5	4	3	Z	2	6	9	14	7	4	6	2	2	3	2	1	2	4	2	1	1	2	1	3.7	14
4-Jul	1	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	2	3	3	1	1	0.7	3
5-Jul	Z	1	1	1	2	4	4	5	4	4	5	6	2	3	4	3	3	2	2	1	1	1	1	1	2.5	6
6-Jul	1	Z	2	4	3	5	8	3	3	3	3	2	3	2	2	2	1	1	1	2	2	4	2	4	2.7	8
7-Jul	1	1	Z	1	1	1	2	2	1	1	3	2	2	0	1	1	1	2	3	3	1	1	0	0	1.3	3
8-Jul	1	1	1	Z	1	2	1	1	3	4	4	2	2	2	1	2	4	3	4	3	3	5	10	9	2.8	10
9-Jul	2	3	3	5	Z	4	8	12	14	14	9	4	4	3	3	3	4	2	3	3	2	3	2	2	4.9	14
10-Jul	4	5	5	3	4	Z	6	10	14	11	4	2	1	1	1	1	1	1	1	1	1	1	1	1	3.5	14
11-Jul	Z	3	5	3	3	3	2	1	1	7	5	3	1	1	1	1	1	1	1	1	1	1	1	2	2.1	7
12-Jul	1	Z	1	1	1	2	3	2	1	1	1	1	1	0	0	1	1	1	1	0	1	1	1	1	0.9	3
13-Jul	2	4	Z	8	7	2	2	1	2	1	1	1	2	2	2	1	2	2	4	2	2	1	1	1	2.3	8
14-Jul	1	1	2	Z	1	0	1	2	3	3	1	1	1	1	1	2	2	3	1	1	0	1	1	2	1.2	3
15-Jul	2	0	0	1	Z	3	0	0	0	0	0	0	0	M	1	1	1	0	0	1	2	1	0	0	0.7	3
16-Jul	Z	0	0	1	9	11	12	11	1	1	1	1	1	1	1	1	1	2	2	1	1	1	2	3	2.6	12
17-Jul	7	Z	7	5	5	5	4	1	1	1	1	1	1	1	1	1	1	2	3	2	1	1	1	1	2.4	7
18-Jul	1	1	Z	1	1	1	6	11	13	12	8	4	4	2	1	1	1	1	1	1	7	24	7	6	4.9	24
19-Jul	6	2	1	Z	1	2	7	5	5	2	1	1	1	1	0	0	1	6	5	1	1	1	3	2.3	7	
20-Jul	2	2	1	1	Z	2	2	2	2	5	9	4	2	3	4	3	2	1	1	1	0	1	9	3	2.7	9
21-Jul	1	0	0	1	1	Z	3	1	0	0	0	0	0	0	1	1	1	1	2	3	2	4	3	2	1.2	4
22-Jul	Z	1	2	3	2	1	3	5	5	5	4	3	2	1	5	1	1	0	1	2	2	0	0	0	2.1	5
23-Jul	0	Z	0	0	0	1	2	8	6	4	4	3	2	1	1	1	2	1	1	1	1	1	1	1	1.7	8
24-Jul	2	2	Z	6	6	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.9	6
25-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	2	2	4	4	3	2	2	1.0	4
26-Jul	2	3	5	4	Z	1	4	8	6	C	C	C	C	C	1	1	1	1	2	3	2	2	2	3	2.7	8
27-Jul	3	10	10	7	2	Z	2	1	2	4	11	7	4	2	2	2	2	4	3	5	7	5	2	1	4.2	11
28-Jul	Z	8	8	8	3	2	2	1	1	2	3	4	3	3	1	2	3	3	3	2	2	2	3	2	3.1	8
29-Jul	3	Z	2	1	1	1	4	4	4	1	1	1	2	1	1	1	1	2	2	1	2	3	5	9	2.2	9
30-Jul	6	4	Z	4	3	2	2	1	1	1	1	1	3	2	1	2	2	3	4	3	1	1	1	1	2.2	6
31-Jul	1	2	2	Z	2	5	3	3	3	2	1	1	1	0	0	0	1	3	2	1	0	0	0	0	1.5	5
	2.5	2.8	2.6	3.1	2.7	2.6	3.7	4.3	4.2	3.5	2.9	2.1	1.6	1.4	1.5	1.3	1.5	1.6	2.0	1.8	1.8	2.3	2.1	2.2	Diurnal Average	
	10	10	10	8	9	11	12	13	14	14	11	7	4	3	5	3	4	4	6	5	7	24	10	9	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Fort McKay South - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Fort McKay South - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	706	99.86	99.86
21 - 40	1	0.14	100.00
11 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Fort McKay South - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	82	69	26	8	6	8	23	39	40	62	59	47	46	43	59	89	706
21 - 40	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	82	69	26	8	6	8	23	39	40	63	59	47	46	43	59	89	707

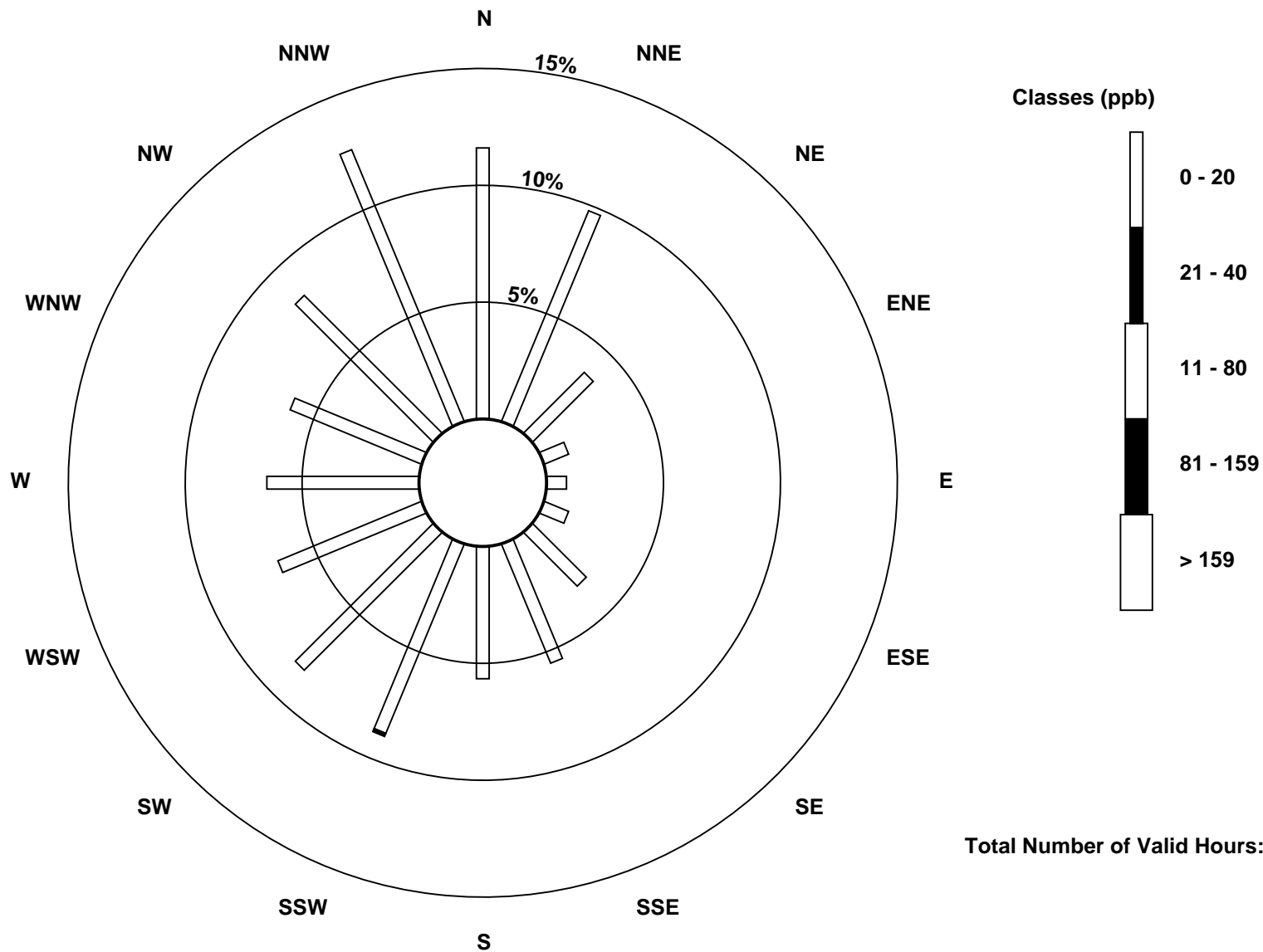
Total Number of Valid Hours: 707

Total Number of Hours: 744

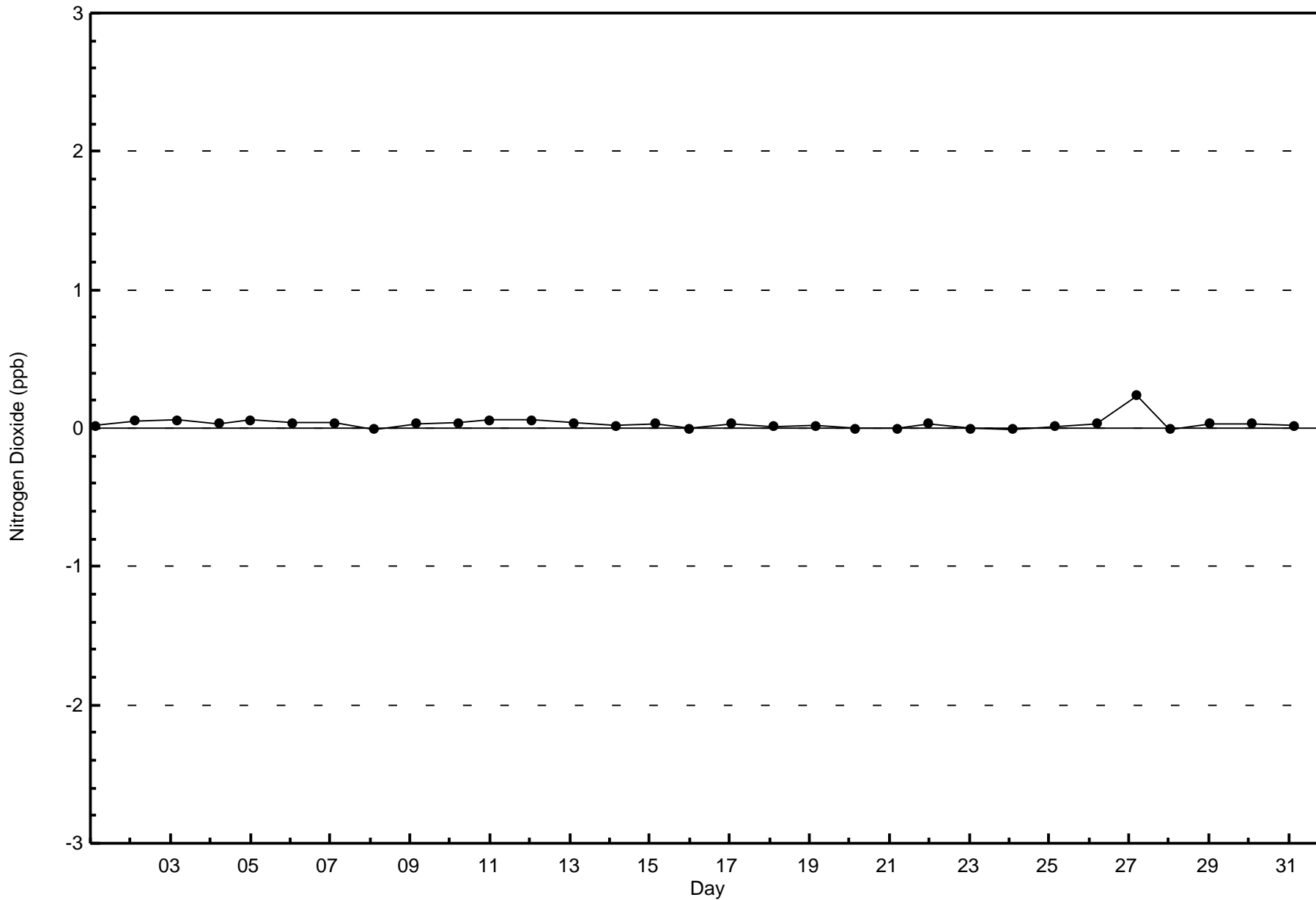


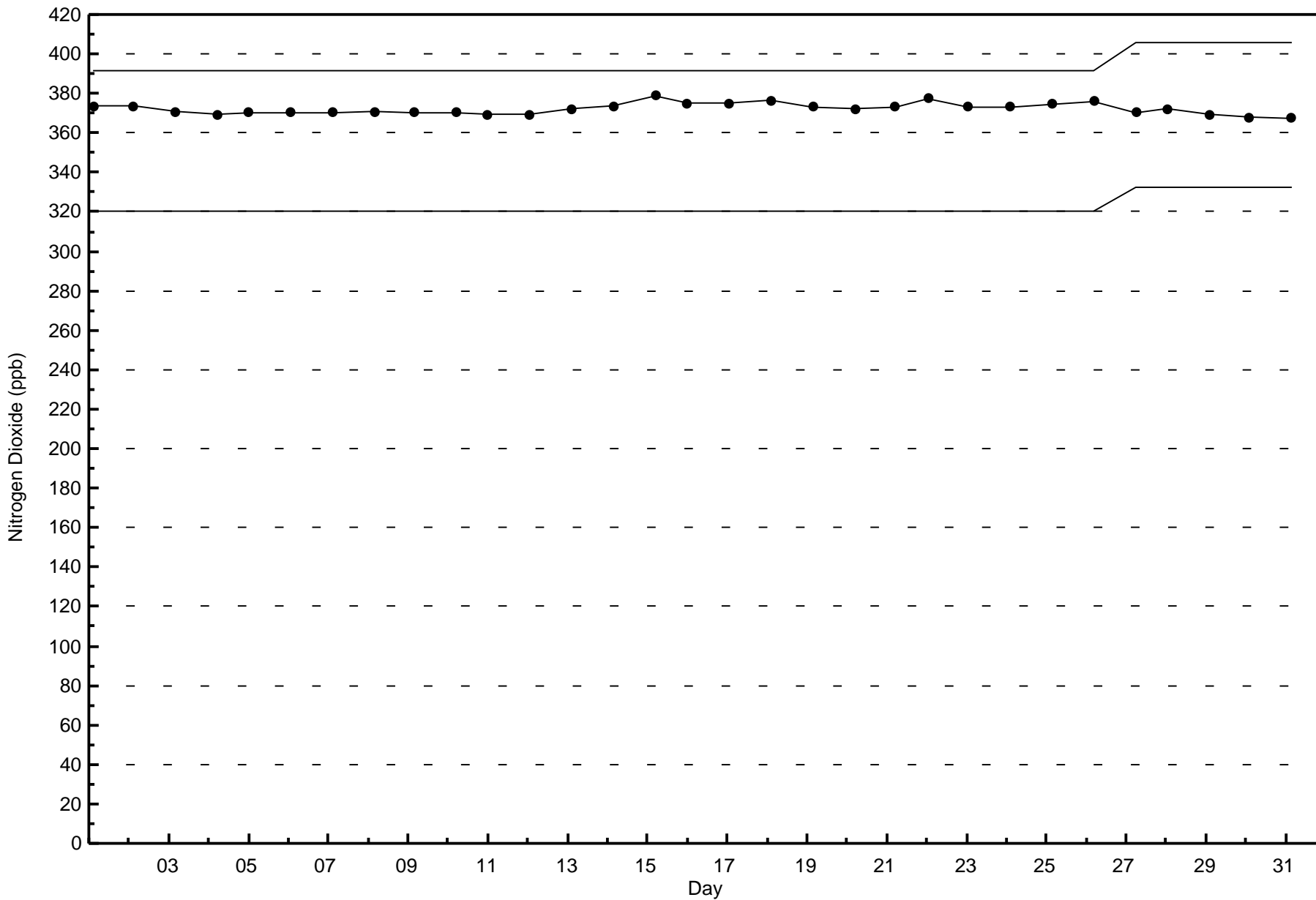
Wood Buffalo Environmental Association
Wind Rose Jul 2016

Nitrogen Dioxide (NO₂) - ppb
Fort McKay South (AMS 13)



Total Number of Valid Hours: 707







Wood Buffalo Environmental Association
Summary of Hour Averages

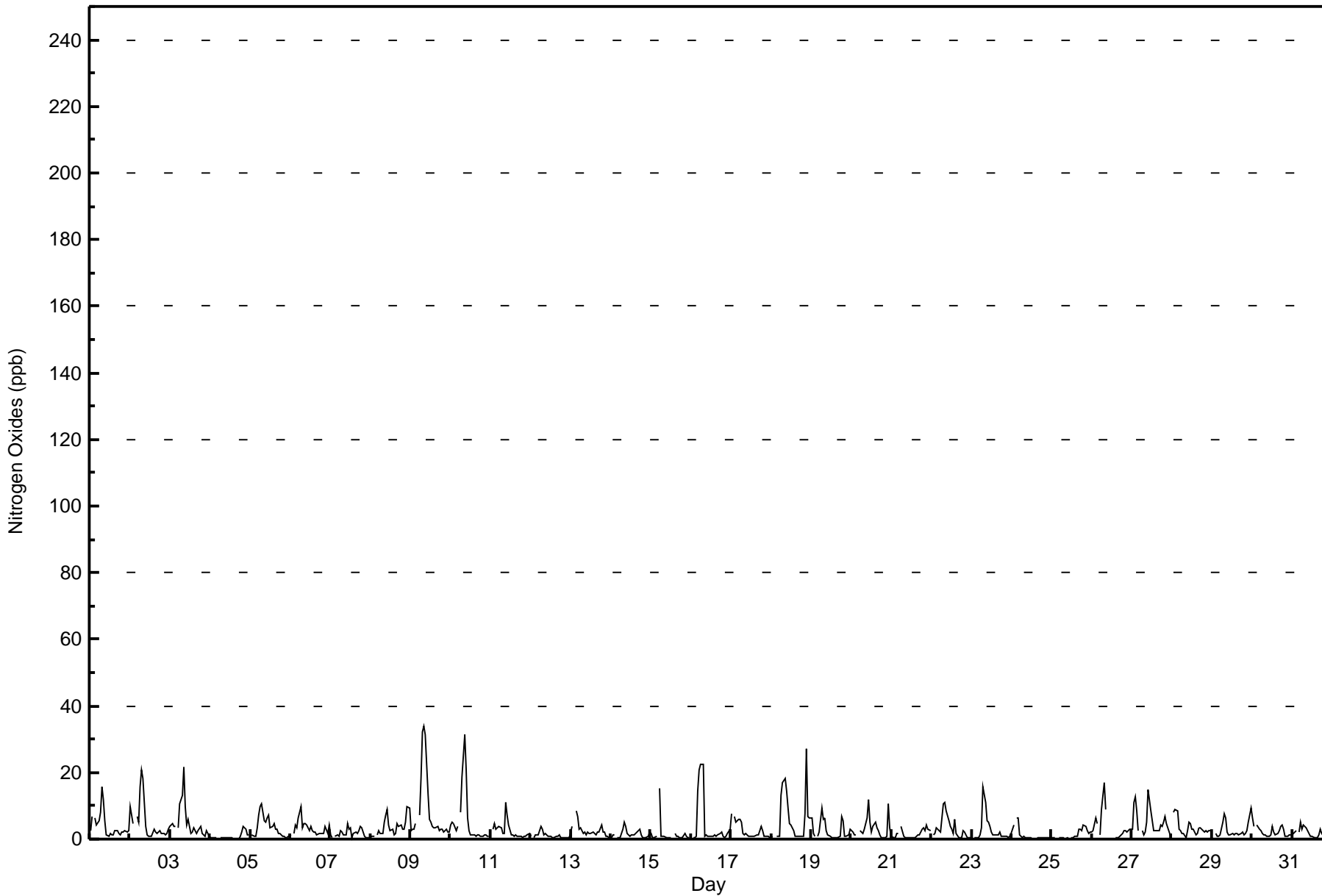
Nitrogen Oxides (NO_x) - ppb
Fort McKay South - July 2016

Maximum Value: 34 ppb on Jul 9 09:00		Maximum Daily Average: 8.4 ppb on Jul 9		Hours in Service: 744																																													
Minimum Value: 0 ppb on Jul 25 12:00		Minimum Daily Average: 0.7 ppb on Jul 4		Hours of Data: 707																																													
Maximum Diurnal Average: 7.7 ppb at hour 8		Minimum Diurnal Average: 1.5 ppb at hour 16		Hours of Missing Data: 37																																													
Monthly Average: 3.1 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 2 Q ₃ = 4 P ₉₀ = 7 P ₉₉ = 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-Jul	3	7	Z	6	4	5	8	16	12	5	1	1	1	1	1	2	3	2	1	2	2	3	2	3	4.0	16																							
2-Jul	10	7	5	Z	7	5	16	21	18	4	1	1	1	1	3	2	2	2	2	2	2	1	2	3	5.1	21																							
3-Jul	4	5	4	4	Z	4	11	13	21	10	4	6	2	2	3	2	2	3	4	2	1	1	2	1	4.8	21																							
4-Jul	1	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	2	4	3	1	1	0.7	4																							
5-Jul	Z	1	1	1	4	7	10	11	5	5	6	7	3	4	4	3	3	0	2	1	1	1	1	1	3.6	11																							
6-Jul	1	Z	1	4	4	6	10	3	5	5	4	2	4	3	2	2	1	2	2	2	2	4	2	4	3.2	10																							
7-Jul	1	1	Z	1	1	1	3	2	1	1	5	3	3	0	1	2	2	2	4	3	1	1	0	0	1.8	5																							
8-Jul	1	1	1	Z	1	2	2	2	5	7	9	4	3	3	1	2	5	4	4	3	3	5	10	9	3.7	10																							
9-Jul	2	3	3	5	Z	7	18	32	34	31	13	6	5	4	3	3	4	3	3	3	2	3	2	2	8.4	34																							
10-Jul	4	5	5	3	4	Z	8	19	31	21	6	3	1	1	1	1	1	1	1	1	1	1	1	1	5.3	31																							
11-Jul	Z	3	5	3	3	4	3	2	2	11	7	4	1	1	1	1	1	1	1	1	1	1	1	2	2.6	11																							
12-Jul	1	Z	1	1	1	2	4	3	1	2	1	1	1	0	0	1	1	1	0	0	0	1	0	1	1.1	4																							
13-Jul	2	4	Z	8	7	3	3	2	2	1	2	2	2	2	2	1	2	2	4	2	2	1	1	1	2.5	8																							
14-Jul	1	1	1	Z	1	0	2	3	5	4	2	1	1	1	1	2	2	3	1	1	1	1	1	2	1.6	5																							
15-Jul	2	0	0	1	Z	15	1	1	1	1	0	0	0	M	2	1	1	0	0	1	2	1	1	0	1.4	15																							
16-Jul	Z	0	0	1	14	21	22	22	1	1	1	1	1	1	1	1	1	2	2	1	1	1	2	3	4.4	22																							
17-Jul	8	Z	7	5	6	6	5	2	1	2	1	1	1	1	1	1	1	3	4	2	1	1	1	1	2.6	8																							
18-Jul	1	1	Z	1	1	1	13	17	18	15	9	5	4	2	1	1	1	1	1	1	8	27	7	6	6.1	27																							
19-Jul	6	2	1	Z	1	2	9	6	6	3	1	1	1	0	0	0	0	1	7	6	1	1	1	3	2.6	9																							
20-Jul	3	2	1	1	Z	2	2	2	3	6	12	5	2	4	5	3	3	1	1	0	0	1	11	3	3.3	12																							
21-Jul	1	0	0	2	2	Z	4	1	0	0	0	0	0	0	1	1	1	1	3	4	2	4	3	2	1.4	4																							
22-Jul	Z	1	2	3	3	2	6	11	11	8	5	4	3	2	6	2	1	0	0	2	2	0	0	0	3.3	11																							
23-Jul	0	Z	0	0	0	1	4	16	11	6	5	4	2	1	1	1	1	2	1	1	1	1	1	1	2.7	16																							
24-Jul	2	4	Z	6	7	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.1	7																							
25-Jul	0	0	0	Z	0	0	0	0	0	1	0	0	0	0	1	1	1	3	3	2	4	4	3	2	1.2	4																							
26-Jul	2	3	6	5	Z	1	9	17	9	C	C	C	C	C	1	1	1	1	2	3	2	2	2	3	3.8	17																							
27-Jul	3	11	13	9	3	Z	2	1	2	5	15	9	5	3	2	3	2	4	4	5	7	4	2	1	5.0	15																							
28-Jul	Z	8	9	8	3	3	2	2	1	3	5	5	3	3	1	2	3	3	3	2	2	2	3	2	3.4	9																							
29-Jul	2	Z	2	1	1	1	5	8	6	2	1	1	2	1	2	2	1	2	2	1	2	3	5	9	2.6	9																							
30-Jul	6	4	Z	4	3	3	2	1	1	1	1	1	4	2	1	2	2	4	4	3	1	1	1	1	2.4	6																							
31-Jul	1	2	2	Z	2	5	3	4	4	2	2	1	1	0	0	0	1	3	2	1	0	0	0	0	1.7	5																							
																								2.6	2.9	2.9	3.3	3.1	4.2	6.0	7.7	7.1	5.4	4.1	2.6	2.0	1.6	1.7	1.5	1.7	1.9	2.2	2.0	1.9	2.5	2.2	2.3	Diurnal Average	
																								10	11	13	9	14	21	22	32	34	31	15	9	5	4	6	3	5	4	7	6	8	27	11	9	Diurnal Maximum	
Z - zerospan																								C - Calibration				M - Maintenance																					



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Fort McKay South - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitrogen Oxides (NO_x) - ppb
Fort McKay South - July 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	696	98.44	98.44
21 - 40	11	1.56	100.00
11 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Fort McKay South - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	79	68	25	8	6	8	21	38	38	62	59	47	46	43	59	89	696
21 - 40	3	1	1	0	0	0	2	1	2	1	0	0	0	0	0	0	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
Totals	82	69	26	8	6	8	23	39	40	63	59	47	46	43	59	89	707

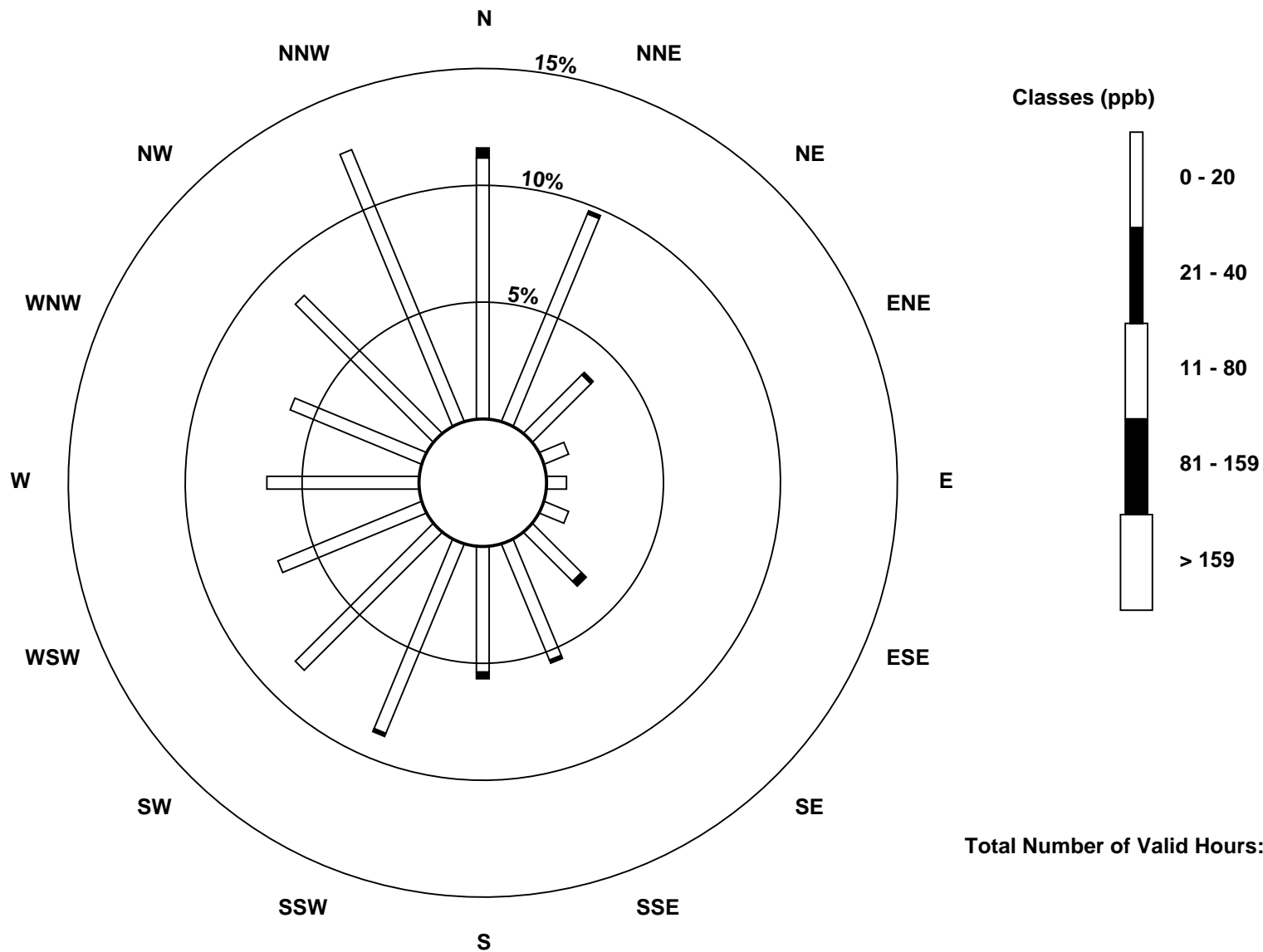
Total Number of Valid Hours: 707

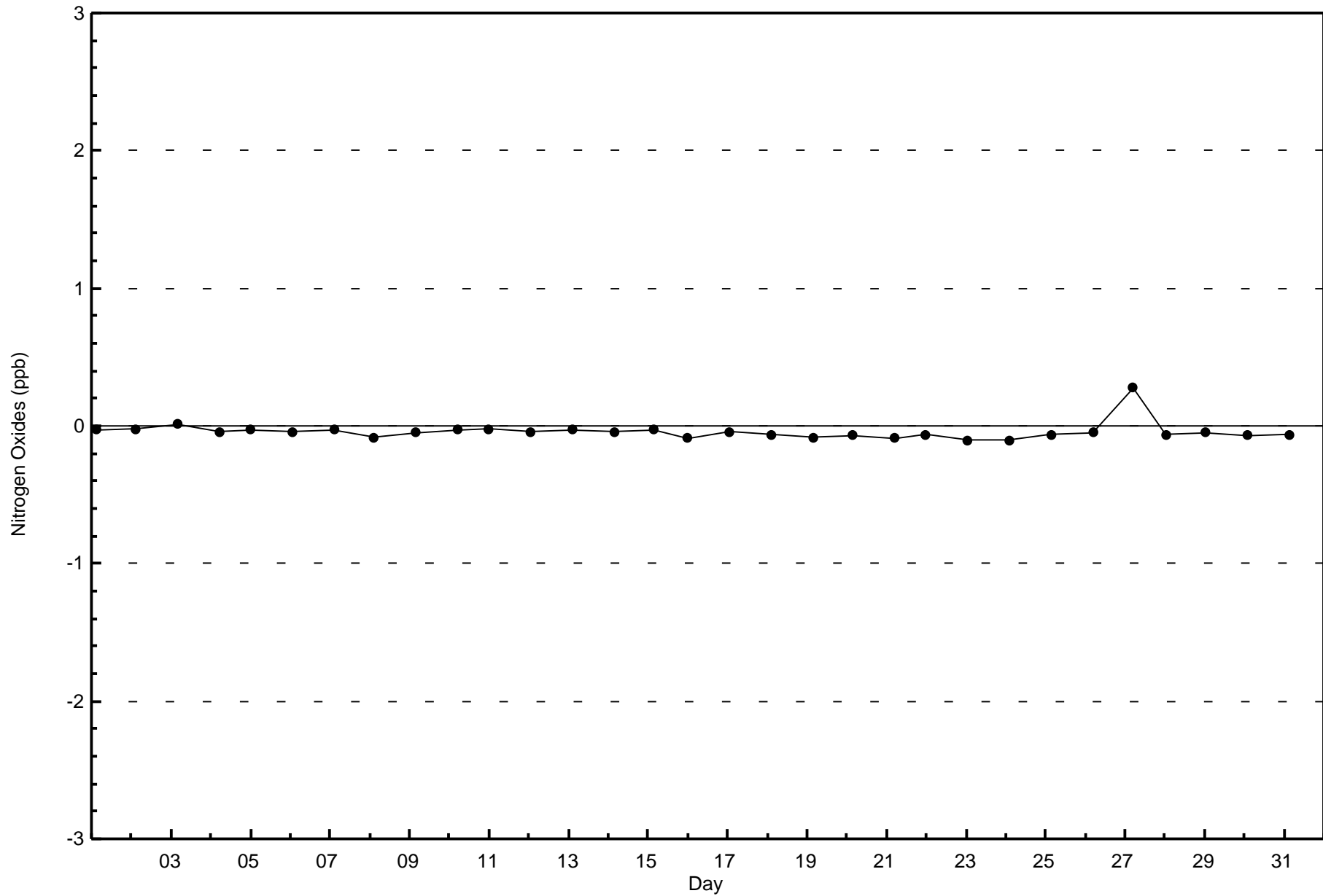
Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

Nitrogen Oxides (NO_x) - ppb
Fort McKay South (AMS 13)

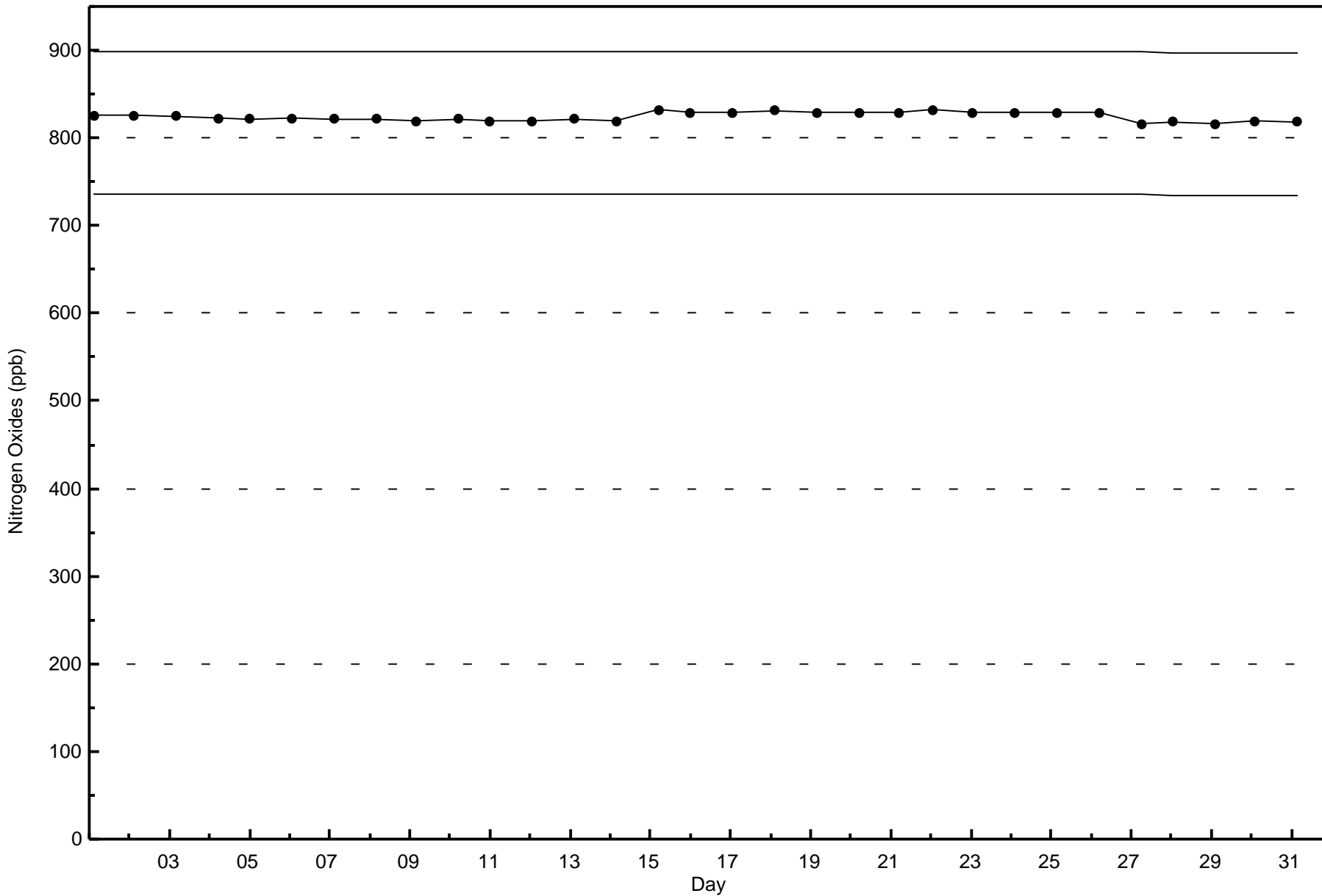






Wood Buffalo Environmental Association
Span Responses

Nitrogen Oxides (NO_x) - ppb
Fort McKay South - July 2016





Summary of Hour Averages

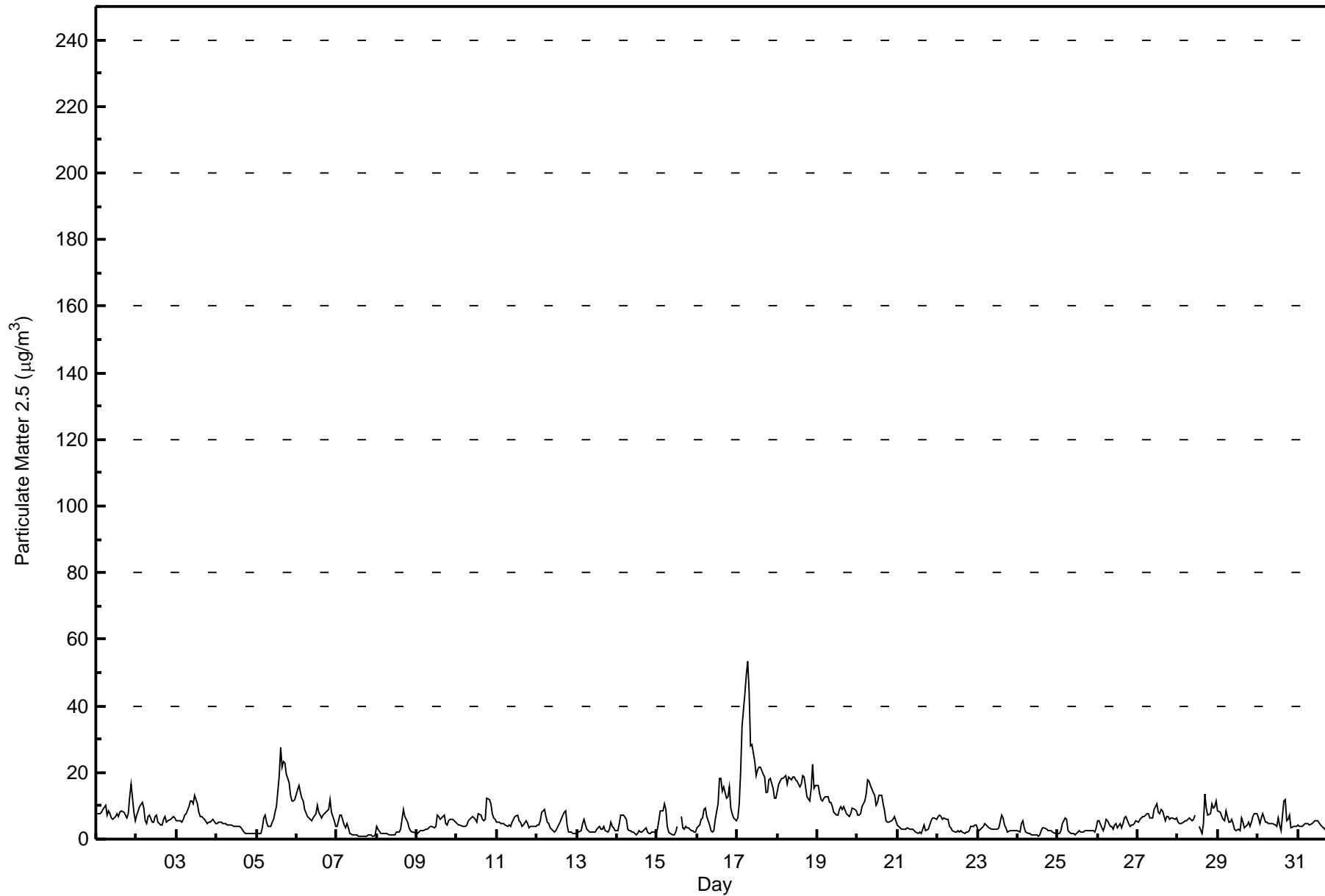
Fort McKay South - July 2016

Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 53.6 µg/m ³ on Jul 17 07:00 Minimum Value: 0.9 µg/m ³ on Jul 7 23:00 Maximum Diurnal Average: 8.0 µg/m ³ at hour 6 Monthly Average: 6.40 µg/m ³		Maximum Daily Average: 23.6 µg/m ³ on Jul 17 Minimum Daily Average: 2.3 µg/m ³ on Jul 24 Minimum Diurnal Average: 5.2 µg/m ³ at hour 24 Percentiles: P ₁ = 1.0 P ₁₀ = 1.9 Q ₁ = 3.0 Median = 5.0 Q ₃ = 7.4 P ₉₀ = 12.6 P ₉₉ = 28.0		Hours in Service: 744 Hours of Data: 741 Hours of Missing Data: 3 Hours of Calibration: 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-Jul	7.5	7.6	7.6	8.2	8.8	10.4	7.0	8.6	7.5	6.3	5.8	6.8	7.7	6.8	7.9	8.4	8.0	7.1	6.1	7.5	12.8	16.4	8.2	5.7	8.1	16.4
2-Jul	7.3	8.5	9.7	11.2	9.2	5.4	4.8	6.8	7.1	5.0	5.0	6.8	7.4	4.9	4.0	4.1	5.9	6.7	5.0	5.6	6.1	6.4	6.6	6.4	6.5	11.2
3-Jul	5.4	5.4	5.4	5.0	6.0	7.3	7.6	9.7	11.2	11.7	10.4	13.2	10.5	8.3	7.0	6.7	6.2	5.7	4.5	5.0	5.2	5.5	6.0	4.5	7.2	13.2
4-Jul	4.8	5.1	5.2	5.1	4.7	4.5	4.4	4.4	4.2	4.1	3.9	3.8	3.7	3.7	3.7	3.2	2.3	1.7	1.8	1.7	1.6	1.5	1.7	1.7	3.4	5.2
5-Jul	1.9	1.7	1.9	3.3	6.4	7.4	5.1	3.7	3.9	5.0	6.0	8.0	9.8	18.9	27.7	21.6	23.3	22.7	19.6	17.0	13.2	11.5	11.5	12.1	11.0	27.7
6-Jul	14.9	16.1	14.2	12.3	11.4	9.0	6.7	6.4	5.8	5.6	6.2	7.6	10.1	7.9	7.4	6.3	7.3	8.2	8.6	8.8	11.8	7.8	5.3	3.7	8.7	16.1
7-Jul	3.9	5.5	7.1	7.1	4.4	3.4	4.7	3.6	1.7	1.3	1.4	1.3	1.2	0.9	1.0	1.0	0.9	1.0	1.1	1.1	1.1	1.0	0.9	1.4	2.4	7.1
8-Jul	3.7	2.8	1.9	1.8	1.7	1.6	1.7	1.4	1.4	1.4	1.5	1.5	2.1	2.3	3.1	5.8	8.8	6.8	5.1	3.5	2.6	2.1	2.1	1.9	2.8	8.8
9-Jul	1.7	1.9	2.5	2.5	2.7	2.8	2.9	3.3	3.7	4.0	3.4	4.0	7.1	6.8	6.0	6.2	7.3	4.6	4.2	5.3	5.8	5.7	5.4	4.9	4.4	7.3
10-Jul	4.5	4.2	4.3	3.7	3.7	4.0	4.3	5.3	6.3	6.7	6.5	5.8	4.9	7.5	7.3	5.8	5.6	5.9	12.2	11.9	10.7	7.6	6.6	5.8	6.3	12.2
11-Jul	5.3	5.1	4.6	4.7	4.6	4.2	3.9	4.4	4.0	5.1	6.1	6.6	7.3	5.5	4.9	3.9	4.3	5.6	4.9	3.5	3.6	3.7	3.8	3.9	4.7	7.3
12-Jul	4.3	4.3	5.6	8.1	9.1	7.0	5.3	4.7	3.5	2.8	2.3	2.6	3.2	4.1	5.0	7.3	8.1	8.5	4.3	2.2	1.9	1.9	1.7	1.6	4.5	9.1
13-Jul	1.6	2.3	2.7	4.6	5.9	4.2	2.8	2.3	2.1	2.0	1.9	2.2	3.1	3.9	2.8	2.9	3.8	2.5	2.1	2.9	4.9	4.0	3.2	2.4	3.1	5.9
14-Jul	2.6	4.7	7.1	7.4	7.3	6.1	3.0	2.5	2.4	2.2	1.9	1.3	1.6	2.5	2.2	2.2	3.1	3.2	2.1	1.7	1.9	2.0	1.9	1.8	3.1	7.4
15-Jul	2.9	5.6	8.3	8.3	10.4	8.8	3.7	2.1	1.6	1.3	1.5	2.3	3.8	M	6.6	3.4	2.8	3.7	3.4	3.4	2.7	2.4	2.1	1.9	4.0	10.4
16-Jul	3.3	4.2	6.1	6.2	8.9	9.5	6.6	4.2	2.4	2.0	2.5	5.8	10.6	18.1	18.2	14.4	15.6	12.4	12.7	15.7	9.3	7.7	6.4	5.3	8.7	18.2
17-Jul	6.3	10.6	20.5	34.0	43.6	49.0	53.6	44.3	28.1	28.3	23.2	19.1	20.6	21.5	21.4	19.7	18.5	14.1	14.2	17.8	18.2	15.4	12.4	12.2	23.6	53.6
18-Jul	14.4	16.5	18.0	18.0	18.6	19.1	16.6	18.8	17.9	18.6	18.8	17.8	17.5	15.7	16.7	18.9	18.4	15.8	12.6	11.6	15.4	22.6	15.2	16.2	17.1	22.6
19-Jul	16.0	13.6	11.7	11.6	12.4	12.8	12.5	11.0	10.8	9.8	8.2	7.2	7.4	8.9	9.8	9.0	9.9	7.8	7.2	6.6	7.5	9.1	8.8	8.3	9.9	16.0
20-Jul	7.1	7.1	7.6	9.8	11.4	13.5	17.9	17.5	16.0	14.2	13.1	10.1	10.8	13.2	12.9	10.5	8.3	5.7	5.0	5.1	5.7	5.9	6.7	5.7	10.0	17.9
21-Jul	4.1	3.2	2.9	3.0	3.1	2.9	3.2	3.1	3.0	3.1	2.5	2.0	1.6	2.1	1.8	3.0	4.3	2.7	3.2	4.4	5.3	6.3	6.2	6.0	3.5	6.3
22-Jul	6.9	7.3	6.6	5.9	6.2	6.0	6.1	3.7	3.5	2.6	2.2	2.2	2.3	2.0	2.4	2.1	1.9	2.0	2.0	2.6	3.9	3.9	4.1	4.1	3.8	7.3
23-Jul	2.8	2.4	2.9	3.6	4.5	4.4	4.0	3.4	3.1	3.1	3.0	2.9	3.2	7.2	6.3	4.3	3.3	2.3	2.5	2.4	2.5	2.7	2.6	3.4	7.2	
24-Jul	2.4	2.2	4.5	5.4	3.5	2.3	1.6	1.6	1.3	1.4	1.3	1.2	1.0	1.2	2.4	3.2	3.3	3.0	2.7	2.6	2.4	2.1	1.9	1.7	2.3	5.4
25-Jul	1.5	1.6	2.6	4.5	6.2	6.0	2.7	2.2	1.9	1.6	1.4	1.5	2.2	2.4	2.2	2.2	2.3	2.4	2.4	2.4	2.5	2.6	2.2	3.2	2.6	6.2
26-Jul	5.6	5.5	3.5	2.5	3.6	5.9	5.5	3.6	3.8	3.1	4.1	4.5	3.3	4.6	3.3	4.8	6.4	6.6	4.9	3.9	4.3	4.3	4.8	5.7	4.5	6.6
27-Jul	5.0	5.8	6.3	6.7	6.8	7.8	7.5	6.3	6.2	6.5	8.9	10.7	8.0	7.8	8.9	8.4	5.4	6.6	6.9	5.9	6.3	6.2	6.0	6.2	7.0	10.7
28-Jul	5.2	4.6	4.6	4.9	5.3	5.4	6.0	6.3	5.7	5.9	7.0	C	C	3.6	1.7	4.8	13.4	9.5	7.4	7.4	10.6	9.5	9.6	11.6	6.8	13.4
29-Jul	8.3	8.1	6.6	5.7	5.4	8.6	5.0	5.1	6.0	4.6	3.1	2.5	2.8	2.6	6.2	5.2	3.6	4.3	5.1	3.8	5.3	6.7	7.6	7.4	5.4	8.6
30-Jul	6.4	4.8	6.2	7.6	5.2	5.0	4.5	4.7	4.8	4.6	4.2	3.9	6.2	4.3	2.7	11.5	11.7	5.4	5.8	7.4	3.5	3.7	4.0	3.7	5.5	11.7
31-Jul	4.1	3.8	3.9	4.0	4.6	4.5	4.8	4.4	4.7	4.9	5.5	5.4	5.4	4.2	3.6	3.5	3.1	3.8	3.2	2.4	2.0	1.8	1.6	2.0	3.8	5.5
																								Diurnal Average		
																								Diurnal Maximum		
5.5 5.9 6.5 7.3 7.9 8.0 7.3 6.7 6.0 5.8 5.6 5.7 6.2 6.6 7.0 7.0 7.4 6.4 5.9 5.9 6.1 6.1 5.4 5.2 16.0 16.5 20.5 34.0 43.6 49.0 53.6 44.3 28.1 28.3 23.2 19.1 20.6 21.5 27.7 21.6 23.3 22.7 19.6 17.8 18.2 22.6 15.2 16.2																										
C - Calibration M - Maintenance Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m ³																										



Wood Buffalo Environmental Association
Hourly Averages

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

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

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	409	55.20	55.20
6 - 15	274	36.98	92.17
16 - 25	45	6.07	98.25
26 - 80	8	1.08	99.33
> 81.0	0	0.00	99.33

Total Number of Valid Hours: 741

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - μg/m³
Fort McKay South - July 2016

Concentration Ranges (μg/m ³)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	54	35	15	3	2	3	5	17	20	35	31	36	36	22	40	55	409
6 - 15	21	23	11	5	4	5	16	20	21	25	28	15	10	19	22	29	274
16 - 25	4	8	0	0	0	0	1	2	5	10	3	0	2	3	2	5	45
26 - 80	2	1	0	0	0	0	0	0	0	0	0	0	0	0	1	4	8
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	81	67	26	8	6	8	22	39	46	70	62	51	48	44	65	93	736

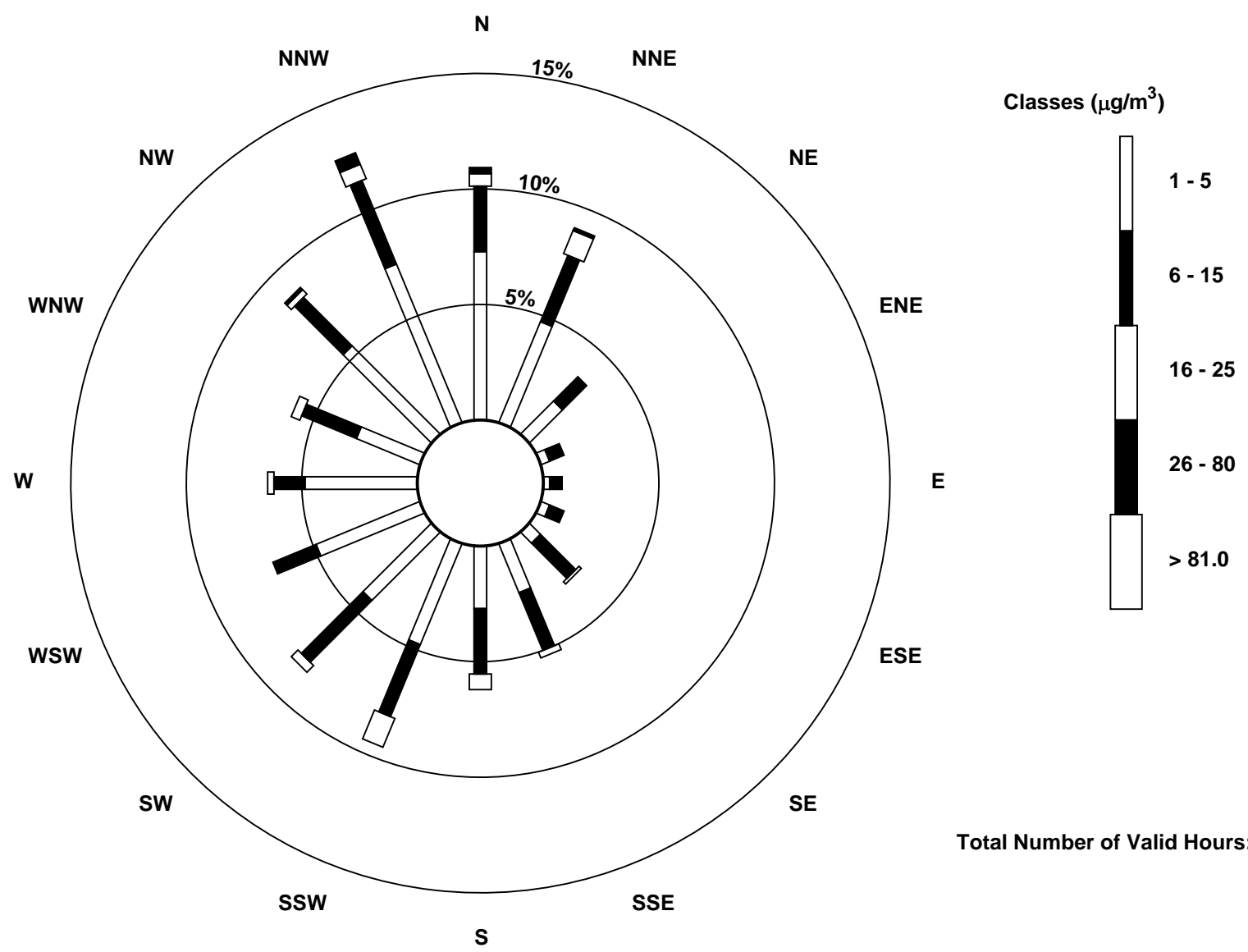
Total Number of Valid Hours: 741

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Fort McKay South (AMS 13)





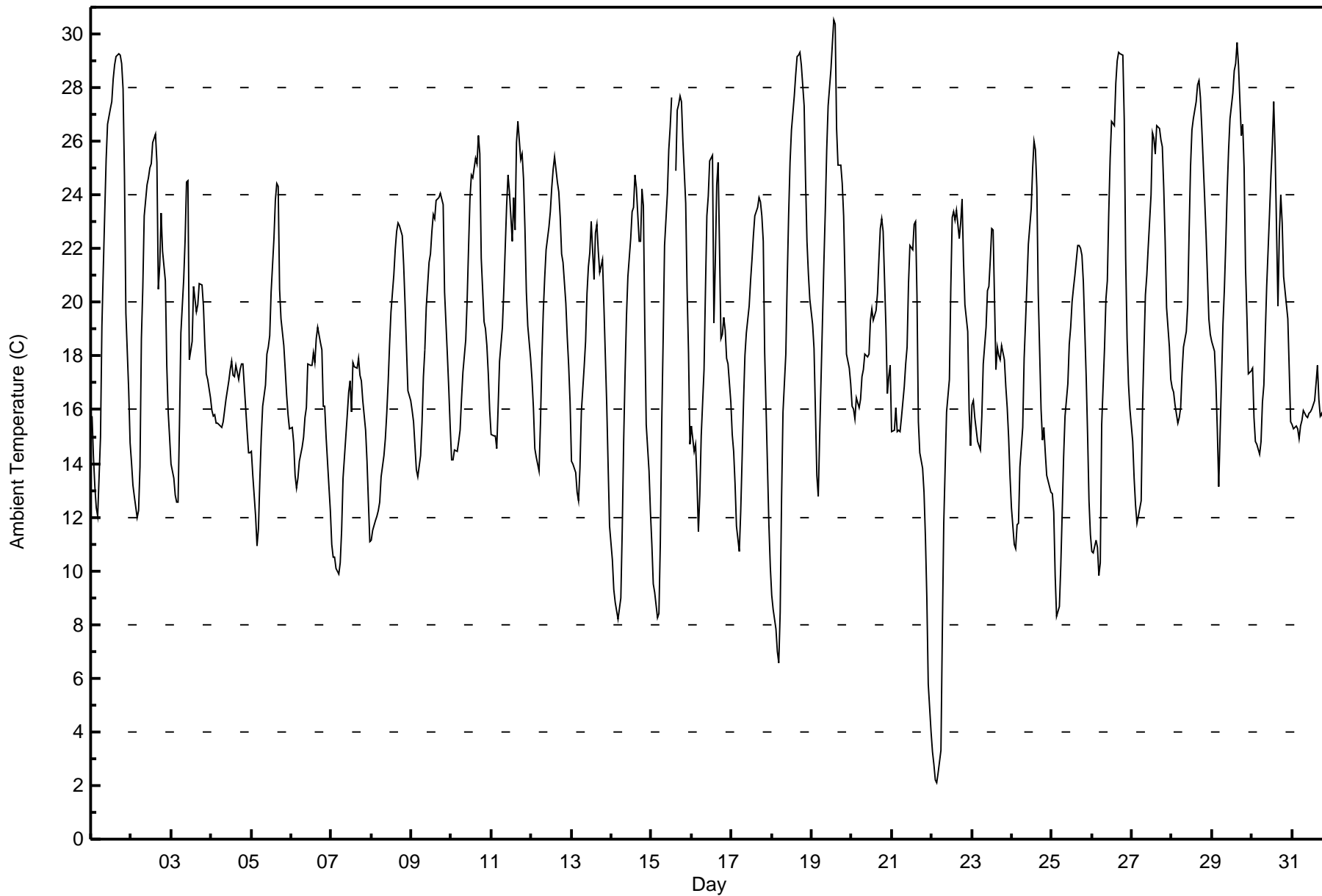
Wood Buffalo Environmental Association

Summary of Hour Averages

Ambient Temperature (AT) - C

Fort McKay South - July 2016

Maximum Value: 30.5 C on Jul 19 14:00		Maximum Daily Average: 22.2 C on Jul 29		Hours in Service: 744																																												
Minimum Value: 2.1 C on Jul 22 04:00		Minimum Daily Average: 14.2 C on Jul 7		Hours of Data: 743																																												
Maximum Diurnal Average: 23.6 C at hour 16		Minimum Diurnal Average: 12.2 C at hour 5		Hours of Missing Data: 1																																												
Monthly Average: 18.51 C		Percentiles: P ₁ = 5.7 P ₁₀ = 12.2 Q ₁ = 15.1 Median = 17.9 Q ₃ = 22.4 P ₉₀ = 25.5 P ₉₉ = 29.2		Hours of Calibration: 0																																												
				Percent Operational Time: 99.9																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Jul	15.7	14.3	13.1	12.3	12.0	15.0	19.1	21.3	23.3	25.3	26.6	27.2	27.5	28.3	28.9	29.2	29.2	29.2	28.9	28.0	24.7	19.6	16.7	14.8	22.1	29.2																						
2-Jul	14.0	13.2	12.8	12.0	12.2	13.9	18.7	20.5	23.2	24.4	24.7	25.0	25.2	26.0	26.3	25.2	20.5	21.4	23.4	21.9	20.8	17.7	15.9	15.0	19.7	26.3																						
3-Jul	14.0	13.4	12.8	12.6	12.6	15.5	18.9	20.8	22.3	24.5	24.6	17.9	18.5	20.6	20.1	19.7	19.9	20.7	20.6	19.9	18.4	17.4	17.1	16.4	18.3	24.6																						
4-Jul	16.0	15.7	15.8	15.5	15.5	15.4	15.3	15.6	16.0	16.4	17.1	17.5	17.8	17.3	17.2	17.7	17.1	17.5	17.7	17.7	16.9	15.2	14.4	14.4	16.4	17.8																						
5-Jul	14.4	13.5	12.0	10.9	11.6	13.4	15.0	16.1	16.9	18.1	18.4	18.8	20.4	22.4	23.8	24.5	24.3	20.5	19.4	18.4	17.5	16.6	15.8	15.3	17.4	24.5																						
6-Jul	15.3	14.8	13.6	13.1	13.5	14.1	14.6	15.0	15.7	16.1	17.7	17.6	17.7	18.1	17.8	18.7	19.1	18.5	18.3	16.2	16.1	15.0	13.1	12.2	15.9	19.1																						
7-Jul	11.0	10.5	10.5	10.1	9.9	10.3	11.5	13.5	14.2	15.8	16.6	17.1	15.9	17.8	17.6	17.6	17.9	17.3	17.1	16.3	15.3	14.1	12.6	11.1	14.2	17.9																						
8-Jul	11.2	11.5	11.9	12.0	12.2	12.6	13.5	14.3	14.9	15.9	17.0	18.5	19.7	21.0	22.0	22.6	23.0	22.8	22.5	21.4	19.9	18.3	16.7	16.3	17.2	23.0																						
9-Jul	16.0	15.5	14.7	13.8	13.5	14.3	15.5	17.2	18.2	19.8	21.5	21.8	22.7	23.3	23.1	23.8	23.9	24.0	23.9	23.6	20.4	18.0	16.8	15.3	19.2	24.0																						
10-Jul	14.1	14.1	14.5	14.4	14.8	15.2	16.4	17.4	18.6	20.1	22.0	23.8	24.8	24.6	25.4	25.1	26.2	25.5	21.7	19.3	19.0	18.4	17.3	16.0	19.5	26.2																						
11-Jul	15.1	15.0	15.0	14.5	16.1	17.8	19.1	20.4	22.0	23.6	24.8	24.1	22.3	23.9	22.7	26.0	26.8	25.3	25.5	24.6	22.8	20.4	19.1	17.9	21.0	26.8																						
12-Jul	17.1	16.1	14.6	14.2	13.7	15.5	17.9	19.7	20.9	22.0	22.8	23.4	24.3	24.9	25.4	24.5	24.1	23.2	21.8	21.5	20.0	18.7	17.7	16.3	20.0	25.4																						
13-Jul	14.1	14.0	13.7	12.9	12.6	13.8	15.9	17.6	18.6	20.3	21.3	21.9	23.0	20.9	22.6	22.9	21.9	21.1	21.6	19.9	18.0	16.2	13.9	11.7	17.9	23.0																						
14-Jul	10.4	9.3	8.8	8.5	8.2	9.0	11.6	14.8	17.3	19.5	21.0	22.4	23.4	23.5	24.8	24.3	22.3	22.3	24.2	23.6	19.0	15.5	13.7	12.2	17.1	24.8																						
15-Jul	11.0	9.5	9.2	8.2	8.4	11.0	15.5	18.6	22.1	24.1	25.7	26.5	27.6	M	24.9	27.2	27.4	27.7	27.5	26.0	23.7	20.4	18.1	14.7	19.8	27.7																						
16-Jul	15.4	14.5	14.7	13.3	11.4	12.8	15.0	17.5	20.4	23.2	24.0	25.3	25.5	19.2	21.6	24.4	25.2	18.6	18.8	19.4	19.0	17.9	17.7	16.3	18.8	25.5																						
17-Jul	15.1	14.4	13.3	11.7	10.7	12.2	14.2	16.3	18.0	18.9	19.8	20.8	21.6	22.5	23.2	23.5	23.9	23.8	23.3	22.3	18.1	13.9	11.7	10.2	17.6	23.9																						
18-Jul	9.1	8.6	7.8	7.0	6.6	8.5	12.8	15.9	18.1	20.8	23.3	25.2	26.4	27.7	28.5	29.2	29.2	29.3	28.8	27.3	24.6	22.3	21.1	20.1	19.9	29.3																						
19-Jul	19.2	18.3	15.9	13.6	12.8	15.0	19.3	21.5	23.4	25.7	27.3	28.7	29.6	30.5	30.3	26.5	25.1	25.1	24.5	23.2	20.8	18.1	17.5	17.0	22.0	30.5																						
20-Jul	16.1	16.0	15.7	16.4	16.1	16.4	17.3	17.5	18.1	18.0	18.1	19.3	19.8	19.3	19.7	20.3	21.6	22.7	23.1	22.6	19.1	16.6	17.2	17.7	18.5	23.1																						
21-Jul	15.2	15.2	16.1	15.2	15.2	15.2	15.7	16.8	17.7	18.3	20.7	22.1	22.0	22.9	23.0	20.3	15.6	14.4	13.8	12.9	11.2	9.0	5.8	4.0	15.8	23.0																						
22-Jul	3.3	2.8	2.2	2.1	2.5	3.3	7.8	11.7	13.8	15.9	17.1	20.6	23.2	23.4	23.1	23.4	22.4	23.0	23.9	21.6	19.9	18.9	16.0	14.7	14.9	23.9																						
23-Jul	16.2	16.4	15.7	14.8	14.7	14.5	15.8	17.7	19.1	20.5	20.6	21.6	22.7	22.7	17.5	18.4	18.0	17.9	18.4	17.9	16.9	16.1	15.0	13.5	17.6	22.7																						
24-Jul	12.4	11.0	10.8	11.7	11.8	13.9	15.3	17.9	19.3	20.7	22.2	23.5	24.9	26.0	25.7	24.3	20.3	16.0	14.9	15.4	14.4	13.5	13.1	12.9	17.2	26.0																						
25-Jul	12.9	12.2	9.8	8.3	8.6	10.2	12.2	14.2	15.8	17.0	18.4	19.1	20.0	20.5	21.0	22.1	22.1	22.0	21.7	20.8	17.3	15.1	12.6	11.4	16.1	22.1																						
26-Jul	10.7	10.6	11.1	10.9	9.9	10.3	15.4	18.3	20.1	20.8	23.3	25.4	26.7	26.6	28.2	29.0	29.3	29.3	29.2	26.8	21.6	18.6	17.0	16.0	20.2	29.3																						
27-Jul	14.8	13.5	12.5	11.8	12.0	12.6	16.2	18.3	20.3	21.0	22.1	24.0	26.3	26.1	25.5	26.6	26.5	26.0	25.8	24.3	22.3	19.8	18.3	17.1	20.2	26.6																						
28-Jul	16.8	16.7	16.2	15.5	15.7	16.1	17.4	18.3	18.9	19.9	22.6	25.1	26.4	26.9	27.5	28.1	28.3	27.6	26.5	23.9	22.6	20.9	19.4	18.8	21.5	28.3																						
29-Jul	18.6	18.2	17.0	15.2	13.1	15.2	19.2	20.5	22.3	24.2	25.7	26.8	27.8	28.6	28.9	29.7	28.8	26.2	26.6	25.0	21.3	19.4	17.4	17.4	22.2	29.7																						
30-Jul	17.5	15.7	14.8	14.7	14.3	14.8	16.3	16.9	18.8	20.6	23.3	24.7	25.8	27.5	25.6	19.9	22.6	24.0	23.0	20.9	20.5	19.4	17.5	15.6	19.8	27.5																						
31-Jul	15.5	15.3	15.4	15.3	14.9	15.4	15.6	16.0	15.8	15.7	15.9	15.9	16.0	16.3	16.9	17.7	16.4	15.7	15.9	15.4	15.2	15.2	15.2	15.1	15.7	17.7																						
																								14.1	13.5	13.0	12.3	12.2	13.3	15.6	17.4	18.8	20.2	21.5	22.3	23.1	23.3	23.5	23.6	23.2	22.5	22.3	21.2	19.3	17.3	15.9	14.8	Diurnal Average
																								19.2	18.3	17.0	16.4	16.1	17.8	19.3	21.5	23.4	25.7	27.3	28.7	29.6	30.5	30.3	29.7	29.3	29.3	29.2	28.0	24.7	22.3	21.1	20.1	Diurnal Maximum
M - Maintenance																																																





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Fort McKay South - July 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	30	4.04	4.04
10 - 20	433	58.28	62.32
> 20	280	37.69	100.00

Total Number of Valid Hours: 743

Total Number of Hours: 744

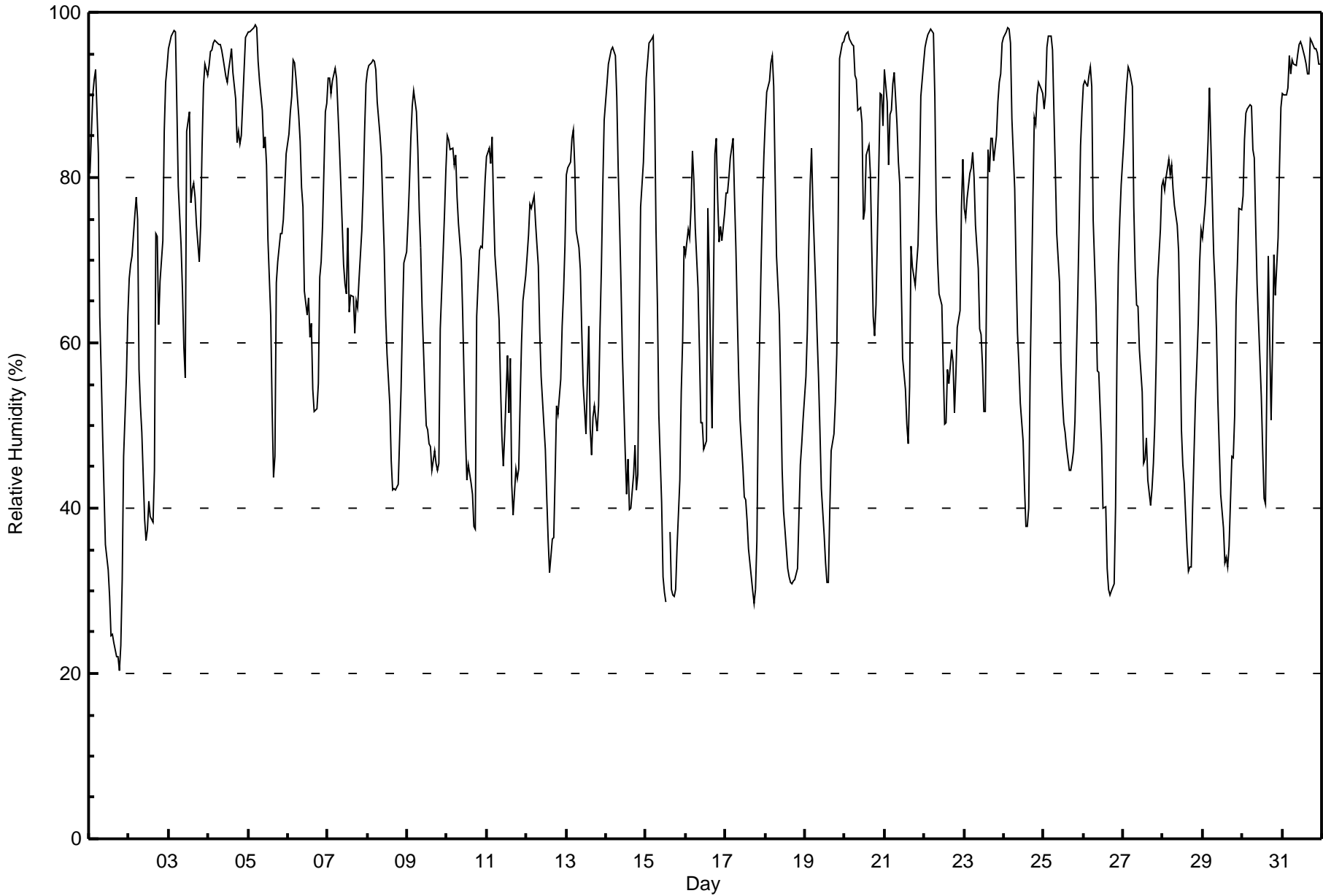


Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %
Fort McKay South - July 2016

Maximum Value: 98 % on Jul 5 05:00																	Maximum Daily Average: 93.9 % on Jul 31																	Hours in Service: 744								
Minimum Value: 20 % on Jul 1 19:00																	Minimum Daily Average: 49.5 % on Jul 1																	Hours of Data: 743								
Maximum Diurnal Average: 90.1 % at hour 5																	Minimum Diurnal Average: 49.9 % at hour 16																	Hours of Missing Data: 1								
Monthly Average: 68.8 %																	Percentiles: P ₁ = 28 P ₁₀ = 40 Q ₁ = 52 Median = 72 Q ₃ = 87 P ₉₀ = 94 P ₉₉ = 98																	Hours of Calibration: 0								
																																		Percent Operational Time: 99.9								
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																		
1-Jul	80	85	90	92	93	83	63	56	49	42	36	32	29	25	25	24	22	22	20	23	31	46	56	63	49.5	93																
2-Jul	68	70	70	75	78	75	57	52	49	39	36	37	41	39	38	45	73	73	62	67	72	86	92	93	62.0	93																
3-Jul	96	97	98	98	98	89	79	72	66	59	56	86	88	77	79	79	78	74	70	74	84	91	94	92	82.2	98																
4-Jul	94	95	95	96	97	96	96	96	95	94	92	92	93	94	96	93	89	84	86	84	85	93	97	97	92.9	97																
5-Jul	98	98	98	98	98	98	94	92	88	84	85	82	73	63	52	44	46	67	70	73	73	75	79	83	79.6	98																
6-Jul	85	88	90	94	94	92	88	84	79	77	66	63	65	61	62	54	52	52	55	68	70	74	88	89	74.6	94																
7-Jul	92	92	90	92	93	92	88	84	79	70	67	66	74	64	66	66	61	65	64	68	74	79	86	91	77.5	93																
8-Jul	93	94	94	94	94	93	89	85	83	77	71	63	59	52	46	42	42	42	43	49	54	62	70	71	69.2	94																
9-Jul	75	79	85	89	90	88	83	76	72	64	54	50	49	48	48	45	47	45	45	45	62	71	75	81	65.2	90																
10-Jul	85	85	83	84	82	83	78	74	70	63	56	49	43	45	43	42	38	37	63	71	72	72	76	80	65.5	85																
11-Jul	83	84	82	85	77	71	66	63	55	49	45	49	59	51	58	43	39	45	44	45	53	60	65	68	59.8	85																
12-Jul	70	73	77	76	78	75	72	69	61	56	50	47	41	36	32	36	36	44	52	51	56	62	66	72	57.9	78																
13-Jul	80	81	82	85	86	81	73	71	69	61	55	52	49	62	50	46	51	52	49	52	62	69	79	87	66.1	87																
14-Jul	91	94	95	95	96	95	90	81	74	67	59	47	42	46	40	40	44	48	42	44	62	77	82	87	68.2	96																
15-Jul	92	94	96	97	97	89	74	64	51	41	32	30	29	M	37	30	30	29	30	35	43	54	60	72	56.8	97																
16-Jul	71	74	73	76	83	80	74	67	59	50	50	47	48	76	69	58	50	83	85	77	72	74	72	76	68.5	85																
17-Jul	78	78	80	82	85	78	72	63	56	51	45	41	41	38	35	32	30	28	30	36	52	69	77	83	56.7	85																
18-Jul	87	90	92	94	95	91	80	70	63	55	45	40	37	33	32	31	31	31	31	33	39	45	48	51	56.0	95																
19-Jul	56	62	71	79	84	76	67	61	56	49	42	37	33	31	31	40	47	49	53	59	74	94	96	96	60.1	96																
20-Jul	97	98	98	97	96	96	92	92	88	88	87	75	76	83	84	80	71	63	61	65	81	90	90	86	84.8	98																
21-Jul	93	89	82	88	88	91	93	87	82	79	67	58	54	50	48	55	72	69	67	69	72	80	90	94	75.7	94																
22-Jul	96	97	97	98	98	97	90	76	70	66	65	57	50	50	57	55	59	58	51	56	62	64	76	82	72.0	98																
23-Jul	76	75	78	81	81	83	80	74	69	62	61	57	52	52	83	81	85	85	82	85	89	92	93	96	77.1	96																
24-Jul	97	98	98	98	96	87	79	69	61	57	53	48	43	38	38	40	56	77	87	86	90	92	91	90	73.7	98																
25-Jul	88	90	96	97	97	96	88	81	73	67	58	53	50	49	47	45	45	46	47	50	66	74	84	88	69.8	97																
26-Jul	91	92	91	92	93	91	75	65	57	56	52	48	40	40	33	30	29	30	31	40	59	69	75	79	60.8	93																
27-Jul	85	88	91	93	93	91	76	69	65	64	59	54	45	46	49	43	40	42	45	50	58	68	74	79	65.4	93																
28-Jul	80	79	80	82	80	82	79	77	74	71	62	49	45	43	35	32	33	33	40	53	57	62	70	74	61.3	82																
29-Jul	73	77	80	84	91	84	71	67	61	53	47	42	38	33	34	33	35	46	46	51	65	70	76	76	59.7	91																
30-Jul	78	85	88	88	89	89	83	82	74	67	58	54	47	41	41	70	61	51	59	71	66	73	81	88	70.1	89																
31-Jul	90	90	90	91	95	93	94	94	93	95	96	96	96	95	94	93	93	97	96	96	96	95	94	94	93.9	97																
																	84.4	86.0	87.4	89.4	90.1	87.2	80.1	74.6	69.1	63.7	58.3	54.9	52.6	52.1	50.9	49.9	51.1	53.8	55.1	59.0	66.1	73.6	79.0	82.6	Diurnal Average	
																	98	98	98	98	98	98	96	96	95	95	96	96	96	95	96	93	93	97	96	96	96	95	97	97	Diurnal Maximum	
M - Maintenance																																										





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Speed (WS) - km/h
Fort McKay South - July 2016

Maximum Speed: 25 km/h on Jul 21 16:00	Maximum Daily Speed Average: 12.0 km/h on Jul 12	Hours in Service: 744
Minimum Speed Value: 0 km/h on Jul 23 06:00	Minimum Daily Speed Average: 0.6 km/h on Jul 28	Hours of Data: 743
Maximum Diurnal Speed Average: 5.2 km/h at hour 17	Minimum Diurnal Speed Average: 0.1 km/h at hour 12	Hours of Missing Data: 1
Monthly Average Velocity: 1.8 km/h 325.4 deg	Percentiles: P ₁ = 1 P ₁₀ = 2 Q ₁ = 3 Median = 6 Q ₃ = 9 P ₉₀ = 13 P ₉₉ = 20	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-Jul	S2	WSW3	SW3	WSW2	WSW2	NW1	SE4	SE9	SE15	SSE17	SSE21	SSE19	SSE18	SSE16	SSE14	SE13	SE13	SE14	SSE15	SSE13	S7	S3	SSW3	SW3	SSE8.8	SSE21
2-Jul	SSW3	SSW3	S3	SSW1	W1	SW2	SE4	SE8	SSE11	SE20	SSE21	SSE19	SSE19	S18	S15	S18	SSE13	SE5	SE9	SE4	SE2	S2	SW3	SW3	SSE8.0	SSE21
3-Jul	SW2	SW2	SSW2	NNW1	NNW2	NW1	SE3	ESE6	SE8	SE8	SSE13	S10	N6	ENE6	E7	E4	E7	SE8	SE6	E3	SW2	S2	S4	W2	SE3.0	SSE13
4-Jul	WSW4	W2	SW4	SSW2	WSW6	W7	WSW6	WSW6	SW3	WSW7	W4	W4	SSW5	WSW6	WSW6	WSW10	WSW10	W7	SSE4	S6	S8	SSW1	SW2	NW3	WSW4.5	WSW10
5-Jul	NNW3	NW3	W3	W2	NNW3	W2	NW2	N10	N7	NNE3	N6	NE4	E1	NNE10	N13	N10	N12	NNW8	NW10	NNW10	NNW9	NNW7	NNW1	NNW6	NNW4.8	N13
6-Jul	NW7	N8	NNW6	NW3	NW7	NNW8	N13	N16	N16	NNE13	NNE14	NNE12	NNE11	NNE11	NE13	NE14	NNE13	NNE11	N8	WNW3	NNW6	NW7	NW4	NNW6	N8.5	N16
7-Jul	NW5	NW5	NNW7	NNW8	NNW7	NNW8	N12	N13	N11	NNE12	NNE14	NNE15	N16	NNE17	NNE15	N17	N15	N15	N12	N10	NNW9	NNW7	NNW4	N10.4	N17	
8-Jul	NNW5	NNW5	NW5	NW4	NW5	NNW6	N7	N7	N9	N10	N9	N10	N11	NE6	NE4	NNE9	N12	N10	N10	NNE10	NNE8	NNW6	NNW5	NNW7	N7.0	N12
9-Jul	NNW8	N9	N9	NNW7	NNW7	N7	N7	NNE10	N9	N8	N3	SW6	W3	N6	NNW4	NE5	ENE5	NE11	NNE9	NNE6	NNW3	NW5	NNW5	NW4	N5.2	NE11
10-Jul	NW5	NNW5	NNW5	NNW5	N5	NNW2	N4	N7	N7	NE4	NNE5	NE7	NE7	ESE9	ENE9	ENE8	NE8	NE5	WNW8	WSW10	W8	NNW7	NW7	NNW4	N3.4	WSW10
11-Jul	NW3	NW3	WNW2	WNW4	NW5	N5	N5	NNE6	NNE8	N11	NNE10	NW7	W7	NNW11	NW9	NNE12	NNE15	N16	N16	N14	N12	NNW7	NNW9	NNW9	N7.7	N16
12-Jul	NNW10	NNW7	NNW7	NW5	NNW4	NW5	N10	N12	N13	NNE14	NNE14	NNE17	NNE17	N18	N18	NNW15	N16	N20	N20	N14	NNW12	NNW12	NNW10	NNW8	N12.0	N20
13-Jul	NW6	NNW8	NW7	NNW5	NW7	NNW5	NNW9	N15	N16	N17	N19	NNE18	N20	N14	NNE16	NNE19	NE13	NNE11	N12	NNW9	NW4	NNW6	NW3	WSW2	N10.0	N20
14-Jul	WSW3	SW2	WSW2	SW2	S2	SW3	SE1	ESE1	W2	ESE3	ENE5	NE5	NE5	WNW11	NNW7	NNE11	NE5	NW4	NW5	WNW4	W4	WSW1	WSW1	SW2	NW1.4	NNE11
15-Jul	W2	S3	SW2	S2	S2	SSE6	SSE4	S5	SW5	W6	W2	NNW3	SSE5	M	NNW14	NNW12	NNW9	NW7	NW7	NNW9	WNW4	WNW4	WNW2	SSW3	WNW2.6	NNW14
16-Jul	WSW6	WSW4	WSW7	SSW5	S5	S3	SSE3	S4	WSW5	WNW4	W5	WNW6	WNW8	W4	S6	NW2	WNW5	NNW10	NNW7	NNW11	NNW12	NNW10	NNW11	NW6	WNW3.9	NNW12
17-Jul	NW8	NW8	NW8	NNW5	NW6	NW6	NNW6	NNW9	N9	NNE14	NNE14	NNE14	NNE12	NNE12	NNE13	NNE14	N14	N12	NNE10	NNE7	WNW2	WSW3	WSW3	SW2	N7.5	NNE14
18-Jul	SW3	W2	SSW3	SSW2	SW3	SSW2	S3	SSE6	SE7	SSE8	S11	S12	SSW10	SSW13	SSW10	SSW10	SW8	SSW10	SSW9	SSW9	SSW7	SSW8	SW8	SSW9	SSW6.6	SSW13
19-Jul	SW8	SW7	SW2	S2	W2	S5	S9	SSW9	SSW11	SSW10	SW11	SW12	SW13	SW12	W10	W10	WNW9	NNW8	S6	SW5	WNW5	NW2	NW3	NNW3	SW5.4	SW13
20-Jul	NW2	NNW4	WNW2	NNW6	NW5	NNW5	NNW7	NNW6	NNW7	NNW6	NNE7	NNE7	N5	NNW6	NNW6	NNW8	N6	NNW5	WNW3	SW3	SSW2	SSW2	SW7	SW5	NNW3.6	NNW8
21-Jul	NNW1	WSW4	SW5	SSE2	SSE2	SSE3	S4	SW5	WSW4	SW4	SW6	W10	WNW9	WSW11	NW12	N25	N23	N19	NNE15	N14	N12	N5	WSW3	SW3	NNW4.1	N25
22-Jul	SSW3	SW3	WSW2	WSW2	WNW2	WNW1	SSE3	SSE14	SSE13	SSE15	SSE18	SSE20	S17	SSW8	SSW6	W4	NNW6	SW5	W7	NNW10	NW6	NW3	SW2	WSW4	S4.2	SSE20
23-Jul	WSW7	WSW7	W9	W9	NNW7	SSE0	NW4	N3	NNE4	ENE4	NNE3	NW4	NE7	NE7	SW6	SW2	WNW6	SSW3	SSW7	SW6	SSW4	SW4	SW4	SSE4	W2.2	W9
24-Jul	S2	S3	S5	S7	S7	SSW9	SSW13	SSW10	WSW12	SW13	SW14	WSW13	SW15	SW15	SW13	SW12	NNW17	W10	W6	WSW7	WSW8	W7	WSW7	SW4	SW8.2	NW17
25-Jul	WSW5	NNW3	W2	WSW3	WSW3	W5	W9	W7	NW8	N9	NNW7	NW8	NNE7	NE9	NE8	NNE10	NNE10	NE8	NNE9	NNE7	NNW4	NNW5	NW3	NNW3	NNW4.0	NNE10
26-Jul	NW3	NW3	NNW3	WNW2	W2	SW2	SE2	SSE10	S11	SSW9	SSW9	S10	SSW9	SW2	SW9	SSW9	SSW9	SSW8	SSW7	SSE8	SSW3	SSW4	SSW5	SSW4	SSW4.9	S11
27-Jul	WSW3	SW3	SW3	S4	SSW5	S3	SSE3	ESE1	NE2	NNE4	NE6	ENE7	NNE14	NNE13	NNE12	NNE14	NNE12	NNE7	NNE8	NNE8	N5	NW2	W2	NW3	NNE3.7	NNE14
28-Jul	NW3	NW2	W1	SSW2	WNW2	SSW3	SSW3	WSW3	WNW2	SE6	SSE5	SE6	SSE5	ESE7	NE7	NE6	NE8	NE6	N1	WNW2	WSW8	SW2	SW6	WSW7	S0.6	NNE8
29-Jul	SSW6	S5	WNW2	S2	SSW4	SSE3	SSW6	SSW8	S9	S9	SSW8	SSW9	S12	SSW11	SSW11	SSW12	SSW9	NNW5	N7	NW1	S3	SSW2	SSW3	NNW3	SSW4.9	S12
30-Jul	N5	W2	SSW3	NNW2	SSW3	SSW2	S2	WNW3	W4	NNE6	ENE7	E6	ESE8	SW2	NNW11	SSE6	NE6	NE7	ESE4	N6	NNW9	NNW8	NNW3	W2	N1.6	NNW11
31-Jul	WNW3	SW2	WNW4	WSW2	WNW3	NNW7	NNE1	WNW4	NW4	WNW5	SSW4	W6	WSW9	W9	WSW9	WSW5	NNE7	SSW2	WSW8	WSW8	W10	W9	W9	W6	W4.7	W10

WNW2.9	NNW2.4	NNW2.6	W1.9	NNW2.4	NNW1.6	NW0.8	NNW0.9	N1.2	NE1.3	E0.9	ENE0.1	N0.5	NNW1.3	NNW2.5	N3.6	N5.2	N4.5	N3.4	NNW3.1	NW3.5	NW3.3	NNW2.8	NNW2.6		Diurnal Average
NNW10	N9	N9	W9	NNW7	SSW9	N13	N16	N16	SE20	SSE21	SSE20	N20	S18	N18	N25	N23	N20	N20	N14	NNW12	NNW12	NNW11	NNW9		Diurnal Maximum

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



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

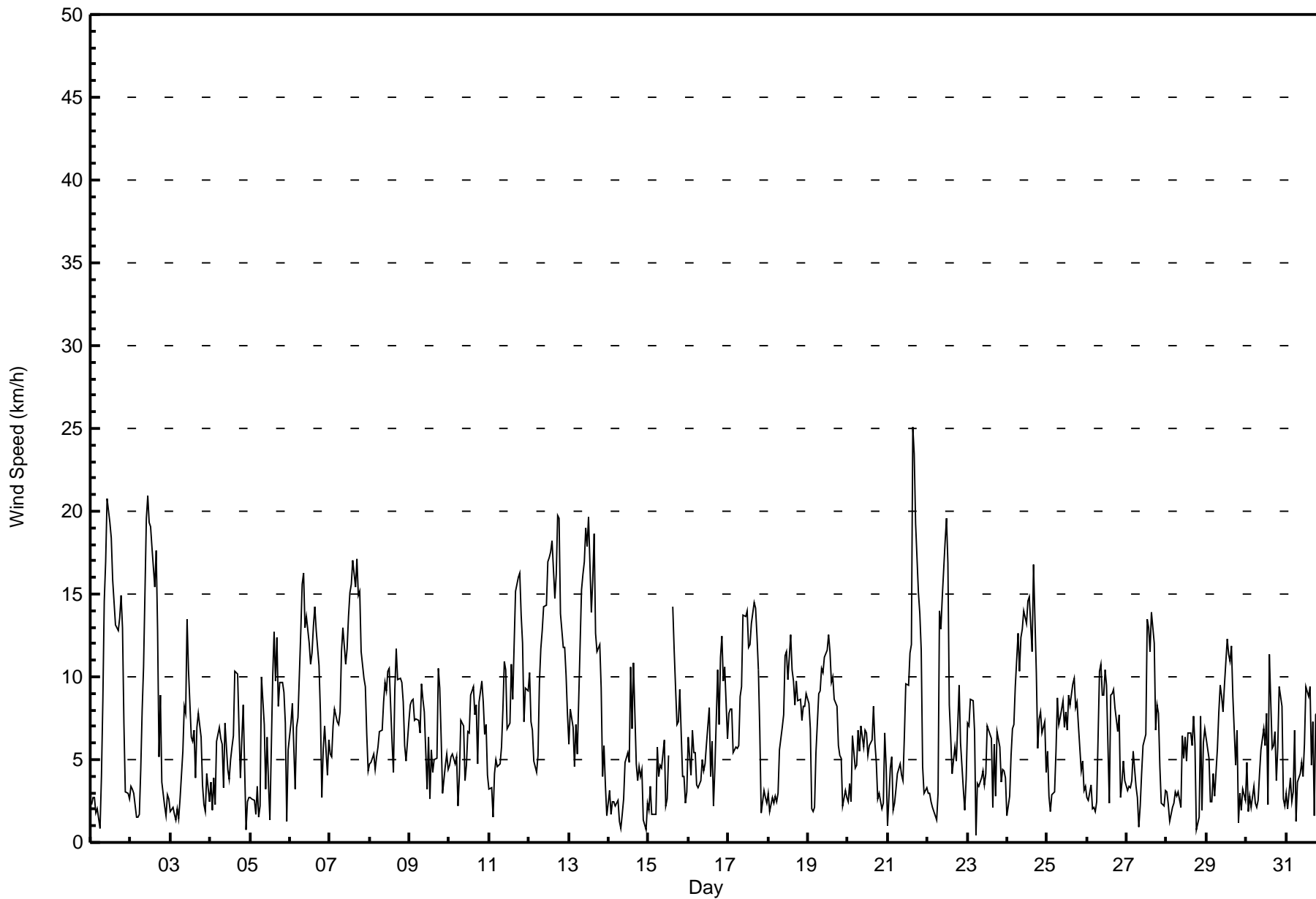
Wind Speed (WS) - km/h
Fort McKay South - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 7 km/h on Jul 21 16:00 Minimum Value: 1 km/h on Jul 2 02:00 Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 3 P ₉₀ = 4 P ₉₉ = 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-Jul	1	2	1	1	1	1	2	2	4	4	4	4	5	5	4	4	4	4	3	3	2	1	1	1	5		
2-Jul	1	1	1	1	1	1	2	4	4	5	6	5	4	4	4	5	7	3	2	2	2	1	1	1	7		
3-Jul	1	1	1	1	1	1	1	3	2	3	6	5	2	3	2	2	2	2	2	1	1	1	2	1	6		
4-Jul	1	1	1	1	1	2	2	2	2	2	2	2	1	3	3	4	3	4	2	1	2	1	2	1	4		
5-Jul	2	1	1	1	1	1	1	3	2	3	2	2	2	3	3	3	4	5	3	3	3	2	2	2	5		
6-Jul	2	2	2	1	2	2	3	3	3	3	4	3	4	4	4	4	3	3	3	1	2	2	2	2	4		
7-Jul	2	1	2	2	2	2	3	3	3	3	3	4	3	4	5	4	4	4	4	3	2	2	2	1	5		
8-Jul	1	1	1	1	1	1	2	2	2	2	3	3	3	3	2	3	3	2	2	2	2	2	1	2	3		
9-Jul	1	2	2	1	2	1	2	2	2	2	2	2	2	2	2	2	1	2	2	2	1	1	1	1	2		
10-Jul	1	1	2	1	1	1	2	1	2	2	2	2	3	2	3	3	3	2	3	3	3	2	2	2	3		
11-Jul	1	1	1	2	1	1	1	1	2	2	3	3	3	5	2	3	4	4	4	3	3	2	2	2	5		
12-Jul	3	4	2	2	2	1	3	3	3	3	4	4	4	4	5	4	4	5	6	3	2	3	2	2	6		
13-Jul	1	2	2	2	2	3	2	4	3	4	4	5	6	6	5	5	4	3	3	3	1	2	1	1	6		
14-Jul	1	1	1	1	1	1	1	1	1	2	2	2	3	4	3	5	3	1	1	1	1	1	1	1	5		
15-Jul	1	2	1	1	1	1	2	2	2	2	3	3	3	M	4	5	3	3	2	4	1	1	2	1	5		
16-Jul	2	2	2	2	2	1	1	1	2	2	2	2	6	4	2	1	3	6	3	3	3	3	2	1	6		
17-Jul	2	2	2	2	1	1	1	3	3	4	4	3	4	4	4	3	3	3	3	2	1	1	1	1	4		
18-Jul	2	1	1	1	1	1	1	1	1	2	3	3	4	4	4	4	3	3	3	2	2	2	2	2	4		
19-Jul	2	2	1	2	1	2	3	3	3	3	4	4	4	5	5	4	4	4	3	2	2	1	1	2	5		
20-Jul	2	1	2	1	1	2	1	2	2	2	2	2	2	1	2	2	2	2	1	1	1	1	2	2	2		
21-Jul	1	2	2	2	1	1	2	2	2	2	3	4	4	4	6	7	6	5	3	4	4	2	1	1	7		
22-Jul	1	1	1	1	1	1	4	3	2	3	3	4	5	3	2	2	2	2	4	5	2	2	1	1	5		
23-Jul	1	2	3	2	3	1	1	1	2	2	2	3	3	2	3	2	3	2	2	2	1	1	1	1	3		
24-Jul	1	1	1	2	1	3	3	3	4	4	5	5	5	4	5	5	7	5	4	3	2	2	2	3	7		
25-Jul	2	1	1	1	1	1	2	3	3	3	4	3	3	3	3	3	4	2	2	2	1	1	1	1	4		
26-Jul	1	1	1	1	1	1	2	3	3	3	3	3	4	2	3	4	4	3	2	2	1	1	1	1	4		
27-Jul	1	1	1	1	2	1	1	1	2	1	1	2	3	3	3	3	3	3	3	2	2	1	1	1	3		
28-Jul	1	1	1	1	2	2	1	1	1	2	2	3	3	3	2	3	3	2	1	1	4	1	1	2	4		
29-Jul	2	2	2	1	1	1	2	2	3	3	3	4	5	5	5	4	3	2	1	2	1	1	1	3	5		
30-Jul	2	1	2	2	1	1	3	1	2	2	2	3	3	3	7	5	3	2	2	5	2	2	2	1	7		
31-Jul	1	2	1	1	2	3	1	1	2	2	2	2	3	3	3	3	4	1	3	2	3	2	3	2	4		
																	Diurnal Maximum										
M - Maintenance																											



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed (WS) - km/h
Fort McKay South - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Fort McKay South - July 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	316	42.53	42.53
6 - 11	303	40.78	83.31
12 - 19	115	15.48	98.79
20 - 28	9	1.21	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
Fort McKay South - July 2016**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	11	6	9	3	3	4	8	14	27	34	42	26	26	30	41	32	316
6 - 11	33	32	14	5	3	4	10	7	14	33	11	23	22	14	22	56	303
12 - 19	34	31	3	0	0	0	4	16	5	3	9	2	0	0	2	6	115
20 - 28	5	0	0	0	0	0	1	3	0	0	0	0	0	0	0	0	9
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	83	69	26	8	6	8	23	40	46	70	62	51	48	44	65	94	743

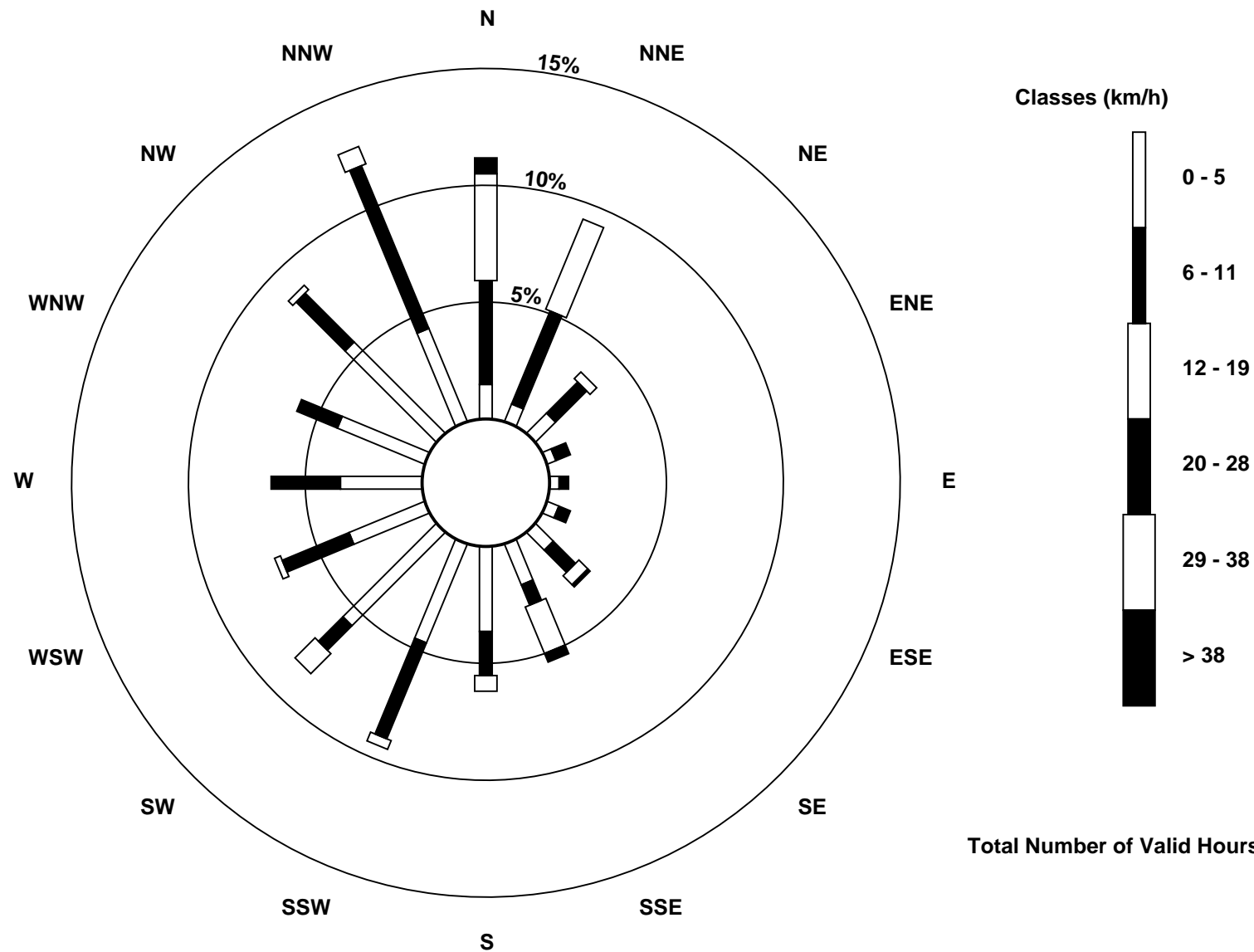
Total Number of Valid Hours: 743

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

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 - July 2016

Direction of Maximum Speed: 359 deg on Jul 21 16:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 354.7 deg on Jul 12	Hours of Data: 743
Direction of Minimum Speed: 165 deg on Jul 23 06:00	Hours of Missing Data: 1
Direction of Minimum Daily Speed Average: 0.6 deg on Jul 28	Percent Operational Time: 99.9
Monthly Average Direction: 284.0 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-Jul	190	239	234	238	246	313	132	142	144	150	158	157	149	154	156	141	141	145	148	153	185	190	201	219	155.5
2-Jul	204	207	190	200	261	225	135	143	151	146	157	165	164	171	188	169	151	143	136	143	145	190	216	231	163.6
3-Jul	228	232	212	293	283	326	130	120	136	136	154	185	8	70	98	88	97	134	128	100	218	181	179	274	136.1
4-Jul	253	271	230	207	248	261	257	250	218	242	266	262	211	258	240	241	237	260	183	182	205	233	320	237.8	
5-Jul	335	313	267	278	319	278	305	9	353	12	5	48	89	13	11	11	3	343	159	301	294	293	282	289	340.8
6-Jul	318	360	336	315	308	342	359	355	9	15	21	20	20	29	43	38	33	24	10	298	339	318	319	331	5.9
7-Jul	326	322	334	340	330	316	348	352	3	3	13	15	12	7	18	18	8	6	10	359	349	346	330	329	358.8
8-Jul	327	327	322	322	324	333	351	2	6	9	10	10	3	34	38	32	8	9	10	20	12	348	339	343	1.4
9-Jul	341	352	352	341	338	353	7	16	5	4	351	217	261	10	333	54	72	43	32	30	342	324	328	323	0.3
10-Jul	324	331	336	332	355	334	356	6	11	46	23	34	53	123	75	70	52	38	296	256	276	297	322	336	0.2
11-Jul	308	311	301	300	319	356	3	32	26	10	12	326	273	337	312	15	13	352	6	352	352	339	335	334	349.9
12-Jul	333	336	335	318	332	321	356	7	5	13	13	13	14	356	4	333	356	2	353	351	345	340	342	344	354.7
13-Jul	318	333	325	327	308	333	341	360	10	7	11	15	8	8	22	12	41	15	1	348	311	332	318	252	0.5
14-Jul	255	219	238	225	188	231	138	108	264	114	57	56	36	299	284	19	49	314	313	296	281	250	239	223	316.4
15-Jul	272	180	219	188	178	164	161	181	217	270	269	348	161	M	332	328	309	311	305	339	295	297	282	204	288.6
16-Jul	250	241	247	202	187	183	162	187	253	300	274	291	299	261	190	316	298	337	331	336	336	329	336	312	293.0
17-Jul	320	324	324	327	312	326	340	339	7	20	19	26	23	22	19	23	10	8	14	26	290	246	241	223	2.0
18-Jul	229	268	206	207	215	200	175	157	131	152	172	175	196	193	209	202	217	211	209	206	206	210	214	210	195.9
19-Jul	215	219	225	182	262	180	181	197	199	200	214	233	220	228	260	273	286	337	172	233	294	326	304	329	229.5
20-Jul	309	327	299	332	323	334	347	348	345	341	20	30	3	339	340	345	354	332	302	218	212	202	219	229	334.2
21-Jul	342	245	232	165	151	153	174	219	237	227	231	274	295	244	317	359	8	8	19	8	7	355	239	216	332.2
22-Jul	201	234	253	252	285	297	149	166	151	148	161	164	178	195	201	259	329	215	264	345	315	317	225	242	188.9
23-Jul	246	251	263	272	294	165	316	3	18	65	18	324	34	40	220	221	292	204	204	230	203	222	216	167	264.3
24-Jul	175	178	179	185	182	200	204	210	239	229	230	237	234	230	234	234	305	274	267	253	256	269	255	227	234.3
25-Jul	258	333	269	256	250	260	259	277	316	350	327	312	12	42	43	24	23	49	27	27	348	335	313	327	345.2
26-Jul	320	317	341	293	279	233	134	161	169	193	194	189	195	221	214	193	205	202	193	165	204	213	205	200	196.1
27-Jul	253	230	219	189	194	181	154	116	41	29	35	57	17	14	14	13	12	13	14	19	357	321	280	309	13.1
28-Jul	325	312	280	202	290	202	206	243	288	138	147	138	150	113	43	52	34	36	4	282	249	217	227	237	172.7
29-Jul	208	183	282	180	196	154	198	201	187	184	207	207	184	193	193	194	213	343	359	317	189	202	201	327	199.3
30-Jul	359	260	207	328	201	208	171	287	278	18	73	85	112	219	332	147	36	51	108	350	346	333	340	260	10.4
31-Jul	299	230	286	238	287	336	18	292	307	301	210	273	254	274	258	258	17	212	256	250	263	269	271	274	273.5

288.4 291.5 285.7 281.2 282.9 284.0 306.9 343.7 5.0 47.9 84.1 69.9 8.9 341.0 338.2 7.3 5.6 2.0 354.9 333.8 306.9 303.8 281.3 282.2
 Diurnal Average

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



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

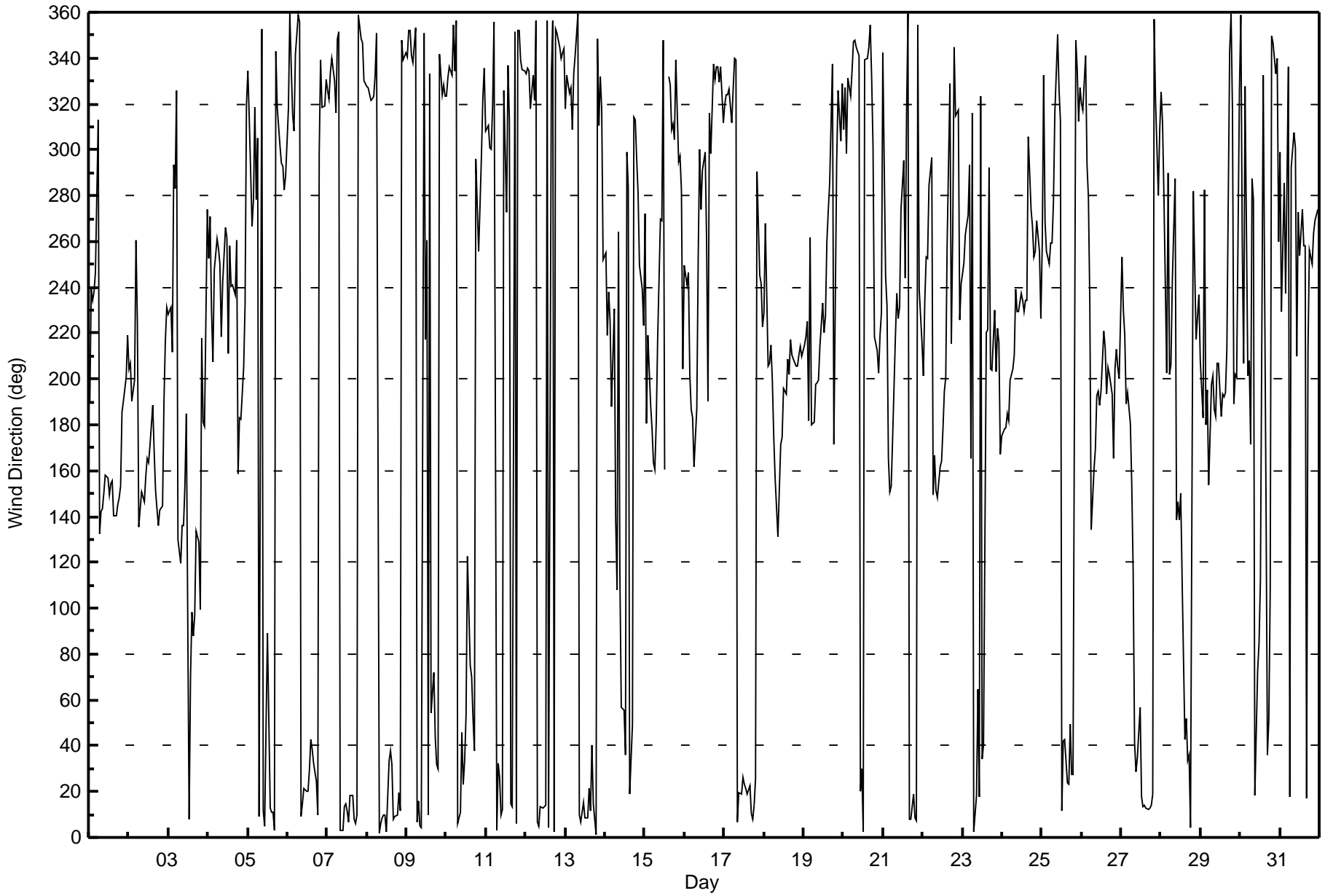
Wind Direction (WD) - deg
Fort McKay South - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 99 deg on Jul 23 06:00 Minimum Value: 7 deg on Jul 24 04:00 Percentiles: P ₁ = 12 P ₁₀ = 16 Q ₁ = 19 Median = 27 Q ₃ = 40 P ₉₀ = 61 P ₉₉ = 92																			Hours in Service: 744 Hours of Data: 743 Hours of Missing Data: 1 Hours of Calibration: 0 Percent Operational Time: 99.9						
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Jul	36	33	45	42	19	51	26	18	17	17	17	22	21	24	31	28	20	17	14	15	10	28	21	19	51
2-Jul	15	15	20	59	21	54	31	27	24	16	16	20	16	17	23	16	19	37	21	53	55	41	21	18	59
3-Jul	24	18	46	33	28	53	64	37	31	37	26	28	48	50	26	39	26	22	26	23	28	37	45	68	68
4-Jul	39	65	30	38	16	20	21	20	32	27	43	60	27	55	28	30	24	41	50	16	16	90	41	43	90
5-Jul	47	33	26	36	20	68	63	17	25	88	21	59	91	26	20	28	20	28	18	21	21	22	87	29	91
6-Jul	18	16	21	40	17	17	16	16	19	20	26	24	26	26	25	27	19	35	39	26	18	37	19	40	40
7-Jul	18	16	14	13	18	18	18	18	18	28	19	19	17	21	19	20	16	17	15	16	16	15	19	22	28
8-Jul	23	17	15	22	19	18	21	25	22	19	31	30	26	57	69	32	21	21	15	19	16	18	12	12	69
9-Jul	11	14	14	10	14	14	15	21	17	27	69	44	82	66	50	44	33	23	19	17	38	13	13	13	82
10-Jul	15	12	10	13	14	39	22	18	23	51	62	40	46	32	33	31	35	61	29	20	24	25	24	40	62
11-Jul	39	23	84	16	18	26	30	22	24	23	25	54	34	34	27	26	19	20	17	17	17	17	11	12	84
12-Jul	14	26	17	19	30	15	18	20	23	26	25	20	22	23	23	22	20	17	17	16	15	14	14	15	30
13-Jul	13	14	15	43	17	28	21	18	17	21	18	16	20	16	23	24	28	17	18	15	17	21	16	55	55
14-Jul	27	65	47	25	38	24	48	79	71	79	55	58	65	38	58	38	44	52	24	16	13	79	82	44	82
15-Jul	26	29	44	69	79	13	39	41	60	45	98	96	81	M	19	35	30	32	26	23	27	27	82	36	98
16-Jul	26	69	18	31	19	39	43	54	48	48	39	45	52	87	23	86	42	24	29	15	14	15	14	16	87
17-Jul	16	15	14	24	18	15	21	21	30	21	24	22	39	27	26	20	19	19	20	23	46	21	16	19	46
18-Jul	26	37	31	22	30	39	52	22	16	28	23	30	42	31	35	40	35	25	21	16	12	12	16	14	52
19-Jul	16	17	67	88	43	31	17	25	24	31	28	41	31	38	55	35	35	48	42	24	56	57	29	29	88
20-Jul	28	20	66	14	18	18	16	20	21	22	19	28	35	22	25	28	40	39	53	28	45	35	17	35	66
21-Jul	90	25	41	88	50	37	74	36	40	38	49	39	36	28	47	24	16	16	16	18	17	25	38	21	90
22-Jul	18	27	44	23	28	61	95	14	17	14	12	16	20	19	20	47	22	41	44	20	19	62	51	27	95
23-Jul	12	15	19	21	33	99	40	63	69	60	70	72	53	42	39	79	47	63	22	22	29	21	35	24	99
24-Jul	47	33	16	7	11	14	18	25	29	29	27	32	30	29	31	31	32	34	48	28	22	27	27	81	81
25-Jul	49	50	50	29	51	16	21	30	30	31	51	41	67	26	33	26	29	28	19	18	14	14	13	18	67
26-Jul	14	28	17	27	34	56	75	18	25	29	34	34	36	76	41	34	32	27	20	16	20	17	12	32	76
27-Jul	12	31	23	19	13	19	41	87	84	38	26	35	23	19	16	19	20	28	22	15	16	18	47	12	87
28-Jul	24	37	60	36	61	72	42	44	81	21	42	48	82	49	37	62	54	29	93	58	30	70	28	20	93
29-Jul	20	29	90	67	19	35	26	24	27	29	40	43	38	34	41	31	30	60	18	77	31	62	27	87	90
30-Jul	33	54	56	73	49	67	97	41	40	36	37	50	47	97	60	79	39	46	39	40	14	13	61	61	97
31-Jul	36	60	19	40	58	58	93	32	28	27	36	36	21	27	21	56	36	61	19	16	22	22	23	30	93
90 69 90 88 79 99 97 87 84 88 98 96 91 97 69 86 54 63 93 77 56 90 87 87																									
Diurnal Maximum																									
M - Maintenance																									



Wood Buffalo Environmental Association
Hourly Averages

Wind Direction (WD) - deg
Fort McKay South - July 2016





Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	July 26, 2016	Last Calibration	June 7, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Reason:	Routine		
Start Time (MST)	9:14	End Time (MST)	13:56
Gas Cert Reference	LL110515	Station temp.	22 Deg C
Cal Gas Concentration	49.8 ppm	Cal Gas Exp Date	9/8/2018
Calibrator Make/Model	Sabio 4010	Serial Number	11041107
ZAG Make/Model	API 701	Serial Number	5613
DACS make/model	Campbell Scientific CR3000	DACS serial No.	11038

Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 1000 ppb		HVPS voltage	548	548
Analyzer IP address	192.168.1.44		Lamp voltage	1454	1453
Calculated slope	0.990534	0.996384	Box temp	29.7	29.5
Calculated intercept	-0.020861	-0.237090	Pressure	26.1	26.2
Analyzer Background	41.9	41.9	Flow	688	691
Analyzer Coefficient	0.986	0.973	Lamp Ratio	49	49

Analyzer make API T100 Analyzer serial # 599

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.1	----
as found span	5000	78.9	785.8	800.0	0.982
calibrator zero	5000	0.0	0.0	0.1	----
high point	5000	78.9	785.8	788.8	0.996
second point	5000	39.4	392.4	394.4	0.995
third point	5000	19.7	196.2	197.2	0.995
as left zero	5000	0.0	0.0	0.2	----
as left span	5000	78.9	785.8	785.2	1.001
Average Correction Factor					0.996

Corrected As found 799.9 Previous response 793.4 % change -0.8%

Notes:

Span adjustment performed, no other maintenance.

Calibration Performed By: Jayme Rycroft



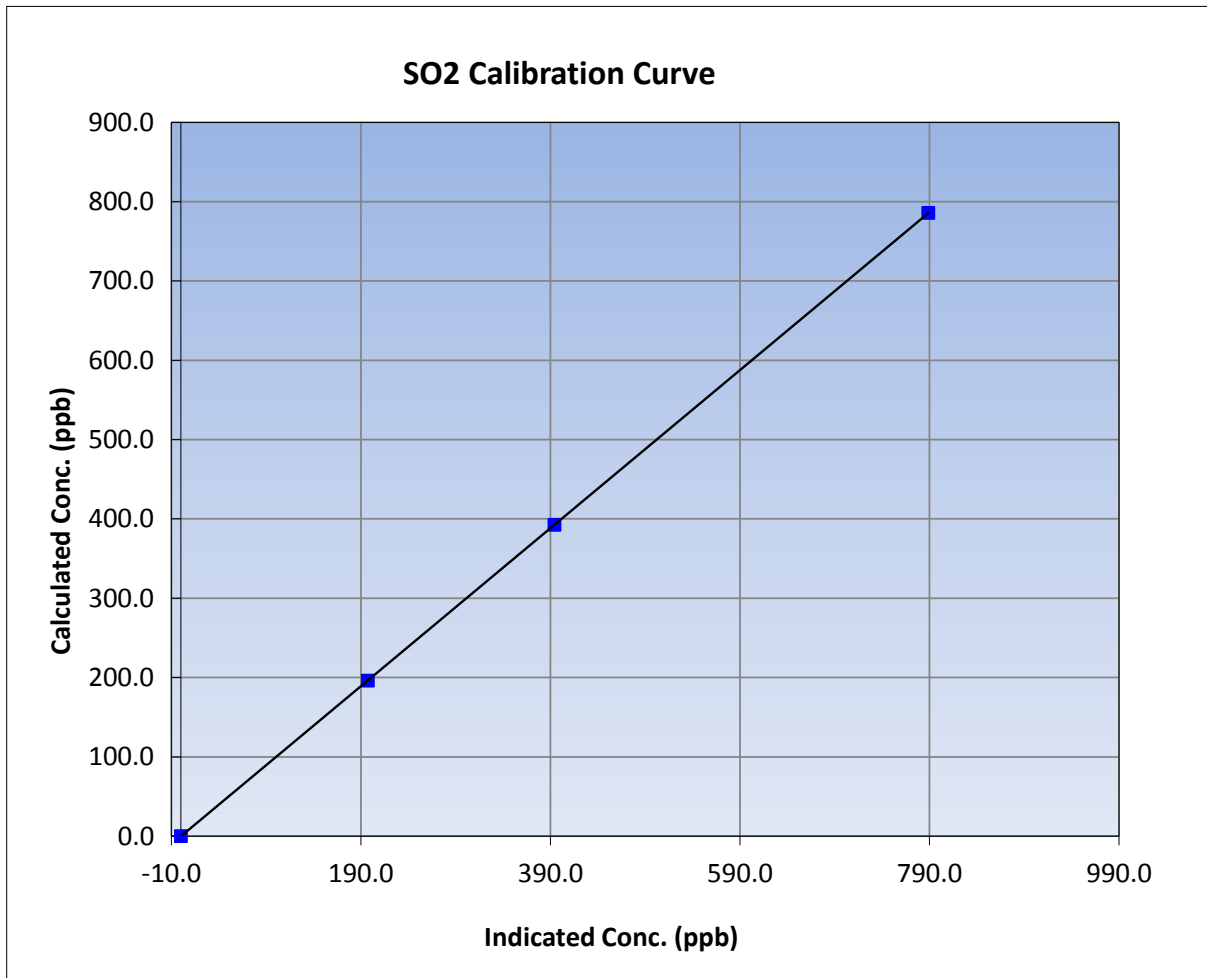
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	July 26, 2016	Previous Calibration	June 7, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	9:14	End Time (MST)	13:56
Analyzer make	API T100	Analyzer serial #	599

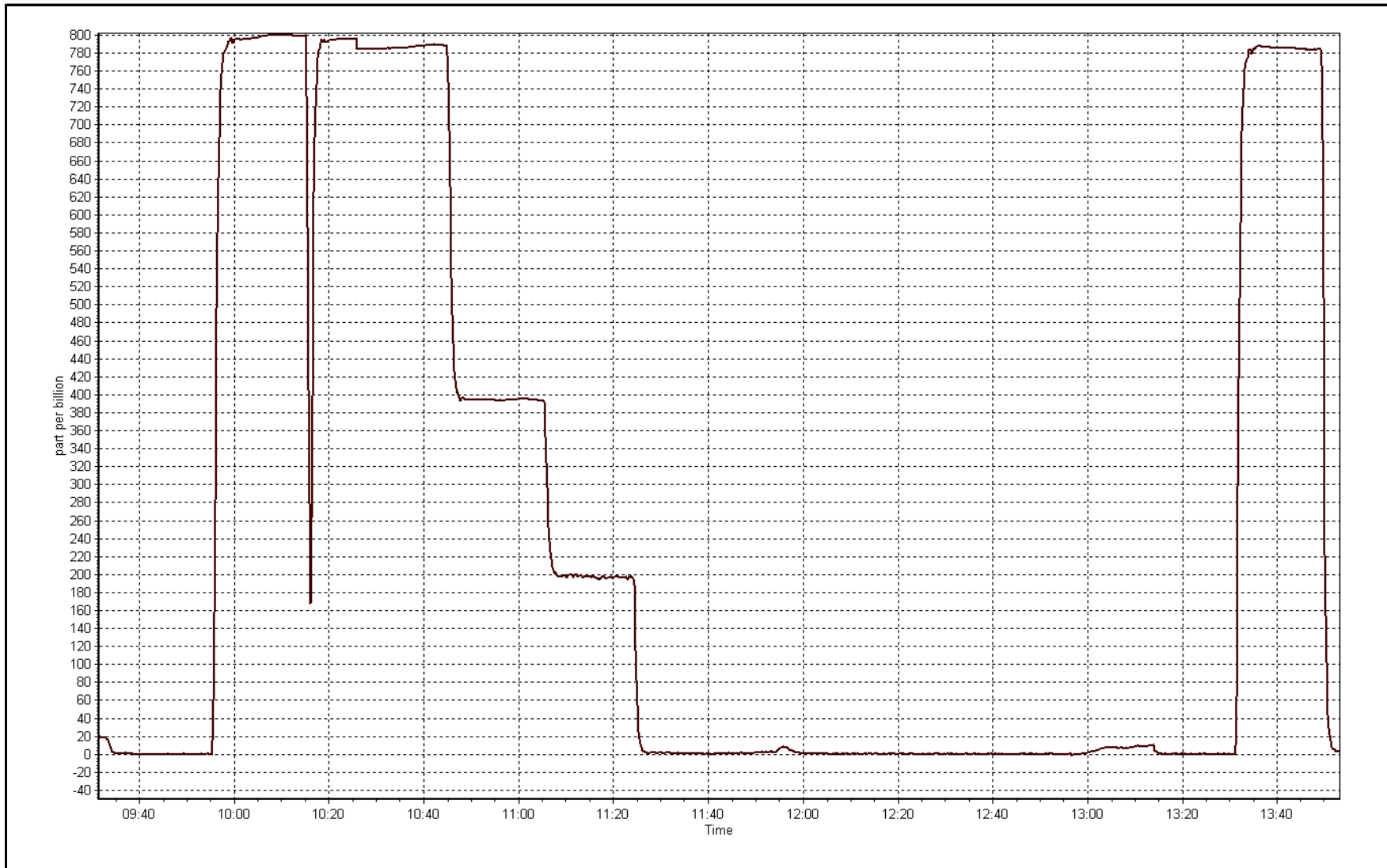
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	1.000000
785.8	788.8	0.9963		
392.4	394.4	0.9951	Slope	0.996384
196.2	197.2	0.9951		
			Intercept	-0.237090



SO2 Calibration Plot

Date: July 26, 2016





Wood Buffalo Environmental Association

TRS Calibration Report

Station Information

Calibration Date	July 14, 2016	Last Calibration	June 9, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Reason:	Routine		
Start Time (MST)	8:45	End Time (MST)	11:31
Gas Cert Reference	CC178364	Station temp.	22 Deg C
Cal Gas Concentration	5.07 ppm	Cal Gas Exp Date	09/09/2017
Calibrator Make/Model	Sabio 4010	Serial Number	11041107
Dil air Make/Model	API 701	Serial Number	5613
DACS make/model	Campbell Scientific CR3000	DACS serial No.	1850
SO2 gas concentration	49.8 ppm	SO2 gas cert/exp	LL110515 8/Sep/18

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-727	-727
Analyzer IP address	192.168.1.44		Lamp voltage	1005	1005
Calculated slope	0.993965	0.999210	Chamber temp	45	45
Calculated intercept	0.219069	0.160540	Pressure	695.9	695.9
Analyzer Background	2.13	2.13	Flow	0.452	0.452
Analyzer Coefficient	1.038	1.016	Intensity	90	90
			Converter temp.	800	800
Analyzer make/model	Thermo 43i-TLE		Analyzer serial #	1218153359	
Converter make/model	CDN-101		Converter serial #	456	

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.2	----
as found span	5000	78.9	80.0	81.7	0.979
SO2 scrubber check	5000	17.6	175.3	0.1	----
calibrator zero	5000	0.0	0.0	-0.2	----
high point	5000	78.9	80.0	79.8	1.003
second point	5000	39.4	40.0	40.1	0.996
third point	5000	19.7	20.0	19.7	1.014
as left zero	5000	0.0	0.0	-0.1	----
as left span	5000	78.9	80.0	79.6	1.005
Average Correction Factor					1.004

Corrected As found	81.9	Previous response	80.3	% change	-2.0%
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Notes:

filter changed out. Span adjusted

Calibration Performed By:

Melissa Lemay



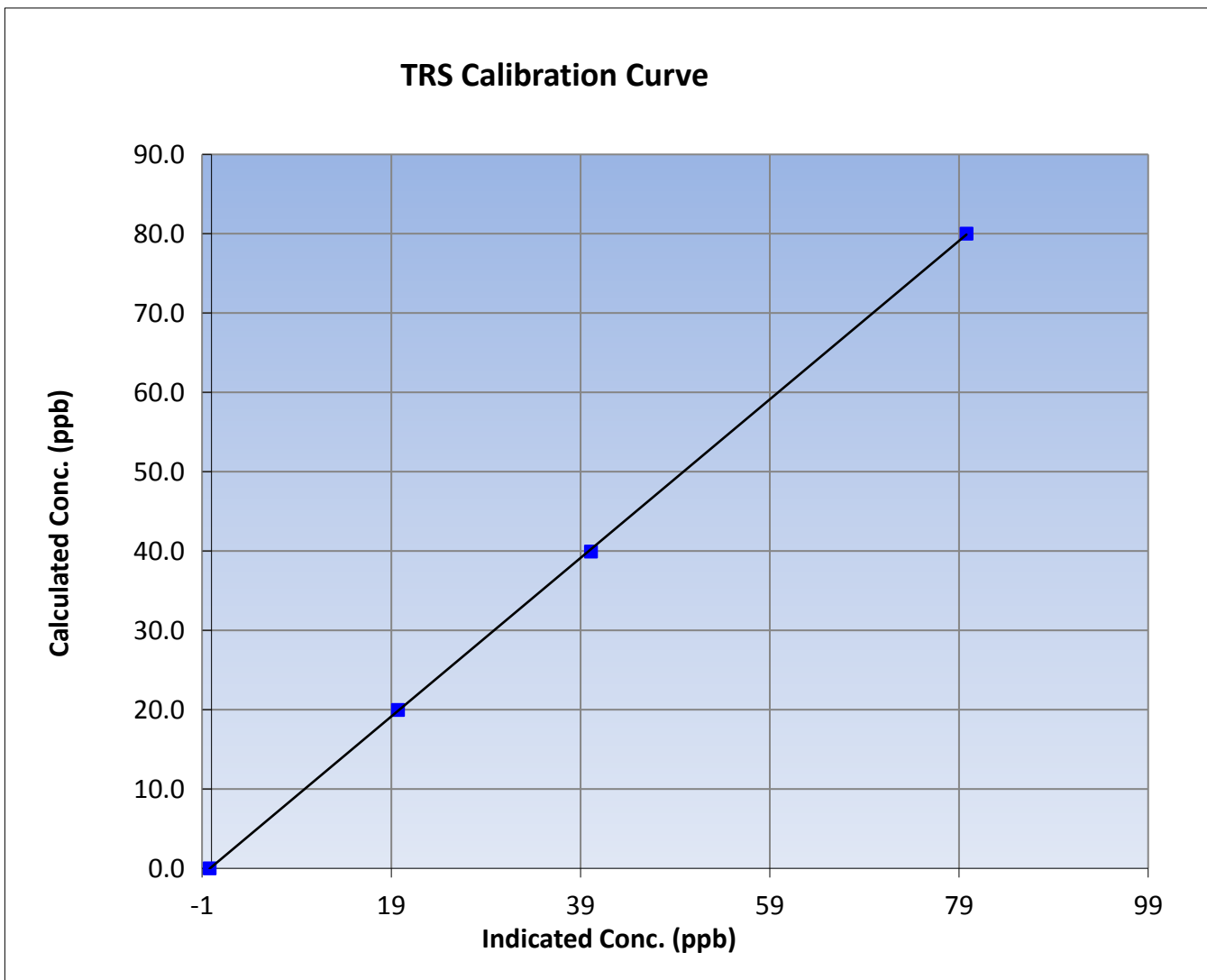
Wood Buffalo Environmental Association TRS Calibration Report

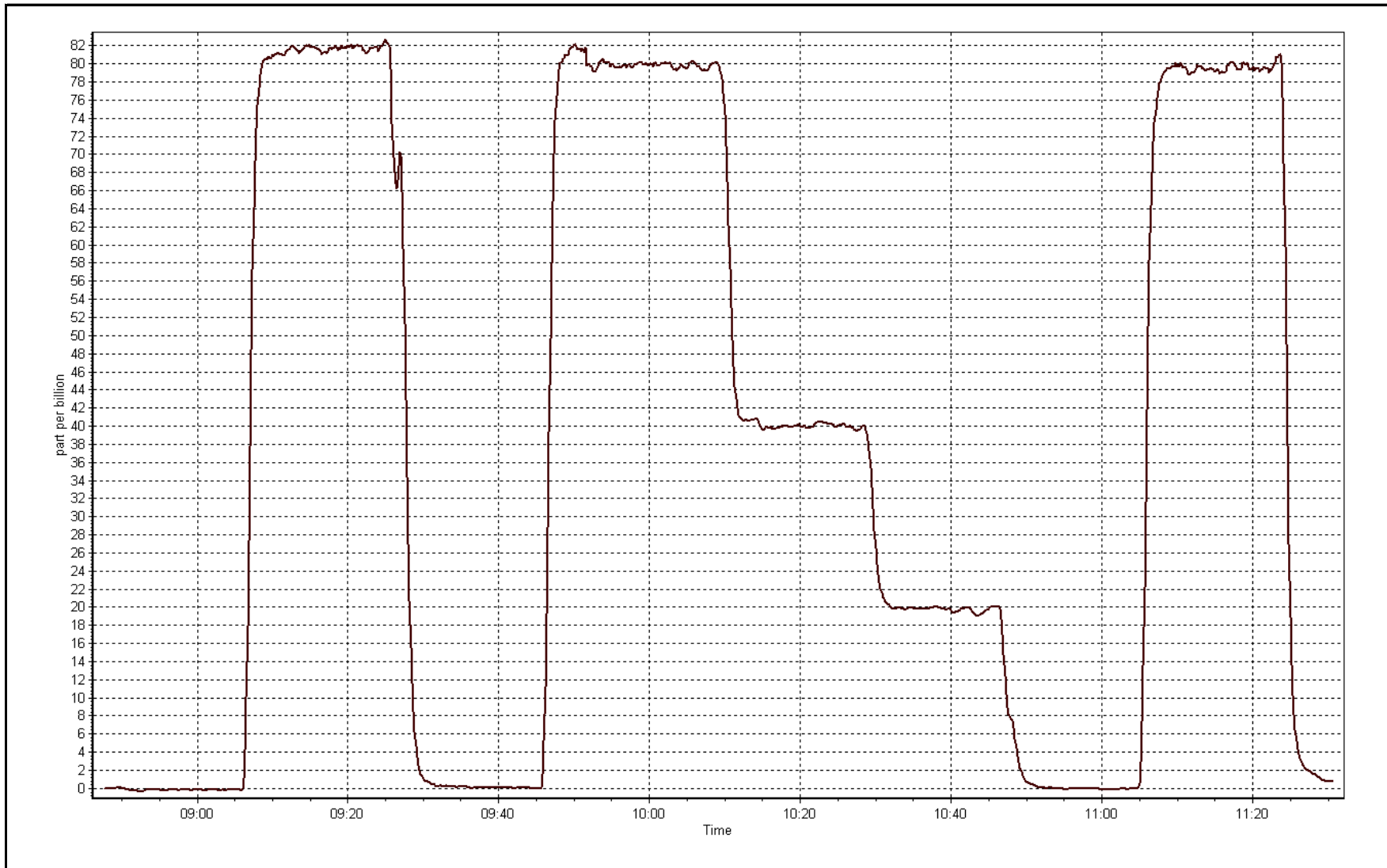
Station Information

Calibration Date	July 14, 2016	Previous Calibration	June 9, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	8:45	End Time (MST)	11:31
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1218153359

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	----	Correlation Coefficient	0.999969
80.0	79.8	1.0026		
40.0	40.1	0.9963	Slope	0.999210
20.0	19.7	1.0140		
			Intercept	0.160540







Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	Tuesday, July 26, 2016	Last Calibration	Tuesday, June 07, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Reason:	Routine		
Start Time (MST)	9:14	End Time (MST)	13:56
Gas Cert Reference	LL110515	Cal Gas Expiry Date	9/8/2018
CH4 Cal Gas Conc.	517 ppm	CH4 Equiv Conc.	1067.0 ppm
C3H8 Cal Gas Conc.	200 ppm	Station temp.	22 Deg C
Calibrator Make/Model	Sabio 4010	Serial Number	11041107
ZAG make/model	Teledyne API 701	Serial Number	5613
DACS make/model	Campbell Scientific CR3000	Serial Number	11038

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 50 ppm		Sample Pressure	9.2	9.2
Analyzer IP address	192.168.1.51		Air or Bypass Press	34.2	34.3
Calculated slope	1.000155	1.007615	Fuel Pressure	23.1	23.1
Calculated intercept	-0.026678	-0.099387	Analyzer Coeff	3.162	3.056
			Analyzer BKG	1.480	1.320

Analyzer make 51i-LT Analyzer serial # 1505164380

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	0.07	----
as found span	5000	78.9	16.84	17.41	0.967
calibrator zero	5000	0.0	0.00	0.07	----
high point	5000	78.9	16.84	16.80	1.002
second point	5000	39.4	8.41	8.44	0.996
third point	5000	19.6	4.18	4.29	0.975
as left zero	5000	0.0	0.00	0.08	----
as left span	5000	78.9	16.84	16.97	0.992
Average Correction Factor					0.991

Corrected As found 17.34 Previous response 16.86 % change -2.8%

Notes:

Span adjustment performed, no other maintenance.

Calibration Performed By:

Jayme Rycroft



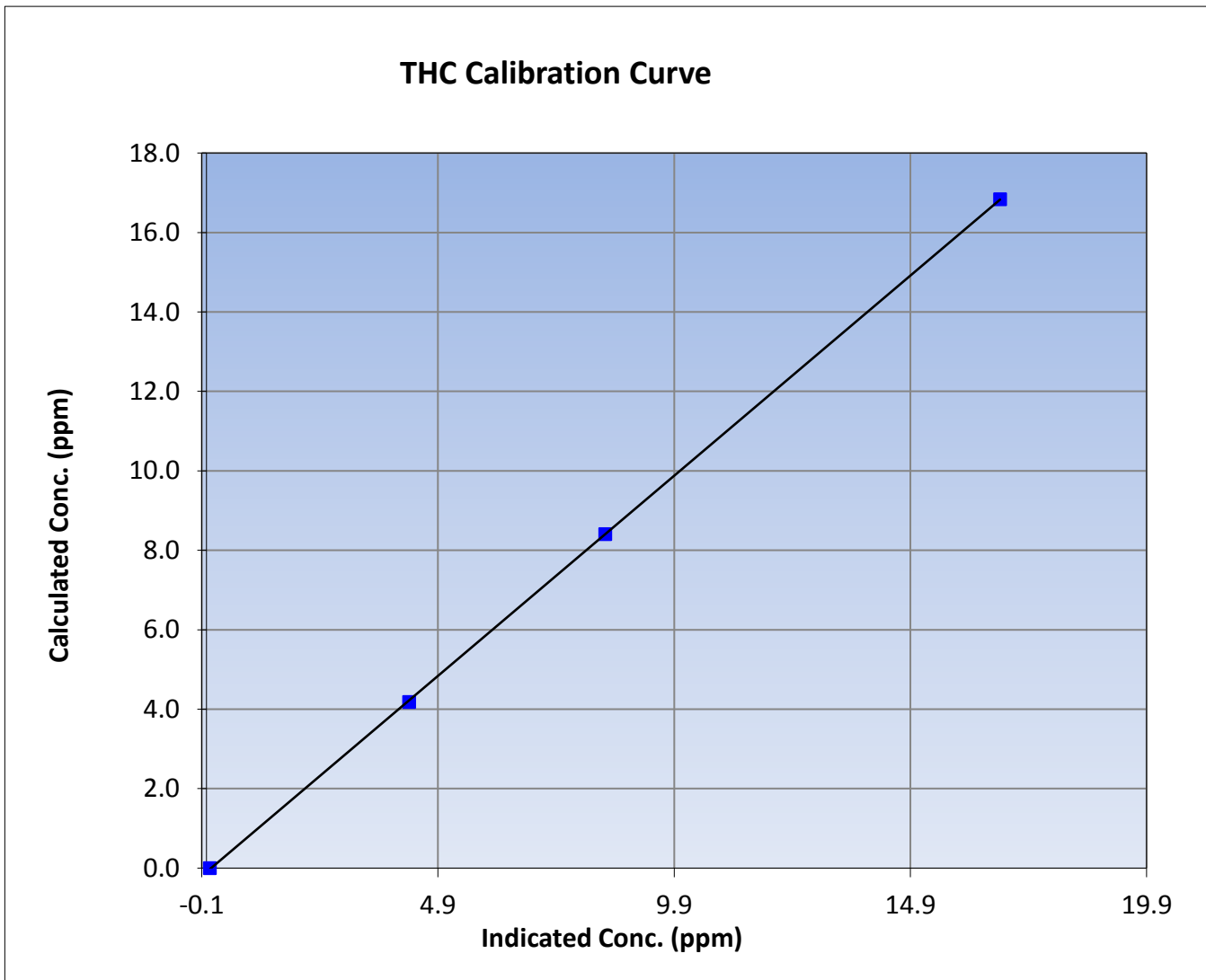
Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	July 26, 2016	Previous Calibration	June 7, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	9:14	End Time (MST)	13:56
Analyzer make	51i-LT	Analyzer serial #	1505164380

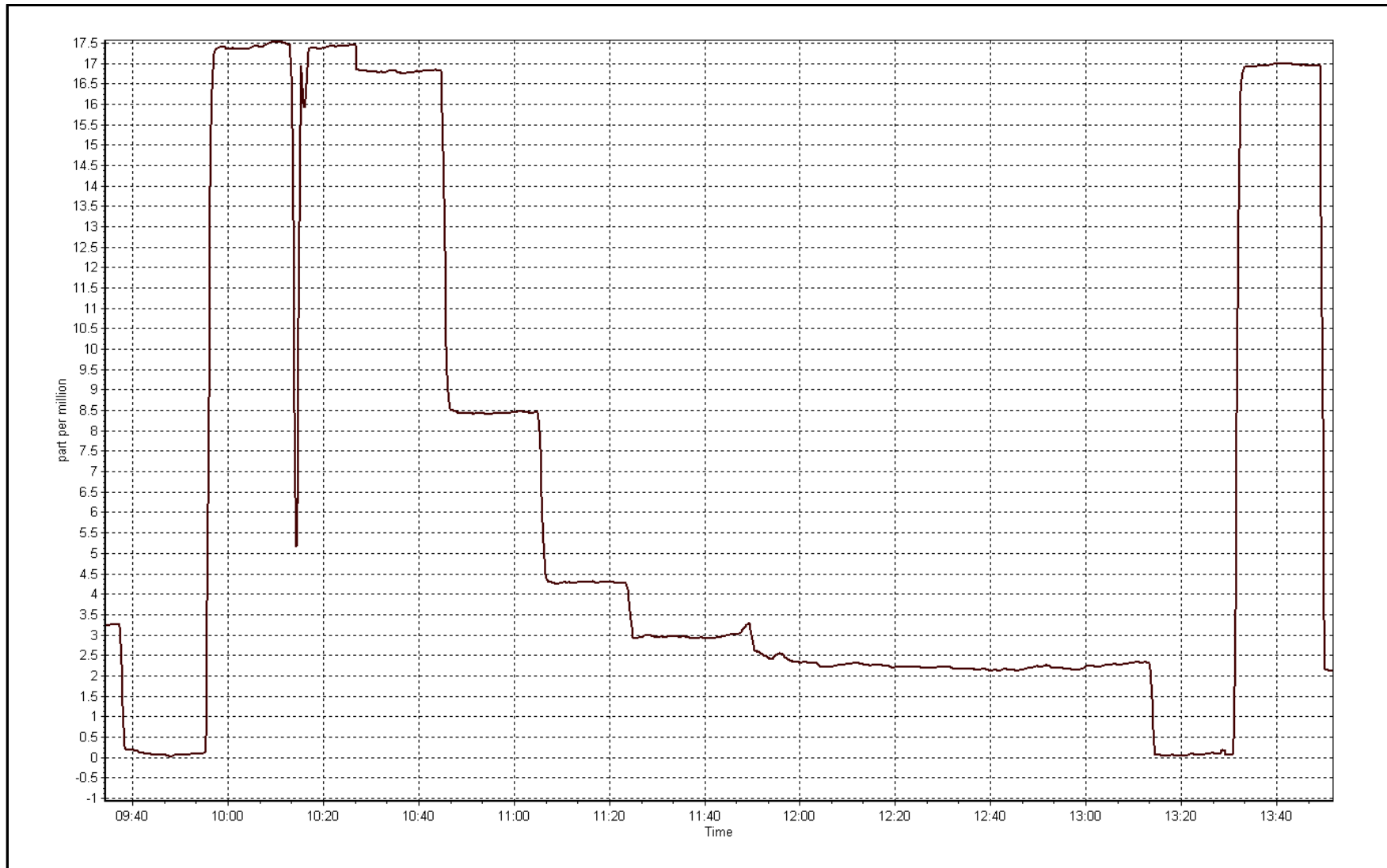
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.07	----	Correlation Coefficient	0.999983
16.84	16.80	1.0022		
8.41	8.44	0.9962	Slope	1.007615
4.18	4.29	0.9750		
			Intercept	-0.099387



THC Calibration Plot

Date: July 26, 2016





Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	July 28, 2016	Previous Calibration	June 28, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Reason:	Routine		
Start Time (MST)	10:24	End Time (MST)	13:01
NO2 GPT Ref date	July-26-16	Transfer Standard	Nox
Calibrator Make/Model	Sabio 4010	Station temp.	22 Deg C
ZAG make/model	Teledyne API 701	Serial Number	11041107
DACS make/model	Campbell Scientific CR3000	Serial Number	3410
		Serial Number	1850

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Box temp.	24.1	24.1
Analyzer IP address	192.168.1.79		Lamp temp.	58.0	58.0
Calculated slope	0.998969	0.995557	Pressure	26.7	26.7
Calculated intercept	-0.195016	0.533244	Flow	771.0	771.0
Analyzer Background	1.2	1.2	Intensity	4382.7	4382.7
Analyzer Coefficient	1.026	1.002			

Analyzer make	API T400	Analyzer serial #	825
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Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator Lamp Intensity	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.00	0.0	0.2	----
as found span	5000	0.89	355.4	364.5	0.975
calibrator zero	5000	0.00	0.0	0.2	----
high point	5000	0.89	355.4	357.0	0.996
second point	5000	0.47	213.1	213.0	1.000
third point	5000	0.36	113.2	112.4	1.007
as left zero	5000	0.00	0.0	0.7	----
as left span	5000	0.89	355.4	363.5	0.978
Average Correction Factor					1.001

Corrected As found	364.3	Previous response	356.0	% change	-2.3%
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Notes:

span adjusted; filter changed out, no maintenance done

Calibration Performed By:

Melissa Lemay



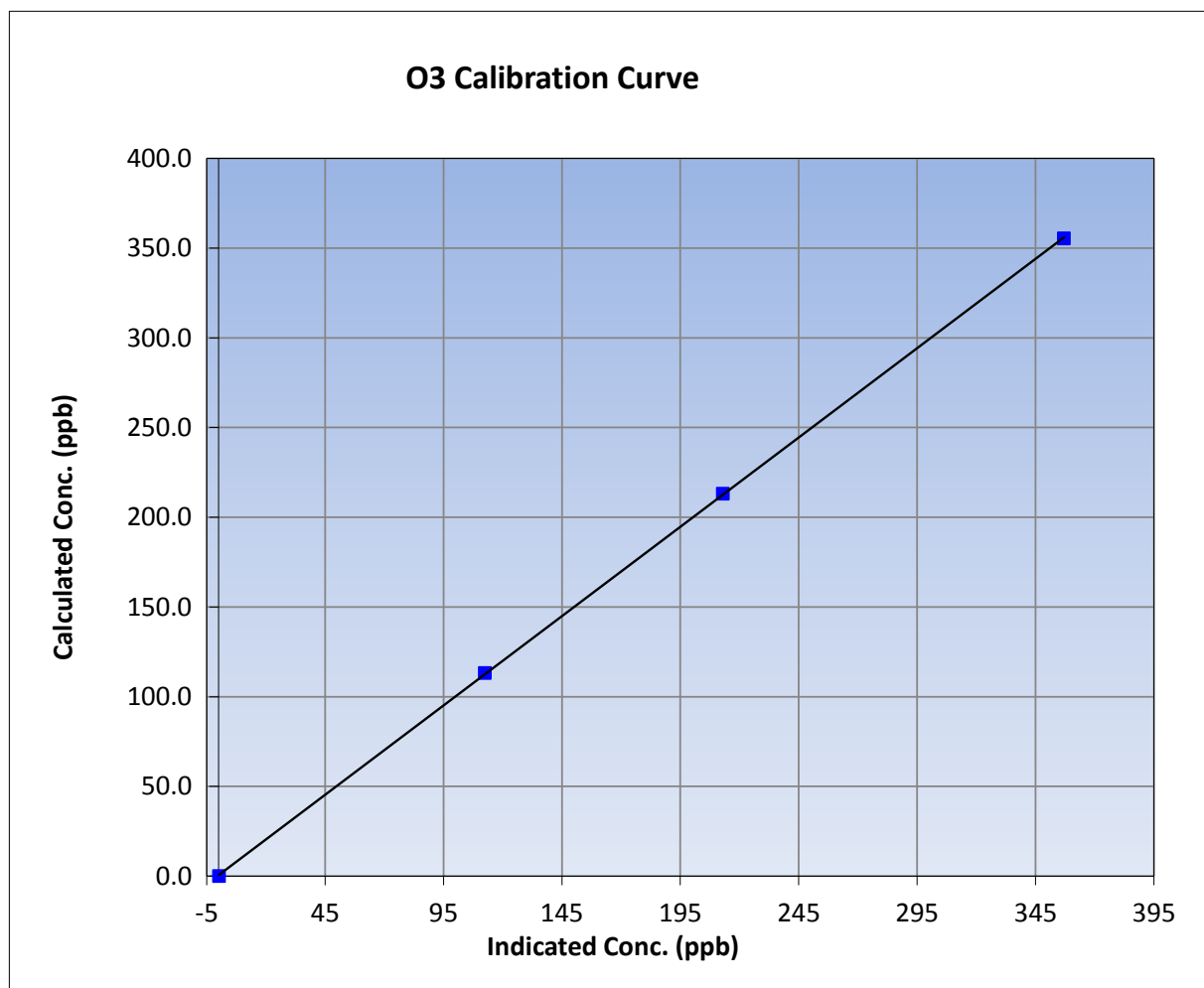
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	July-28-16	Previous Calibration	June 28, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	10:24	End Time (MST)	13:01
Analyzer make	API T400	Analyzer serial #	825

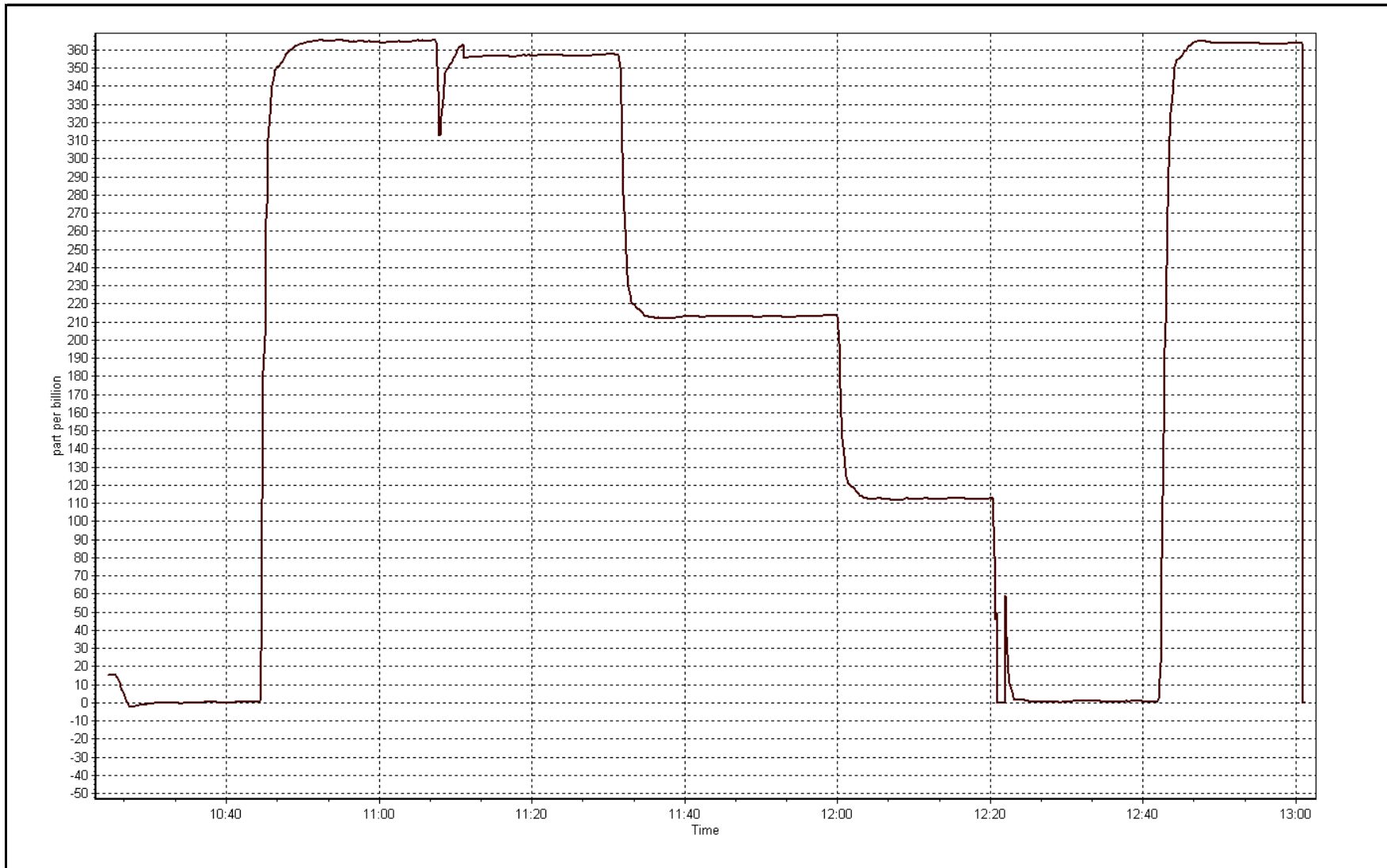
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	----	Correlation Coefficient	0.999975
355.4	357.0	0.9955		
213.1	213.0	1.0005	Slope	0.995557
113.2	112.4	1.0071		
			Intercept	0.533244



O3 Calibration Plot

Date: July 28, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	July 26, 2016	Previous Calibration	June 7, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Reason:	Routine		
Start Time (MST)	9:14	End Time (MST)	13:56
NO Cal Gas Conc	50.7 ppm	Gas Cert Reference	LL110515
NOX Cal Gas Conc	50.9 ppm	Cal Gas Expiry Date	9/8/2018
Calibrator	Sabio 4010	Serial Number	11041107
Zero air Generator	Teledyne API T701	Serial Number	5613

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	1850
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.998812	0.998163	1.001328
	Data Offset	-0.222067	-0.200825	-0.080662
Current Calibration	Data Slope	1.001452	1.000516	1.010563
	Data Offset	-1.381096	-1.416248	1.105160

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1410661329
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.42		192.168.1.42	
NO coefficient	1.046		1.046	
NOX coefficient	1.001		1.002	
NO2 coefficient	1.000		1.001	
NO bkgrnd	7.7		7.7	
NOX bkgrnd	7.8		7.8	
Chamber Temp	50.4	Deg C	50.5	Deg C
Moly Temp	322.1	Deg C	323.7	Deg C
PMT voltage	-827.7	V	-827.3	V
PMT Temp	-2.9	Deg C	-3	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	185.4	mmHg	181.2	mmHg
R Cell Press Nox	184.8	mmHg	181.2	mmHg
NO sample flow	0.856	lpm	0.864	lpm
Nox sample Flow	0.854	lpm	0.864	lpm

Notes:

Zero air scrubbers were changed out, filter changed out, span adjusted;



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

July 26, 2016

Station Number:

AMS 13

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	----	----
as found span	5000	78.9	803.2	800.0	3.2	814.1	810.5	3.5	0.9866	0.9871
calibrator zero	5000	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	----	----
high point	5000	78.9	803.2	800.0	3.2	802.8	800.4	2.4	1.0005	0.9996
second point	5000	39.4	401.1	399.5	1.6	402.4	401.3	1.1	0.9968	0.9957
third point	5000	19.7	200.5	199.8	0.8	203.2	202.8	0.4	0.9871	0.9852
as left zero	5000	0.0	0.0	0.0	0.0	0.0	0.0	0.1	----	----
as left span	5000	78.9	803.2	450.4	352.8	812.3	447.8	364.6	0.9888	1.0059
Average Correction Factor									0.9948	0.9935

Corrected As found
Previous Response

NO_x= 814.1
NO_x= 804.4

NO= 810.6
NO= 801.7

Percent Change

NO_x= -1.2%

NO= -1.1%

GPT Calibration Data

Dilution Flow (total) 5000 ccm Source Gas Flow 78.90 ccm NOx ref calc conc = 803.2 ppb NO ref calc conc = 800.0 ppb

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
1st NO ref point		3.2	807.7	805.8	0.1	0.9944	0.9929	----	----
1st NO2 (300)	450.4	358.5	805.0	450.4	354.5	0.9978	----	1.0112	98.9%
2nd NO2 (200)	592.7	216.3	804.8	592.7	212.2	0.9980	----	1.0194	98.1%
3rd NO2 (100)	692.6	116.3	805.3	692.6	112.7	0.9974	----	1.0321	96.9%
2nd NO ref point		3.2	804.9	802.9	2.0	0.9979	0.9964	----	----
Average Correction Factor						0.9978		1.0209	98.0%

Calibration Performed By: Jayne Rycroft



Wood Buffalo Environmental Association

NO_x Calibration Summary

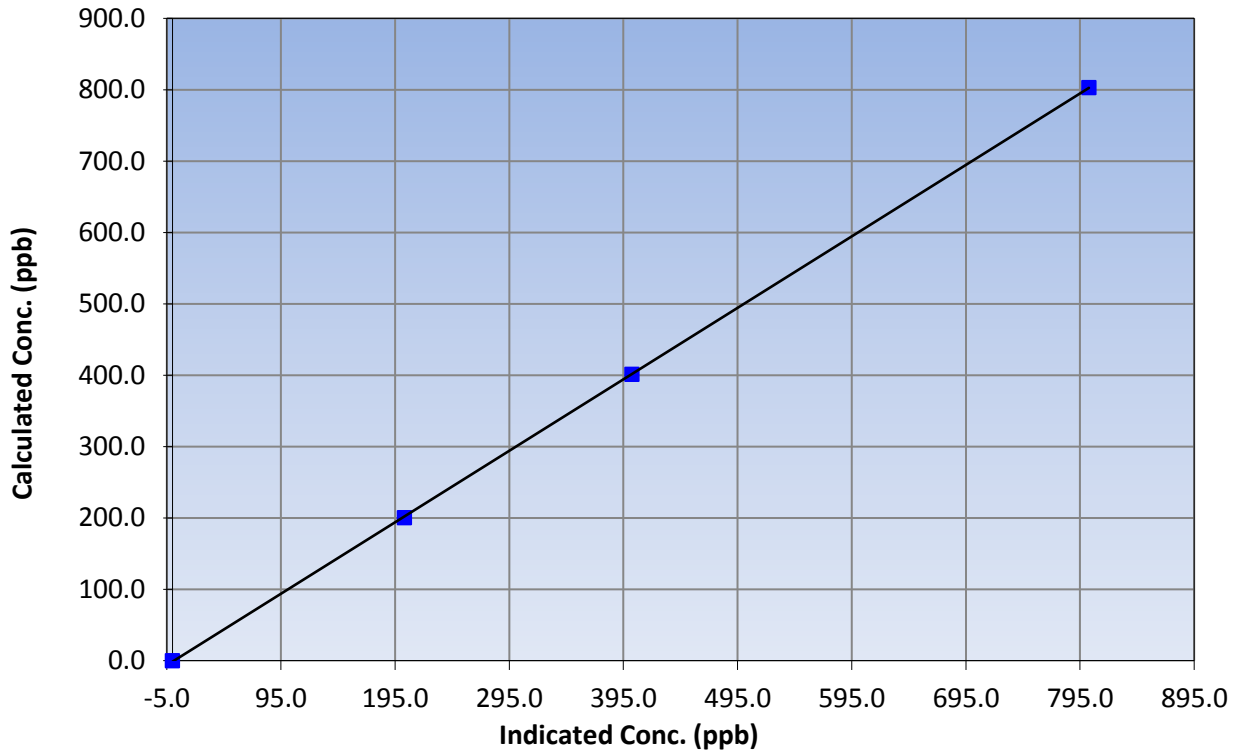
Station Information

Calibration Date	July 26, 2016	Previous Calibration	June 7, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	9:14	End Time (MST)	13:56
Analyzer make	Thermo 42i	Analyzer serial #	1410661329

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999986
803.2	802.8	1.0005		
401.1	402.4	0.9968	Slope	1.001452
200.5	203.2	0.9871		
			Intercept	-1.381096

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

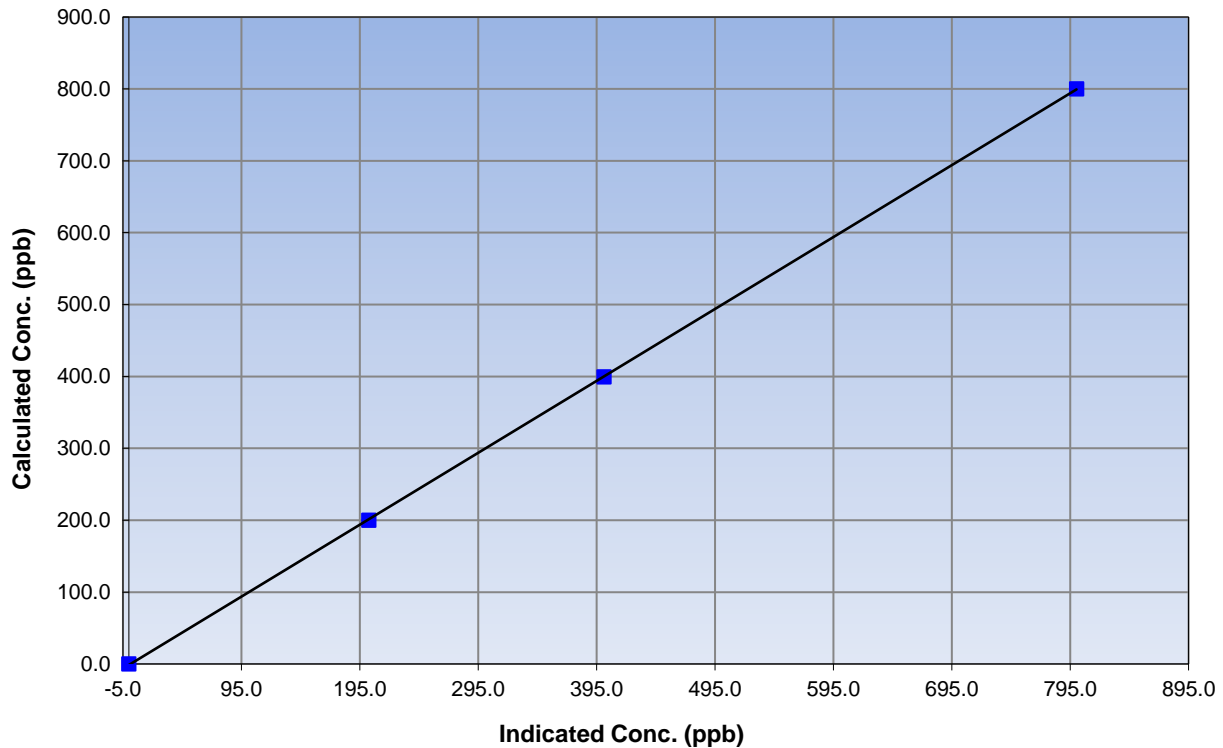
Station Information

Calibration Date	July 26, 2016	Previous Calibration	June 7, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	9:14	End Time (MST)	13:56
Analyzer make	Thermo 42i	Analyzer serial #	1410661329

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999983
800.0	800.4	0.9996		
399.5	401.3	0.9957	Slope	1.000516
199.8	202.8	0.9852		
			Intercept	-1.416248

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

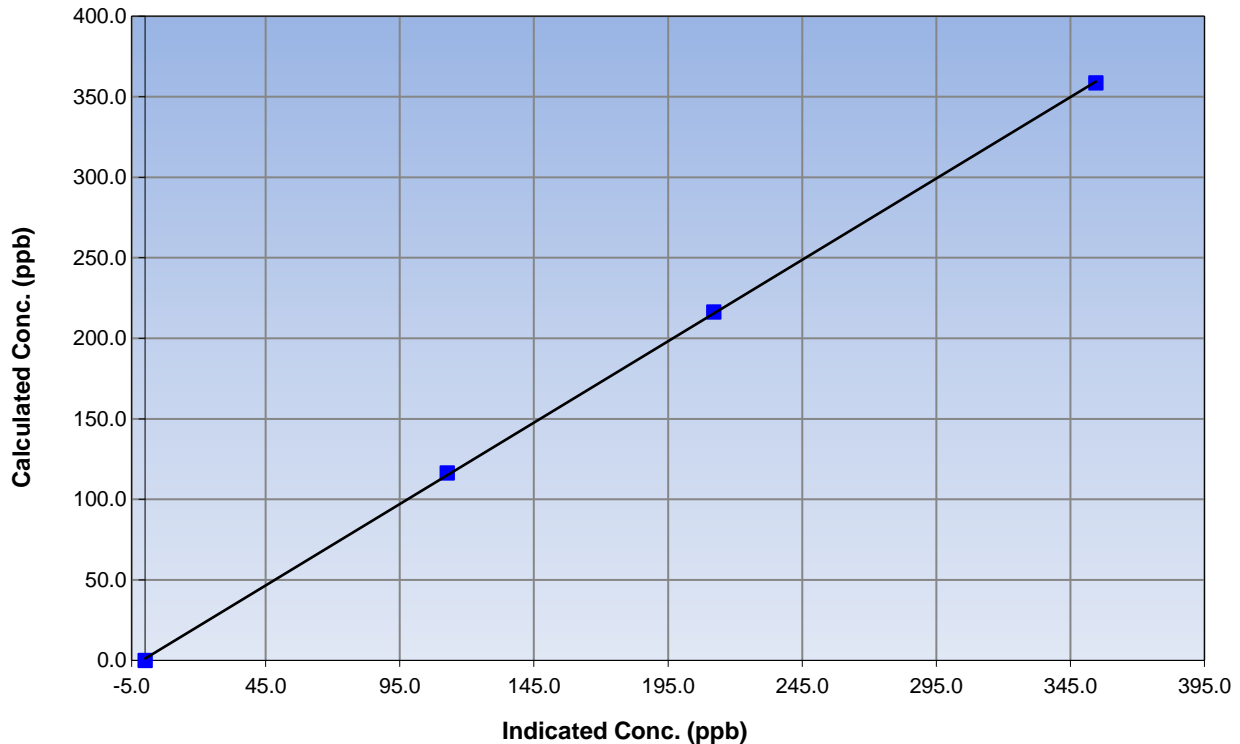
Station Information

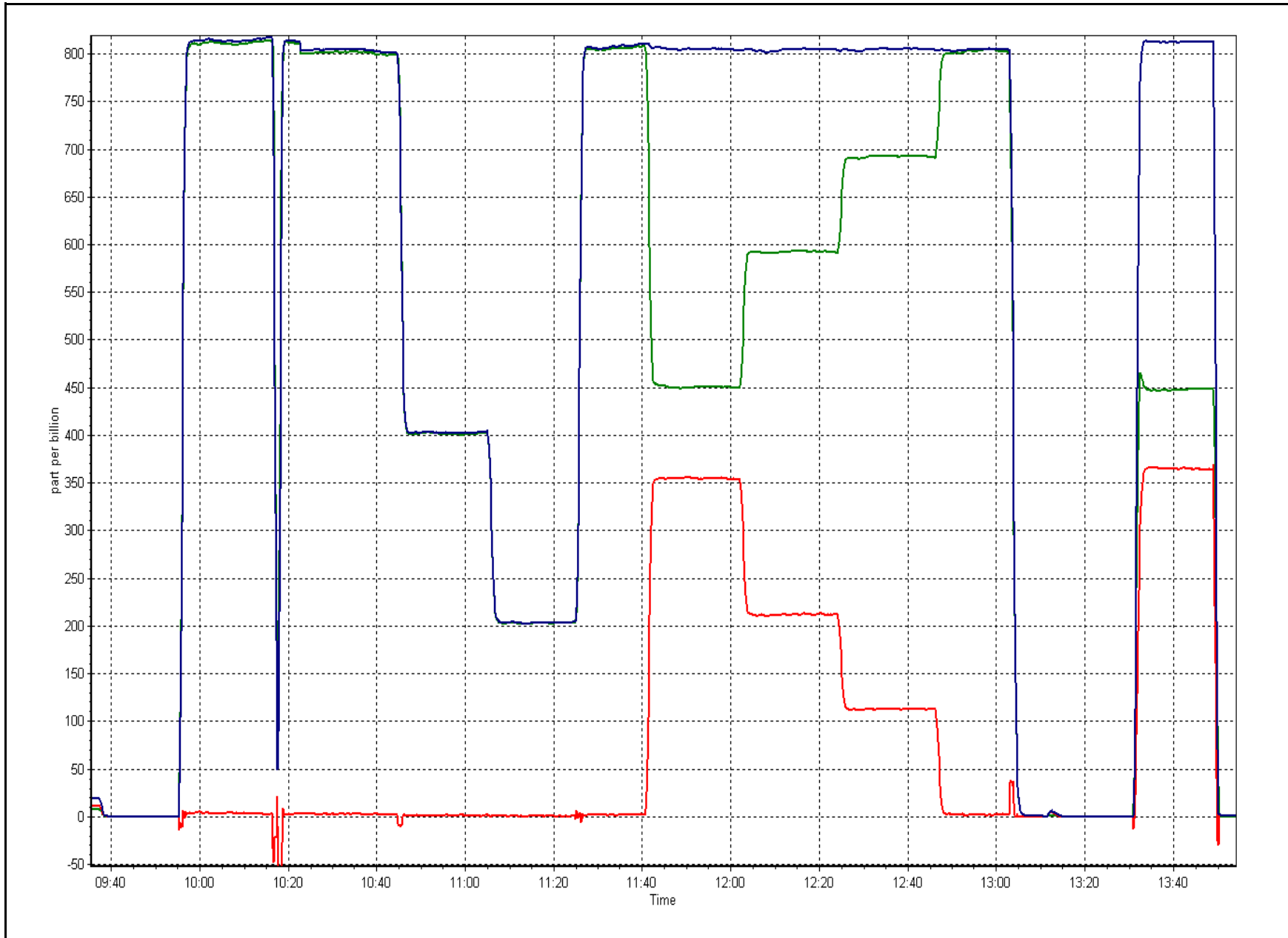
Calibration Date	July 26, 2016	Previous Calibration	June 7, 2016
Station Number	Fort McKay South	Station Number	AMS 13
Start Time (MST)	9:14	End Time (MST)	13:56
Analyzer make	Thermo 42i	Analyzer serial #	1410661329

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	N/A	Correlation Coefficient	0.999935
358.5	354.5	1.0112		
216.3	212.2	1.0194	Slope	1.010563
116.3	112.7	1.0321		
			Intercept	1.105160

NO₂ Calibration Curve







Wood Buffalo Environmental Association

SHARP CALIBRATION

STATION INFORMATION			
Calibration Date:	July 28, 2016	Previous Calibration:	June 9, 2016
Station Name:	Fort McKay South	Station Number:	AMS 13
Start Time (MST):	11:41	End Time (MST):	12:36
Calibrator Make/Model:	Delta Cal	Calibrator Serial Number:	1097

SHARP INFORMATION			
Particulate Fraction:	PM2.5		
Make/Model:	Thermo / SHARP 5030		
Serial Number	E-803		
C ₁₄ Source SN:	4066		
Confirmation of Time settings:	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Parameters Checked:	T1 <input checked="" type="checkbox"/>	T2 <input type="checkbox"/>	T3 <input type="checkbox"/>
	T4 <input type="checkbox"/>	P3 <input checked="" type="checkbox"/>	Main Flow <input checked="" type="checkbox"/>
		Beta <input type="checkbox"/>	Neph <input checked="" type="checkbox"/>

CALIBRATION DATA				
Temperature (°C)				
Sensor	Indicated	Measured	Difference (Limit +/- 2.0°C)	Final Indicated
T1	13.0	13.0	0.0	13.0
T2	25.0	24.0	-1.0	25.0
T3	24.0	24.0	0.0	24.0
T4	24.0	24.0	0.0	24.0
RH (%)	49.0	na	N/A	49.0

Pressure (Hpa)				
Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	969	969.0	0.0	969

Main Flow (Lph)				
Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1000	990	-10	1000	1000

Nephelometer Calibration			
Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	461		461
Neph	7.4		0.7
C14	-14.7		-10.5
Indicated Concentration (ug/m3)	2.2	Yes	-0.2
Offset 1	463		463.4
Offset 2	58		58.6

Leak Check (Quarterly)			
Leak Check Date:	June 9, 2015	Previous Leak Check Date:	April 18, 2015
	Measured		Difference LPM (Limit +/- 0.42 LPM)
Flow without adaptor (LPM):	16.44		0.14
*Flow with adaptor (LPM):	16.30		
<i>*Note - do not attach adaptor without shutting off the pump first</i>			

Mass Foil Calibration (Annually)			
Foil Calibration Date:	June 9, 2016	Previous Foil Calibration:	July 14, 2015
Zeroed?:	Yes		
Foil Mass:	1337		Mass foil set S/N: 2587
Previous Correction Factor:	7079		
New Correction Factor:	7150		

INSPECTION DATA		
Item	Condition	Date of install or rebuild
Cyclone	Good / cleaned	28/07/2016
Pump	Good	
Filter Tape	Good	28/09/2015
Mass Foil Cal Set	na	
HEPA filter	Good	

NOTES:

nephelometer adjusted, cyclone head cleaned

Calibration Performed By: Melissa Lemay



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY MONITORING PROGRAM MONTHLY REPORT

**AMS 14
ANZAC
JULY 2016**

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

August 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - ANZAC (AMS 14)
 JULY 2016

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2(ppb) Average	694	36	50	98.12	7	0	2	0
TRS(ppb) Average	704	35	40	99.33	2	0	0	0
THC(ppm) Average	703	36	41	99.33	2.5	-	2.1	-
NMHC(ppm) Average	703	36	41	99.33	0.127	-	0.014	-
CH4(ppm) Average	703	36	41	99.33	2.5	-	2.1	-
NO2(ppb) Average	702	36	42	99.19	12	0	3	-
NO(ppb) Average	702	36	42	99.19	7	-	1	-
NOX(ppb) Average	702	36	42	99.19	18	-	3	-
O3(ppb) Average	706	35	38	99.60	50	0	36	-
PM2.5(ug/m3) Average	740	1	4	99.60	38.8	-	15.7	0
AT 2m(C) Average	743	0	1	99.87	29.4	-	22.2	-
RH(%) Average	743	0	1	99.87	97	-	91	-
Leaf Wetness (% of range) Average	743	0	1	99.87	56	-	14	-
WS(km/h) Average	740	0	4	99.46	21	-	13	-
WD(deg) Average	740	0	4	99.46	-	-	-	-
PC(mm) Total	743	0	1	99.87	11.2	-	23.6	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - ANZAC (AMS 14)
 JULY 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2(ppb) Average	694	0.6	1	-	0	0	0	0	1	1	7
TRS(ppb) Average	704	0.3	0	-	0	0	0	0	0	0	2
THC(ppm) Average	703	1.98	0.1	-	1.9	1.9	1.9	2	2	2.1	2.5
NMHC (ppm) Average	703	0.004	0.012	-	0	0	0	0	0	0	0.127
CH4(ppm) Average	703	1.98	0.1	-	1.9	1.9	1.9	2	2	2.1	2.5
NO2(ppb) Average	702	1.2	1	-	0	0	1	1	2	3	12
NO(ppb) Average	702	0.3	1	-	0	0	0	0	0	1	7
NOX(ppb) Average	702	1.5	2	-	0	0	1	1	2	3	18
O3(ppb) Average	706	24.2	10	-	3	11	18	24	31	38	50
PM2.5(ug/m3) Average	740	5.97	4.9	-	0.8	1.6	2.5	4.7	7.8	11.9	38.8
Temperature 2 m (C) Average	743	18.05	4.5	-	5.3	12.8	14.9	17.5	21.5	24.2	29.4
Relative Humidity (%) Average	743	68	19	-	20	42	51	70	85	93	97
Leaf Wetness (% of range) Average	743	3.9	9	-	-1	0	0	0	2	15	56
Wind Speed 20 m (km/h) Average	740	7.9	4	-	1	3	5	8	10	13	21
Wind Direction 20 m (deg) Average	740	-	-	-	-	-	-	-	-	-	-
Precipitation (mm) Total	743	-	-	75.18	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - ANZAC (AMS 14)
JULY 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
ALL PARAMETERS	17 Jul 2016 13:00	17 Jul 2016 13:00	1	Maintenance - wiring/data logger upgrades
SO2	21 Jul 2016 17:00	21 Jul 2016 18:00	2	Station power failure
SO2	21 Jul 2016 19:00	22 Jul 2016 05:00	11	Unstable Operation following power failure
TRS	21 Jul 2016 17:00	21 Jul 2016 20:00	4	Station power failure
CH4, NMHC, THC	21 Jul 2016 17:00	21 Jul 2016 20:00	4	Station power failure
NO2, NO, NOX	21 Jul 2016 17:00	21 Jul 2016 21:00	5	Station power failure
O3	21 Jul 2016 17:00	21 Jul 2016 18:00	2	Station power failure
PM2.5	21 Jul 2016 17:00	21 Jul 2016 18:00	2	Station power failure
Wind Speed, Wind Direction	10 Jul 2016 02:00	10 Jul 2016 02:00	1	Flat line in sensor output signal
Wind Speed, Wind Direction	14 Jul 2016 03:00	14 Jul 2016 03:00	1	Flat line in sensor output signal
Wind Speed, Wind Direction	17 Jul 2016 13:00	17 Jul 2016 14:00	2	Maintenance - wiring/data logger upgrades

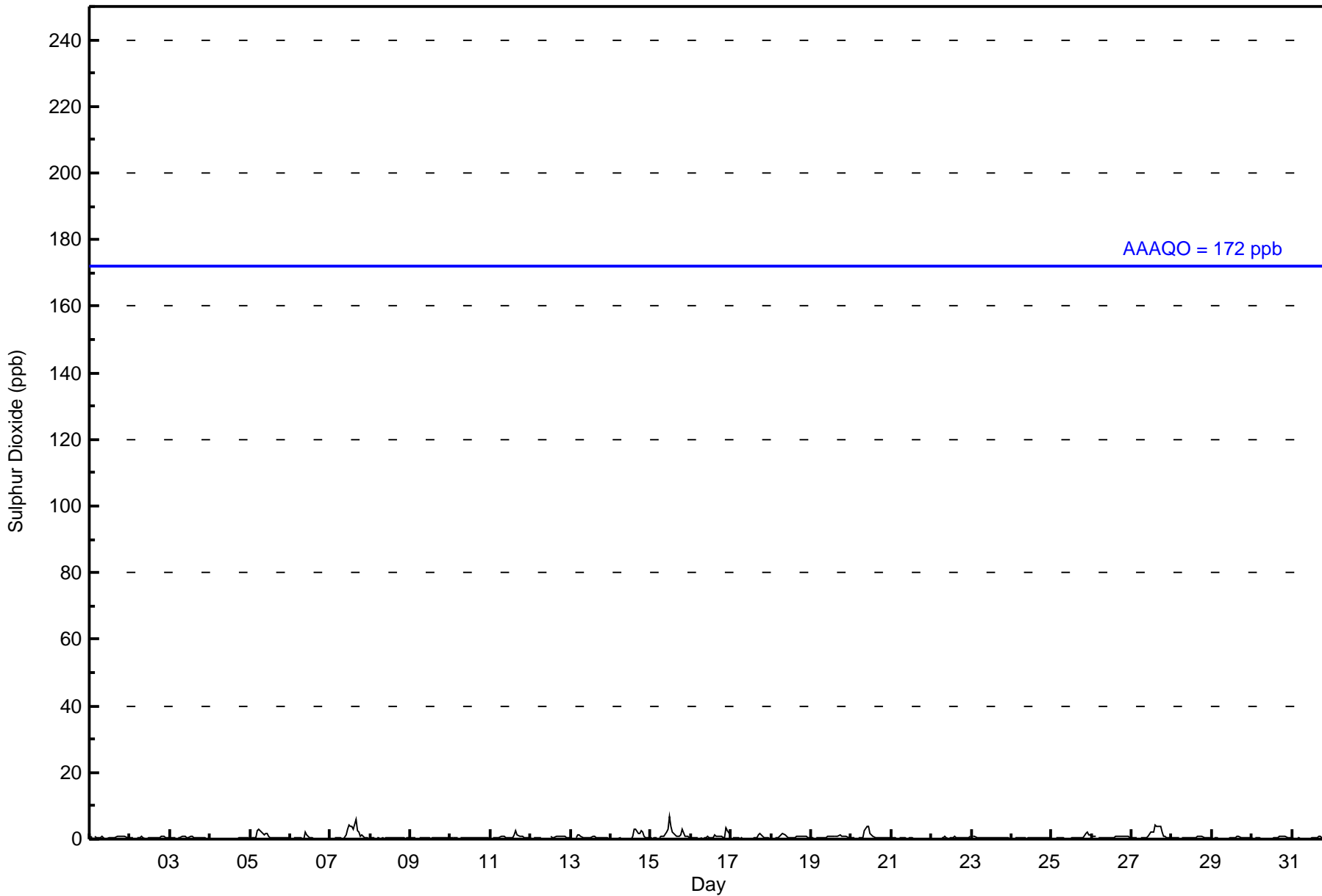


Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 7 ppb on Jul 15 12:00 Maximum Daily Average: 1.5 ppb on Jul 7																	Hours in Service: 744 Hours of Data: 694 Hours of Missing Data: 50 Hours of Calibration: 36 Percent Operational Time: 98.1									
Minimum Value: 0 ppb on Jul 4 11:00 Minimum Daily Average: 0.2 ppb on Jul 4 Maximum Diurnal Average: 1.0 ppb at hour 16 Minimum Diurnal Average: 0.3 ppb at hour 1 Monthly Average: 0.6 ppb Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 1 P ₉₉ = 4																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	1	0	Z	1	0	0	0	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0.6	1
2-Jul	0	0	0	Z	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0.4	1
3-Jul	0	0	0	0	Z	1	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0.5	1	
4-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
5-Jul	Z	0	0	1	3	3	3	2	1	2	2	1	1	0	1	1	0	0	0	0	0	0	0	1.0	3	
6-Jul	0	Z	0	0	0	0	0	0	0	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0.4	2	
7-Jul	0	0	Z	0	0	0	0	0	0	1	3	4	4	4	3	6	2	2	1	1	0	0	0	1.5	6	
8-Jul	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	
9-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0.4	1	
10-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	1	0	1	1	0	0	0	0	1	0	0	0.4	1	
11-Jul	Z	0	0	0	0	0	1	1	1	1	0	0	0	1	1	2	1	1	1	1	1	1	0	0.7	2	
12-Jul	0	Z	0	0	0	1	0	C	C	C	C	C	1	1	1	1	1	1	1	1	1	1	0	0.5	1	
13-Jul	0	0	Z	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0.5	1	
14-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	3	3	2	2	2	2	1	1	0	0.8	3	
15-Jul	0	0	0	0	Z	0	1	1	1	2	3	7	4	2	1	1	1	1	1	3	1	1	1	1.4	7	
16-Jul	0	0	0	0	0	Z	0	0	0	0	1	0	0	0	1	1	1	1	1	1	1	3	3	0.8	3	
17-Jul	Z	0	0	0	0	0	0	0	0	0	0	0	M	0	0	0	1	2	1	1	0	0	0	0.4	2	
18-Jul	0	Z	0	0	0	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	1	1	0	0.6	1	
19-Jul	0	0	Z	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0.6	1	
20-Jul	0	0	0	Z	0	0	0	1	3	4	4	2	1	1	1	0	0	0	0	0	0	0	0	0.9	4	
21-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	PF	PF	UO	UO	UO	UO	UO	--	0	
22-Jul	UO	UO	UO	UO	UO	Z	0	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0.4	1	
23-Jul	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
24-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0.3	1	
25-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	2	2	1	1	0.5	2	
26-Jul	1	1	1	Z	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	0.7	1	
27-Jul	1	0	0	0	Z	0	0	0	0	1	2	2	2	4	4	4	4	4	2	1	1	1	0	1.4	4	
28-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0.4	1	
29-Jul	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0.3	1	
30-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0.4	1	
31-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0.3	1	
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan C - Calibration M - Maintenance UO - Unstable Operation 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 (SO₂) - ppb
Anzac - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Anzac - July 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
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 (SO₂) - ppb
Anzac - July 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	70	29	23	31	17	6	12	53	34	22	29	38	66	106	88	67	691
11 - 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	70	29	23	31	17	6	12	53	34	22	29	38	66	106	88	67	691

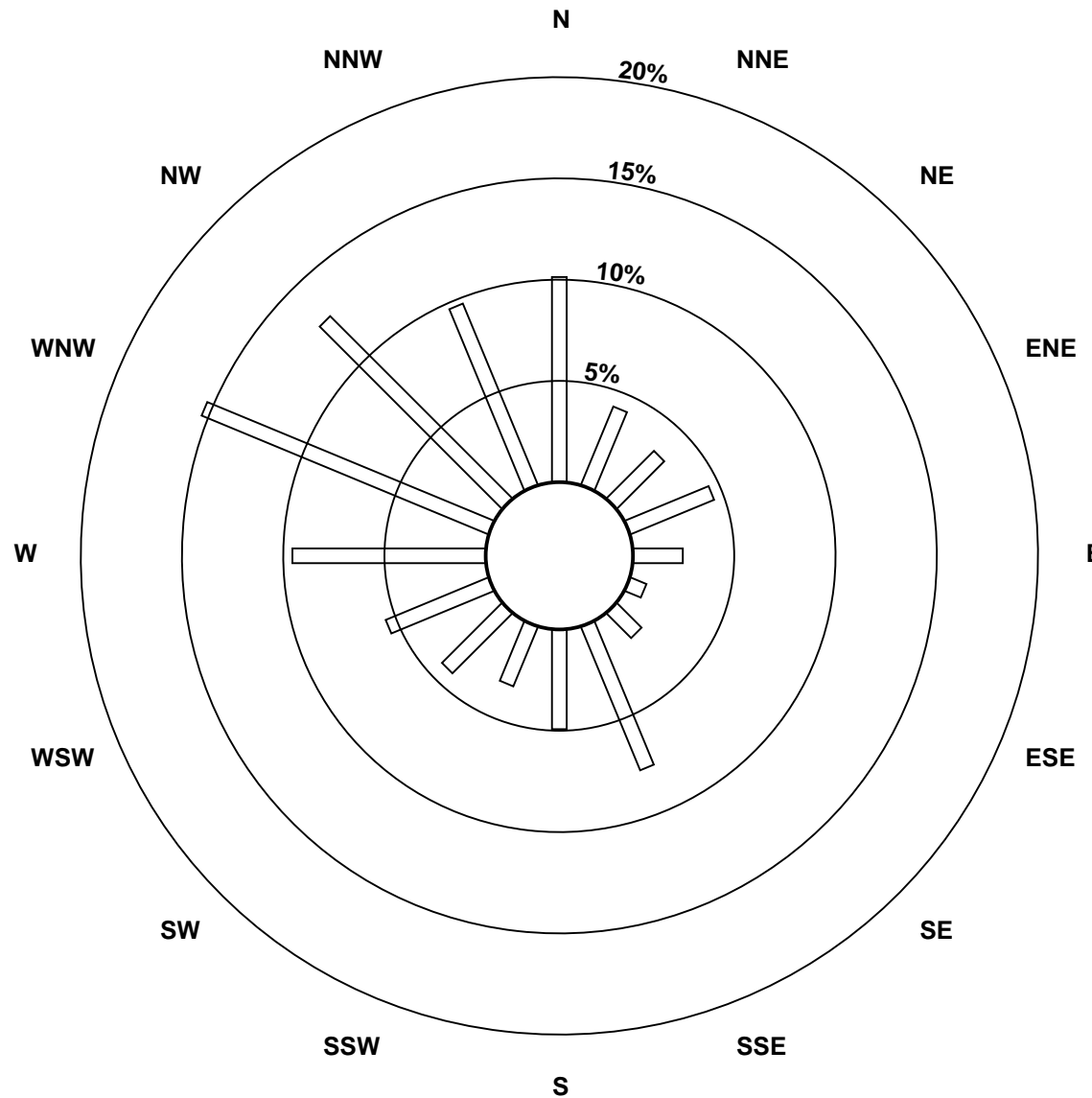
Total Number of Valid Hours: 691

Total Number of Hours: 744

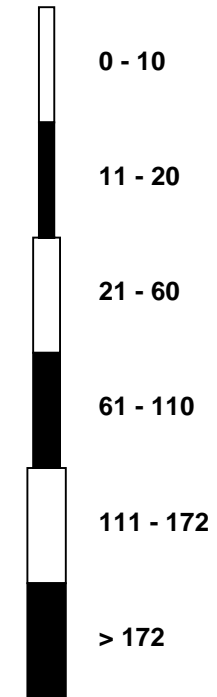


Wood Buffalo Environmental Association
Wind Rose Jul 2016

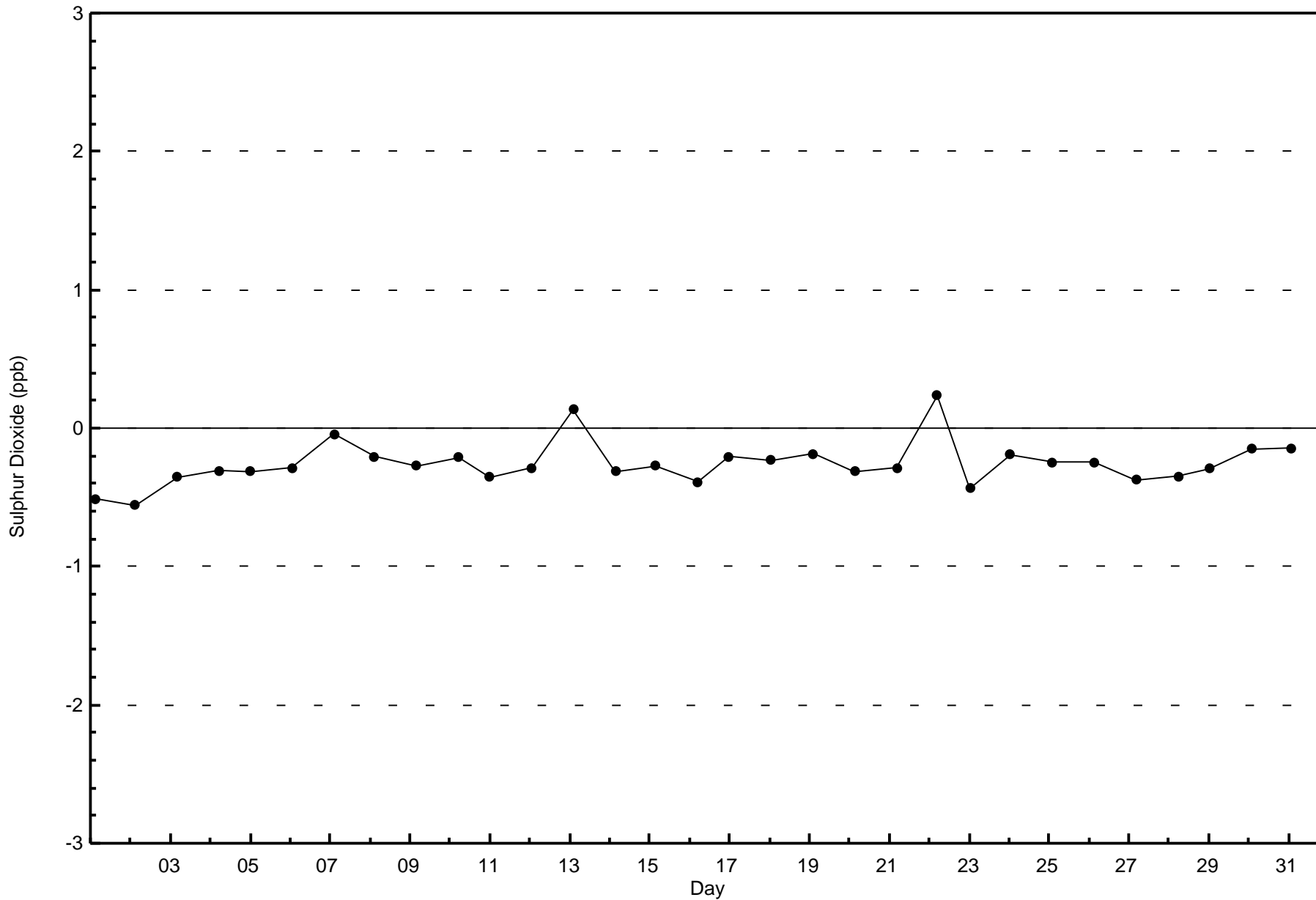
Sulphur Dioxide (SO₂) - ppb
Anzac (AMS 14)

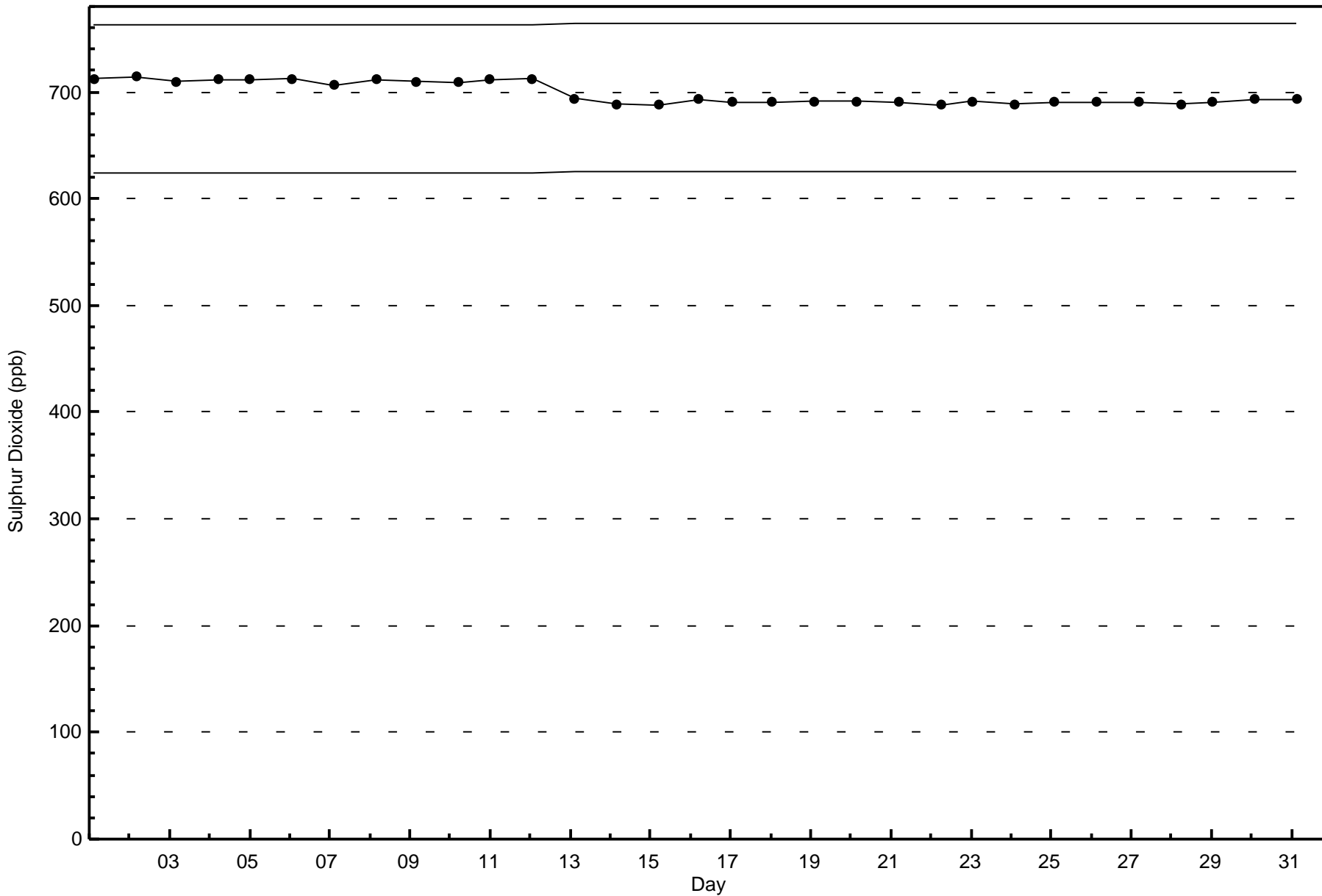


Classes (ppb)



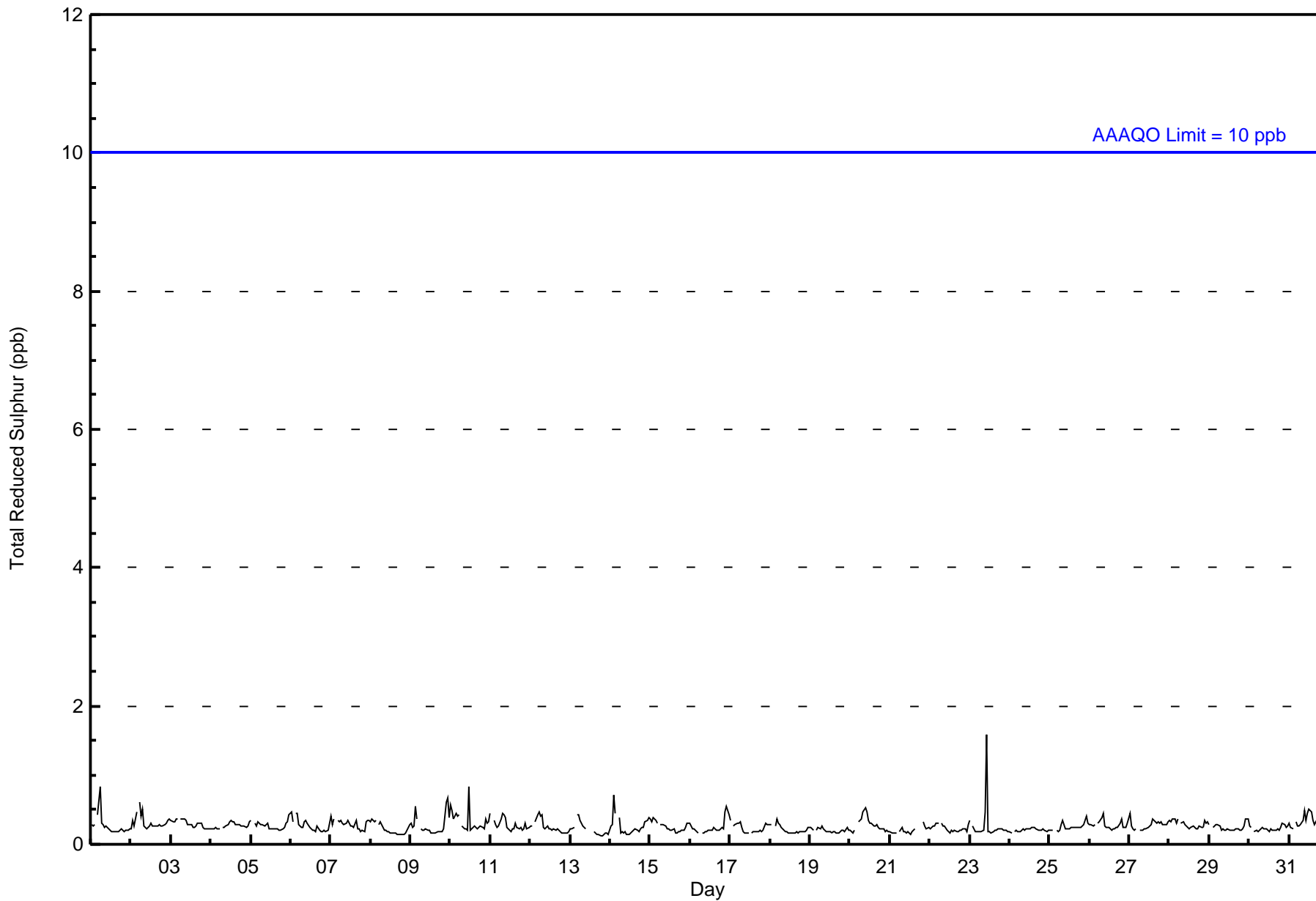
Total Number of Valid Hours: 691







Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																		
Maximum Value: 2 ppb on Jul 23 11:00										Maximum Daily Average: 0.3 ppb on Jul 10										Hours of Data: 704								
Minimum Value: 0 ppb on Jul 13 20:00										Minimum Daily Average: 0.2 ppb on Jul 21										Hours of Missing Data: 40								
Maximum Diurnal Average: 0.3 ppb at hour 6										Minimum Diurnal Average: 0.2 ppb at hour 18										Hours of Calibration: 35								
Monthly Average: 0.3 ppb										Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 1										Percent Operational Time: 99.3								
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-Jul	0	0	0	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1		
2-Jul	0	0	0	0	Z	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1		
3-Jul	0	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		
4-Jul	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		
5-Jul	0	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		
6-Jul	0	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		
7-Jul	0	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		
8-Jul	0	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-Jul	0	0	0	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0.3	1		
10-Jul	1	0	0	0	0	0	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1		
11-Jul	0	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		
12-Jul	0	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		
13-Jul	0	0	0	Z	0	0	0	0	0	0	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0.2	0		
14-Jul	0	0	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1		
15-Jul	0	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		
16-Jul	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.2	1		
17-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	M	0	0	0	0	0	0	0	0	0	0	0	0.2	0		
18-Jul	0	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		
19-Jul	0	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		
20-Jul	0	0	0	0	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1		
21-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	PF	PF	PF	PF	0	0	0	0.2	0		
22-Jul	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		
23-Jul	0	Z	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	2		
24-Jul	0	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		
25-Jul	0	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		
26-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0		
27-Jul	0	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		
28-Jul	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		
29-Jul	0	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		
30-Jul	0	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		
31-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.3	1		
	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	Diurnal Average		
	1	0	1	1	0	1	0	1	0	1	2	1	1	0	0	0	0	0	0	0	0	0	1	1	0	Diurnal Maximum		
Z - zerospan	C - Calibration	M - Maintenance	PF - Power Failure																									
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 - July 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	704	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 704

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb
Anzac - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	70	32	22	31	18	6	11	54	39	21	31	41	64	101	87	73	701
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	70	32	22	31	18	6	11	54	39	21	31	41	64	101	87	73	701

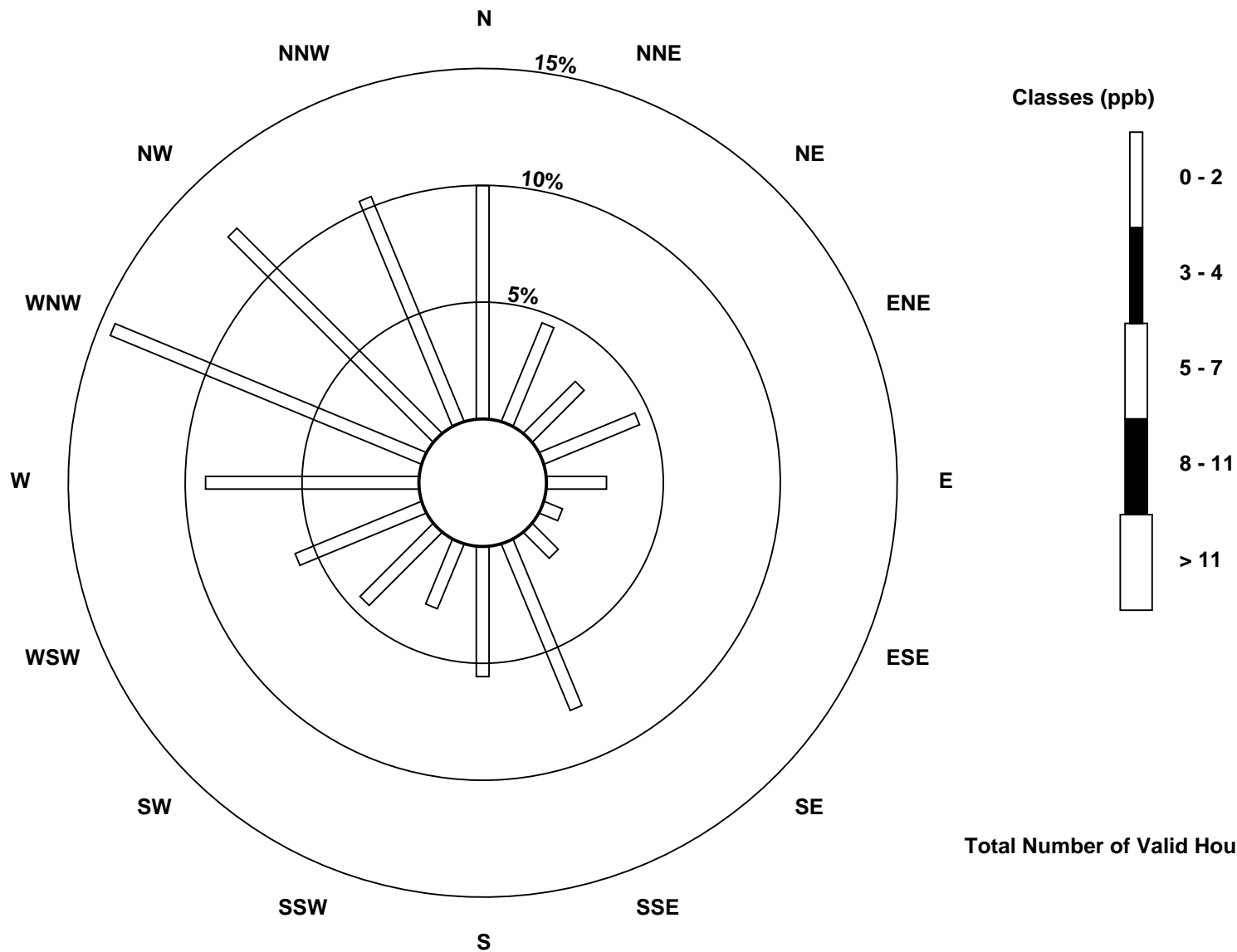
Total Number of Valid Hours: 701

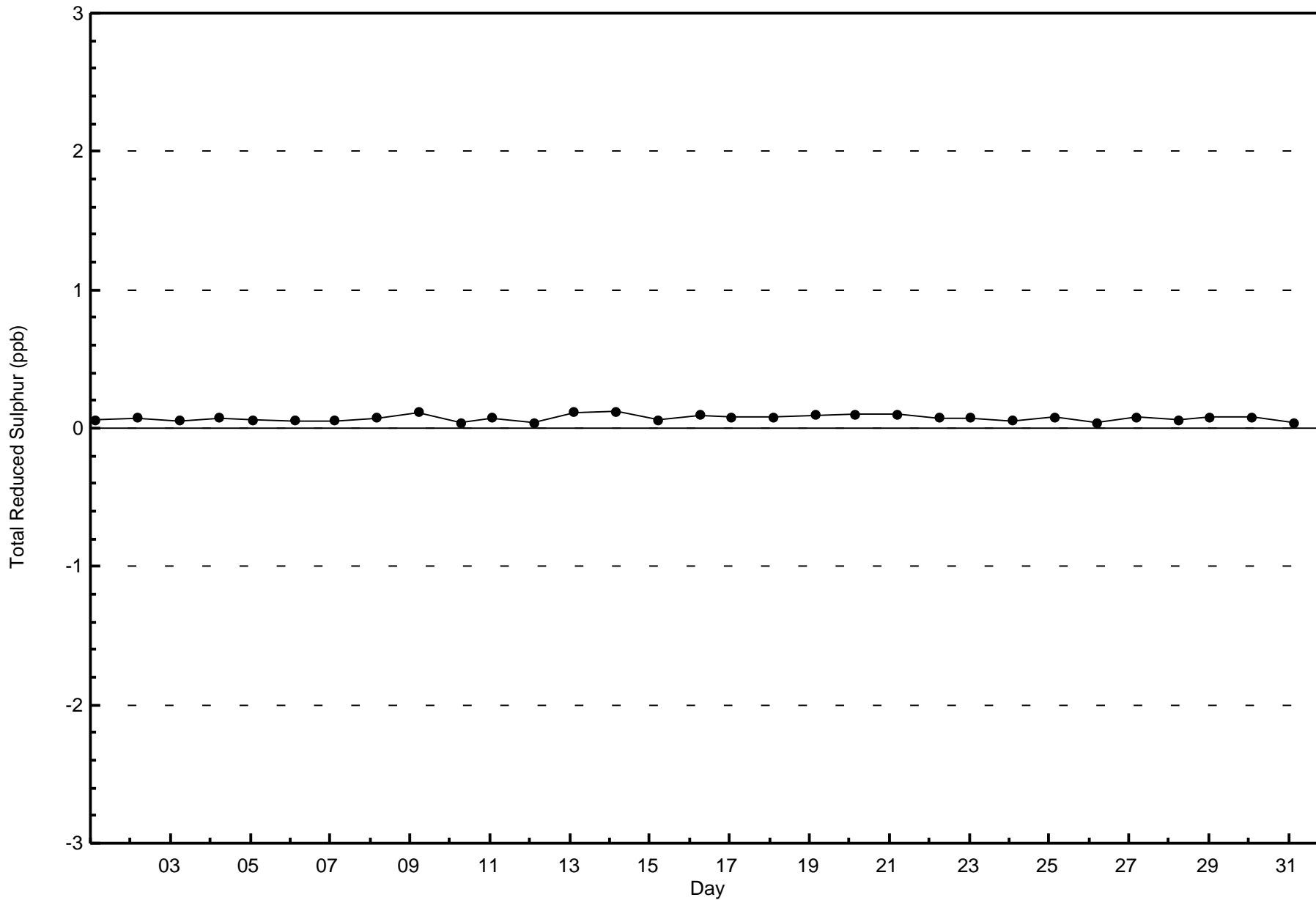
Total Number of Hours: 744

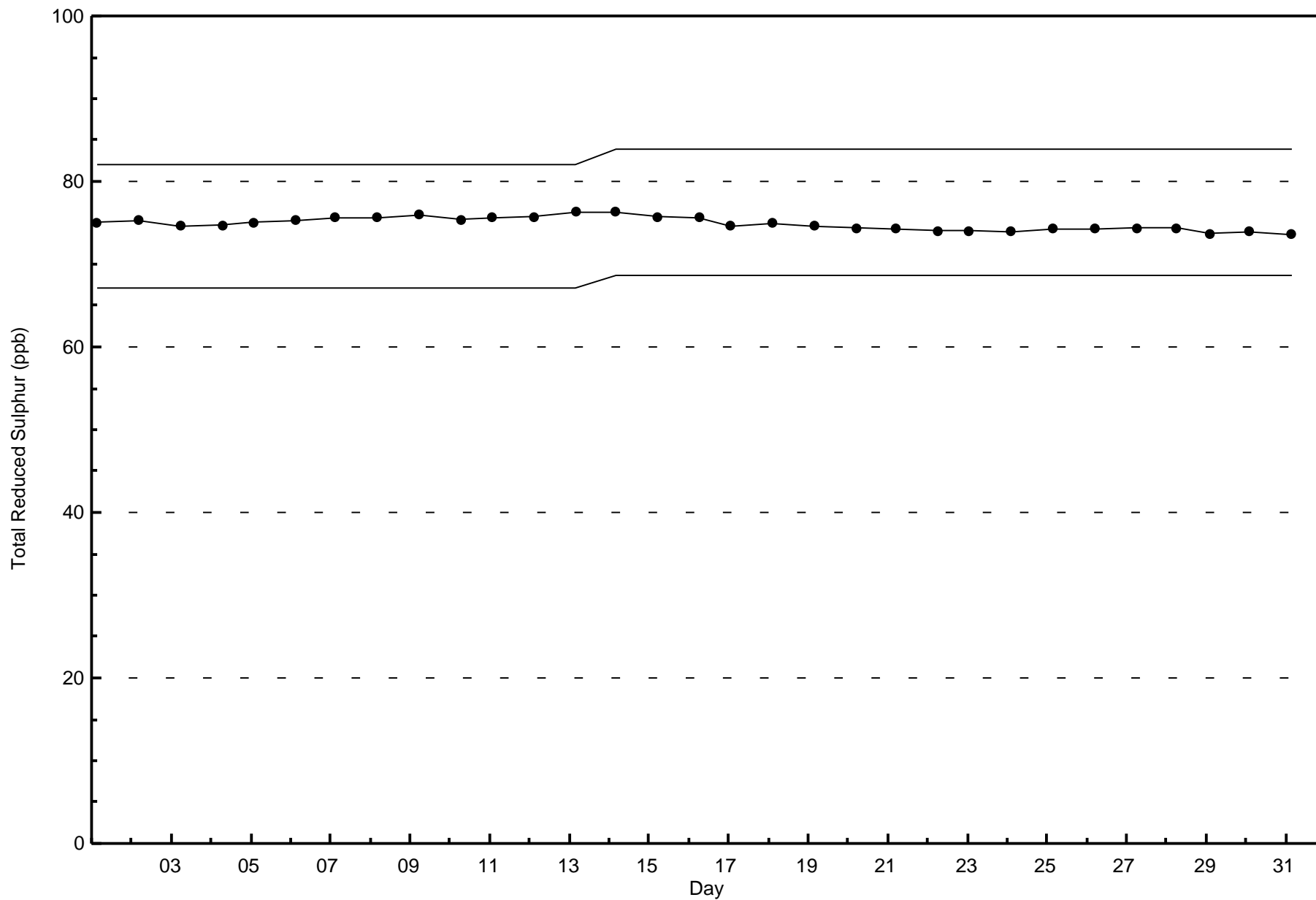


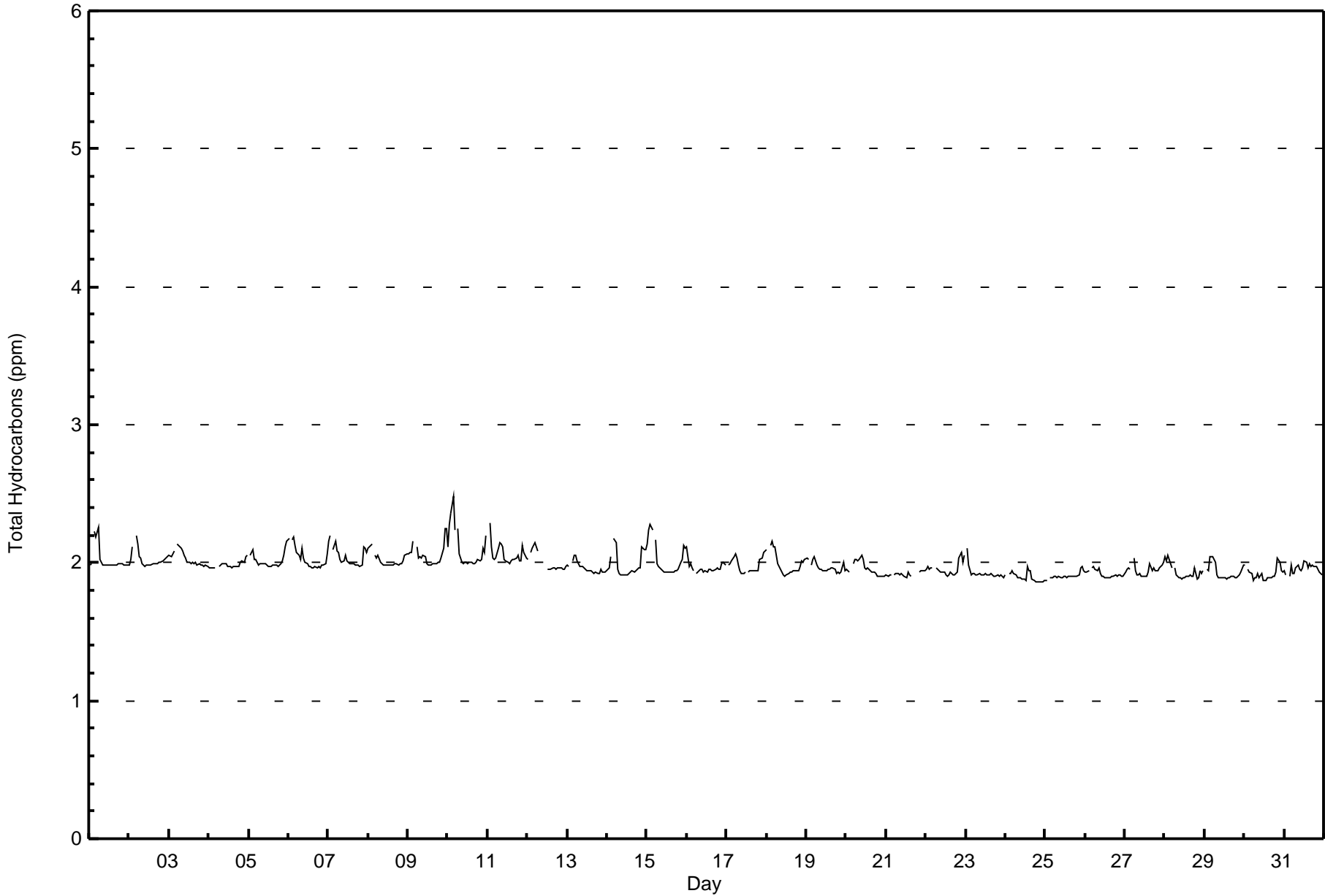
Wood Buffalo Environmental Association
Wind Rose Jul 2016

Total Reduced Sulphur (TRS) - ppb
Anzac (AMS 14)











Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Anzac - July 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	598	85.06	85.06
2.1 - 3.0	105	14.94	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 703

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Total Hydrocarbons (THC) - ppm
Anzac - July 2016

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	63	28	21	27	14	5	6	43	38	21	21	33	55	96	69	56	596
2.1 - 3.0	8	4	2	4	3	1	6	10	1	1	8	5	11	10	19	11	104
3.1 - 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	71	32	23	31	17	6	12	53	39	22	29	38	66	106	88	67	700

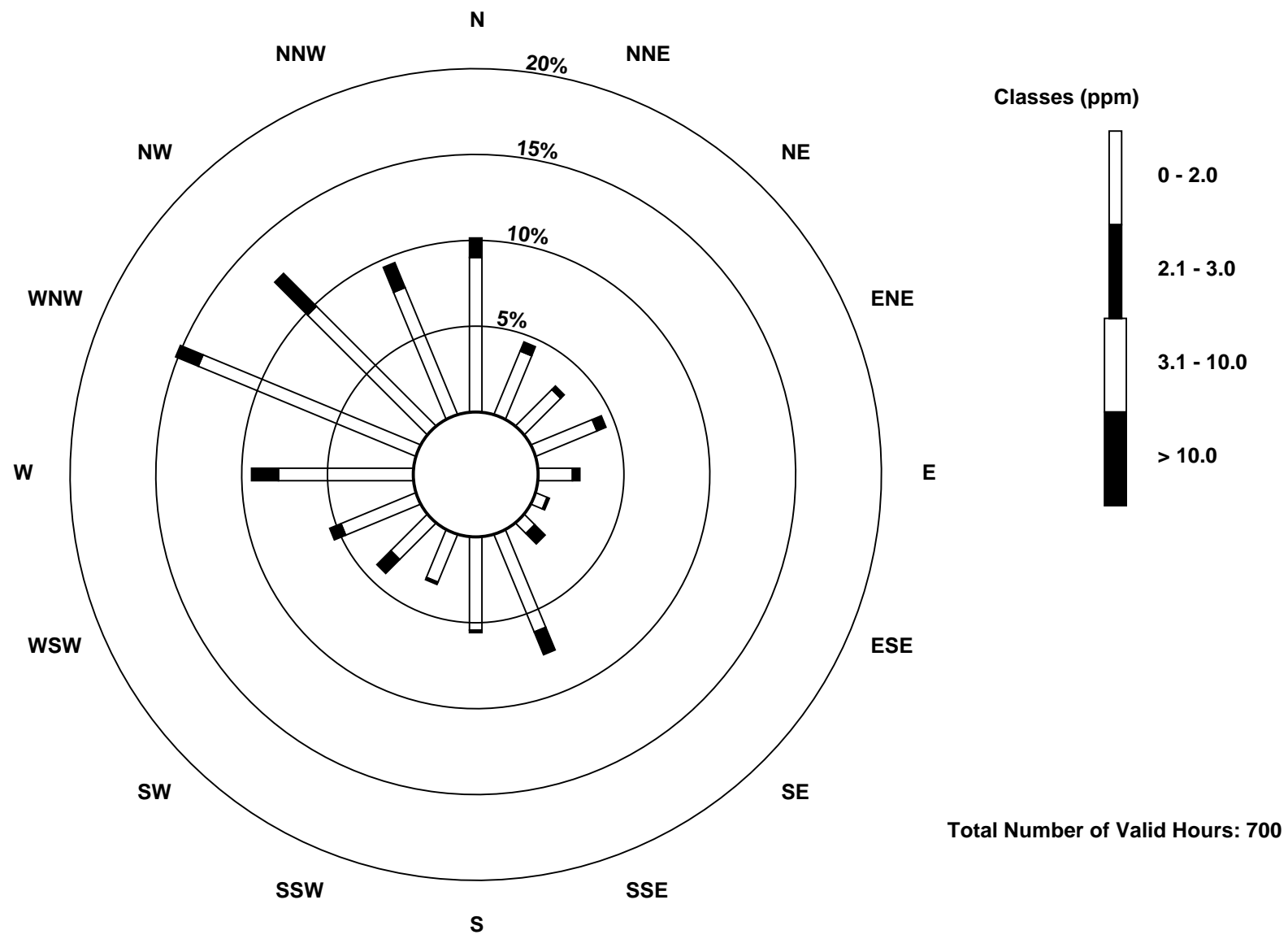
Total Number of Valid Hours: 700

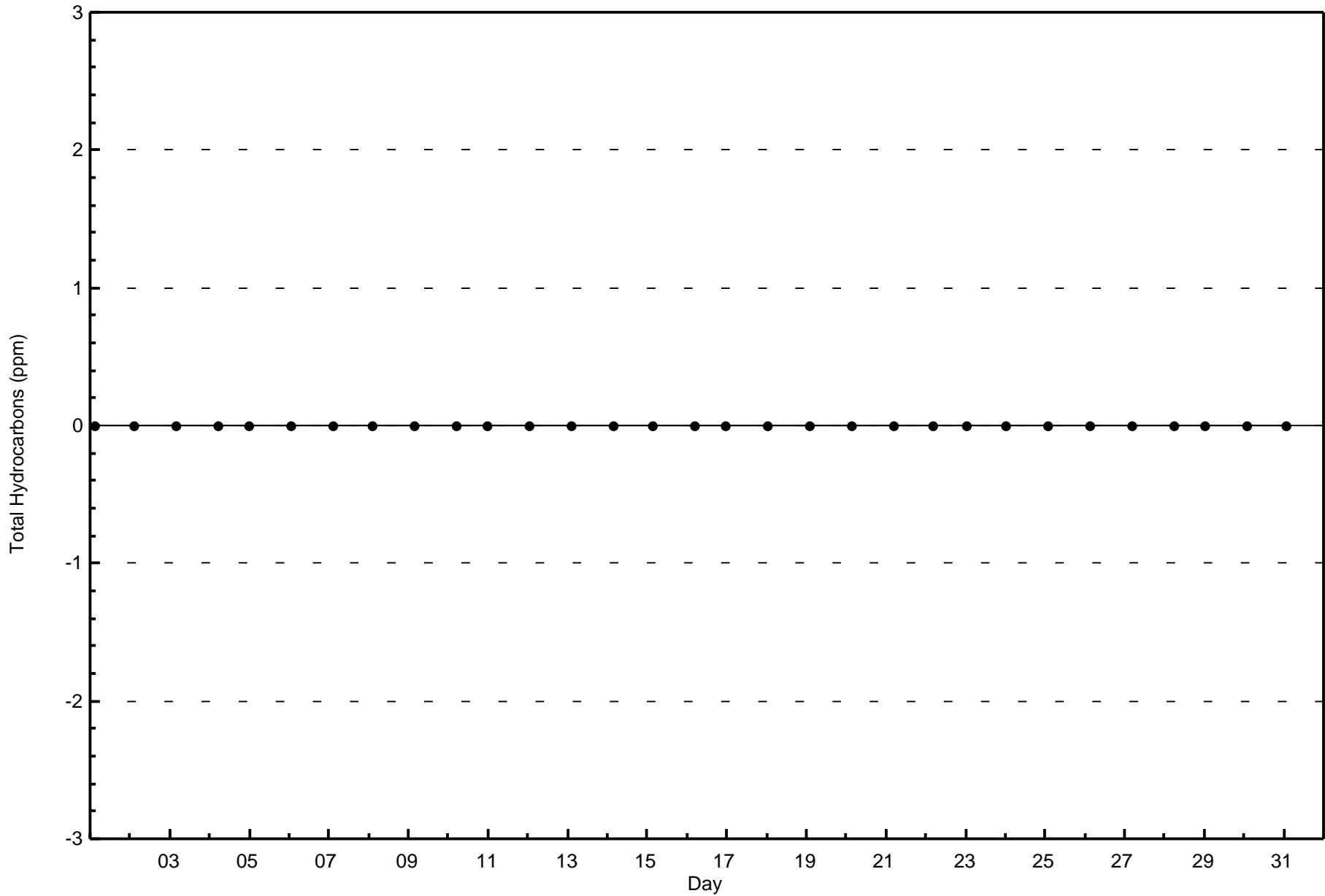
Total Number of Hours: 744

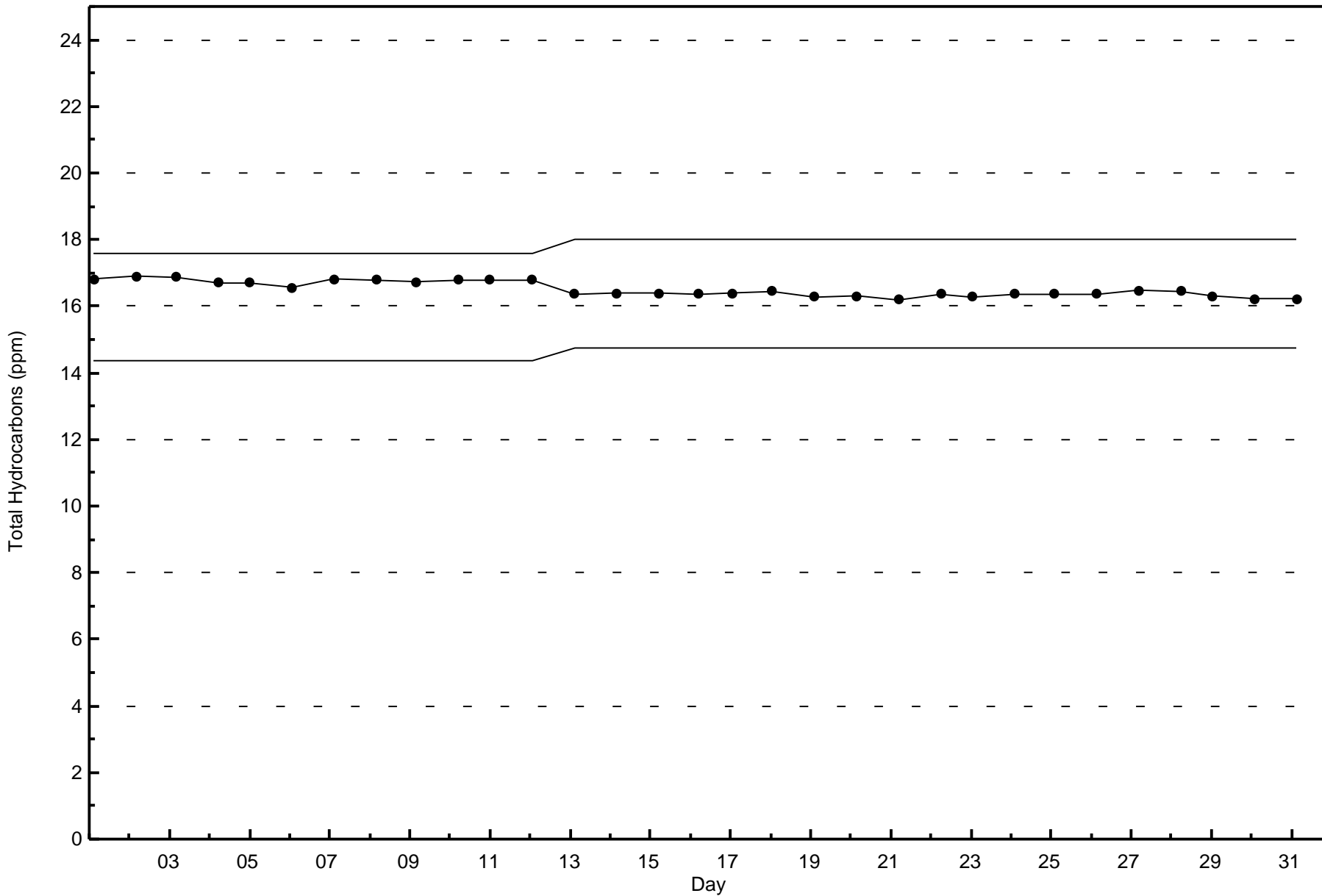


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Total Hydrocarbons (THC) - ppm
Anzac (AMS 14)

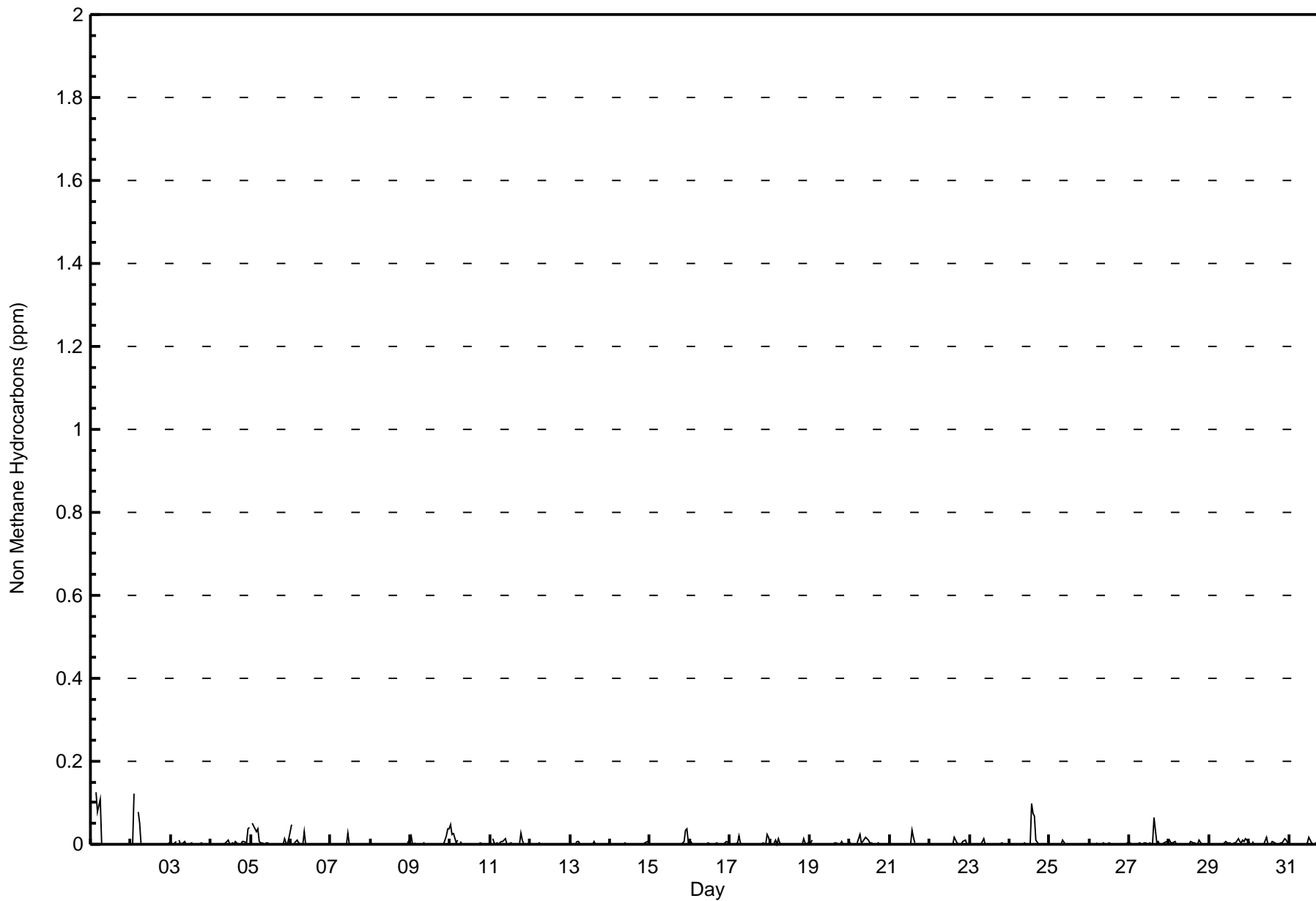








Maximum Value: 0.127 ppm on Jul 1 04:00																			Maximum Daily Average: 0.014 ppm on Jul 1						Hours in Service: 744	
Minimum Value: 0.000 ppm on Jul 1 01:00																			Minimum Daily Average: 0.000 ppm on Jul 12						Hours of Data: 703	
Maximum Diurnal Average: 0.009 ppm at hour 6																			Minimum Diurnal Average: 0.001 ppm at hour 8						Hours of Missing Data: 41	
Monthly Average: 0.004 ppm																			Percentiles: P ₁ = 0.0 P ₁₀ = 0.0 Q ₁ = 0.0 Median = 0.0 Q ₃ = 0.0 P ₉₀ = 0.0 P ₉₉ = 0.1						Hours of Calibration: 36	
																									Percent Operational Time: 99.3	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	0.000	0.000	Z	0.127	0.078	0.108	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	0.014	0.127
2-Jul	0.000	0.002	0.121	Z	0.076	0.050	0.000	0.000	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	0.001	0.001	0.002	0.011	0.121
3-Jul	0.003	0.001	0.003	0.007	Z	0.011	0.001	0.002	0.006	0.001	0.000	0.001	0.003	0.000	0.001	0.001	0.000	0.002	0.004	0.000	0.000	0.000	0.000	0.000	0.002	0.011
4-Jul	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.002	0.011	0.001	0.000	0.004	0.000	0.006	0.001	0.001	0.001	0.007	0.005	0.003	0.036	0.039	0.005	0.039
5-Jul	Z	0.050	0.036	0.030	0.038	0.008	0.002	0.003	0.001	0.003	0.004	0.001	0.001	0.000	0.002	0.001	0.000	0.000	0.000	0.002	0.013	0.002	0.001	0.015	0.009	0.050
6-Jul	0.047	Z	0.004	0.007	0.010	0.003	0.001	0.000	0.031	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	0.005	0.047
7-Jul	0.000	0.000	Z	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.027	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.027
8-Jul	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	0.013	0.001	0.013
9-Jul	0.019	0.000	0.001	0.002	Z	0.001	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.019	0.037	0.036	0.005	0.037
10-Jul	0.047	0.023	0.028	0.004	0.010	Z	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.005	0.000	0.000	0.000	0.000	0.001	0.005	0.047
11-Jul	Z	0.012	0.002	0.000	0.002	0.000	0.006	0.008	0.010	0.013	0.000	0.000	0.003	0.001	0.001	0.001	0.002	0.000	0.028	0.009	0.000	0.002	0.000	0.000	0.004	0.028
12-Jul	0.000	Z	0.001	0.000	0.001	0.003	0.001	C	C	C	C	C	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
13-Jul	0.000	0.001	Z	0.002	0.008	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.008
14-Jul	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.001	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	0.008	0.003	0.001	0.008
15-Jul	0.001	0.001	0.001	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	0.002	0.000	0.000	0.007	0.034	0.036	0.003	0.004	0.036
16-Jul	0.009	0.000	0.000	0.000	0.001	Z	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.001	0.001	0.003	0.001	0.000	0.000	0.000	0.004	0.006	0.005	0.001	0.009
17-Jul	Z	0.000	0.000	0.001	0.002	0.019	0.004	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	0.002	0.002	0.023	0.017	0.003	0.023
18-Jul	0.005	Z	0.003	0.009	0.000	0.012	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.001	0.012	0.004	0.001	0.004	0.002	0.012
19-Jul	0.004	0.011	Z	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.001	0.003	0.002	0.001	0.000	0.006	0.000	0.001	0.000	0.001	0.001	0.011
20-Jul	0.002	0.001	0.001	Z	0.002	0.015	0.024	0.004	0.007	0.018	0.014	0.010	0.003	0.004	0.000	0.001	0.002	0.003	0.002	0.000	0.000	0.001	0.000	0.000	0.005	0.024
21-Jul	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.032	0.016	0.002	PF	PF	PF	PF	0.000	0.000	0.000	0.000	0.003	0.032
22-Jul	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	0.016	0.003	0.000	0.001	0.000	0.007	0.009	0.001	0.000	0.002	0.016
23-Jul	Z	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.013	0.001	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.002	0.001	0.000	0.000	0.001	0.001	0.013
24-Jul	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.001	0.001	0.000	0.098	0.074	0.067	0.012	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.011	0.098
25-Jul	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.009	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	0.009
26-Jul	0.000	0.000	0.000	Z	0.002	0.000	0.000	0.000	0.002	0.000	0.000	0.001	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.001	0.002	0.001	0.004
27-Jul	0.004	0.000	0.000	0.000	Z	0.003	0.005	0.000	0.002	0.005	0.002	0.001	0.005	0.001	0.005	0.063	0.005	0.008	0.001	0.000	0.001	0.002	0.006	0.008	0.006	0.063
28-Jul	0.011	0.005	0.002	0.006	0.000	Z	0.001	0.001	0.000	0.000	0.000	0.001	0.002	0.006	0.004	0.003	0.001	0.000	0.011	0.000	0.001	0.000	0.001	0.001	0.002	0.011
29-Jul	Z	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.004	0.005	0.002	0.003	0.001	0.001	0.004	0.005	0.012	0.008	0.003	0.009	0.005	0.014	0.007	0.004	0.014
30-Jul	0.004	Z	0.005	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.016	0.001	0.001	0.000	0.008	0.002	0.000	0.000	0.000	0.003	0.004	0.014	0.011	0.003	0.003	0.016
31-Jul	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.003	0.017	0.003	0.002	0.002	0.002	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.017
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan			C - Calibration			M - Maintenance			PF - Power Failure																	





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm
Anzac - July 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 0.005	608	86.49	86.49
0.006 - 0.05	86	12.23	98.72
0.06 - 0.1	9	1.28	100.00
> 0.1	0	0.00	100.00

Total Number of Valid Hours: 703

Total Number of Hours: 744



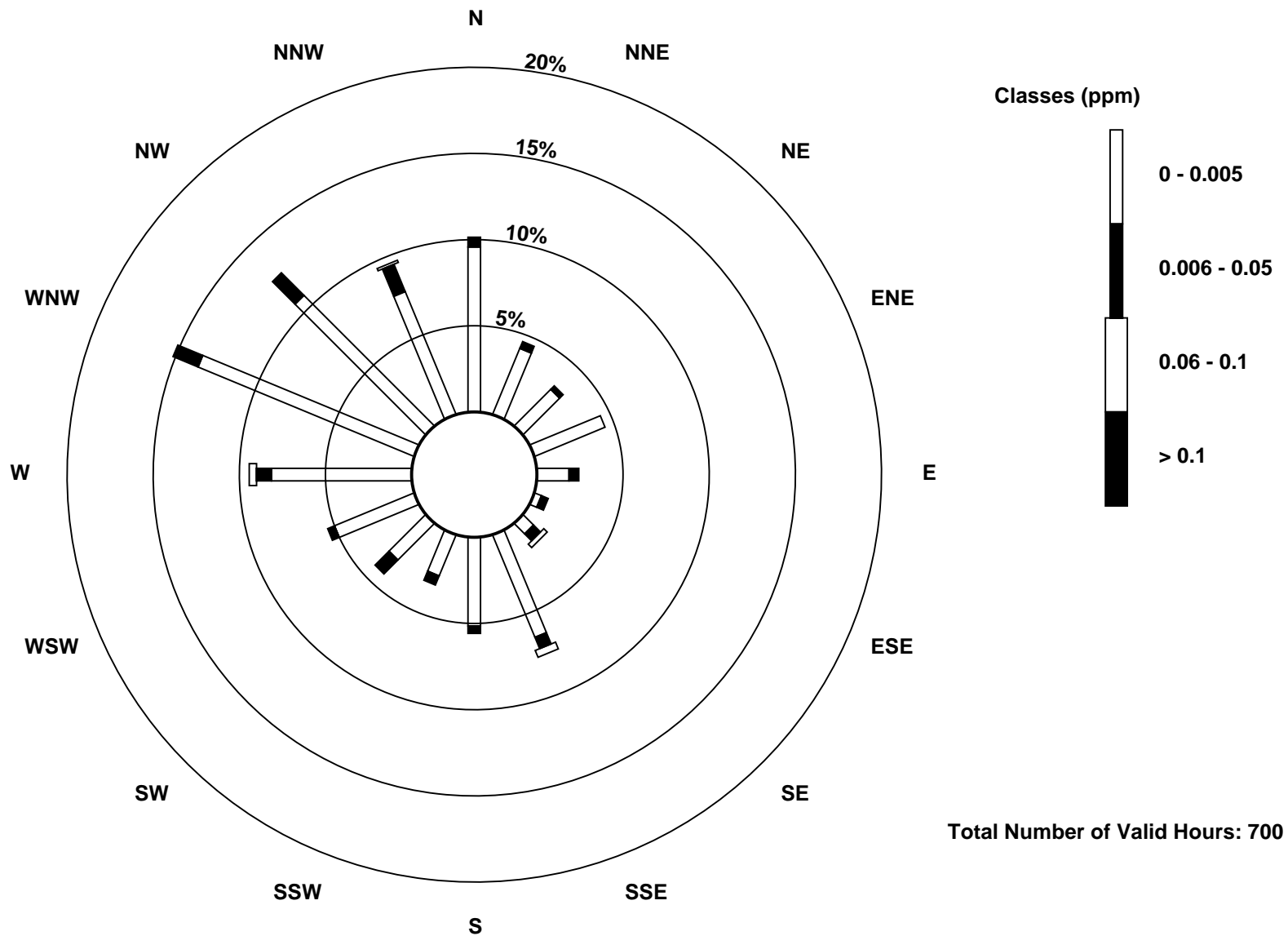
**Wood Buffalo Environmental Association
Frequency Distribution**

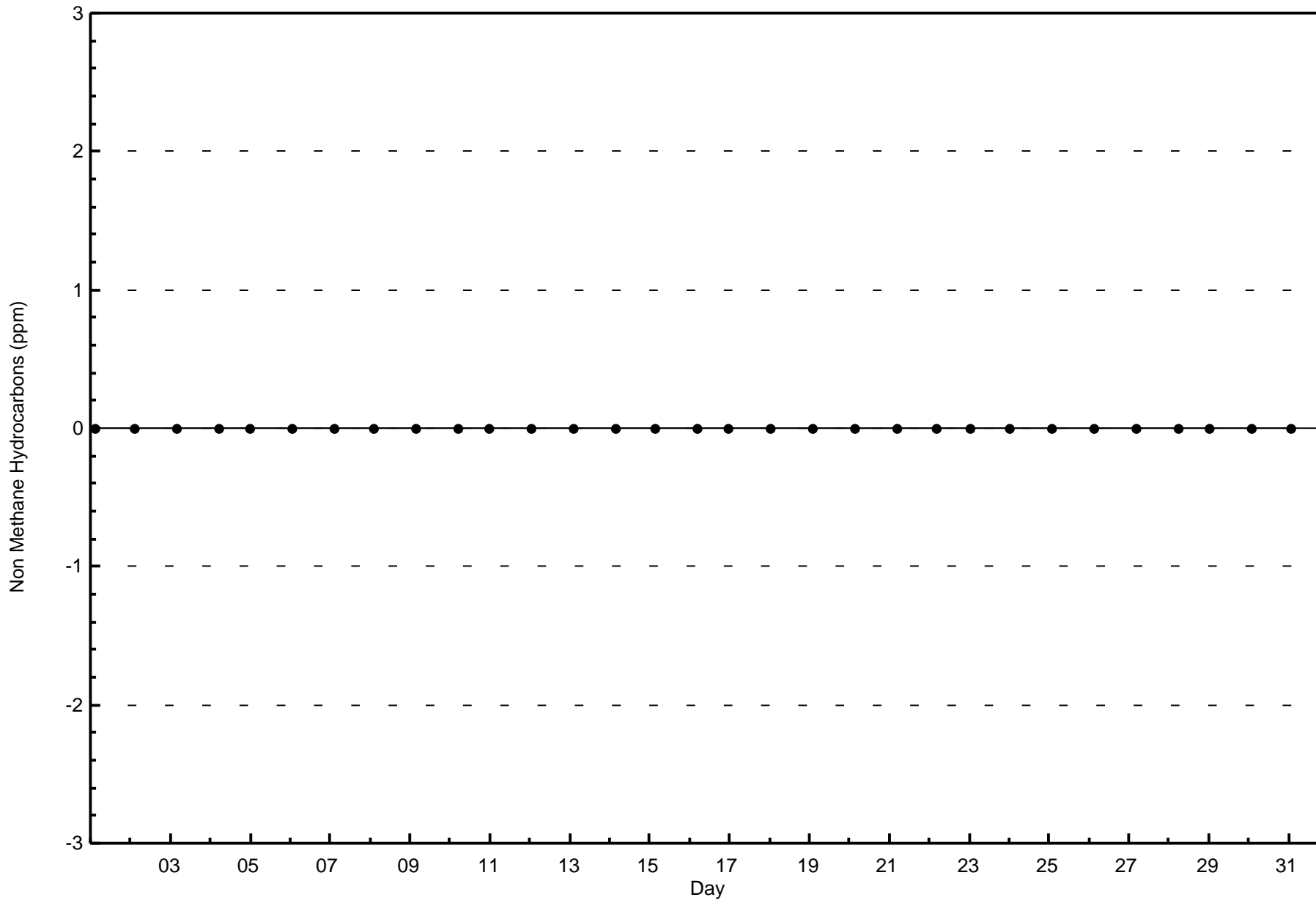
**Non Methane Hydrocarbons (NMHC) - ppm
Anzac - July 2016**

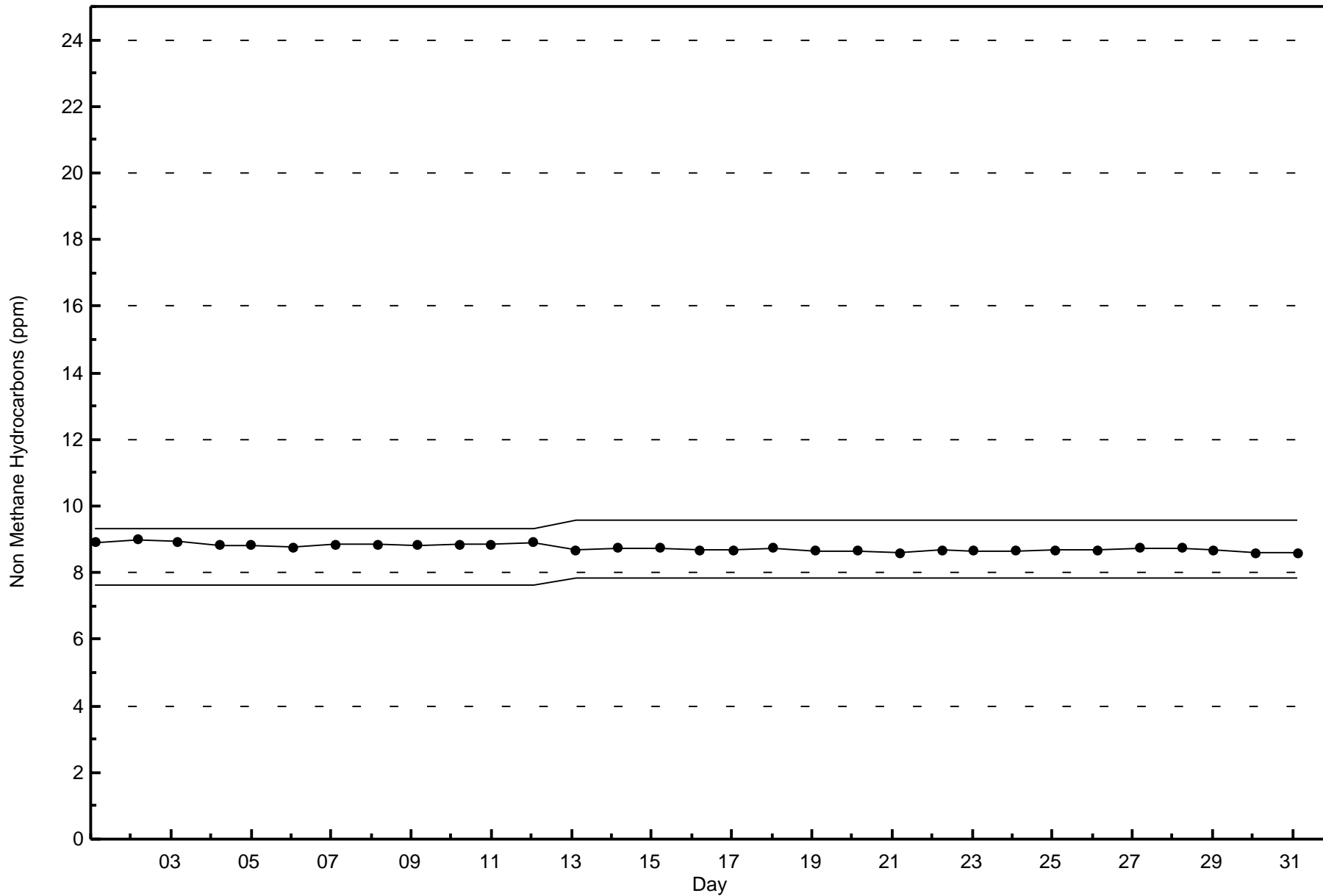
Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 0.005	67	29	21	31	13	3	6	45	36	18	21	35	57	95	75	54	606
0.006 - 0.05	4	3	2	0	4	3	4	5	3	4	8	3	6	11	13	12	85
0.06 - 0.1	0	0	0	0	0	0	2	3	0	0	0	0	3	0	0	1	9
> 0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	71	32	23	31	17	6	12	53	39	22	29	38	66	106	88	67	700

Total Number of Valid Hours: 700

Total Number of Hours: 744









Wood Buffalo Environmental Association

Summary of Hour Averages

Methane (CH₄) - ppm

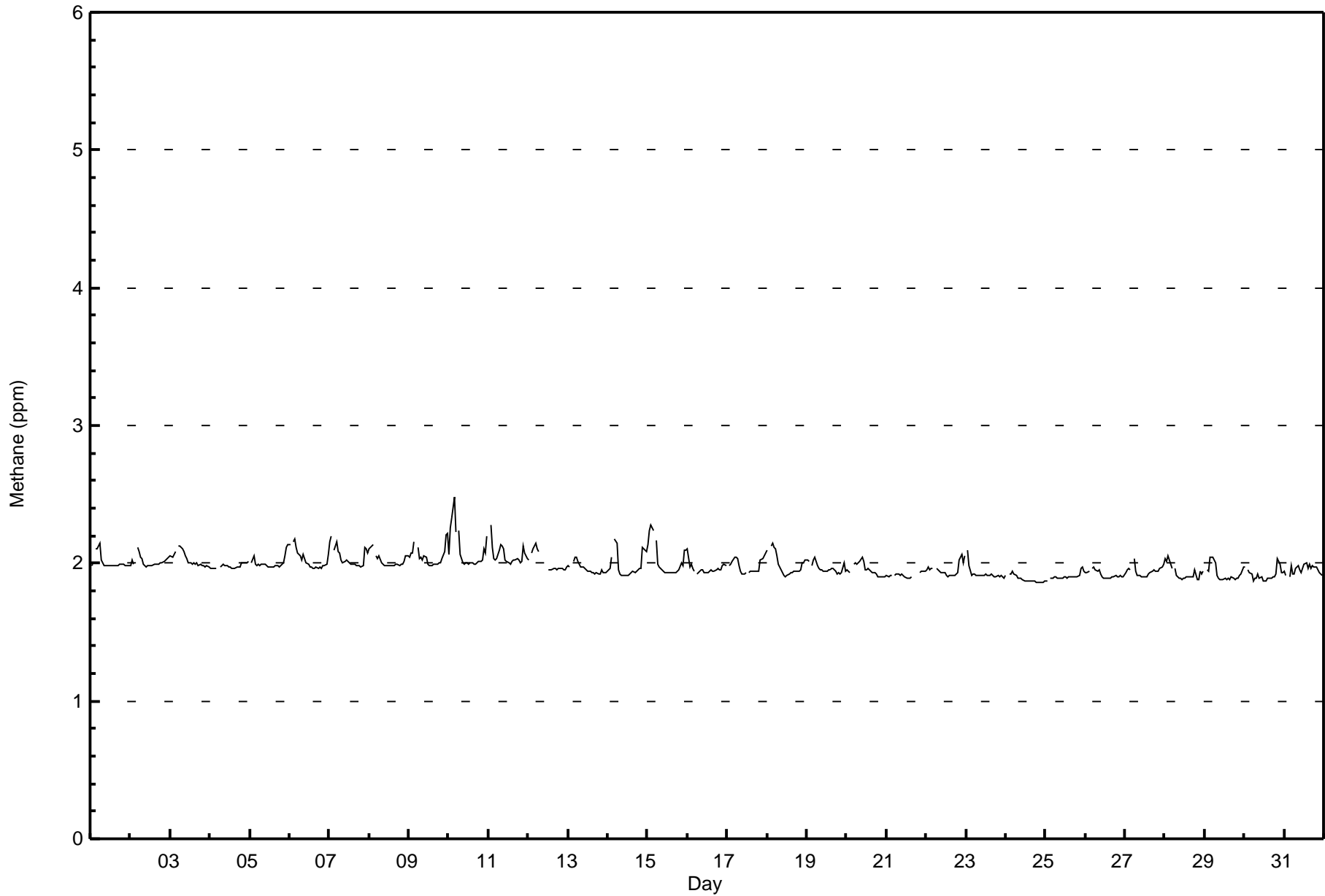
Anzac - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 2.5 ppm on Jul 10 04:00 Maximum Daily Average: 2.1 ppm on Jul 10														Hours in Service: 744 Hours of Data: 703 Hours of Missing Data: 41 Hours of Calibration: 36 Percent Operational Time: 99.3														
Minimum Value: 1.9 ppm on Jul 24 20:00 Minimum Daily Average: 1.9 ppm on Jul 24 Maximum Diurnal Average: 2.0 ppm at hour 3 Minimum Diurnal Average: 1.9 ppm at hour 13 Monthly Average: 1.98 ppm Percentiles: P ₁ = 1.9 P ₁₀ = 1.9 Q ₁ = 1.9 Median = 2.0 Q ₃ = 2.0 P ₉₀ = 2.1 P ₉₉ = 2.2																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24				
1-Jul	2.0	2.0	Z	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1
2-Jul	2.0	2.0	2.0	Z	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1
3-Jul	2.1	2.0	2.1	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	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	
4-Jul	2.0	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
5-Jul	Z	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.0	2.1	2.1	
6-Jul	2.1	Z	2.2	2.2	2.1	2.1	2.1	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.2	
7-Jul	2.2	2.2	Z	2.1	2.2	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.0	2.2	2.2	
8-Jul	2.1	2.1	2.1	Z	2.1	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.0	2.1	2.1	
9-Jul	2.0	2.1	2.1	2.2	Z	2.1	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.2	2.2	2.1	2.2	2.2	
10-Jul	2.1	2.3	2.3	2.5	2.2	Z	2.2	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.2	2.1	2.5	2.5	
11-Jul	Z	2.3	2.1	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.0	2.1	2.3	2.3	
12-Jul	2.0	Z	2.1	2.1	2.1	2.1	2.1	C	C	C	C	C	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	
13-Jul	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	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	
14-Jul	2.0	2.0	2.0	Z	2.2	2.1	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.1	2.1	2.1	2.0	2.2	2.2	
15-Jul	2.1	2.2	2.3	2.2	Z	2.2	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.1	2.1	2.0	2.3	2.3	
16-Jul	2.1	2.0	2.0	2.0	1.9	Z	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	2.0	1.9	1.9	2.0	2.0	2.0	1.9	2.0	2.0	2.0	2.0	2.1	2.1	
17-Jul	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	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	2.0	2.0	2.1	2.1	2.0	2.1	
18-Jul	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.1	
19-Jul	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	2.0	1.9	2.0	2.0	2.0	
20-Jul	2.0	1.9	1.9	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	
21-Jul	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	PF	PF	PF	PF	1.9	1.9	1.9	1.9	1.9	1.9	
22-Jul	2.0	2.0	2.0	2.0	2.0	Z	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.1	2.0	2.1	2.0	2.1	2.1	
23-Jul	Z	2.1	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.1	
24-Jul	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	
25-Jul	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	2.0	1.9	1.9	2.0	2.0	
26-Jul	1.9	1.9	1.9	Z	2.0	2.0	2.0	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	
27-Jul	1.9	2.0	2.0	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	2.0	1.9	1.9	1.9	2.0	2.0	2.0	2.0	
28-Jul	2.0	2.0	2.1	2.0	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	2.0	1.9	1.9	1.9	1.9	1.9	1.9	2.1	
29-Jul	Z	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	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	
30-Jul	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	2.0	2.0	1.9	1.9	1.9	2.0	2.0	
31-Jul	1.9	1.9	Z	1.9	2.0	1.9	1.9	2.0	2.0	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	2.0	2.0	2.0	
																								Diurnal Average				
																								Diurnal Maximum				
Z - zerospan C - Calibration M - Maintenance PF - Power Failure																												



Wood Buffalo Environmental Association
Hourly Averages

Methane (CH₄) - ppm
Anzac - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Methane (CH₄) - ppm
Anzac - July 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	607	86.34	86.34
2.1 - 3.0	96	13.66	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 703

Total Number of Hours: 744



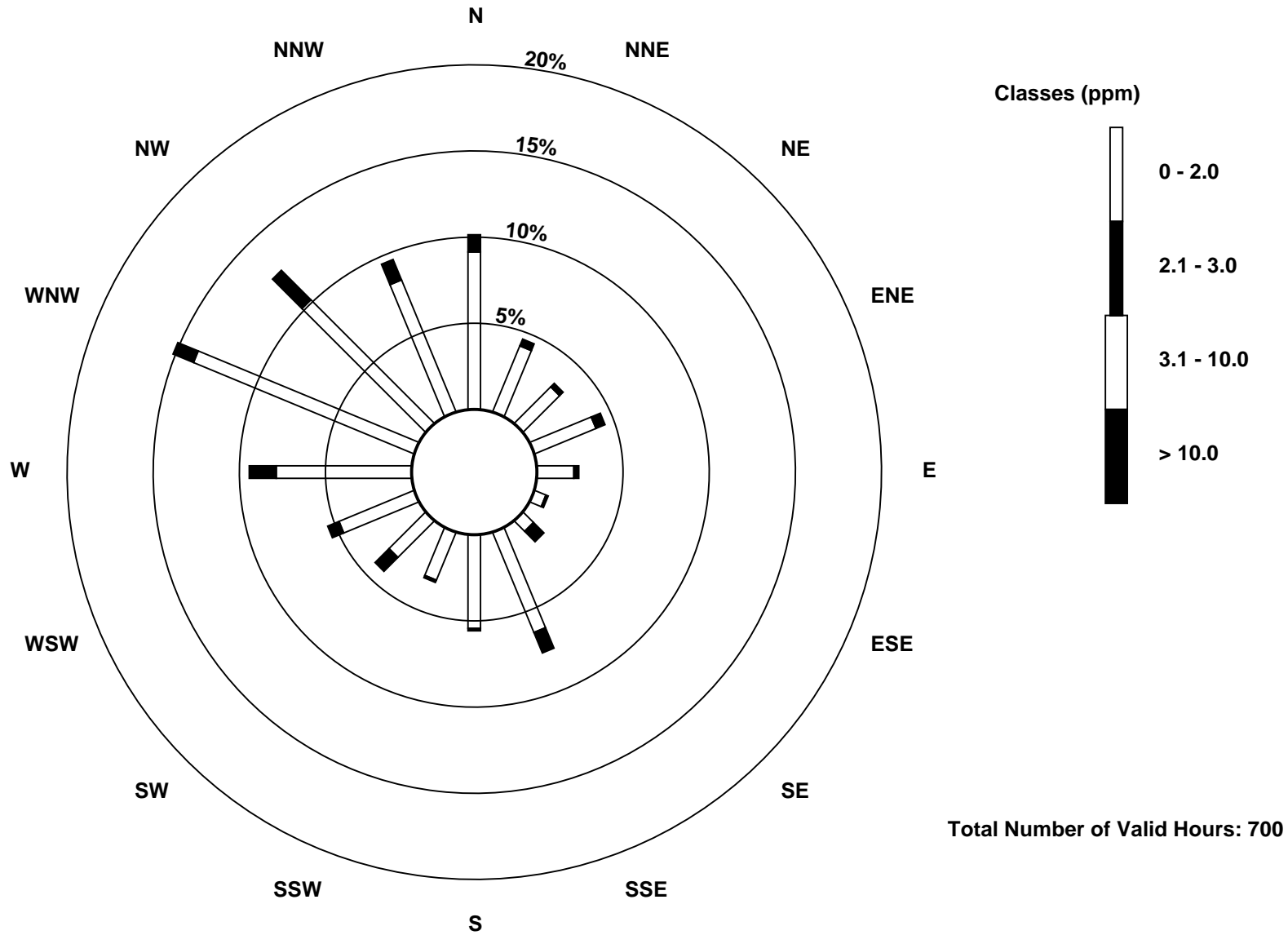
**Wood Buffalo Environmental Association
Frequency Distribution**

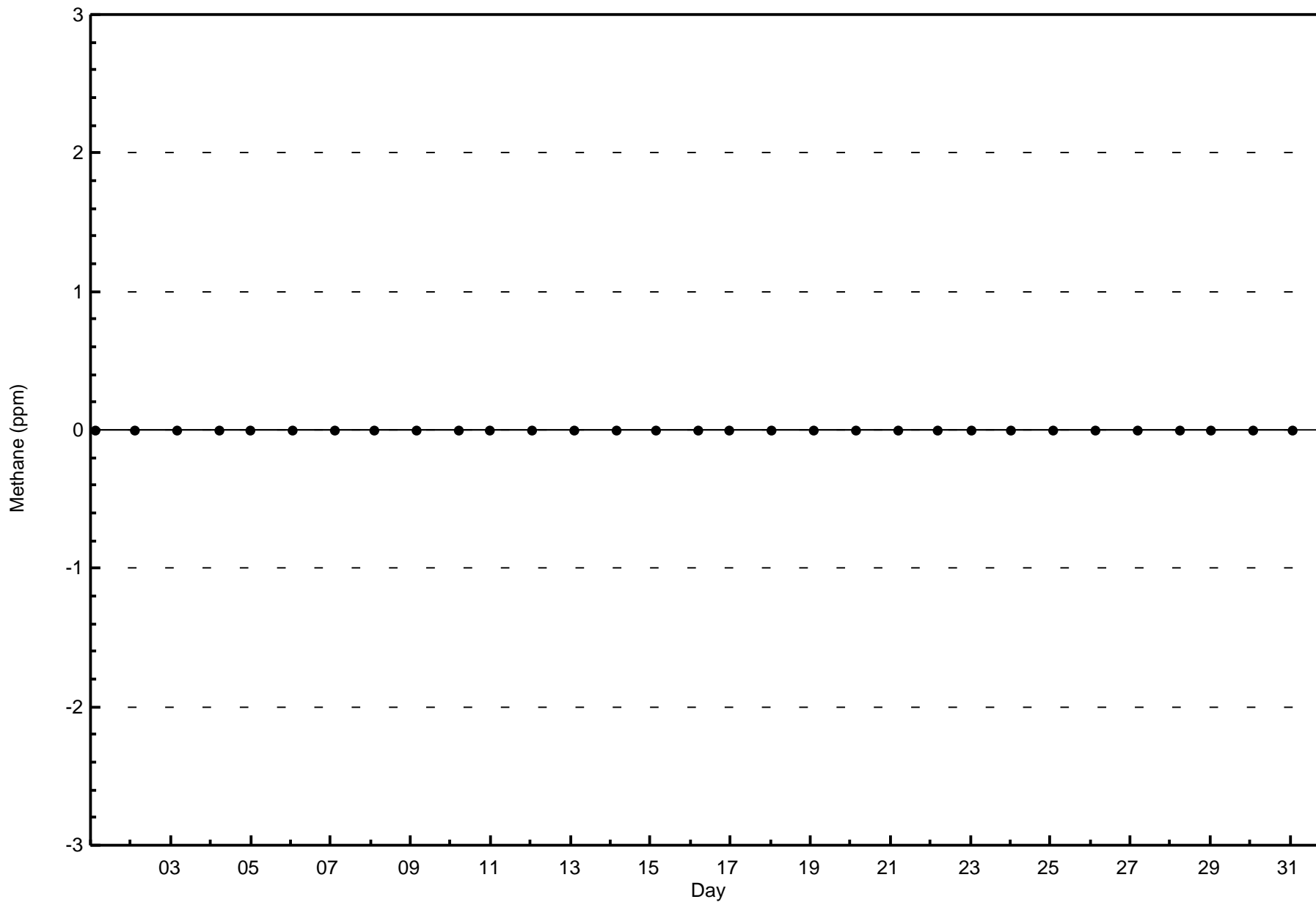
**Methane (CH₄) - ppm
Anzac - July 2016**

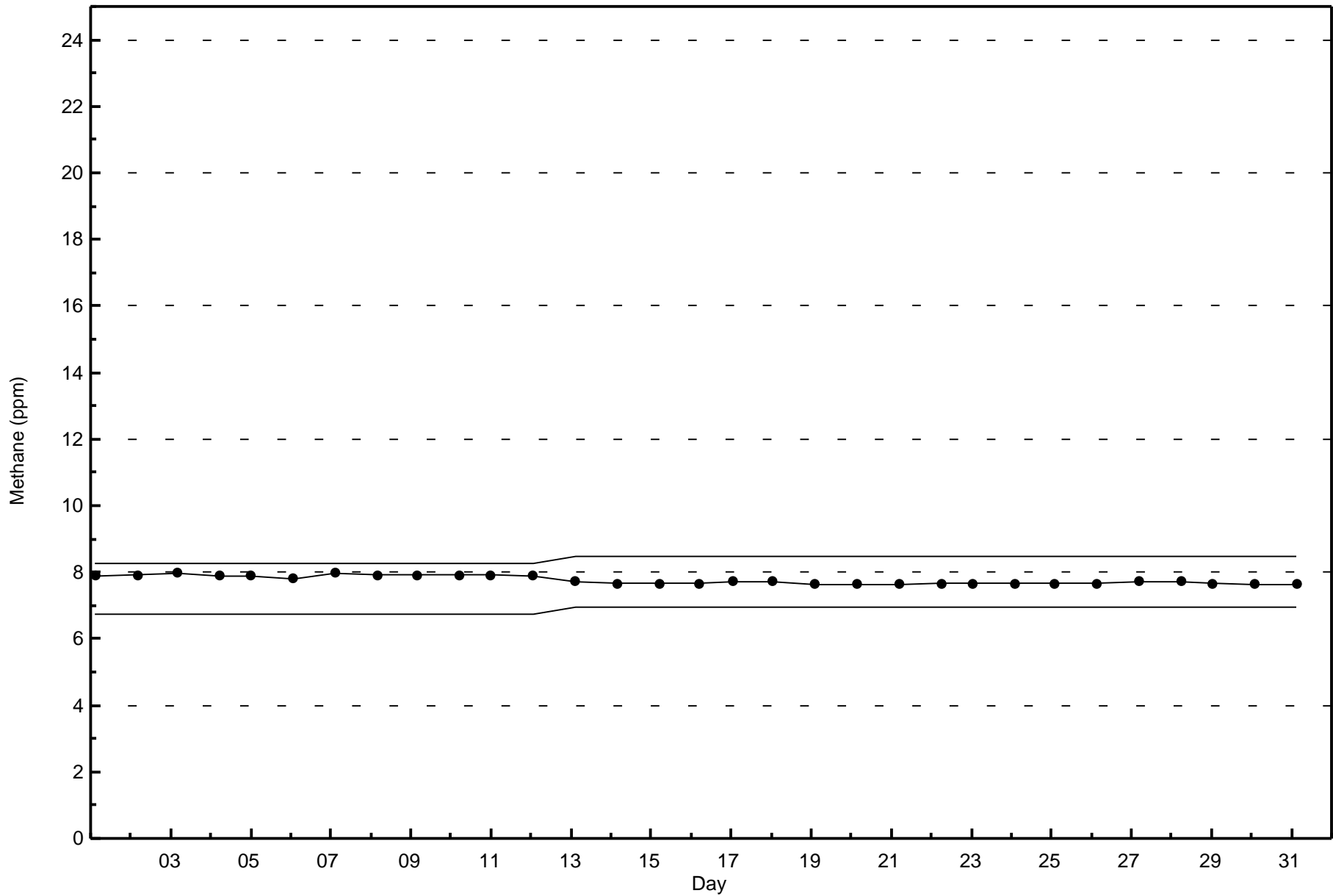
Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	64	29	21	27	15	5	6	44	38	21	21	33	55	97	71	58	605
2.1 - 3.0	7	3	2	4	2	1	6	9	1	1	8	5	11	9	17	9	95
3.1 - 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	71	32	23	31	17	6	12	53	39	22	29	38	66	106	88	67	700

Total Number of Valid Hours: 700

Total Number of Hours: 744







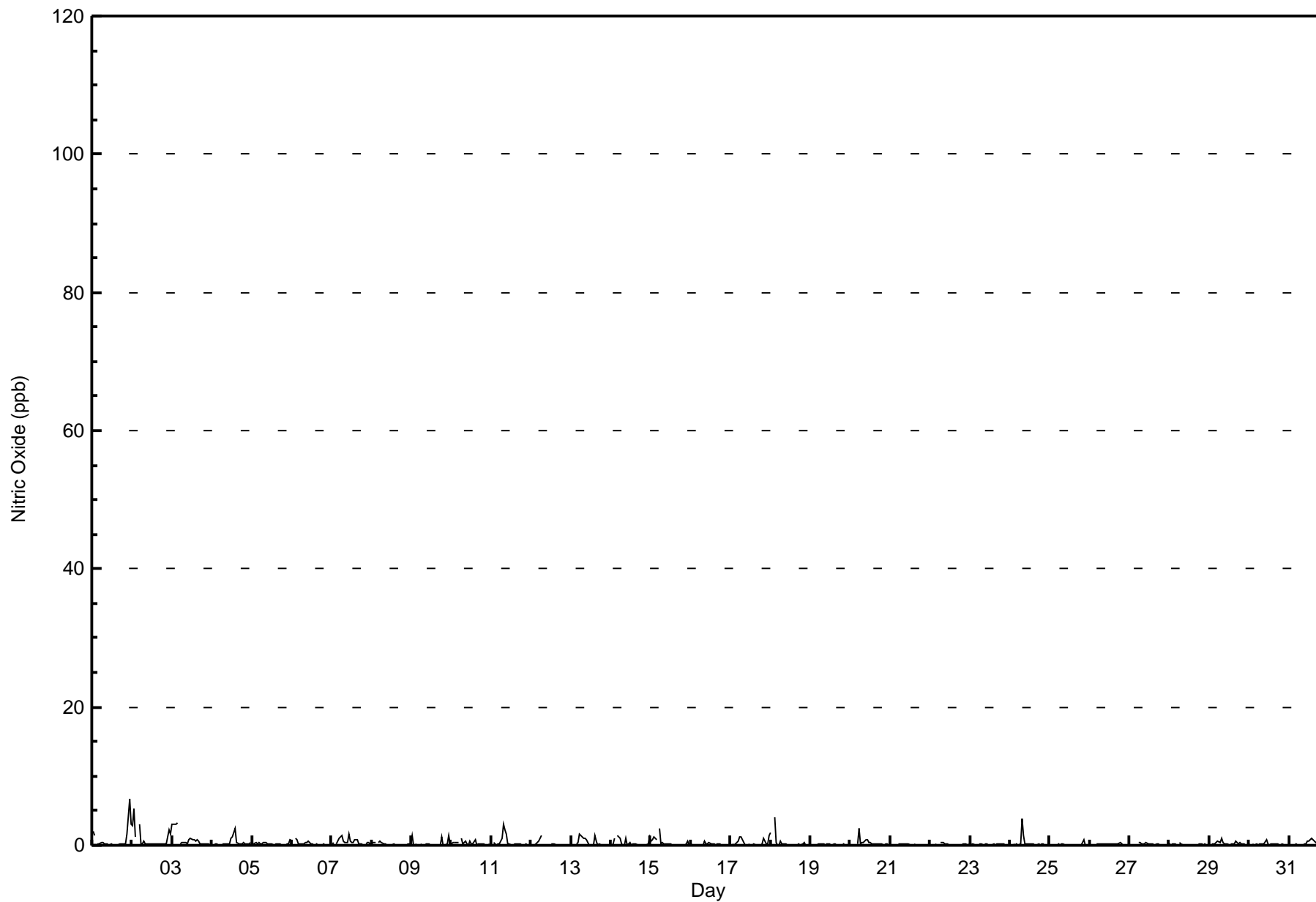


Maximum Value: 7 ppb on Jul 1 23:00		Maximum Daily Average: 0.9 ppb on Jul 2		Hours in Service: 744																							
Minimum Value: 0 ppb on Jul 13 23:00		Minimum Daily Average: 0.1 ppb on Jul 19		Hours of Data: 702																							
Maximum Diurnal Average: 0.6 ppb at hour 6		Minimum Diurnal Average: 0.1 ppb at hour 20		Hours of Missing Data: 42																							
Monthly Average: 0.3 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 3		Hours of Calibration: 36																							
				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-Jul	2	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	7	3	0.8	7	
2-Jul	3	5	1	Z	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	0.9	5	
3-Jul	3	3	3	3	Z	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0.9	3	
4-Jul	0	0	0	0	0	Z	0	0	0	0	0	1	1	2	3	0	0	0	0	0	0	0	0	0	0.5	3	
5-Jul	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	1	
6-Jul	1	Z	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
7-Jul	0	0	Z	0	1	1	1	1	0	1	2	1	0	0	1	1	0	0	0	0	0	0	0	0	0.5	2	
8-Jul	0	0	0	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
9-Jul	1	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0.3	1	
10-Jul	0	0	0	0	0	Z	1	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0.3	1	
11-Jul	Z	0	0	0	0	0	1	3	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	3	
12-Jul	0	Z	0	0	1	1	1	C	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
13-Jul	0	0	Z	0	0	2	1	1	1	1	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0.4	2	
14-Jul	0	0	1	Z	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.4	1	
15-Jul	1	1	1	1	Z	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2	
16-Jul	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	
17-Jul	Z	0	0	0	1	1	1	1	0	0	0	0	M	0	0	0	0	0	0	0	0	1	0	1	0.4	1	
18-Jul	2	Z	4	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	4	
19-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
20-Jul	0	0	0	Z	0	2	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2	
21-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	PF	PF	PF	PF	PF	0	0	0.1	0	
22-Jul	0	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	
23-Jul	Z	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	
24-Jul	0	Z	0	0	0	0	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	4	
25-Jul	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	
26-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
27-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
28-Jul	0	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	
29-Jul	Z	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.3	1	
30-Jul	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
31-Jul	0	0	Z	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0.3	1	
		0.5	0.5	0.6	0.3	0.4	0.6	0.5	0.5	0.4	0.3	0.3	0.3	0.2	0.2	0.3	0.2	0.2	0.1	0.2	0.1	0.2	0.2	0.5	0.4	Diurnal Average	
		3	5	4	3	3	2	1	4	2	2	2	1	1	2	3	1	1	0	1	0	1	2	7	3	Diurnal Maximum	
Z - zerospan		C - Calibration			M - Maintenance			PF - Power Failure																			



Wood Buffalo Environmental Association
Hourly Averages

Nitric Oxide (NO) - ppb
Anzac - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb
Anzac - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
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
Anzac - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	70	32	23	31	17	6	12	53	39	22	29	38	66	106	88	67	699
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	70	32	23	31	17	6	12	53	39	22	29	38	66	106	88	67	699

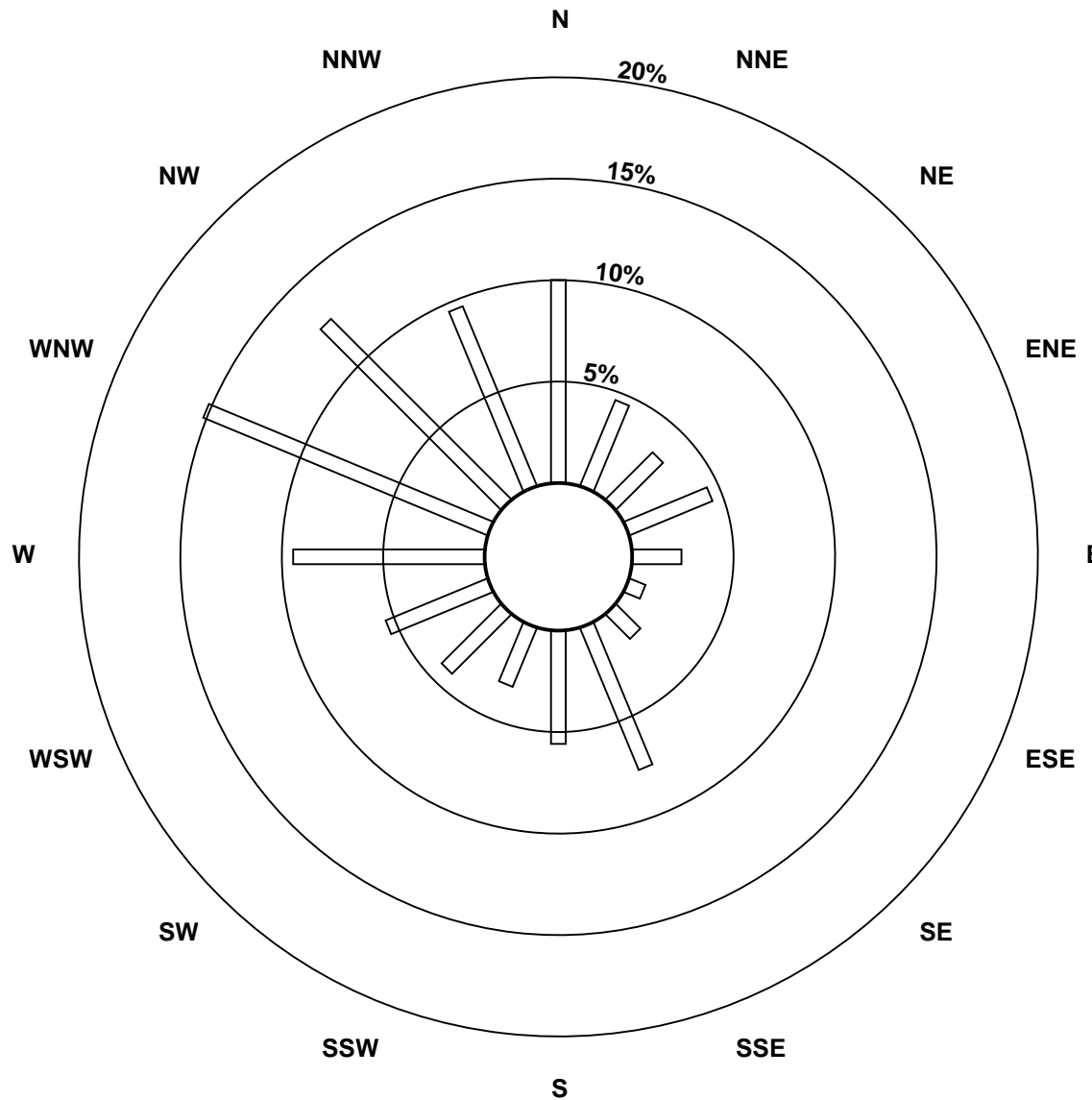
Total Number of Valid Hours: 699

Total Number of Hours: 744

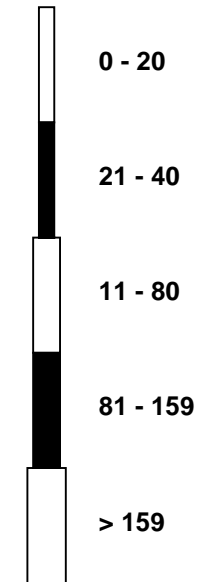


Wood Buffalo Environmental Association
Wind Rose Jul 2016

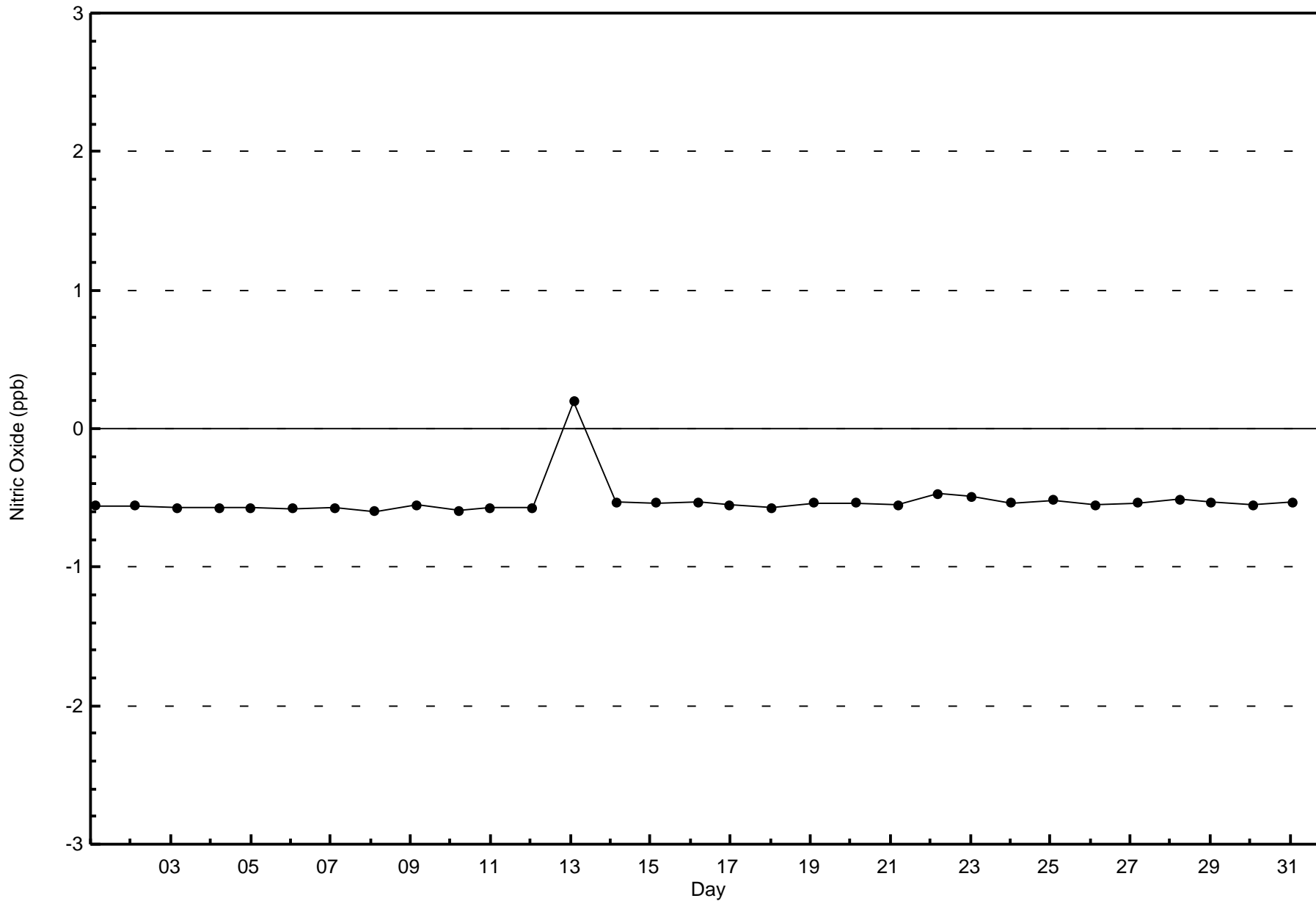
Nitric Oxide (NO) - ppb
Anzac (AMS 14)

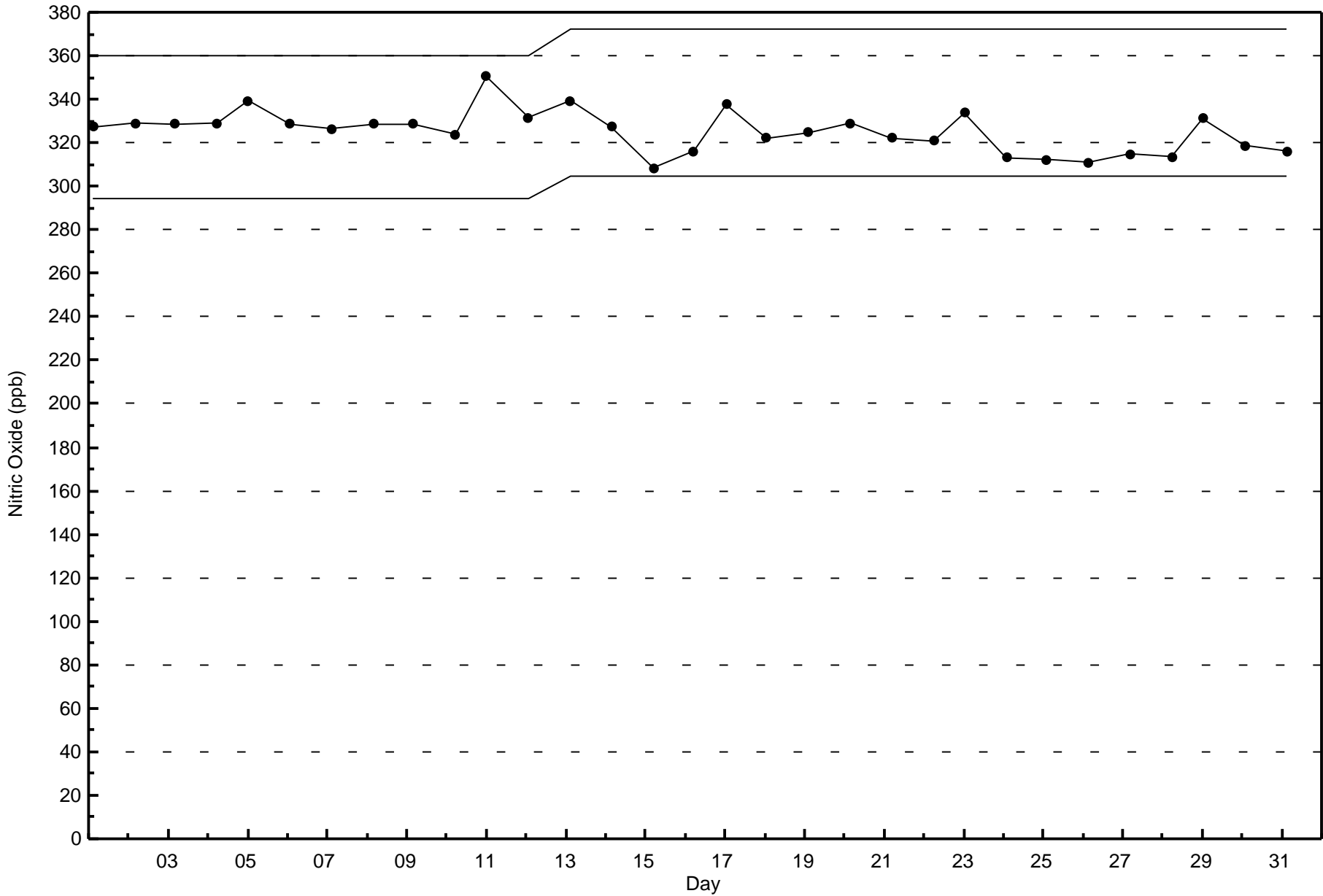


Classes (ppb)



Total Number of Valid Hours: 699







Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

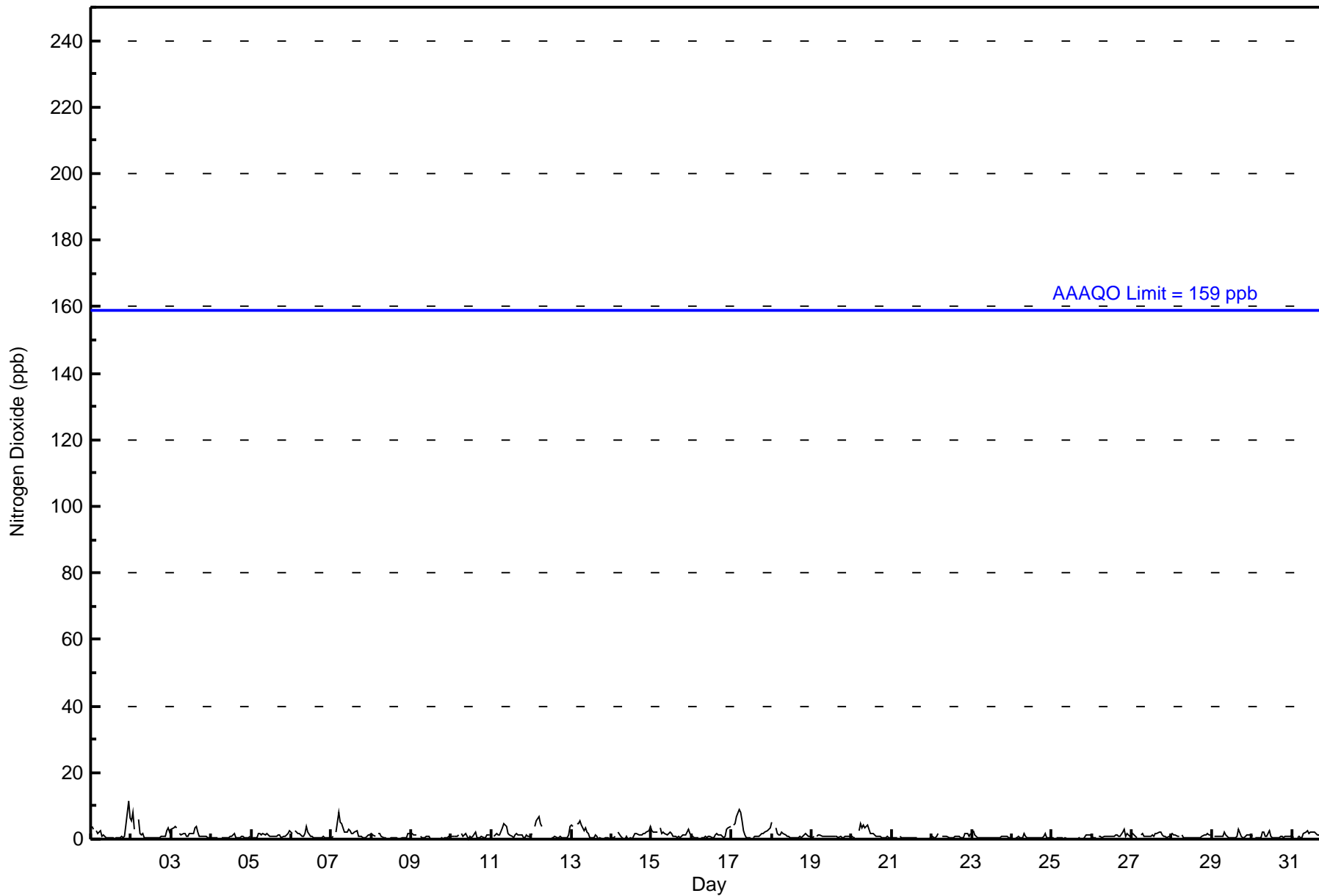
Anzac - July 2016

Number of Exceedences (AAAQO):		1-hr: 0 24-hr: 0		Hours in Service: 744																																													
Maximum Value: 12 ppb on Jul 1 23:00		Maximum Daily Average: 2.8 ppb on Jul 17		Hours of Data: 702																																													
Minimum Value: 0 ppb on Jul 25 11:00		Minimum Daily Average: 0.4 ppb on Jul 21		Hours of Missing Data: 42																																													
Maximum Diurnal Average: 2.3 ppb at hour 5		Minimum Diurnal Average: 0.7 ppb at hour 18		Hours of Calibration: 36																																													
Monthly Average: 1.2 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 1 Q ₃ = 2 P ₉₀ = 3 P ₉₉ = 7		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-Jul	4	3	Z	2	2	2	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	4	12	6	1.9	12																							
2-Jul	6	8	3	Z	6	2	1	2	1	0	0	1	1	1	1	1	1	1	1	1	1	3	3	2	1.9	8																							
3-Jul	3	3	4	3	Z	2	1	2	2	1	1	2	2	2	3	4	2	1	1	1	1	1	1	0	1.7	4																							
4-Jul	0	0	0	0	0	Z	0	1	1	1	1	1	1	1	2	1	1	0	1	1	1	1	1	1	0.7	2																							
5-Jul	Z	1	0	1	2	2	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	2	3	1.2	3																							
6-Jul	2	Z	2	2	2	2	1	1	2	4	2	1	1	1	0	1	1	0	0	1	1	0	0	1	1.1	4																							
7-Jul	1	1	Z	2	8	5	5	3	2	2	3	2	2	2	3	1	1	1	1	1	0	1	1	1	2.2	8																							
8-Jul	2	1	1	Z	2	2	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	2	2	0.7	2																							
9-Jul	2	1	1	1	Z	1	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	1	1	1	0.6	2																							
10-Jul	1	1	1	1	1	Z	2	1	2	1	0	1	0	1	2	0	0	1	1	1	1	1	1	1	0.9	2																							
11-Jul	Z	1	1	2	1	1	3	5	4	4	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1.6	5																							
12-Jul	2	Z	4	6	7	5	4	C	C	C	C	C	1	1	1	1	1	1	0	0	0	0	1	4	2.0	7																							
13-Jul	4	4	Z	5	5	6	4	3	3	2	2	0	0	1	1	0	1	0	0	0	0	0	0	0	1.8	6																							
14-Jul	0	1	1	Z	2	1	1	0	0	1	0	0	0	1	2	2	1	1	1	2	2	2	3	4	1.2	4																							
15-Jul	3	2	2	2	Z	3	2	2	2	1	2	2	2	1	1	1	1	1	1	1	1	2	3	2	1.6	3																							
16-Jul	1	1	1	0	1	Z	0	1	1	1	1	1	1	1	2	1	1	1	1	1	1	3	4	4	1.1	4																							
17-Jul	Z	4	5	7	9	8	5	3	1	0	1	1	M	1	1	1	1	1	1	2	2	2	2	3	3	2.8	9																						
18-Jul	5	Z	4	2	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1.3	5																							
19-Jul	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1																							
20-Jul	1	0	0	Z	3	5	3	4	4	4	3	2	2	2	1	1	1	1	1	1	1	1	1	0	1.7	5																							
21-Jul	0	0	0	0	Z	1	1	0	0	0	0	1	0	0	0	0	PF	PF	PF	PF	PF	0	0	1	0.4	1																							
22-Jul	1	1	1	1	2	Z	1	1	1	1	1	1	0	1	1	1	1	1	1	1	2	2	1	2	0.8	2																							
23-Jul	Z	3	1	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	1	1	1	1	0	0	0.6	3																							
24-Jul	0	Z	1	1	1	0	1	2	1	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0.5	2																							
25-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0.4	1																							
26-Jul	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3	1	2	1	1	1.1	3																							
27-Jul	2	1	1	1	Z	1	2	1	1	1	1	1	1	1	2	2	2	2	2	1	1	1	1	1	1.1	2																							
28-Jul	2	1	1	1	1	Z	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	2	1	1	0.8	2																							
29-Jul	Z	1	1	1	1	1	1	2	1	1	1	1	0	0	1	1	3	1	1	0	1	1	1	1	0.9	3																							
30-Jul	1	Z	1	0	1	0	2	2	1	1	3	1	0	0	1	0	1	1	1	1	1	1	1	1	0.9	3																							
31-Jul	1	0	Z	0	1	1	1	2	2	3	2	2	2	2	2	1	1	1	1	1	1	1	1	0	1.2	3																							
																								1.7	1.6	1.5	1.6	2.3	2.0	1.6	1.4	1.2	1.2	1.0	0.8	0.7	0.7	1.0	0.9	0.8	0.7	0.8	0.8	0.9	1.3	1.6	1.5	Diurnal Average	
																								6	8	5	7	9	8	5	5	4	4	3	2	2	2	3	4	3	2	2	3	2	4	12	6	Diurnal Maximum	
Z - zerospan 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 (NO₂) - ppb
Anzac - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitrogen Dioxide (NO₂) - ppb
Anzac - July 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
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**

**Nitrogen Dioxide (NO₂) - ppb
Anzac - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	70	32	23	31	17	6	12	53	39	22	29	38	66	106	88	67	699
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	70	32	23	31	17	6	12	53	39	22	29	38	66	106	88	67	699

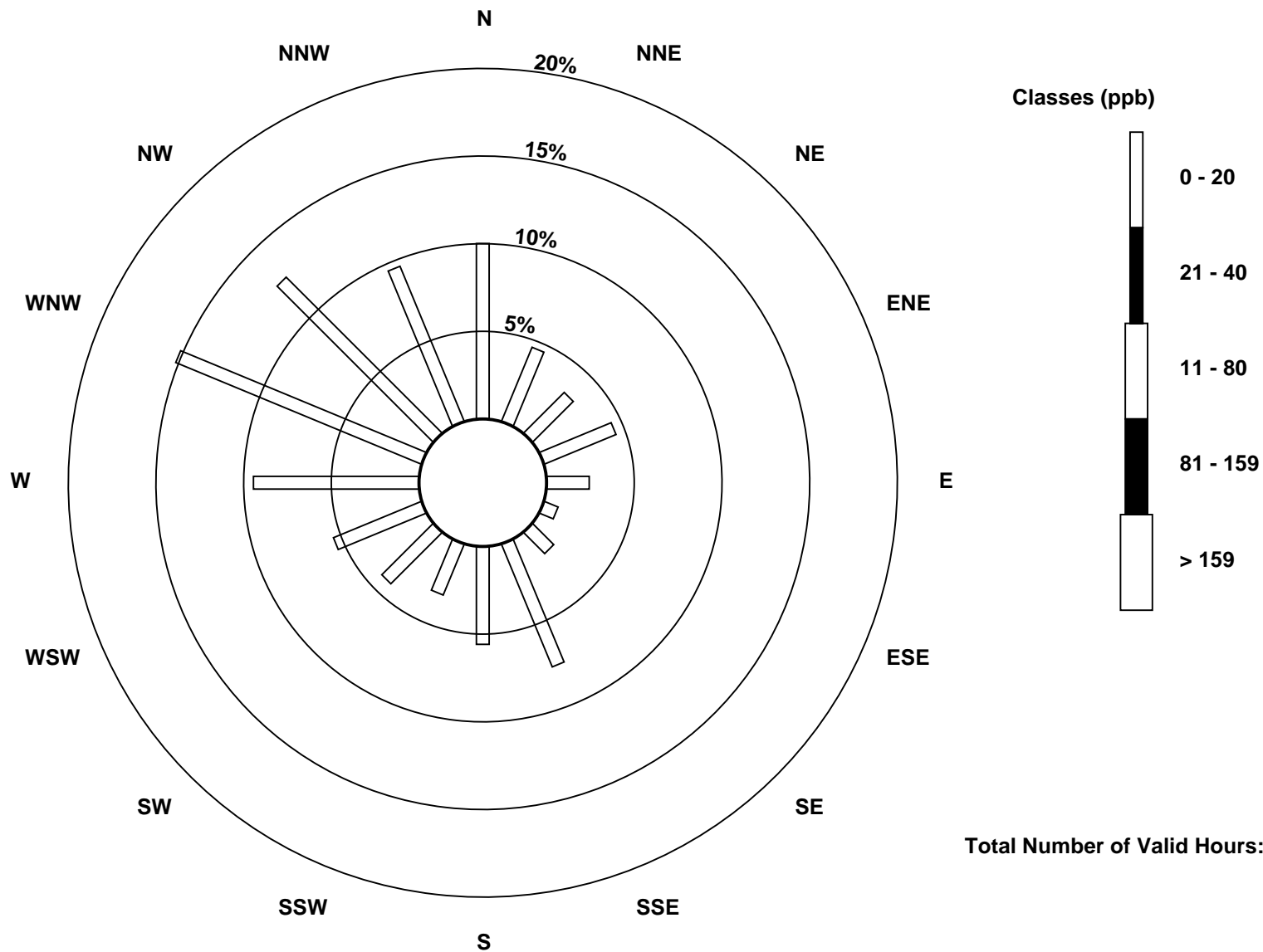
Total Number of Valid Hours: 699

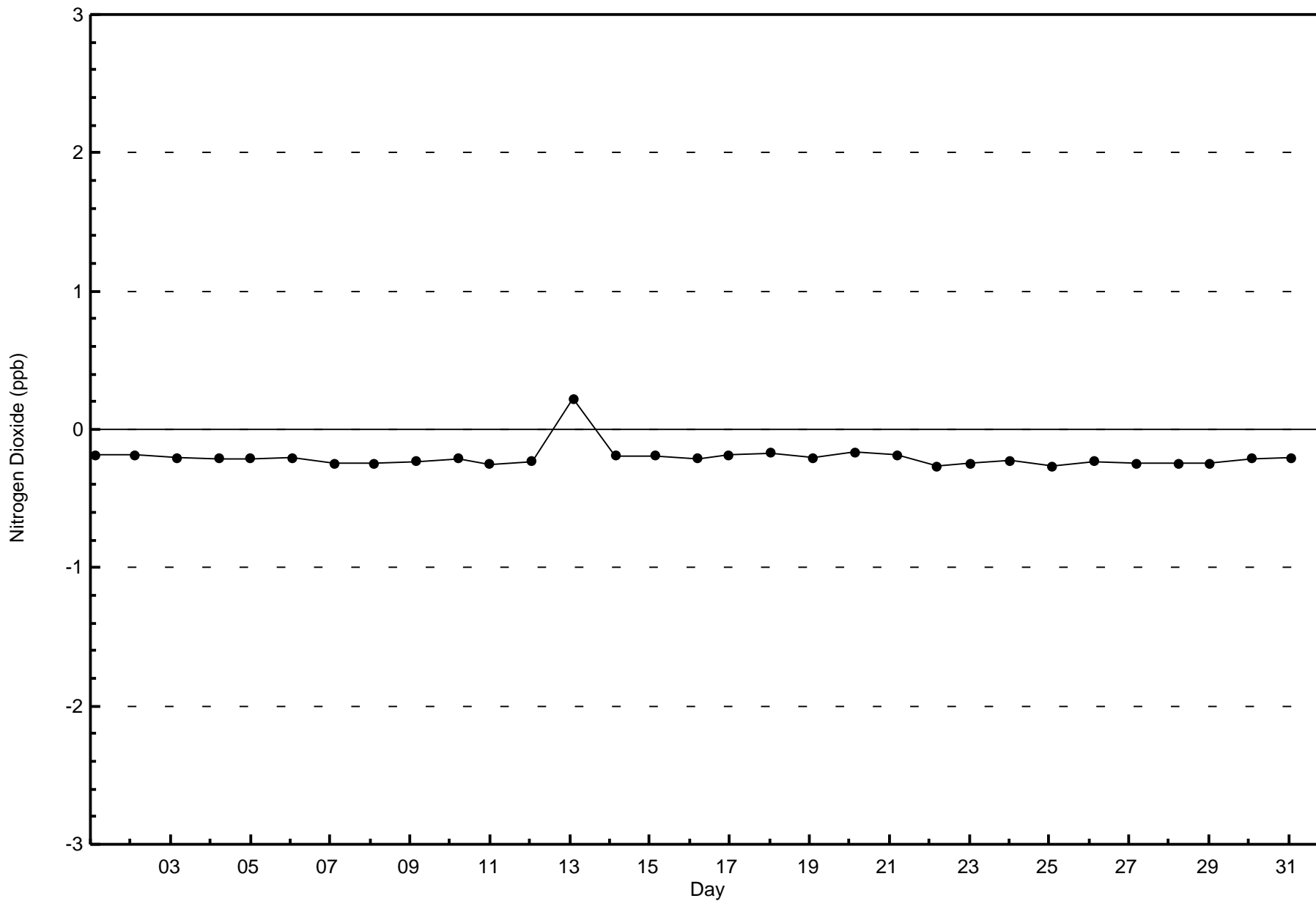
Total Number of Hours: 744

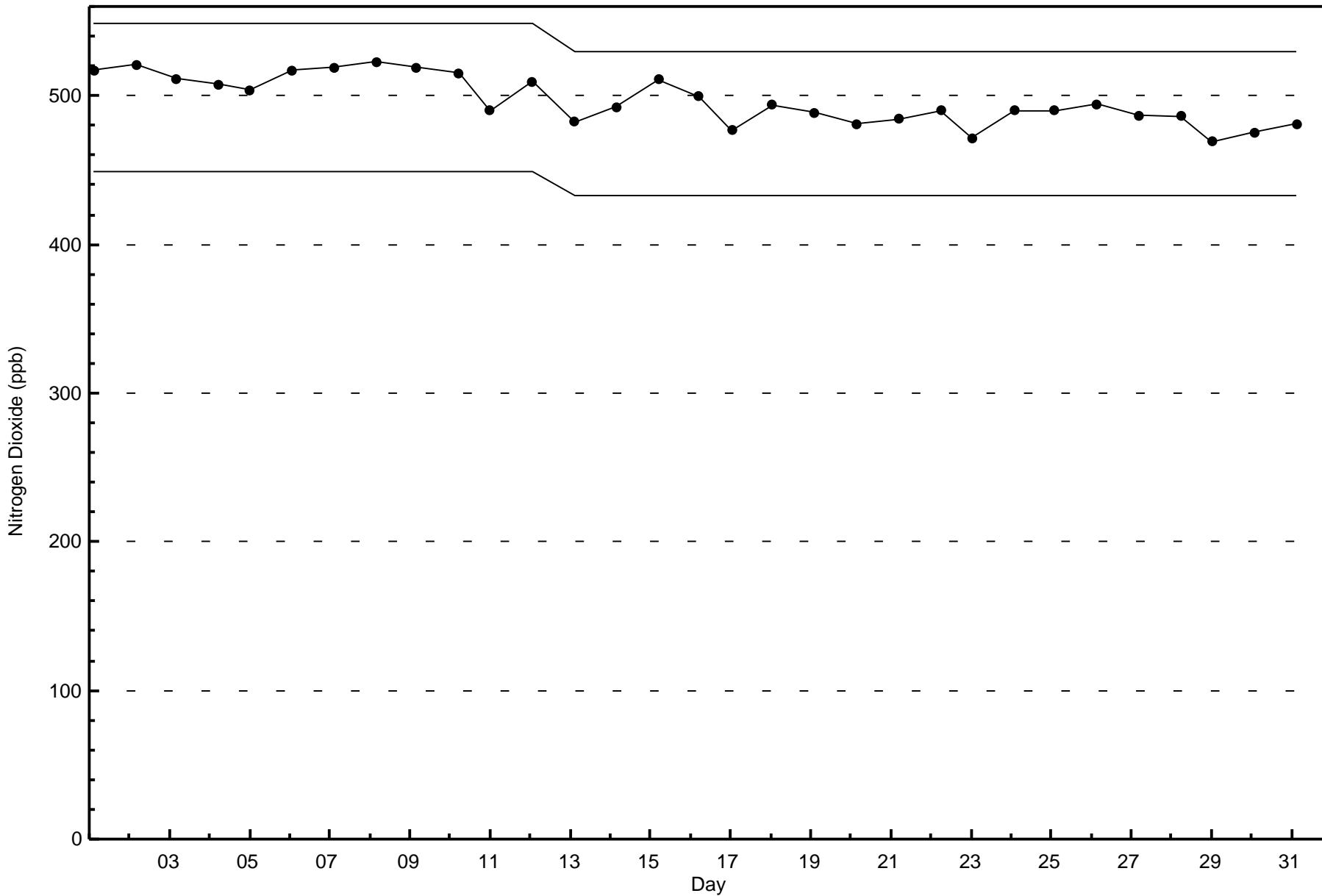


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Nitrogen Dioxide (NO₂) - ppb
Anzac (AMS 14)









Wood Buffalo Environmental Association
Summary of Hour Averages

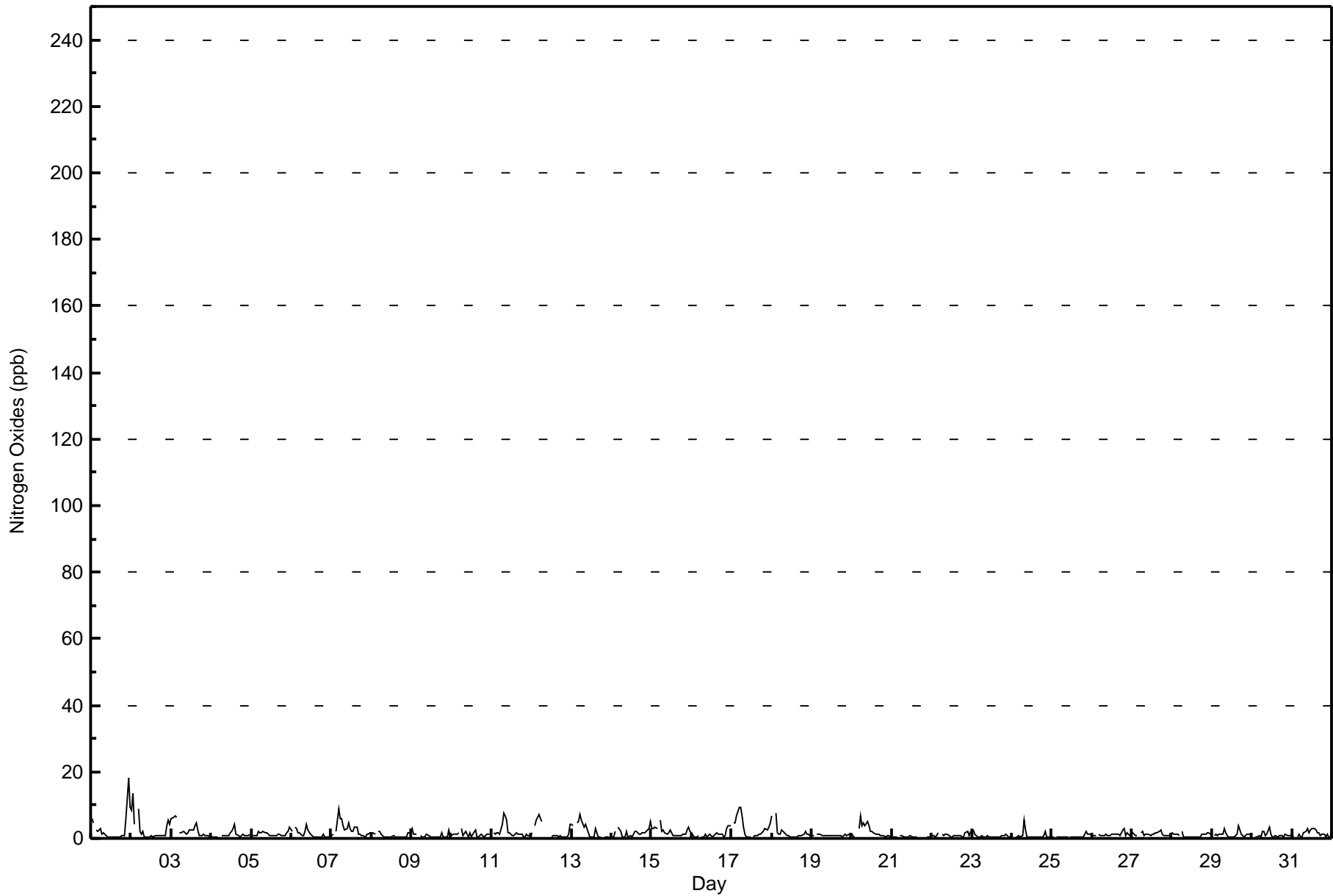
Nitrogen Oxides (NO_x) - ppb
Anzac - July 2016

Maximum Value: 18 ppb on Jul 1 23:00		Maximum Daily Average: 3.2 ppb on Jul 17		Hours in Service: 744																																												
Minimum Value: 0 ppb on Jul 14 00:00		Minimum Daily Average: 0.5 ppb on Jul 21		Hours of Data: 702																																												
Maximum Diurnal Average: 2.7 ppb at hour 5		Minimum Diurnal Average: 0.8 ppb at hour 18		Hours of Missing Data: 42																																												
Monthly Average: 1.5 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 1 Q ₃ = 2 P ₉₀ = 3 P ₉₉ = 9		Hours of Calibration: 36																																												
				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-Jul	6	4	Z	2	2	3	1	2	1	1	0	1	0	0	0	0	1	1	1	1	1	6	18	9	2.7	18																						
2-Jul	8	13	4	Z	9	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	4	6	4	2.8	13																						
3-Jul	6	6	7	7	Z	2	2	2	2	1	1	3	2	3	4	5	3	1	1	1	1	1	1	1	2.6	7																						
4-Jul	1	1	0	0	0	Z	1	1	1	1	1	2	2	3	4	1	1	0	1	1	1	1	1	1	1.1	4																						
5-Jul	Z	1	1	1	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	2	2	3	1.4	3																						
6-Jul	2	Z	4	3	2	2	1	1	2	4	3	1	1	1	0	1	1	0	0	1	1	0	0	1	1.4	4																						
7-Jul	1	1	Z	2	9	6	6	4	3	3	5	3	2	2	3	3	1	1	1	1	0	1	1	2	2.7	9																						
8-Jul	2	2	1	Z	2	2	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	1	2	2	0.9	2																						
9-Jul	3	1	1	1	Z	1	0	0	0	1	1	0	0	0	0	0	0	0	2	0	1	1	3	1	0.9	3																						
10-Jul	1	1	1	1	2	Z	3	1	2	1	0	2	0	1	3	0	0	1	1	1	1	1	1	1	1.2	3																						
11-Jul	Z	2	1	2	2	1	4	8	7	5	2	2	1	1	1	2	1	1	1	1	1	1	1	1	2.1	8																						
12-Jul	2	Z	4	6	7	6	5	C	C	C	C	C	1	1	1	1	1	1	1	0	0	0	1	4	2.3	7																						
13-Jul	4	4	Z	5	5	7	6	4	4	3	2	1	0	0	3	2	0	1	0	0	0	0	0	0	2.3	7																						
14-Jul	0	1	2	Z	3	2	1	0	0	2	0	1	0	1	2	2	1	1	2	2	2	2	3	5	1.6	5																						
15-Jul	3	3	3	3	Z	6	2	3	2	1	2	3	2	1	1	1	1	1	1	1	1	2	3	2	2.0	6																						
16-Jul	2	1	1	0	1	Z	0	1	1	1	1	1	1	1	2	1	1	1	1	1	1	3	4	4	1.3	4																						
17-Jul	Z	4	5	7	9	9	7	4	1	0	1	1	M	1	1	1	1	1	1	2	2	3	2	3	3.2	9																						
18-Jul	7	Z	8	2	1	1	3	2	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1.7	8																						
19-Jul	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1																						
20-Jul	1	1	0	Z	3	7	4	5	4	5	4	2	2	2	1	1	1	1	1	1	1	1	1	0	2.1	7																						
21-Jul	1	0	0	0	Z	1	1	1	0	1	0	1	0	0	0	1	PF	PF	PF	PF	PF	0	0	1	0.5	1																						
22-Jul	1	1	1	1	2	Z	1	1	1	1	1	1	0	1	1	1	1	1	1	1	2	2	1	2	1.0	2																						
23-Jul	Z	3	1	0	0	0	1	1	0	1	1	0	0	0	0	0	1	1	1	1	1	1	1	0	0.7	3																						
24-Jul	1	Z	1	1	1	1	1	6	2	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0.9	6																						
25-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	1	0.5	2																						
26-Jul	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	3	1	2	1	1	1.2	3																						
27-Jul	2	1	1	1	Z	2	2	1	1	1	1	1	1	1	2	2	2	3	1	1	1	1	1	1	1.3	3																						
28-Jul	2	1	1	1	1	Z	2	1	0	0	0	0	0	0	0	0	0	0	1	1	1	2	1	1	0.9	2																						
29-Jul	Z	1	1	1	1	1	1	3	2	1	1	1	0	0	1	1	4	1	1	1	1	1	1	1	1.2	4																						
30-Jul	1	Z	1	1	1	0	2	2	1	1	4	1	0	1	1	1	1	1	1	1	1	1	1	1	1.0	4																						
31-Jul	1	1	Z	0	1	1	1	2	2	3	2	3	3	3	3	2	2	1	1	1	1	1	1	0	1.5	3																						
																								2.2	2.1	2.1	1.9	2.7	2.6	2.0	2.0	1.6	1.5	1.2	1.1	0.9	1.0	1.3	1.1	1.0	0.8	0.9	0.9	1.0	1.4	2.0	1.9	Diurnal Average
																								8	13	8	7	9	9	7	8	7	5	5	3	3	3	4	5	4	3	3	3	3	6	18	9	Diurnal Maximum
Z - zerospan																								C - Calibration				M - Maintenance				PF - Power Failure																



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Anzac - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Anzac - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
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**

**Nitrogen Oxides (NO_x) - ppb
Anzac - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	70	32	23	31	17	6	12	53	39	22	29	38	66	106	88	67	699
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	70	32	23	31	17	6	12	53	39	22	29	38	66	106	88	67	699

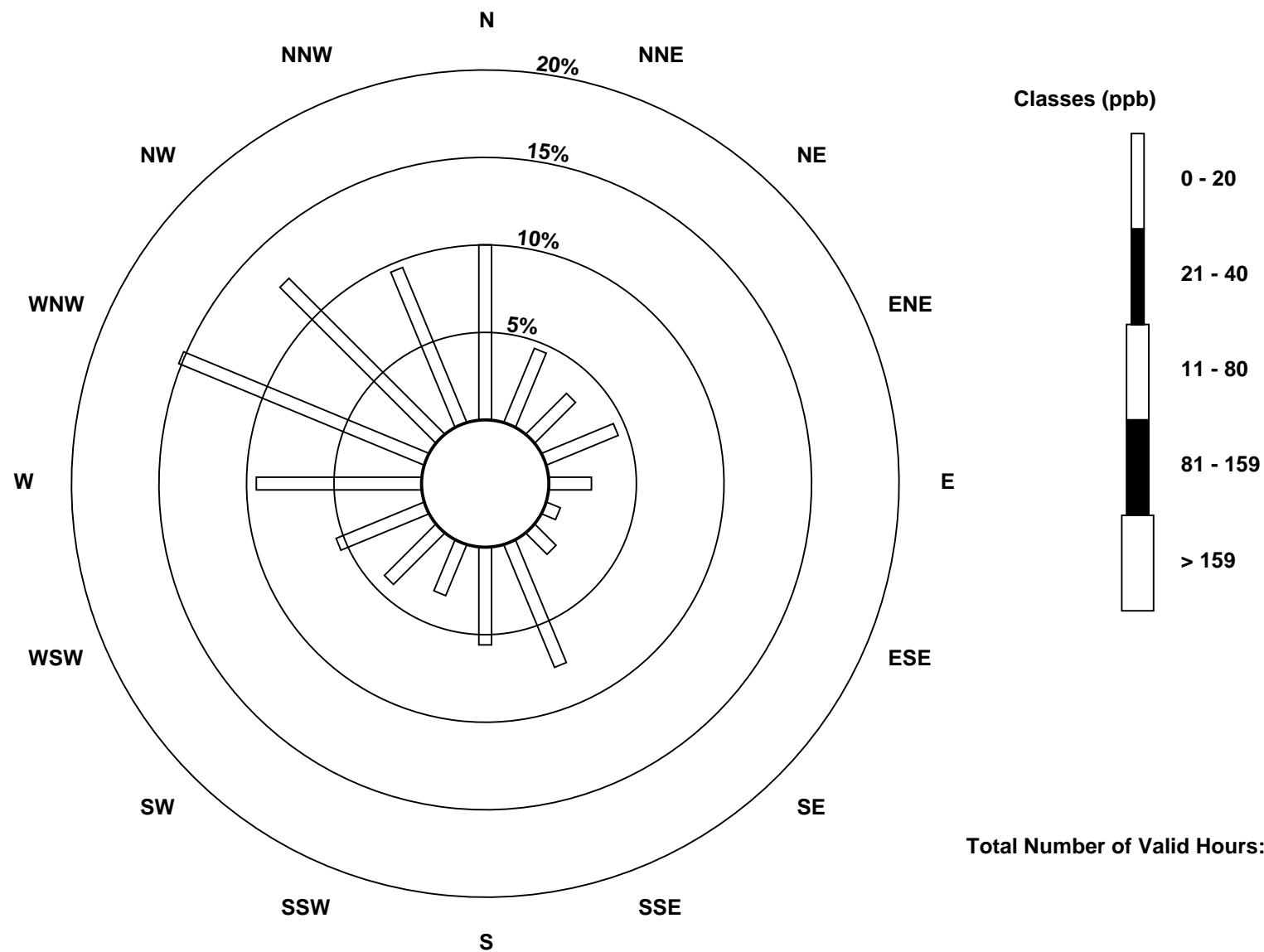
Total Number of Valid Hours: 699

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

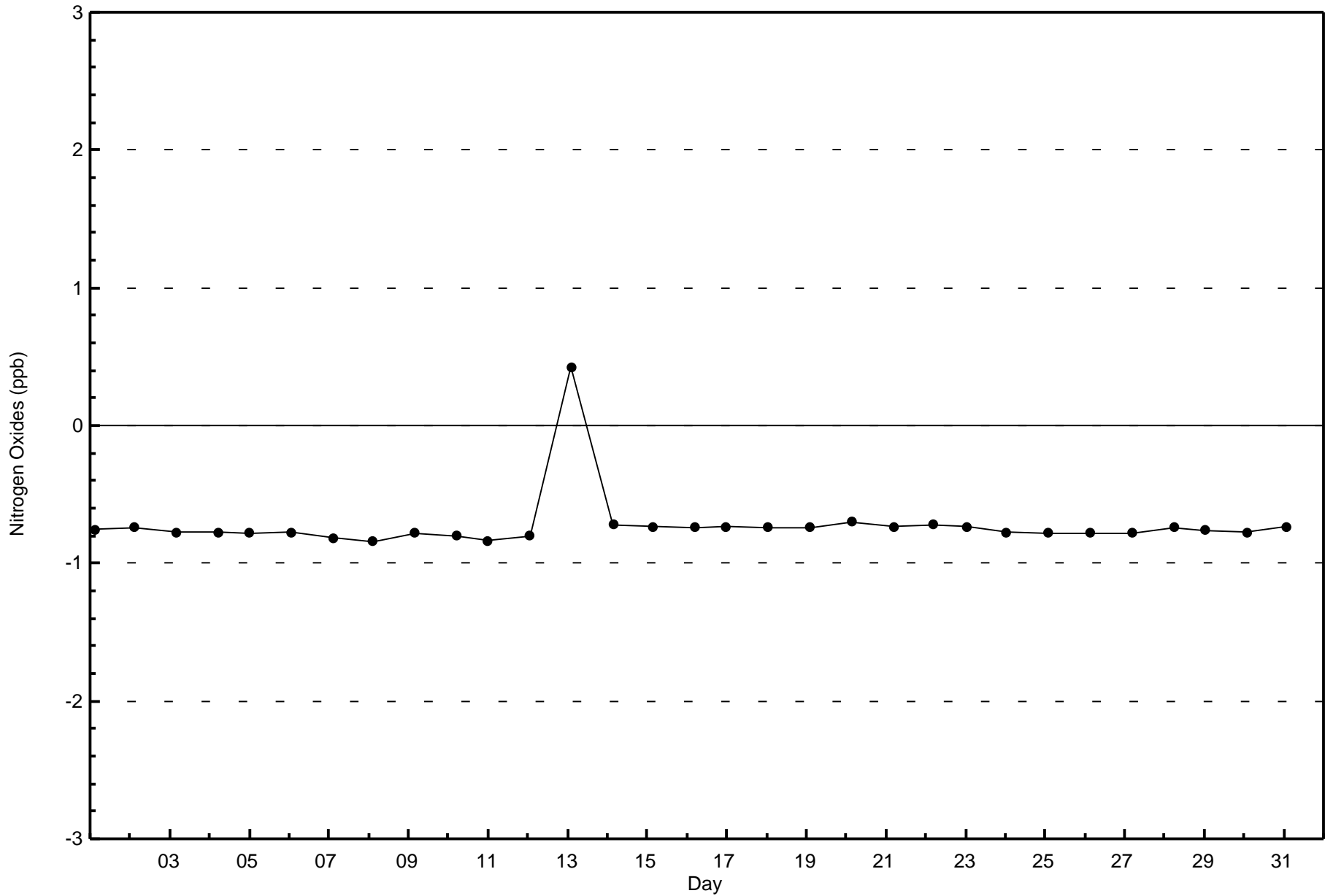
Nitrogen Oxides (NO_x) - ppb
Anzac (AMS 14)

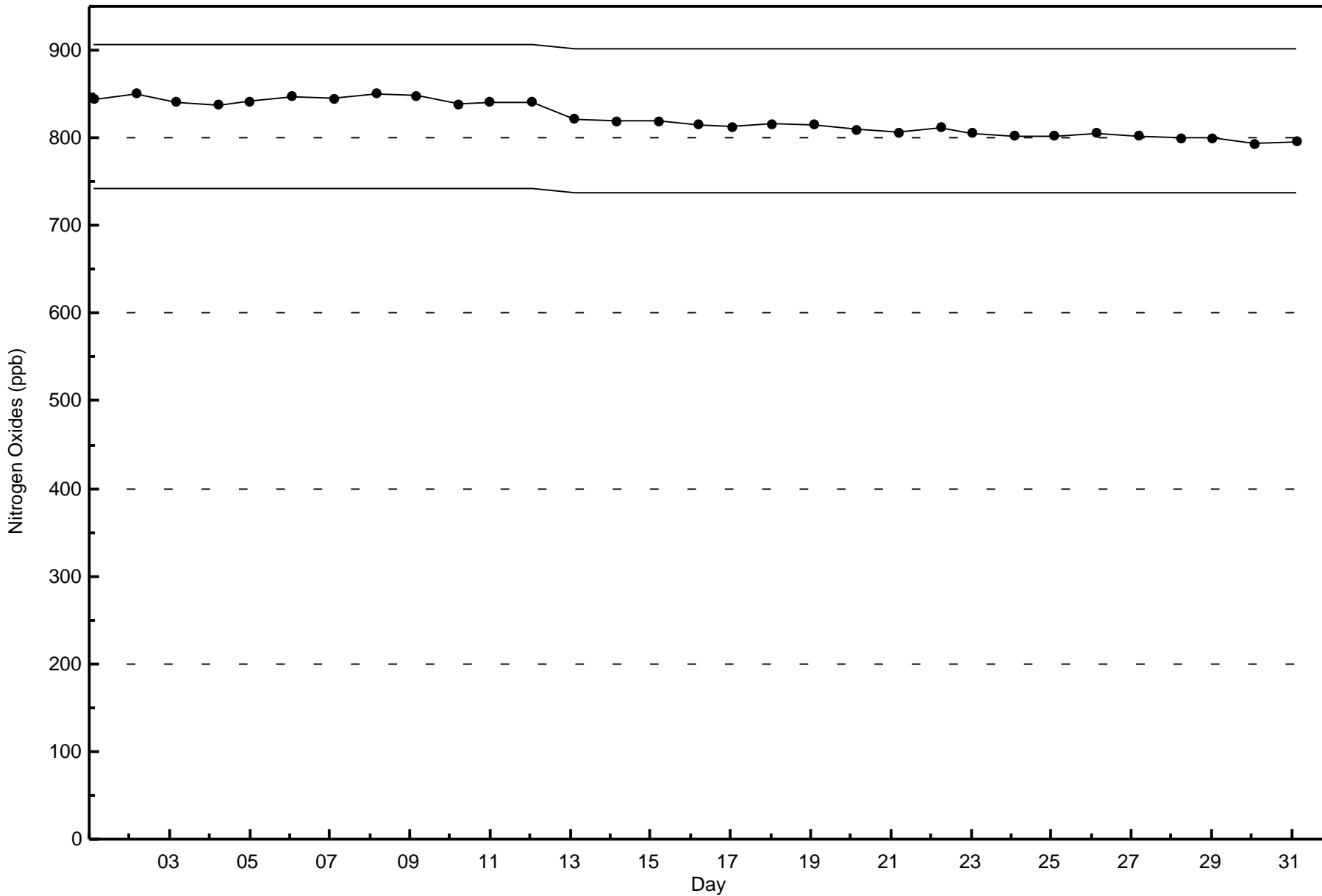




Wood Buffalo Environmental Association
Zero Responses

Nitrogen Oxides (NO_x) - ppb
Anzac - July 2016







Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O₃) - ppb

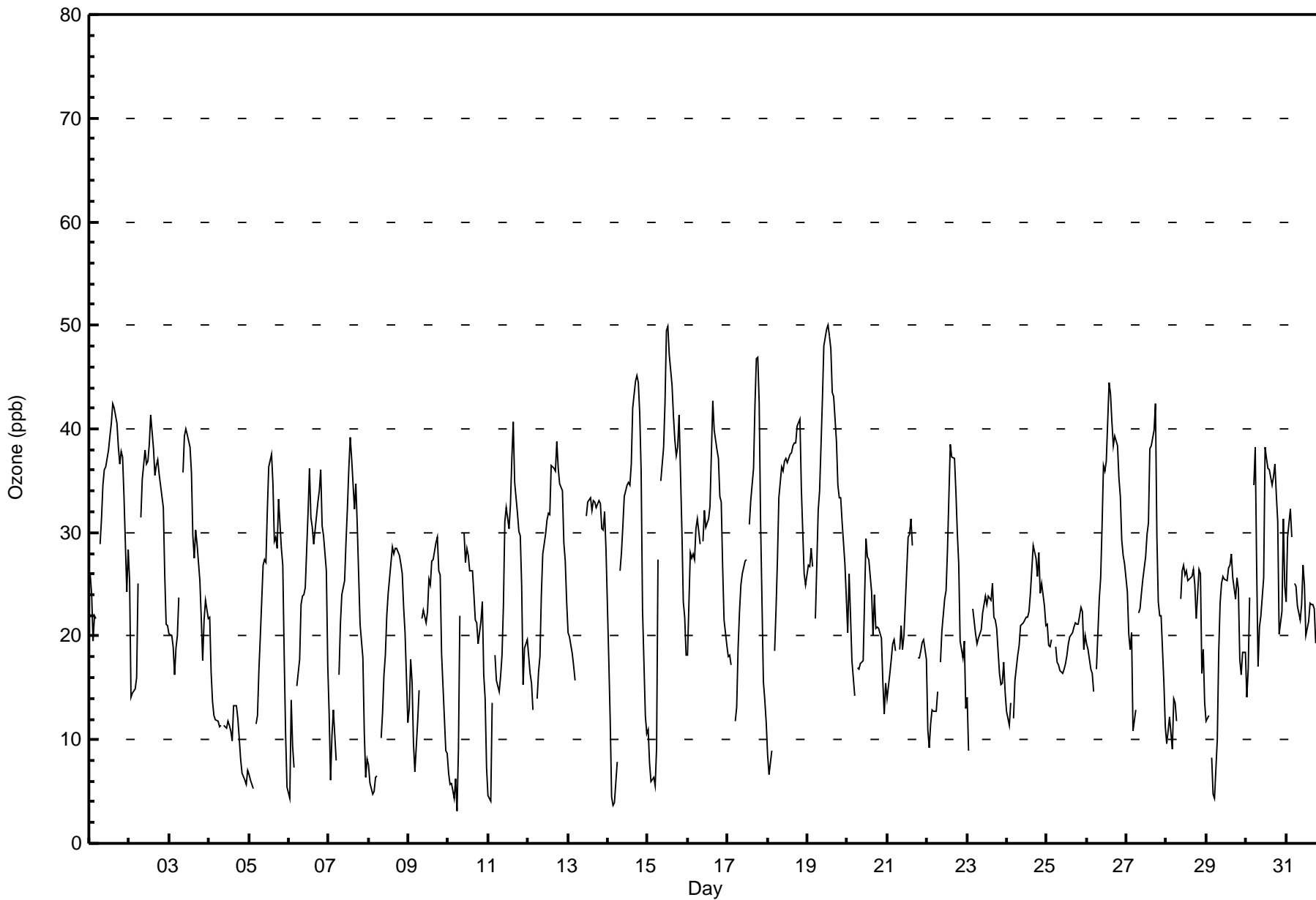
Anzac - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																																							
Maximum Value: 50 ppb on Jul 19 13:00										Maximum Daily Average: 36.1 ppb on Jul 19										Hours of Data: 706																													
Minimum Value: 3 ppb on Jul 10 06:00										Minimum Daily Average: 11.3 ppb on Jul 4										Hours of Missing Data: 38																													
Maximum Diurnal Average: 32.3 ppb at hour 15										Minimum Diurnal Average: 14.1 ppb at hour 5										Hours of Calibration: 35																													
Monthly Average: 24.2 ppb										Percentiles: P ₁ = 4 P ₁₀ = 11 Q ₁ = 18 Median = 24 Q ₃ = 31 P ₉₀ = 38 P ₉₉ = 48										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-Jul	26	24	20	22	22	Z	29	31	35	36	36	38	39	41	42	42	41	38	37	38	37	33	24	28	33.0	42																							
2-Jul	25	14	15	15	16	25	Z	31	35	38	37	37	39	41	38	35	37	37	36	35	32	26	21	21	29.8	41																							
3-Jul	20	20	19	16	19	20	24	Z	36	39	40	39	38	36	30	28	30	29	25	22	18	22	23	22	26.7	40																							
4-Jul	22	16	14	12	12	12	11	11	Z	11	11	12	11	11	10	13	13	12	10	8	7	6	6	7	11.3	22																							
5-Jul	7	6	5	Z	12	12	17	20	27	27	27	32	36	38	35	29	30	28	33	28	27	18	11	5	22.2	38																							
6-Jul	4	14	9	7	Z	15	18	23	24	24	25	32	36	31	31	29	30	33	34	36	31	30	26	17	24.3	36																							
7-Jul	12	6	10	13	8	Z	16	21	24	25	29	32	36	39	37	32	35	31	26	21	18	11	6	8	21.7	39																							
8-Jul	8	6	5	5	6	7	Z	10	13	16	18	22	24	27	29	28	28	29	28	27	26	23	20	12	18.1	29																							
9-Jul	13	18	16	10	7	12	15	Z	22	23	21	22	25	25	27	27	29	30	26	26	18	12	9	9	19.2	30																							
10-Jul	7	6	6	4	6	3	9	22	Z	30	27	28	28	26	26	24	22	21	19	21	23	16	14	7	17.3	30																							
11-Jul	5	4	14	Z	18	16	15	16	18	23	31	32	30	33	37	41	35	32	30	30	25	15	19	20	23.4	41																							
12-Jul	18	16	15	13	Z	14	17	18	24	28	30	31	32	32	36	36	36	39	36	35	34	29	27	23	26.9	39																							
13-Jul	20	20	18	17	16	Z	20	C	C	C	C	32	33	33	32	33	32	33	33	30	30	32	28	27.7	33																								
14-Jul	18	12	4	4	4	8	Z	26	28	31	33	35	35	35	37	42	45	45	44	41	36	22	12	11	26.4	45																							
15-Jul	11	8	6	6	6	9	27	Z	35	38	43	50	50	47	44	41	39	37	38	41	30	23	22	18	29.2	50																							
16-Jul	18	28	27	28	27	30	31	29	Z	29	32	30	31	33	38	43	40	38	37	33	33	27	22	19	30.6	43																							
17-Jul	18	18	17	Z	12	13	19	22	25	26	27	27	M	31	33	36	42	47	47	43	31	16	14	12	26.2	47																							
18-Jul	9	7	9	Z	19	23	27	33	36	36	37	37	37	38	38	38	39	39	40	41	34	30	26	25	30.3	41																							
19-Jul	27	27	29	27	Z	22	32	34	38	43	48	50	50	49	48	44	43	39	35	33	33	31	27	24	36.1	50																							
20-Jul	20	26	22	18	14	Z	17	17	17	18	24	29	28	27	24	20	24	21	21	21	20	16	12	15	20.5	29																							
21-Jul	14	16	18	19	20	19	Z	19	21	19	20	23	29	30	31	29	PF	PF	18	18	19	19	20	18	20.9	31																							
22-Jul	11	9	12	13	13	13	15	Z	17	20	24	24	28	33	39	37	37	34	30	27	20	18	19	13	22.0	39																							
23-Jul	14	9	Z	23	21	20	19	20	21	22	23	24	23	24	23	25	22	22	21	16	15	15	18	15	19.8	25																							
24-Jul	13	11	14	Z	12	16	18	19	21	21	21	22	22	22	24	26	29	27	26	28	24	25	23	21	21.1	29																							
25-Jul	21	19	19	20	Z	19	18	17	17	16	17	17	18	19	20	20	21	21	21	21	23	22	19	20	19.4	23																							
26-Jul	19	19	17	16	15	Z	17	24	26	31	37	36	37	44	43	41	38	39	38	35	34	29	28	27	30.0	44																							
27-Jul	24	20	19	20	11	13	Z	22	23	24	25	28	30	31	38	38	40	42	30	23	22	22	16	11	24.9	42																							
28-Jul	10	11	12	9	14	14	12	Z	24	26	27	26	26	25	26	26	26	25	22	26	26	16	19	14	20.0	27																							
29-Jul	12	12	Z	8	5	4	10	18	23	25	26	26	25	27	27	28	26	24	26	25	18	16	18	18	19.4	28																							
30-Jul	14	17	24	Z	35	38	27	17	21	22	26	38	37	36	36	35	35	37	34	31	20	22	31	25	28.6	38																							
31-Jul	23	30	32	30	Z	25	25	23	22	23	27	25	20	21	23	23	23	23	19	19	18	25	26	25	23.9	32																							
																								15.6	15.1	15.4	15.0	14.1	16.2	19.4	21.8	24.9	26.4	28.3	30.3	31.2	31.8	32.3	32.0	32.2	31.7	29.7	28.5	25.2	21.5	19.7	17.4	Diurnal Average	
																								27	30	32	30	35	38	32	34	38	43	48	50	50	49	48	44	45	47	47	43	37	33	32	28	Diurnal Maximum	
Z - zerospan C - Calibration M - Maintenance PF - Power Failure																																																	
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb																																																	



Wood Buffalo Environmental Association
Hourly Averages

Ozone (O₃) - ppb
Anzac - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Ozone (O₃) - ppb
Anzac - July 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	264	37.39	37.39
21 - 50	442	62.61	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 706

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Ozone (O₃) - ppb
Anzac - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	21	7	5	8	6	2	3	23	13	7	11	27	25	32	41	31	262
21 - 50	58	26	17	22	12	4	8	33	23	14	20	15	41	68	46	34	441
51 - 82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	79	33	22	30	18	6	11	56	36	21	31	42	66	100	87	65	703

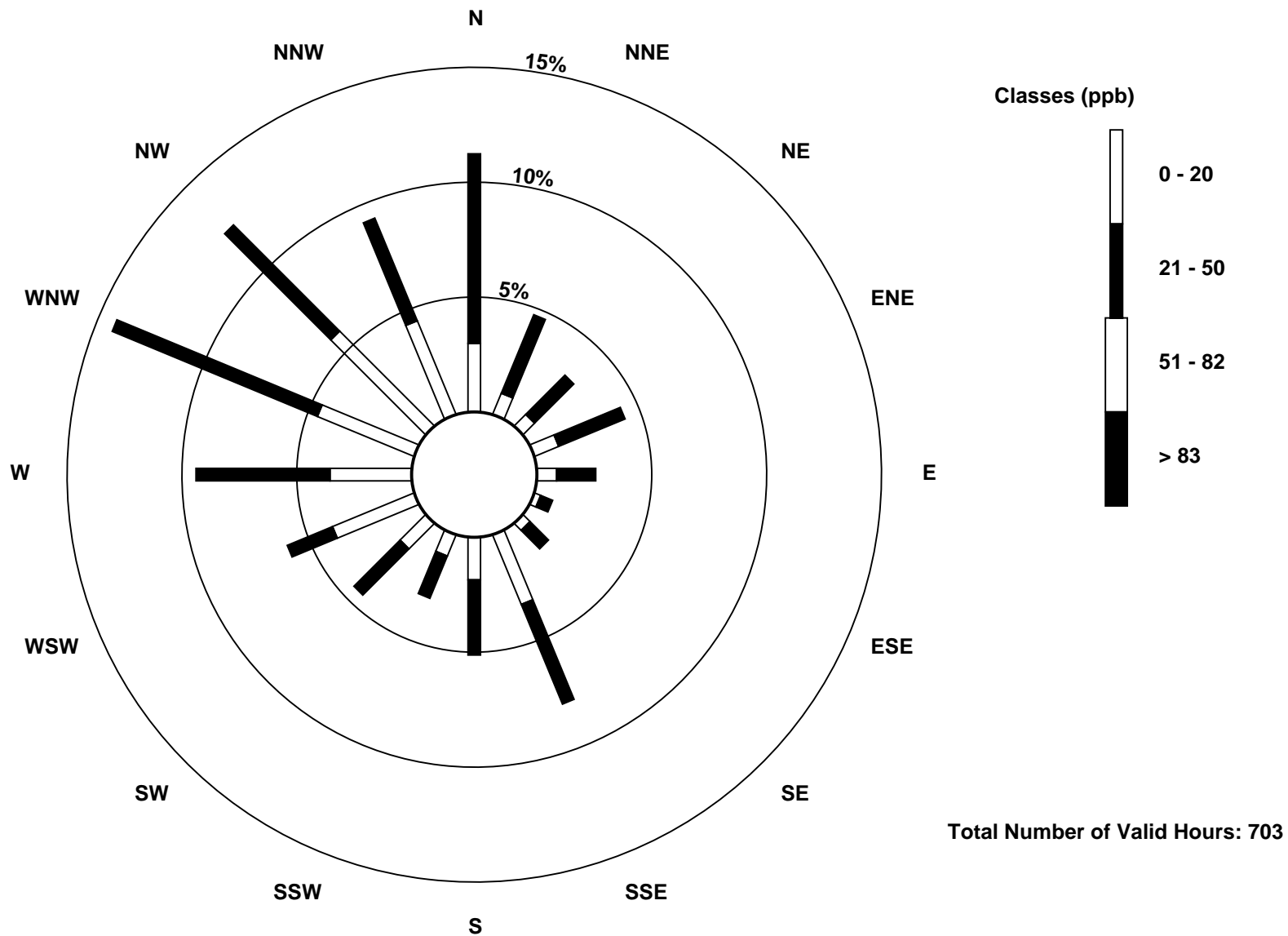
Total Number of Valid Hours: 703

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

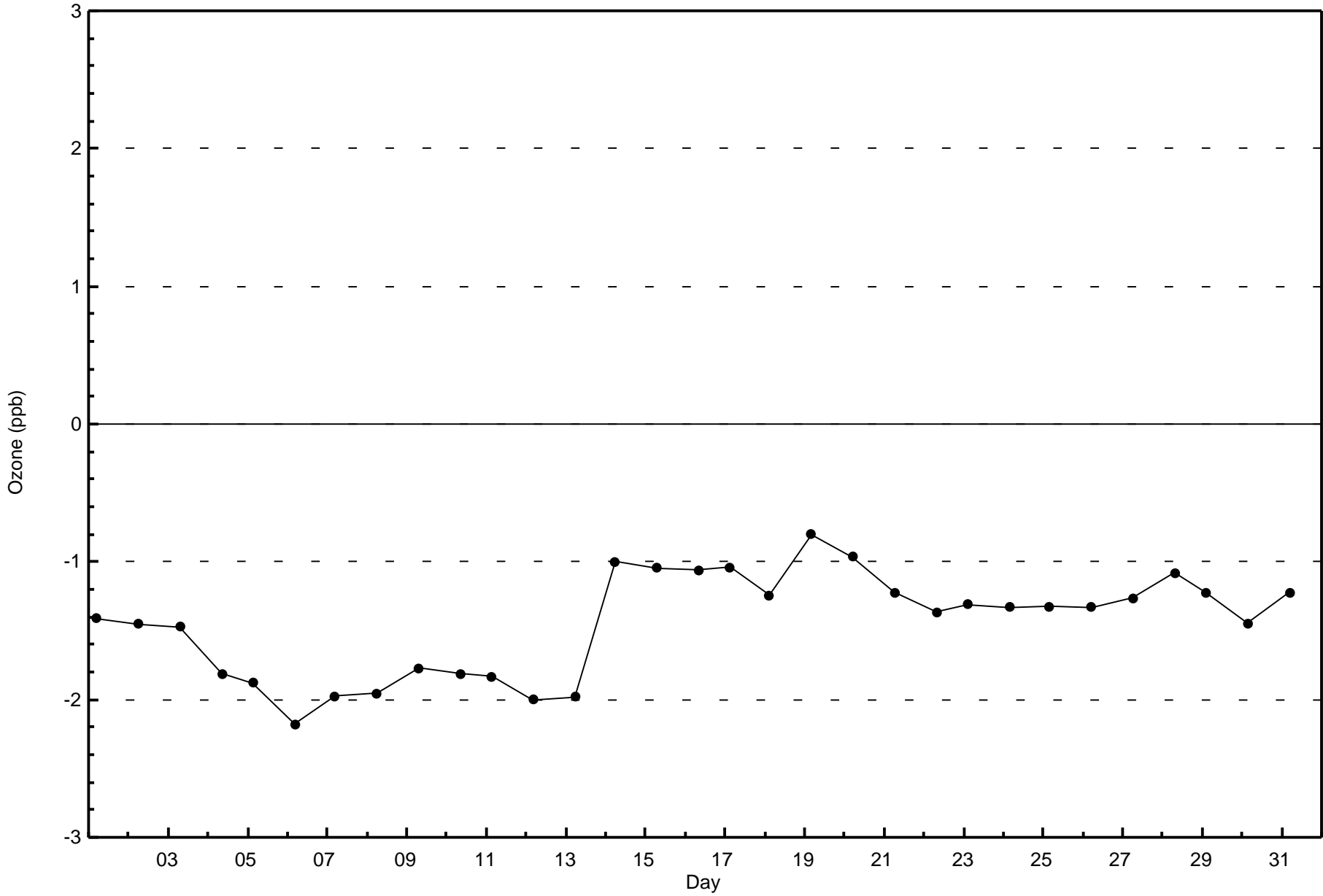
Ozone (O₃) - ppb
Anzac (AMS 14)





Wood Buffalo Environmental Association
Zero Responses

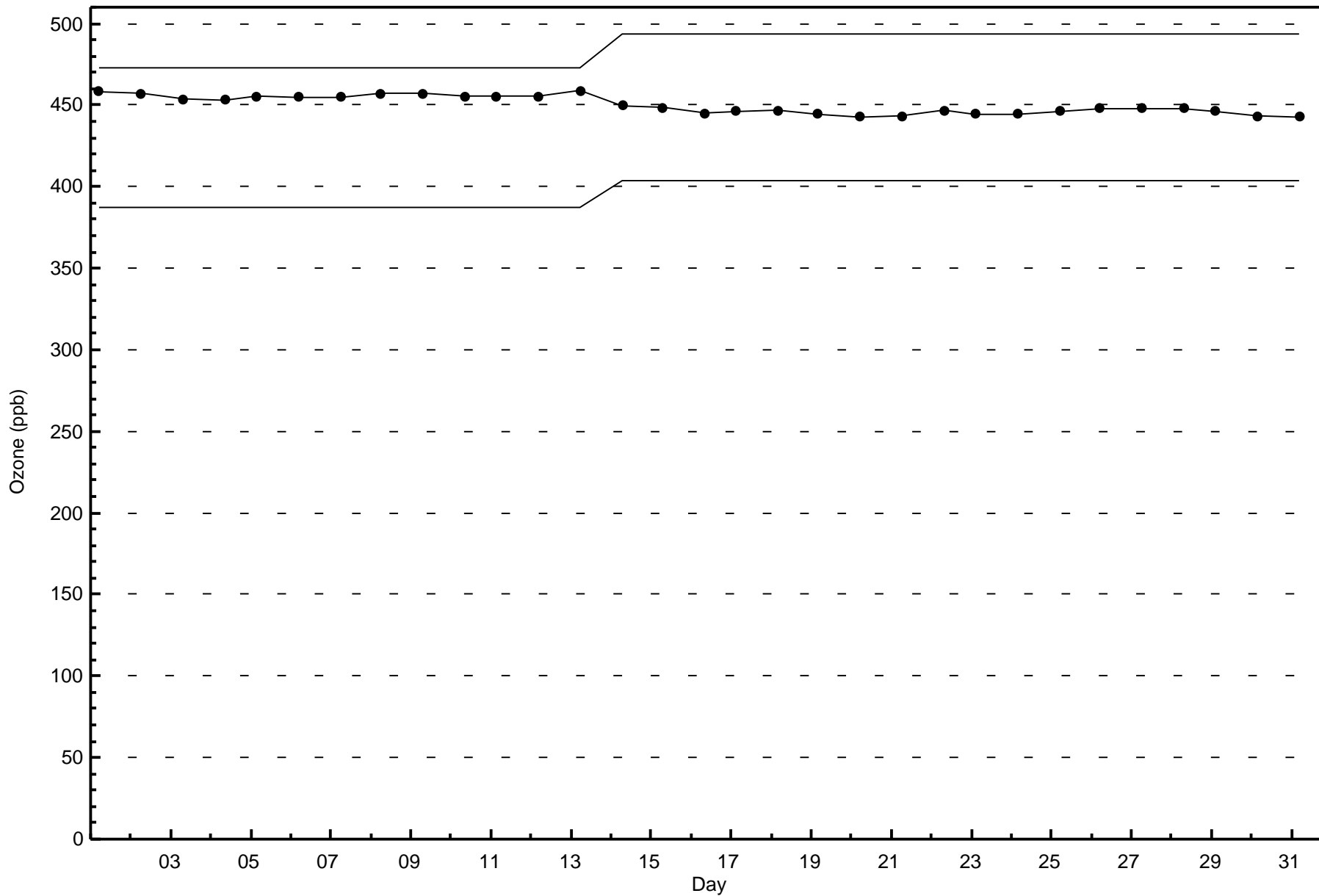
Ozone (O₃) - ppb
Anzac - July 2016





Wood Buffalo Environmental Association
Span Responses

Ozone (O₃) - ppb
Anzac - July 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

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

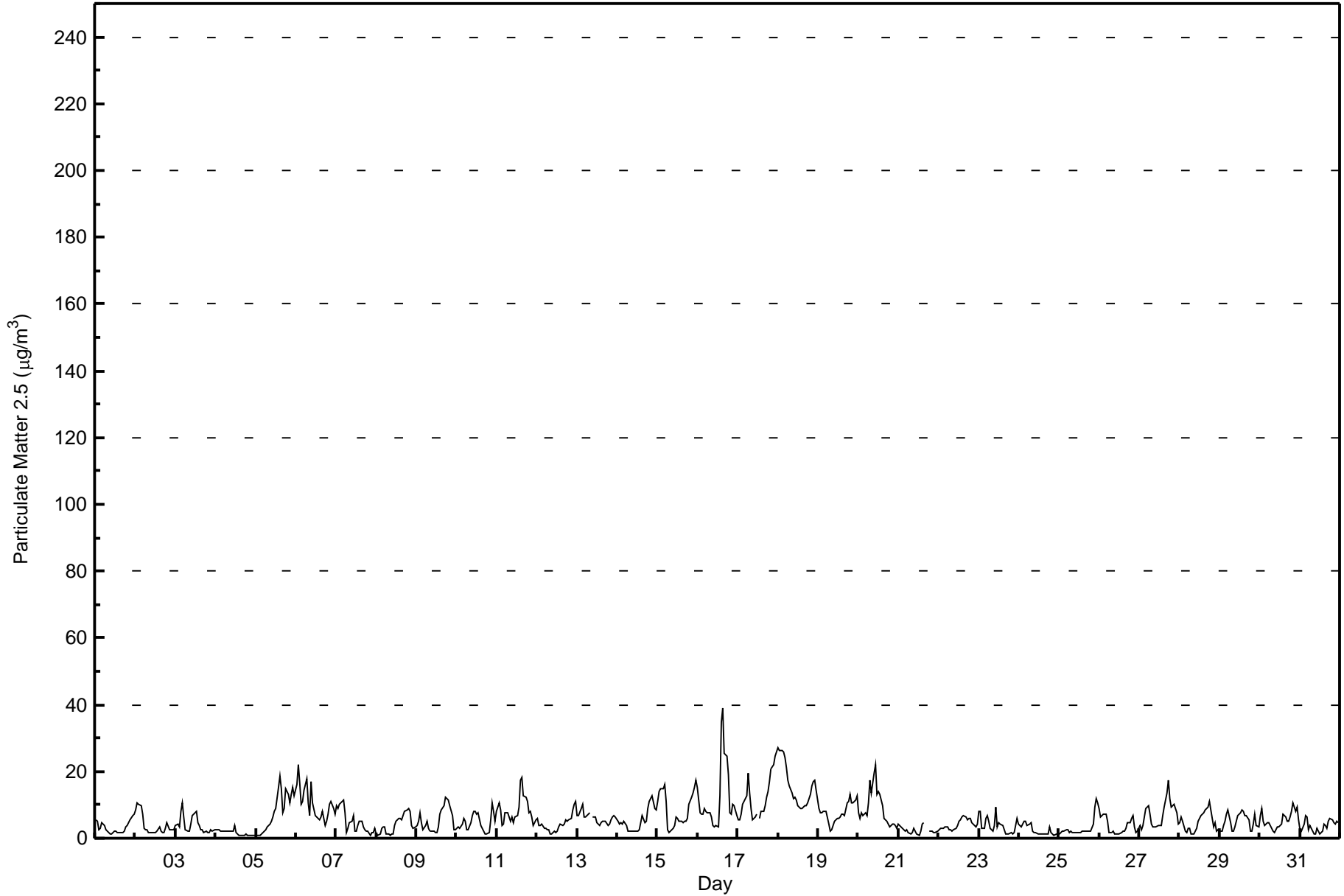
Anzac - July 2016

Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 38.8 µg/m ³ on Jul 16 16:00 Minimum Value: 0.8 µg/m ³ on Jul 4 23:00 Maximum Diurnal Average: 7.3 µg/m ³ at hour 22 Monthly Average: 5.97 µg/m ³		Maximum Daily Average: 15.7 µg/m ³ on Jul 18 Minimum Daily Average: 1.7 µg/m ³ on Jul 4 Minimum Diurnal Average: 3.6 µg/m ³ at hour 9 Percentiles: P ₁ = 0.8 P ₁₀ = 1.6 Q ₁ = 2.5 Median = 4.7 Q ₃ = 7.8 P ₉₀ = 11.9 P ₉₉ = 25.9		Hours in Service: 744 Hours of Data: 740 Hours of Missing Data: 4 Hours of Calibration: 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-Jul	5.7	5.1	2.7	3.0	4.7	3.8	2.7	2.3	1.5	1.3	1.3	2.0	1.9	1.8	1.7	1.6	1.6	2.3	3.2	3.9	4.9	5.7	6.6	7.2	3.3	7.2																						
2-Jul	8.5	10.4	10.3	9.8	7.2	2.8	2.7	2.6	1.5	1.7	1.7	1.5	1.6	2.2	3.5	2.1	1.8	1.9	2.9	4.6	2.5	2.6	2.7	2.4	3.8	10.4																						
3-Jul	3.8	4.4	3.4	8.1	10.7	6.5	2.5	1.9	2.0	4.1	6.7	7.3	8.1	4.8	3.8	2.5	2.6	1.8	2.2	1.7	1.6	2.7	2.3	2.7	4.1	10.7																						
4-Jul	2.4	2.7	2.5	2.1	2.0	2.0	2.1	2.1	2.1	2.3	2.2	3.6	1.8	1.1	1.0	0.9	0.8	1.0	1.1	0.8	0.8	0.8	0.8	0.8	1.7	3.6																						
5-Jul	0.8	0.9	1.0	1.2	1.6	1.9	2.6	3.4	4.1	5.1	6.5	8.1	8.7	15.2	18.5	14.9	7.8	9.0	14.8	13.2	10.7	13.2	15.3	12.9	8.0	18.5																						
6-Jul	16.1	22.0	16.5	10.0	11.2	14.4	18.0	10.4	7.0	16.9	10.7	6.7	6.4	6.1	5.4	6.2	8.2	3.9	5.0	7.1	10.3	11.1	8.7	7.3	10.2	22.0																						
7-Jul	9.9	8.7	10.4	10.8	11.3	7.6	1.9	3.1	4.6	5.2	6.8	2.3	2.2	4.0	4.9	4.9	3.2	2.7	2.1	1.9	0.9	1.7	1.9	2.8	4.8	11.3																						
8-Jul	1.4	0.8	1.1	2.9	3.4	3.4	1.4	1.2	1.0	1.1	1.2	3.6	5.2	5.7	6.1	5.6	6.9	8.2	8.5	9.1	8.3	3.9	3.1	3.3	4.0	9.1																						
9-Jul	3.9	5.2	7.7	4.9	2.4	3.6	5.3	3.0	2.1	2.2	2.3	1.9	1.6	3.2	7.0	8.6	9.6	12.1	12.0	11.2	9.7	6.9	2.7	2.5	5.5	12.1																						
10-Jul	3.0	3.2	2.8	4.1	5.9	5.0	2.5	2.5	4.8	6.7	8.2	8.0	7.1	7.6	3.9	2.8	2.0	1.4	1.3	1.6	5.4	10.7	8.1	5.1	4.7	10.7																						
11-Jul	7.9	10.5	8.3	3.8	4.1	7.7	7.6	6.2	5.1	6.5	4.7	6.2	6.6	9.3	17.5	18.4	12.7	12.1	11.0	7.7	8.1	6.3	3.9	5.4	8.2	18.4																						
12-Jul	5.8	3.7	3.9	4.0	2.8	2.9	2.6	2.8	1.3	1.3	2.0	1.9	1.9	3.3	4.2	3.9	4.1	5.4	5.2	5.5	6.0	8.5	10.3	11.2	4.4	11.2																						
13-Jul	6.7	6.6	8.9	10.2	6.3	6.6	6.8	7.5	C	6.2	6.3	6.2	4.6	3.9	4.8	5.1	5.0	5.0	3.9	4.4	5.5	6.3	7.0	6.2	6.1	10.2																						
14-Jul	5.0	4.2	4.7	4.4	5.0	3.7	1.9	2.0	2.1	2.1	1.9	2.1	2.7	4.5	6.9	4.8	5.2	8.8	10.8	11.8	12.5	8.9	8.3	5.3	5.3	12.5																						
15-Jul	11.1	13.9	14.7	15.0	16.1	11.0	2.7	1.7	1.9	2.8	3.7	6.5	5.9	5.1	5.0	4.5	4.9	5.1	5.9	10.1	12.4	13.5	15.4	17.5	8.6	17.5																						
16-Jul	15.3	7.7	7.0	7.4	8.7	8.2	7.7	7.4	6.4	3.8	3.2	3.7	3.6	12.9	34.9	38.8	25.6	24.4	18.9	7.8	7.0	10.3	9.8	6.7	12.0	38.8																						
17-Jul	5.6	5.7	7.1	10.0	12.0	12.8	19.3	13.5	8.7	5.6	6.3	7.2	M	6.0	8.2	8.0	9.7	12.2	13.9	16.8	20.7	22.1	24.8	26.0	12.3	26.0																						
18-Jul	27.0	26.4	26.4	26.1	24.0	21.2	17.6	15.8	13.4	11.9	12.1	11.2	9.9	8.9	9.1	9.4	9.6	9.6	10.6	13.2	15.6	16.9	17.3	14.5	15.7	27.0																						
19-Jul	8.9	7.5	7.8	8.0	8.0	7.9	4.3	2.3	2.7	3.9	5.0	6.1	6.1	6.5	7.0	7.1	6.8	10.7	10.9	12.9	10.7	10.7	11.3	12.6	7.7	12.9																						
20-Jul	7.7	5.8	7.5	6.7	7.7	6.7	10.6	17.2	13.6	19.5	22.0	13.0	14.0	13.0	9.9	6.1	5.3	5.2	4.4	3.4	4.3	4.4	3.7	3.0	9.0	22.0																						
21-Jul	4.1	3.5	3.0	2.6	2.1	2.7	1.8	1.2	1.7	3.1	2.0	1.2	1.0	2.1	4.4	4.5	PF	PF	2.0	2.2	2.0	1.7	1.7	2.0	2.4	4.5																						
22-Jul	2.4	3.0	2.9	2.9	3.4	3.5	2.7	2.6	2.3	2.5	2.9	3.9	4.9	5.6	6.2	6.6	6.3	5.6	5.9	5.8	4.8	3.7	3.2	4.4	4.1	6.6																						
23-Jul	8.2	8.0	3.1	3.1	5.7	6.7	5.0	2.8	2.1	4.0	9.2	3.5	4.5	4.2	4.0	2.5	1.5	1.1	1.5	1.7	1.5	1.7	3.9	5.8	4.0	9.2																						
24-Jul	4.3	3.2	4.1	5.0	5.0	4.0	4.0	4.5	2.3	1.5	1.8	1.4	1.3	1.2	1.2	1.3	1.2	1.3	3.4	1.8	1.1	1.0	1.2	1.3	2.4	5.0																						
25-Jul	1.3	1.8	2.3	2.1	2.5	2.5	1.7	2.0	1.6	1.6	1.6	1.6	1.7	1.7	1.8	1.9	2.0	2.1	2.1	2.2	2.2	4.4	9.4	11.8	3.1	11.8																						
26-Jul	8.7	6.4	7.0	7.4	7.3	4.9	1.8	1.7	2.0	1.3	1.2	1.3	1.4	1.7	2.2	2.0	3.1	4.5	4.6	6.1	6.7	3.4	1.9	2.2	3.8	8.7																						
27-Jul	4.0	2.5	3.7	6.2	9.0	9.7	7.2	4.4	3.6	3.5	3.4	3.9	3.7	3.9	6.9	9.4	13.7	17.4	11.8	9.4	9.7	10.2	7.5	4.4	7.1	17.4																						
28-Jul	4.8	6.2	5.2	2.3	1.6	3.1	2.9	1.5	1.3	2.3	3.2	5.2	6.0	6.9	7.6	8.3	8.8	9.3	10.9	5.8	3.6	4.5	2.3	2.6	4.8	10.9																						
29-Jul	2.2	1.9	3.7	5.1	7.1	8.5	4.8	2.1	2.3	3.3	5.1	7.0	7.5	8.6	7.9	6.8	6.7	5.4	2.0	2.1	4.3	7.1	3.8	3.5	4.9	8.6																						
30-Jul	6.6	8.8	5.3	3.7	4.6	4.6	3.7	3.0	2.3	1.5	3.3	3.2	3.7	4.3	7.1	6.3	5.3	5.2	6.3	7.9	10.7	8.0	9.5	5.4	5.4	10.7																						
31-Jul	2.6	2.2	4.3	6.6	6.2	2.6	3.9	3.1	1.3	1.3	2.8	2.0	1.2	2.2	4.4	3.9	2.9	4.9	6.1	5.6	4.8	4.3	5.2	4.5	3.7	6.6																						
																								6.6	6.5	6.4	6.4	6.8	6.2	5.2	4.4	3.6	4.4	4.9	4.6	4.5	5.4	6.9	6.8	6.2	6.5	6.6	6.4	6.8	7.3	7.0	6.6	Diurnal Average
																								27.0	26.4	26.4	26.1	24.0	21.2	19.3	17.2	13.6	19.5	22.0	13.0	14.0	15.2	34.9	38.8	25.6	24.4	18.9	16.8	20.7	22.1	24.8	26.0	Diurnal Maximum
C - Calibration M - Maintenance PF - Power Failure Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m ³																																																



Wood Buffalo Environmental Association
Hourly Averages

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Anzac - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Anzac - July 2016

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	416	56.22	56.22
6 - 15	273	36.89	93.11
16 - 25	28	3.78	96.89
26 - 80	8	1.08	97.97
> 81.0	0	0.00	97.97

Total Number of Valid Hours: 740

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Anzac - July 2016

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	41	18	9	15	7	2	7	40	28	12	10	24	40	75	52	34	414
6 - 15	29	16	13	14	11	4	5	18	9	6	15	15	25	28	32	32	272
16 - 25	5	0	0	1	0	0	0	0	1	3	4	2	1	2	5	4	28
26 - 80	2	0	0	0	0	0	0	0	0	0	3	2	0	0	1	0	8
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	77	34	22	30	18	6	12	58	38	21	32	43	66	105	90	70	722

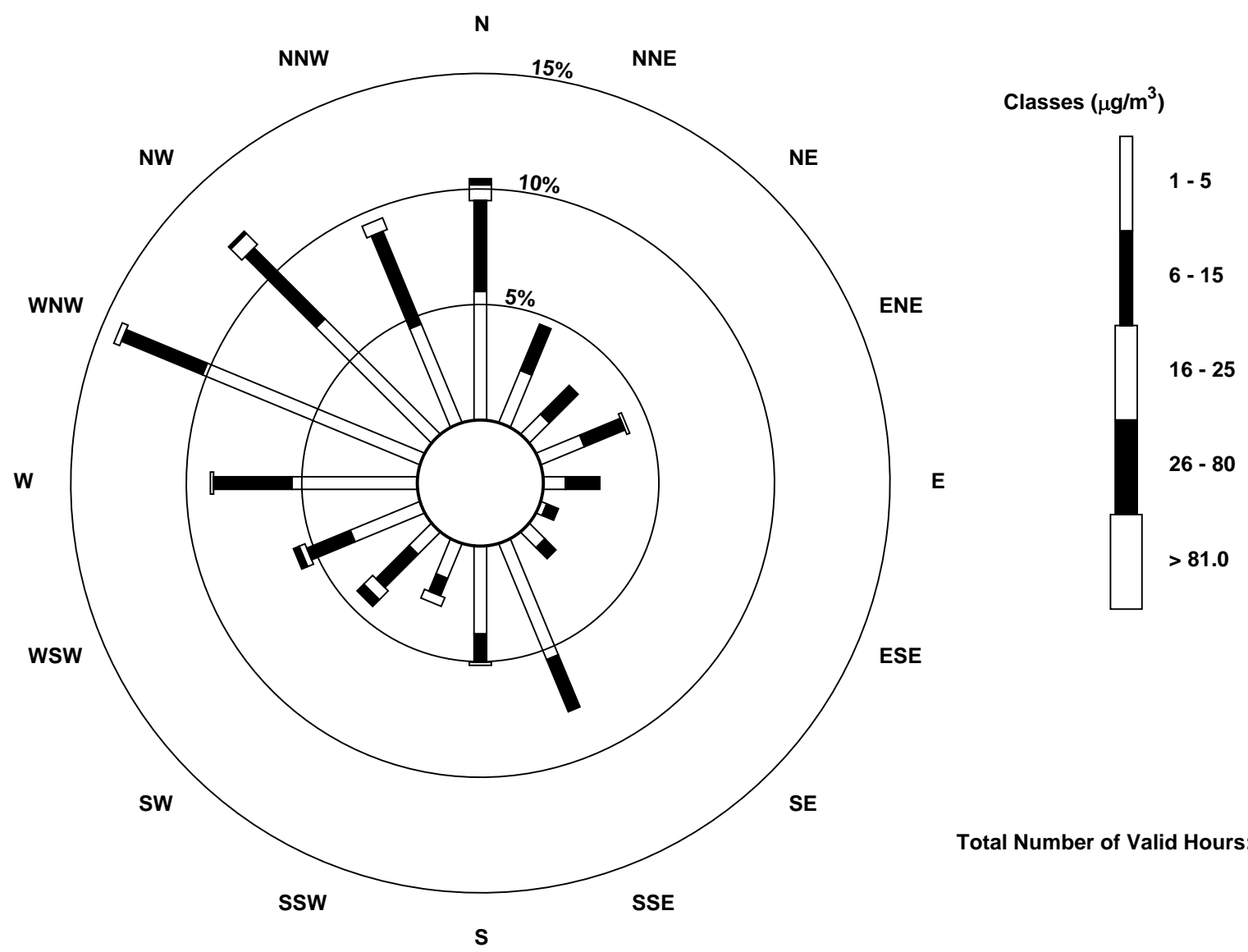
Total Number of Valid Hours: 737

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

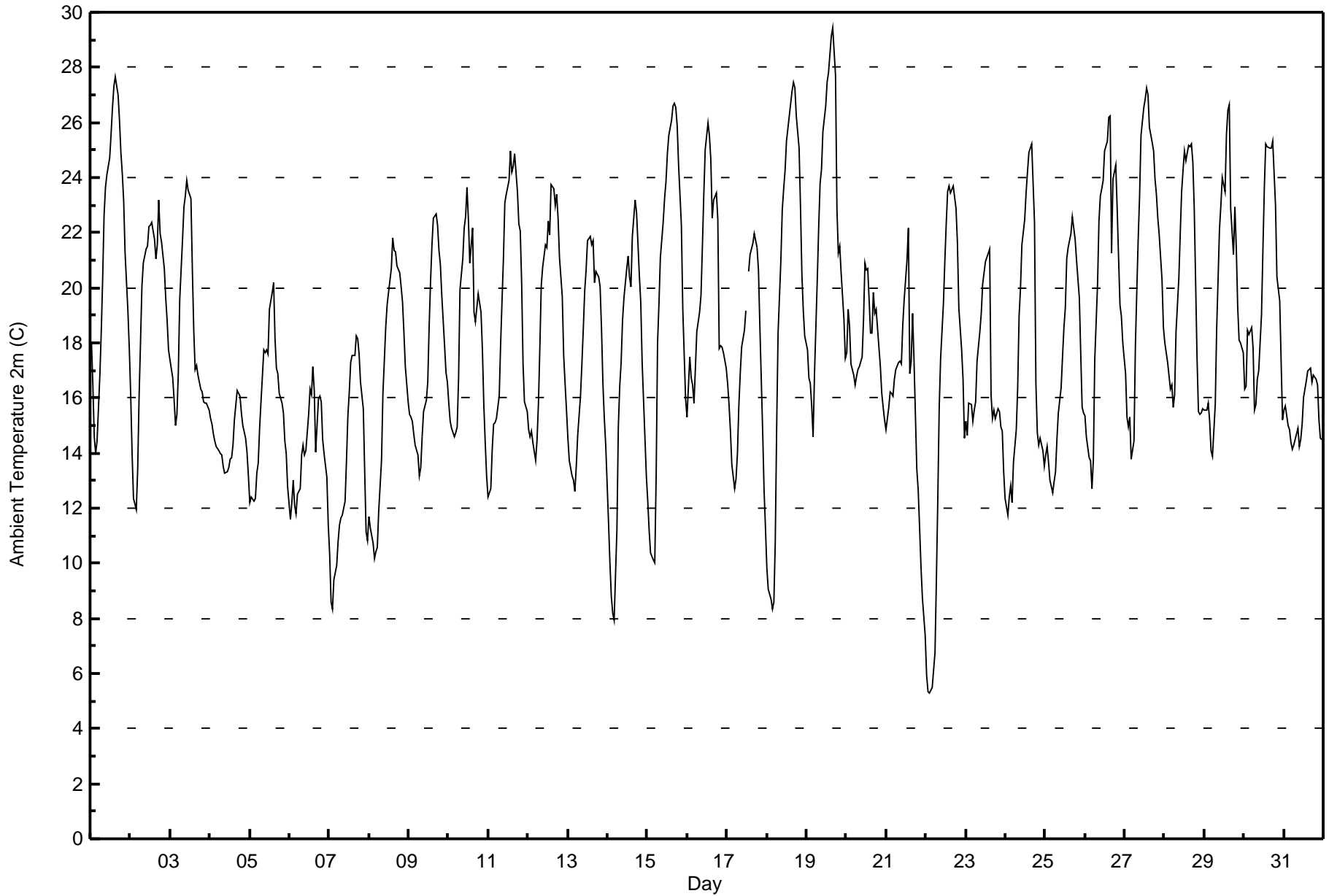
Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Anzac (AMS 14)



Total Number of Valid Hours: 737



Maximum Value: 29.4 C on Jul 19 17:00		Maximum Daily Average: 22.2 C on Jul 19		Hours in Service: 744																																												
Minimum Value: 5.3 C on Jul 22 03:00		Minimum Daily Average: 13.5 C on Jul 7		Hours of Data: 743																																												
Maximum Diurnal Average: 22.3 C at hour 15		Minimum Diurnal Average: 13.3 C at hour 5		Hours of Missing Data: 1																																												
Monthly Average: 18.05 C		Percentiles: P ₁ = 7.9 P ₁₀ = 12.8 Q ₁ = 14.9 Median = 17.5 Q ₃ = 21.5 P ₉₀ = 24.2 P ₉₉ = 27.3		Hours of Calibration: 0																																												
				Percent Operational Time: 99.9																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Jul	18.1	16.5	14.6	14.0	14.5	16.8	18.4	20.3	22.6	23.6	24.1	24.7	25.6	26.6	27.3	27.6	27.0	26.1	24.9	24.2	23.1	21.2	19.2	17.8	21.6	27.6																						
2-Jul	16.1	14.0	12.4	11.9	13.4	16.1	18.0	20.0	20.9	21.4	21.5	22.2	22.3	22.4	21.8	21.0	21.6	23.2	22.0	21.7	20.7	19.6	18.8	17.7	19.2	23.2																						
3-Jul	17.4	16.7	15.9	15.0	15.4	16.9	19.6	21.7	22.9	23.3	23.9	23.5	23.3	20.7	18.5	17.0	17.2	16.8	16.3	16.2	15.9	15.8	15.8	15.6	18.4	23.9																						
4-Jul	15.2	15.1	14.7	14.4	14.2	14.1	14.0	13.9	13.5	13.3	13.3	13.5	13.8	13.8	14.3	15.2	16.3	16.2	16.1	15.4	15.0	14.5	14.0	13.2	14.5	16.3																						
5-Jul	12.2	12.4	12.2	12.3	13.3	13.6	14.9	15.9	17.8	17.6	17.7	17.6	19.2	19.8	20.2	18.2	17.1	16.9	16.2	15.8	15.4	14.4	14.0	12.8	15.7	20.2																						
6-Jul	11.6	12.2	13.0	12.1	11.8	12.5	12.7	13.9	14.3	13.9	14.1	15.4	16.3	16.1	17.1	16.2	14.0	16.0	16.1	15.9	14.5	14.0	13.1	11.4	14.1	17.1																						
7-Jul	10.3	8.6	8.3	9.4	9.9	10.8	11.4	11.6	11.8	12.3	13.7	15.4	16.2	17.3	17.6	17.6	18.3	18.2	17.6	16.6	15.6	13.3	11.1	10.8	13.5	18.3																						
8-Jul	11.7	11.3	10.7	10.2	10.4	10.6	11.9	13.7	16.2	17.4	18.5	19.4	19.8	20.7	21.8	21.3	21.3	20.8	20.5	20.0	19.5	18.3	17.1	15.9	16.6	21.8																						
9-Jul	15.4	15.3	15.2	14.7	14.3	13.9	13.2	13.5	14.6	15.5	15.9	16.6	18.6	20.3	21.5	22.5	22.7	22.2	21.4	20.9	19.7	17.9	17.0	16.6	17.5	22.7																						
10-Jul	15.8	15.2	14.9	14.6	14.7	15.0	16.7	19.9	21.1	22.2	22.6	23.7	22.5	20.9	22.2	19.1	18.8	19.3	19.8	19.1	17.8	15.8	14.4	13.2	18.3	23.7																						
11-Jul	12.4	12.7	14.1	15.1	15.1	15.3	16.0	18.0	19.5	21.0	23.1	23.4	23.9	25.0	24.2	24.4	24.8	23.5	22.3	22.1	20.2	17.2	15.9	15.5	19.4	25.0																						
12-Jul	14.9	14.6	14.8	14.4	13.7	14.5	15.8	17.8	20.1	20.7	21.6	21.4	22.4	21.9	23.8	23.6	23.0	23.4	22.6	21.1	19.7	17.5	16.6	15.6	19.0	23.8																						
13-Jul	14.5	13.7	13.2	13.0	12.6	13.5	14.6	16.1	17.3	18.5	19.9	20.6	21.7	21.9	21.5	21.7	20.2	20.6	20.4	20.0	18.5	16.5	15.3	14.3	17.5	21.9																						
14-Jul	11.5	10.0	8.8	8.2	7.9	11.2	15.0	16.4	17.3	18.8	19.6	20.7	21.2	20.4	20.0	21.8	23.2	22.7	21.6	20.4	19.5	17.3	14.5	13.2	16.7	23.2																						
15-Jul	12.3	11.2	10.4	10.1	10.0	13.1	18.0	19.4	21.1	22.3	23.3	23.8	24.8	25.5	26.1	26.6	26.7	26.5	25.9	24.5	22.3	19.2	17.6	16.0	19.9	26.7																						
16-Jul	15.3	17.5	16.7	16.5	15.8	17.1	18.4	19.1	19.7	21.5	23.4	25.0	26.0	25.5	24.7	22.5	23.2	23.5	22.5	17.8	17.9	17.8	17.7	17.1	20.1	26.0																						
17-Jul	16.5	15.8	14.8	13.6	12.7	13.1	14.0	15.7	16.9	17.8	18.5	19.2	M	20.6	21.2	21.6	22.0	21.7	21.4	20.6	18.6	14.8	12.6	11.3	17.2	22.0																						
18-Jul	9.8	9.0	8.7	8.4	8.6	10.8	14.9	18.4	21.0	22.8	23.6	24.3	25.3	26.2	26.7	27.2	27.4	27.3	26.3	25.0	22.9	20.5	19.2	18.3	19.7	27.4																						
19-Jul	17.7	16.7	16.5	15.7	14.6	16.9	20.4	22.2	23.8	24.3	25.7	26.6	27.5	27.8	28.5	29.1	29.4	27.7	22.9	21.3	21.5	20.6	18.9	17.4	22.2	29.4																						
20-Jul	17.7	19.2	18.6	17.2	16.8	16.5	16.8	17.0	17.1	17.5	18.8	20.9	20.6	20.7	18.4	18.4	19.8	19.1	19.2	18.5	17.1	16.1	15.7	15.2	18.0	20.9																						
21-Jul	14.8	15.7	16.2	16.2	16.0	16.7	17.0	17.3	17.3	17.2	18.6	19.6	21.0	22.1	16.9	17.3	19.1	17.4	13.4	12.7	11.3	9.9	8.8	7.4	15.8	22.1																						
22-Jul	6.0	5.4	5.3	5.4	5.5	6.8	9.4	12.4	15.7	17.4	19.4	20.9	22.3	23.5	23.7	23.4	23.7	23.3	22.9	21.6	19.3	17.7	16.7	14.5	15.9	23.7																						
23-Jul	15.2	14.7	15.8	15.8	15.2	15.6	15.9	17.3	18.4	19.1	20.1	20.6	21.0	21.1	21.4	16.1	15.2	15.6	15.2	15.6	15.5	15.0	14.8	13.3	16.8	21.4																						
24-Jul	12.4	11.8	12.4	12.8	12.2	13.7	14.8	16.4	18.9	20.0	21.5	22.5	23.4	24.2	24.9	25.1	25.2	22.4	16.5	14.8	14.3	14.5	14.1	13.5	17.6	25.2																						
25-Jul	13.9	14.2	13.7	13.0	12.5	13.0	13.3	14.5	15.5	16.4	17.5	18.5	19.3	21.0	21.4	22.0	22.6	22.2	21.8	21.0	19.6	17.6	15.7	15.5	17.3	22.6																						
26-Jul	15.3	14.6	13.8	13.7	12.7	13.7	17.4	20.2	22.4	23.3	23.6	23.9	25.0	25.3	26.2	26.3	21.3	23.9	24.5	22.9	21.1	19.4	18.9	18.0	20.3	26.3																						
27-Jul	16.9	15.3	14.9	15.3	13.8	14.5	17.9	19.9	21.8	23.4	25.5	26.6	26.8	27.2	27.0	25.8	25.3	25.0	23.9	23.4	22.6	21.9	20.3	18.6	21.4	27.2																						
28-Jul	18.0	17.6	17.3	16.3	16.5	15.6	16.1	18.4	20.3	22.0	23.5	24.3	25.0	24.6	25.2	25.1	25.2	24.5	22.9	17.5	15.5	15.4	15.4	15.6	19.9	25.2																						
29-Jul	15.6	15.6	15.8	15.2	14.1	13.9	15.8	18.5	20.3	22.1	23.0	24.0	23.5	25.6	26.5	26.6	22.9	21.2	23.0	21.4	19.3	18.1	18.0	17.6	19.9	26.6																						
30-Jul	16.3	16.4	18.5	18.3	18.6	17.8	15.6	15.8	16.7	17.0	19.0	21.4	23.6	25.2	25.1	25.1	25.0	25.3	24.2	23.0	20.4	19.5	17.3	15.2	20.0	25.3																						
31-Jul	15.6	15.7	15.0	14.9	14.4	14.2	14.3	14.5	14.9	14.2	14.5	15.1	16.0	16.6	17.0	17.0	17.1	16.6	16.8	16.7	16.5	15.2	14.6	14.5	15.5	17.1																						
																								14.4	14.0	13.8	13.5	13.3	14.1	15.6	17.1	18.4	19.3	20.3	21.1	21.9	22.3	22.3	22.0	21.8	21.6	20.7	19.6	18.4	17.0	15.9	14.9	Diurnal Average
																								18.1	19.2	18.6	18.3	18.6	17.8	20.4	22.2	23.8	24.3	25.7	26.6	27.5	27.8	28.5	29.1	29.4	27.7	26.3	25.0	23.1	21.9	20.3	18.6	Diurnal Maximum
M - Maintenance																																																





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature 2m (AT 2m) - C
Anzac - July 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	23	3.10	3.10
10 - 20	463	62.31	65.41
> 20	257	34.59	100.00

Total Number of Valid Hours: 743

Total Number of Hours: 744



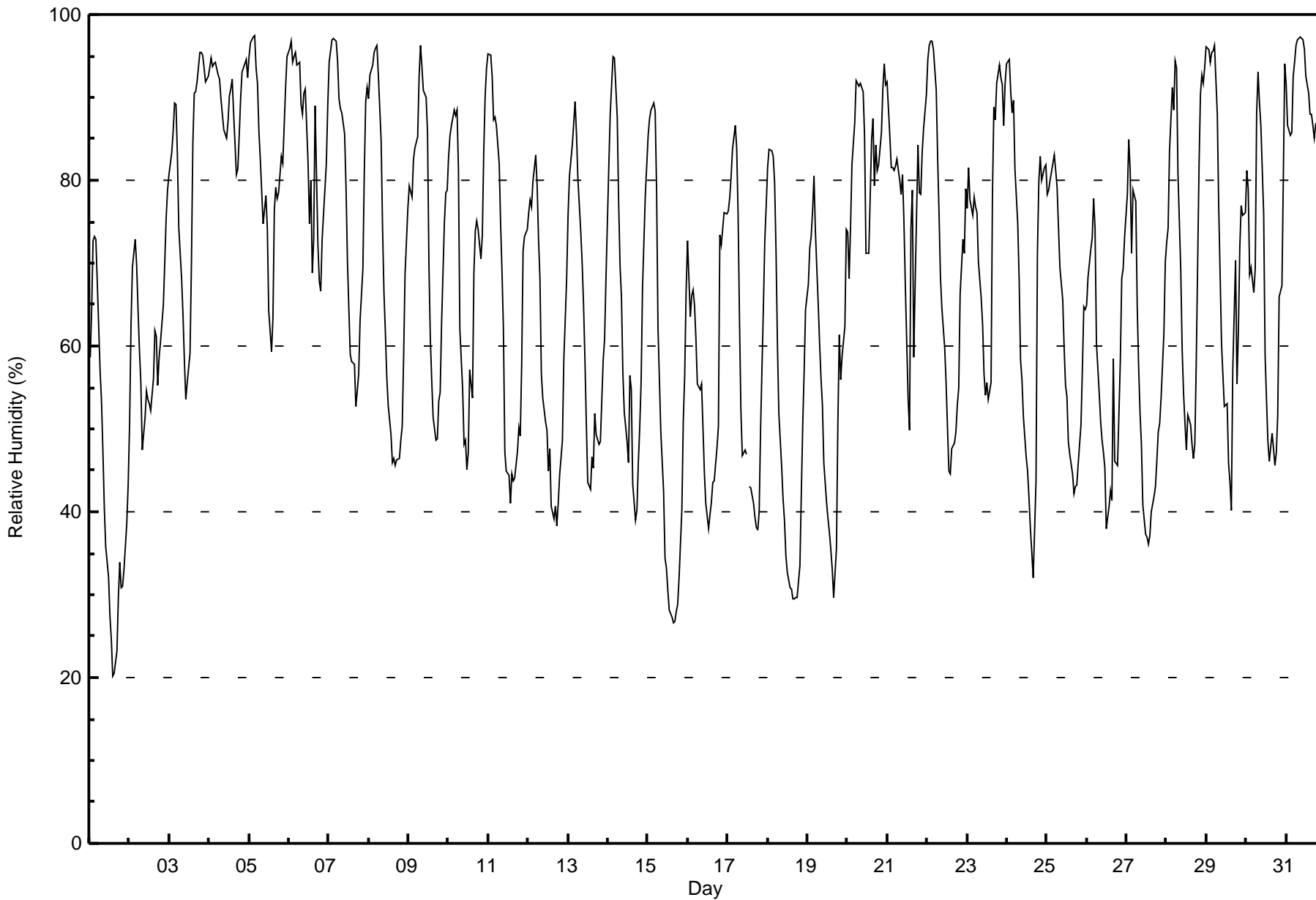
Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

Anzac - July 2016

Maximum Value: 97 % on Jul 5 04:00																	Maximum Daily Average: 91.0 % on Jul 31																	Hours in Service: 744								
Minimum Value: 20 % on Jul 1 15:00																	Minimum Daily Average: 42.8 % on Jul 1																	Hours of Data: 743								
Maximum Diurnal Average: 85.4 % at hour 5																	Minimum Diurnal Average: 51.4 % at hour 14																	Hours of Missing Data: 1								
Monthly Average: 68.0 %																	Percentiles: P ₁ = 27 P ₁₀ = 42 Q ₁ = 51 Median = 70 Q ₃ = 85 P ₉₀ = 93 P ₉₉ = 97																	Hours of Calibration: 0								
																																		Percent Operational Time: 99.9								
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																		
1-Jul	59	64	73	73	73	62	57	53	47	41	36	32	27	25	20	20	23	30	34	31	31	33	39	43	42.8	73																
2-Jul	51	62	69	73	70	64	60	56	47	51	55	54	53	52	56	62	61	55	59	61	65	70	75	79	60.8	79																
3-Jul	81	83	86	89	89	83	74	68	64	58	54	56	59	70	84	91	91	92	95	95	95	94	92	93	80.6	95																
4-Jul	93	95	94	94	94	93	92	90	88	86	85	87	90	91	92	88	81	81	85	90	93	94	95	92	90.2	95																
5-Jul	95	97	97	97	93	92	86	83	75	76	78	74	64	59	63	76	79	78	78	83	82	87	91	95	82.5	97																
6-Jul	96	97	94	95	96	94	94	89	88	90	91	82	75	80	69	73	89	72	68	67	73	76	82	89	84.1	97																
7-Jul	94	96	97	97	97	94	90	89	88	86	79	70	65	59	58	58	53	55	57	63	69	81	89	91	78.1	97																
8-Jul	90	93	94	95	96	96	93	85	74	66	62	56	53	49	46	46	46	46	46	49	50	59	69	77	68.2	96																
9-Jul	79	79	78	83	84	85	93	96	94	91	90	86	70	61	56	51	49	49	53	54	63	75	79	79	74.0	96																
10-Jul	83	85	87	89	88	88	81	62	55	48	49	45	47	57	54	69	74	75	74	71	73	83	90	94	71.7	94																
11-Jul	95	95	93	87	88	87	82	75	69	62	47	45	44	41	45	44	44	47	50	49	58	72	73	74	65.2	95																
12-Jul	76	78	77	80	83	79	73	68	57	54	51	50	45	48	41	39	41	38	41	44	49	59	63	68	58.3	83																
13-Jul	76	80	84	87	89	86	80	74	70	65	58	51	44	43	47	45	52	49	48	48	53	58	61	68	63.2	89																
14-Jul	82	88	92	95	95	88	77	70	66	57	52	48	46	56	55	43	39	40	46	50	56	67	78	82	65.3	95																
15-Jul	85	87	89	89	88	79	62	56	50	42	34	33	31	28	27	27	27	28	29	32	40	51	57	66	51.6	89																
16-Jul	73	64	66	67	65	61	55	55	56	50	45	41	38	40	41	44	44	48	50	73	72	74	76	76	57.2	76																
17-Jul	76	78	80	84	87	84	76	63	52	47	48	47	M	43	43	41	39	38	38	40	50	65	73	77	59.5	87																
18-Jul	82	84	84	83	80	71	60	52	45	41	39	35	33	31	31	29	29	30	30	33	42	50	57	64	50.7	84																
19-Jul	67	72	73	76	81	74	65	60	56	53	46	41	39	38	35	33	30	36	51	61	56	59	62	74	55.8	81																
20-Jul	74	68	74	82	87	92	92	91	92	91	85	71	71	71	85	87	79	84	81	82	86	91	94	91	83.4	94																
21-Jul	92	85	82	81	81	82	83	80	78	81	75	67	53	50	74	79	59	68	84	78	78	83	86	90	77.1	92																
22-Jul	95	96	97	97	96	91	83	76	68	65	60	56	50	45	45	48	48	50	53	55	66	73	71	79	69.2	97																
23-Jul	77	82	78	76	78	77	76	70	66	63	57	54	56	54	56	78	89	87	92	94	92	92	87	92	75.8	94																
24-Jul	94	95	91	88	90	81	75	68	58	56	51	47	45	42	38	35	32	44	71	80	83	80	81	82	66.9	95																
25-Jul	78	79	80	81	83	81	79	74	70	66	60	55	54	49	47	45	42	43	43	46	50	57	65	64	62.1	83																
26-Jul	65	68	72	73	78	74	60	54	51	49	47	45	38	41	43	41	59	46	46	52	58	68	69	73	57.1	78																
27-Jul	78	85	81	71	79	77	65	58	52	48	41	37	37	36	37	40	42	43	46	50	51	54	62	70	55.8	85																
28-Jul	73	74	84	91	89	94	94	81	69	60	54	51	47	52	50	48	46	48	58	82	90	93	92	94	71.4	94																
29-Jul	96	96	94	95	96	96	88	77	69	60	56	53	53	46	44	40	57	70	55	62	72	77	76	76	71.0	96																
30-Jul	81	79	69	69	66	69	88	93	89	87	76	59	54	48	46	50	48	46	47	52	66	67	81	94	67.7	94																
31-Jul	92	87	85	86	93	94	96	97	97	97	97	96	93	91	88	88	87	85	87	87	88	89	92	92	91.0	97																
																	81.5	82.9	83.6	84.7	85.4	82.9	78.3	73.0	67.7	64.1	59.9	55.6	52.4	51.4	52.1	53.5	54.1	54.9	58.0	61.7	66.2	71.9	76.0	80.0	Diurnal Average	
																	96	97	97	97	97	96	96	97	97	97	97	96	93	91	92	91	91	92	95	95	95	94	95	95	Diurnal Maximum	
M - Maintenance																																										





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity (RH) - %
Anzac - July 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	55	7.40	7.40
40 - 60	226	30.42	37.82
60 - 80	209	28.13	65.95
80 - 100	253	34.05	100.00

Total Number of Valid Hours: 743

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Leaf Wetness (SW) - %

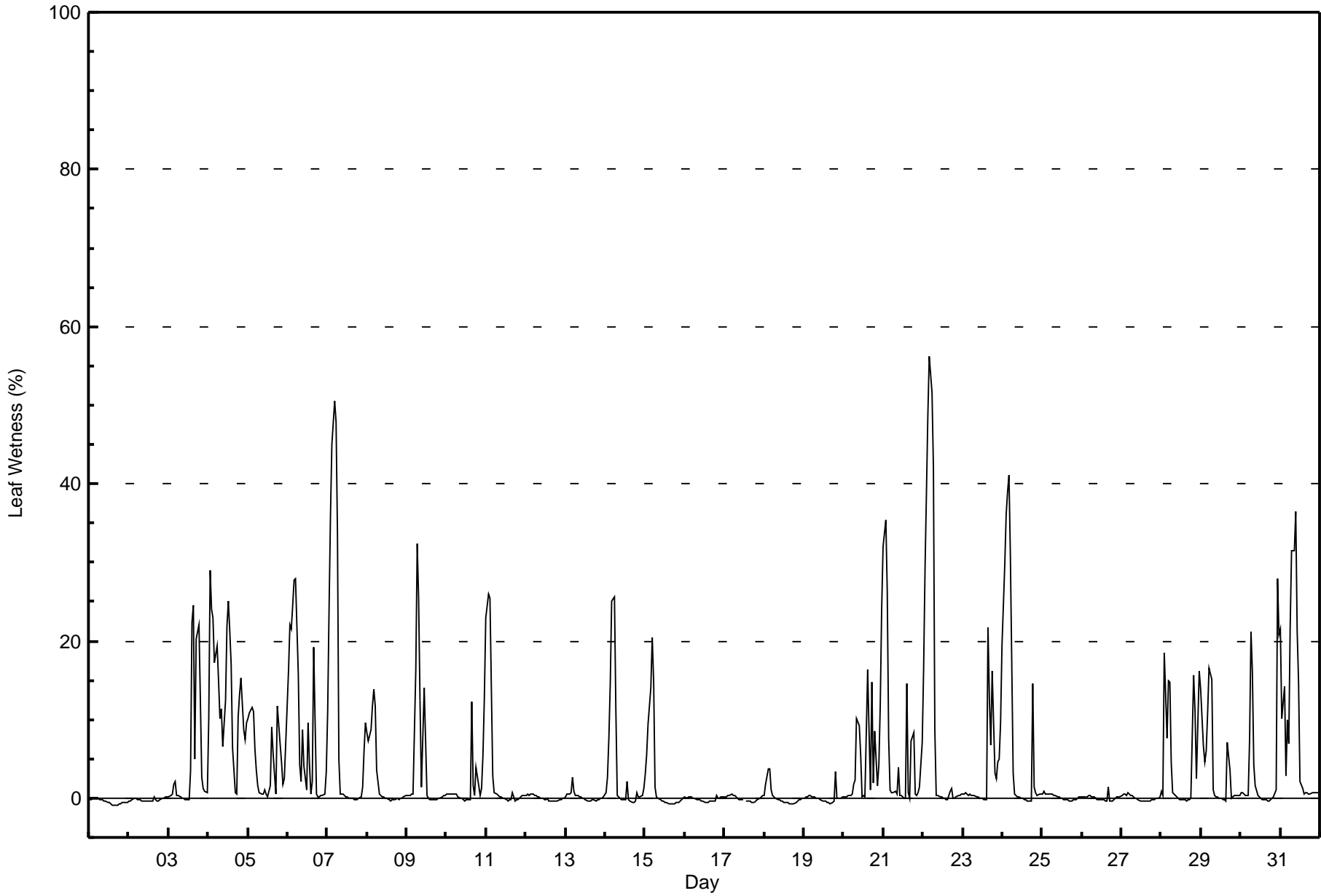
Anzac - July 2016

Maximum Value: 56 % on Jul 22 05:00																		Maximum Daily Average: 14.0 % on Jul 4																		Hours in Service: 744						
Minimum Value: -1 % on Jul 1 17:00																		Minimum Daily Average: -0.5 % on Jul 1																		Hours of Data: 743						
Maximum Diurnal Average: 10.0 % at hour 5																		Minimum Diurnal Average: 0.9 % at hour 14																		Hours of Missing Data: 1						
Monthly Average: 3.9 %																		Percentiles: P ₁ = -1 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 2 P ₉₀ = 15 P ₉₉ = 39																		Hours of Calibration: 0						
																																				Percent Operational Time: 99.9						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																		
1-Jul	0	0	0	0	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	-0.5	0																
2-Jul	0	0	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-Jul	0	0	0	2	2	0	0	0	0	0	0	0	4	22	25	5	20	22	12	3	1	1	1	1	5.0	25																
4-Jul	10	29	24	23	17	19	15	10	11	6	13	22	25	21	17	6	1	1	10	13	15	9	7	10	14.0	29																
5-Jul	10	11	12	11	6	4	2	1	0	0	1	1	0	2	9	6	3	0	12	7	5	2	2	7	4.7	12																
6-Jul	16	22	21	25	28	28	16	4	2	9	4	1	10	4	1	2	19	1	0	0	0	0	1	3	9.1	28																
7-Jul	11	24	36	45	51	48	34	5	1	0	0	0	0	0	0	0	0	0	0	0	0	1	6	10	11.3	51																
8-Jul	8	7	9	12	14	12	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.7	14																
9-Jul	0	0	0	0	0	16	32	25	12	1	14	7	0	0	0	0	0	0	0	0	0	0	0	0	4.7	32																
10-Jul	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	12	2	0	4	2	0	1	6	13	1.8	13																
11-Jul	23	26	25	14	3	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	3.9	26																
12-Jul	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	1																
13-Jul	0	0	1	1	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	3																
14-Jul	1	3	8	15	25	26	11	0	0	0	0	0	2	0	0	-1	0	0	1	0	0	0	1	3.7	26																	
15-Jul	3	5	9	14	20	15	1	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	0	0	0	2.6	20																	
16-Jul	0	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																
17-Jul	0	0	0	0	1	0	0	0	0	0	0	0	M	0	0	0	-1	-1	-1	0	0	0	0	0	0.0	1																
18-Jul	0	2	4	4	1	0	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	0	0	0	0	0.2	4																
19-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	-1	-1	0	3	0	0	0	0	0.0	3																
20-Jul	0	0	0	0	0	0	2	2	10	9	6	0	0	0	16	8	1	15	2	9	2	4	12	24	5.2	24																
21-Jul	32	35	26	8	1	1	1	1	1	4	0	0	0	0	15	1	0	7	8	1	0	1	1	7	6.3	35																
22-Jul	17	29	39	49	56	52	42	9	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	12.3	56																
23-Jul	0	1	1	0	0	0	0	0	0	0	0	0	0	0	22	13	7	16	3	2	5	5	10	3.6	22																	
24-Jul	19	30	36	39	41	31	3	0	0	0	0	0	0	0	0	0	0	0	15	1	1	0	0	0	9.0	41																
25-Jul	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1																
26-Jul	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	1																
27-Jul	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	1																
28-Jul	1	0	18	8	15	15	4	1	0	0	0	0	0	0	0	0	0	0	0	16	11	2	9	16	4.8	18																
29-Jul	14	7	5	6	11	17	15	1	0	0	0	0	0	0	0	7	3	0	0	0	0	0	0	0	3.6	17																
30-Jul	1	1	0	0	0	7	21	16	4	2	0	0	0	0	0	0	0	0	0	0	0	1	28	21	4.2	28																
31-Jul	22	10	14	3	10	7	22	31	31	36	21	15	2	1	1	1	1	1	1	1	1	1	1	1	9.7	36																
																		6.1	7.9	9.4	9.0	10.0	9.7	7.4	3.5	2.4	2.2	1.9	1.4	1.1	0.9	2.3	2.4	1.5	1.5	2.7	2.1	1.2	0.9	2.6	4.1	Diurnal Average
																		32	35	39	49	56	52	42	31	31	36	21	22	25	21	22	25	19	20	22	16	15	9	28	24	Diurnal Maximum
M - Maintenance																																										



Wood Buffalo Environmental Association
Hourly Averages

Leaf Wetness (SW) - %
Anzac - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Leaf Wetness (SW) - %
Anzac - July 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 0.3	142	29.40	29.40
0.4 - 0.5	77	15.94	45.34
0.6 - 0.7	34	7.04	52.38
0.8 - 1.4	22	4.55	56.94
1.5 - 10	92	19.05	75.98
> 10	112	23.19	99.17

Total Number of Valid Hours: 483

Total Number of Hours: 744



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Speed (WS) - km/h
Anzac - July 2016

Maximum Speed: 21 km/h on Jul 24 17:00	Maximum Daily Speed Average: 11.6 km/h on Jul 24	Hours in Service: 744
Minimum Speed Value: 1 km/h on Jul 29 05:00	Minimum Daily Speed Average: 1.0 km/h on Jul 10	Hours of Data: 740
Maximum Diurnal Speed Average: 4.9 km/h at hour 17	Minimum Diurnal Speed Average: 1.1 km/h at hour 21	Hours of Missing Data: 4
Monthly Average Velocity: 3.0 km/h 303.0 deg	Percentiles: P ₁ = 1 P ₁₀ = 3 Q ₁ = 5 Median = 8 Q ₃ = 10 P ₉₀ = 13 P ₉₉ = 17	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-Jul	S8	SSE7	SSE6	SE7	SE8	SSE9	SSE11	S11	S11	SSE15	SSE16	SSE14	S12	SSE14	SSE13	SSE11	SSW12	SSW14	SSW12	S10	S9	SSE7	S7	S8	SSE10.1	SSE16
2-Jul	S7	S5	SSE5	SSE6	SSE6	SSE7	SSE9	SSE12	SSE14	SSE16	SSE17	SSE15	S13	S15	S13	SSE14	SSE13	S11	S11	S10	S9	SSE7	SSE8	SSE7	SSE10.2	SSE17
3-Jul	SSE9	SSE10	SSE9	SSE9	SSE9	SSE8	SSE8	SE9	SE13	SSE15	SSE15	SSE14	SE15	SSW8	W4	ENE3	NNW4	N5	WNW1	WSW5	WSW5	W6	WNW10	WNW11	S5.0	SSE15
4-Jul	WNW10	WNW8	WNW10	WNW10	WNW10	NW10	NW9	WNW10	WNW11	WNW11	WNW12	WNW10	WNW7	WSW8	WSW9	W9	WNW6	WNW5	SW4	S5	SSW5	W4	NNW5	NNW6	WNW7.1	WNW12
5-Jul	N5	N5	NNW5	NNW6	NNW6	NNW6	NNW6	N5	N6	N12	N11	NNE11	N9	N9	S5	N1	W9	WNW6	NW7	NNW5	NNE3	NW3	WSW3	W2	NNW5.0	N12
6-Jul	NW3	NNW3	WSW3	N2	NE3	W3	ENE4	S5	SW7	NW8	NNE8	NNE8	NE10	NE8	NNE8	NNE9	NNE9	NNE9	NNE7	NNE8	NNE5	ENE6	NE4	NNE5	NNE4.3	NE10
7-Jul	N2	NNW4	NNW5	NW6	NNW6	NNW7	NW8	NNW8	NW8	NW9	WNW11	NNW9	NNW9	NNW12	N14	NNW12	NNW11	NNW11	N9	N7	NE6	N3	NNW2	N4	NNW7.2	N14
8-Jul	NNW2	NW2	NW2	N2	N4	N4	NNE2	NE3	ENE5	NE2	ENE5	ENE6	NE6	ENE7	NE7	NE8	NE9	ENE8	ENE8	ENE6	E6	S4	SSW4	SSW1	NE3.6	NE9
9-Jul	E4	ENE6	ENE4	NE2	N2	NNE4	NE5	S3	E3	W2	N2	NNE6	NE8	NE8	NE9	ENE9	E7	E8	E10	E6	ENE5	E4	E3	SE2	ENE4.2	E10
10-Jul	ESE3	AF	S2	WNW2	SE2	NNE1	N1	ENE2	ENE4	SE5	ENE8	SE8	E3	SW8	WSW5	NNW9	NW5	WNW5	NW4	NW8	NW7	NW6	W3	SW3	NNW1.0	NNW9
11-Jul	WSW2	WNW4	NW7	NW8	NW6	NW5	NW6	WNW6	WNW7	NNW6	N10	N10	N10	NNE10	N14	N13	NNE13	N12	NNE10	NNE8	NNE4	N5	NNW7	NNW6	NNW6.9	N14
12-Jul	N7	NNW7	NW6	NW7	NW6	NW7	NW7	NW8	N11	N11	NNW14	N15	N15	N14	NNW15	N15	N13	N17	N14	N14	N10	NNW8	NNW9	NNW8	NNW10.3	N17
13-Jul	NNW7	NNW7	NNW8	NW8	NW7	NW8	NNW11	NNW11	NNW9	NNW12	NNW13	N13	NNE12	N11	NNW11	N15	NNE13	N11	N11	NNE8	N6	NNE6	NE6	ENE6	N8.6	N15
14-Jul	ENE6	ENE4	AF	E2	WNW3	NNW3	WNW4	WNW5	W7	NW5	NNE5	N4	WNW3	NE8	ENE8	E6	NE6	ENE9	ENE7	NE5	SSW3	W2	W5	W4	NNE2.0	ENE9
15-Jul	WSW5	W5	W5	W5	W4	WNW4	NW5	WNW5	W6	W9	W9	W10	W8	WNW9	W9	W8	WNW8	NW8	NW6	N8	NNW5	NNW5	NNW5	WNW5	WNW5.8	W10
16-Jul	WNW7	WNW9	WNW8	W7	W7	WNW10	WNW12	WNW11	WNW11	WNW12	W12	WNW12	NW11	NNW14	N15	N15	NW10	WNW7	N11	N10	NW8	NNW9	NNW10	N9	WNW9.0	N15
17-Jul	NNW8	N8	NNW7	NNW7	NNW7	NNW9	N10	N14	N13	N13	N11	M	M	N10	NNW8	N9	N9	N7	NNW6	NNW3	N2	WSW3	SW3	N7.5	N14	
18-Jul	WSW4	WSW3	SW4	SW5	SW7	SW6	SW5	SSW5	SW5	WNW5	WNW8	NW10	NW10	NNW9	NW10	NW11	WNW8	WSW9	SW13	WSW10	SW8	SSW7	SSW8	SW8	W5.8	SW13
19-Jul	SW10	SW9	SW9	SSW2	SSW6	SW5	WSW7	W7	WNW7	WNW7	WNW9	WNW11	WNW12	WNW11	W11	WNW11	WNW11	NW13	NW16	W10	WSW8	W6	NW3	NNW3	W7.1	NW16
20-Jul	WSW5	WNW9	NW11	NW10	WNW10	NW7	NW5	NW5	NW5	NW7	NW7	WNW10	NNW10	NNW7	N10	W6	W9	WNW7	WNW8	W8	W7	W6	WSW6	WSW6	WNW6.6	NW11
21-Jul	W7	WSW8	W8	WSW9	WSW8	W8	W9	W12	WNW11	WNW13	WNW14	WNW12	WNW16	WNW15	NW13	WNW11	NW16	NNW14	N15	N11	N8	NNE8	NNE7	NNE2	WNW8.4	NW16
22-Jul	S3	S6	S7	S10	S10	SSE10	SSE11	S12	S12	SSE12	SSW12	SSW12	SW16	SW19	SW17	SW15	WSW18	W10	WNW7	NW7	WNW4	WNW6	NW5	NW6	SW7.2	SW19
23-Jul	SW4	W4	WNW8	WNW8	WNW9	NNW11	NW10	WNW9	WNW9	W9	WNW9	W9	WNW9	NNW9	NNW10	NNE4	N7	WSW6	WSW6	W5	W7	W6	W4	WNW6.7	WNW11	
24-Jul	WSW6	SW6	WSW7	WSW7	WSW7	WSW10	SW12	WSW12	W14	WNW15	W13	W19	W16	W18	W15	W18	W21	NW16	NW17	W7	W9	WNW13	WNW13	WNW13	W11.6	W21
25-Jul	WNW13	WNW14	WNW13	WNW13	WNW13	WNW13	NW13	WNW13	NW11	NW10	NNW12	NW11	NNW11	NNW11	NNW10	NW8	NW6	N8	N5	NE6	E7	SE6	SSE6	SSE7	NW7.1	WNW14
26-Jul	SSE8	SSE7	SSE9	SSE11	SSE8	S5	SSE3	SSE5	SSE6	SW7	WNW7	W2	SW10	WSW10	W11	WNW11	WNW11	W5	SSE10	SSE9	S9	S10	SSE10	SSE9	SSW5.1	WNW11
27-Jul	S6	S8	SW9	WSW8	WSW5	W6	WNW10	WNW12	WNW10	WNW9	NW8	NW9	WNW10	NW9	WNW9	NNW10	NNW10	N8	N8	N5	NNE5	NE5	E4	ESE1	NW4.7	WNW12
28-Jul	SSW2	S4	NW4	SE4	NW7	NNE2	N2	NNW4	NE5	ENE6	E7	ENE6	ENE4	NE11	ENE10	ENE7	E8	ESE6	W5	SW13	S6	NNW2	N5	NW4	NE1.9	SW13
29-Jul	W5	W5	W2	SW5	WSW1	SSW3	SW3	WNW6	WNW7	WNW5	WNW4	W3	NW4	WSW2	SSW6	WSW4	W9	SSW6	SSW8	S7	SSE4	S7	SSE8	S8	SW3.2	W9
30-Jul	SSW6	WSW8	WNW10	WNW11	WNW9	WSW12	WSW4	SSW1	NE2	NNW3	WSW3	WNW3	SSE4	SE7	SW5	SSE5	E7	E10	ESE6	ESE4	E2	ESE1	WSW10	NW4	WSW1.8	WSW12
31-Jul	N9	NNE10	NNW8	NE7	NNW4	NNW4	NW6	NW10	NW10	N10	NW8	NW11	NW8	WNW9	WNW11	WNW10	NW10	WNW9	NW7	NW7	NW8	NW11	NW11	WNW15	NW7.9	WNW15

WSW1.9	W2.5	W3.5	W3.0	W3.1	NNW3.4	NNW3.3	W3.6	NNW3.5	NNW3.7	NW3.9	NW4.0	NW4.0	NW4.0	NW4.4	NNW4.7	NW4.9	NNW4.4	NNW3.5	NW2.0	WNW1.1	WNW1.7	WNW2.0	WNW2.1	Diurnal Average
WNW13	WNW14	WNW13	WNW13	WNW11	WNW13	NW13	WNW13	W14	SSE16	SSE17	W19	SW16	SW19	SW17	W18	W21	N17	NW17	N14	N10	WNW13	WNW13	WNW15	Diurnal Maximum

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



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

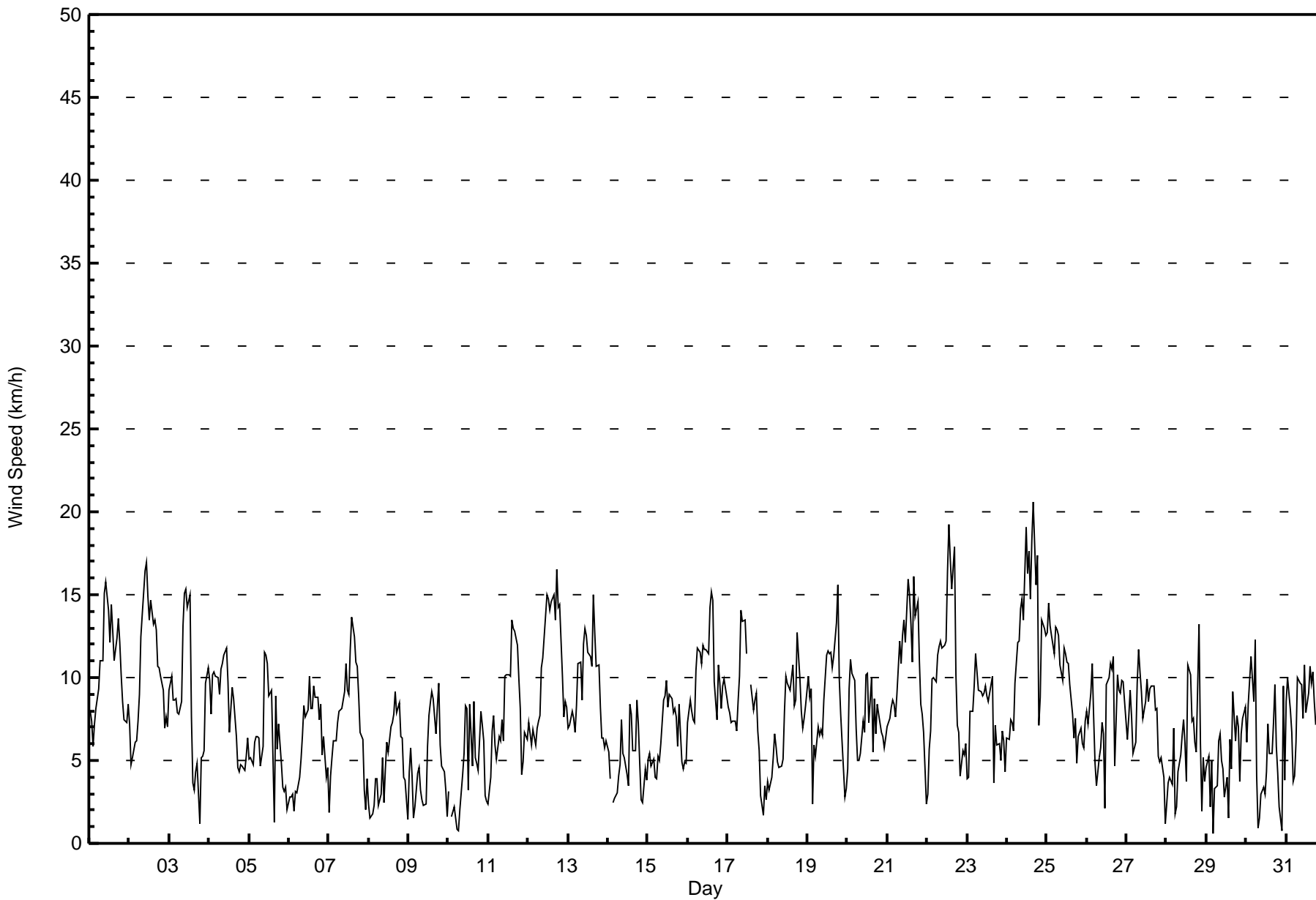
Wind Speed (WS) - km/h
Anzac - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 9 km/h on Jul 21 15:00 Minimum Value: 1 km/h on Jul 15 00:00 Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 2 Q ₃ = 3 P ₉₀ = 4 P ₉₉ = 6																	Hours in Service: 744 Hours of Data: 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-Jul	2	1	1	1	2	2	3	4	4	6	5	5	5	5	5	5	5	4	4	4	3	2	2	2	6
2-Jul	1	2	2	2	1	2	3	4	4	5	5	5	5	4	5	4	4	4	4	3	3	2	2	2	5
3-Jul	2	2	2	2	2	2	2	3	4	5	5	5	5	4	2	2	2	1	1	2	2	2	4	4	5
4-Jul	3	3	3	3	3	3	4	4	3	4	4	4	2	3	3	3	2	2	2	1	1	2	1	1	4
5-Jul	1	1	1	1	2	2	2	2	2	4	4	3	3	3	2	4	3	2	2	2	1	1	2	1	4
6-Jul	1	2	2	1	2	2	2	2	2	2	2	2	4	3	3	4	4	3	2	2	2	2	1	1	4
7-Jul	1	1	1	2	2	2	3	2	3	3	3	3	3	4	4	4	4	3	3	2	2	1	1	1	4
8-Jul	1	1	1	1	1	1	1	1	2	2	3	3	2	2	3	3	2	2	2	2	1	2	1	1	3
9-Jul	3	1	1	1	1	1	1	1	1	1	1	2	2	3	3	2	2	2	3	2	1	1	1	1	3
10-Jul	1	AF	1	2	1	1	1	2	2	3	3	4	3	2	2	3	2	1	1	3	2	1	1	1	4
11-Jul	1	1	2	2	2	1	2	1	2	2	4	4	4	4	4	4	4	3	3	2	2	1	1	1	4
12-Jul	1	2	1	2	2	2	2	3	3	3	4	5	5	4	4	5	4	5	4	4	3	2	2	2	5
13-Jul	2	2	2	2	2	2	4	4	3	4	4	4	4	4	4	5	5	4	3	3	2	1	2	1	5
14-Jul	1	1	AF	1	2	1	1	2	2	2	2	3	3	3	2	2	3	3	2	2	2	2	1	1	3
15-Jul	1	1	1	1	1	1	1	2	2	2	3	3	3	3	3	3	2	3	3	2	1	1	2	2	3
16-Jul	2	2	2	2	2	4	3	4	3	4	3	4	4	4	6	4	3	2	7	4	2	3	3	3	7
17-Jul	2	2	2	2	2	2	2	3	4	4	4	4	M	M	3	4	3	3	2	2	1	1	1	1	4
18-Jul	1	1	1	1	1	2	1	1	2	2	3	3	3	3	3	3	3	4	4	3	2	1	2	1	4
19-Jul	2	1	3	2	2	2	3	2	2	2	3	4	4	4	5	4	3	6	7	3	3	2	1	2	7
20-Jul	2	3	4	3	3	2	2	1	1	2	2	3	4	3	4	2	3	2	2	2	2	1	1	1	4
21-Jul	1	2	2	3	2	3	4	4	4	4	4	4	6	5	9	4	6	5	5	4	3	2	2	2	9
22-Jul	1	1	2	2	2	2	3	3	4	4	4	4	5	6	6	5	6	6	6	2	2	1	2	2	6
23-Jul	1	1	4	3	3	4	3	3	3	3	3	3	3	3	4	5	2	4	2	2	1	2	2	1	5
24-Jul	1	1	1	2	2	3	3	4	5	5	6	7	6	7	6	7	8	8	6	3	4	5	4	4	8
25-Jul	4	5	5	4	4	4	5	4	4	3	3	4	4	4	4	3	3	3	2	2	2	2	1	2	5
26-Jul	2	2	2	3	2	1	1	2	2	5	3	1	4	3	4	5	6	3	3	2	2	2	2	2	6
27-Jul	2	2	1	1	1	1	3	3	3	3	3	3	4	4	4	3	3	2	2	1	1	1	1	1	4
28-Jul	2	1	2	2	4	2	2	2	2	2	2	3	2	3	3	3	4	2	8	4	3	2	1	2	8
29-Jul	2	2	2	1	1	2	1	2	2	2	2	2	1	3	3	3	6	3	3	2	1	2	2	2	6
30-Jul	2	2	4	3	3	4	3	2	2	2	2	2	2	3	3	5	3	3	3	1	2	2	4	2	5
31-Jul	2	3	3	2	1	2	4	3	3	3	2	4	2	3	3	3	3	2	2	2	3	3	4	4	4
																	Diurnal Maximum								
																	4 5 5 4 4 4 5 4 5 6 6 7 6 7 9 7 8 8 8 8 4 4 5 4 4								
M - Maintenance																	AF - Analyzer Failure								



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed (WS) - km/h
Anzac - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Anzac - July 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	202	27.30	27.30
6 - 11	427	57.70	85.00
12 - 19	110	14.86	99.86
20 - 28	1	0.14	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 740

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Anzac - July 2016**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	21	13	9	10	8	4	4	6	10	9	12	17	23	17	20	19	202
6 - 11	37	18	14	21	10	2	6	35	24	8	13	23	35	69	65	47	427
12 - 19	21	3	0	0	0	0	2	17	5	5	7	3	9	22	7	9	110
20 - 28	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	79	34	23	31	18	6	12	58	39	22	32	43	68	108	92	75	740

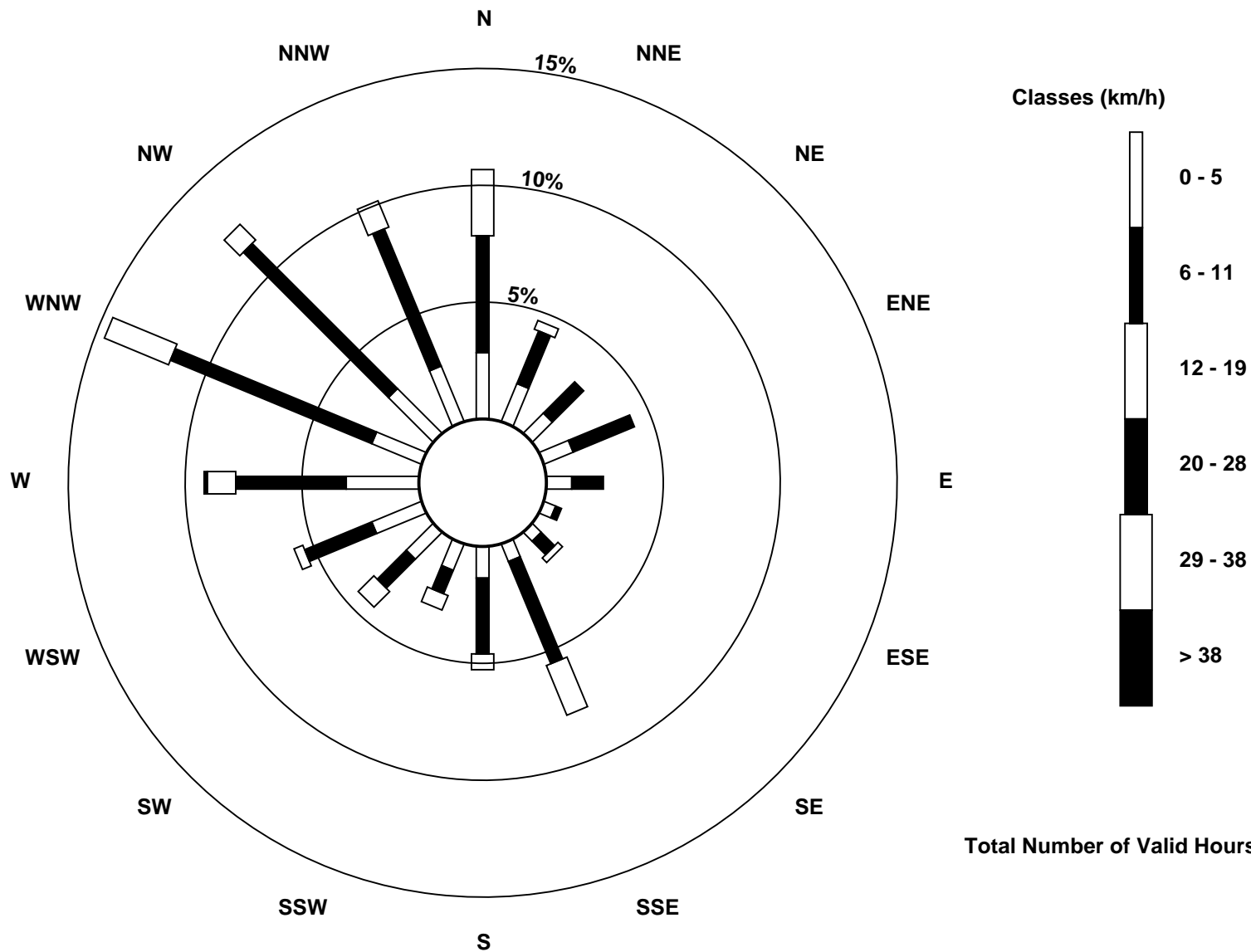
Total Number of Valid Hours: 740

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

Wind Speed (WS) - km/h
Anzac (AMS 14)





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Anzac - July 2016

Direction of Maximum Speed: 261 deg on Jul 24 17:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 272.0 deg on Jul 24	Hours of Data: 740
Direction of Minimum Speed: 253 deg on Jul 29 05:00	Hours of Missing Data: 4
Direction of Minimum Daily Speed Average: 1.0 deg on Jul 10	Percent Operational Time: 99.5
Monthly Average Direction: 297.4 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-Jul	170	165	151	140	127	151	167	169	171	153	149	153	169	152	151	156	202	194	192	190	171	164	175	177	165.3
2-Jul	169	175	155	148	159	155	153	150	164	163	160	156	179	172	171	153	152	187	178	181	175	157	158	158	163.9
3-Jul	164	166	167	164	165	155	155	146	146	150	156	156	132	213	277	59	345	9	298	239	251	263	287	296	170.0
4-Jul	299	292	291	298	296	304	306	298	300	298	302	296	282	251	241	259	282	299	223	189	204	260	334	330	287.3
5-Jul	357	2	344	348	334	328	341	352	351	355	3	12	4	5	178	351	275	298	323	306	12	318	256	265	341.3
6-Jul	322	333	237	351	44	269	72	180	236	322	28	15	48	46	30	25	12	17	18	23	32	62	42	29	21.2
7-Jul	354	334	347	322	329	331	317	328	319	320	299	332	327	340	351	339	338	342	357	3	34	7	346	359	337.0
8-Jul	343	314	317	5	1	4	17	52	68	38	66	63	41	65	52	37	53	62	75	70	81	170	205	206	54.0
9-Jul	82	61	71	47	357	12	55	180	98	262	359	26	46	56	56	57	95	87	81	84	75	83	93	125	66.0
10-Jul	102	AF	180	288	129	29	11	58	65	126	77	132	87	236	244	342	322	302	315	323	320	307	268	220	326.6
11-Jul	257	287	307	305	312	317	309	290	300	336	356	352	1	14	359	2	14	2	16	28	16	358	348	346	347.2
12-Jul	352	337	321	312	309	320	324	304	349	3	348	352	350	360	344	357	4	353	2	7	0	343	338	343	347.7
13-Jul	345	334	330	312	305	318	330	337	338	343	346	7	17	1	337	357	20	11	7	14	11	27	54	69	354.1
14-Jul	70	77	AF	85	284	327	298	287	267	320	33	6	286	56	74	80	46	64	64	36	211	271	267	265	21.9
15-Jul	254	265	270	263	273	289	308	282	266	260	264	270	281	290	277	280	291	308	316	350	341	333	318	288	287.2
16-Jul	285	290	291	277	266	296	294	292	296	293	281	292	310	348	357	359	313	299	352	7	309	330	345	349	314.7
17-Jul	346	350	346	345	347	333	347	1	1	357	354	3	M	M	354	348	356	354	350	334	348	5	256	232	350.0
18-Jul	247	253	231	230	232	229	222	203	235	283	303	307	309	306	311	306	286	252	234	245	233	209	207	218	258.8
19-Jul	225	224	228	211	213	220	245	262	298	290	285	298	302	284	279	286	285	326	320	270	245	261	318	327	276.1
20-Jul	239	282	308	309	303	312	315	323	316	304	310	290	343	345	355	266	275	297	285	276	259	262	255	257	297.9
21-Jul	261	258	263	257	257	259	271	280	284	283	299	297	300	294	326	295	322	343	6	352	9	19	22	20	305.0
22-Jul	170	176	175	182	172	167	163	170	172	164	193	198	225	231	232	234	248	274	299	323	294	288	319	323	214.5
23-Jul	228	268	292	287	294	303	305	300	289	279	288	277	290	307	301	346	31	353	245	242	260	270	265	260	290.8
24-Jul	249	234	256	255	239	240	229	240	269	282	277	265	274	275	280	263	261	313	326	267	265	291	299	292	272.0
25-Jul	294	298	296	300	301	301	304	301	314	321	334	325	337	331	337	322	306	4	5	56	95	143	154	167	316.1
26-Jul	164	157	165	161	162	172	167	167	160	228	287	264	219	249	260	302	291	278	150	149	173	172	166	159	193.6
27-Jul	173	187	225	241	253	280	302	299	300	293	326	314	300	311	325	342	342	350	2	10	25	48	81	102	310.3
28-Jul	193	169	324	130	319	25	352	343	34	76	79	71	61	45	58	69	84	119	269	219	184	332	349	308	55.5
29-Jul	260	276	266	232	253	192	233	282	283	298	298	264	324	241	192	257	278	202	205	178	148	170	151	171	230.1
30-Jul	196	249	288	294	291	251	254	209	48	342	258	285	147	141	214	168	79	98	112	117	80	123	251	312	237.4
31-Jul	2	22	348	43	346	347	319	305	305	351	324	307	317	299	301	303	318	314	314	310	306	307	305	302	320.3

257.4 270.4 278.8 276.6 279.7 282.4 288.6 280.6 291.3 302.0 314.8 312.2 312.8 313.4 317.8 326.5 317.2 336.5 337.6 324.9 302.2 295.4 289.2 285.9
 Diurnal Average

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



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

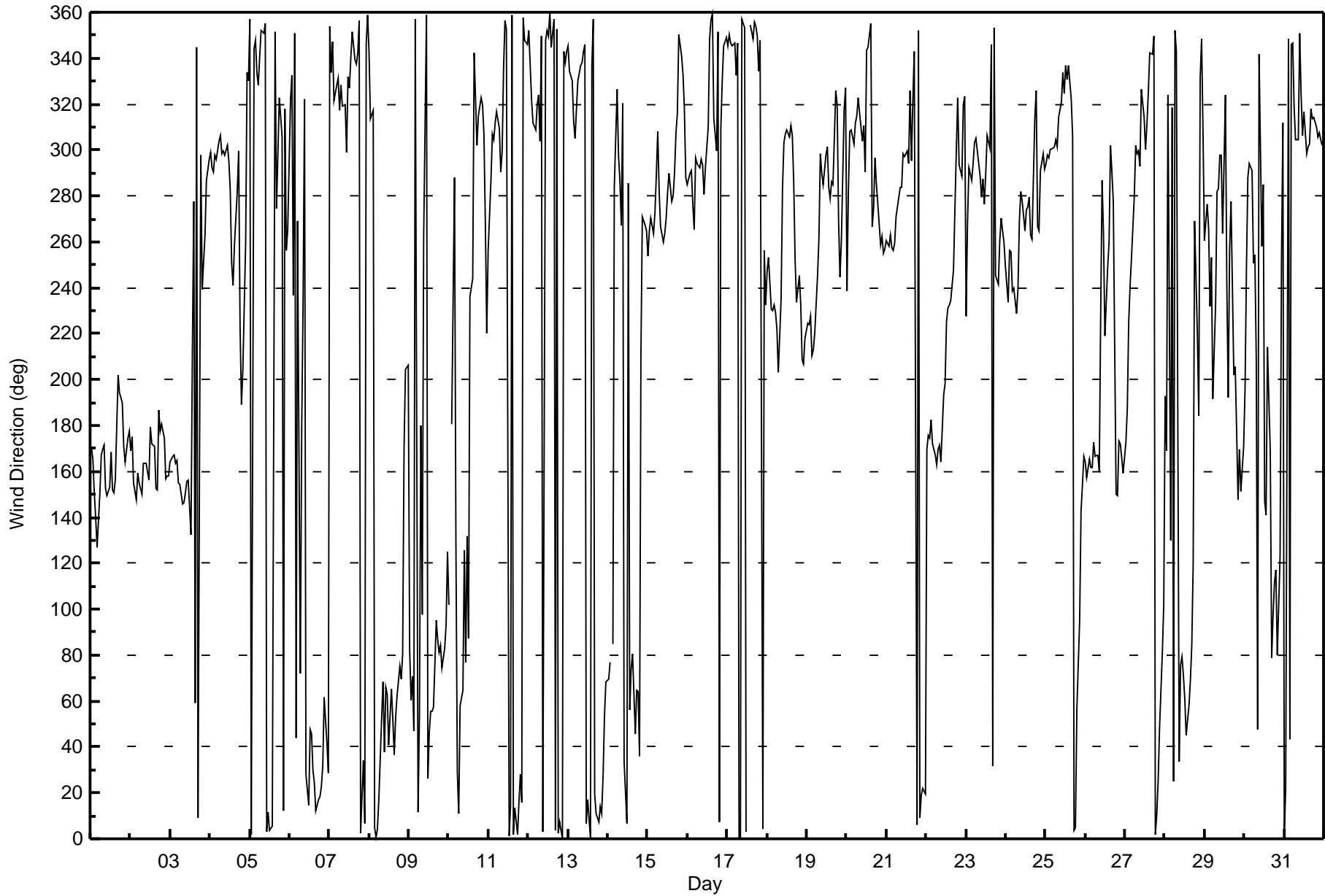
Wind Direction (WD) - deg
Anzac - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 106 deg on Jul 29 14:00	Hours of Data: 740
Minimum Value: 7 deg on Jul 15 04:00	Hours of Missing Data: 4
Percentiles: P ₁ = 10 P ₁₀ = 15 Q ₁ = 18 Median = 23 Q ₃ = 31 P ₉₀ = 49 P ₉₉ = 82	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-Jul	15	14	14	12	17	19	20	24	32	28	28	32	35	30	33	40	37	26	27	27	23	17	13	14	40
2-Jul	13	16	15	12	15	20	19	21	24	23	24	27	29	23	24	22	21	31	24	27	18	17	16	16	31
3-Jul	15	14	14	11	16	14	21	25	26	25	27	39	29	50	49	72	46	30	77	29	27	27	25	23	77
4-Jul	21	25	22	22	23	22	22	23	20	22	20	23	30	25	19	24	28	29	50	27	27	41	15	10	50
5-Jul	11	16	14	13	22	14	21	34	32	18	18	19	24	23	50	97	25	40	20	25	41	22	32	39	97
6-Jul	28	29	72	66	53	32	38	27	34	20	31	25	27	34	25	28	18	17	17	17	19	29	11	72	
7-Jul	54	22	12	18	20	19	18	19	25	20	23	25	28	22	22	18	27	22	23	22	15	18	34	14	54
8-Jul	45	53	40	24	12	19	46	41	46	85	66	41	30	32	34	27	17	17	16	16	14	54	18	66	85
9-Jul	57	11	17	30	10	23	27	40	63	49	57	17	19	23	20	31	42	23	19	21	19	14	40	56	63
10-Jul	30	AF	51	48	71	81	71	66	66	61	41	47	82	23	69	24	24	24	31	16	13	15	43	44	82
11-Jul	46	28	19	19	27	20	23	24	24	35	29	25	28	29	22	21	28	22	26	19	19	9	12	13	46
12-Jul	13	15	16	15	16	17	20	29	23	22	23	21	21	23	23	23	22	22	22	19	16	15	13	15	29
13-Jul	15	13	13	18	19	18	16	21	25	20	23	24	27	23	34	24	21	20	20	19	15	15	19	13	34
14-Jul	16	13	AF	45	38	21	28	34	24	49	66	66	80	48	25	50	66	33	20	36	59	33	8	13	80
15-Jul	13	8	8	7	15	28	20	38	31	26	29	30	35	29	32	37	28	35	37	18	12	12	34	18	38
16-Jul	17	18	16	19	21	21	21	22	20	22	25	26	31	21	22	22	25	24	30	28	20	16	17	16	31
17-Jul	16	15	14	14	14	15	17	20	20	23	24	30	M	M	33	41	35	25	29	17	10	15	11	37	41
18-Jul	10	9	12	12	12	11	14	24	39	52	27	23	24	27	21	24	37	38	20	17	18	15	15	13	52
19-Jul	11	10	16	57	22	29	36	31	29	35	36	23	22	28	33	28	27	30	25	30	16	17	54	48	57
20-Jul	22	27	21	18	18	17	22	23	24	22	26	26	37	34	22	32	27	29	24	24	20	15	12	13	37
21-Jul	15	20	23	20	19	24	25	25	25	25	25	25	22	26	31	23	21	22	19	19	19	15	17	69	69
22-Jul	22	14	12	14	13	14	15	19	23	23	33	31	24	23	21	23	25	32	34	15	27	21	17	12	34
23-Jul	31	40	25	23	22	20	20	22	28	29	31	28	29	30	41	31	42	42	37	23	26	21	18	12	42
24-Jul	16	21	15	15	15	17	17	23	27	31	27	28	27	29	27	25	43	22	40	32	24	21	21	43	
25-Jul	23	22	21	21	22	21	21	22	24	27	23	29	27	34	36	40	56	26	39	22	28	19	15	17	56
26-Jul	16	17	14	14	19	23	41	43	35	40	50	90	41	29	37	28	31	50	27	20	15	13	15	17	90
27-Jul	20	15	17	10	8	18	16	18	19	23	39	31	31	41	33	26	17	19	16	15	14	22	30	70	70
28-Jul	56	52	49	49	53	73	55	33	41	26	29	54	83	27	30	30	43	36	68	31	61	67	23	37	83
29-Jul	45	26	73	12	81	31	23	30	36	47	52	74	39	106	66	57	28	35	25	17	30	17	17	18	106
30-Jul	27	19	26	20	23	23	67	88	68	58	61	74	70	45	57	83	44	25	26	34	36	86	31	61	88
31-Jul	19	17	25	21	34	60	54	21	20	18	21	18	20	22	21	21	18	17	19	21	25	20	20	20	60
	57	53	73	66	81	81	71	88	68	85	66	90	83	106	69	97	66	50	77	40	61	86	54	70	

Diurnal Maximum

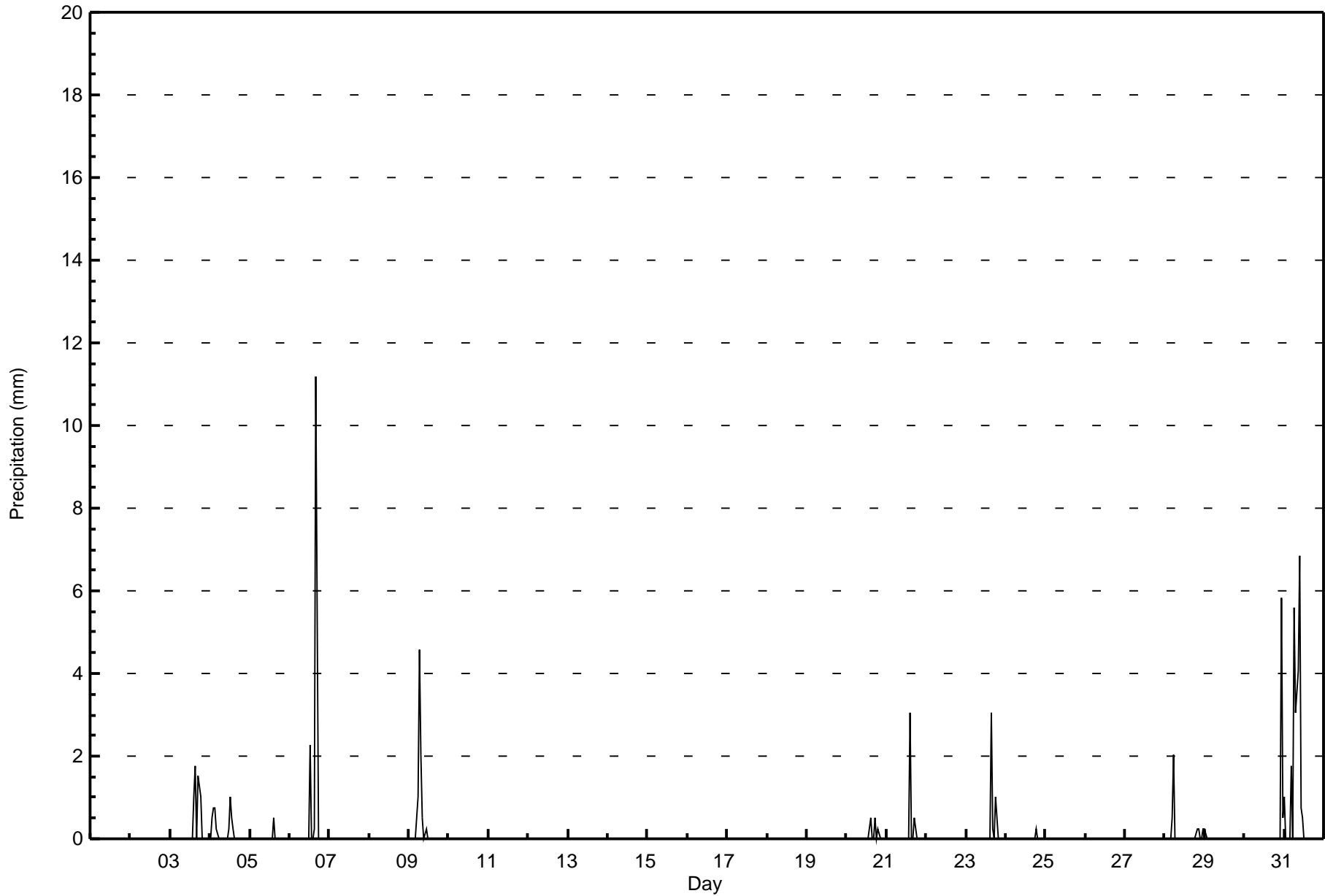
M - Maintenance AF - Analyzer Failure





Wood Buffalo Environmental Association
Hourly Averages

Precipitation (PC) - mm
Anzac - July 2016





Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	July 12, 2016	Last Calibration	June 14, 2016
Station Name	Anzac	Station Number	AMS 14
Reason:	Routine		
Start Time (MST)	7:00	End Time (MST)	11:16
Gas Cert Reference	SA130026A	Station temp.	22 Deg C
Cal Gas Concentration	47.2 ppm	Cal Gas Exp Date	12/12/2016
Calibrator Make/Model	Sabio 4010	Serial Number	8400311
ZAG Make/Model	API 701	Serial Number	764
DACS make/model	Campbell Scientific CR3000	DACS serial No.	8790

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	524	524
Analyzer IP address	192.168.1.43		Lamp voltage	2420	2406
Calculated slope	1.006279	0.997153	Chamber temp	50.0	50.0
Calculated intercept	0.141273	2.434951	Pressure	25.9	26.0
Analyzer Background	19.7	19.7	Flow	494	488
Analyzer Coefficient	1.086	1.050	Intensity	60	59

Analyzer make API T100 Analyzer serial # 723

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.4	----
as found span	5000	74.9	707.1	727.9	0.971
calibrator zero	5000	0.0	0.0	-0.4	----
high point	5000	74.9	707.1	708.1	0.999
second point	5000	37.5	354.0	350.1	1.011
third point	5000	18.7	176.5	173.6	1.017
as left zero	5000	0.0	0.0	0.2	----
as left span	5000	74.9	707.1	690.4	1.024
Average Correction Factor					1.009

Corrected As found 728.3 Previous response 702.5 % change -3.5%

Notes:

Span adjusted, filter changed out no maintenance

Calibration Performed By: Melissa Lemay



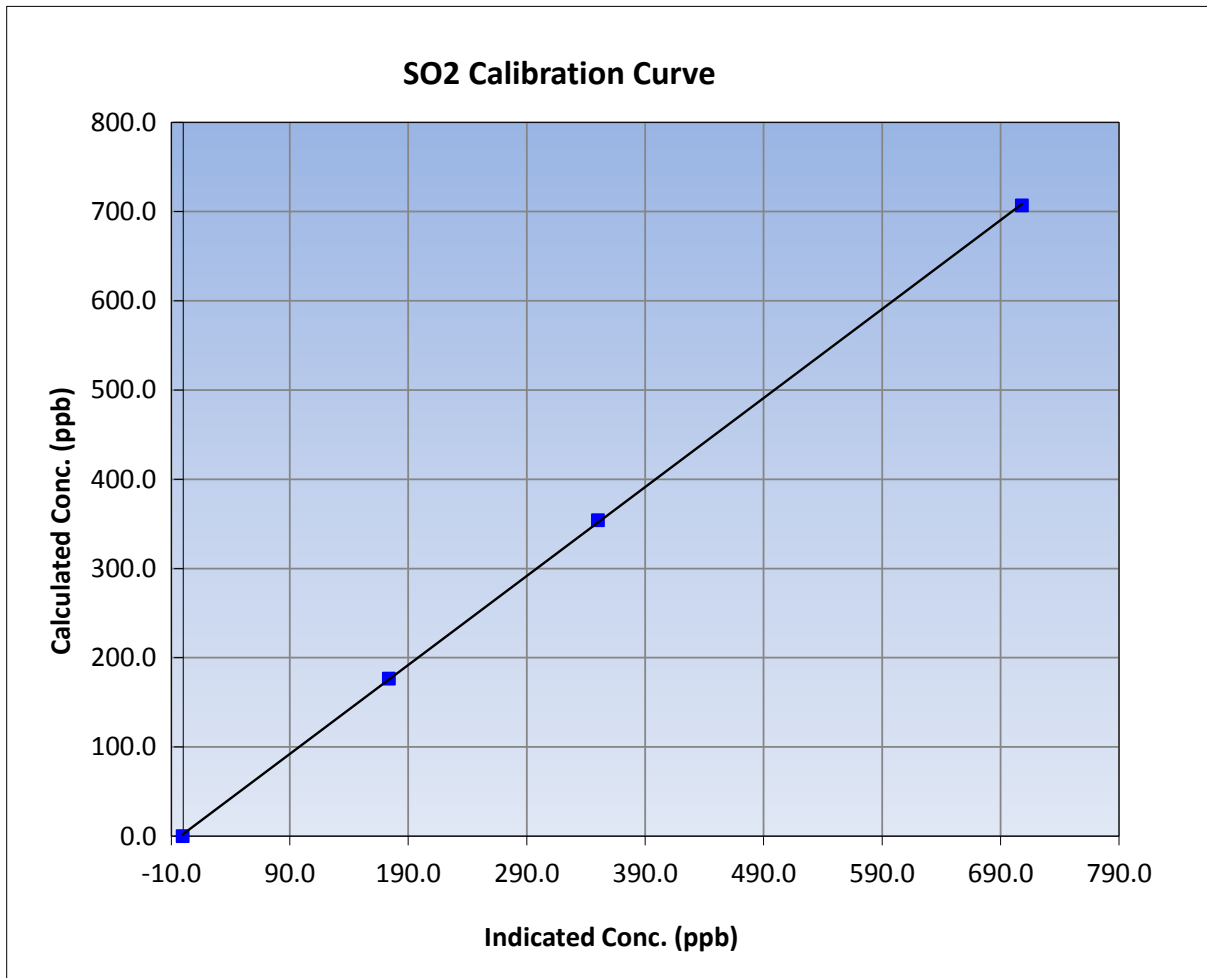
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	July 12, 2016	Previous Calibration	June 14, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	7:00	End Time (MST)	11:16
Analyzer make	API T100	Analyzer serial #	723

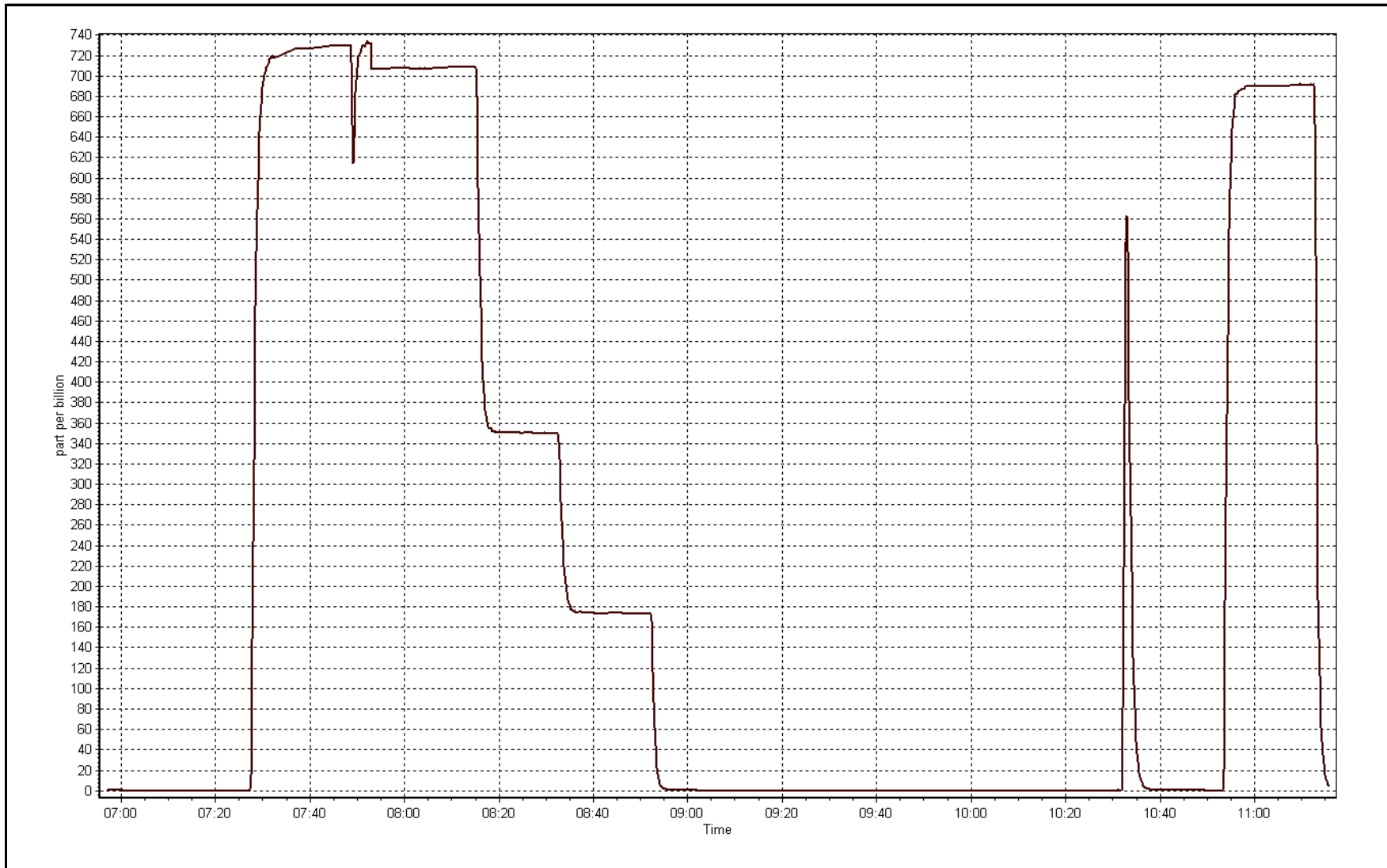
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.4	----	Correlation Coefficient	0.999952
707.1	708.1	0.9985		
354.0	350.1	1.0111	Slope	0.997153
176.5	173.6	1.0169		
			Intercept	2.434951



SO2 Calibration Plot

Date: July 12, 2016





Wood Buffalo Environmental Association

TRS Calibration Report

Station Information

Calibration Date	July 13, 2016	Last Calibration	June 15, 2016
Station Name	Anzac	Station Number	AMS 14
Reason:	Routine		
Start Time (MST)	10:12	End Time (MST)	13:05
Gas Cert Reference	ALM033528	Station temp.	22 Deg C
Cal Gas Concentration	5.05 ppm	Cal Gas Exp Date	09/09/2017
Calibrator Make/Model	Sabio 4010	Serial Number	8400311
Dil air Make/Model	API 701	Serial Number	4764
DACS make/model	Campbell Scientific CR3000	DACS serial No.	8790
SO2 gas concentration	47.2 ppm	SO2 gas cert/exp	SA130026A 12/Dec/16

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-732	-731
Analyzer IP address	192.168.1.42		Lamp voltage	978	976
Calculated slope	1.002837	1.000913	Chamber temp	45	45
Calculated intercept	-0.287069	0.003455	Pressure	659.8	684.6
Analyzer Background	1.75	1.68	Flow	0.407	0.420
Analyzer Coefficient	1.207	1.19	Intensity	98	98
			Converter temp.	800	800
Analyzer make/model	Thermo 43i-TLE		Analyzer serial #	1300156232	
Converter make/model	CDN-101		Converter serial #	510	

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.1	----
as found span	5000	74.3	75.0	76.3	0.984
SO2 scrubber check	5000	18.7	176.5	0.5	----
calibrator zero	5000	0.0	0.0	0.1	----
high point	5000	74.3	75.0	75.1	0.999
second point	5000	39.6	40.0	39.7	1.007
third point	5000	19.8	20.0	20.0	1.000
as left zero	5000	0.0	0.0	0.2	----
as left span	5000	74.3	75.0	74.4	1.009
Average Correction Factor					1.002

Corrected As found	76.2	Previous response	75.1	% change	-1.4%
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Notes:

span adjusted, no maintenance done, filter changed out,

Calibration Performed By:

Melissa Lemay



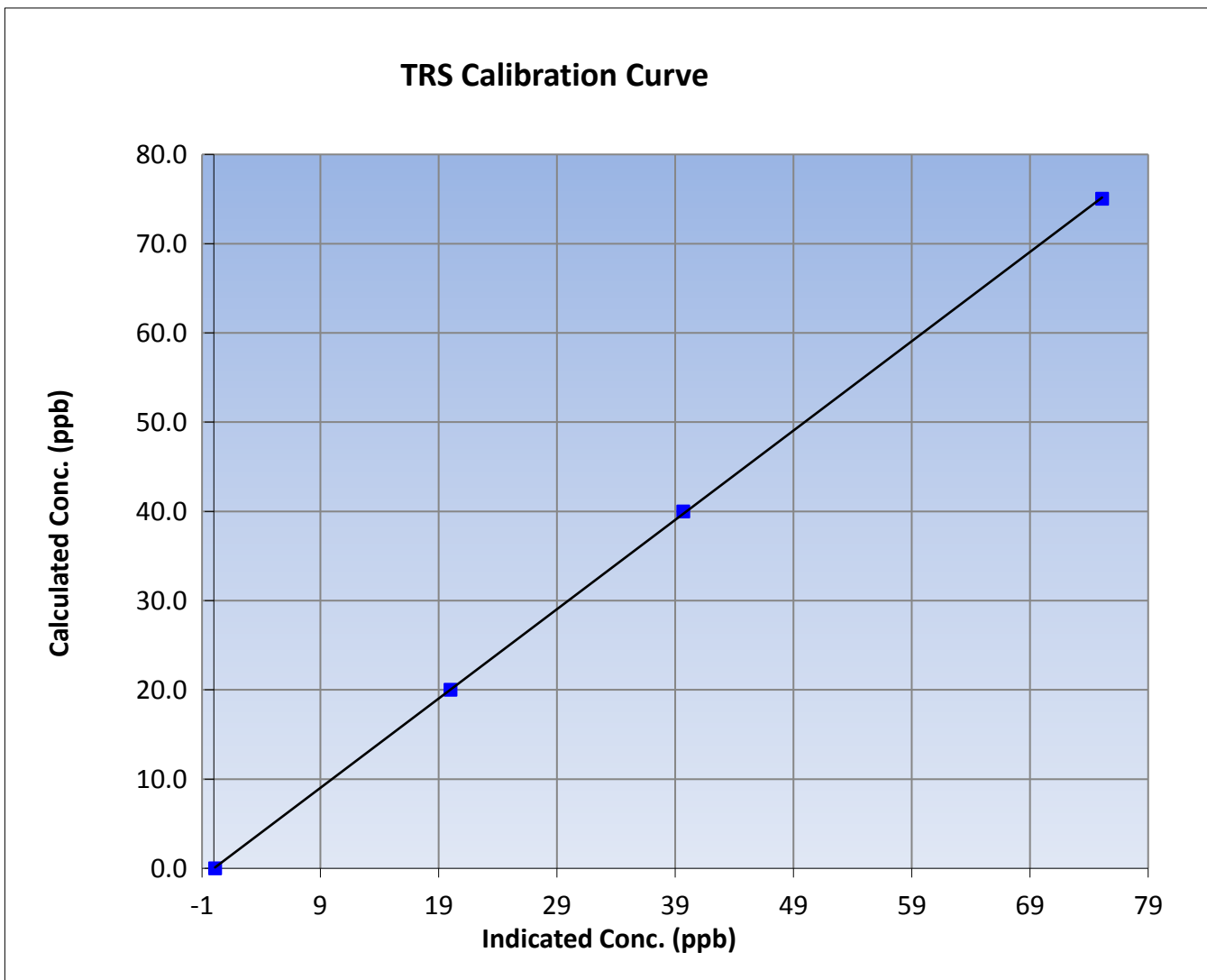
Wood Buffalo Environmental Association TRS Calibration Report

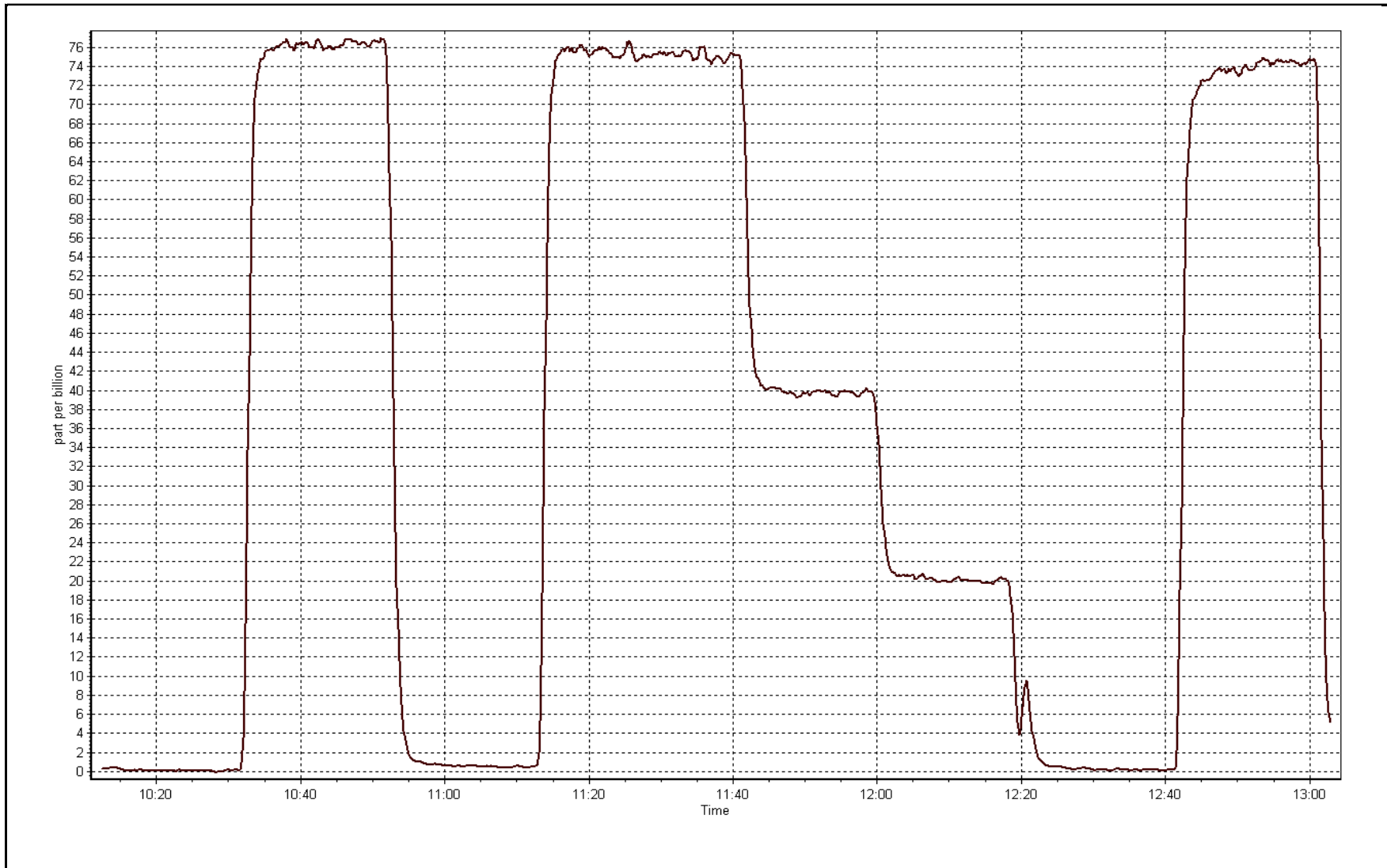
Station Information

Calibration Date	July 13, 2016	Previous Calibration	June 15, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	10:12	End Time (MST)	13:05
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1300156232

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999970
75.0	75.1	0.9992		
40.0	39.7	1.0075	Slope	1.000913
20.0	20.0	0.9999		
			Intercept	0.003455







Wood Buffalo Environmental Association THC / NMHC Calibration Report

Station Information

Calibration Date	July-12-16	Last Calibration	June-14-16
Station Name	Anzac	Station Number	AMS 14
Reason:	Routine		
Start Time (MST)	7:00	End Time (MST)	11:15
Gas Cert Reference	SA130026A	Cal Gas Expiry Date	December-12-16
CH4 Cal Gas Conc.	512.0 ppm	CH4 Equiv Conc.	1092.3 ppm
C3H8 Cal Gas Conc.	211.0 ppm	Station temp.	22 Deg C
Calibrator Model	Sabio 4010	Serial Number	8400311
ZAG make/model	Teledyne API 701	Serial Number	4764
DACS make/model	Campbell Scientific CR3000	Serial Number	8790

Analyzer Information

	Before	After		Before	After
THC Range (ppm)	0 - 50 ppm		Column Temp	74.9	75.2
NMHC Range (ppm)	0 - 25 ppm		Detector Temp	175.1	175.0
Analyzer IP address	192.168.1.55		Flame Temp	357.5	356.8
THC Calc slope	1.009458	0.997950	Carrier Pressure	32.0	32.0
THC Calc intercept	0.020309	0.044315	Fuel Pressure	44.6	44.6
NMHC Calc slope	1.010352	0.997726	Air Pressure	32.7	32.7
NMHC Calc intercept	0.002090	0.022157			

Analyzer make Thermo 55i Analyzer serial # 1317958219

THC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	0.00	----
as found span	5000	74.9	16.36	16.83	0.972
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	74.9	16.36	16.39	0.998
second point	5000	37.5	8.19	8.09	1.013
third point	5000	18.7	4.09	4.04	1.011
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	74.9	16.36	16.35	1.001
Average Correction Factor					1.007

Corrected As found 16.83 Previous response 16.19 % change -3.8%

Notes:

Filter changed out, span adjusted, no maintenance done

Calibration Performed By: Melissa Lemay



Wood Buffalo Environmental Association THC / NMHC Calibration Report

NMHC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0	0.00	0.00	----
as found span	5000	74.9	8.69	8.92	0.974
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	74.9	8.69	8.71	0.998
second point	5000	37.5	4.35	4.30	1.012
third point	5000	18.7	2.17	2.15	1.009
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	74.9	8.69	8.62	1.008
Average Correction Factor					1.006

Corrected As found 8.92 Previous response 8.60 % change -3.6%

CH4 Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0	0.00	0.00	----
as found span	5000	74.9	7.67	7.90	0.971
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	74.9	7.67	7.69	0.997
second point	5000	37.5	3.84	3.79	1.013
third point	5000	18.7	1.91	1.89	1.013
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	74.9	7.67	7.73	0.992
Average Correction Factor					1.008

Corrected As found 7.90 Previous response 7.59 % change -4.0%



Wood Buffalo Environmental Association

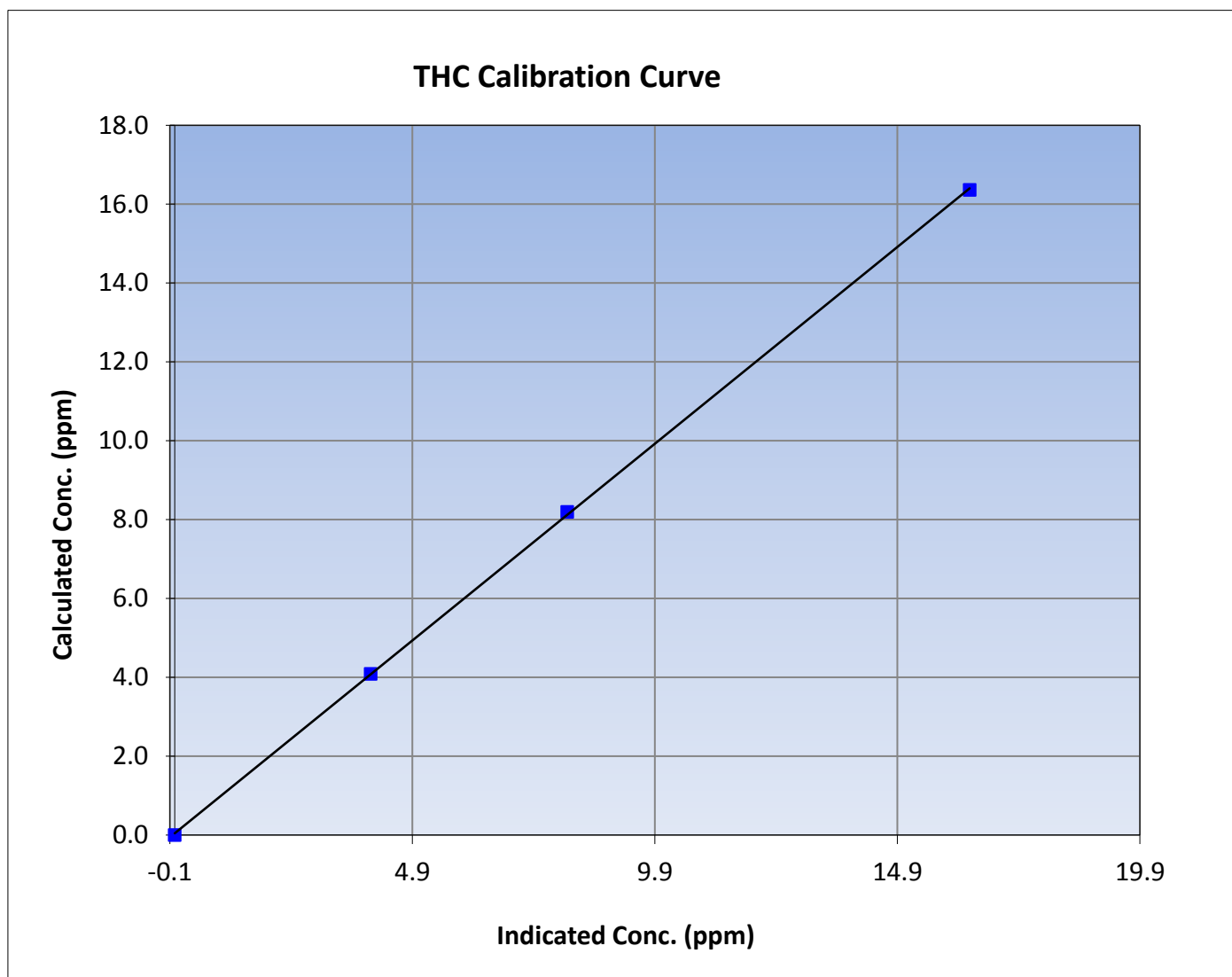
THC Calibration Summary

Station Information

Calibration Date	July 12, 2016	Previous Calibration	June 14, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	7:00	End Time (MST)	11:15
Analyzer make	Thermo 55i	Analyzer serial #	1317958219

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999938
16.36	16.39	0.9983		
8.19	8.09	1.0126	Slope	0.997950
4.09	4.04	1.0111		
			Intercept	0.044315





Wood Buffalo Environmental Association

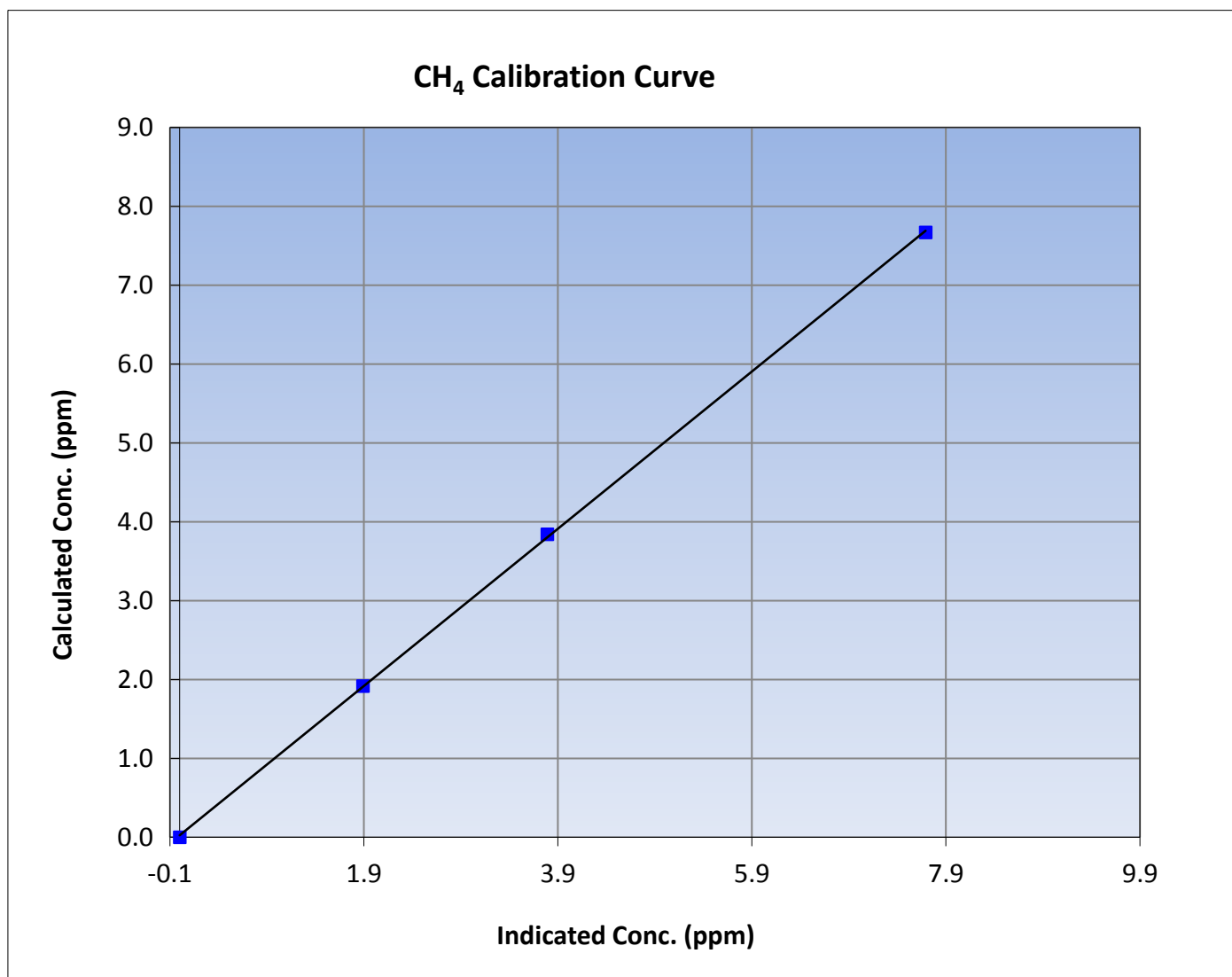
CH₄ Calibration Summary

Station Information

Calibration Date	July 12, 2016	Previous Calibration	June 14, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	7:00	End Time (MST)	11:15
Analyzer make	Thermo 55i	Analyzer serial #	1317958219

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999923
7.67	7.69	0.9974		
3.84	3.79	1.0132	Slope	0.996858
1.91	1.89	1.0132		
			Intercept	0.024163





Wood Buffalo Environmental Association

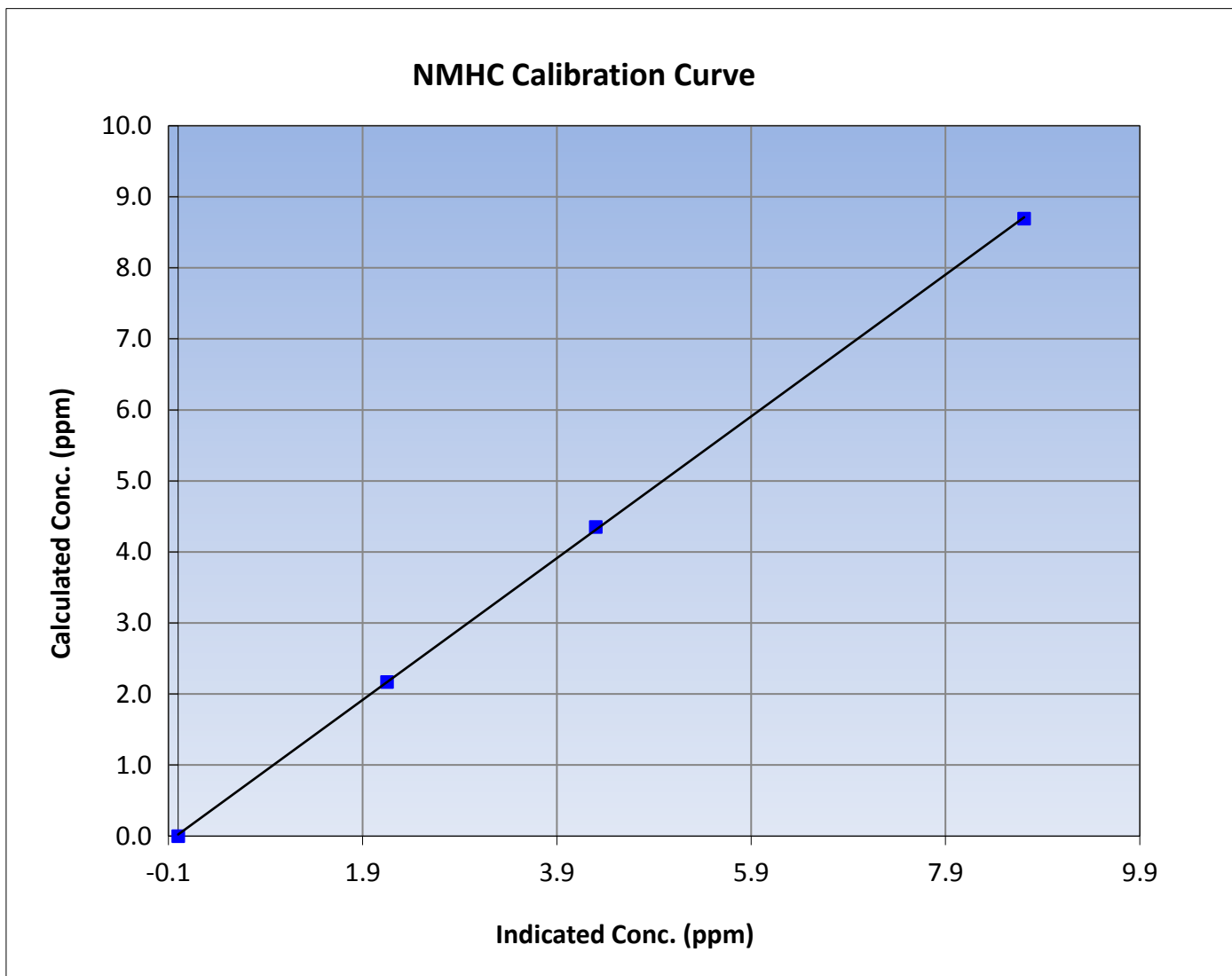
NMHC Calibration Summary

Station Information

Calibration Date	July 12, 2016	Previous Calibration	June 14, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	7:00	End Time (MST)	11:15
Analyzer make	Thermo 55i	Analyzer serial #	1317958219

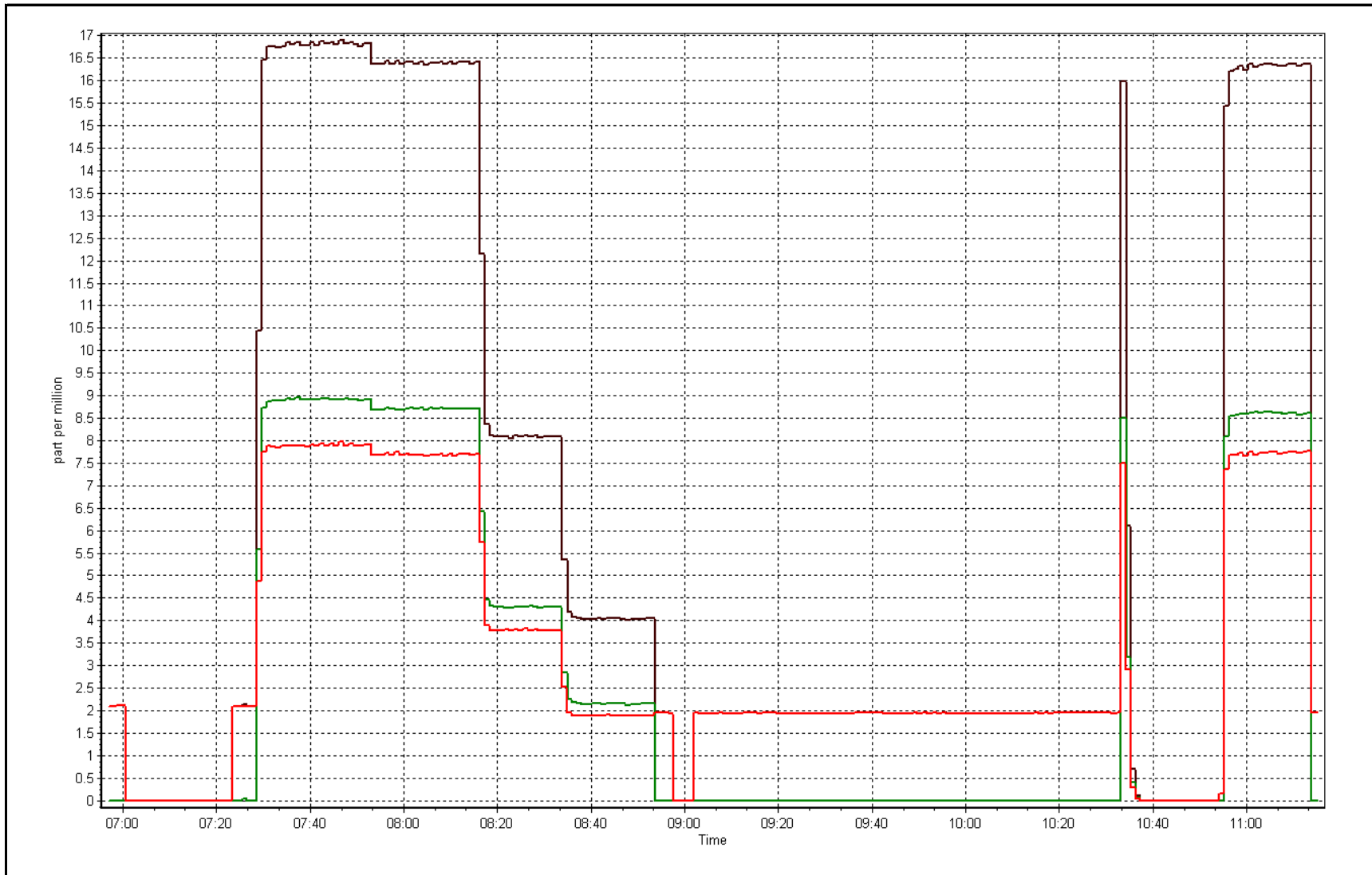
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999940
8.69	8.71	0.9980		
4.35	4.30	1.0121	Slope	0.997726
2.17	2.15	1.0094		
			Intercept	0.022157



THC Calibration Plot

Date: July 12, 2016





Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	July 13, 2016	Previous Calibration	June 15, 2016
Station Name	Anzac	Station Number	AMS 14
Reason:	Routine		
Start Time (MST)	7:08	End Time (MST)	10:14
NO2 GPT Ref date	July-13-16	Transfer Standard	NO2
		Station temp.	23 Deg C
Calibrator Make/Model	Sabio 4010	Serial Number	8400311
ZAG make/model	Teledyne API 701	Serial Number	4764
DACS make/model	Campbell Scientific CR3000	Serial Number	8790

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Bench temp.	26.8	26.2
Analyzer IP address	192.168.1.48		Lamp temp.	53.8	53.8
Calculated slope	1.002256	1.001659	Pressure	654.3	664.7
Calculated intercept	0.949842	0.117972	Flow cell A	0.703	0.712
Analyzer Background	0.4	-0.5	Flow cell B	0.718	0.723
Analyzer Coefficient	0.993	0.963	Cell A Intensity	101254	101300
			Cell B Intensity	110139	110106

Analyzer make	Thermo 49i	Analyzer serial #	1426262596
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Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator Lamp Intensity	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.00	0.0	-2.1	----
as found span	5000	1.19	452.5	464.1	0.975
calibrator zero	5000	0.00	0.0	0.4	----
high point	5000	1.19	452.5	451.8	1.002
second point	5000	0.85	309.0	308.6	1.001
third point	5000	0.51	161.6	160.3	1.008
as left zero	5000	0.00	0.0	1.1	----
as left span	5000	1.19	452.5	447.0	1.012
Average Correction Factor					1.004

Corrected As found	466.2	Previous response	450.5	% change	-3.4%
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Notes:

zero and span adjusted, filter changed out, no maintenace done

Calibration Performed By: Melissa Lemay



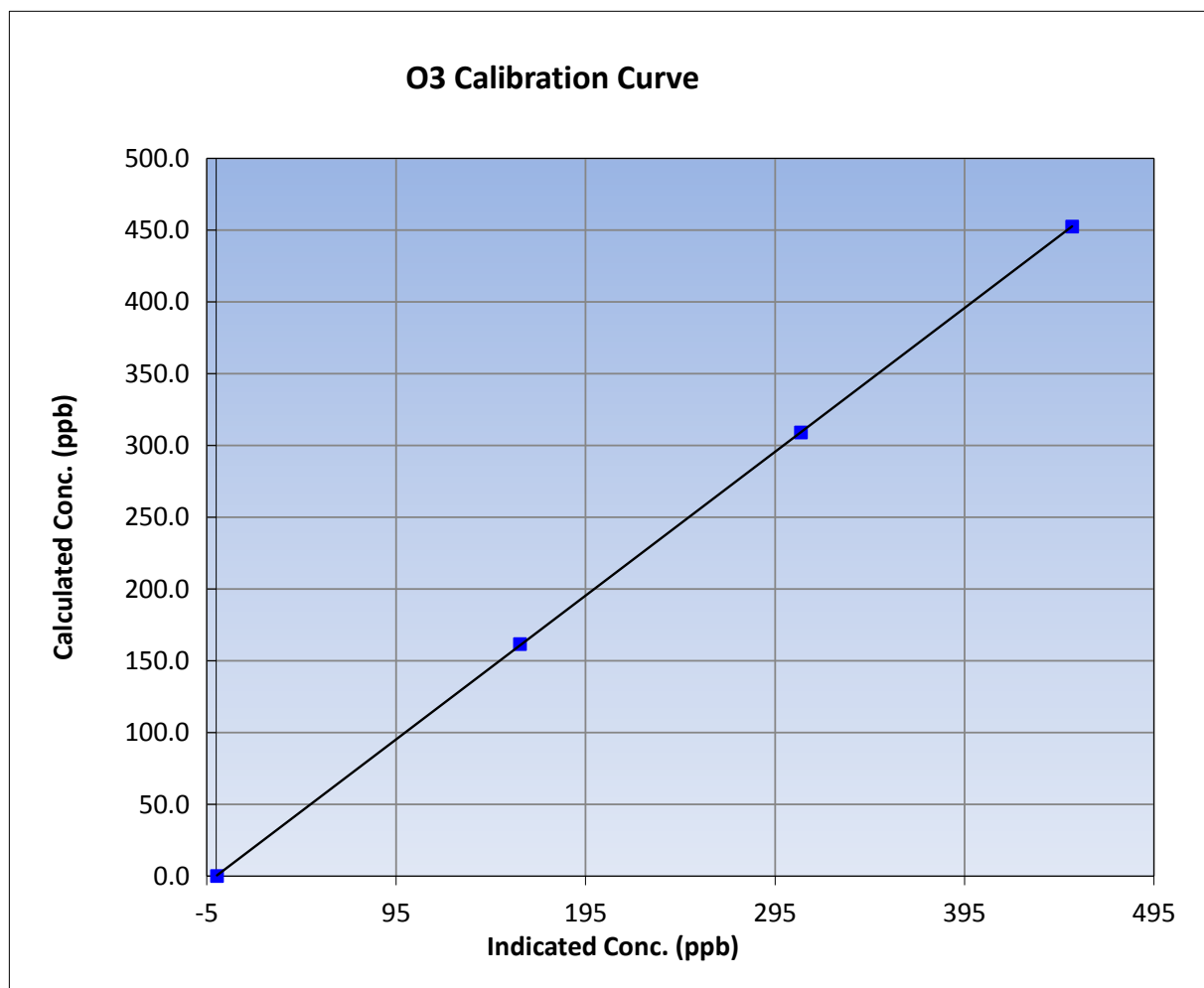
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	July-13-16	Previous Calibration	June 15, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	7:08	End Time (MST)	10:14
Analyzer make	Thermo 49i	Analyzer serial #	1426262596

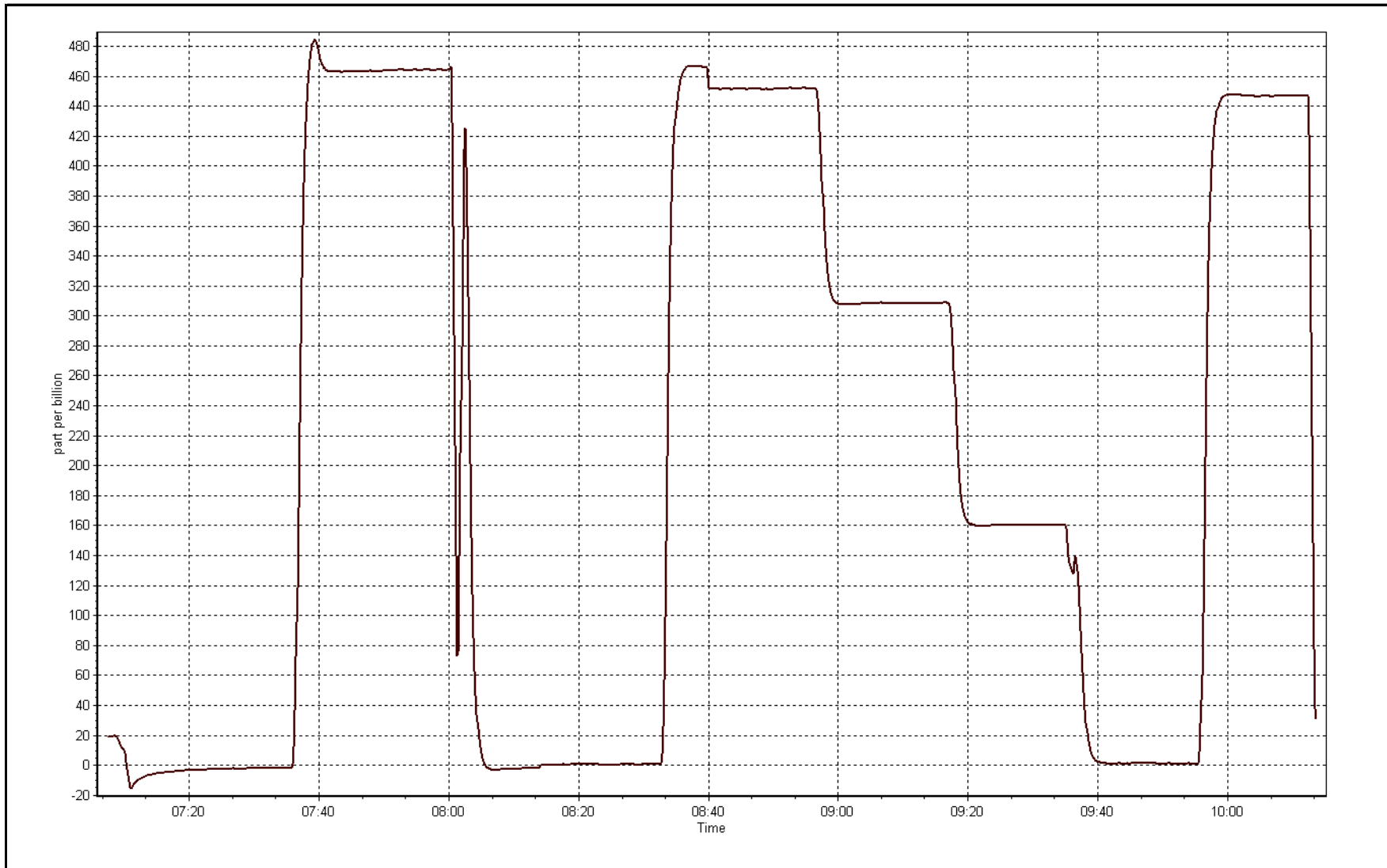
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.4	----	Correlation Coefficient	0.999990
452.5	451.8	1.0015		
309.0	308.6	1.0013	Slope	1.001659
161.6	160.3	1.0081		
			Intercept	0.117972



O3 Calibration Plot

Date: July 13, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	July 12, 2016	Previous Calibration	June 16, 2016
Station Name	Anzac	Station Number	AMS 14
Reason:	Routine		
Start Time (MST)	7:00	End Time (MST)	11:15
NO Cal Gas Conc	53.4 ppm	Gas Cert Reference	SA130026A
NOX Cal Gas Conc	53.4 ppm	Cal Gas Expiry Date	12/12/2016
Calibrator	Sabio 4010	Serial Number	8400311
Zero air Generator	Teledyne PAI T701	Serial Number	4764

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	8790
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.998421	0.997994	1.001770
	Data Offset	0.639695	0.439672	0.190818
Current Calibration	Data Slope	0.996814	0.998768	1.000051
	Data Offset	2.649909	2.593073	0.115715

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1426262592
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.42		192.168.1.42	
NO coefficient	1.154		1.112	
NOX coefficient	1.000		1.000	
NO2 coefficient	0.998		1.000	
NO bkgrnd	4.5		4.3	
NOX bkgrnd	4.8		4.6	
Chamber Temp	50	Deg C	50	Deg C
Moly Temp	321.8	Deg C	321.8	Deg C
PMT voltage	-808.1	V	-807.7	V
PMT Temp	-3	Deg C	-2.8	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	145.7	mmHg	148.2	mmHg
R Cell Press Nox	145.7	mmHg	148.2	mmHg
NO sample flow	0.669	lpm	0.691	lpm
Nox sample Flow	0.670	lpm	0.691	lpm

Notes:

Filter changed out, span adjusted, no maintenance done



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

July 12, 2016

Station Number:

AMS 14

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	-0.6	-0.6	0.0	----	----
as found span	5000	74.9	799.9	799.9	0.0	829.9	828.9	1.1	0.9639	0.9651
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.6	-0.6	0.0	----	----
high point	5000	74.9	799.9	799.9	0.0	801.3	799.8	1.6	0.9983	1.0002
second point	5000	37.5	400.5	400.5	0.0	396.7	395.9	0.8	1.0096	1.0116
third point	5000	18.7	199.7	199.7	0.0	196.6	196.4	0.2	1.0158	1.0169
as left zero	5000	0.0	0.0	0.0	0.0	-0.5	-0.4	-0.1	----	----
as left span	5000	74.9	799.9	344.3	455.6	810.9	354.0	456.9	0.9865	0.9726
									1.0079	1.0096

Corrected As found
Previous Response

NO_x= 830.5
NO_x= 800.6

NO= 829.5
NO= 801.1

Percent Change

NO_x= -3.6%

NO= -3.4%

GPT Calibration Data

Dilution Flow (total) 5000 ccm Source Gas Flow 74.90 ccm NOx ref calc conc = 799.9 ppb NO ref calc conc = 799.9 ppb

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
1st NO ref point		0.0	797.9	796.8	0.0	1.0025	1.0039	----	----
1st NO2 (300)	344.3	452.5	796.6	344.3	452.2	1.0042	----	1.0007	99.9%
2nd NO2 (200)	487.8	309.0	797.1	487.8	309.3	1.0036	----	0.9990	100.1%
3rd NO2 (100)	635.2	161.6	796.2	635.2	161.1	1.0047	----	1.0031	99.7%
2nd NO ref point		0.0	797.7	796.1	1.6	1.0028	1.0048	----	----
Average Correction Factor						1.0038		1.0009	99.9%

Calibration Performed By: Melissa Lemay



Wood Buffalo Environmental Association

NO_x Calibration Summary

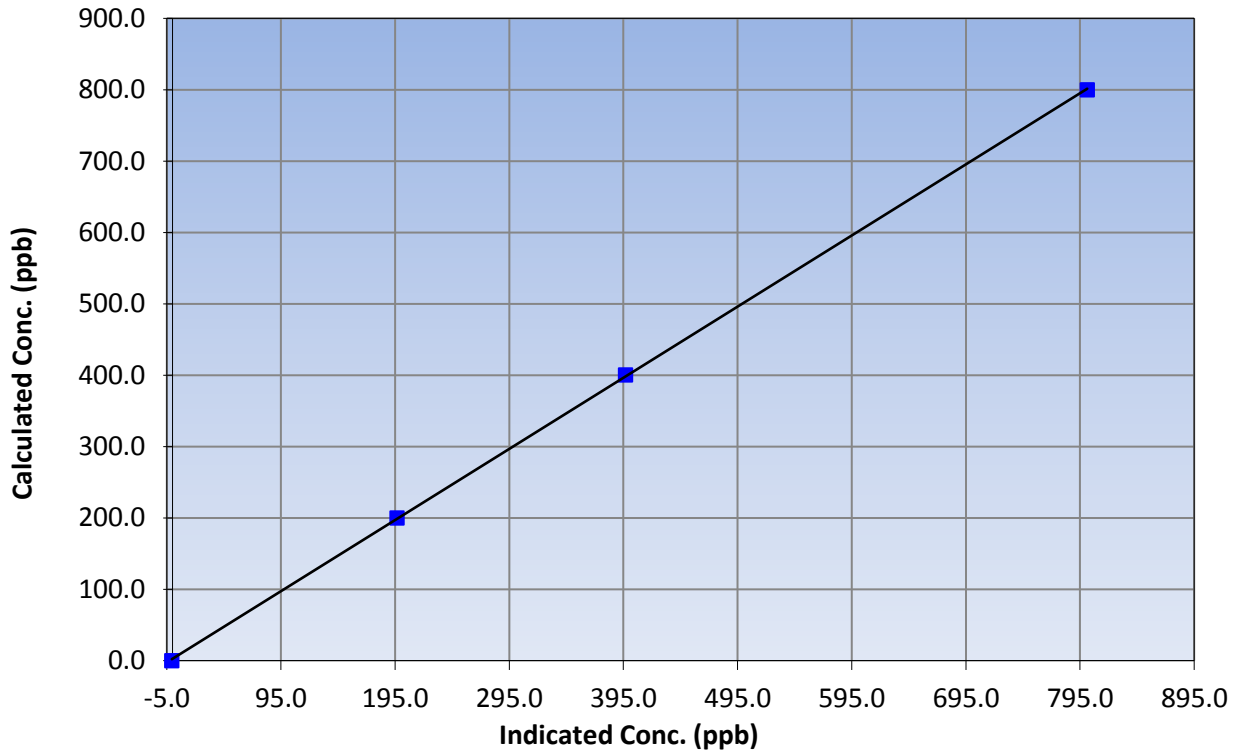
Station Information

Calibration Date	July 12, 2016	Previous Calibration	June 16, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	7:00	End Time (MST)	11:15
Analyzer make	Thermo 42i	Analyzer serial #	1426262592

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.6	----	Correlation Coefficient	0.999962
799.9	801.3	0.9983		
400.5	396.7	1.0096	Slope	0.996814
199.7	196.6	1.0158		
			Intercept	2.649909

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

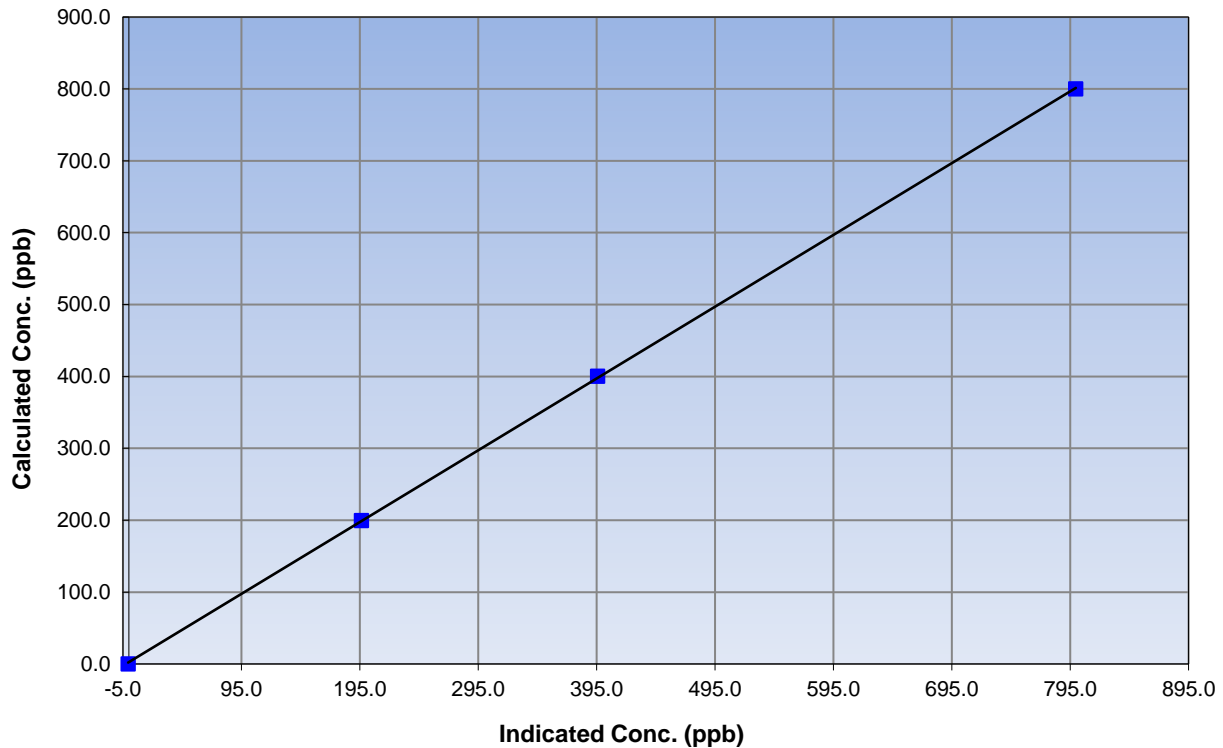
Station Information

Calibration Date	July 12, 2016	Previous Calibration	June 16, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	7:00	End Time (MST)	11:15
Analyzer make	Thermo 42i	Analyzer serial #	1426262592

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.6	N/A	Correlation Coefficient	0.999962
799.9	799.8	1.0002		
400.5	395.9	1.0116	Slope	0.998768
199.7	196.4	1.0169		
			Intercept	2.593073

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

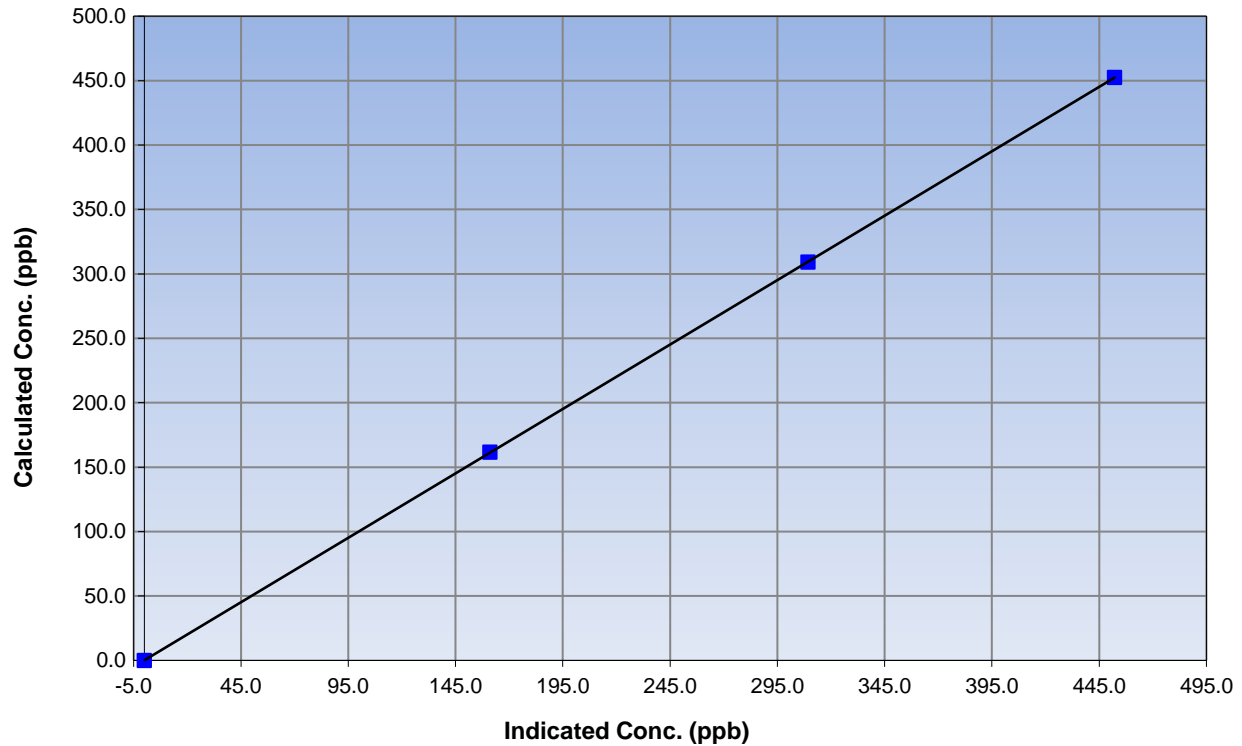
Station Information

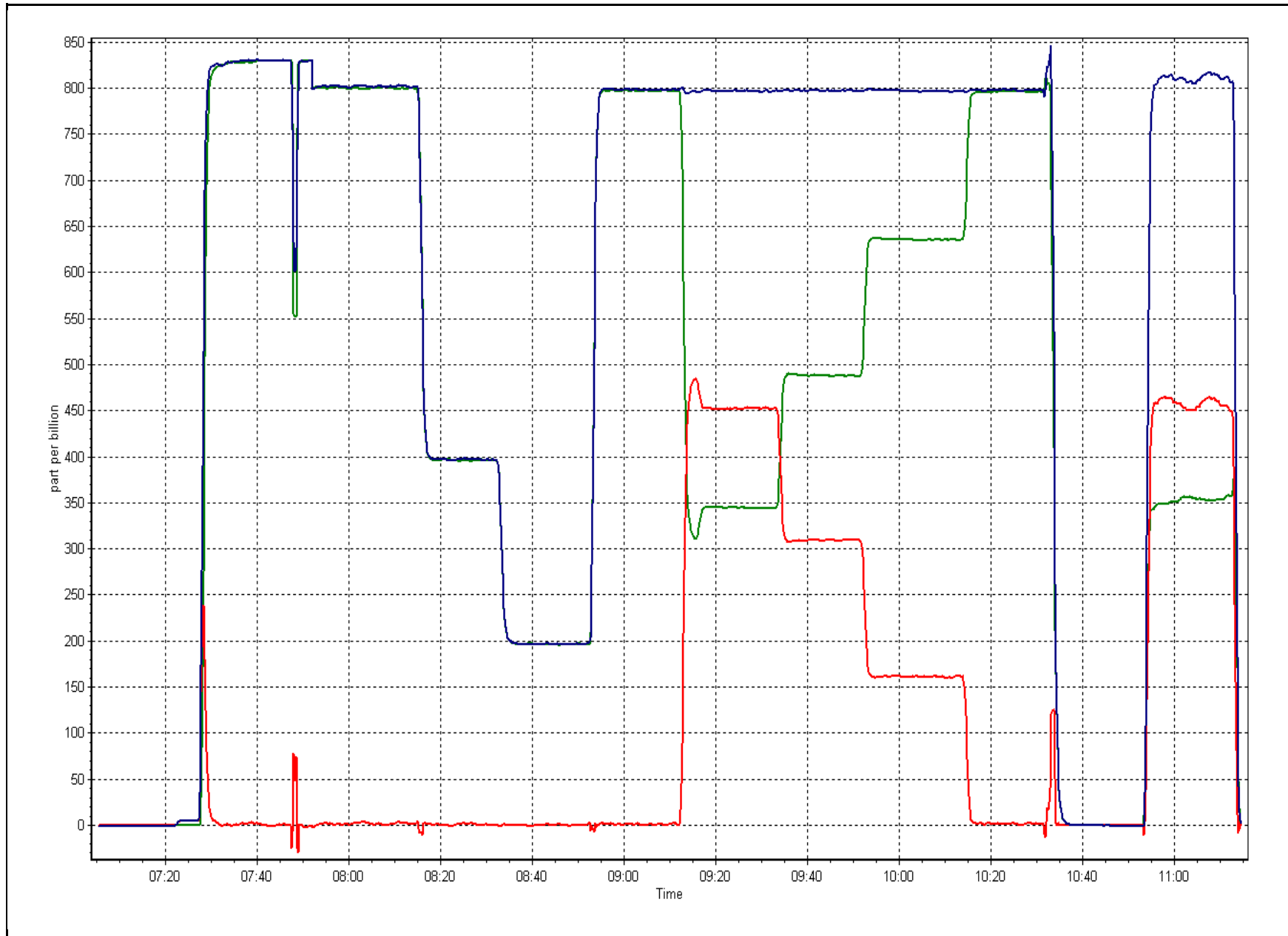
Calibration Date	July 12, 2016	Previous Calibration	June 16, 2016
Station Number	Anzac	Station Number	AMS 14
Start Time (MST)	7:00	End Time (MST)	11:15
Analyzer make	Thermo 42i	Analyzer serial #	1426262592

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	N/A	Correlation Coefficient	0.999997
452.5	452.2	1.0007		
309.0	309.3	0.9990	Slope	1.000051
161.6	161.1	1.0031		
			Intercept	0.115715

NO₂ Calibration Curve







Wood Buffalo Environmental Association

SHARP CALIBRATION

STATION INFORMATION

Calibration Date: July 13, 2016 Previous Calibration: June 15, 2016
 Station Name: Anzac Station Number: AMS 14
 Start Time (MST): 8:07 End Time (MST): 8:43
 Calibrator Make/Model: Delta Cal Calibrator Serial Number: 1450

SHARP INFORMATION

Particulate Fraction: PM2.5
 Make/Model: Thermo / SHARP 5030
 Serial Number: E1093
 C₁₄ Source SN: 4933
 Confirmation of Time settings: Yes No
 Parameters Checked: T1 T2 T3 T4 P3 Main Flow Beta Neph

CALIBRATION DATA

Temperature (°C)

Sensor	Indicated	Measured	Difference (Limit +/- 2.0°C)	Final Indicated
T1	18.0	19.0	1.0	18.0
T2	27.0	na	#VALUE!	27.0
T3	25.0	na	#VALUE!	25.0
T4	35.0	na	#VALUE!	35.0
RH (%)	39.0	na	na	39.0

Pressure (Hpa)

Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	956	955.0	-1.0	956

Main Flow (Lph)

Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1000	982	-18	1000	1000

Nephelometer Calibration

Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	190		190
Neph	0.8		0.8
C14	-3.6		-3.6
Indicated Concentration (ug/m3)	0.4	No	0.4

Offset 1
Offset 2

Leak Check (Quarterly)

Leak Check Date: June 15, 2016 Previous Leak Check Date: March 1, 2016

	Measured	Difference LPM (Limit +/- 0.42 LPM)
Flow without adaptor (LPM):	16.70	
*Flow with adaptor (LPM):	16.80	-0.10

*Note - do not attach adaptor without shutting off the pump first

Mass Foil Calibration (Annually)

Foil Calibration Date: June 15, 2016 Previous Foil Calibration: March 16, 2016
 Zeroed?:
 Foil Mass: 1337
 Previous Correction Factor: 7124 **Mass foil set S/N:** 5872
 New Correction Factor: 7212

INSPECTION DATA

Item	Condition	Date of install or rebuild
Cyclone	Good / cleaned	July 13, 2016
Pump	Good	NA
Filter Tape	Good	Mar 1, 2016
Mass Foil Cal Set	na	NA
HEPA filter	Good	NA

NOTES:

Cyclone head cleaned, flow adjusted

Melissa Lemay



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 15
CNRL HORIZON
JULY 2016**

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

August 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CNRL HORIZON (AMS 15)
 JULY 2016

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	704	38	40	99.73	23	0	4	0
TRS (ppb) Average	705	36	39	99.60	20	4	3	0
THC (ppm) Average	704	38	40	99.73	3.3	-	2.4	-
NO2 (ppb) Average	704	38	40	99.73	20	0	6	-
NO (ppb) Average	704	38	40	99.73	19	-	2	-
NOX (ppb) Average	704	38	40	99.73	37	-	8	-
PM2.5 (ug/m3) Average	740	2	4	99.73	102.3	-	39.5	1
Temperature 2 m (C) Average	742	0	2	99.73	31.7	-	22.5	-
Wind Speed 10 m (km/h) Average	742	0	2	99.73	29	-	13	-
Wind Direction 10 m (deg) Average	742	0	2	99.73	-	-	-	-
Precipitation (mm) Total	742	0	2	99.73	6.1	-	11.7	-
Relative Humidity (%) Average	742	0	2	99.73	99	-	92	-
Global Solar Radiation (W/m2) Average	742	0	2	99.73	915	-	348	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CNRL HORIZON (AMS 15)
 JULY 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	704	0.5	2	-	0	0	0	0	0	1	23
TRS (ppb) Average	705	0.4	1	-	0	0	0	0	0	1	20
THC (ppm) Average	704	2.14	0.2	-	1.8	1.9	2	2.1	2.2	2.4	3.3
NO2 (ppb) Average	704	2.6	3	-	0	0	1	1	4	7	20
NO (ppb) Average	704	0.7	2	-	0	0	0	0	0	1	19
NOX (ppb) Average	704	3.3	5	-	0	0	1	2	4	8	37
PM2.5 (ug/m3) Average	740	10.27	10	-	1.2	2.7	4.8	7.6	11.4	21.9	102.3
Temperature 2 m (C) Average	742	18.65	5	-	2.6	12.6	15.1	18	22.4	25.2	31.7
Wind Speed 10 m (km/h) Average	742	8.3	4	-	1	3	5	8	11	14	29
Wind Direction 10 m (deg) Average	742	-	-	-	-	-	-	-	-	-	-
Precipitation (mm) Total	742	-	-	41.66	-	-	-	-	-	-	-
Relative Humidity (%) Average	742	67.6	20	-	22	40	52	69	85	93	99
Global Solar Radiation (W/m2) Average	742	244.2	275	-	0	0	1	120	452	696	915

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CNRL HORIZON (AMS 15)
JULY 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
ALL PARAMETERS	13 Jul 2016 11:00	13 Jul 2016 12:00	2	Maintenance - wiring/data logger upgrades
TRS	15 Jul 2016 14:00	15 Jul 2016 14:00	1	Maintenance - cleaned glass manifold



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

CNRL Horizon - July 2016

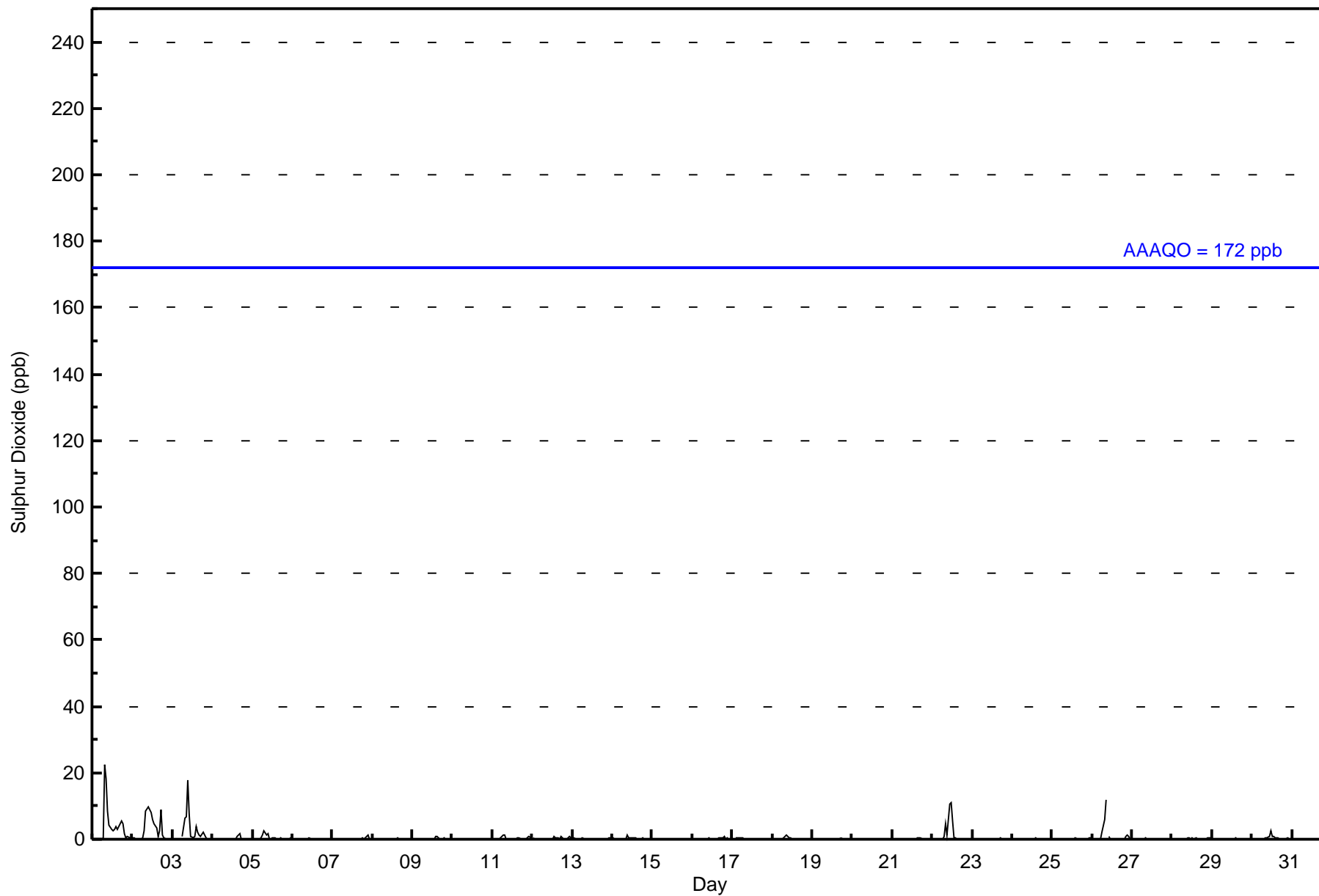
Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0		Hours in Service: 744	
Maximum Value: 23 ppb on Jul 1 08:00		Maximum Daily Average: 3.8 ppb on Jul 1	
Minimum Value: 0 ppb on Jul 1 02:00		Hours of Data: 704	
Maximum Diurnal Average: 1.7 ppb at hour 9		Hours of Missing Data: 40	
Monthly Average: 0.5 ppb		Hours of Calibration: 38	
Minimum Daily Average: 0.0 ppb on Jul 24		Percent Operational Time: 99.7	
Minimum Diurnal Average: 0.0 ppb at hour 5		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 9	

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	0	0	0	Z	0	0	0	23	18	8	4	3	2	3	4	3	5	6	5	2	1	1	0	0	3.8	23
2-Jul	0	0	0	0	Z	0	1	2	8	10	9	8	6	4	3	1	2	9	1	0	0	0	0	0	2.9	10
3-Jul	0	0	0	0	0	Z	1	6	7	18	8	1	0	1	4	2	1	1	2	1	0	0	0	0	2.3	18
4-Jul	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0.2	2
5-Jul	0	Z	0	0	0	0	1	3	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	3
6-Jul	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
7-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0.1	1
8-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
9-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0.1	1
10-Jul	Z	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
11-Jul	0	Z	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	0.3	1
12-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	1	0	0.2	1
13-Jul	0	0	0	Z	0	0	0	0	0	0	M	M	0	0	0	0	0	0	0	0	0	0	0	1	0.1	1
14-Jul	0	0	0	0	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
15-Jul	0	0	0	0	0	Z	0	0	0	C	C	C	C	C	C	C	0	0	0	0	0	0	0	0	--	0
16-Jul	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0.2	1
17-Jul	0	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-Jul	0	0	Z	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
19-Jul	0	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
20-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
21-Jul	0	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
22-Jul	Z	0	0	0	0	0	0	1	5	1	10	11	6	1	0	0	0	0	0	0	0	0	0	0	1.5	11
23-Jul	0	Z	0	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-Jul	0	0	Z	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-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
26-Jul	0	0	0	0	0	0	2	6	12	Z	1	0	0	0	0	0	0	0	0	0	1	1	1	0	1.0	12
27-Jul	0	0	0	0	0	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	1
28-Jul	Z	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0.2	1
29-Jul	0	Z	0	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-Jul	0	0	Z	0	0	0	0	0	0	0	1	3	1	1	1	0	0	0	0	0	0	0	0	0	0.3	3
31-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
0.0 0.1 0.1 0.1 0.0 0.1 0.2 1.4 1.7 1.5 1.2 1.0 0.6 0.4 0.5 0.4 0.4 0.6 0.4 0.2 0.1 0.2 0.2 0.1																								Diurnal Average		
0 0 0 0 0 0 2 23 18 18 10 11 6 4 4 3 5 9 5 2 1 1 1 1																								Diurnal Maximum		
Z - zerospan C - Calibration M - Maintenance																										
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb																										



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
CNRL Horizon - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
CNRL Horizon - July 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	699	99.29	99.29
11 - 20	4	0.57	99.86
21 - 60	1	0.14	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 704

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
CNRL Horizon - July 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	100	100	38	19	12	5	16	27	69	85	62	30	24	38	32	42	699
11 - 20	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	4
21 - 60	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	100	100	38	19	12	6	18	28	70	85	62	30	24	38	32	42	704

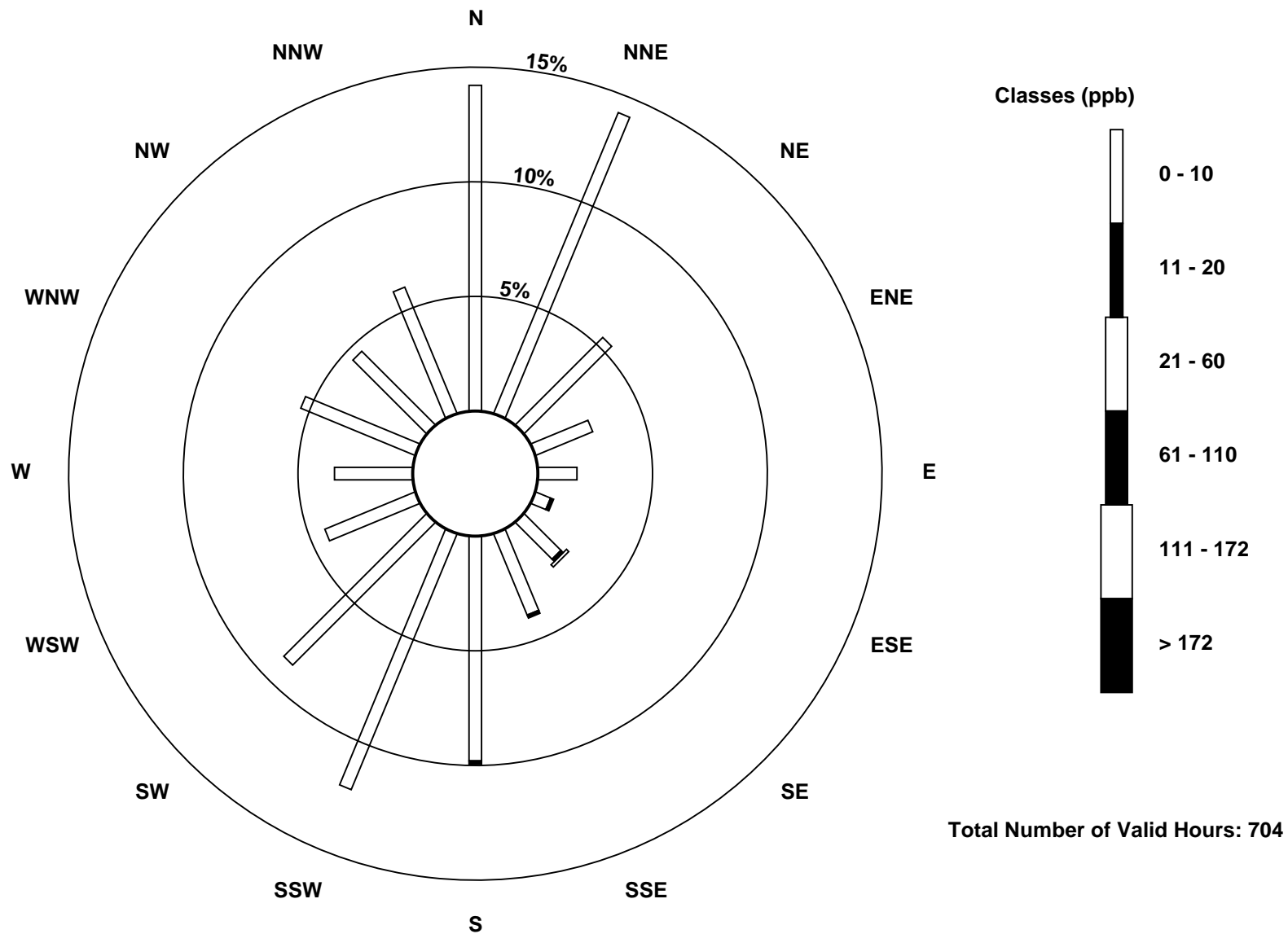
Total Number of Valid Hours: 704

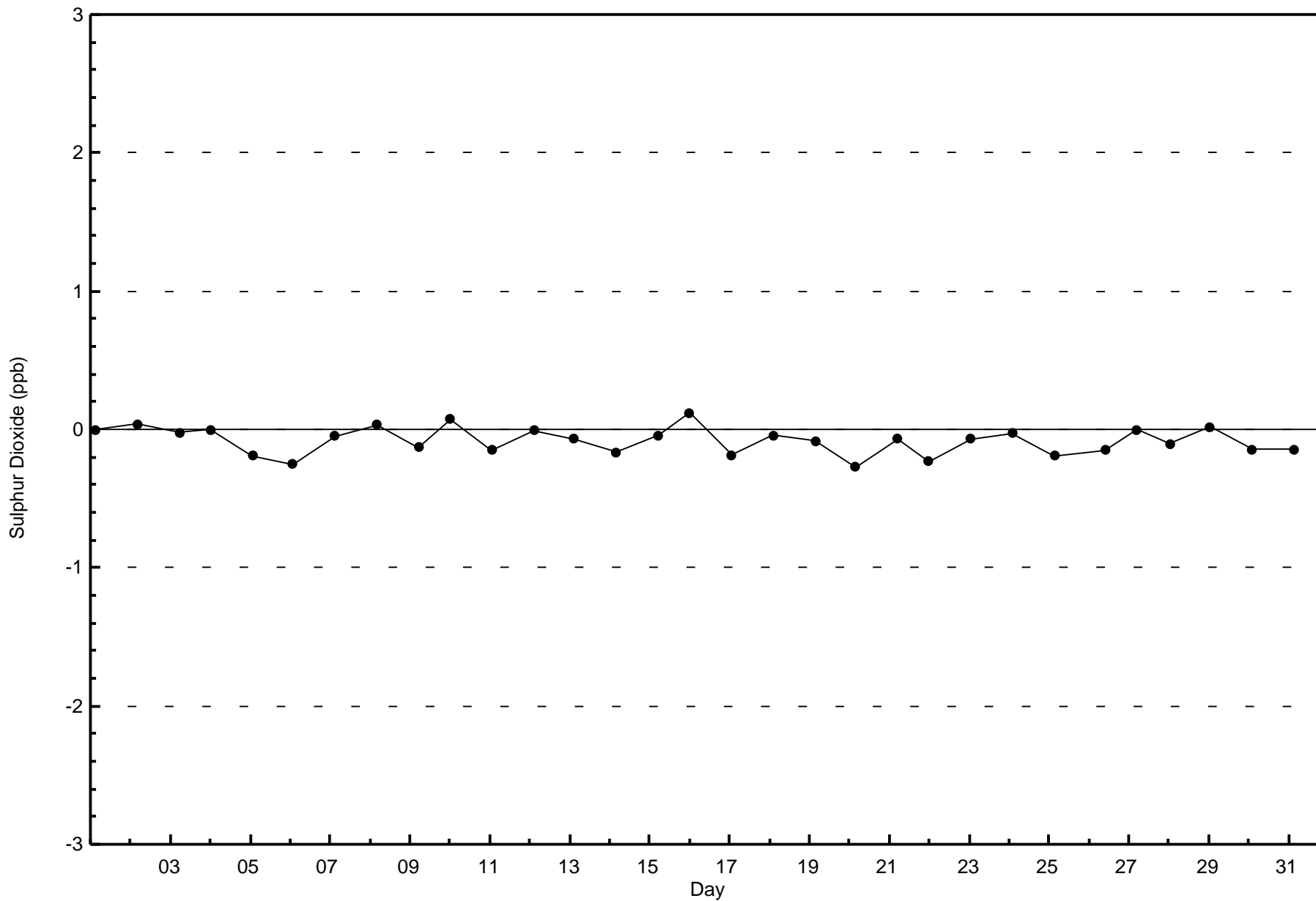
Total Number of Hours: 744

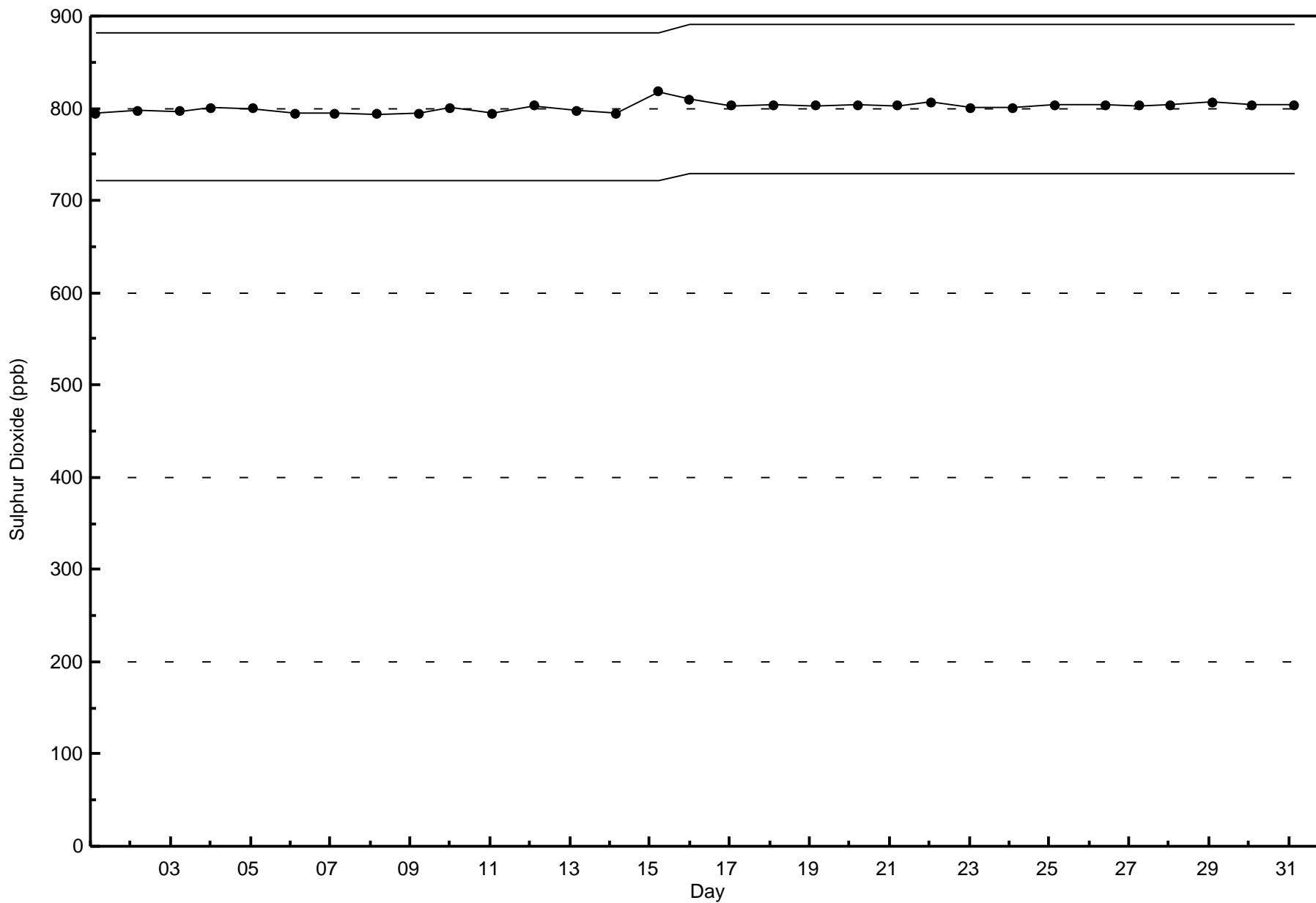


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Sulphur Dioxide (SO₂) - ppb
CNRL Horizon (AMS 15)









Number of Exceedences (AAAQO):	1-hr: 4	24-hr: 0	Hours in Service:	744
Maximum Value: 20 ppb on Jul 26 02:00	Maximum Daily Average: 2.9 ppb on Jul 26		Hours of Data:	705
Minimum Value: 0 ppb on Jul 19 13:00	Minimum Daily Average: 0.2 ppb on Jul 6		Hours of Missing Data:	39
Maximum Diurnal Average: 1.1 ppb at hour 2	Minimum Diurnal Average: 0.2 ppb at hour 13		Hours of Calibration:	36
Monthly Average: 0.4 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 0 P ₉₀ = 1 P ₉₉ = 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-Jul	0	0	0	0	Z	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
2-Jul	0	0	0	1	1	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
3-Jul	0	0	0	0	0	1	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
4-Jul	0	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-Jul	0	0	Z	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
6-Jul	0	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-Jul	0	0	0	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
8-Jul	0	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-Jul	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	
10-Jul	0	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-Jul	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	
12-Jul	0	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-Jul	0	0	0	0	Z	0	0	0	0	0	M	M	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
14-Jul	0	0	0	0	0	Z	0	0	0	0	C	C	C	C	C	0	0	0	0	0	0	0	0	0	0.3	0	
15-Jul	1	0	0	0	0	0	Z	0	0	0	0	0	0	M	0	0	0	0	0	0	0	0	0	0	0.3	1	
16-Jul	0	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	
17-Jul	0	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-Jul	0	0	0	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
19-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	1	0.3	2
20-Jul	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	
21-Jul	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	
22-Jul	0	Z	0	1	1	2	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	2	
23-Jul	0	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-Jul	0	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-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0.4	2	
26-Jul	13	20	5	16	6	1	1	1	1	1	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	2.9	20	
27-Jul	0	0	0	0	0	0	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	14	1	0	1.0	14	
28-Jul	0	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0.3	1	
29-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0.3	1	
30-Jul	0	0	0	Z	0	1	0	0	0	0	0	0	0	1	2	0	0	1	0	1	0	1	0	1	2	0.5	2
31-Jul	1	1	1	1	Z	0	1	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	2	

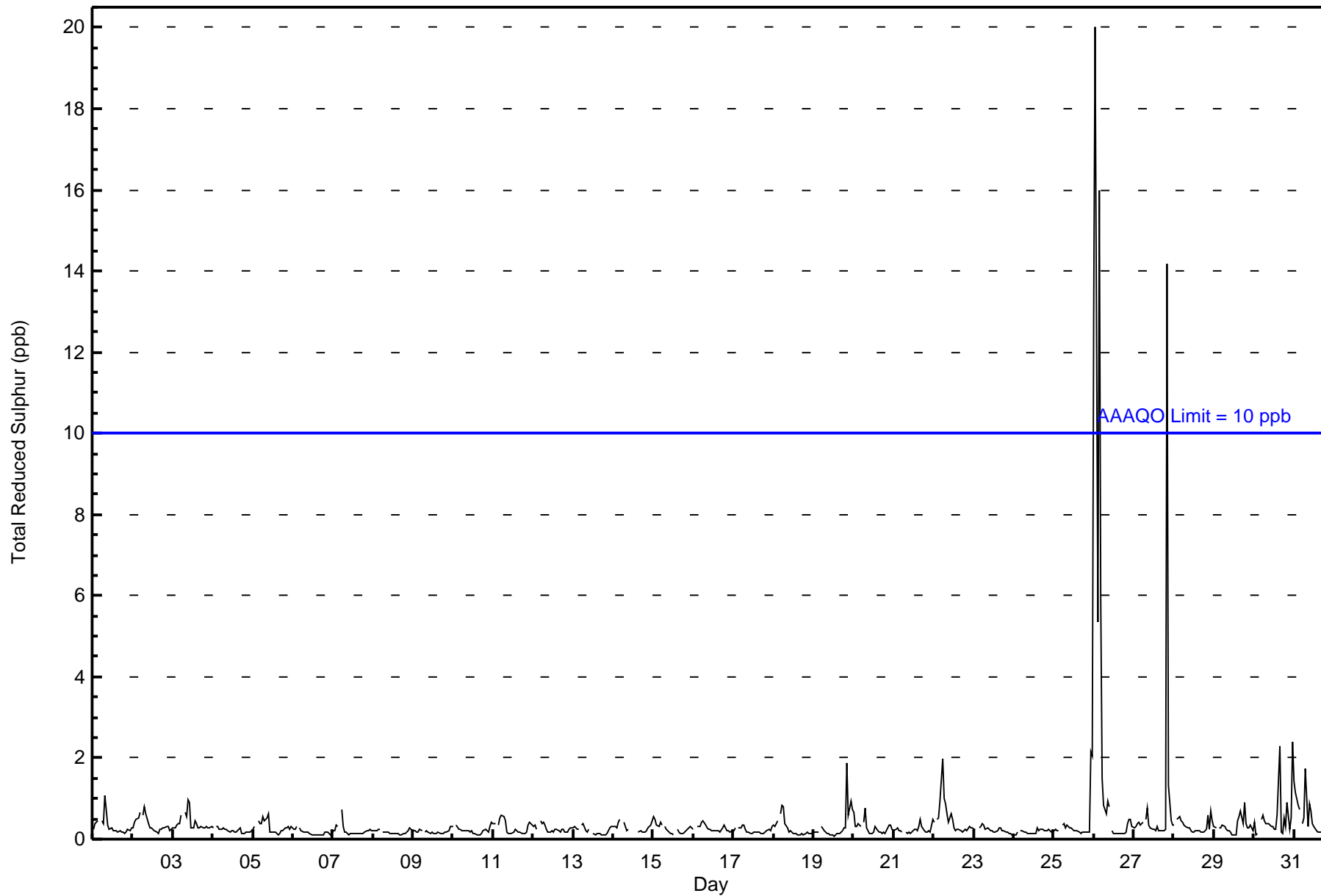
0.7	1.1	0.5	0.9	0.6	0.5	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.8	0.3	0.4	0.4	Diurnal Average
13	20	5	16	6	2	1	2	1	1	1	1	0	0	0	1	2	1	0	1	0	14	1	2	2	Diurnal Maximum	

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
CNRL Horizon - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Reduced Sulphur (TRS) - ppb
CNRL Horizon - July 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	699	99.15	99.15
3 - 4	0	0.00	99.15
5 - 7	2	0.28	99.43
8 - 11	0	0.00	99.43
> 11	4	0.57	100.00

Total Number of Valid Hours: 705

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Total Reduced Sulphur (TRS) - ppb
CNRL Horizon - July 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	95	99	38	18	12	7	18	26	68	89	64	30	25	37	29	44	699
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Totals	99	100	38	19	12	7	18	26	68	89	64	30	25	37	29	44	705

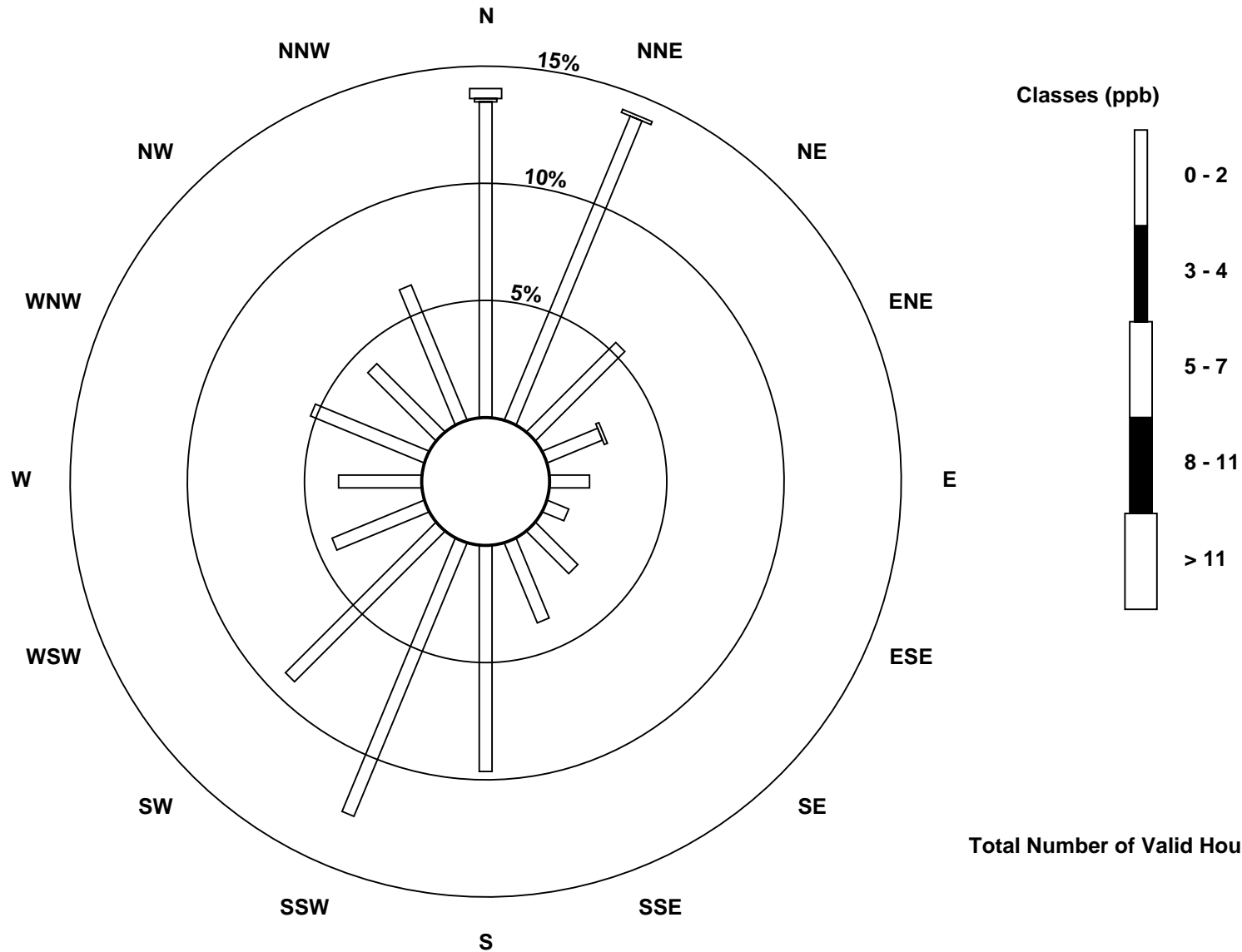
Total Number of Valid Hours: 705

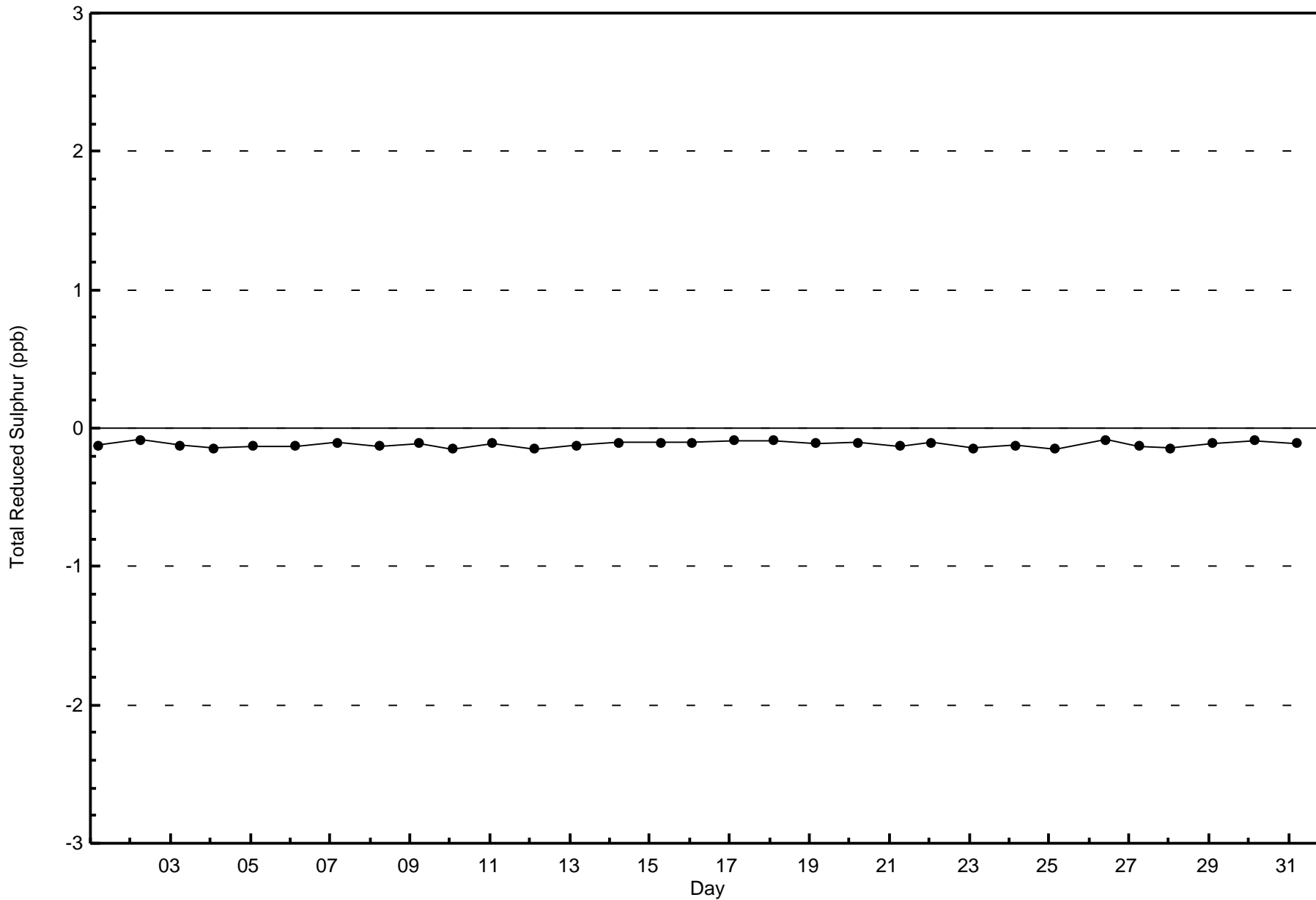
Total Number of Hours: 744

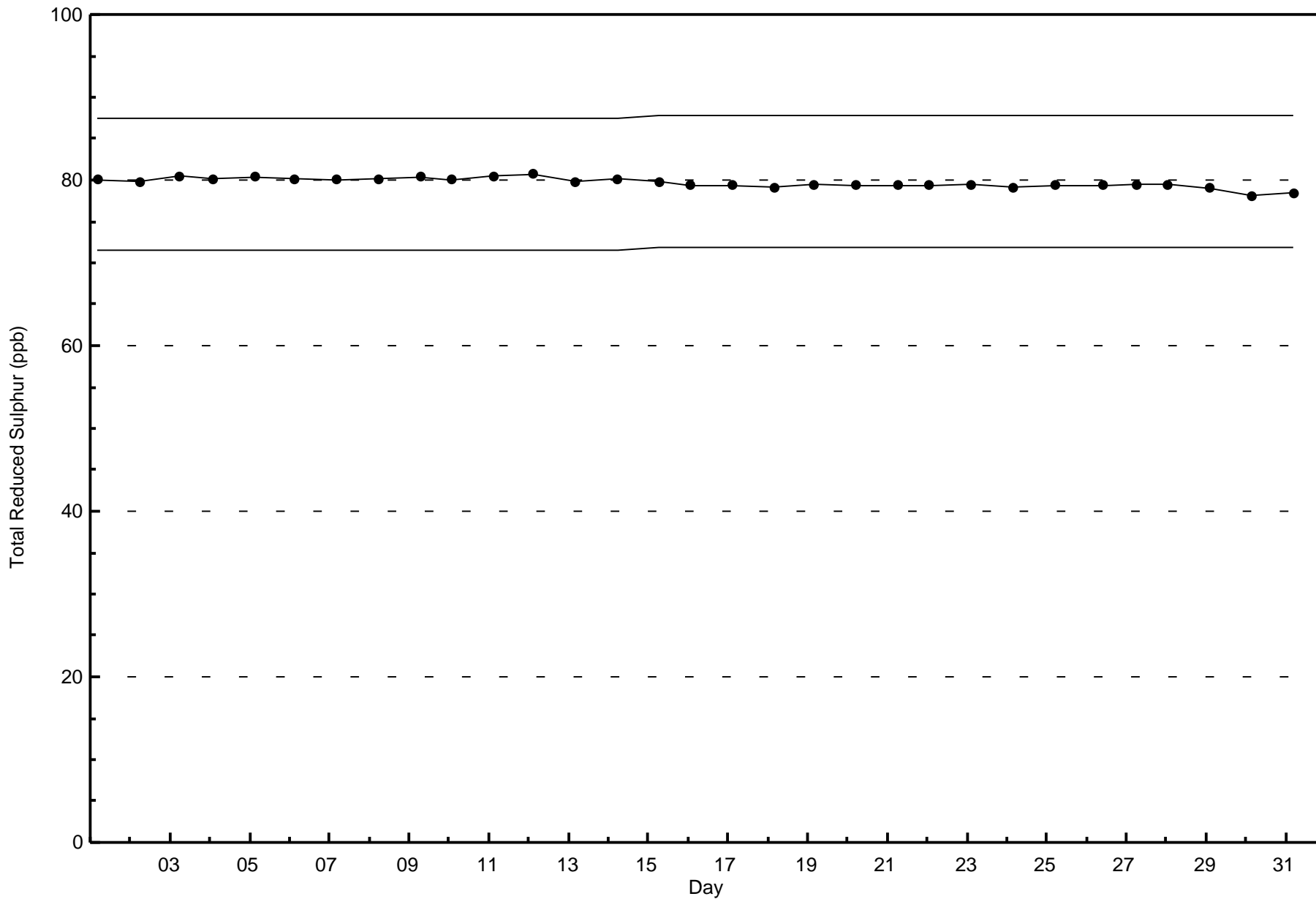


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Total Reduced Sulphur (TRS) - ppb
CNRL Horizon (AMS 15)





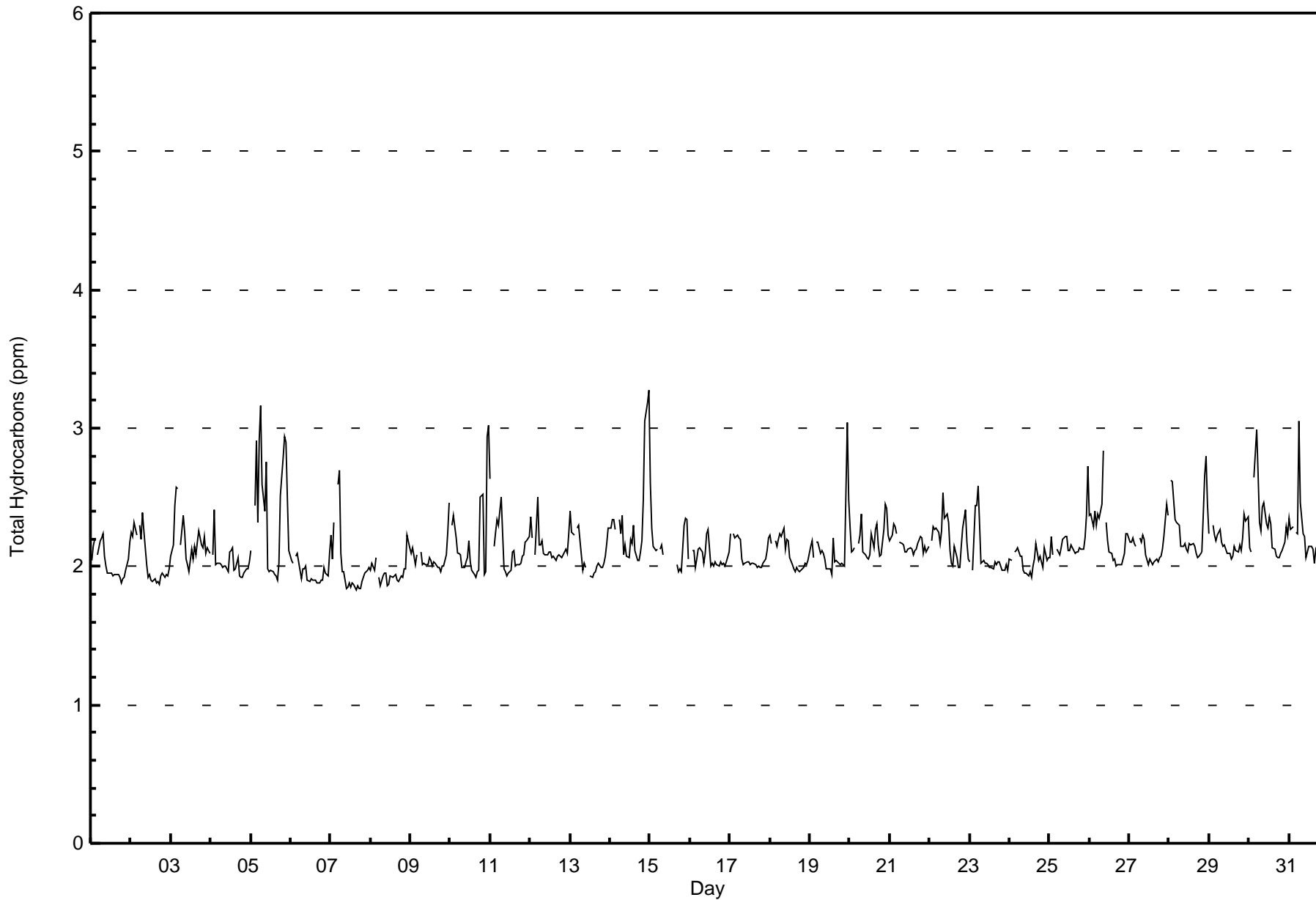




Wood Buffalo Environmental Association
Summary of Hour Averages

Total Hydrocarbons (THC) - ppm
CNRL Horizon - July 2016

Maximum Value: 3.3 ppm on Jul 15 00:00		Maximum Daily Average: 2.4 ppm on Jul 5		Hours in Service: 744																							
Minimum Value: 1.8 ppm on Jul 7 16:00		Minimum Daily Average: 2.0 ppm on Jul 6		Hours of Data: 704																							
Maximum Diurnal Average: 2.3 ppm at hour 23		Minimum Diurnal Average: 2.0 ppm at hour 18		Hours of Missing Data: 40																							
Monthly Average: 2.14 ppm		Percentiles: P ₁ = 1.9 P ₁₀ = 1.9 Q ₁ = 2.0 Median = 2.1 Q ₃ = 2.2 P ₉₀ = 2.4 P ₉₉ = 3.0		Hours of Calibration: 38																							
				Percent Operational Time: 99.7																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Jul	2.0	2.1	2.2	Z	2.1	2.2	2.2	2.2	2.1	2.0	1.9	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.1	2.2	2.0	2.2	
2-Jul	2.2	2.2	2.3	2.2	Z	2.3	2.2	2.4	2.3	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	1.9	1.9	2.0	2.0	2.4
3-Jul	2.1	2.2	2.4	2.6	2.6	Z	2.2	2.4	2.2	2.1	2.0	2.0	2.1	2.1	2.1	2.1	2.2	2.3	2.2	2.1	2.2	2.1	2.1	2.1	2.2	2.6	
4-Jul	Z	2.1	2.4	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.0	2.0	2.1	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.4	
5-Jul	2.1	Z	2.4	2.9	2.3	2.9	3.2	2.6	2.4	2.8	2.0	2.0	2.0	2.0	1.9	1.9	1.9	2.0	2.5	2.8	2.9	2.9	2.5	2.1	2.4	3.2	
6-Jul	2.0	2.0	Z	2.1	2.1	2.0	1.9	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	1.9	2.1	2.0	2.1	
7-Jul	2.2	2.1	2.3	Z	2.6	2.7	2.1	2.0	2.0	1.8	1.8	1.9	1.9	1.9	1.9	1.8	1.9	1.8	1.8	1.9	2.0	2.0	2.0	2.0	2.0	2.7	
8-Jul	2.0	2.0	2.0	2.1	Z	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	2.2	2.1	2.0	2.2	
9-Jul	2.1	2.1	2.1	2.0	2.1	Z	2.1	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.2	2.5	2.1	2.5	
10-Jul	Z	2.3	2.4	2.2	2.1	2.1	2.1	2.0	2.0	2.0	2.1	2.2	2.0	2.0	1.9	1.9	2.0	2.0	2.5	2.5	1.9	2.0	2.9	3.0	2.2	3.0	
11-Jul	2.6	Z	2.1	2.2	2.3	2.3	2.5	2.2	2.0	2.0	1.9	2.0	2.0	2.1	2.1	2.0	2.0	2.0	2.0	2.1	2.1	2.2	2.2	2.2	2.1	2.6	
12-Jul	2.4	2.2	Z	2.1	2.5	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.5	
13-Jul	2.4	2.2	2.2	Z	2.3	2.3	2.2	2.0	2.0	2.0	M	M	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.2	2.3	2.1	2.4	
14-Jul	2.3	2.3	2.3	Z	Z	2.3	2.2	2.4	2.1	2.2	2.1	2.1	2.2	2.2	2.3	2.1	2.0	2.0	2.1	2.2	2.5	3.0	3.2	3.3	2.3	3.3	
15-Jul	2.6	2.3	2.1	2.1	2.1	Z	2.1	2.2	2.1	C	C	C	C	C	C	C	2.0	2.0	2.0	2.0	2.3	2.4	2.3	2.1	--	2.6	
16-Jul	Z	2.1	2.1	2.0	2.1	2.1	2.1	2.1	2.0	2.1	2.2	2.3	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.3	
17-Jul	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.2	2.1	2.2	
18-Jul	2.2	2.2	Z	2.2	2.1	2.2	2.2	2.2	2.3	2.1	2.2	2.2	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.3	
19-Jul	2.1	2.2	2.1	Z	2.2	2.2	2.1	2.1	2.1	2.1	2.0	2.0	2.0	1.9	2.2	2.0	2.0	2.0	2.0	2.0	2.0	2.0	3.0	2.5	2.1	3.0	
20-Jul	2.3	2.1	2.1	2.1	Z	2.2	2.2	2.4	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.3	2.3	2.2	2.1	2.1	2.3	2.5	2.4	2.2	2.2	2.5	
21-Jul	2.2	2.2	2.3	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	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.2	2.3	
22-Jul	Z	2.2	2.3	2.3	2.3	2.3	2.2	2.3	2.5	2.4	2.4	2.3	2.1	2.0	2.0	2.1	2.1	2.0	2.0	2.1	2.3	2.4	2.2	2.1	2.2	2.5	
23-Jul	2.0	Z	2.0	2.4	2.4	2.6	2.3	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.6	
24-Jul	2.1	2.0	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	1.9	2.0	1.9	2.0	2.1	2.2	2.0	2.1	2.0	2.1	2.0	2.1	2.0	2.2	
25-Jul	2.1	2.2	2.1	Z	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.1	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.4	2.7	2.2	2.7
26-Jul	2.4	2.4	2.3	2.4	2.3	2.4	2.3	2.5	2.8	Z	2.3	2.2	2.1	2.1	2.0	2.1	2.0	2.0	2.0	2.0	2.1	2.1	2.2	2.2	2.2	2.2	2.8
27-Jul	2.2	2.2	2.2	2.2	2.1	Z	2.2	2.2	2.2	2.2	2.1	2.0	2.1	2.0	2.0	2.0	2.1	2.0	2.1	2.1	2.1	2.2	2.5	2.4	2.1	2.5	
28-Jul	Z	2.6	2.6	2.3	2.3	2.3	2.3	2.2	2.1	2.2	2.1	2.1	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.4	2.7	2.8	2.5	2.3	2.8
29-Jul	2.2	Z	2.3	2.2	2.2	2.2	2.3	2.2	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.2	2.4	2.3	2.4	2.2	2.4	
30-Jul	2.1	2.1	Z	2.6	3.0	2.7	2.3	2.3	2.4	2.5	2.3	2.3	2.4	2.3	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.3	2.2	2.3	3.0	
31-Jul	2.4	2.3	2.3	Z	2.3	2.2	3.1	2.5	2.2	2.2	2.1	2.1	2.1	2.2	2.1	2.0	2.1	2.1	2.0	2.0	2.0	2.0	2.2	2.0	2.2	3.1	
	2.2	2.2	2.2	2.2	2.3	2.3	2.2	2.2	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.2	2.3	2.3		Diurnal Average	
	2.6	2.6	2.6	2.9	3.0	2.9	3.2	2.6	2.8	2.8	2.4	2.3	2.4	2.3	2.3	2.3	2.3	2.3	2.5	2.8	2.9	3.0	3.2	3.3		Diurnal Maximum	
Z - zerospan		C - Calibration				M - Maintenance																					





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
CNRL Horizon - July 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	265	37.64	37.64
2.1 - 3.0	435	61.79	99.43
3.1 - 10.0	4	0.57	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
CNRL Horizon - July 2016

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	40	61	20	6	4	1	12	18	14	25	29	14	3	5	5	8	265
2.1 - 3.0	60	39	18	13	8	5	6	10	56	60	32	16	20	32	26	34	435
3.1 - 10.0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	0	4
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	100	100	38	19	12	6	18	28	70	85	62	30	24	38	32	42	704

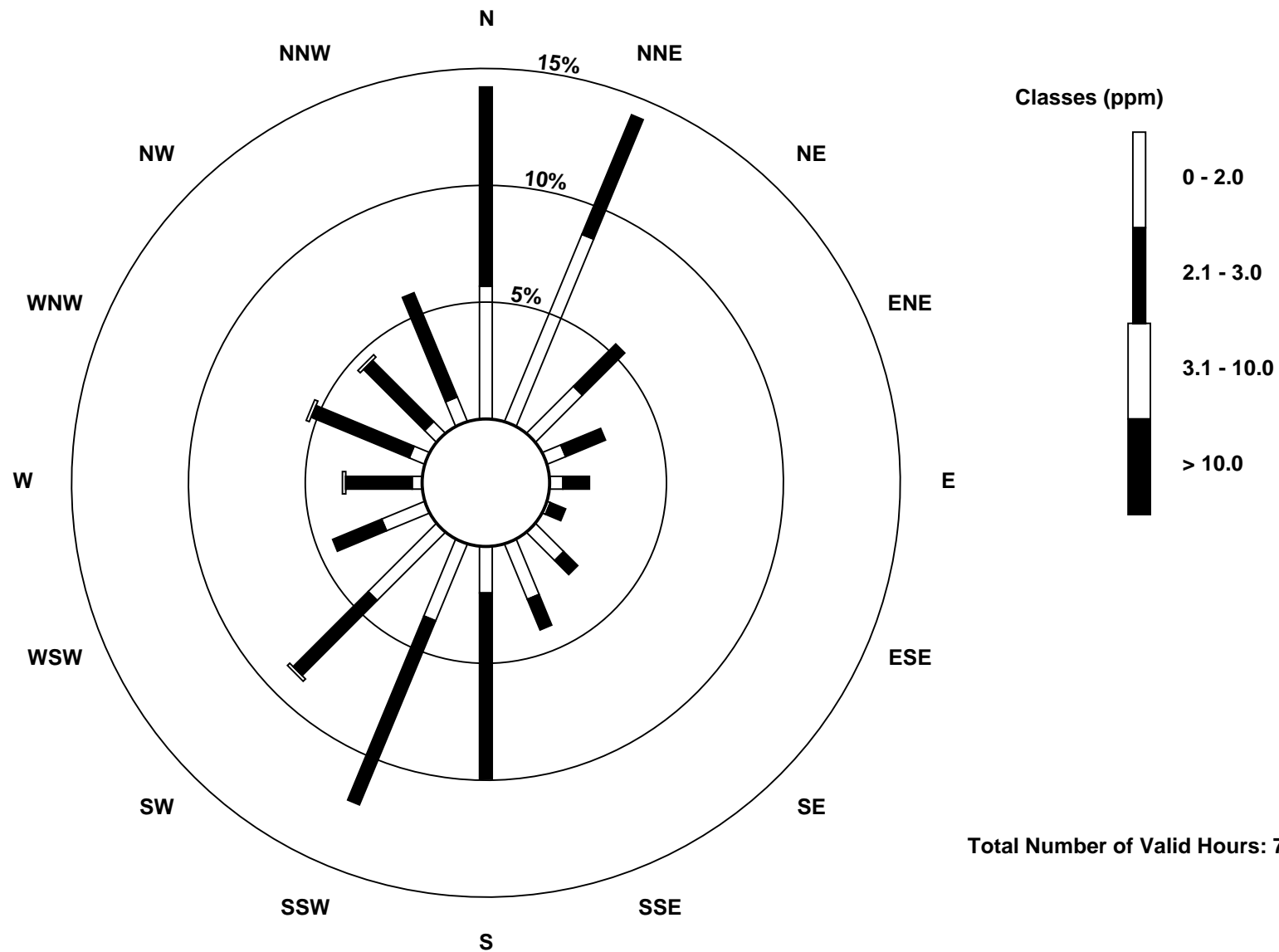
Total Number of Valid Hours: 704

Total Number of Hours: 744

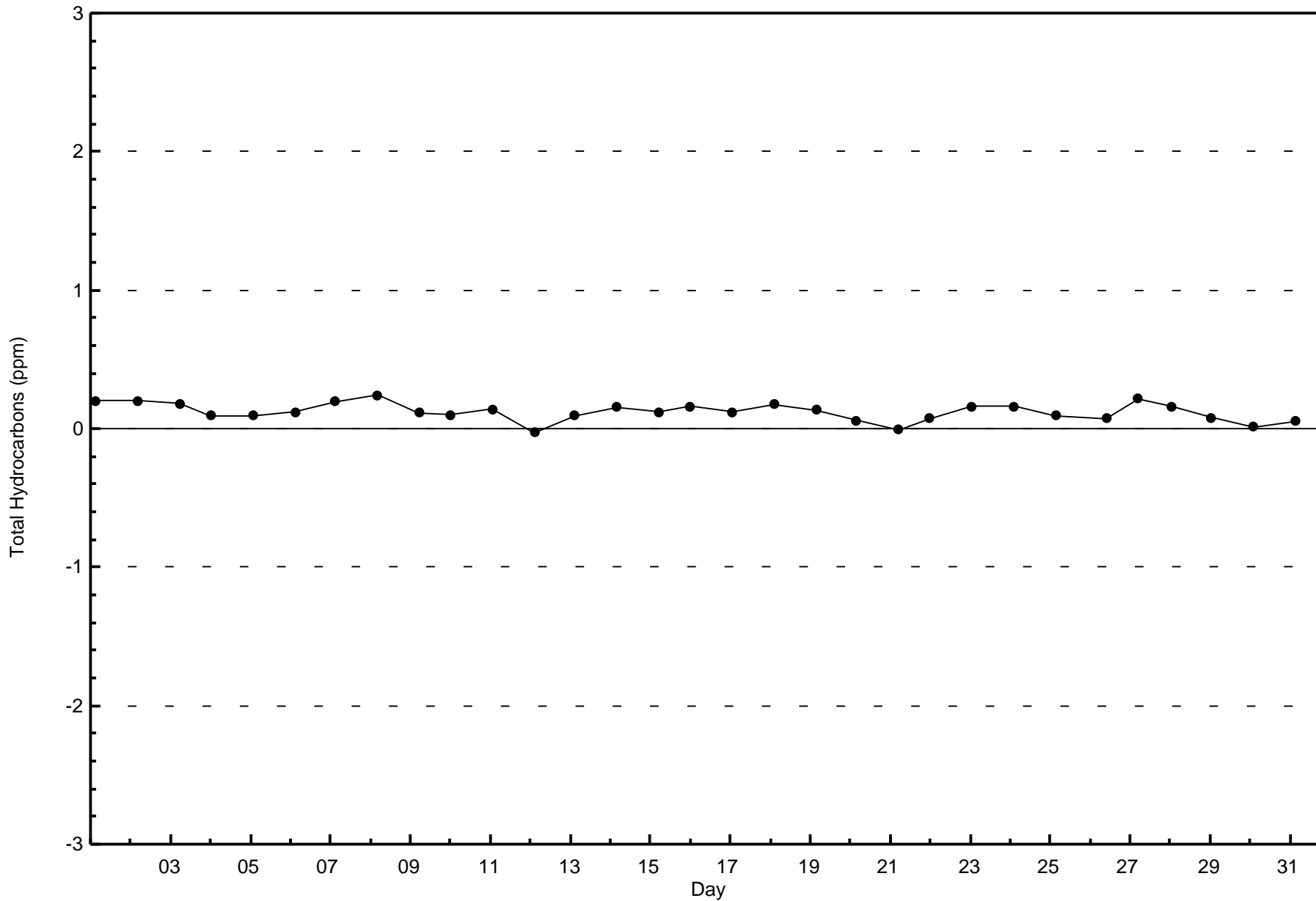


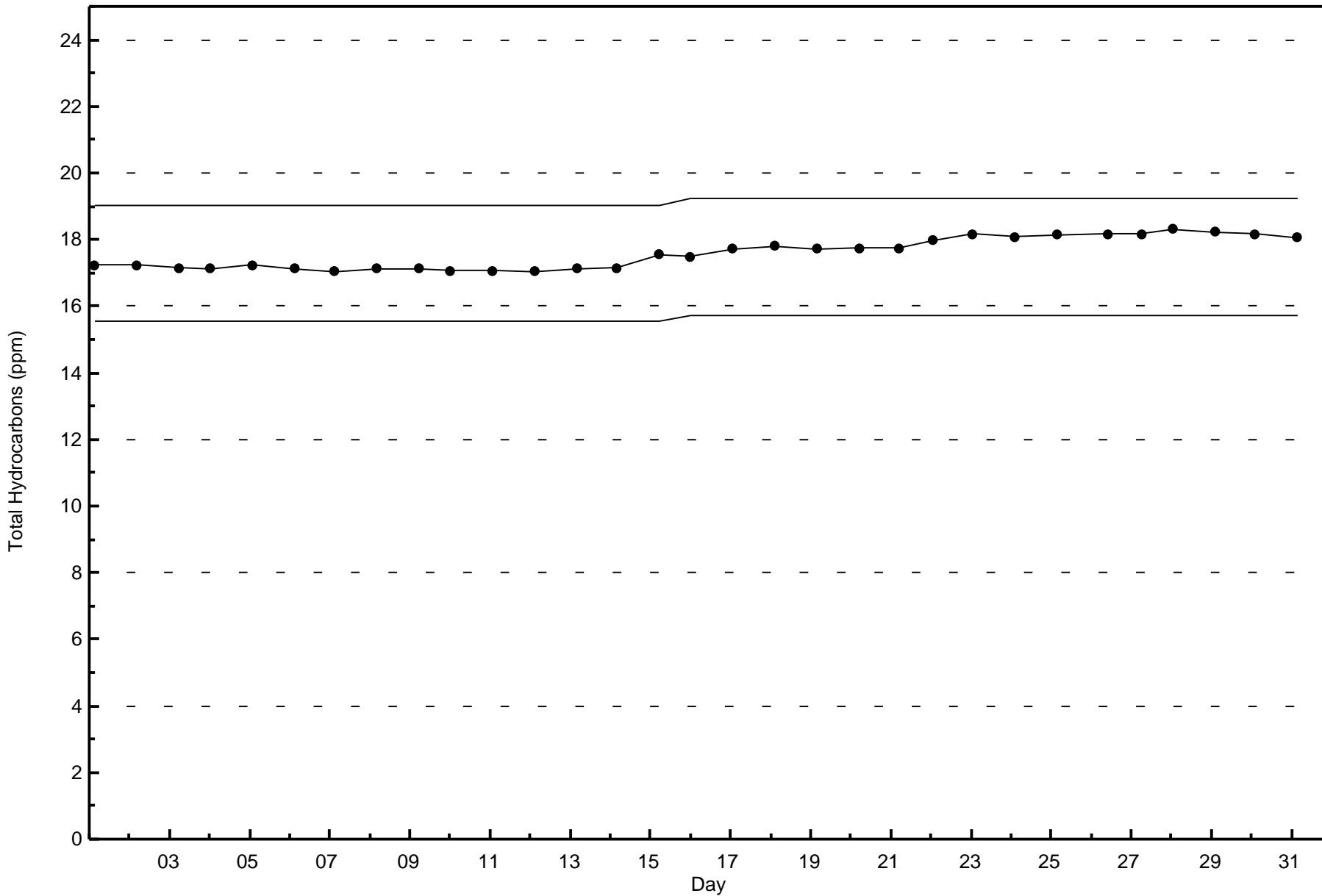
Wood Buffalo Environmental Association
Wind Rose Jul 2016

Total Hydrocarbons (THC) - ppm
CNRL Horizon (AMS 15)



Total Number of Valid Hours: 704







Wood Buffalo Environmental Association
Summary of Hour Averages

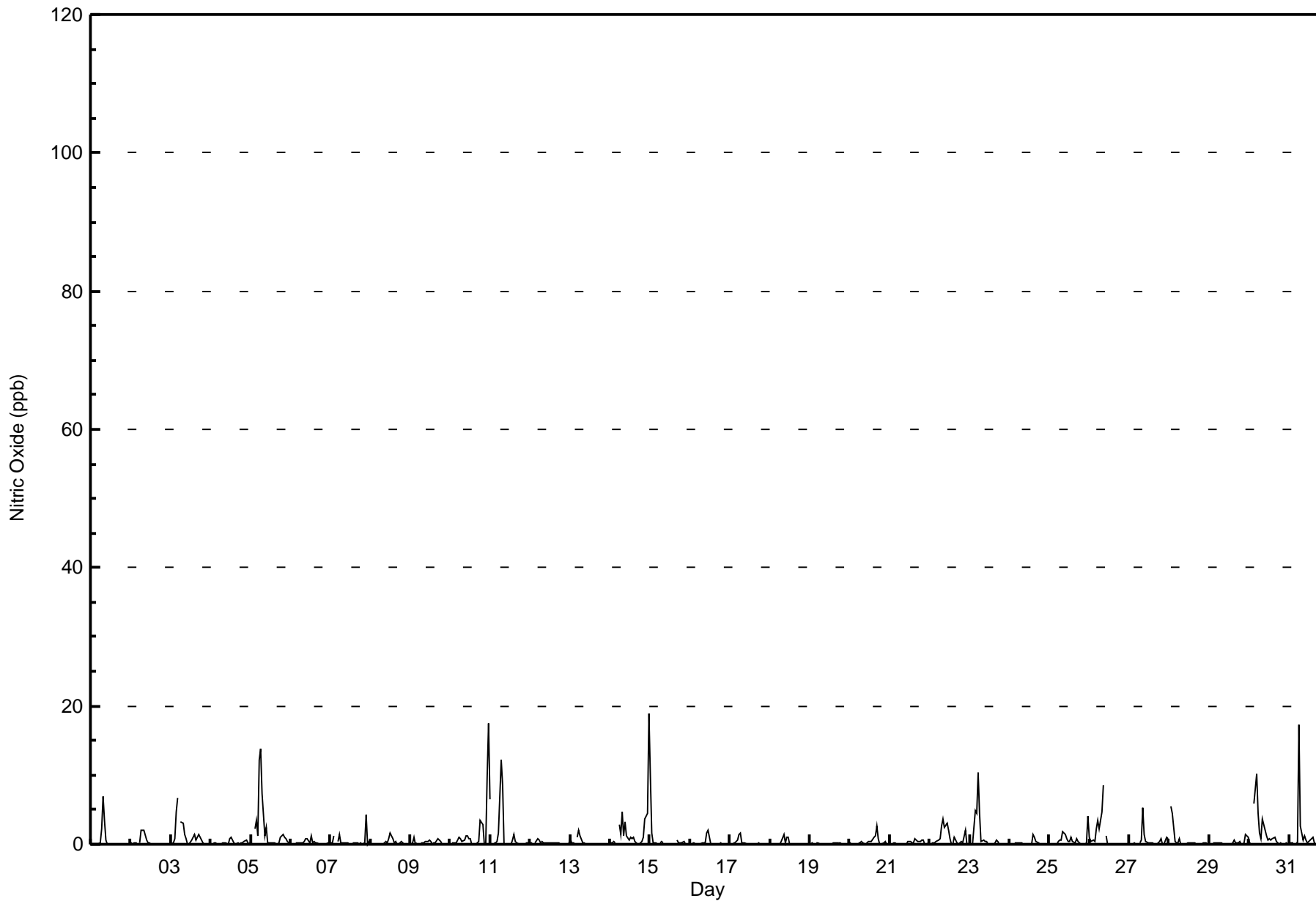
Nitric Oxide (NO) - ppb
CNRL Horizon - July 2016

Maximum Value: 19 ppb on Jul 15 00:00																	Maximum Daily Average: 2.2 ppb on Jul 5																	Hours in Service: 744	
Minimum Value: 0 ppb on Jul 1 01:00																	Minimum Daily Average: 0.1 ppb on Jul 19																	Hours of Data: 704	
Maximum Diurnal Average: 2.2 ppb at hour 7																	Minimum Diurnal Average: 0.1 ppb at hour 21																	Hours of Missing Data: 40	
Monthly Average: 0.7 ppb																	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 0 P ₉₀ = 1 P ₉₉ = 9																	Hours of Calibration: 38	
																	Percent Operational Time: 99.7																		
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24											
1-Jul	0	0	0	Z	0	0	2	7	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	7									
2-Jul	0	0	0	0	Z	0	2	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	2									
3-Jul	0	0	1	5	7	Z	3	3	1	1	0	0	1	1	1	1	1	1	1	0	0	0	0	1.2	7										
4-Jul	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	1	0	0	0.2	1									
5-Jul	0	Z	2	3	1	12	14	7	1	2	0	0	0	0	0	0	0	0	0	1	2	1	1	0	2.2	14									
6-Jul	0	0	Z	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0.3	1									
7-Jul	0	0	1	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0.4	4									
8-Jul	0	0	0	0	Z	0	0	0	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0	0	0.2	2									
9-Jul	0	0	1	0	0	Z	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0.3	1									
10-Jul	Z	0	0	0	1	1	1	0	1	1	1	1	1	0	0	0	0	0	4	3	0	0	10	18	1.8	18									
11-Jul	7	Z	0	0	0	2	12	9	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1.4	12									
12-Jul	0	0	Z	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1									
13-Jul	1	0	0	Z	1	2	1	0	0	0	M	M	0	0	0	0	0	0	0	0	0	0	0	0	0.3	2									
14-Jul	0	0	0	0	Z	3	1	5	1	3	1	1	1	1	0	0	0	0	0	1	4	4	19	2.1	19										
15-Jul	10	2	0	0	0	Z	0	0	0	C	C	C	C	C	C	C	1	0	0	0	0	0	0	--	10										
16-Jul	Z	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0.2	2									
17-Jul	0	Z	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	2									
18-Jul	0	0	Z	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1									
19-Jul	0	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									
20-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	1	3	1	0	0	0	0	0	0	0.4	3									
21-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	0	0	0.2	1									
22-Jul	Z	0	0	0	0	1	1	3	4	3	3	2	1	0	0	1	0	0	0	0	0	2	0	0	0.9	4									
23-Jul	0	Z	0	5	4	10	4	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1.2	10									
24-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0.2	1									
25-Jul	0	0	0	Z	0	0	1	1	2	2	1	0	0	1	0	0	1	0	0	0	0	0	0	4	0.6	4									
26-Jul	1	0	1	0	2	3	2	5	9	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1.1	9									
27-Jul	0	0	0	0	0	Z	0	1	5	1	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0.5	5									
28-Jul	Z	5	5	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	5									
29-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0.3	1									
30-Jul	0	0	Z	6	10	4	2	1	4	3	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1.6	10									
31-Jul	0	0	0	Z	0	0	17	3	1	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	1.1	17									
0.8 0.4 0.5 0.9 1.1 1.7 2.2 1.6 1.2 0.8 0.5 0.4 0.3 0.3 0.4 0.3 0.3 0.2 0.3 0.3 0.1 0.4 0.6 1.4																								Diurnal Average											
10 5 5 6 10 12 17 9 9 3 3 2 2 1 1 1 1 3 1 4 3 1 4 10 19																								Diurnal Maximum											
Z - zerospan C - Calibration M - Maintenance																																			



Wood Buffalo Environmental Association
Hourly Averages

Nitric Oxide (NO) - ppb
CNRL Horizon - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb
CNRL Horizon - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	704	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: 704

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitric Oxide (NO) - ppb
CNRL Horizon - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	100	100	38	19	12	6	18	28	70	85	62	30	24	38	32	42	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
Totals	100	100	38	19	12	6	18	28	70	85	62	30	24	38	32	42	704

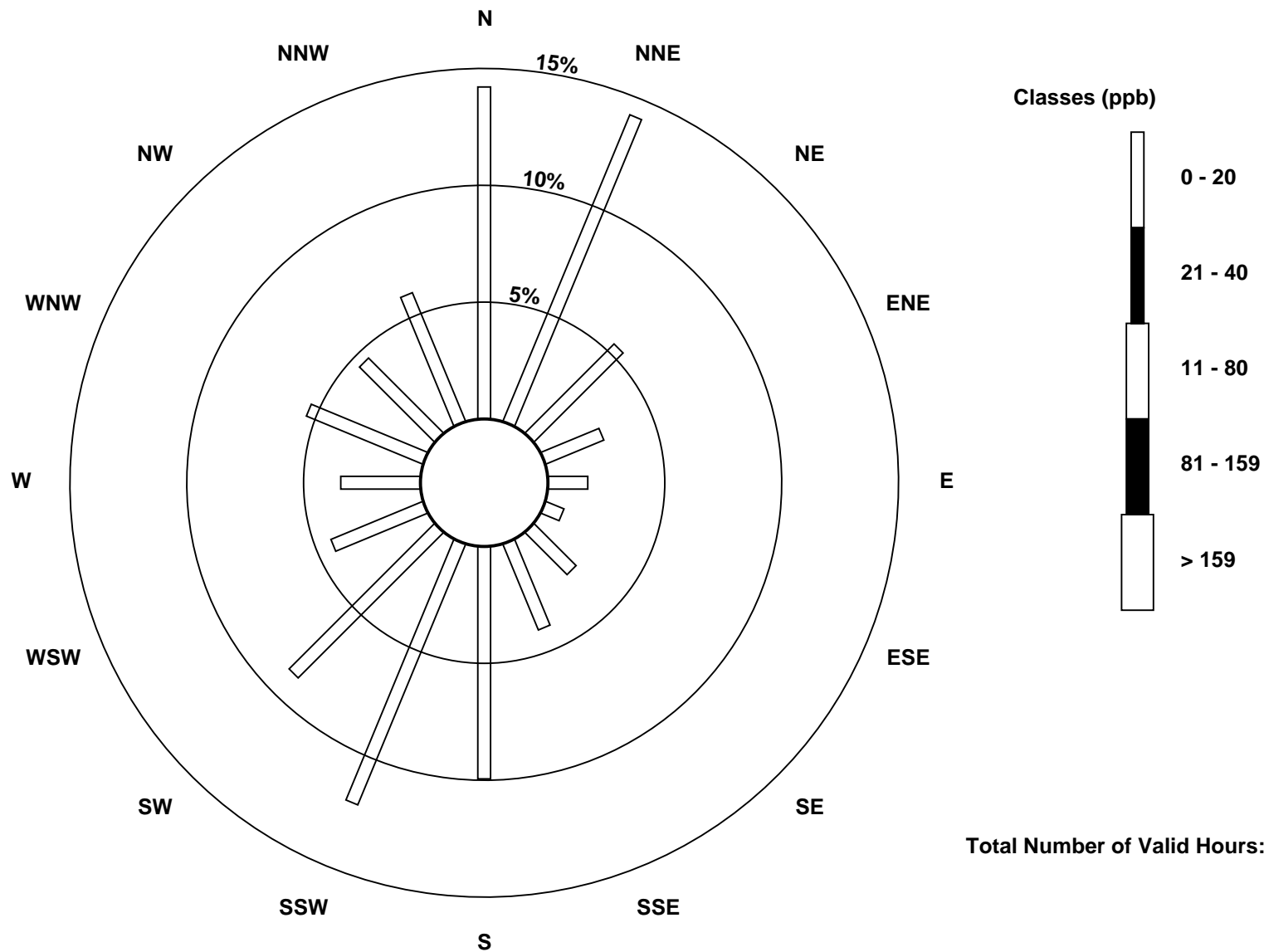
Total Number of Valid Hours: 704

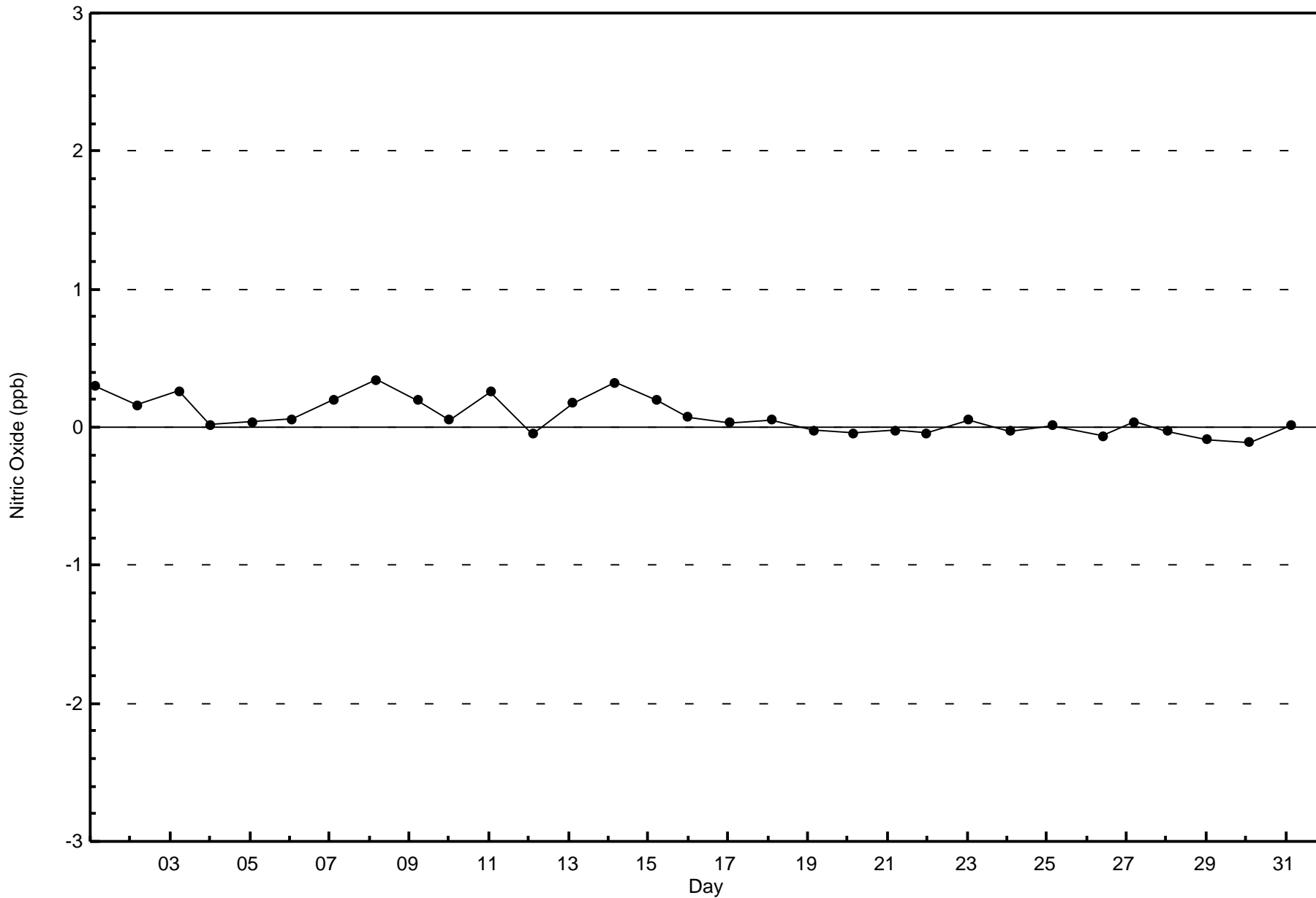
Total Number of Hours: 744

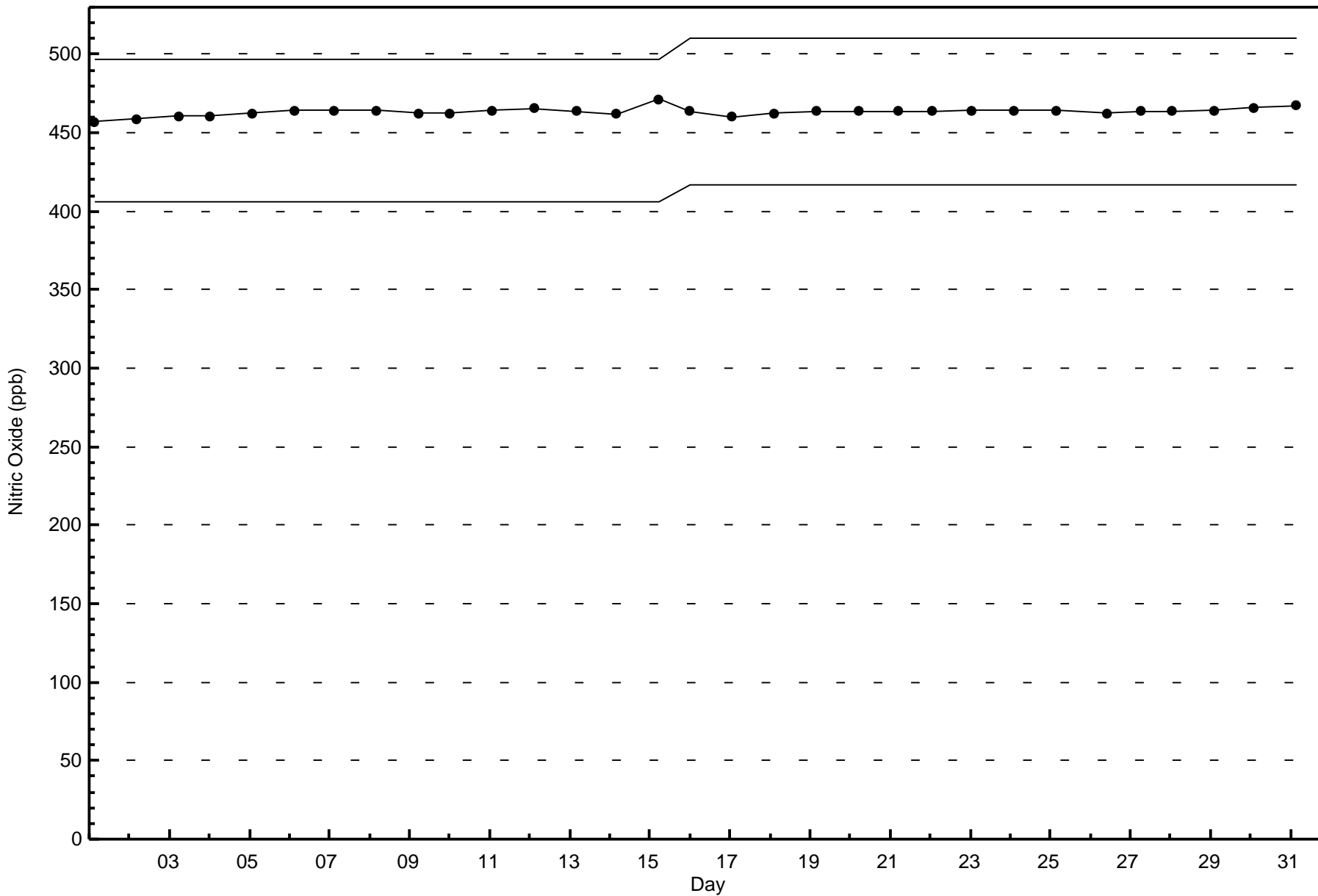


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Nitric Oxide (NO) - ppb
CNRL Horizon (AMS 15)









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

CNRL Horizon - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 20 ppb on Jul 5 22:00	Maximum Daily Average: 6.1 ppb on Jul 5
Minimum Value: 0 ppb on Jul 7 14:00	Hours of Data: 704
Maximum Diurnal Average: 5.2 ppb at hour 23	Hours of Missing Data: 40
Monthly Average: 2.6 ppb	Hours of Calibration: 38
Minimum Daily Average: 0.7 ppb on Jul 21	Percent Operational Time: 99.7
Minimum Diurnal Average: 1.4 ppb at hour 14	
Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 1 Q ₃ = 4 P ₉₀ = 7 P ₉₉ = 17	

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	1	1	1	Z	1	1	6	14	10	4	2	2	1	1	2	1	1	2	2	2	1	3	4	5	2.9	14
2-Jul	7	4	5	4	Z	1	5	7	7	4	2	2	2	2	2	1	2	2	2	2	1	2	1	2	2.9	7
3-Jul	2	2	6	7	5	Z	6	7	6	5	3	2	4	4	6	6	7	8	7	8	7	3	4	2	5.0	8
4-Jul	Z	2	4	1	0	0	0	0	1	1	0	3	3	4	1	0	1	0	1	1	2	2	1	2	1.2	4
5-Jul	4	Z	5	6	2	7	9	6	4	6	1	2	2	2	2	1	1	3	10	16	17	20	13	2	6.1	20
6-Jul	1	1	Z	1	1	1	0	1	1	1	1	0	0	1	1	1	1	0	1	2	5	3	1	1	1.1	5
7-Jul	1	1	4	Z	2	3	1	1	0	1	1	0	0	0	0	1	0	0	1	0	1	7	1	1	1.2	7
8-Jul	0	1	0	1	Z	0	0	0	1	1	1	1	2	2	2	2	1	1	1	1	1	1	2	1	1.0	2
9-Jul	0	1	2	1	2	Z	0	0	1	1	2	3	2	2	2	2	3	2	1	1	0	2	2	3	1.5	3
10-Jul	Z	1	2	1	2	3	1	1	1	2	3	3	2	1	1	1	2	2	10	8	0	0	11	16	3.2	16
11-Jul	16	Z	4	6	5	3	11	10	1	0	0	1	1	2	3	2	1	0	1	1	0	4	6	7	3.6	16
12-Jul	4	9	Z	3	8	4	1	1	0	1	1	1	1	1	1	1	1	1	1	0	0	4	5	4	2.2	9
13-Jul	15	8	8	Z	8	6	3	1	1	0	M	M	0	0	1	0	1	1	0	1	1	2	2	6	3.0	15
14-Jul	5	6	6	4	Z	4	2	5	3	7	5	3	4	3	4	3	1	1	2	4	11	18	20	18	6.0	20
15-Jul	13	5	0	0	0	Z	0	1	0	C	C	C	C	C	C	C	3	2	3	5	9	11	16	4	--	16
16-Jul	Z	0	0	0	0	0	0	0	1	2	8	8	1	1	1	1	1	1	2	2	1	1	2	4	1.7	8
17-Jul	6	Z	4	6	10	11	6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2.6	11
18-Jul	1	1	Z	1	1	1	1	2	5	1	4	5	1	0	0	0	0	0	0	0	0	0	0	0	1.1	5
19-Jul	0	1	1	Z	0	1	1	1	1	1	0	0	0	0	3	2	3	4	3	2	1	2	3	6	1.5	6
20-Jul	3	1	3	4	Z	3	1	2	1	1	1	2	2	3	4	5	6	2	1	1	5	9	4	1	2.7	9
21-Jul	0	0	0	0	0	Z	0	0	0	0	0	1	1	1	2	1	1	1	1	1	1	1	1	1	0.7	2
22-Jul	Z	2	5	3	3	2	1	3	4	4	5	4	2	1	0	3	1	0	2	6	10	20	7	2	3.9	20
23-Jul	0	Z	0	9	8	9	4	1	1	1	2	1	1	1	0	3	4	2	1	0	0	0	0	0	2.1	9
24-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	3	4	6	2	1	0	1	4	0	0	1.0	6
25-Jul	1	5	0	Z	0	1	1	1	3	2	1	1	1	1	1	0	2	1	1	1	1	1	6	12	1.8	12
26-Jul	5	3	2	5	4	5	3	5	10	Z	4	1	1	0	0	0	0	0	0	1	1	1	4	4	2.5	10
27-Jul	2	1	1	0	0	Z	0	1	7	4	1	1	1	1	1	1	1	1	1	2	1	4	7	7	2.0	7
28-Jul	Z	8	6	3	1	1	1	0	0	0	1	1	2	2	3	4	2	2	1	1	6	13	19	7	3.6	19
29-Jul	2	Z	1	1	1	1	0	0	0	0	0	0	0	0	1	3	2	1	4	2	4	7	6	9	1.8	9
30-Jul	2	2	Z	9	12	8	5	2	6	7	5	5	7	5	4	4	2	2	2	2	2	4	11	5	4.8	12
31-Jul	6	4	3	Z	5	3	11	7	4	5	3	2	3	1	1	1	3	2	1	0	0	0	4	2	3.0	11

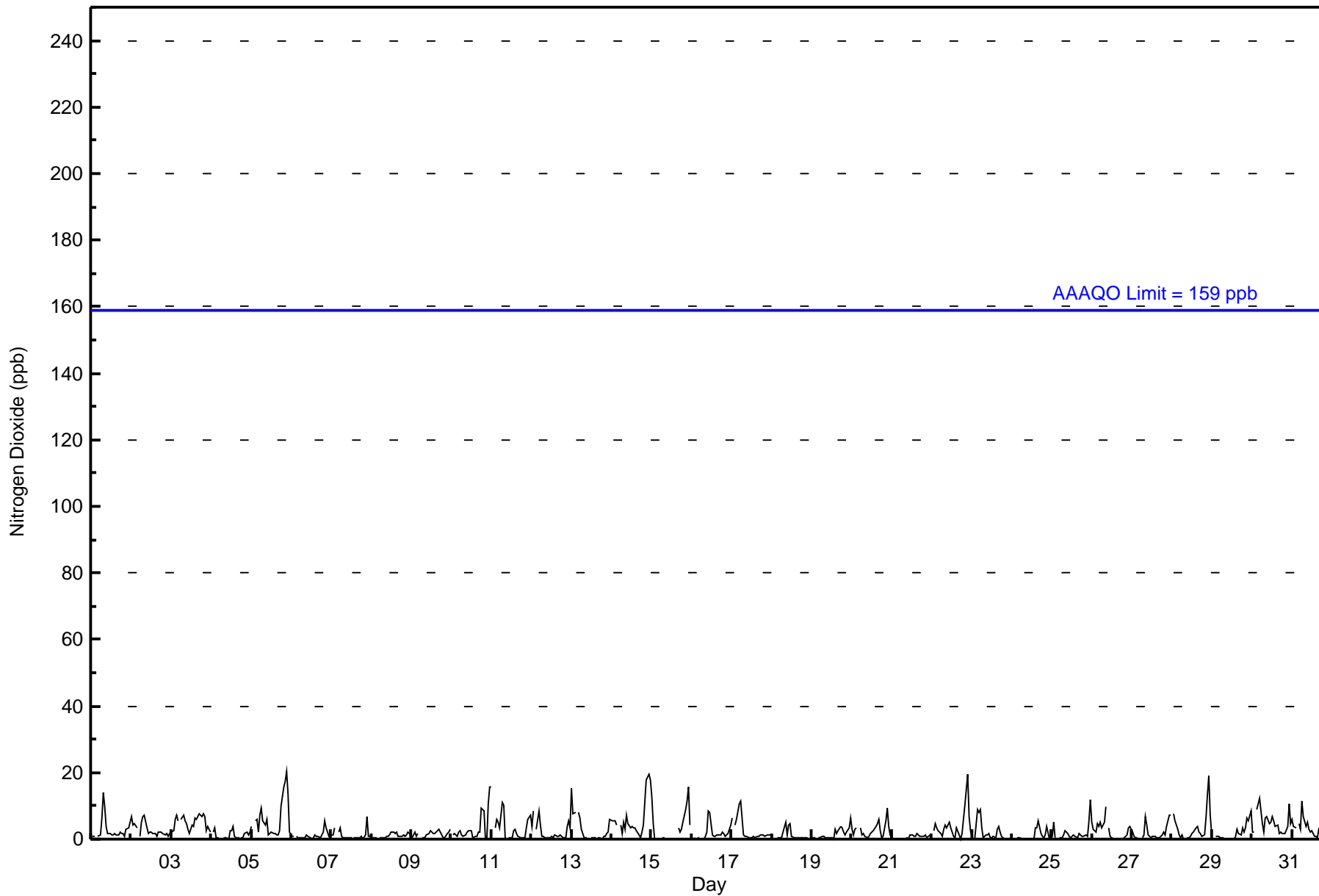
3.8	2.7	2.8	3.0	3.1	3.0	2.6	2.6	2.5	2.1	1.9	1.8	1.6	1.4	1.7	1.8	1.9	1.5	2.0	2.4	3.0	4.8	5.2	4.4	Diurnal Average
16	9	8	9	12	11	11	14	10	7	8	8	7	5	6	6	7	8	10	16	17	20	20	18	Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
CNRL Horizon - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
CNRL Horizon - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	704	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: 704

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
CNRL Horizon - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	100	100	38	19	12	6	18	28	70	85	62	30	24	38	32	42	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
Totals	100	100	38	19	12	6	18	28	70	85	62	30	24	38	32	42	704

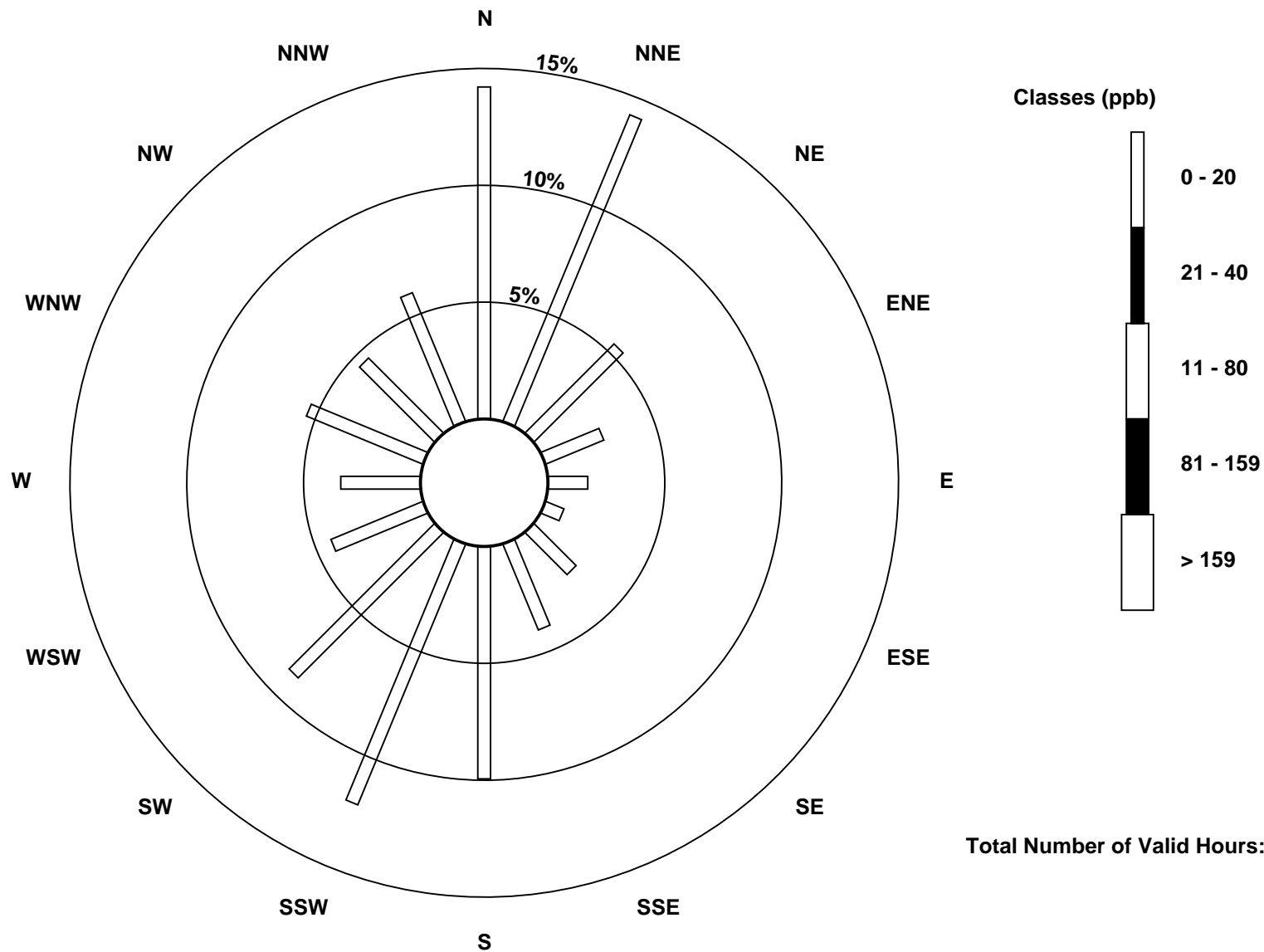
Total Number of Valid Hours: 704

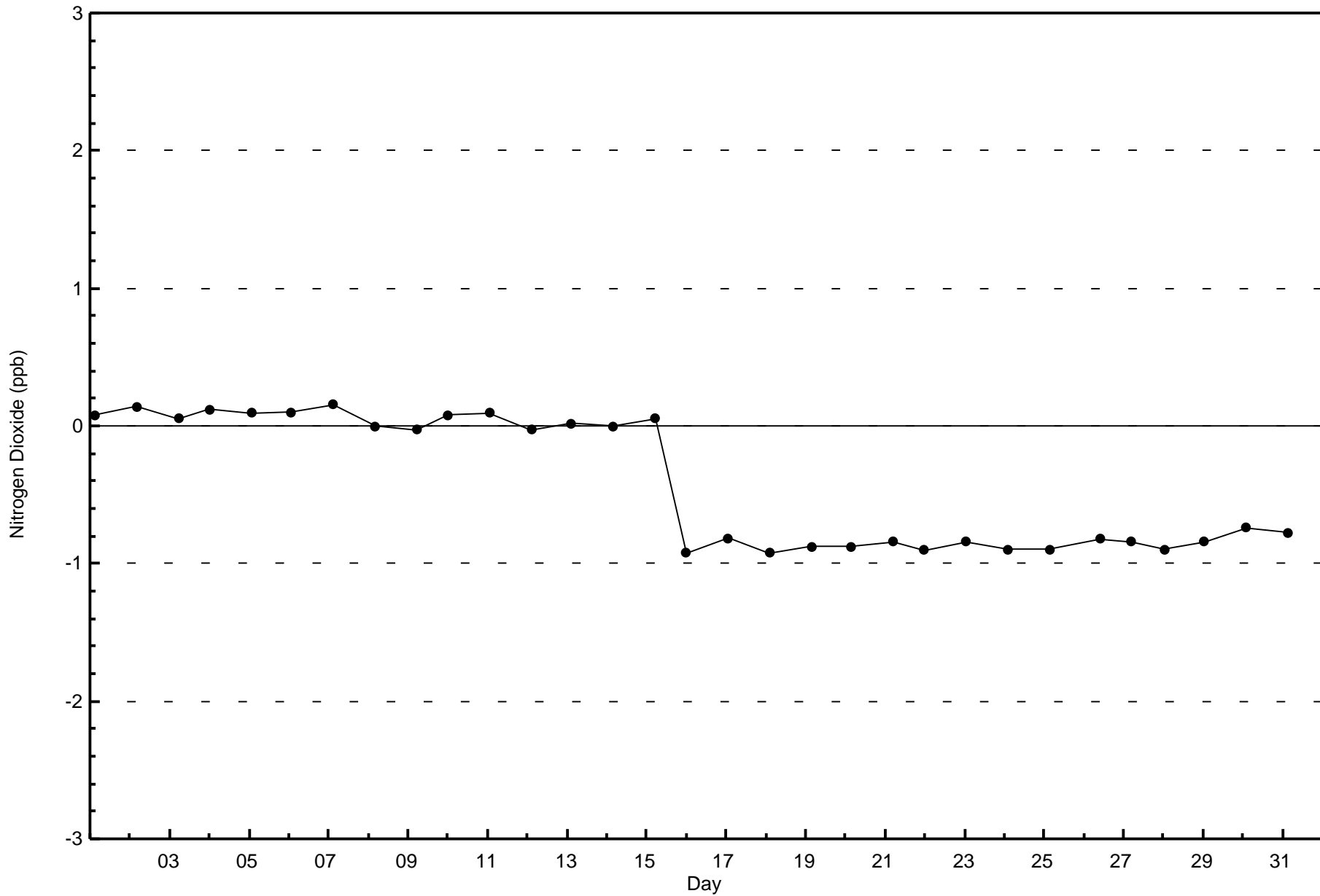
Total Number of Hours: 744

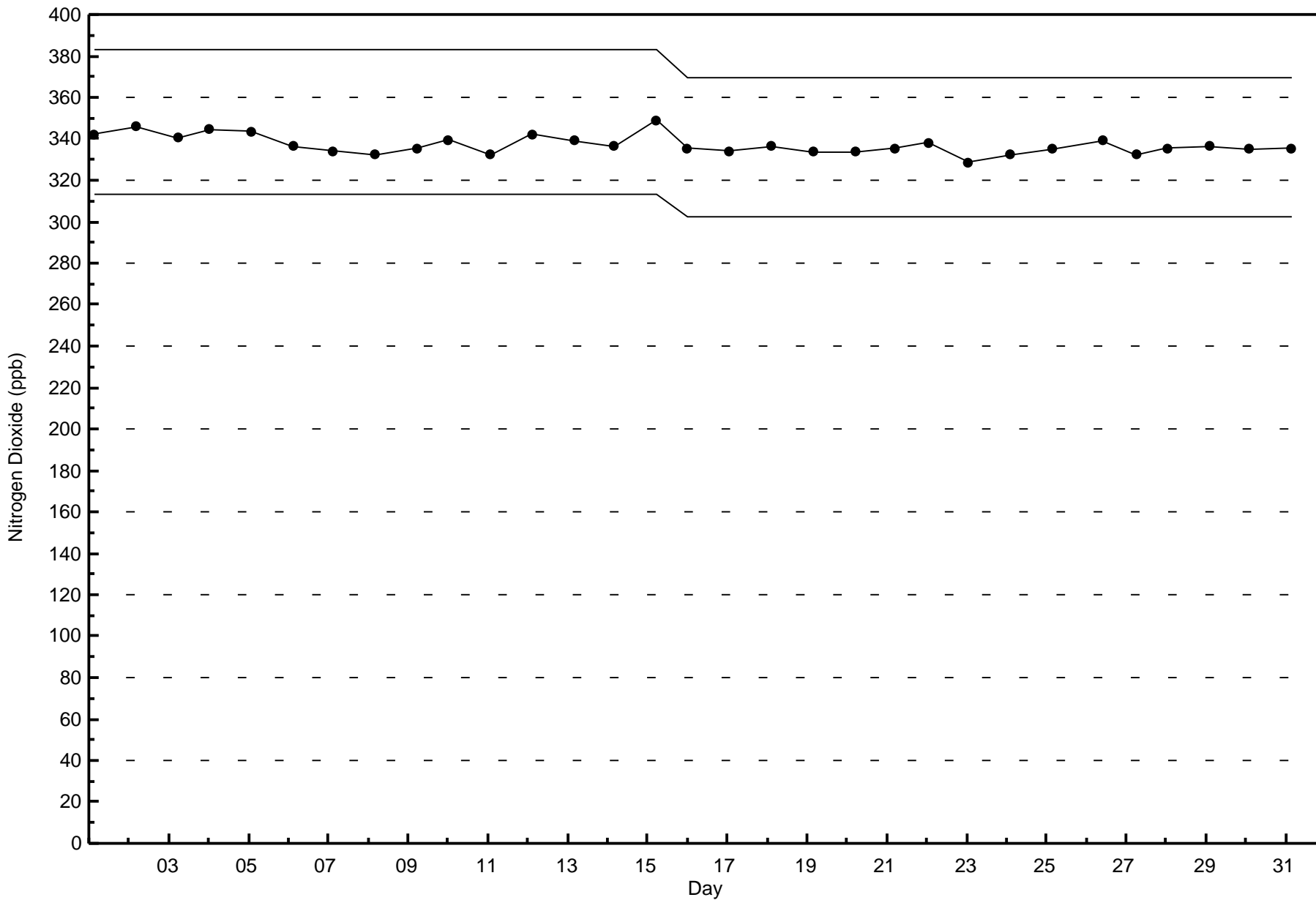


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Nitrogen Dioxide (NO₂) - ppb
CNRL Horizon (AMS 15)









Wood Buffalo Environmental Association
Summary of Hour Averages

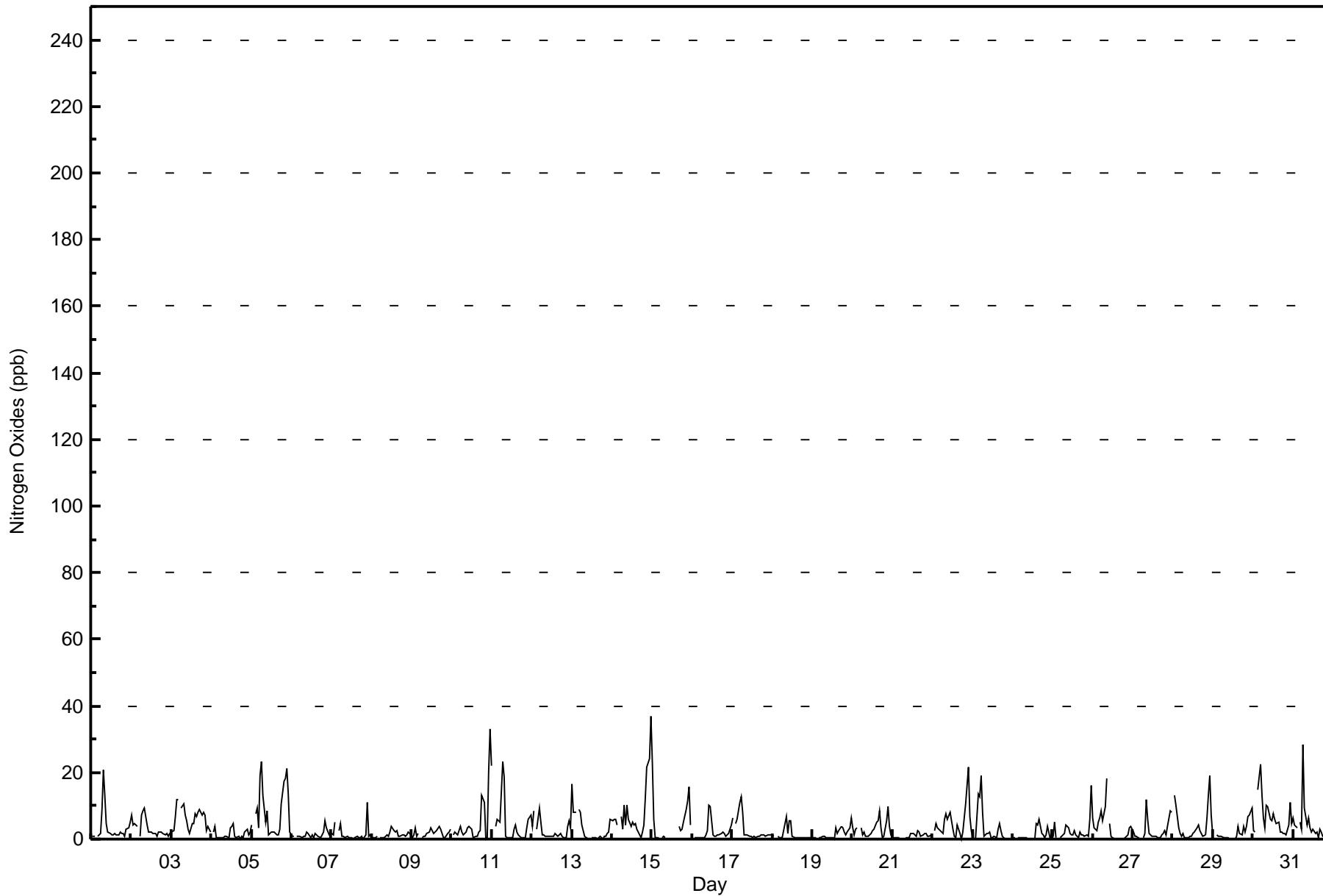
Nitrogen Oxides (NO_x) - ppb
CNRL Horizon - July 2016

Maximum Value: 37 ppb on Jul 15 00:00		Maximum Daily Average: 8.3 ppb on Jul 5		Hours in Service: 744																							
Minimum Value: 0 ppb on Jul 7 20:00		Minimum Daily Average: 0.9 ppb on Jul 21		Hours of Data: 704																							
Maximum Diurnal Average: 5.8 ppb at hour 24		Minimum Diurnal Average: 1.7 ppb at hour 14		Hours of Missing Data: 40																							
Monthly Average: 3.3 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 2 O ₃ = 4 P ₉₀ = 8 P ₉₉ = 23		Hours of Calibration: 38																							
				Percent Operational Time: 99.7																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Jul	1	1	1	Z	1	2	9	21	13	4	2	2	1	1	1	1	1	2	2	2	1	3	4	5	3.5	21	
2-Jul	7	4	5	4	Z	1	7	9	9	4	2	2	2	2	1	2	2	2	2	2	1	2	1	2	3.2	9	
3-Jul	2	3	7	12	12	Z	9	10	7	5	3	2	5	5	8	7	8	9	7	8	7	2	4	2	6.3	12	
4-Jul	Z	2	4	1	0	0	0	1	1	0	1	3	4	5	1	1	1	0	1	1	2	3	1	2	1.4	5	
5-Jul	4	Z	8	9	4	19	23	13	5	8	1	2	2	2	1	1	1	3	11	17	18	21	14	2	8.3	23	
6-Jul	1	1	Z	1	1	1	1	1	1	2	2	1	1	1	2	1	1	0	1	2	5	3	1	1	1.4	5	
7-Jul	2	1	5	Z	2	5	1	1	1	1	1	0	0	0	0	1	0	0	1	0	1	11	1	1	1.6	11	
8-Jul	0	0	0	1	Z	0	0	0	1	1	1	2	4	3	2	3	1	1	1	1	1	1	2	1	1.3	4	
9-Jul	0	1	3	1	2	Z	1	1	1	2	2	3	3	2	2	2	4	3	2	0	0	2	2	3	1.8	4	
10-Jul	Z	1	2	1	3	4	2	1	2	4	4	3	3	1	1	1	2	3	13	11	0	0	20	33	5.0	33	
11-Jul	22	Z	4	6	5	5	23	19	1	0	0	1	0	3	4	2	1	0	1	1	0	4	6	7	5.0	23	
12-Jul	4	9	Z	3	9	5	1	1	1	1	1	1	1	2	1	1	2	1	2	1	0	0	4	5	4	2.5	9
13-Jul	16	8	8	Z	9	8	4	1	1	0	M	M	0	0	0	0	1	1	0	1	1	2	2	6	3.3	16	
14-Jul	5	6	6	4	Z	7	3	10	4	10	6	4	5	4	5	3	1	1	2	4	12	22	24	37	8.1	37	
15-Jul	23	6	0	0	0	Z	0	1	1	C	C	C	C	C	C	C	4	2	3	5	9	11	16	4	--	23	
16-Jul	Z	0	0	0	0	0	0	0	1	3	10	10	1	1	1	1	1	2	2	2	1	1	2	4	1.9	10	
17-Jul	6	Z	5	6	11	13	8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2.8	13	
18-Jul	1	1	Z	1	1	0	1	2	7	1	5	6	1	0	0	0	0	0	0	0	0	0	0	0	1.3	7	
19-Jul	0	1	0	Z	1	1	1	1	1	0	0	0	0	0	3	2	3	4	3	2	1	2	3	6	1.6	6	
20-Jul	3	1	3	4	Z	3	1	2	1	1	1	2	3	3	5	6	8	3	1	1	5	10	4	1	3.1	10	
21-Jul	0	0	0	0	0	Z	0	0	0	0	0	2	2	1	1	2	2	1	1	2	2	1	1	1	0.9	2	
22-Jul	Z	3	5	4	3	2	2	6	8	6	8	6	3	1	0	4	2	0	2	6	11	22	7	2	4.8	22	
23-Jul	0	Z	0	14	13	19	8	1	2	2	2	1	1	1	0	3	5	2	1	0	0	0	0	0	3.2	19	
24-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	5	4	6	2	1	1	1	4	0	0	1.2	6	
25-Jul	1	5	0	Z	0	1	1	2	4	3	2	1	1	2	1	1	2	1	1	1	1	1	6	16	2.4	16	
26-Jul	6	4	3	5	6	8	5	10	18	Z	5	1	0	0	0	0	0	0	0	0	0	1	1	3	4	3.6	18
27-Jul	2	1	1	0	0	Z	0	2	12	6	2	1	1	1	1	1	1	1	1	2	3	1	4	8	8	2.5	12
28-Jul	Z	13	10	3	2	1	2	0	0	0	1	1	2	2	3	4	2	2	1	1	6	13	19	7	4.2	19	
29-Jul	2	Z	1	1	1	1	1	0	0	0	0	0	0	0	1	4	2	1	4	2	4	7	7	9	2.1	9	
30-Jul	3	2	Z	15	22	13	6	3	10	10	6	5	7	6	4	5	2	2	2	2	1	4	11	5	6.4	22	
31-Jul	6	4	4	Z	5	3	29	10	4	6	3	2	3	2	2	1	3	2	1	0	0	0	4	2	4.2	29	
4.6 3.0 3.3 3.8 4.2 4.7 4.8 4.2 3.8 2.9 2.4 2.2 1.9 1.7 2.0 2.1 2.2 1.7 2.3 2.6 3.1 5.2 5.8 5.8																								Diurnal Average			
23 13 10 15 22 19 29 21 18 10 10 10 7 6 8 7 8 9 13 17 18 22 24 37																								Diurnal Maximum			
Z - zerospan		C - Calibration				M - Maintenance																					



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
CNRL Horizon - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitrogen Oxides (NO_x) - ppb
CNRL Horizon - July 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	691	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: 704

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
CNRL Horizon - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	100	100	38	19	12	6	17	28	70	84	60	30	23	33	30	41	691
21 - 40	0	0	0	0	0	0	1	0	0	1	2	0	1	5	2	1	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
Totals	100	100	38	19	12	6	18	28	70	85	62	30	24	38	32	42	704

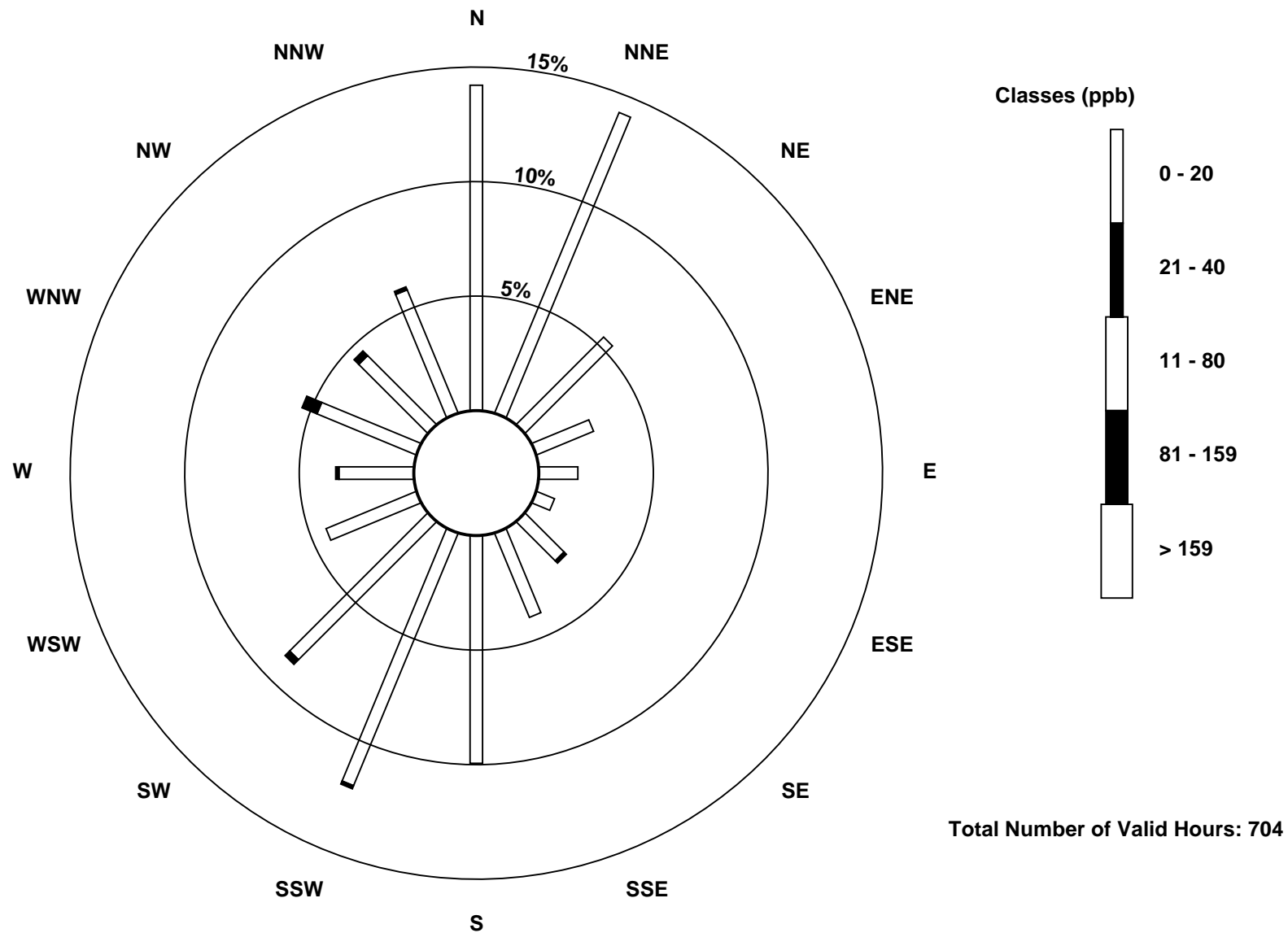
Total Number of Valid Hours: 704

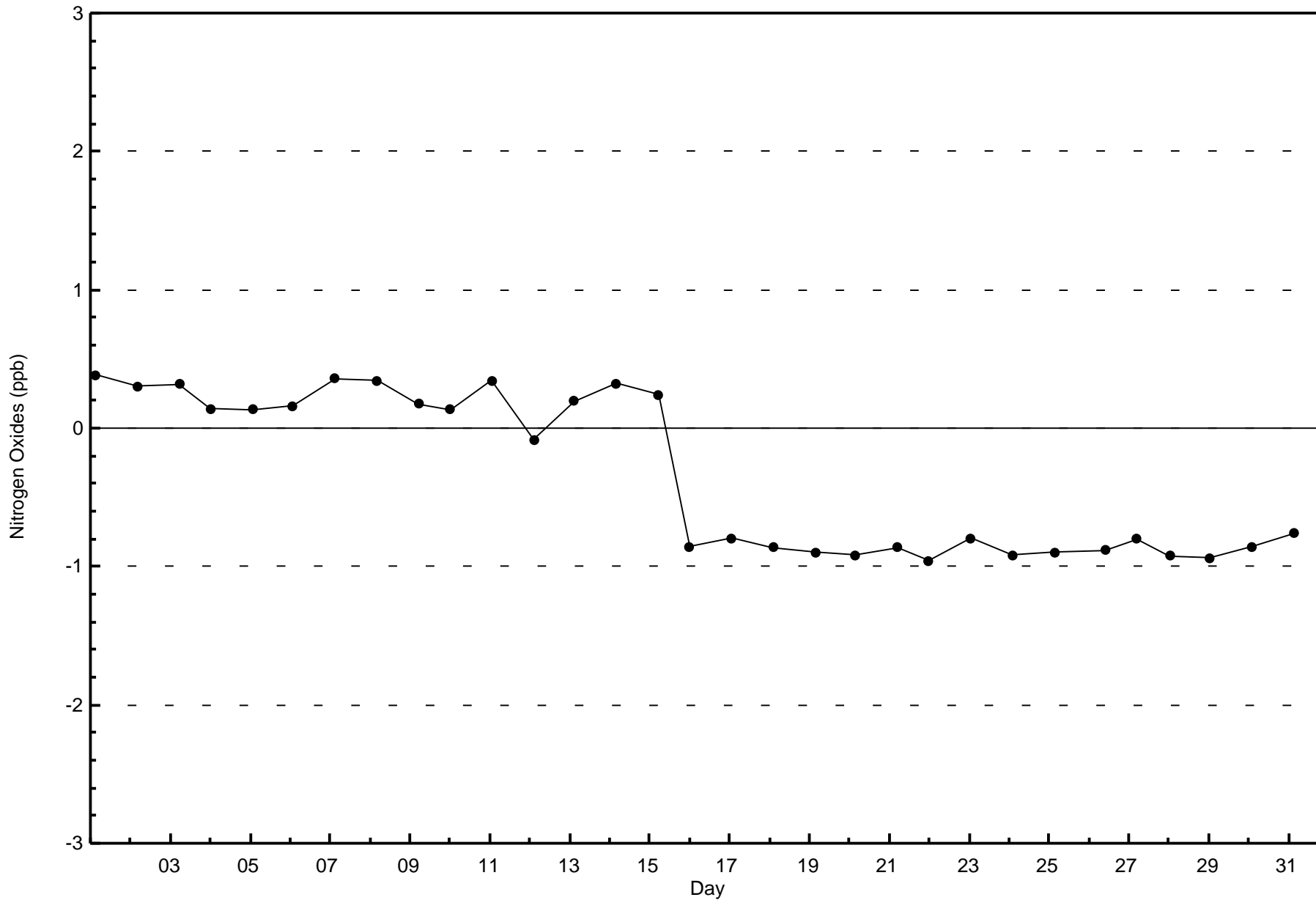
Total Number of Hours: 744

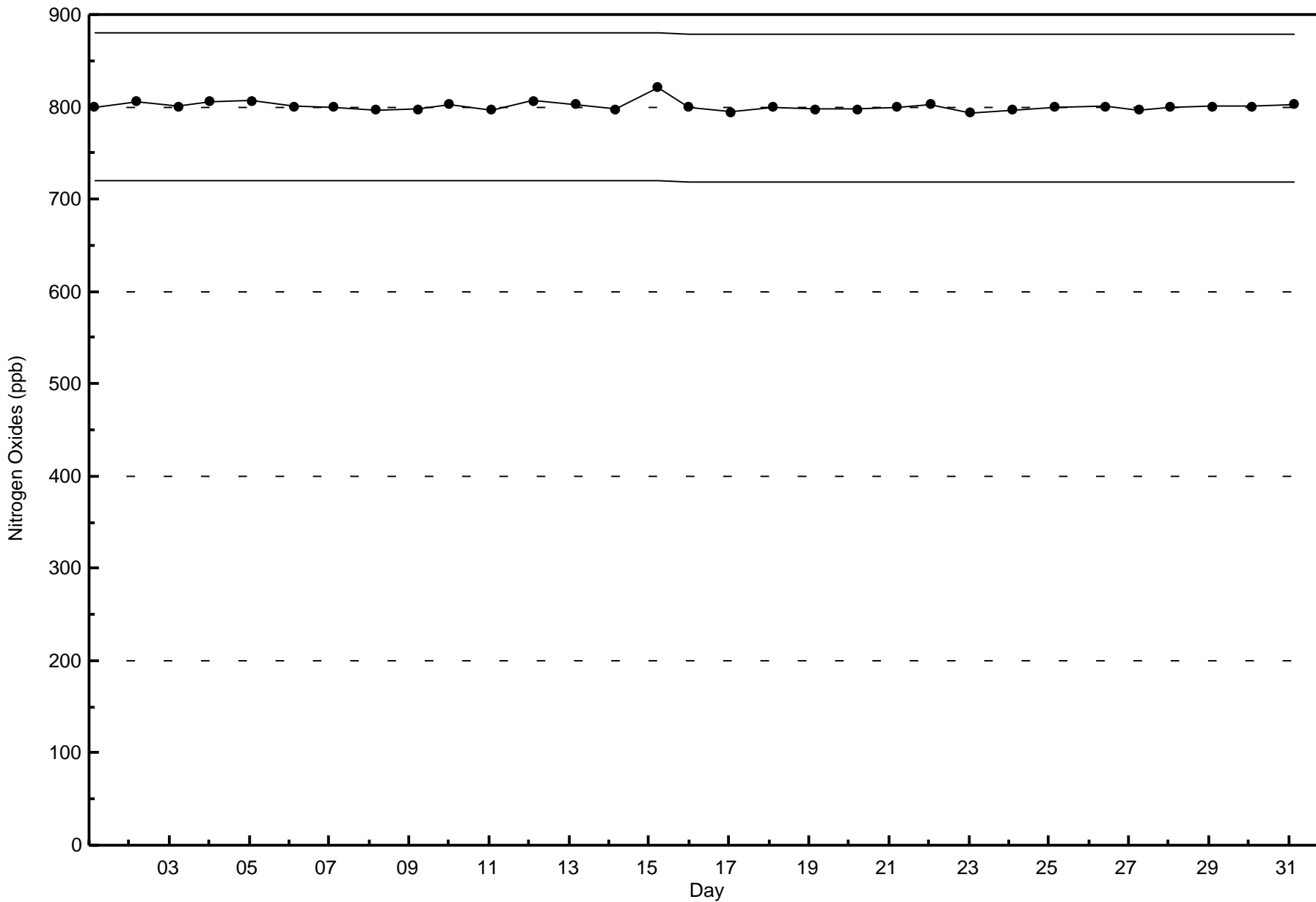


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Nitrogen Oxides (NO_x) - ppb
CNRL Horizon (AMS 15)









Number of Exceedences (AAAQO): 24-hr: 1	Hours in Service: 744
Maximum Value: 102.3 µg/m ³ on Jul 17 06:00	Maximum Daily Average: 39.5 µg/m ³ on Jul 17
Minimum Value: 1.2 µg/m ³ on Jul 7 17:00	Hours of Data: 740
Maximum Diurnal Average: 14.8 µg/m ³ at hour 6	Hours of Missing Data: 4
Monthly Average: 10.27 µg/m ³	Hours of Calibration: 2
Minimum Daily Average: 2.9 µg/m ³ on Jul 8	Percent Operational Time: 99.7
Minimum Diurnal Average: 8.6 µg/m ³ at hour 18	
Percentiles: P ₁ = 1.5 P ₁₀ = 2.7 Q ₁ = 4.8 Median = 7.6 Q ₃ = 11.4 P ₉₀ = 21.9 P ₉₉ = 57.4	

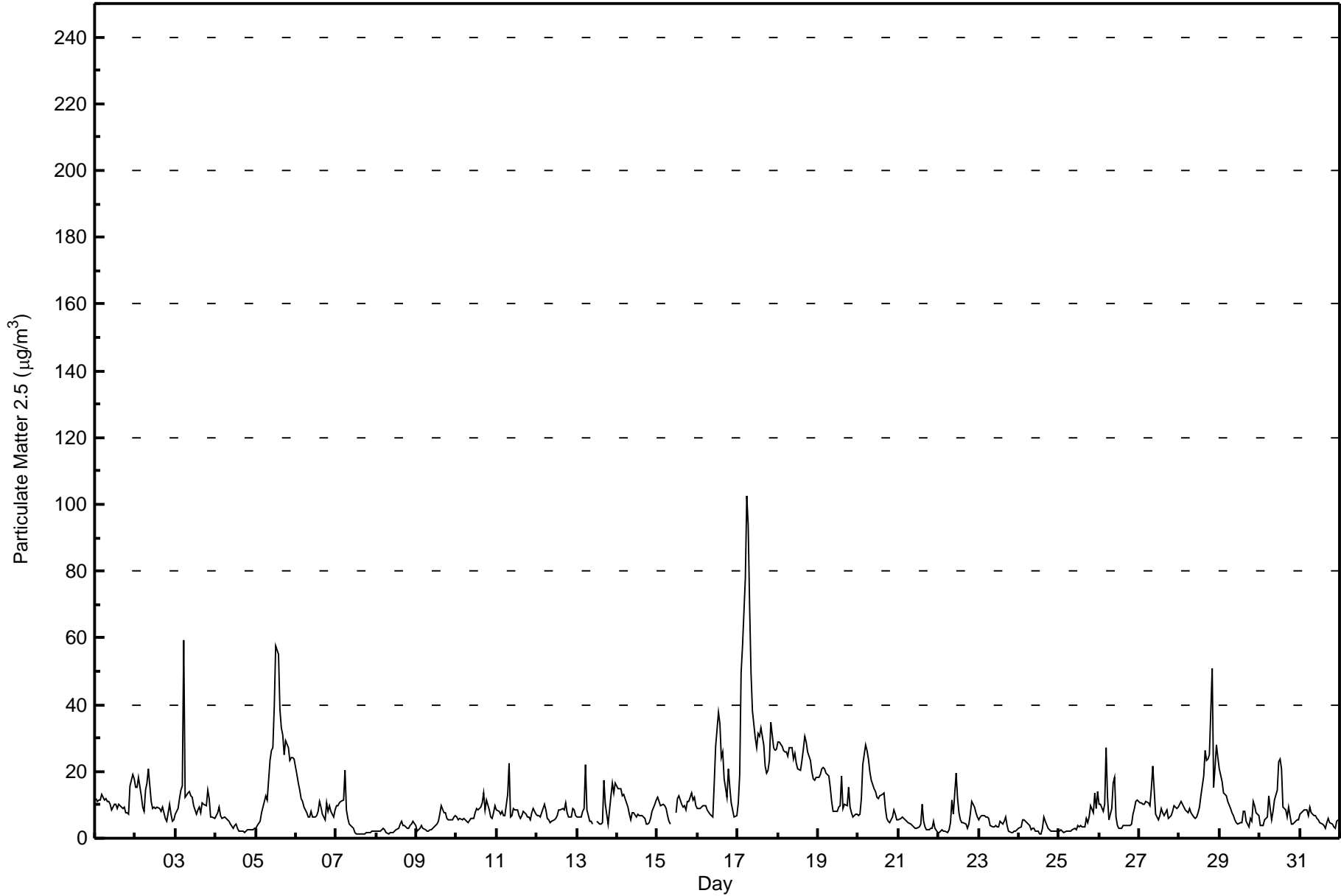
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Jul	11.9	11.1	11.2	11.6	12.9	11.3	11.7	11.2	11.1	10.2	8.6	10.0	10.0	8.8	10.1	9.6	9.0	9.3	7.8	7.5	7.2	15.9	19.3	17.7	11.0	19.3																							
2-Jul	15.2	15.1	18.2	12.8	9.1	8.2	14.2	16.5	20.9	11.1	8.8	9.5	9.0	9.2	9.1	8.2	9.1	7.7	6.1	5.1	10.0	7.3	4.9	5.3	10.5	20.9																							
3-Jul	7.1	8.9	11.7	14.3	15.8	59.1	12.4	13.8	13.9	12.7	12.3	9.8	7.1	8.6	9.4	7.6	10.8	10.3	9.8	14.3	11.7	6.3	6.5	5.9	12.5	59.1																							
4-Jul	6.9	7.7	9.5	6.7	5.8	6.3	6.1	5.4	4.9	4.2	3.0	3.6	4.3	3.1	2.1	1.9	2.2	1.9	2.2	2.4	2.4	2.7	2.7	2.9	4.2	9.5																							
5-Jul	3.2	3.9	5.3	7.8	9.2	10.8	12.7	11.6	23.4	26.4	26.9	39.5	57.8	55.0	38.6	32.9	30.8	25.1	29.3	27.0	23.2	24.3	24.0	23.8	23.9	57.8																							
6-Jul	18.9	16.7	14.4	11.9	11.0	9.5	7.5	6.3	6.3	8.0	6.2	6.3	6.8	8.0	10.9	9.2	7.2	5.5	10.6	7.9	9.8	7.9	6.5	8.6	9.3	18.9																							
7-Jul	9.5	9.9	10.4	10.9	11.3	20.4	8.5	5.9	4.2	3.2	2.9	1.7	1.5	1.3	1.3	1.2	1.3	1.8	1.7	1.5	2.1	1.9	2.1	4.9	20.4																								
8-Jul	2.2	2.1	2.1	2.4	2.8	2.5	1.8	1.5	1.5	1.6	1.9	2.3	2.7	3.0	4.1	5.1	3.7	3.6	2.8	3.0	3.9	4.1	5.1	3.6	2.9	5.1																							
9-Jul	2.3	2.5	3.0	3.7	2.9	2.3	2.2	2.3	2.6	2.6	3.5	3.9	4.4	5.0	7.1	9.9	7.4	7.8	5.8	5.4	5.3	5.5	6.2	6.9	4.6	9.9																							
10-Jul	6.4	5.6	5.8	5.3	6.1	5.4	4.9	4.8	5.7	6.1	5.9	7.7	9.1	8.5	9.4	10.5	13.6	8.5	11.4	8.4	6.5	6.1	7.7	9.7	7.5	13.6																							
11-Jul	8.6	8.1	7.3	7.9	7.0	6.8	13.2	22.4	6.2	6.8	8.8	8.6	8.3	6.9	5.8	6.6	7.9	7.0	6.5	6.2	5.4	7.7	8.8	7.1	8.2	22.4																							
12-Jul	7.0	6.7	6.5	7.6	10.1	8.4	6.0	5.6	4.6	5.0	5.7	6.0	6.8	8.4	8.5	9.0	8.7	10.5	7.7	6.5	6.5	8.9	8.5	6.9	7.3	10.5																							
13-Jul	6.5	6.5	6.3	8.0	9.0	21.8	8.6	5.0	4.9	4.2	M	M	5.0	4.3	4.3	4.8	17.5	10.1	4.4	8.4	12.9	16.5	13.7	16.4	9.1	21.8																							
14-Jul	14.6	14.7	14.9	12.9	13.1	10.8	9.5	7.3	5.4	7.7	7.4	6.3	7.2	6.8	6.8	6.7	5.9	4.0	4.2	4.8	6.0	8.1	10.1	11.6	8.6	14.9																							
15-Jul	12.3	10.8	9.8	10.1	9.9	8.9	7.0	5.2	4.4	C	C	7.6	11.9	12.6	10.3	9.4	9.9	8.3	10.8	11.1	13.4	11.5	12.4	9.8	9.9	13.4																							
16-Jul	8.8	8.9	9.4	9.8	9.5	9.7	8.6	7.0	6.9	6.3	16.4	27.3	37.7	34.3	24.2	25.8	17.9	12.1	20.9	15.2	10.6	8.7	6.5	6.6	14.6	37.7																							
17-Jul	10.8	19.2	49.5	57.6	77.8	102.3	93.6	70.0	49.4	38.3	30.0	27.0	31.3	30.6	32.9	28.0	21.8	19.6	20.5	23.1	34.8	27.0	26.3	26.8	39.5	102.3																							
18-Jul	28.8	28.7	27.5	26.2	26.0	25.7	24.5	27.0	27.3	23.6	25.2	22.6	20.6	20.4	23.3	26.8	30.4	28.8	25.8	23.4	19.8	17.9	17.4	18.1	24.4	30.4																							
19-Jul	18.2	19.2	20.8	21.2	20.6	19.6	18.5	15.2	11.2	8.2	7.9	8.0	9.2	9.6	18.6	9.0	10.3	9.9	15.1	9.3	7.8	6.3	7.3	7.0	12.8	21.2																							
20-Jul	7.0	7.1	11.8	22.1	27.9	26.4	23.7	19.9	17.5	15.0	13.9	12.3	12.0	12.9	13.3	13.7	9.0	5.9	5.2	4.6	6.5	8.5	7.4	5.6	12.9	27.9																							
21-Jul	5.6	6.1	6.2	5.9	5.4	5.0	4.5	4.2	3.9	3.3	2.9	3.0	3.3	4.0	10.1	5.2	3.5	2.6	2.7	2.8	2.9	5.0	2.9	1.8	4.3	10.1																							
22-Jul	1.6	1.9	2.6	2.2	2.1	1.9	2.4	4.6	11.4	7.0	19.4	11.9	7.6	5.5	4.8	4.6	4.1	2.9	4.2	7.1	11.1	9.3	7.5	6.5	6.0	19.4																							
23-Jul	5.7	6.4	6.7	6.7	6.4	6.5	5.9	3.8	3.5	3.4	3.7	3.4	3.5	4.9	4.1	5.2	6.4	3.7	2.3	1.7	1.8	2.0	2.1	2.5	4.3	6.7																							
24-Jul	3.1	3.5	5.4	5.5	5.3	4.7	3.7	2.5	2.9	3.1	2.2	2.0	1.5	1.3	3.0	6.2	5.3	3.1	2.6	2.3	2.1	2.3	2.2	2.1	3.2	6.2																							
25-Jul	2.2	2.5	2.1	1.9	2.0	2.2	2.3	2.2	2.7	2.9	2.6	3.7	3.5	3.9	3.4	3.5	5.9	4.7	6.2	9.8	7.7	13.6	8.7	14.1	4.8	14.1																							
26-Jul	10.3	10.2	7.8	10.0	27.3	12.1	5.5	9.0	16.4	18.3	6.4	3.9	3.0	3.2	3.7	3.6	3.8	3.8	3.8	4.4	7.3	9.1	11.0	11.4	8.6	27.3																							
27-Jul	10.8	10.7	10.0	10.3	11.0	10.6	9.8	14.6	21.5	14.5	7.2	5.6	6.9	8.9	7.8	6.7	8.3	5.8	6.4	6.9	8.2	9.8	8.8	9.4	9.6	21.5																							
28-Jul	10.3	11.0	10.1	8.5	7.9	7.7	9.0	7.5	6.5	6.1	6.2	7.5	9.1	12.5	18.6	26.4	23.3	23.7	25.0	50.9	15.2	21.3	27.8	24.2	15.7	50.9																							
29-Jul	20.8	16.9	13.4	13.2	12.6	11.0	9.0	7.7	6.7	5.5	4.9	4.2	4.5	4.8	8.0	8.1	4.9	3.4	6.0	5.2	10.8	9.9	7.8	6.8	8.6	20.8																							
30-Jul	3.8	3.9	4.0	5.5	6.2	12.6	8.7	5.7	8.1	11.3	14.5	22.9	23.6	20.7	9.5	8.4	6.3	9.5	6.7	4.2	4.3	5.0	5.4	5.5	9.0	23.6																							
31-Jul	7.1	7.4	8.6	8.4	8.4	6.7	9.4	7.5	6.7	6.9	6.0	5.6	4.8	4.3	3.6	2.9	4.6	5.8	4.6	4.1	3.6	3.0	5.0	5.4	5.9	9.4																							
																								9.3	9.5	10.7	11.3	12.7	14.8	11.8	10.7	10.4	9.5	9.4	9.8	10.8	10.7	10.5	10.2	10.0	8.6	9.0	9.5	9.0	9.5	9.4	9.4	Diurnal Average	
																								28.8	28.7	49.5	57.6	77.8	102.3	93.6	70.0	49.4	38.3	30.0	39.5	57.8	55.0	38.6	32.9	30.8	28.8	29.3	50.9	34.8	27.0	27.8	26.8	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
CNRL Horizon - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
CNRL Horizon - July 2016**

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	227	30.68	30.68
6 - 15	393	53.11	83.78
16 - 25	69	9.32	93.11
26 - 80	49	6.62	99.73
> 81.0	2	0.27	100.00

Total Number of Valid Hours: 740

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - μg/m³
CNRL Horizon - July 2016

Concentration Ranges (μg/m ³)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	43	36	6	4	3	1	7	5	17	28	32	17	8	9	10	1	227
6 - 15	46	47	23	12	7	5	10	19	39	48	26	14	14	26	22	35	393
16 - 25	10	7	5	2	1	0	1	3	11	11	4	1	3	4	1	5	69
26 - 80	4	12	4	1	1	1	0	1	6	7	5	0	1	2	0	4	49
> 81.0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Totals	105	102	38	19	12	7	18	28	73	94	67	32	26	41	33	45	740

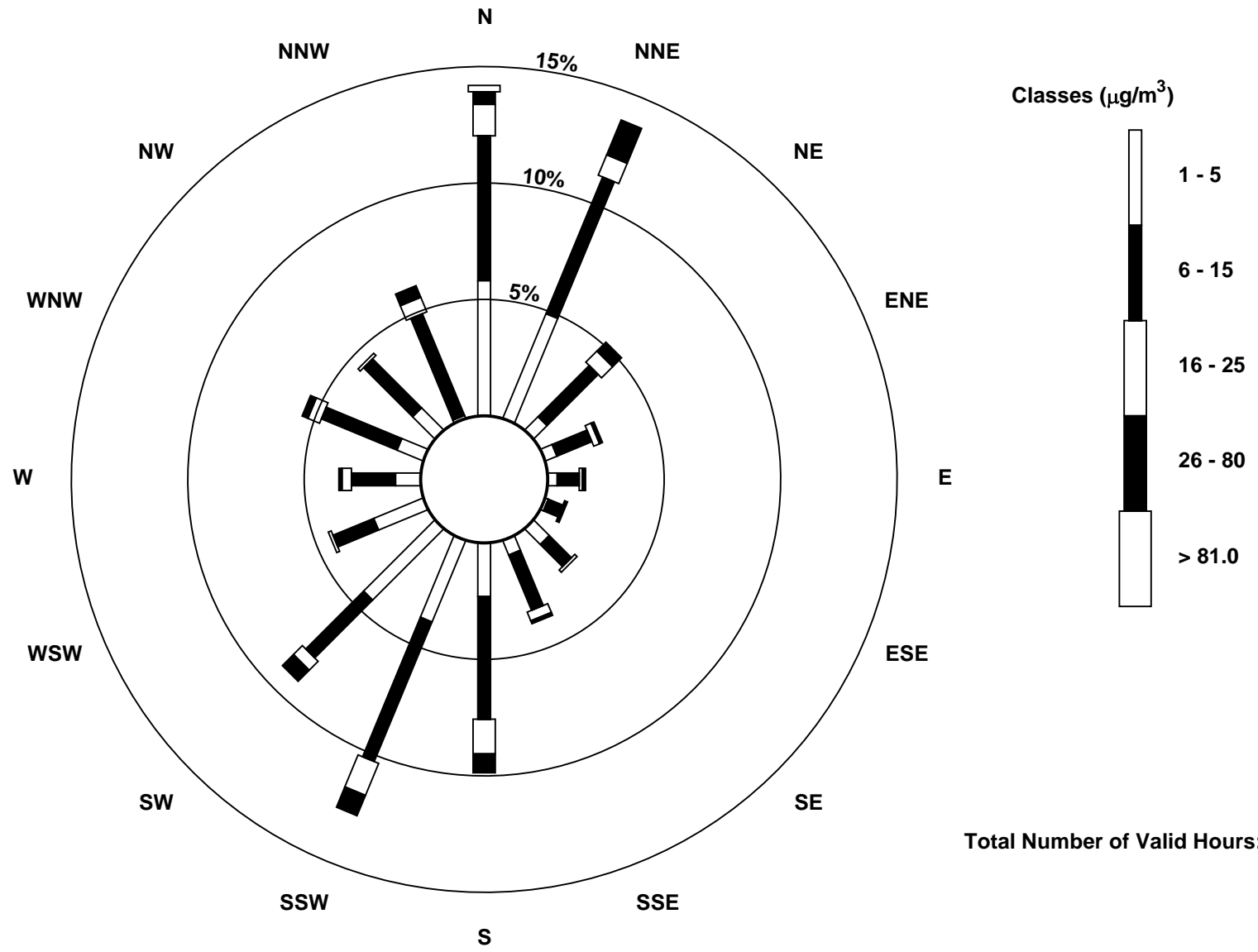
Total Number of Valid Hours: 740

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
CNRL Horizon (AMS 15)

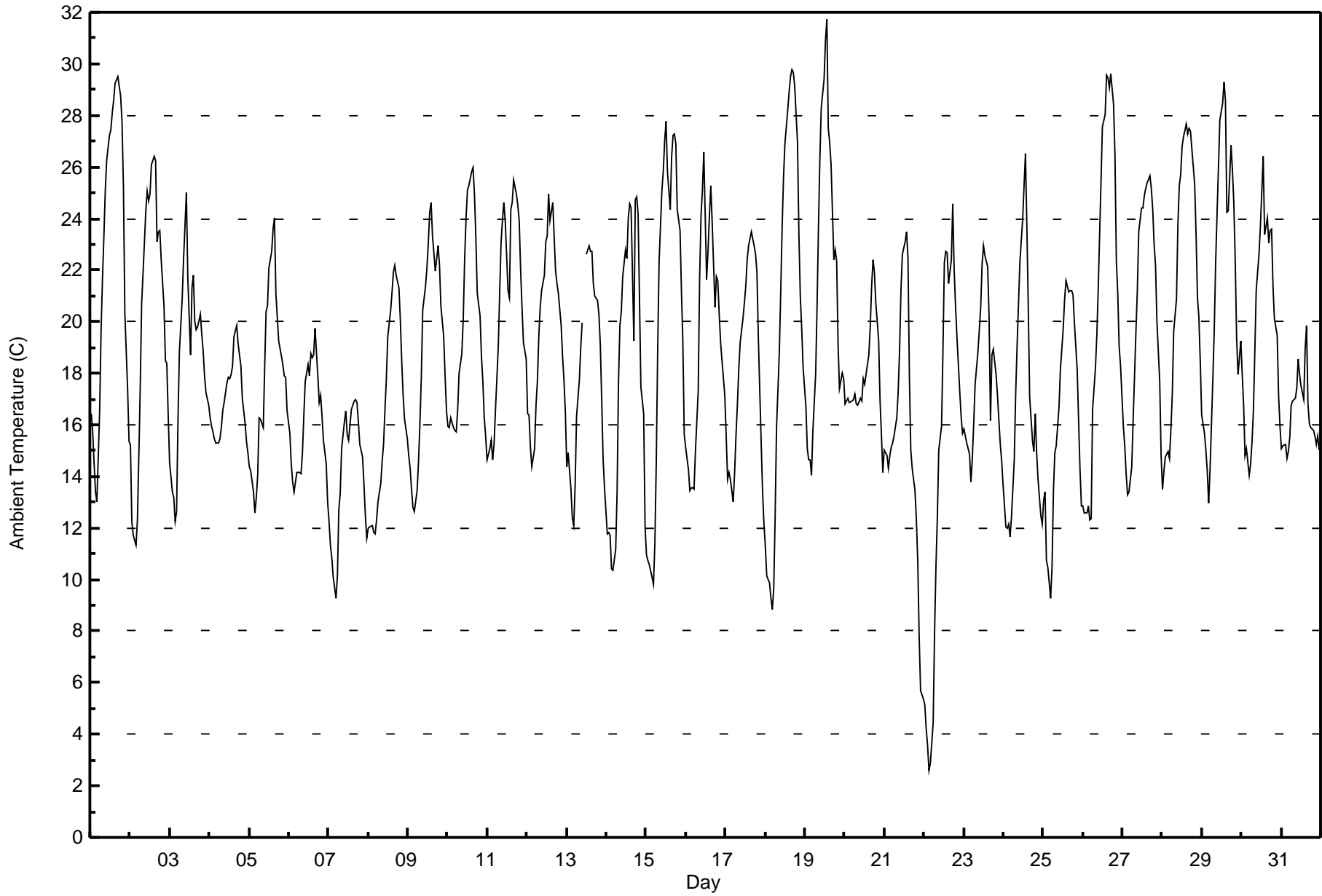




Wood Buffalo Environmental Association
Summary of Hour Averages

Ambient Temperature (AT) - C
CNRL Horizon - July 2016

Maximum Value: 31.7 C on Jul 19 14:00 Maximum Daily Average: 22.5 C on Jul 1																						Hours in Service: 744 Hours of Data: 742																									
Minimum Value: 2.6 C on Jul 22 04:00 Minimum Daily Average: 14.0 C on Jul 7 Maximum Diurnal Average: 23.7 C at hour 15 Minimum Diurnal Average: 12.7 C at hour 5 Monthly Average: 18.65 C Percentiles: P ₁ = 5.5 P ₁₀ = 12.6 Q ₁ = 15.1 Median = 18.0 Q ₃ = 22.4 P ₉₀ = 25.2 P ₉₉ = 29.5																						Hours of Missing Data: 2 Hours of Calibration: 0 Percent Operational Time: 99.7																									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																							
1-Jul	16.4	15.7	14.6	13.4	13.0	16.6	19.6	21.6	23.3	25.1	26.2	27.2	27.4	28.1	28.6	29.2	29.5	29.1	28.7	27.7	25.2	20.3	17.4	15.4	22.5	29.5																					
2-Jul	15.2	12.3	11.7	11.4	12.3	14.8	17.4	20.7	21.9	24.3	25.1	24.7	25.0	26.1	26.4	26.2	23.1	23.5	23.6	22.4	20.6	18.5	18.4	16.4	20.1	26.4																					
3-Jul	14.5	13.4	13.2	12.3	12.6	16.2	18.8	20.9	22.4	23.7	25.0	21.7	18.7	21.3	21.8	20.0	19.7	19.8	20.3	19.5	18.9	17.9	17.3	16.7	18.6	25.0																					
4-Jul	16.3	16.0	15.7	15.5	15.3	15.3	15.5	15.9	16.5	16.9	17.6	17.8	18.0	18.3	19.4	19.8	19.2	18.7	18.3	17.0	16.0	15.4	14.9	17.0	17.0	19.8																					
5-Jul	14.4	14.2	13.4	12.6	13.2	14.1	16.3	16.2	15.9	18.3	20.4	20.6	22.1	22.7	23.6	24.1	21.1	20.2	19.2	18.7	18.3	17.9	17.9	16.5	18.0	24.1																					
6-Jul	15.7	14.5	13.8	13.4	13.8	14.1	14.2	14.1	14.9	16.4	17.7	18.3	17.9	18.7	18.6	18.7	19.8	17.9	16.9	17.1	16.3	15.4	14.5	13.0	16.1	19.8																					
7-Jul	12.2	11.4	10.8	10.1	9.3	10.2	12.7	13.3	15.1	16.1	16.6	15.6	15.4	16.0	16.6	16.9	17.0	16.9	16.1	15.2	14.7	13.7	12.5	11.6	14.0	17.0																					
8-Jul	12.0	12.0	12.1	11.8	11.8	12.3	13.0	13.7	14.6	15.2	16.6	17.8	19.4	20.4	21.1	21.9	22.2	21.8	21.3	20.1	18.4	17.1	16.2	15.5	16.6	22.2																					
9-Jul	14.8	14.3	13.5	12.8	12.6	13.4	14.6	16.1	17.8	20.4	21.4	22.1	23.0	24.2	24.6	23.3	22.0	22.5	22.9	22.2	20.6	19.4	17.9	16.5	18.9	24.6																					
10-Jul	15.9	15.9	16.3	15.9	15.8	15.8	16.6	18.0	18.8	20.2	22.5	24.0	25.1	25.2	25.8	26.0	25.0	23.3	21.1	20.2	18.7	17.7	16.3	15.6	19.8	26.0																					
11-Jul	14.6	15.1	15.4	14.6	15.2	16.5	19.0	21.0	23.0	23.9	24.6	23.9	21.2	20.9	24.3	24.6	25.5	25.0	24.5	23.9	22.0	20.6	19.2	18.6	20.7	25.5																					
12-Jul	16.4	16.4	15.1	14.3	15.1	16.8	17.7	19.4	20.5	21.2	21.8	23.1	23.3	24.9	23.9	24.6	23.3	22.0	21.5	21.1	19.8	18.7	17.8	16.5	19.8	24.9																					
13-Jul	14.4	14.9	13.5	12.3	12.1	13.7	16.3	17.7	19.0	20.0	M	M	22.6	23.0	22.7	22.7	21.5	21.0	20.8	20.3	19.1	16.9	14.6	13.6	17.9	23.0																					
14-Jul	11.8	11.8	11.7	10.4	10.4	11.2	13.4	17.7	19.9	20.4	21.7	22.8	22.5	24.0	24.6	24.4	19.2	24.7	24.8	24.2	21.0	17.5	16.4	12.0	18.3	24.8																					
15-Jul	10.9	10.8	10.6	10.1	9.8	11.4	14.5	18.8	22.3	25.0	25.8	27.0	27.8	25.8	24.4	26.4	27.2	27.3	26.9	24.3	23.5	21.2	19.2	15.6	20.3	27.8																					
16-Jul	15.1	14.2	13.4	13.6	13.6	13.5	15.0	17.3	21.6	24.1	25.1	26.6	21.6	22.7	24.1	25.3	23.8	20.6	21.8	21.6	20.3	19.2	18.5	17.2	19.6	26.6																					
17-Jul	15.5	13.9	14.2	13.9	13.0	14.1	15.6	16.7	18.2	19.2	20.1	20.7	21.4	22.4	22.9	23.5	23.2	23.0	22.6	21.9	19.4	15.4	13.5	12.2	18.2	23.5																					
18-Jul	11.3	10.2	9.9	9.3	8.9	9.7	12.4	15.9	18.8	21.2	23.6	25.6	26.9	28.2	28.9	29.5	29.8	29.7	29.1	27.0	23.4	21.0	19.7	18.2	20.3	29.8																					
19-Jul	16.7	15.1	14.6	14.6	14.0	15.8	18.0	20.6	23.7	26.4	28.3	29.4	30.9	31.7	27.5	27.0	26.1	22.4	22.8	22.3	19.2	17.4	18.0	17.8	21.7	31.7																					
20-Jul	16.8	16.9	17.0	16.9	16.9	17.0	17.2	16.8	16.7	17.0	16.9	17.8	17.6	18.0	18.7	19.8	21.4	22.4	21.9	20.7	19.3	17.0	15.6	14.2	17.9	22.4																					
21-Jul	15.0	14.8	14.3	14.8	15.1	15.3	15.6	16.3	17.3	18.9	21.3	22.6	23.1	23.5	22.5	17.9	15.0	14.3	13.4	12.3	10.7	7.8	5.7	5.4	15.5	23.5																					
22-Jul	5.2	4.2	3.6	2.6	2.9	4.4	7.9	10.5	12.4	15.0	15.9	18.9	22.3	22.7	22.7	21.5	22.4	24.6	22.0	20.6	19.4	17.3	16.3	15.7	14.6	24.6																					
23-Jul	15.8	15.6	15.3	14.9	13.8	14.7	16.0	17.6	18.8	19.7	20.6	22.2	23.0	22.6	22.1	20.1	16.2	18.7	18.9	17.9	17.1	16.1	15.3	14.6	17.8	23.0																					
24-Jul	13.7	12.0	12.0	12.2	11.7	12.4	14.6	17.2	19.0	20.7	22.3	24.0	25.2	26.5	23.7	20.6	17.1	15.4	15.0	16.4	14.9	13.9	12.5	12.2	16.9	26.5																					
25-Jul	13.1	13.4	10.7	10.4	9.3	10.5	13.5	14.9	15.2	16.7	18.2	18.9	19.8	20.9	21.6	21.1	21.2	21.2	21.0	20.0	18.1	16.2	14.3	12.9	16.4	21.6																					
26-Jul	12.9	12.6	12.6	12.8	12.3	12.4	16.6	18.2	19.4	21.2	23.3	25.4	27.6	28.0	29.5	29.5	29.1	29.6	28.4	26.5	22.3	21.1	19.0	18.3	21.2	29.6																					
27-Jul	15.9	15.2	14.1	13.3	13.4	14.4	16.2	17.9	19.6	21.2	23.5	24.4	24.4	24.9	25.2	25.4	25.6	25.2	24.4	23.0	22.2	20.0	17.7	14.8	20.1	25.6																					
28-Jul	13.5	14.2	14.8	14.9	14.7	15.8	17.2	19.7	20.9	23.8	25.3	25.7	26.8	27.2	27.7	27.3	27.5	27.4	26.7	25.3	23.4	21.0	20.2	18.4	21.6	27.7																					
29-Jul	16.4	15.7	15.0	14.2	13.0	14.3	17.8	19.7	22.3	24.2	26.0	27.8	28.5	29.3	28.6	24.3	24.3	26.8	25.8	24.6	22.4	19.4	18.0	19.3	21.6	29.3																					
30-Jul	18.0	16.8	14.8	15.1	14.1	14.5	15.3	16.5	18.8	21.2	22.6	23.7	25.0	26.4	23.4	24.0	23.1	23.6	23.6	21.4	20.1	19.5	17.1	16.0	19.8	26.4																					
31-Jul	15.1	15.2	15.2	14.7	14.9	15.5	16.7	16.9	17.0	17.4	18.5	17.9	17.5	17.0	19.0	19.9	16.8	16.1	15.9	15.8	15.6	15.3	15.6	15.0	16.4	19.9																					
																						14.4	13.8	13.3	12.9	12.7	13.8	15.7	17.4	18.9	20.5	21.8	22.6	22.9	23.6	23.7	23.4	22.5	22.4	22.0	21.0	19.4	17.6	16.4	15.2	Diurnal Average	
																						18.0	16.9	17.0	16.9	16.9	17.0	19.6	21.6	23.7	26.4	28.3	29.4	30.9	31.7	29.5	29.5	29.8	29.7	29.1	27.7	25.2	21.2	20.2	19.3	Diurnal Maximum	
M - Maintenance																																															





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
CNRL Horizon - July 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	17	2.29	2.29
10 - 20	438	59.03	61.32
> 20	287	38.68	100.00

Total Number of Valid Hours: 742

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Precipitation (PC) - mm

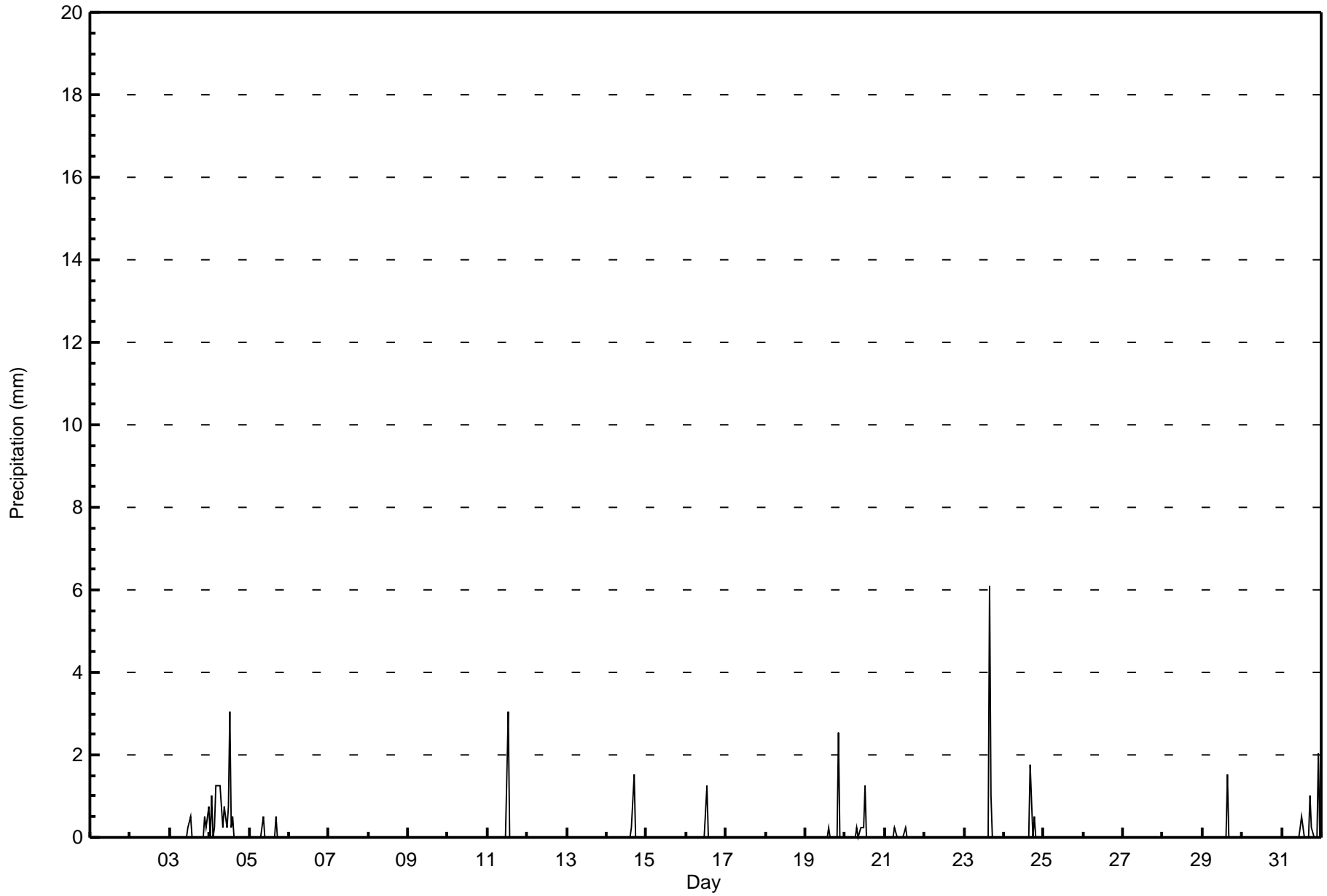
CNRL Horizon - July 2016

Maximum Value: 6.1 mm on Jul 23 16:00 Minimum Value: 0.0 mm on Jul 1 01:00 Maximum Diurnal Total: 9.9 mm at hour 13 Monthly Total: 41.66 mm		Maximum Daily Total: 11.7 mm on Jul 4 Minimum Daily Total: 0.0 mm on Jul 1 Minimum Diurnal Total: 0.0 mm at hour 1 Percentiles: P ₁ = 0.0 P ₁₀ = 0.0 Q ₁ = 0.0 Median = 0.0 Q ₃ = 0.0 P ₉₀ = 0.0 P ₉₉ = 1.3		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 Average	Daily Maximum											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24													
1-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.3	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3	0.8	
4-Jul	0.0	1.0	0.0	0.3	1.3	1.3	1.3	0.8	0.3	0.8	0.3	0.8	3.0	0.3	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	11.7	3.0		
5-Jul	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	0.0	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	1.0	0.5			
6-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	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	0.0	0.0	0.0	0.0	0.0	0.0	3.0	3.0	0.0	0.0	
12-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	M	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
14-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	1.5	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	1.8	1.5	0.0	0.0	
15-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	1.3	0.0	0.0	
17-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	2.8	2.5	0.0	0.0
20-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.3	0.3	0.3	1.3	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	2.3	1.3	0.0	0.0
21-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.3	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	0.5	0.3	0.0	0.0	
22-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.1	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.1	6.1	0.0	0.0	
24-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	0.0	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	2.3	1.8	0.0	0.0	
25-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	1.5	0.0	0.0	
30-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	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	0.0	0.0	0.0	0.0	0.0	1.0	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	4.1	2.0	0.0	0.0	
																								Diurnal Average													
																								Diurnal Maximum													
																								M - Maintenance													



Wood Buffalo Environmental Association
Hourly Averages

Precipitation (PC) - mm
CNRL Horizon - July 2016

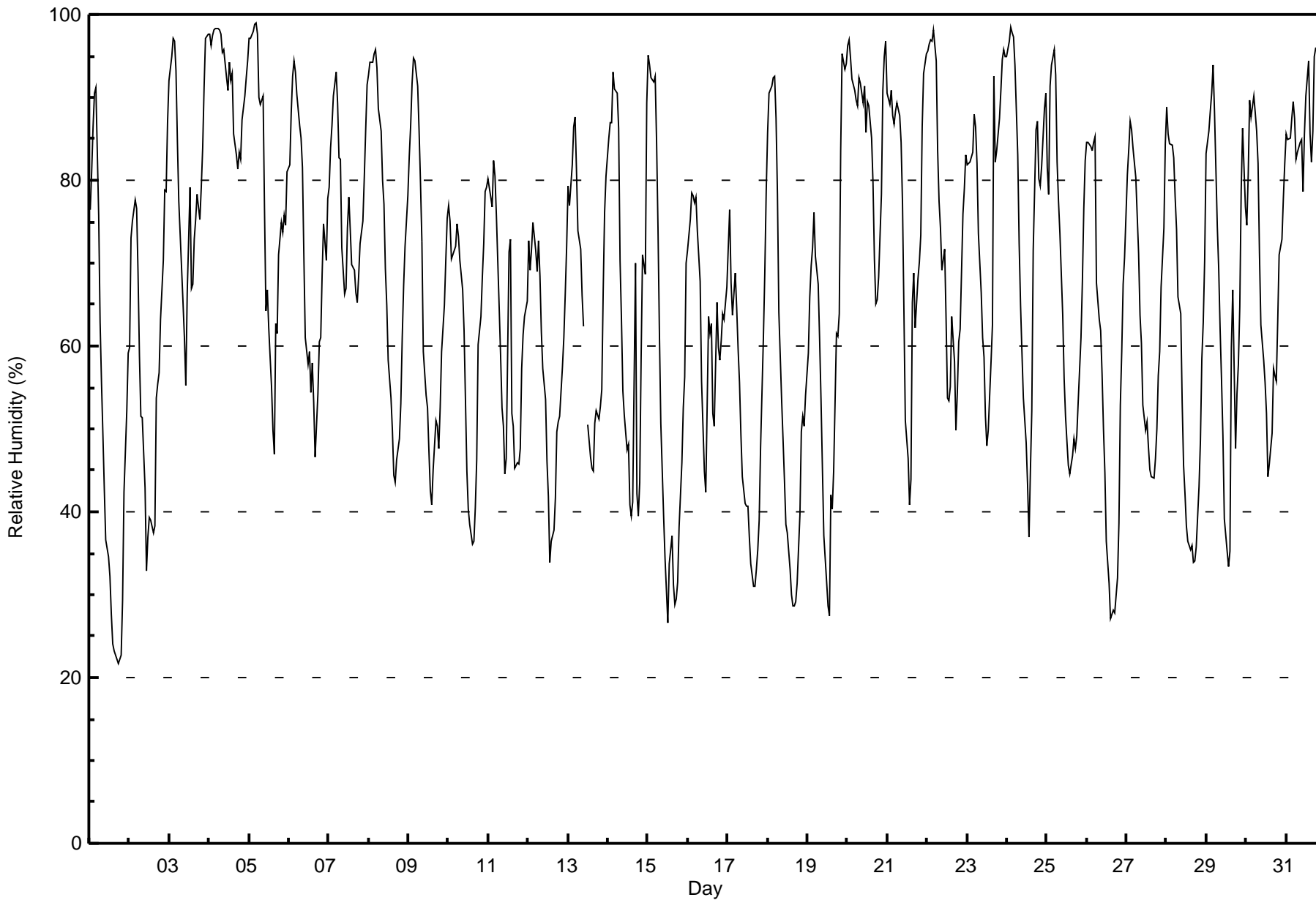




Wood Buffalo Environmental Association
Summary of Hour Averages

Relative Humidity (RH) - %
CNRL Horizon - July 2016

Maximum Value: 99 % on Jul 5 05:00																	Maximum Daily Average: 92.3 % on Jul 4										Hours in Service: 744															
Minimum Value: 22 % on Jul 1 18:00																	Minimum Daily Average: 48.4 % on Jul 1										Hours of Data: 742															
Maximum Diurnal Average: 88.0 % at hour 5																	Minimum Diurnal Average: 48.7 % at hour 15										Hours of Missing Data: 2															
Monthly Average: 67.6 %																	Percentiles: P ₁ = 27 P ₁₀ = 40 Q ₁ = 52 Median = 69 Q ₃ = 85 P ₉₀ = 93 P ₉₉ = 98										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-Jul	76	81	87	91	91	76	63	56	49	43	37	35	32	28	24	23	22	22	22	23	29	42	52	59	48.4	91																
2-Jul	60	73	75	78	77	69	59	51	51	43	33	37	39	39	37	38	54	55	57	63	70	79	79	87	58.5	87																
3-Jul	92	95	97	97	93	85	77	69	65	61	55	66	79	67	67	73	75	78	75	79	84	91	97	98	79.9	98																
4-Jul	98	96	97	98	98	98	98	98	95	96	92	91	94	92	93	86	83	81	83	83	87	90	92	94	92.3	98																
5-Jul	97	97	98	99	99	98	90	89	90	76	64	67	62	55	50	47	63	61	71	75	74	76	75	81	77.2	99																
6-Jul	82	88	93	94	93	90	87	85	81	71	61	58	59	54	58	53	47	54	60	61	69	75	70	78	71.8	94																
7-Jul	79	84	87	90	93	89	83	83	72	66	67	74	78	74	70	69	66	65	68	72	75	80	86	92	77.6	93																
8-Jul	93	94	94	95	96	94	89	86	80	77	69	65	58	54	50	44	44	46	49	53	61	67	72	78	71.2	96																
9-Jul	83	87	92	95	94	91	86	80	73	59	54	53	47	43	41	45	51	50	48	53	59	65	70	75	66.4	95																
10-Jul	77	75	70	71	72	75	73	70	67	62	53	45	40	39	36	36	41	46	60	63	68	72	79	79	61.3	79																
11-Jul	80	78	77	82	81	76	65	59	53	50	45	46	71	73	52	50	45	46	46	48	57	61	63	65	61.2	82																
12-Jul	73	69	72	75	72	69	73	68	62	57	54	46	42	34	36	38	42	50	51	52	57	61	66	72	57.9	75																
13-Jul	79	77	82	86	88	81	74	72	66	62	M	M	50	47	45	45	51	52	51	53	55	67	76	81	65.4	88																
14-Jul	85	87	87	93	91	91	86	70	63	55	52	48	48	41	40	41	70	42	39	44	59	71	69	89	65.0	93																
15-Jul	95	94	92	92	93	85	74	62	51	39	34	31	27	34	37	31	29	30	32	38	46	52	56	70	55.1	95																
16-Jul	72	75	78	78	77	78	74	68	56	50	45	42	64	62	63	52	50	65	60	58	61	64	63	67	63.4	78																
17-Jul	72	76	68	64	69	65	60	56	49	44	41	41	41	37	34	31	31	33	35	39	48	61	69	79	51.7	79																
18-Jul	86	91	91	92	93	88	78	64	53	49	44	39	38	33	30	29	29	29	31	40	50	52	50	54	55.4	93																
19-Jul	59	66	70	72	76	71	68	61	54	45	37	31	29	27	42	40	45	61	61	64	84	95	93	94	60.3	95																
20-Jul	96	97	95	92	91	90	89	92	92	89	91	86	90	89	85	80	70	65	66	68	78	91	95	97	86.4	97																
21-Jul	91	89	91	88	87	88	89	88	85	77	64	51	46	41	44	65	69	62	68	70	73	86	93	95	75.1	95																
22-Jul	96	96	97	97	98	94	84	78	74	69	72	63	54	53	55	64	58	50	54	60	62	76	79	83	73.6	98																
23-Jul	82	82	82	83	88	86	82	74	66	61	59	52	48	50	58	62	92	82	83	87	91	95	96	95	76.5	96																
24-Jul	95	97	98	98	97	94	83	72	65	59	54	48	43	37	45	52	72	86	87	80	79	82	89	91	75.1	98																
25-Jul	81	78	91	94	96	93	82	77	74	64	56	52	48	46	45	47	49	48	49	53	61	68	77	82	67.1	96																
26-Jul	85	85	84	84	85	85	68	63	62	57	50	45	36	31	27	28	28	28	32	39	53	59	68	71	56.3	85																
27-Jul	81	84	87	86	84	80	76	71	64	60	53	50	51	48	45	44	44	46	50	56	59	67	74	84	64.4	87																
28-Jul	89	86	84	84	83	78	74	66	64	53	46	42	38	36	35	36	34	34	36	43	49	58	63	70	57.6	89																
29-Jul	83	86	88	90	94	88	74	69	62	56	49	39	35	33	35	60	67	48	54	58	65	79	86	77	65.7	94																
30-Jul	75	81	90	88	90	88	86	82	71	63	58	56	52	44	46	49	57	56	56	63	71	73	78	82	68.9	90																
31-Jul	86	85	85	87	89	87	83	83	85	85	79	86	90	94	86	82	86	95	96	96	95	94	91	94	88.3	96																
																	83.1	84.8	86.4	87.5	88.0	84.5	78.2	73.0	67.5	61.3	55.6	52.7	52.6	49.5	48.7	49.7	53.6	53.9	55.9	59.2	65.5	72.6	76.4	81.1	Diurnal Average	
																	98	97	98	99	99	98	98	98	95	96	92	91	94	94	93	86	92	95	96	96	95	95	97	98	Diurnal Maximum	
M - Maintenance																																										





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity (RH) - %
CNRL Horizon - July 2016

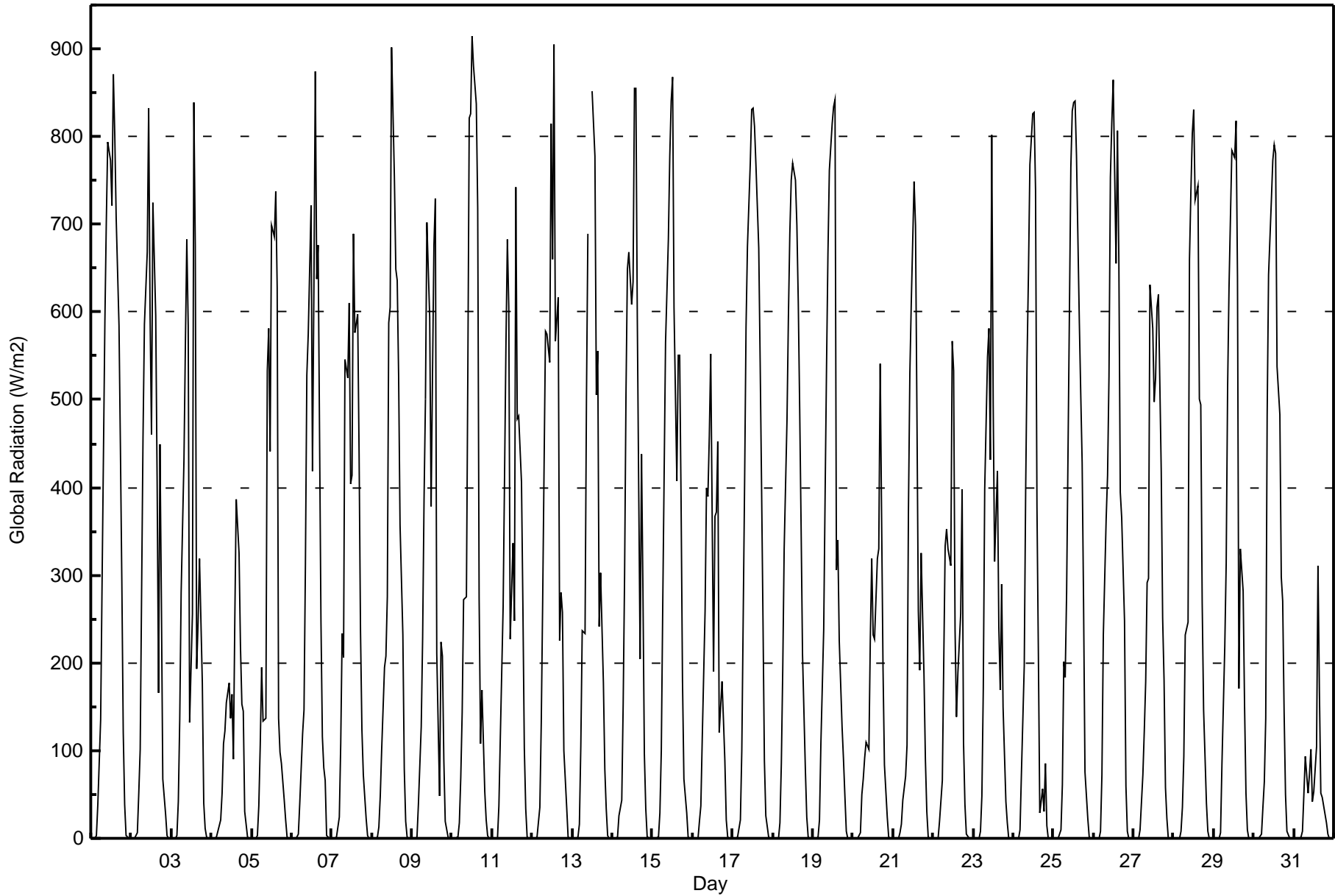
Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	76	10.24	10.24
40 - 60	190	25.61	35.85
60 - 80	231	31.13	66.98
80 - 100	245	33.02	100.00

Total Number of Valid Hours: 742

Total Number of Hours: 744



Maximum Value: 915 W/m2 on Jul 10 13:00														Maximum Daily Average: 348.1 W/m2 on Jul 1														Hours in Service: 744	
Minimum Value: 0 W/m2 on Jul 1 01:00														Minimum Daily Average: 50.7 W/m2 on Jul 31														Hours of Data: 742	
Maximum Diurnal Average: 634.5 W/m2 at hour 14														Minimum Diurnal Average: 0.0 W/m2 at hour 1														Hours of Missing Data: 2	
Monthly Average: 244.2 W/m2														Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 120 Q ₃ = 452 P ₉₀ = 696 P ₉₉ = 864														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-Jul	0	0	0	4	39	136	290	439	589	702	794	774	721	872	802	707	585	445	293	121	39	4	0	0	348.1	872			
2-Jul	0	0	0	6	51	102	280	457	586	668	832	597	461	725	596	405	166	449	273	68	28	4	0	0	281.5	832			
3-Jul	0	0	0	3	43	135	280	431	562	682	584	132	255	839	676	193	246	318	177	40	11	1	0	0	233.7	839			
4-Jul	0	0	0	1	9	20	51	107	122	154	177	136	164	90	249	386	326	220	153	145	30	2	0	0	106.0	386			
5-Jul	0	0	0	3	37	107	194	133	137	533	582	442	699	686	737	628	137	98	85	44	22	1	0	0	220.9	737			
6-Jul	0	0	0	2	4	40	118	146	313	528	574	722	418	626	875	638	676	248	116	80	66	3	0	0	258.1	875			
7-Jul	0	0	0	2	23	107	233	206	546	525	610	404	415	689	577	598	439	236	124	72	23	3	0	0	243.0	689			
8-Jul	0	0	0	1	13	48	102	195	208	276	588	605	902	754	649	636	526	358	232	79	19	2	0	0	258.0	902			
9-Jul	0	0	0	2	38	128	229	387	501	702	595	379	530	676	729	211	49	223	208	90	20	2	0	0	237.5	729			
10-Jul	0	0	0	1	18	69	144	272	276	531	821	826	915	881	838	718	274	108	169	52	20	3	0	0	289.0	915			
11-Jul	0	0	0	1	36	114	265	412	563	683	606	227	337	248	742	478	482	406	263	104	35	2	0	0	250.1	742			
12-Jul	0	0	0	2	35	132	270	424	578	575	543	814	660	905	567	617	226	280	257	100	35	2	0	0	292.5	905			
13-Jul	0	0	0	1	16	105	237	234	501	689	M	M	852	778	506	555	242	303	177	79	34	3	0	0	241.5	852			
14-Jul	0	0	0	2	26	44	153	300	507	649	668	609	634	854	855	594	204	437	282	97	34	2	0	0	289.6	855			
15-Jul	0	0	0	1	29	100	262	414	565	683	778	841	868	606	408	550	551	385	181	67	29	1	0	0	305.0	868			
16-Jul	0	0	0	1	19	37	114	260	399	389	460	552	190	367	371	452	120	179	135	88	21	1	0	0	173.1	552			
17-Jul	0	0	0	1	20	99	253	408	583	675	770	830	833	811	768	673	542	402	250	88	26	2	0	0	334.7	833			
18-Jul	0	0	0	1	18	85	193	331	476	594	690	750	769	751	698	610	487	353	210	78	24	1	0	0	296.7	769			
19-Jul	0	0	0	1	22	108	238	394	538	667	762	814	835	842	305	339	225	127	90	48	9	1	0	0	265.2	842			
20-Jul	0	0	0	0	7	49	68	92	109	101	227	318	232	226	320	330	541	363	193	84	23	1	0	0	136.9	541			
21-Jul	0	0	0	0	7	15	43	71	106	374	530	610	749	698	486	259	191	325	188	90	30	1	0	0	198.9	749			
22-Jul	0	0	0	1	19	66	201	333	352	330	310	567	533	238	139	189	256	398	110	39	4	0	0	0	170.2	567			
23-Jul	0	0	0	0	9	49	170	397	548	581	431	801	495	316	418	241	170	289	150	43	18	0	0	0	213.6	801			
24-Jul	0	0	0	0	10	73	197	396	546	646	768	825	827	738	379	212	29	56	31	86	15	0	0	0	243.2	827			
25-Jul	0	0	0	0	9	62	201	183	281	602	764	830	839	840	777	589	507	428	269	76	22	2	0	0	303.4	840			
26-Jul	0	0	0	0	8	72	232	363	414	527	753	817	865	656	807	657	394	366	247	59	9	0	0	0	301.9	865			
27-Jul	0	0	0	0	10	73	123	179	292	297	631	582	498	524	606	620	419	250	180	59	22	0	0	0	223.5	631			
28-Jul	0	0	0	0	8	36	94	233	247	659	738	803	831	728	744	501	494	268	146	40	9	0	0	0	274.1	831			
29-Jul	0	0	0	0	6	85	218	314	514	627	707	784	777	818	640	170	330	282	151	52	10	0	0	0	270.2	818			
30-Jul	0	0	0	0	5	35	64	137	481	643	727	773	790	781	537	484	299	270	144	50	9	0	0	0	259.5	790			
31-Jul	0	0	0	0	1	9	49	93	51	75	101	42	54	105	311	167	51	47	37	18	6	0	0	0	50.7	311			
														0.0 0.0 0.0 1.1 19.1 75.5 179.5 281.9 402.9 528.0 604.1 606.9 611.2 634.5 584.3 464.8 328.5 287.7 178.1 72.2 22.6 1.5 0.0 0.0														Diurnal Average	
														0 0 0 6 51 136 290 457 589 702 832 841 915 905 875 718 676 449 293 145 66 4 0 0														Diurnal Maximum	
M - Maintenance																													





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Speed (WS) - km/h
CNRL Horizon - July 2016

Maximum Speed: 29 km/h on Jul 21 15:00	Maximum Daily Speed Average: 12.0 km/h on Jul 12	Hours in Service: 744
Minimum Speed Value: 1 km/h on Jul 1 06:00	Minimum Daily Speed Average: 0.1 km/h on Jul 28	Hours of Data: 742
Maximum Diurnal Speed Average: 4.2 km/h at hour 16	Minimum Diurnal Speed Average: 0.5 km/h at hour 10	Hours of Missing Data: 2
Monthly Average Velocity: 1.6 km/h 314.8 deg	Percentiles: P ₁ = 1 P ₁₀ = 3 Q ₁ = 5 Median = 8 Q ₃ = 11 P ₉₀ = 14 P ₉₉ = 21	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-Jul	SSW8	SSW8	S7	SSW6	S4	SSW1	SSE4	SE6	SE10	SSE15	SSE17	SSE14	SSE13	SE12	SSE11	S12	S11	SSE10	SSE10	SE8	SSE7	SE5	S6	SSE6	SSE8.3	SSE17
2-Jul	S6	WSW1	WSW2	S4	S5	SSW4	SSE3	SSE3	E5	SSE12	SSE17	SSE16	S15	S15	S15	S15	SSE16	SE12	SE11	SE5	SE4	SSE4	SSE7	S5	SSE8.0	SSE17
3-Jul	S2	WNW1	NNW3	ENE2	NNE2	ESE2	SSE5	S5	E5	ESE7	SE7	S15	WNW7	NE2	E12	E10	ENE11	ENE10	E7	ENE6	NE3	NE4	ESE3	SSW6	ESE3.3	S15
4-Jul	SW6	WSW6	SW4	SSW6	SSW7	SW8	SW6	SW6	SSW4	SSW7	WSW4	W2	SSW1	WSW4	SW5	SW10	SW11	WSW10	SE6	SE8	SE6	SE5	SSE2	NNE2	SW4.4	SW11
5-Jul	N2	NNE5	NW4	NW6	N2	W5	W4	N10	NNW5	N6	NNE8	NE7	NE6	NNE9	NNE9	NNE8	N7	WNW13	W12	WNW9	WNW9	WNW11	NNE6	NNW4.9	WNW13	
6-Jul	N10	N10	N10	N8	N10	N12	N14	NNE14	NNE11	N13	NNE13	NNE14	NE18	ENE18	NE14	NNE13	NNE9	ESE6	N3	E6	N5	NNE13	N9	NNE10.3	NE18	
7-Jul	N7	N7	N7	N8	N3	N1	N10	NNE13	NNE13	NNE12	NNE14	N15	NNE12	N16	NNE15	N14	NNE15	N14	N12	N12	NNW13	N11	NNE8	N10.9	N16	
8-Jul	N7	N8	N7	N9	N8	N8	N7	N7	NNE5	N7	NE7	NE6	E8	NE6	NNE5	N6	NNE9	NNE11	NNE13	NNE11	N9	N7	N8	N9	NNE7.3	NNE13
9-Jul	N8	NNE7	NNE7	N7	N6	N8	NNE10	NNE9	NNE8	NNE7	ENE6	W3	SW5	SSW9	SSW3	NNE9	NNE8	NNE8	NNE11	N10	N8	N7	N6	N6	NNE5.7	NNE11
10-Jul	N6	N6	N7	N7	NNE6	NNE6	NNE8	NNE8	NNE7	NE7	NE9	ENE8	NE9	NE14	NE10	ENE11	NE7	NNW6	W15	WSW10	SW10	WSW10	WNW8	WNW9	N4.4	W15
11-Jul	NW6	NNW5	NNE1	SSW4	SSW3	NNW1	NNW4	N5	NE5	ENE8	NE10	NE7	WSW5	WSW5	NNW6	NW7	N12	N17	N16	N14	N10	NNW9	NNW10	NNW12	N5.7	N17
12-Jul	N8	NNW8	NNE7	N8	N7	N8	NNE6	NNE10	N13	NNE11	NNE14	N16	NNE14	NNW17	NNW20	NW16	N17	N22	N16	N14	N11	NNW12	NNW14	NW13	N12.0	NNW22
13-Jul	WNW9	NNW8	NW8	WNW8	WNW7	WNW2	NNW9	NNE16	NNE17	N18	M	M	NNE17	N16	NNE18	N15	NE12	NE12	N13	NNE9	N7	N6	NNW4	NNW6	N9.6	N18
14-Jul	N1	SW2	WNW4	SSW4	WSW4	SW3	S1	SW2	S2	NE3	NW5	W5	WNW12	WNW4	WNW12	NNW7	WSW8	W4	WNW2	W6	WNW7	WNW7	WNW5	SW2	WNW3.7	WNW12
15-Jul	SW3	SSW6	SSW6	SSW8	SSW8	SSW8	S6	S6	S6	SW6	W4	SW5	W9	NW23	NNW21	WNW8	W13	WNW13	WNW14	WNW10	W9	W9	W7	SSW8	W6.2	NW23
16-Jul	SW11	SSW11	SSW10	SSW11	SSW11	SSW12	S8	SSW10	S6	S5	W3	SW6	SSE4	S4	SSW7	SW4	N16	NNW15	NNW18	NNW19	NNW17	NNW17	NNW18	NW14	W3.9	NNW19
17-Jul	NW11	WNW9	NNW11	NNW10	NNW8	N5	N8	N10	NNE11	NNE13	N11	NNE10	NE8	NNE12	NE13	NNE14	NE15	NNE13	NNE11	NE6	E2	SSW3	SW5	SW6	N7.3	NE15
18-Jul	SW6	S6	SSW7	SSW8	S7	S8	S7	S7	S7	S10	S11	S13	S13	SSW13	SSW11	SSW12	SSW11	SSW12	SSW10	S8	S10	SSW10	SSW10	SW9	SSW9.2	S13
19-Jul	SW7	SW6	SSW9	SSW8	SW8	SSW9	S13	SSW13	SSW12	SSW13	SW16	SW18	SW15	SW15	W17	WSW15	WNW17	NW9	E3	NNE4	NNE3	NNE3	NNW4	NNW5	SW7.0	SW18
20-Jul	NNE3	NNE2	N7	NNW9	NNW9	N7	N5	N7	N5	NE4	NE4	NE5	NNE5	N4	NW6	WSW3	NW3	SW2	NE3	E6	ESE5	S4	W2	SW5	N2.8	NNW9
21-Jul	SW10	SW11	SW11	SW10	SW12	SW12	SW9	SSW8	SSW6	SSW8	WSW10	NNW16	NW23	NW28	NW29	N21	N22	N14	NNE14	NNE13	NNE9	ENE3	SE2	S6	WNW5.7	NW29
22-Jul	SSW7	SSW7	SW8	SSW7	SSW6	SSW6	SSW4	S7	S6	S8	SSE10	SSE11	SSW15	S10	SW4	WNW11	SW8	SW13	NW12	WNW6	WNW15	WNW5	S3	SW6	SW5.6	WNW15
23-Jul	SSW8	SW9	WSW9	W6	WNW5	NNW2	NNE1	NNE6	NNE5	ENE4	SSE2	SSW4	WNW2	ENE1	SSW11	N9	NNE1	SW5	SW5	SSW9	SW8	SW6	SW10	SSW7	SW3.0	SSW11
24-Jul	SSW6	SSW6	S9	S10	S9	SSW11	SSW14	SW12	SW16	SW17	SW19	SW18	SW19	WSW17	NW12	NW17	W22	WSW11	WSW10	WSW10	W13	W14	SW9	SW9	WSW10.9	WNW22
25-Jul	WSW13	W8	S6	SSW8	S5	S6	SSW5	WSW6	NW10	NNW11	WNW16	NNW15	NW10	NW8	N9	NE11	NE11	NE8	NE9	ENE7	NE6	NE6	N5	NNW5	NW3.2	WNW16
26-Jul	N6	NNE6	N4	N6	ENE5	S5	SSE5	S6	S6	S6	S8	S10	SSW11	SW9	SW13	SSW11	SSW10	SW11	S7	SSE5	SSE7	S7	SSW7	SSW7	SSW5.0	SW13
27-Jul	S6	SSW7	S7	SSW7	SSW7	S6	SSE2	SW1	NNE3	NNE4	NNE10	NNE12	NNE11	NNE12	NNE12	NNE11	NNE9	NNE10	NNE10	NNE9	N6	NW4	WNW5	W3	NNE3.3	NNE12
28-Jul	W3	NW3	S2	SW2	SSW5	SSW4	SSW4	SSW5	S5	SSW4	E4	ESE8	SE3	ENE4	NE7	NE9	NE8	ENE5	ENE5	NNE3	WNW7	W10	WNW12	SSW6	SSW0.1	WNW12
29-Jul	SSW9	SSW12	SSW12	SW9	SSW8	SSW6	SSW4	S4	S5	S7	S6	SSW11	SSW12	S11	WNW1	NNW10	WSW2	WNW2	ENE2	E4	ENE4	S3	S2	NW10	SSW4.3	SSW12
30-Jul	NNE8	SE3	SW4	W6	SSW4	N1	S5	SSW5	NNW4	NNW5	N7	N4	NNE4	NNW10	NNW16	N10	NNE13	NNE6	N7	NNE11	N7	NW9	NW4	NW5	NNW4.3	NNW16
31-Jul	SE1	NNW3	WSW2	WSW1	SW5	WSW7	NW9	NNE5	S2	NW5	NNE7	NW3	SW7	WSW11	WSW11	SW8	ESE8	S3	WSW9	WSW9	WSW8	SW9	W10	WSW8	WSW3.9	WSW11

W2.3 W2.2WSW2.2WSW2.4 SW2.1 SW2.0WSW0.8NNW0.6NNE1.2 ENE0.5 ENE0.6 SW0.9 W1.3 NW2.6NNW4.1NNW4.2 N4.1 N3.6 N3.8 N3.2 NW2.5WNW3.1WNW3.4WNW2.9
 WSW13 SSW12 SSW12 SSW11 SW12 N12 SSW14 NNE16 NNE17 N18 SW19 SW18 NW23 NW28 NW29 N21 WNW22NNW22 NNW18 NNW19 NNW17 NNW17 NNW18 NW14
 Diurnal Average
 Diurnal Maximum

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



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
CNRL Horizon - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 10 km/h on Jul 24 16:00	Hours in Service: 744 Hours of Data: 742 Hours of Missing Data: 2 Hours of Calibration: 0 Percent Operational Time: 99.7
Minimum Value: 1 km/h on Jul 18 00:00	
Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 2 Q ₃ = 4 P ₉₀ = 5 P ₉₉ = 8	

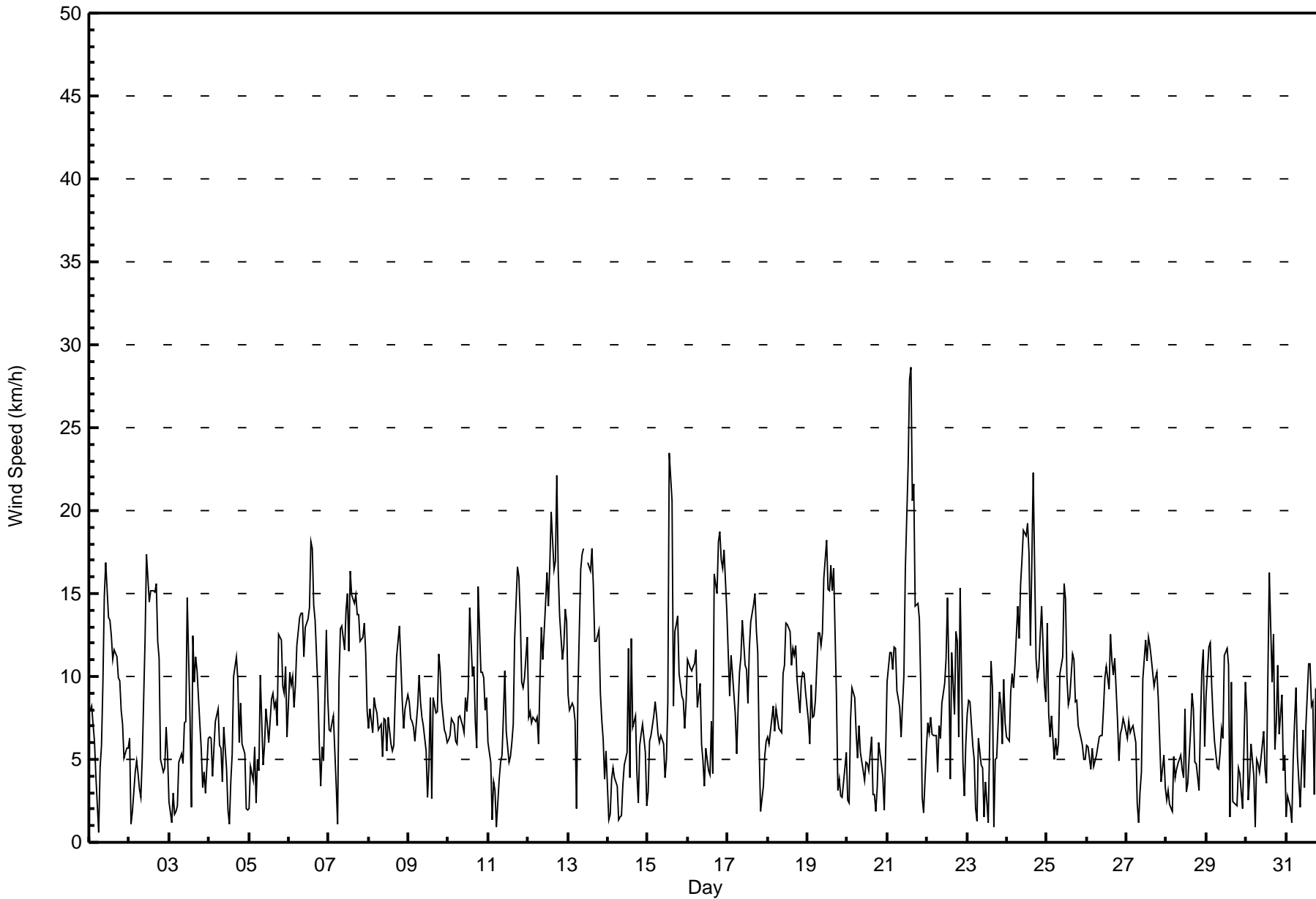
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Jul	1	1	1	2	1	1	2	2	3	5	6	4	5	5	4	4	4	3	3	3	3	1	1	1	6
2-Jul	1	2	1	1	1	1	1	2	2	6	6	5	5	5	5	5	5	4	3	2	2	2	2	2	6
3-Jul	2	1	1	1	2	2	2	2	3	3	4	8	5	4	4	3	3	3	2	2	1	1	2	2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

M - Maintenance



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed (WS) - km/h
CNRL Horizon - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
CNRL Horizon - July 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	202	27.22	27.22
6 - 11	383	51.62	78.84
12 - 19	147	19.81	98.65
20 - 28	9	1.21	99.87
29 - 38	1	0.13	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 742

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
CNRL Horizon - July 2016**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	16	20	9	10	6	3	8	11	23	20	20	11	11	12	9	13	202
6 - 11	63	51	22	8	5	4	8	9	41	61	35	18	10	17	14	17	383
12 - 19	24	31	7	1	1	0	2	8	9	13	13	3	6	11	6	12	147
20 - 28	2	0	0	0	0	0	0	0	0	0	0	0	0	1	3	3	9
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	105	102	38	19	12	7	18	28	73	94	68	32	27	41	33	45	742

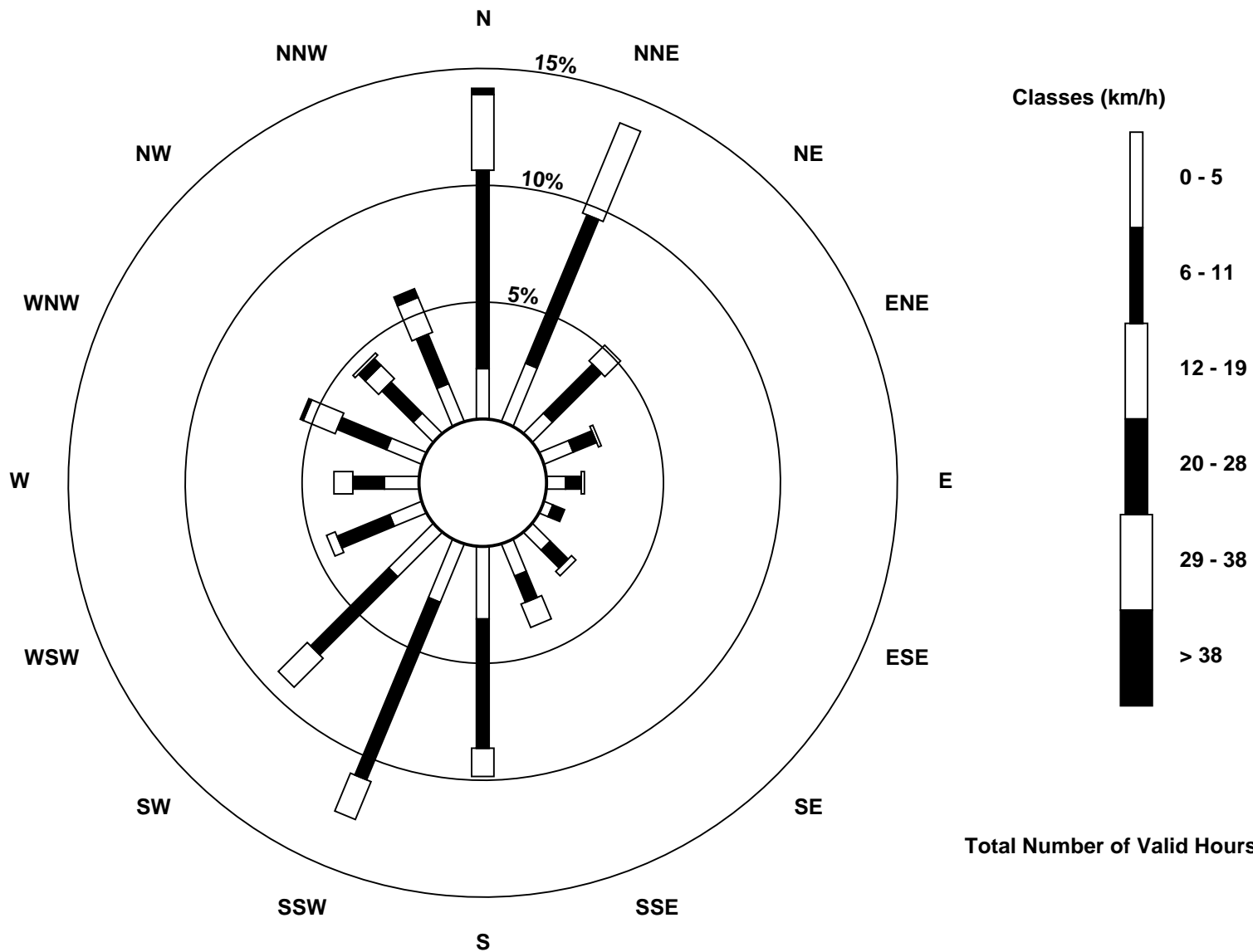
Total Number of Valid Hours: 742

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

Wind Speed (WS) - km/h
CNRL Horizon (AMS 15)





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
CNRL Horizon - July 2016

Direction of Maximum Speed: 318 deg on Jul 21 15:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 356.3 deg on Jul 12	Hours of Data: 742
Direction of Minimum Speed: 202 deg on Jul 1 06:00	Direction of Minimum Daily Speed Average: 0.1 deg on Jul 28
Direction of Minimum Speed: 202 deg on Jul 1 06:00	Hours of Missing Data: 2
Monthly Average Direction: 257.4 deg	Percent Operational Time: 99.7

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Jul	213	200	187	195	189	202	150	142	130	151	152	161	151	141	155	174	171	153	158	141	160	144	179	158	160.8
2-Jul	184	258	249	182	186	194	157	158	93	149	158	156	169	169	174	176	155	145	133	137	126	159	162	170	160.7
3-Jul	184	287	340	65	23	103	161	182	94	115	129	176	296	56	95	80	73	71	82	64	46	41	106	192	101.9
4-Jul	229	251	224	210	210	232	230	232	200	207	242	275	207	242	233	234	232	237	135	143	124	141	168	13	214.9
5-Jul	350	18	316	320	352	265	279	8	342	351	20	44	45	27	31	23	32	357	282	279	287	285	305	13	341.7
6-Jul	5	5	4	5	7	7	7	12	15	13	7	15	15	34	63	45	33	14	110	10	92	5	19	360	20.7
7-Jul	9	358	356	5	5	6	5	14	19	20	27	11	17	11	17	6	15	3	8	4	354	348	2	12	8.8
8-Jul	6	4	6	0	9	10	2	4	17	9	50	37	91	51	31	351	18	32	24	18	9	11	1	7	17.3
9-Jul	7	13	19	8	9	10	12	20	29	26	63	259	233	199	207	22	29	18	23	5	5	7	3	1	13.2
10-Jul	1	357	0	4	13	25	29	21	25	39	42	63	55	42	50	60	52	342	279	246	234	249	285	297	5.9
11-Jul	307	329	29	211	196	345	328	359	37	65	55	37	257	258	338	314	351	2	11	6	7	344	335	342	354.7
12-Jul	4	341	29	356	349	358	14	15	9	22	17	11	18	348	330	325	7	349	358	8	3	345	336	325	356.3
13-Jul	302	345	307	294	300	292	346	15	16	6	M	M	14	11	16	3	44	34	7	12	7	9	331	343	1.9
14-Jul	0	231	284	203	245	222	188	235	180	36	317	272	293	297	301	345	252	261	294	276	288	288	296	227	282.4
15-Jul	228	212	212	208	202	197	188	186	184	216	260	228	272	324	329	292	277	285	292	298	267	280	266	213	264.7
16-Jul	216	209	198	201	198	200	180	192	183	187	262	230	162	187	195	230	356	340	342	342	328	330	331	318	276.6
17-Jul	316	301	327	332	338	352	360	5	14	12	2	27	34	31	40	27	36	31	19	35	97	207	220	233	7.3
18-Jul	224	185	202	202	185	179	183	182	177	189	183	183	180	193	201	195	209	204	205	190	187	201	206	219	194.4
19-Jul	216	223	208	209	232	200	177	205	196	197	218	233	214	224	276	254	285	324	99	24	18	15	346	345	230.6
20-Jul	13	24	350	347	343	4	5	11	4	51	35	40	17	6	311	251	308	229	48	95	117	187	275	221	3.4
21-Jul	226	224	214	215	216	217	220	201	204	209	249	285	311	306	318	358	350	357	31	25	27	72	142	185	294.1
22-Jul	204	207	216	210	193	204	195	185	171	174	149	164	193	189	225	292	214	217	309	294	289	288	180	218	214.9
23-Jul	207	214	238	269	282	331	32	33	28	75	153	195	293	72	206	355	31	222	225	204	215	235	221	209	228.7
24-Jul	204	194	174	186	190	192	210	224	231	231	225	223	224	239	314	305	281	244	253	251	262	265	231	234	236.3
25-Jul	257	260	188	192	181	184	209	247	322	301	290	297	317	313	352	48	39	36	56	60	48	44	0	340	321.0
26-Jul	10	13	8	5	75	176	161	190	191	185	187	181	205	228	219	206	211	217	172	157	166	186	193	200	194.6
27-Jul	186	196	191	203	199	191	165	227	25	33	22	18	17	15	23	32	28	29	22	20	5	324	300	280	17.8
28-Jul	281	309	180	219	193	206	209	192	181	210	90	105	124	68	48	36	45	61	63	30	284	281	289	203	209.5
29-Jul	197	206	213	214	213	203	196	188	184	178	182	195	204	183	290	334	250	289	60	82	77	184	191	317	204.7
30-Jul	32	139	236	268	212	5	186	205	328	340	360	358	32	336	331	11	24	17	10	14	4	316	319	307	347.4
31-Jul	144	340	251	246	232	255	324	28	176	312	28	316	222	247	251	225	114	172	248	240	251	230	274	247	253.5

266.2 265.8 252.3 251.6 235.0 224.6 238.9 347.3 30.1 67.6 63.7 222.1 275.4 320.9 335.5 347.2 1.8 351.8 358.7 357.2 326.0 300.7 300.2 286.5
 Diurnal Average

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



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

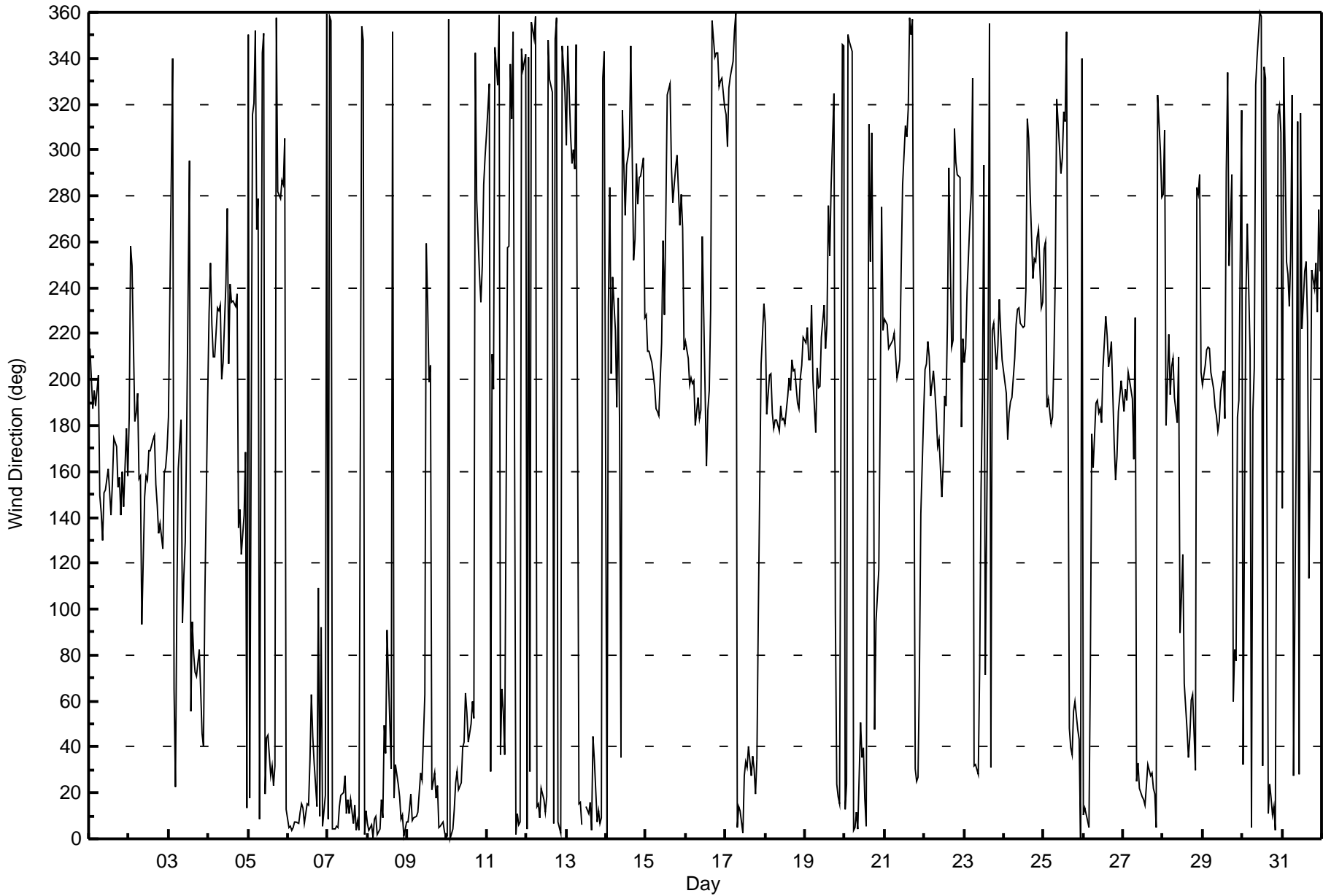
Wind Direction (WD) - deg
CNRL Horizon - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 97 deg on Jul 23 14:00 Minimum Value: 6 deg on Jul 11 00:00 Percentiles: P ₁ = 9 P ₁₀ = 14 Q ₁ = 18 Median = 24 Q ₃ = 34 P ₉₀ = 56 P ₉₉ = 85																		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-Jul	12	11	9	21	10	78	31	32	28	29	26	31	34	33	33	32	31	31	27	21	20	13	16	14	78
2-Jul	16	66	53	19	17	13	34	67	54	35	25	24	29	26	27	24	21	26	23	29	25	16	22	19	67
3-Jul	67	42	26	38	46	55	32	45	57	44	45	36	40	88	27	22	19	21	31	16	14	15	35	29	88
4-Jul	20	33	31	16	12	13	17	22	44	32	57	87	78	45	36	20	18	28	30	23	22	20	64	57	87
5-Jul	62	29	24	29	64	21	48	23	57	30	30	32	56	32	30	30	32	39	18	12	13	11	22	31	64
6-Jul	21	20	20	19	21	19	22	21	21	29	30	26	22	20	21	24	25	24	31	84	39	81	19	20	84
7-Jul	15	16	17	18	24	54	22	22	26	24	22	23	27	21	25	25	22	26	25	21	20	21	20	19	54
8-Jul	21	19	21	20	21	20	23	23	45	29	37	56	39	65	52	48	33	23	20	19	18	18	18	19	65
9-Jul	19	19	18	15	15	20	20	24	31	34	42	75	56	27	85	42	18	22	19	22	19	19	16	16	85
10-Jul	14	15	18	17	18	17	20	25	24	27	29	47	46	24	38	30	38	51	11	32	13	13	16	6	51
11-Jul	18	26	77	15	48	28	46	38	45	34	30	36	73	47	56	43	30	22	21	21	19	18	15	20	77
12-Jul	18	17	17	21	19	21	23	25	23	27	26	26	25	27	19	25	25	22	24	21	20	19	16	10	27
13-Jul	10	19	10	6	11	67	26	21	20	25	M	M	24	25	27	24	29	29	22	20	17	15	33	19	67
14-Jul	72	52	34	25	21	24	76	53	81	72	64	59	30	86	35	66	47	38	37	23	11	8	14	40	86
15-Jul	31	9	11	13	15	15	18	20	25	45	75	66	43	20	15	41	20	15	33	29	15	12	28	11	75
16-Jul	11	9	15	12	15	12	19	18	24	29	45	48	69	72	24	46	32	26	20	20	14	12	12	12	72
17-Jul	17	11	13	14	19	22	23	25	25	25	31	36	41	33	24	25	21	21	21	27	45	18	13	13	45
18-Jul	13	20	12	12	14	14	18	23	26	20	25	23	24	27	35	27	31	20	18	16	12	11	11	15	35
19-Jul	20	21	15	19	30	19	17	21	20	24	23	22	25	27	31	29	24	57	76	77	79	67	17	16	79
20-Jul	60	62	19	21	18	21	23	21	19	21	28	34	29	33	23	63	82	81	71	29	13	56	62	27	82
21-Jul	18	12	12	15	13	14	17	22	18	21	31	18	18	13	16	28	23	30	19	20	19	37	75	35	75
22-Jul	12	15	11	14	16	16	21	23	33	28	25	27	23	20	36	17	28	19	34	20	16	39	30	17	39
23-Jul	11	14	14	15	21	19	82	31	60	57	91	76	84	97	31	45	87	22	20	14	18	39	18	19	97
24-Jul	11	14	12	15	15	16	16	21	18	19	20	20	23	22	29	21	14	21	23	15	17	18	14	28	29
25-Jul	18	25	18	17	24	29	38	45	28	25	22	21	39	49	44	22	23	25	25	20	12	9	17	18	49
26-Jul	17	14	20	14	40	19	25	26	28	35	34	33	35	35	28	30	27	23	25	15	10	14	13	22	40
27-Jul	10	12	13	13	15	13	30	65	34	35	25	24	24	23	25	22	25	20	21	18	17	32	14	17	65
28-Jul	25	23	60	53	18	20	39	21	19	46	79	54	92	77	76	39	29	55	21	25	48	15	9	49	92
29-Jul	17	10	11	13	14	18	32	35	38	35	56	30	32	33	92	56	97	66	66	15	40	41	64	23	97
30-Jul	19	62	46	34	50	93	19	35	33	46	44	66	82	51	29	32	21	35	28	18	21	17	47	33	93
31-Jul	84	48	59	48	53	28	35	38	65	49	37	75	60	26	27	31	31	56	13	12	13	16	19	12	84
84 66 77 53 64 93 82 67 81 72 91 87 92 97 92 66 97 81 76 84 79 81 75 57																									
Diurnal Maximum																									
M - Maintenance																									



Wood Buffalo Environmental Association
Hourly Averages

Wind Direction (WD) - deg
CNRL Horizon - July 2016





Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	July 15, 2016	Last Calibration	June 21, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Reason:	Routine		
Start Time (MST)	9:00	End Time (MST)	15:22
Gas Cert Reference	S0002486	Station temp.	21 Deg C
Cal Gas Concentration	50 ppm	Cal Gas Exp Date	26/09/2017
Calibrator Make/Model	Teledyne API T700	Serial Number	1223
ZAG Make/Model	Teledyne API 701	Serial Number	1004
DACS make/model	Campbell Scientific CR3000	DACS serial No.	11040

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-623	-623
Analyzer IP address	192.168.1.43		Lamp voltage	853	853
Calculated slope	0.997067	0.992857	Chamber temp	45.3	45.3
Calculated intercept	0.603787	0.556377	Pressure	702.4	706.9
Analyzer Background	18.8	18.5	Flow	0.426	0.428
Analyzer Coefficient	1.005	0.993	Intensity	91	91

Analyzer make Thermo 43i Analyzer serial # 710321322

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.0	----
as found span	5000	81.5	815.0	825.5	0.987
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	81.5	815.0	820.6	0.993
second point	5000	40.7	407.0	408.9	0.995
third point	5000	20.3	203.0	203.5	0.998
as left zero	5000	0.0	0.0	0.7	----
as left span	5000	81.5	815.0	820.3	0.993
Average Correction Factor					0.995

Corrected As found 825.5 Previous response 816.8 % change -1.1%

Notes:

Sample inlet filter replaced after as founds. Pump shut off for couple mins at about 10:50 MST to change exhaust line's path (see docit note). No major changes seen after the fact. Adjusted span. As left began at 14:41 MST.

Calibration Performed By: Asad Hidayat



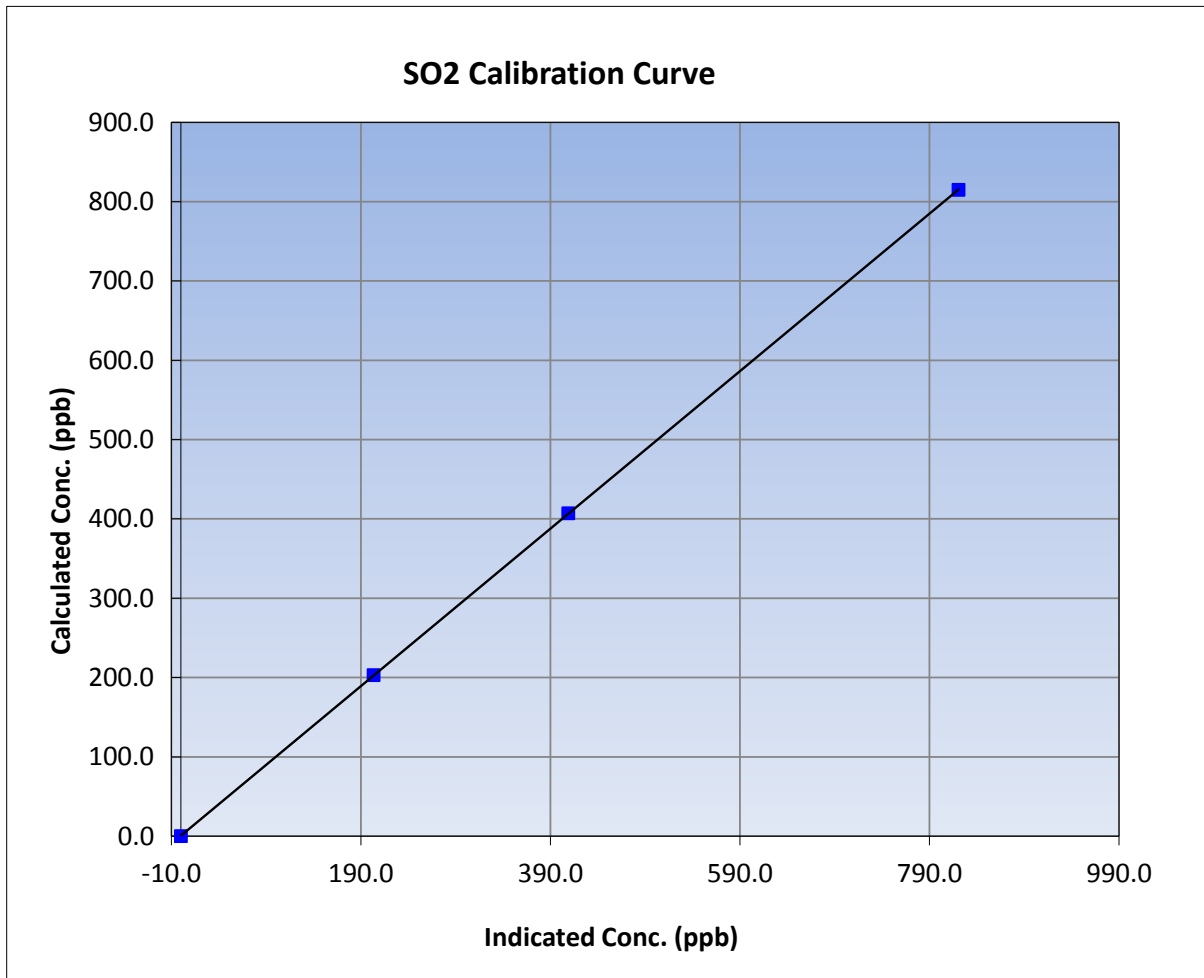
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	July 15, 2016	Previous Calibration	June 21, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Start Time (MST)	9:00	End Time (MST)	15:22
Analyzer make	Thermo 43i	Analyzer serial #	710321322

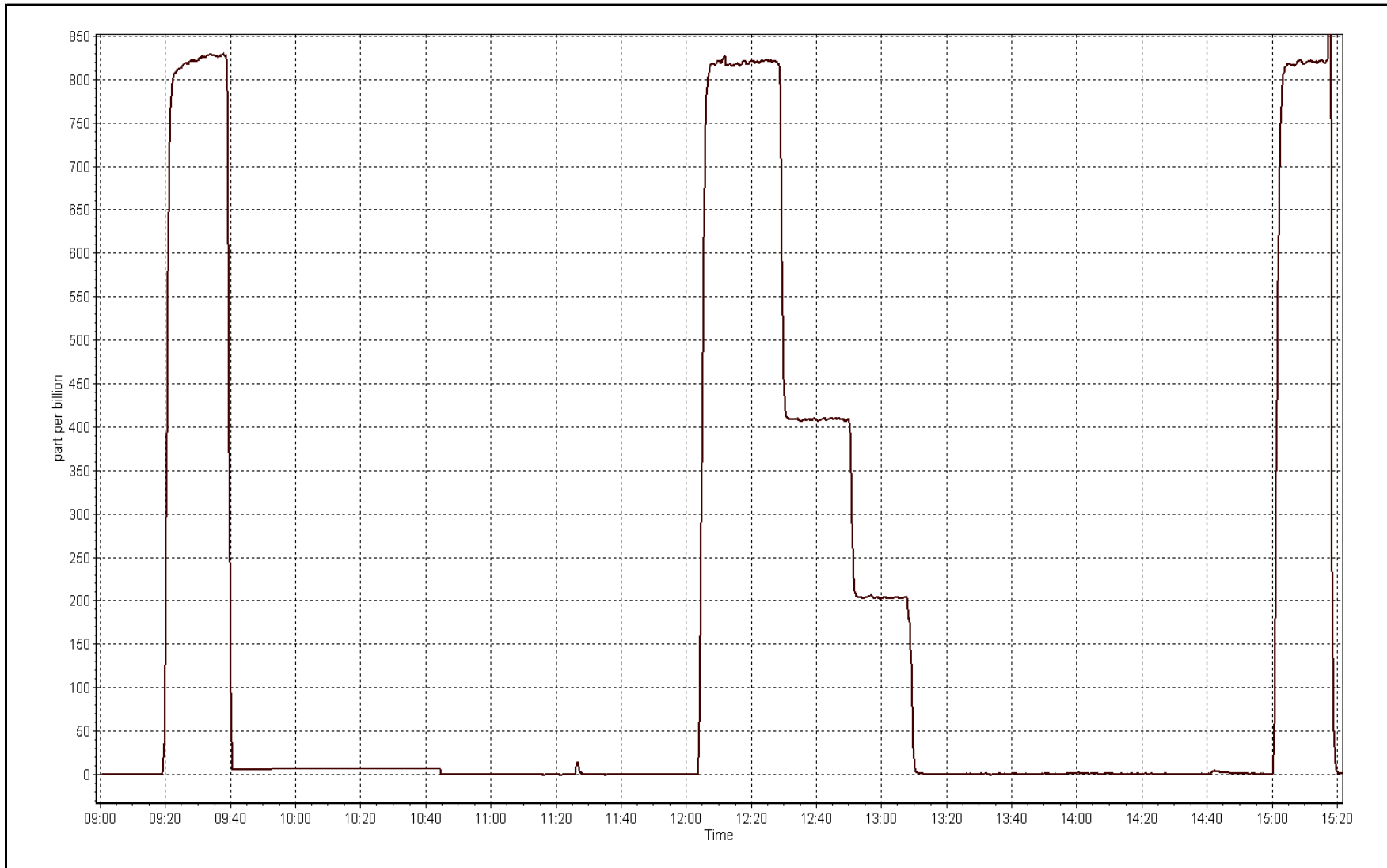
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999998
815.0	820.6	0.9931		
407.0	408.9	0.9953	Slope	0.992857
203.0	203.5	0.9975		
			Intercept	0.556377



SO2 Calibration Plot

Date: July 15, 2016





Wood Buffalo Environmental Association TRS Calibration Report

Station Information

Calibration Date	July 14, 2016	Last Calibration	June 20, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Reason:	Routine		
Start Time (MST)	10:15	End Time (MST)	14:25
Gas Cert Reference	LL82745	Station temp.	22 Deg C
Cal Gas Concentration	9.6 ppm	Cal Gas Exp Date	2/22/16
Calibrator Make/Model	API T700	Serial Number	1223
Dil air Make/Model	API 701	Serial Number	1004
DACS make/model	Campbell Scientific CR3000	DACS serial No.	11040
SO2 gas concentration	50 ppm	SO2 gas cert/exp	S0002486 26/Sep/17

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-685	-684
Analyzer IP address	192.168.1.44		Lamp voltage	989	985
Calculated slope	0.998932	0.991107	Chamber temp	45	45
Calculated intercept	-0.046347	-0.078892	Pressure	643.8	644.8
Analyzer Background	2.11	2.04	Flow	0.404	0.406
Analyzer Coefficient	1.196	1.161	Intensity	91	91
			Converter temp.	800	800
Analyzer make/model	Thermo 43i TLE		Analyzer serial #	1151680032	
Converter make/model	CDN-101		Converter serial #	531	

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.1	----
as found span	5000	41.5	79.7	80.6	0.989
SO2 scrubber check	5000	20.4	204.0	0.6	----
calibrator zero	5000	0.0	0.0	-0.1	----
high point	5000	41.5	79.7	80.3	0.992
second point	5000	20.6	39.6	40.2	0.984
third point	5000	10.2	19.6	20.0	0.982
as left zero	5000	0.0	0.0	-0.1	----
as left span	5000	41.5	79.7	80.4	0.992
Average Correction Factor					0.986

Corrected As found	80.7	Previous response	79.8	% change	-1.1%
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Notes:

Sample inlet filter replaced after as founds. Conducted a mass flow calibrator on calibrator after as founds. "Calibrator zero" began at 12:20 MST. Span reponse went up a bit. Adjusted span. Sox scrubber test done after 3rd point.

Calibration Performed By:

Asad Hidayat



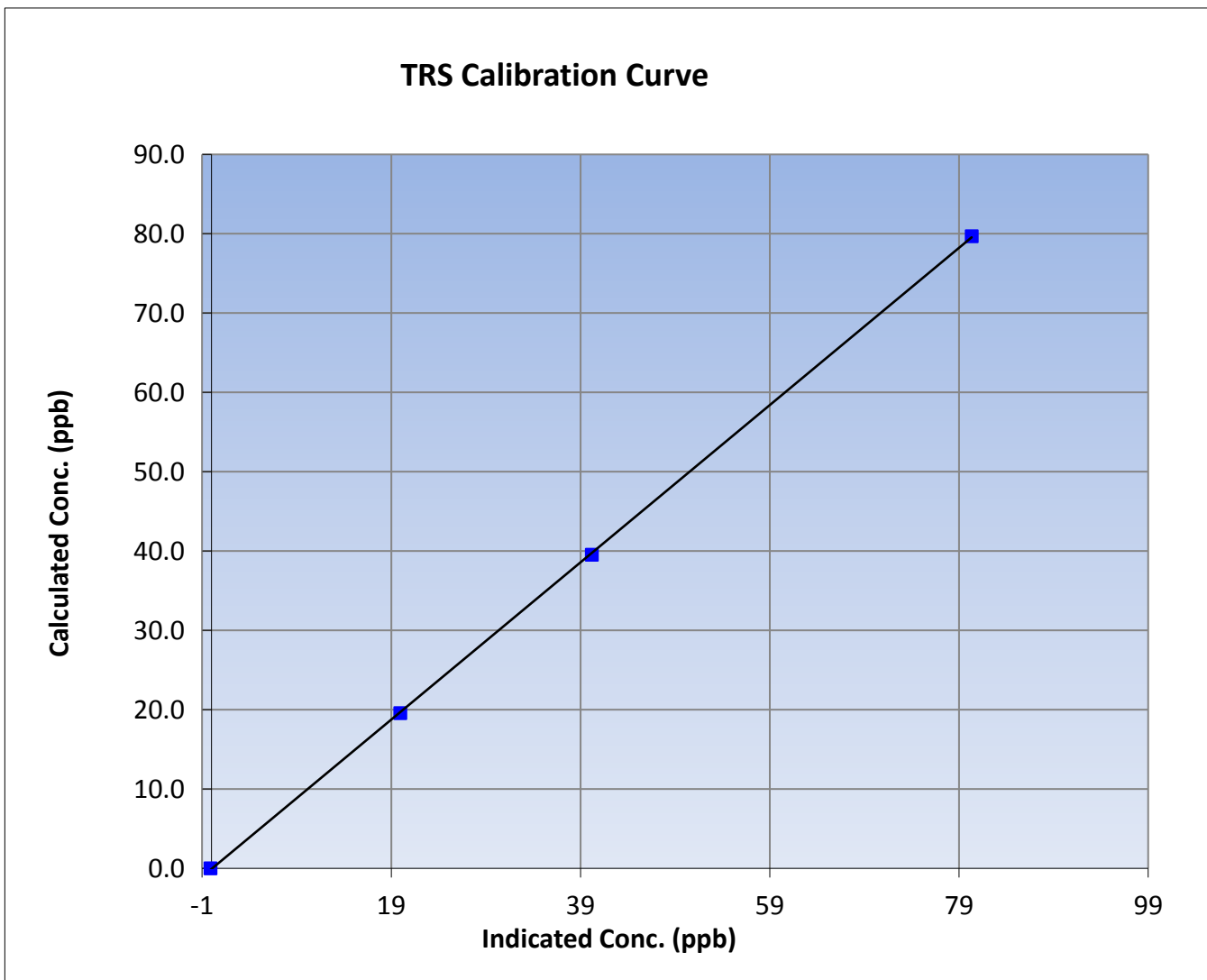
Wood Buffalo Environmental Association TRS Calibration Report

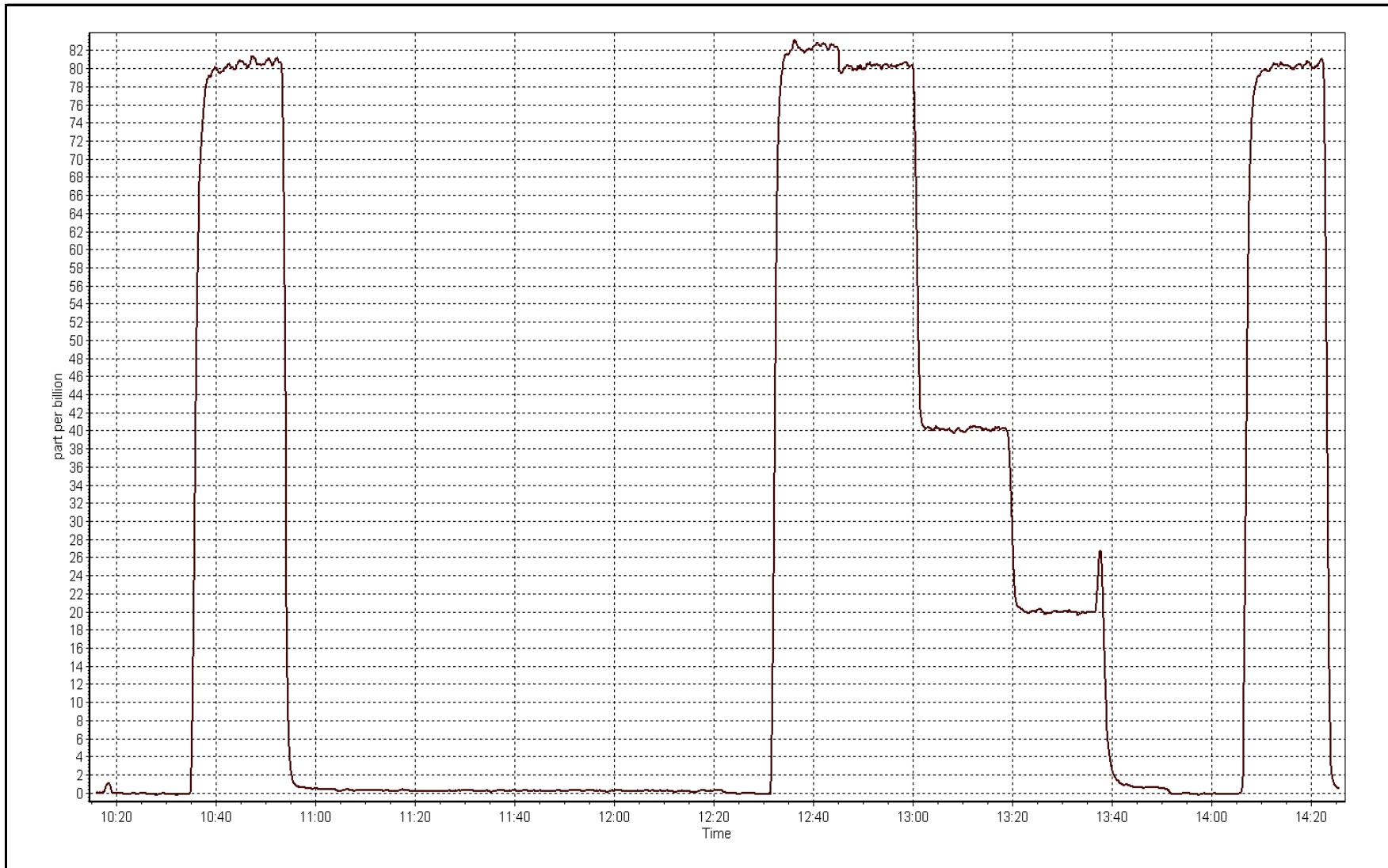
Station Information

Calibration Date	July 14, 2016	Previous Calibration	June 20, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Start Time (MST)	10:15	End Time (MST)	14:25
Analyzer make	Thermo 43i TLE	Analyzer serial #	1151680032

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999968
79.7	80.3	0.9918		
39.6	40.2	0.9839	Slope	0.991107
19.6	20.0	0.9817		
			Intercept	-0.078892







Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	July-15-16	Last Calibration	June-21-16
Station Name	CNRL Horizon	Station Number	AMS 15
Reason:	Routine		
Start Time (MST)	9:00	End Time (MST)	15:20
Gas Cert Reference	S0002486	Cal Gas Expiry Date	26-Sep-17
CH4 Cal Gas Conc.	505 ppm	CH4 Equiv Conc.	1046.8 ppm
C3H8 Cal Gas Conc.	197 ppm	Station temp.	22 Deg C
Calibrator Make/Model	Teledyne API T700	Serial Number	1223
ZAG make/model	Teledyne API 701	Serial Number	1004
DACS make/model	Campbell Scientific CR3000	Serial Number	11040

Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 50 ppm		Sample Pressure	8.8	8.7
Analyzer IP address	192.168.1.51		Air or Bypass Press	38.0	38.0
Calculated slope	0.990043	1.003475	Fuel Pressure	26.3	26.3
Calculated intercept	0.025344	-0.030342	Analyzer Coeff	3.3	3.3
			Analyzer BKG	2.030	2.060

Analyzer make	Thermo 51i-LT	Analyzer serial #	1327059295
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Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	0.13	----
as found span	5000	81.5	17.06	17.44	0.978
calibrator zero	5000	0.0	0.00	0.03	----
high point	5000	81.5	17.06	17.02	1.002
second point	5000	40.7	8.52	8.56	0.995
third point	5000	20.3	4.25	4.24	1.002
as left zero	5000	0.0	0.00	0.05	----
as left span	5000	81.5	17.06	17.08	0.999
Average Correction Factor					1.000

Corrected As found	17.31	Previous response	17.21	% change	-0.6%
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Notes:

Sample inlet filter replaced after as founds. Analyzer shut off (from 9:40-10:20 MST) after as founds to replace sample pump for preventative maintenance. Zero response slightly dropped after replacing pump. Span dropped as well; adjusted span only.

Calibration Performed By:

Asad Hidayat



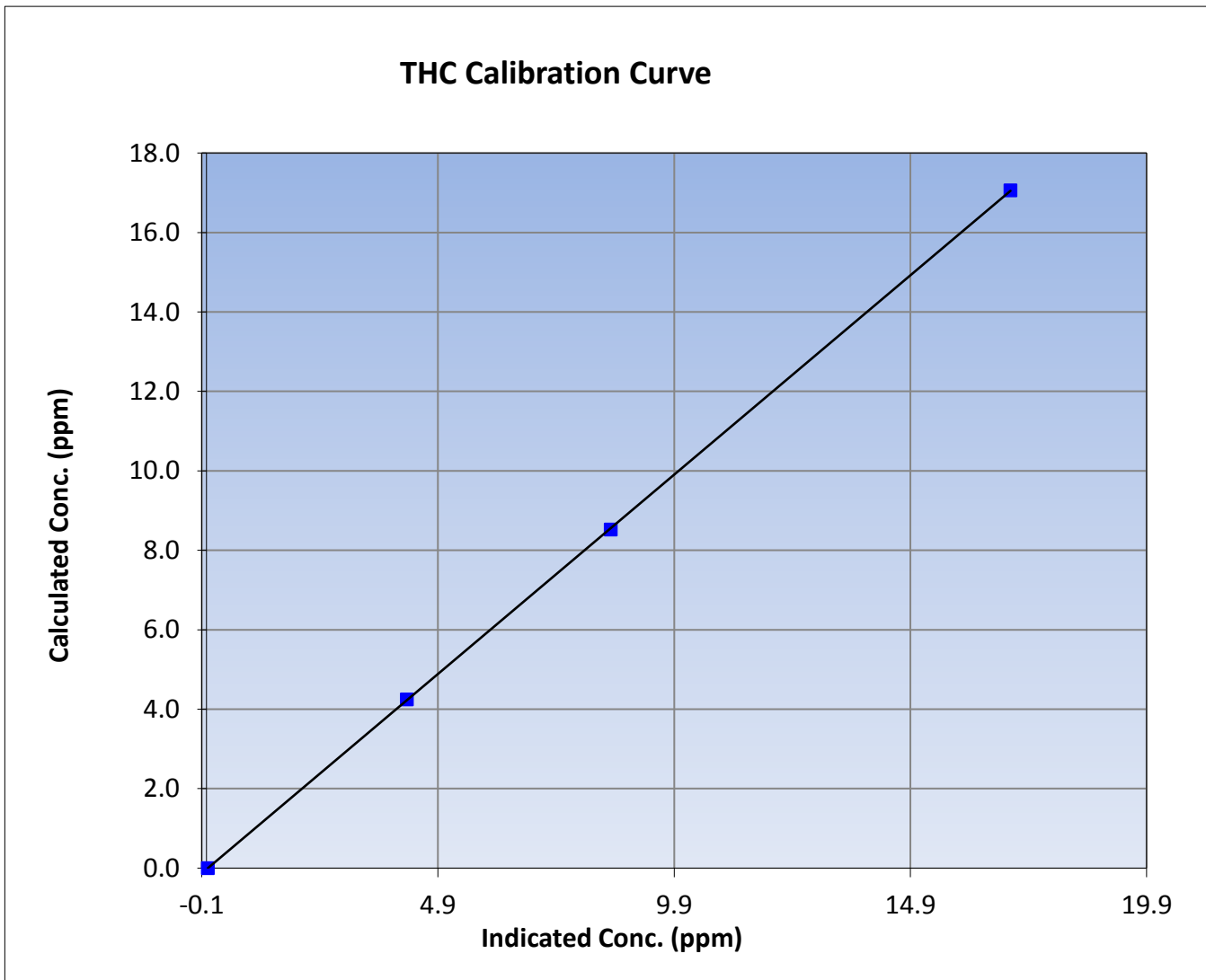
Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	July 15, 2016	Previous Calibration	June 21, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Start Time (MST)	9:00	End Time (MST)	15:20
Analyzer make	Thermo 51i-LT	Analyzer serial #	1327059295

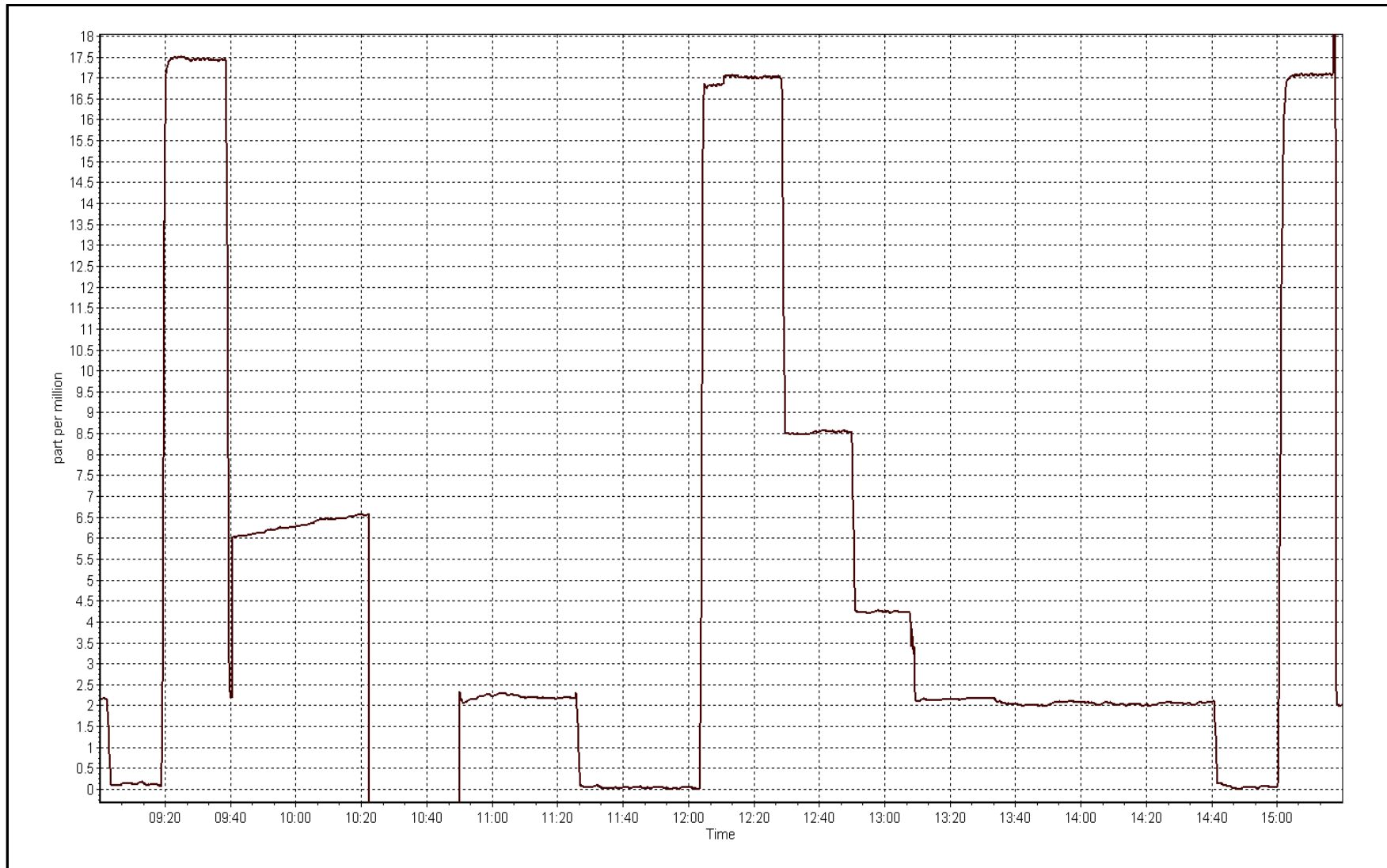
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.03	----	Correlation Coefficient	0.999985
17.06	17.02	1.0025		
8.52	8.56	0.9954	Slope	1.003475
4.25	4.24	1.0023		
			Intercept	-0.030342



THC Calibration Plot

Date: July 15, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	July 15, 2016	Previous Calibration	June 21, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Reason:	Routine		
Start Time (MST)	9:00	End Time (MST)	15:25
NO Cal Gas Conc	48.9 ppm	Gas Cert Reference	S0002486
NOx Cal Gas Conc	48.9 ppm	Cal Gas Expiry Date	26/09/2017
Calibrator	Teledyne API T700	Serial Number	1223
Zero air Generator	Teledyne API T701	Serial Number	1004

DACs Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	11040
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.999122	0.999521	0.995753
	Data Offset	0.168555	0.259304	-0.201629
Current Calibration	Data Slope	1.000606	1.000342	0.993960
	Data Offset	0.767106	0.558646	-0.970416

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	710321429
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Test Point	before		after	
Concentration range	0-1000	ppb	0-1000	ppb
Analyzer IP	192.168.1.42		192.168.1.42	
NO coefficient	1.004		0.979	
NOx coefficient	1.001		1.000	
NO2 coefficient	1.000		1.000	
NO bkgrnd	11.5		11.4	
NOx bkgrnd	11.6		12.4	
Chamber Temp	50	Deg C	49.7	Deg C
Moly Temp	326.3	Deg C	323.9	Deg C
PMT voltage	-779.2	V	-779.2	V
PMT Temp	-2.9	Deg C	-3.1	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	175.5	mmHg	173.1	mmHg
R Cell Press Nox	175.5	mmHg	172.8	mmHg
NO sample flow	0.616	lpm	0.646	lpm
Nox sample Flow	0.618	lpm	0.647	lpm

Notes:

Sample inlet filter replaced after as founds. Adjusted zero and span. Pump shut off from 10:57-11:23 MST (see docit note).
Accidentally pressed "sample" button on the instrument during 3rd GPT, which made the analyzer go into "zero" mode.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

July 15, 2016

Station Number:

AMS 15

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	0.2	0.2	0.0	----	----
as found span	5000	81.5	797.1	797.1	0.0	820.2	818.4	1.7	0.9718	0.9739
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.1	0.1	-0.2	----	----
high point	5000	81.5	797.1	797.1	0.0	796.2	796.6	-0.4	1.0011	1.0007
second point	5000	40.7	398.0	398.0	0.0	396.6	397.0	-0.4	1.0035	1.0026
third point	5000	20.3	198.5	198.5	0.0	197.1	197.3	-0.2	1.0074	1.0062
as left zero	5000	0.0	0.0	0.0	0.0	1.4	2.1	-0.7	----	----
as left span	5000	81.5	797.1	462.0	335.1	795.5	462.2	333.3	1.0020	0.9997
Average Correction Factor									1.0040	1.0031

Corrected As found
Previous Response

NO_x= 820.0
NO_x= 797.6

NO= 818.2
NO= 797.2

Percent Change

NO_x= -2.7%

NO= -2.6%

GPT Calibration Data

Dilution Flow (total) 5000 ccm Source Gas Flow 81.50 ccm NOx ref calc conc = 797.1 ppb NO ref calc conc = 797.1 ppb

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
1st NO ref point		0.0	795.4	792.5	-0.2	1.0021	1.0058	----	----
1st NO2 (300)	462.0	330.5	794.5	462.0	332.4	1.0033	----	0.9941	100.6%
2nd NO2 (200)	566.7	225.8	795.5	566.7	228.9	1.0019	----	0.9867	101.3%
3rd NO2 (100)	675.0	117.5	795.7	675.0	120.7	1.0017	----	0.9735	102.7%
2nd NO ref point		0.0	795.9	794.6	1.3	1.0014	1.0031	----	----
Average Correction Factor						1.0021		0.9848	101.6%

Calibration Performed By: Asad Hidayat



Wood Buffalo Environmental Association

NO_x Calibration Summary

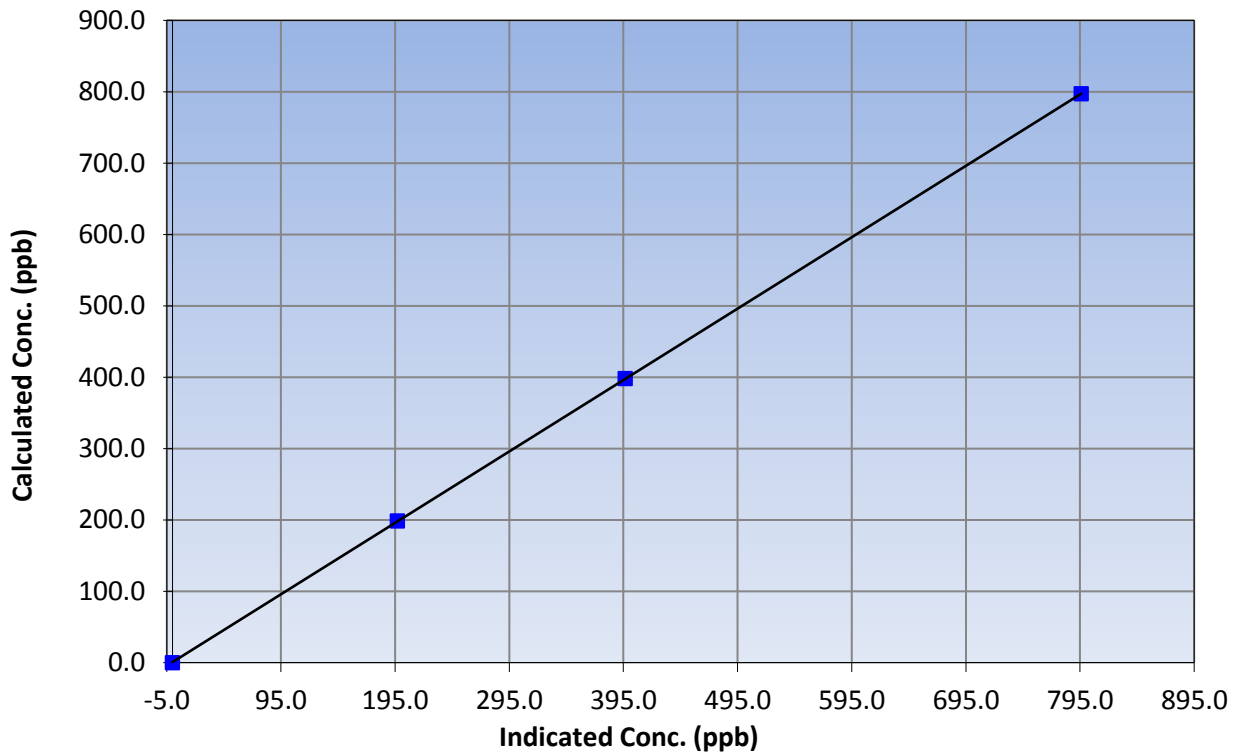
Station Information

Calibration Date	July 15, 2016	Previous Calibration	June 21, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Start Time (MST)	9:00	End Time (MST)	15:25
Analyzer make	Thermo 42i	Analyzer serial #	710321429

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999997
797.1	796.2	1.0011		
398.0	396.6	1.0035	Slope	1.000606
198.5	197.1	1.0074		
			Intercept	0.767106

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

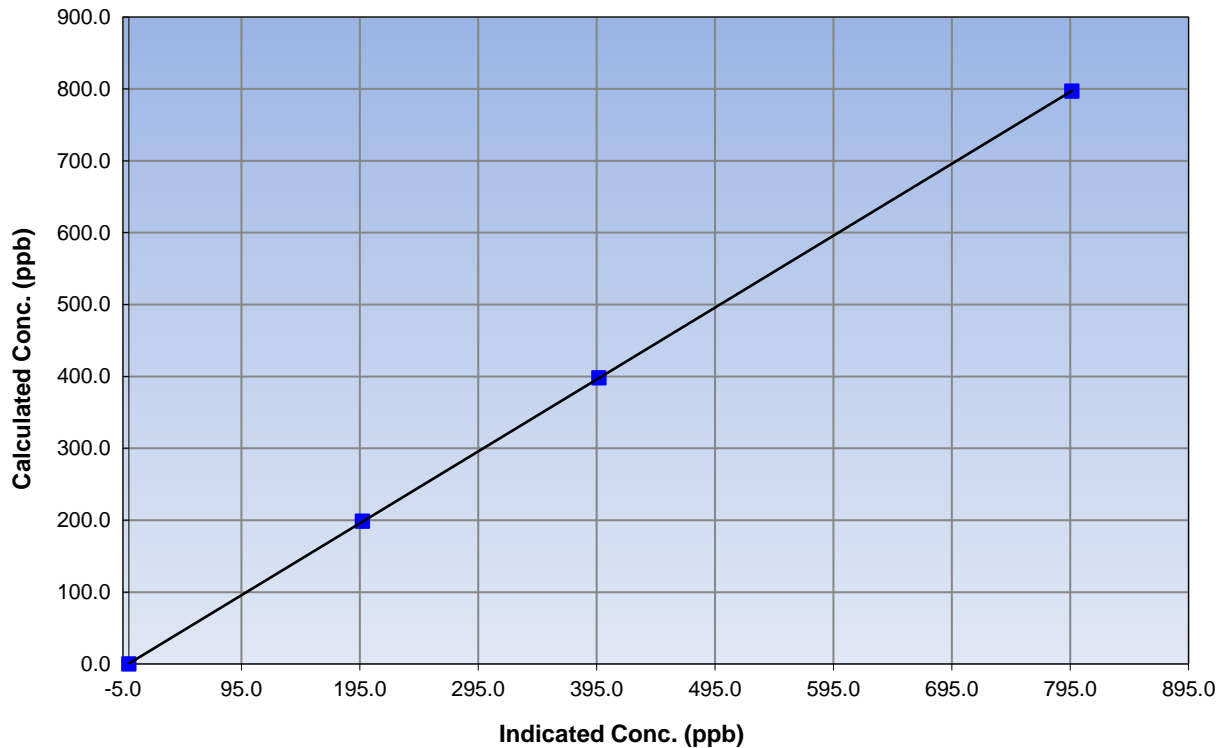
Station Information

Calibration Date	July 15, 2016	Previous Calibration	June 21, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Start Time (MST)	9:00	End Time (MST)	15:25
Analyzer make	Thermo 42i	Analyzer serial #	710321429

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	N/A	Correlation Coefficient	0.999997
797.1	796.6	1.0007		
398.0	397.0	1.0026	Slope	1.000342
198.5	197.3	1.0062		
			Intercept	0.558646

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

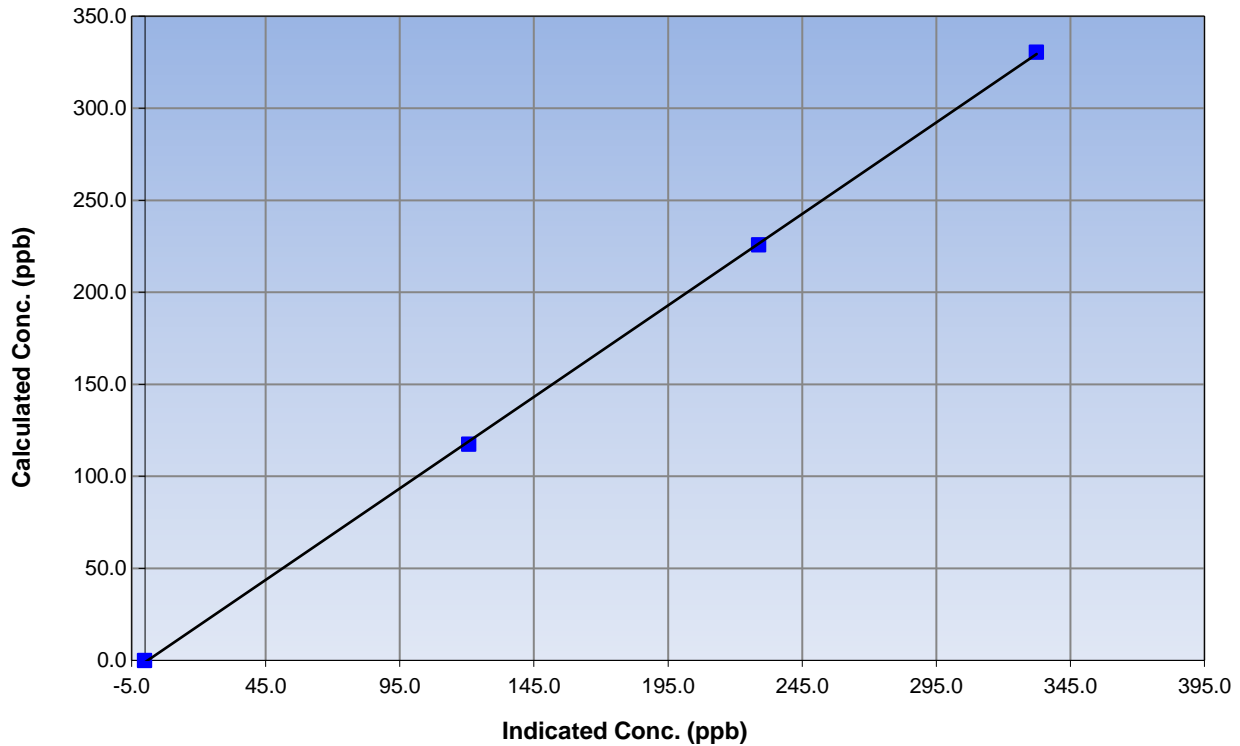
Station Information

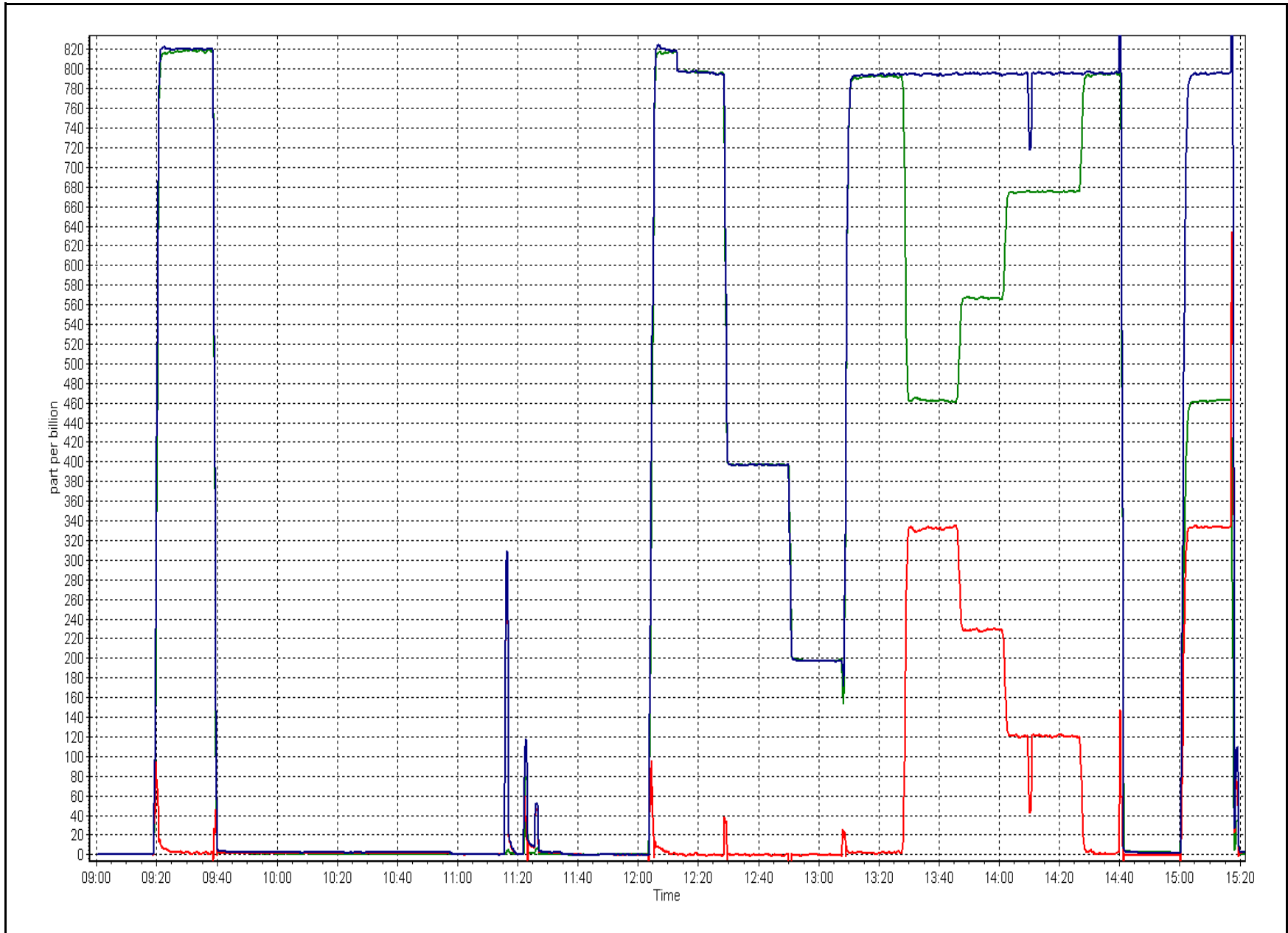
Calibration Date	July 15, 2016	Previous Calibration	June 21, 2016
Station Number	CNRL Horizon	Station Number	AMS 15
Start Time (MST)	9:00	End Time (MST)	15:25
Analyzer make	Thermo 42i	Analyzer serial #	710321429

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	N/A	Correlation Coefficient	0.999915
330.5	332.4	0.9941		
225.8	228.9	0.9867	Slope	0.993960
117.5	120.7	0.9735		
			Intercept	-0.970416

NO₂ Calibration Curve







Wood Buffalo Environmental Association

SHARP CALIBRATION

STATION INFORMATION

Calibration Date:	July 15, 2016	Previous Calibration:	June 21, 2016
Station Name:	CNRL Horizon	Station Number:	AMS 15
Start Time (MST):	9:15	End Time (MST):	10:35
Calibrator Make/Model:	Delta Cal	Calibrator Serial Number:	1451

SHARP INFORMATION

Particulate Fraction:	PM2.5
Make/Model:	Thermo / SHARP 5030
Serial Number:	E-2020
C ₁₄ Source SN:	7409
Confirmation of Time settings:	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Parameters Checked:	T1 <input checked="" type="checkbox"/> T2 <input checked="" type="checkbox"/> T3 <input checked="" type="checkbox"/> T4 <input checked="" type="checkbox"/> P3 <input checked="" type="checkbox"/> Main Flow <input checked="" type="checkbox"/> Beta <input type="checkbox"/> Neph <input checked="" type="checkbox"/>

CALIBRATION DATA

Temperature (°C)

Sensor	Indicated	Measured	Difference (Limit +/- 2.0°C)	Final Indicated
T1	24.0	24.4	0.4	24.0
T2	28.0	na	na	28.0
T3	25.0	na	na	25.0
T4	28.0	na	na	28.0
RH (%)	36.0	na	na	36.0

Pressure (Hpa)

Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	980	981.0	1.0	980

Main Flow (Lph)

Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1000	1002	2	1002	1000

Nephelometer Calibration

Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	165		165
Neph	0.9		0.9
C14	13		13
Indicated Concentration (ug/m3)	0.5	no	0.5
Offset 1			
Offset 2			

Leak Check (Quarterly)

Leak Check Date:	April 28, 2016	Previous Leak Check Date:	January 13, 2016
------------------	----------------	---------------------------	------------------

Measured

Difference LPM (Limit +/- 0.42 LPM)

Flow without adaptor (LPM):	16.76	0.06
*Flow with adaptor (LPM):	16.70	

*Note - do not attach adaptor without shutting off the pump first

Mass Foil Calibration (Annually)

Foil Calibration Date:	June 21, 2016	Previous Foil Calibration:	June 22, 2015
Zeroed?:	Yes		
Foil Mass:	1265		
Previous Correction Factor:	7029	Mass foil set S/N:	2598
New Correction Factor:	9992		

INSPECTION DATA

Item	Condition	Date of install or rebuild
Cyclone	Good / cleaned	15/07/2016
Pump	Good	09/06/2014
Filter Tape	Good	09/06/2014
Mass Foil Cal Set	Good	21/06/2016
HEPA filter	Good	15/03/2016

NOTES:

No adjustments. Cleaned cyclone head.

Calibration Performed By:	Asad Hidayat
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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

AMS 16
SHELL MUSKEG RIVER
JULY 2016

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

August 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - SHELL MUSKEG RIVER (AMS 16)
 JULY 2016

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	693	32	51	97.45	27	0	5	0
THC (ppm) Average	693	32	51	97.45	13.2	-	3.1	-
NO2 (ppb) Average	693	33	51	97.58	29	0	13	-
NO (ppb) Average	693	33	51	97.58	83	-	20	-
NOX (ppb) Average	693	33	51	97.58	106	-	30	-
PM2.5 (ug/m3) Average	721	1	23	97.04	61.7	-	27.7	0
Temperature 2 m (C) Average	744	0	0	100.00	30.1	-	22.6	-
Relative Humidity (%) Average	744	0	0	100.00	99	-	94	-
Barometric Pressure (inHg) Average	744	0	0	100.00	29.1	-	29.1	-
Wind Speed 10 m (km/h) Average	744	0	0	100.00	30	-	16	-
Wind Direction 10 m (deg) Average	744	0	0	100.00	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - SHELL MUSKEG RIVER (AMS 16)
 JULY 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile							
					Min	P10	Q1	Median	Q3	P90	Max	
SO2 (ppb) Average	693	0.6	3	-	0	0	0	0	0	0	0	27
THC (ppm) Average	693	2.52	0.6	-	1.9	2.1	2.2	2.4	2.6	3.1	13.2	
NO2 (ppb) Average	693	5.9	6	-	0	0	1	4	8	14	29	
NO (ppb) Average	693	5.7	10	-	0	0	0	1	7	15	83	
NOX (ppb) Average	693	11.6	15	-	0	0	2	6	16	28	106	
PM2.5 (ug/m3) Average	721	8.94	7.6	-	0.3	2.1	4.2	7.2	11.3	18.1	61.7	
Temperature 2 m (C) Average	744	18.58	4.7	-	3.5	13.1	15.4	18	21.9	25.1	30.1	
Relative Humidity (%) Average	744	69.1	19	-	21	42	53	70	86	94	99	
Barometric Pressure (inHg) Average	744	28.77	0.1	-	28.5	28.6	28.7	28.7	28.9	29	29.1	
Wind Speed 10 m (km/h) Average	744	10	5	-	0	4	6	9	13	16	30	
Wind Direction 10 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-	

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - SHELL MUSKEG RIVER (AMS 16)
 JULY 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
AIR QUALITY ANALYZERS	04 Jul 2016 19:00	05 Jul 2016 10:00	16	Station power failure
AIR QUALITY ANALYZERS	09 Jul 2016 05:00	09 Jul 2016 06:00	2	Station power failure
SO2, THC	18 Jul 2016 16:00	18 Jul 2016 16:00	1	Maintenance - cleaned glass manifold
PM2.5	04 Jul 2016 19:00	04 Jul 2016 22:00	4	Station power failure
PM2.5	04 Jul 2016 23:00	05 Jul 2016 14:00	16	Unstable Operation following power failure



Wood Buffalo Environmental Association

Summary of Hour Averages

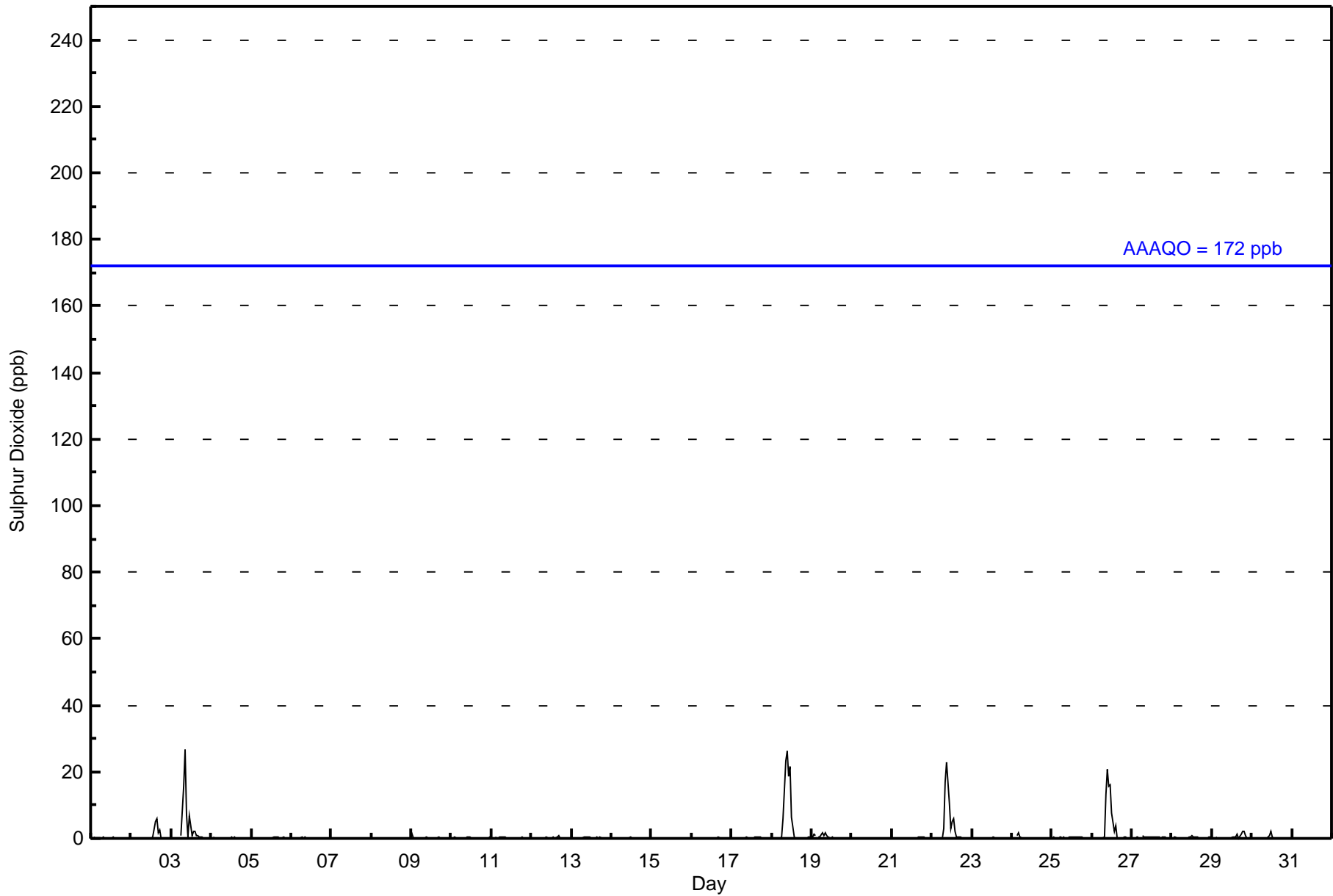
Sulphur Dioxide (SO₂) - ppb
Shell Muskeg River - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 27 ppb on Jul 3 09:00 Maximum Daily Average: 4.8 ppb on Jul 18																	Hours in Service: 744 Hours of Data: 693 Hours of Missing Data: 51 Hours of Calibration: 32 Percent Operational Time: 97.5									
Minimum Value: 0 ppb on Jul 1 16:00 Minimum Daily Average: 0.0 ppb on Jul 31 Maximum Diurnal Average: 2.8 ppb at hour 9 Minimum Diurnal Average: 0.1 ppb at hour 22 Monthly Average: 0.6 ppb Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 18																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
2-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	5	6	2	2	0	0	0	0	0	0	0	0.7	6
3-Jul	0	0	0	0	0	Z	1	16	27	7	0	7	1	2	2	1	1	0	0	0	0	0	0	2.8	27	
4-Jul	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	PF	PF	PF	PF	PF	PF	--	0
5-Jul	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	0	0	0	0	0	0	0	0	0	0	0	0	0	--	0	
6-Jul	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-Jul	0	0	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-Jul	0	0	0	0	Z	0	0	0	0	0	C	C	C	0	0	0	0	0	0	0	0	0	0	0.0	0	
9-Jul	1	0	0	0	PF	PF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	
10-Jul	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-Jul	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-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.2	1	
13-Jul	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-Jul	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-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
16-Jul	Z	0	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-Jul	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-Jul	0	0	Z	0	0	0	1	6	23	26	19	22	6	0	0	M	0	0	0	0	0	0	0	4.8	26	
19-Jul	1	1	1	Z	0	0	2	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2	
20-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
21-Jul	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	
22-Jul	Z	0	0	0	0	0	0	3	17	23	10	3	5	6	2	0	0	0	0	0	0	0	0	3.1	23	
23-Jul	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-Jul	0	0	Z	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	2	
25-Jul	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-Jul	0	0	0	0	Z	0	0	0	13	21	16	16	8	2	4	0	0	0	0	0	1	0	0	3.6	21	
27-Jul	0	0	0	0	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
28-Jul	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0.3	1	
29-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2	2	1	0	0	0	0.5	2	
30-Jul	0	0	Z	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0.2	2	
31-Jul	0	0	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 M - Maintenance 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 (SO₂) - ppb
Shell Muskeg River - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Shell Muskeg River - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	681	98.27	98.27
11 - 20	6	0.87	99.13
21 - 60	6	0.87	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 693

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Shell Muskeg River - July 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	70	68	74	35	16	8	18	41	73	72	33	42	35	24	26	46	681
11 - 20	0	0	0	0	0	0	0	0	1	5	0	0	0	0	0	0	6
21 - 60	0	0	0	0	0	0	1	0	1	3	1	0	0	0	0	0	6
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	70	68	74	35	16	8	19	41	75	80	34	42	35	24	26	46	693

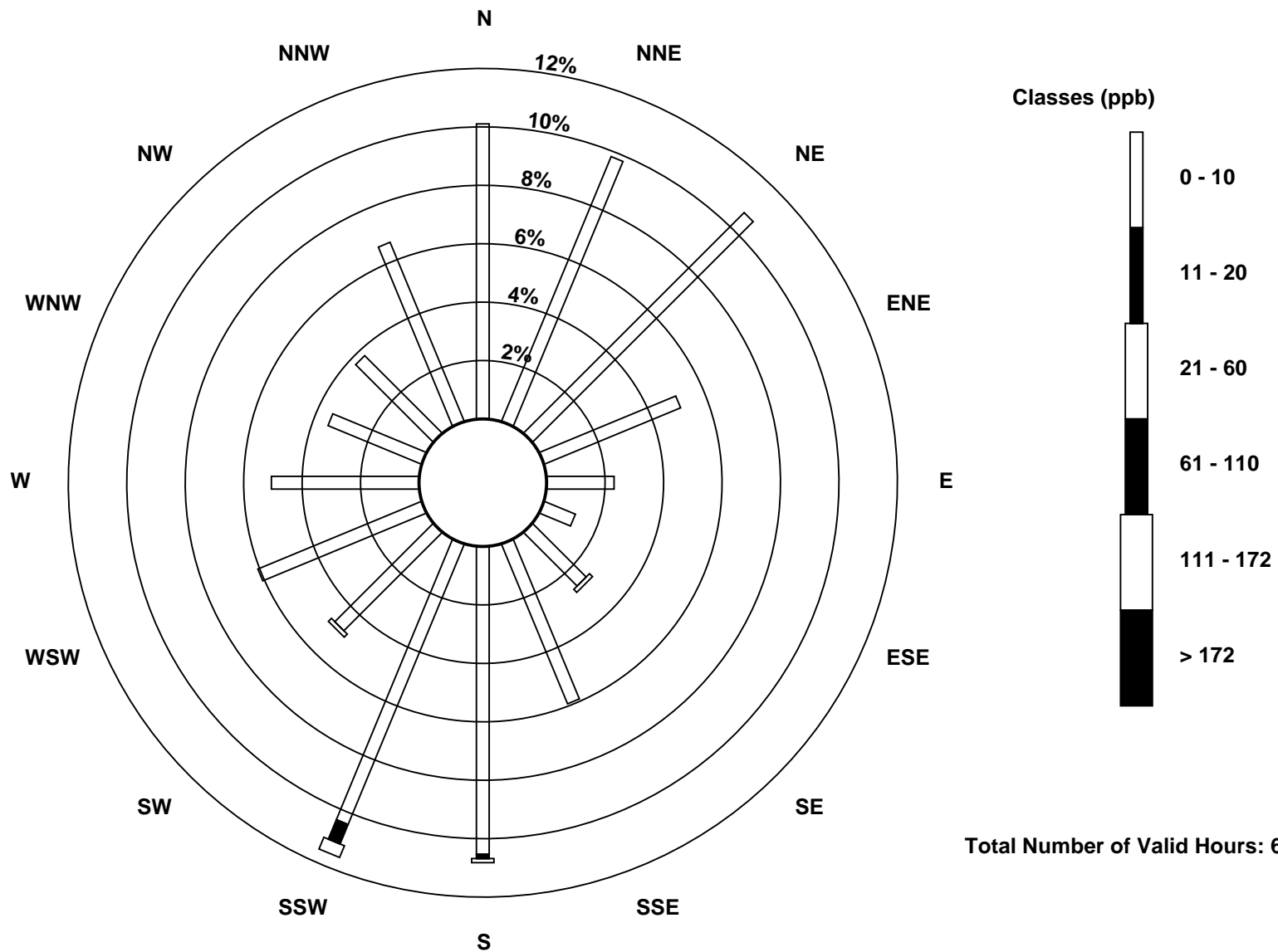
Total Number of Valid Hours: 693

Total Number of Hours: 744

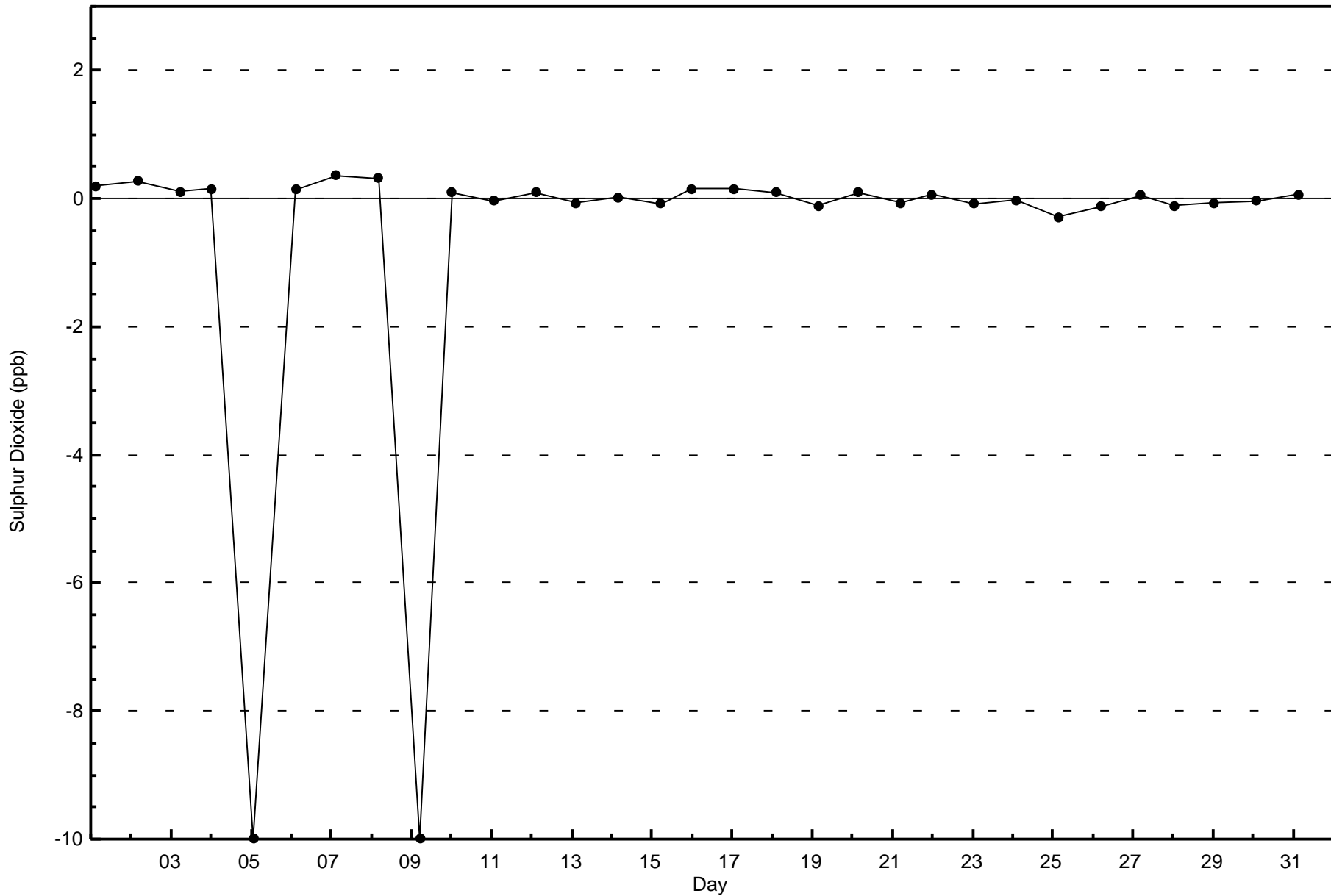


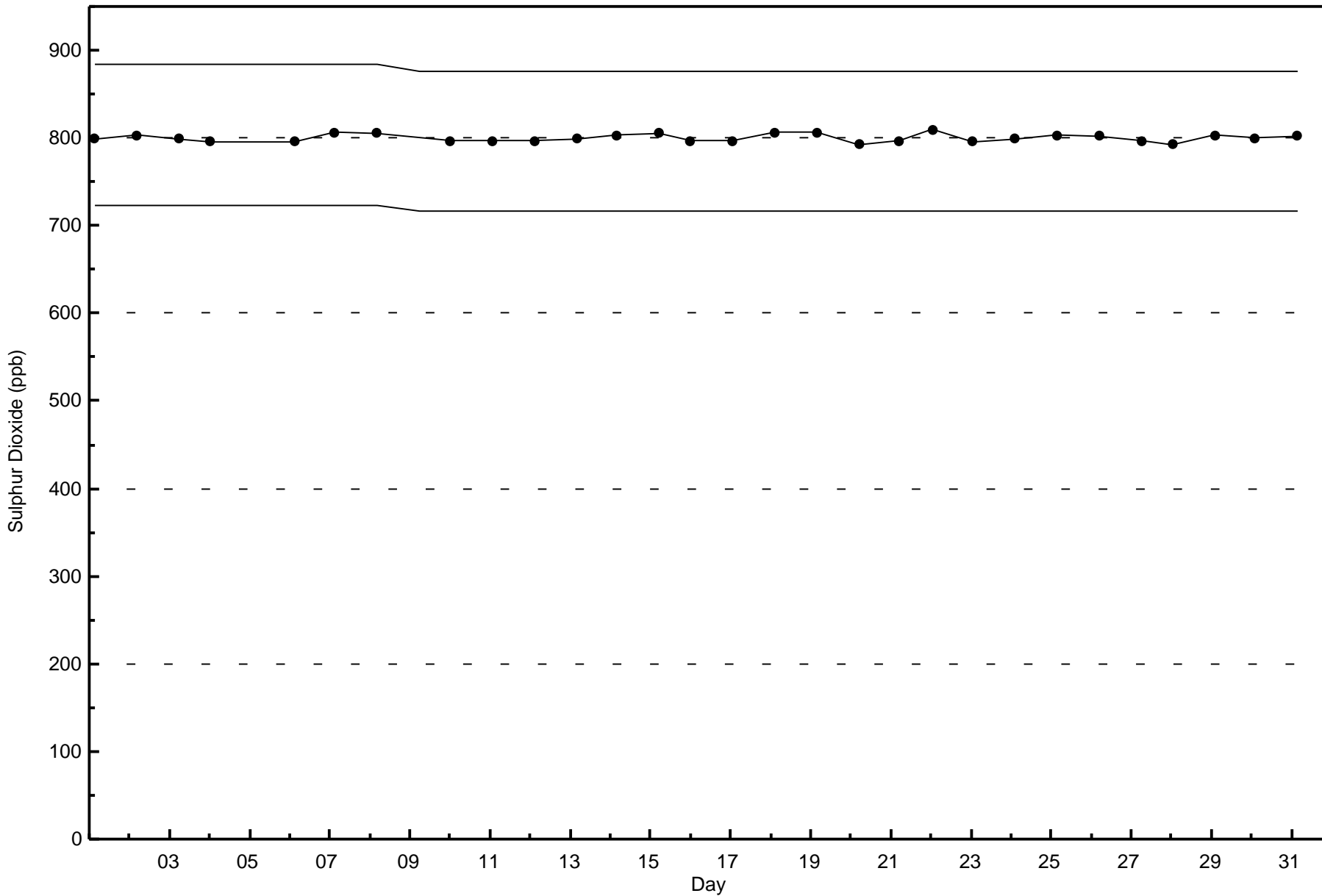
Wood Buffalo Environmental Association
Wind Rose Jul 2016

Sulphur Dioxide (SO₂) - ppb
Shell Muskeg River (AMS 16)



Total Number of Valid Hours: 693







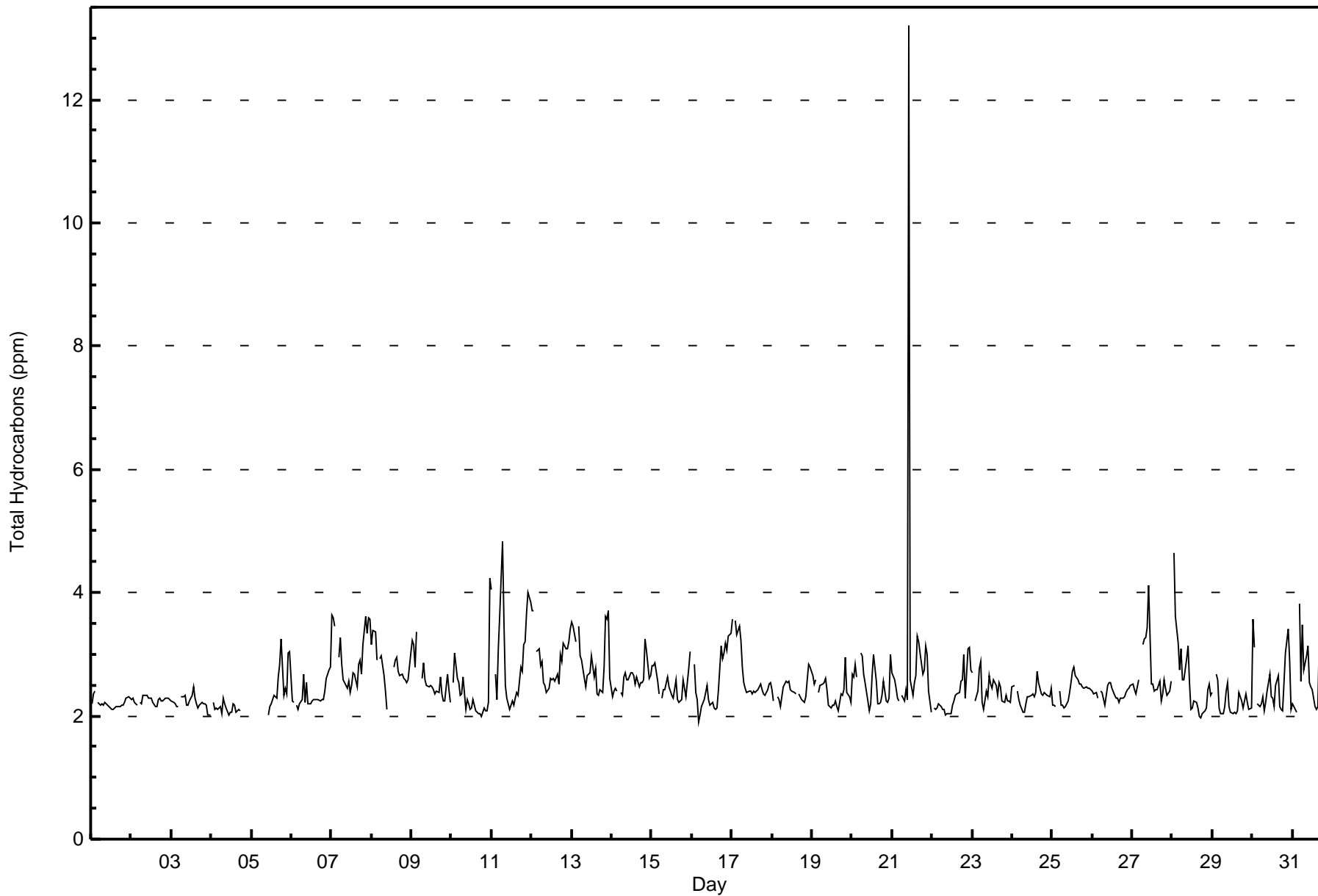
Wood Buffalo Environmental Association

Summary of Hour Averages

Total Hydrocarbons (THC) - ppm

Shell Muskeg River - July 2016

Maximum Value: 13.2 ppm on Jul 21 11:00																			Maximum Daily Average: 3.1 ppm on Jul 21						Hours in Service: 744		
Minimum Value: 1.9 ppm on Jul 16 05:00																			Minimum Daily Average: 2.2 ppm on Jul 1						Hours of Data: 693		
Maximum Diurnal Average: 2.8 ppm at hour 1																			Minimum Diurnal Average: 2.3 ppm at hour 12						Hours of Missing Data: 51		
Monthly Average: 2.52 ppm																			Percentiles: P ₁ = 2.0 P ₁₀ = 2.1 Q ₁ = 2.2 Median = 2.4 Q ₃ = 2.6 P ₉₀ = 3.1 P ₉₉ = 4.0						Hours of Calibration: 32		
																									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-Jul	2.2	2.4	2.4	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	2.2	2.2	2.2	2.3	2.3	2.3	2.2	2.4	
2-Jul	2.3	2.3	2.2	2.2	Z	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.1	2.3	2.3	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	
3-Jul	2.2	2.2	2.2	2.2	2.1	Z	2.3	2.3	2.3	2.2	2.2	2.2	2.3	2.5	2.3	2.2	2.1	2.2	2.2	2.2	2.2	2.0	2.0	2.0	2.0	2.0	
4-Jul	Z	2.2	2.1	2.1	2.1	2.2	2.0	2.3	2.2	2.1	2.0	2.0	2.1	2.2	2.2	2.1	2.1	2.1	PF	PF	PF	PF	PF	PF	PF	PF	
5-Jul	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	2.0	2.2	2.2	2.3	2.3	2.3	2.6	2.8	3.2	2.3	2.4	2.4	3.0	3.0	--	3.2	
6-Jul	2.2	2.2	Z	2.2	2.1	2.2	2.3	2.7	2.2	2.5	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.2	2.3	2.3	2.4	2.6	2.7	2.8	2.3	2.8	
7-Jul	3.6	3.6	3.4	Z	2.9	3.3	2.8	2.6	2.5	2.4	2.6	2.4	2.5	2.7	2.7	2.5	2.8	2.9	2.7	3.2	3.6	3.3	3.6	3.6	3.0	3.6	
8-Jul	3.1	3.4	3.4	2.9	Z	2.9	3.0	2.7	2.4	2.1	C	C	C	2.8	2.9	3.0	2.7	2.7	2.7	2.6	2.6	2.5	2.6	3.0	2.8	3.4	
9-Jul	3.2	3.2	2.8	3.4	PF	PF	2.6	2.9	2.6	2.5	2.5	2.5	2.5	2.4	2.4	2.4	2.4	2.6	2.4	2.3	2.3	2.7	2.4	2.2	2.6	3.4	
10-Jul	Z	2.5	3.0	2.6	2.5	2.3	2.4	2.6	2.1	2.3	2.2	2.1	2.1	2.3	2.1	2.1	2.0	2.0	2.0	2.1	2.1	2.1	2.2	4.2	2.3	4.2	
11-Jul	4.0	Z	2.7	2.3	3.1	3.6	4.8	3.5	2.5	2.3	2.2	2.1	2.2	2.2	2.3	2.4	2.3	2.8	2.7	3.2	3.2	3.7	4.0	3.8	3.0	4.8	
12-Jul	3.7	3.7	Z	3.0	3.1	2.8	2.9	2.5	2.5	2.4	2.4	2.6	2.6	2.6	2.6	2.7	2.5	3.0	2.9	3.2	3.1	3.1	3.2	3.4	2.9	3.7	
13-Jul	3.5	3.5	3.2	Z	3.5	3.0	2.9	2.6	2.5	2.7	2.7	2.7	3.0	2.6	2.8	2.4	2.3	2.4	2.4	2.8	3.6	3.6	3.7	2.6	2.9	3.7	
14-Jul	2.3	2.4	2.4	2.4	Z	2.4	2.3	2.6	2.7	2.6	2.6	2.7	2.7	2.5	2.6	2.5	2.6	2.5	2.6	2.6	3.3	3.1	2.6	2.6	2.6	3.3	
15-Jul	2.8	2.8	2.9	2.6	2.4	Z	2.3	2.4	2.4	2.6	2.5	2.4	2.3	2.3	2.6	2.3	2.2	2.2	2.3	2.6	2.3	2.5	2.8	3.0	2.5	3.0	
16-Jul	Z	2.8	2.4	2.3	1.9	2.0	2.2	2.3	2.4	2.5	2.3	2.2	2.2	2.1	2.1	2.1	2.4	3.1	2.9	3.0	3.2	3.1	3.3	3.3	2.5	3.3	
17-Jul	3.6	Z	3.5	3.3	3.5	3.2	2.8	2.5	2.5	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.5	2.5	2.4	2.3	2.3	2.4	2.5	2.5	2.7	3.6	
18-Jul	2.4	2.2	Z	2.3	2.3	2.2	2.3	2.5	2.6	2.5	2.6	2.4	2.4	2.4	2.4	M	2.4	2.3	2.3	2.2	2.3	2.6	2.8	2.8	2.4	2.8	
19-Jul	2.7	2.5	2.6	Z	2.4	2.5	2.5	2.5	2.6	2.4	2.2	2.1	2.2	2.2	2.2	2.2	2.1	2.4	2.3	2.4	3.0	2.4	2.3	2.2	2.4	3.0	
20-Jul	2.7	2.6	2.8	2.6	Z	3.0	3.0	2.7	2.5	2.2	2.1	2.2	2.7	3.0	2.6	2.2	2.2	2.2	2.3	2.6	2.2	2.2	2.3	3.0	2.5	3.0	
21-Jul	2.7	2.6	2.5	2.3	2.2	Z	2.3	2.2	2.4	2.3	13.2	2.6	2.3	2.5	2.7	3.3	3.2	3.0	2.7	2.7	3.1	3.0	2.4	2.1	3.1	13.2	
22-Jul	Z	2.1	2.1	2.1	2.2	2.2	2.1	2.1	2.0	2.0	2.0	2.0	2.2	2.2	2.3	2.4	2.4	2.6	2.6	3.0	2.3	3.1	3.1	2.7	2.3	3.1	
23-Jul	2.7	Z	2.2	2.4	2.8	2.9	2.2	2.1	2.4	2.3	2.7	2.5	2.5	2.6	2.5	2.3	2.5	2.5	2.2	2.2	2.3	2.2	2.2	2.2	2.4	2.9	
24-Jul	2.5	2.5	Z	2.4	2.3	2.2	2.1	2.1	2.2	2.3	2.3	2.3	2.3	2.3	2.4	2.7	2.5	2.3	2.3	2.4	2.4	2.3	2.3	2.4	2.3	2.7	
25-Jul	2.2	2.2	2.2	Z	2.4	2.2	2.2	2.1	2.2	2.2	2.4	2.5	2.7	2.8	2.7	2.6	2.5	2.5	2.5	2.4	2.5	2.5	2.4	2.4	2.4	2.4	2.8
26-Jul	2.4	2.4	2.4	2.3	Z	2.4	2.4	2.2	2.3	2.5	2.5	2.5	2.4	2.3	2.3	2.3	2.2	2.3	2.3	2.3	2.4	2.4	2.4	2.5	2.4	2.5	
27-Jul	2.5	2.4	2.4	2.5	2.6	Z	3.2	3.2	3.3	3.4	4.1	2.5	2.5	2.4	2.4	2.4	2.6	2.2	2.4	2.6	2.4	2.3	2.4	2.6	2.7	4.1	
28-Jul	Z	4.6	3.6	3.2	2.7	3.1	2.6	2.6	2.9	3.1	2.5	2.1	2.1	2.2	2.2	2.1	2.0	2.0	2.0	2.1	2.1	2.4	2.5	2.3	2.6	4.6	
29-Jul	2.4	Z	2.7	2.6	2.1	2.0	2.0	2.1	2.4	2.5	2.1	2.1	2.0	2.1	2.0	2.1	2.4	2.2	2.1	2.2	2.4	2.2	2.1	2.1	2.2	2.7	
30-Jul	3.6	3.1	Z	2.2	2.1	2.2	2.3	2.1	2.2	2.4	2.7	2.3	2.3	2.2	2.5	2.7	2.2	2.1	2.1	2.5	3.0	3.4	2.9	2.1	2.5	3.6	
31-Jul	2.2	2.2	2.1	Z	3.8	2.6	3.5	2.8	3.0	3.1	2.5	2.5	2.4	2.2	2.1	2.1	3.3	3.1	2.6	2.2	2.2	2.1	2.1	2.2	2.6	3.8	
2.8 2.7 2.6 2.5 2.6 2.5 2.6 2.5 2.4 2.5 2.8 2.3 2.4 2.4 2.4 2.4 2.4 2.5 2.4 2.5 2.6 2.6 2.7 2.7																								Diurnal Average			
4.0 4.6 3.6 3.4 3.8 3.6 4.8 3.5 3.3 3.4 13.2 2.7 3.0 3.0 2.9 3.3 3.3 3.1 3.2 3.2 3.6 3.7 4.0 4.2																								Diurnal Maximum			
Z - zerospan			C - Calibration			M - Maintenance			PF - Power Failure																		





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Shell Muskeg River - July 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	22	3.17	3.17
2.1 - 3.0	593	85.57	88.74
3.1 - 10.0	77	11.11	99.86
> 10.0	1	0.14	100.00

Total Number of Valid Hours: 693

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Shell Muskeg River - July 2016**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	0	0	3	2	2	0	0	2	3	7	0	1	2	0	0	0	22
2.1 - 3.0	42	63	71	32	13	8	19	37	67	72	32	40	33	24	25	15	593
3.1 - 10.0	28	5	0	1	1	0	0	2	5	1	1	1	0	0	1	31	77
> 10.0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Totals	70	68	74	35	16	8	19	41	75	80	34	42	35	24	26	46	693

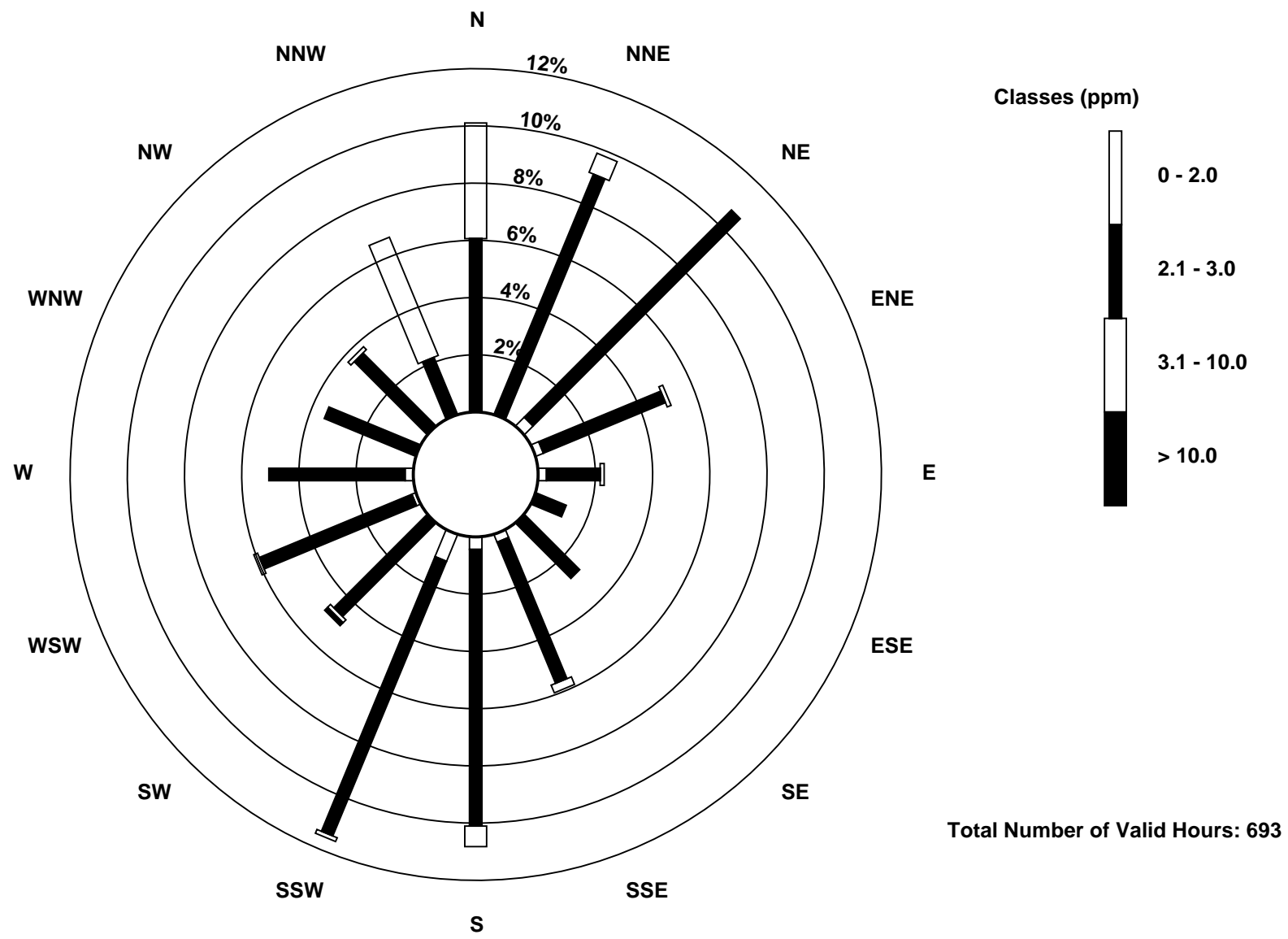
Total Number of Valid Hours: 693

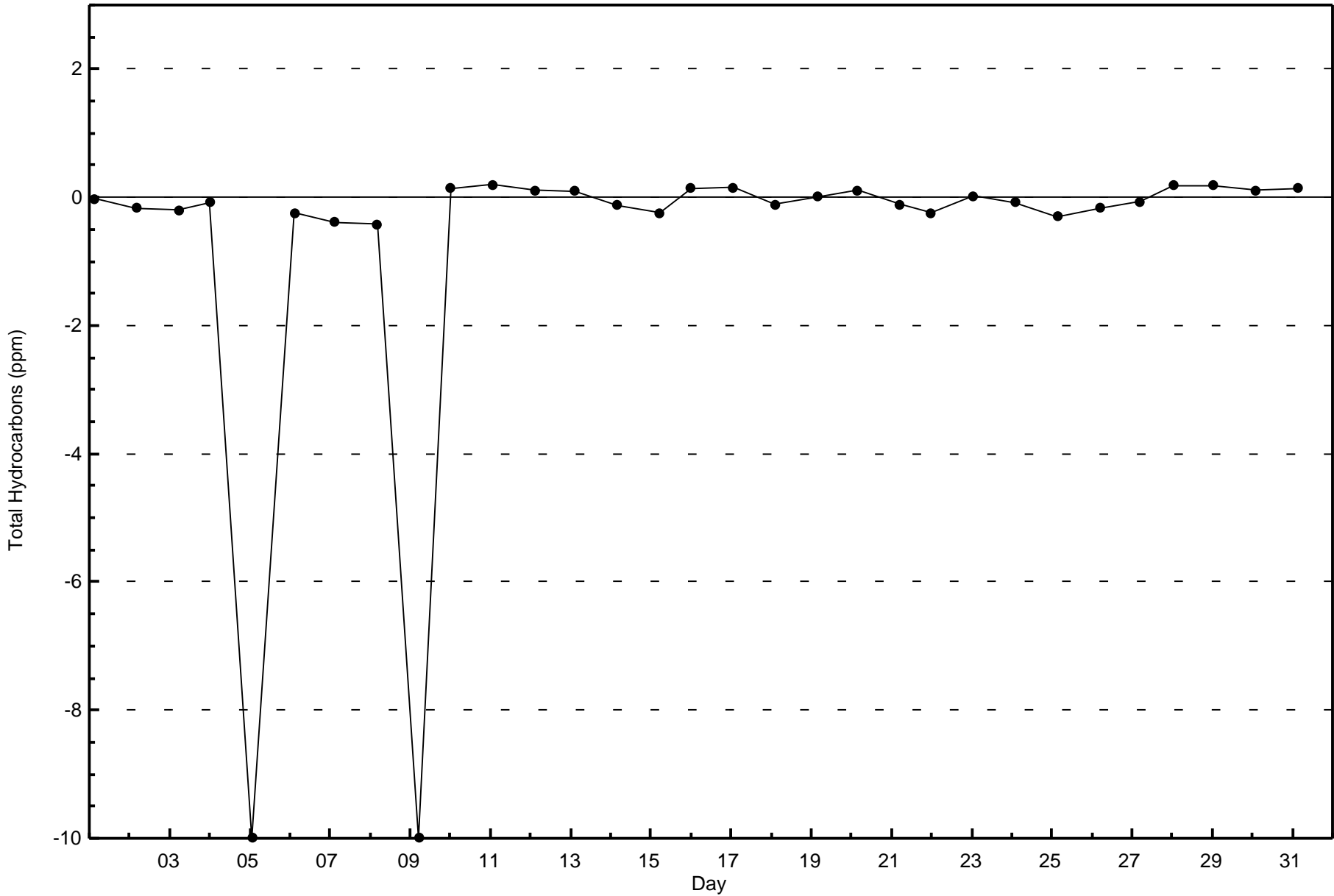
Total Number of Hours: 744

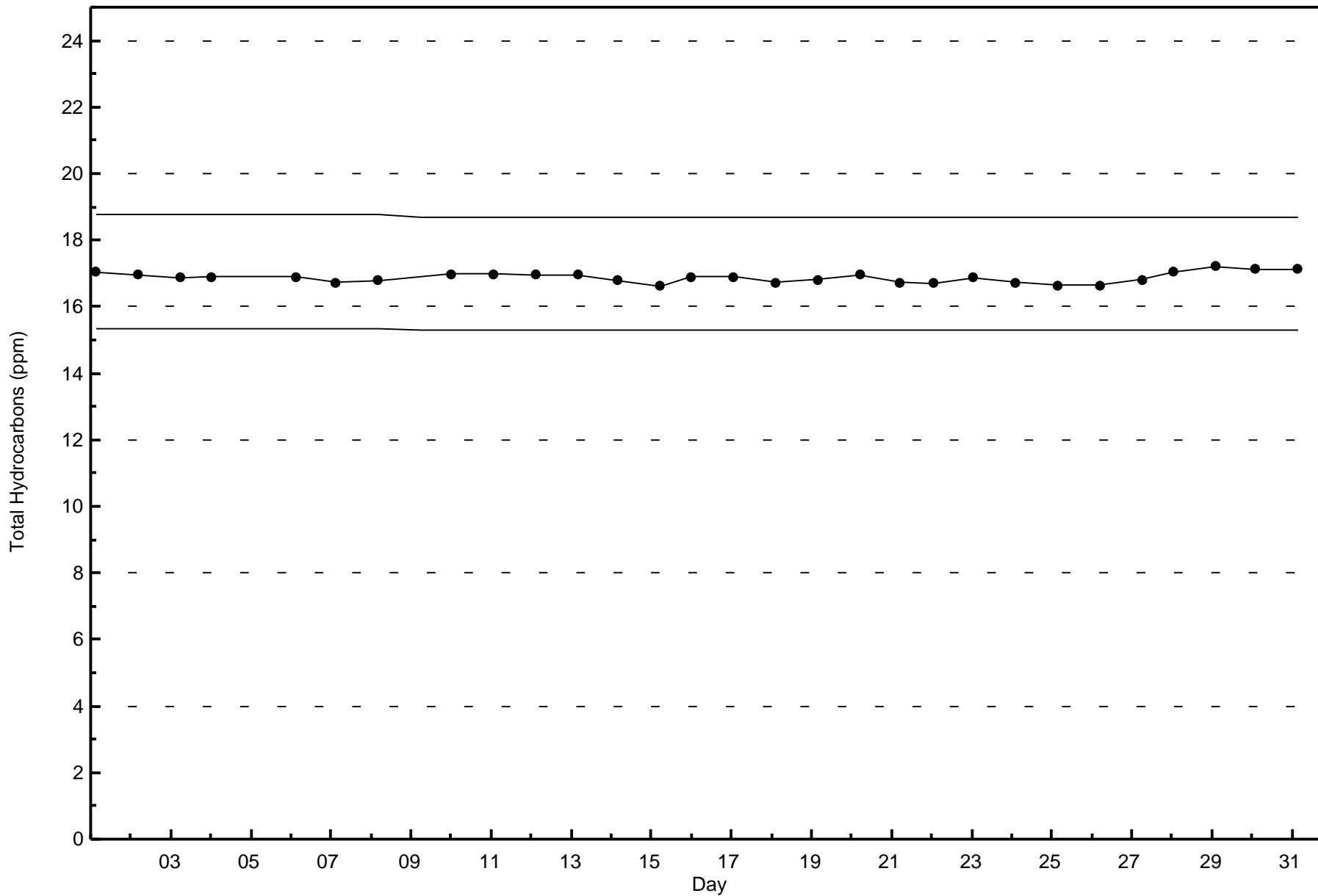


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Total Hydrocarbons (THC) - ppm
Shell Muskeg River (AMS 16)







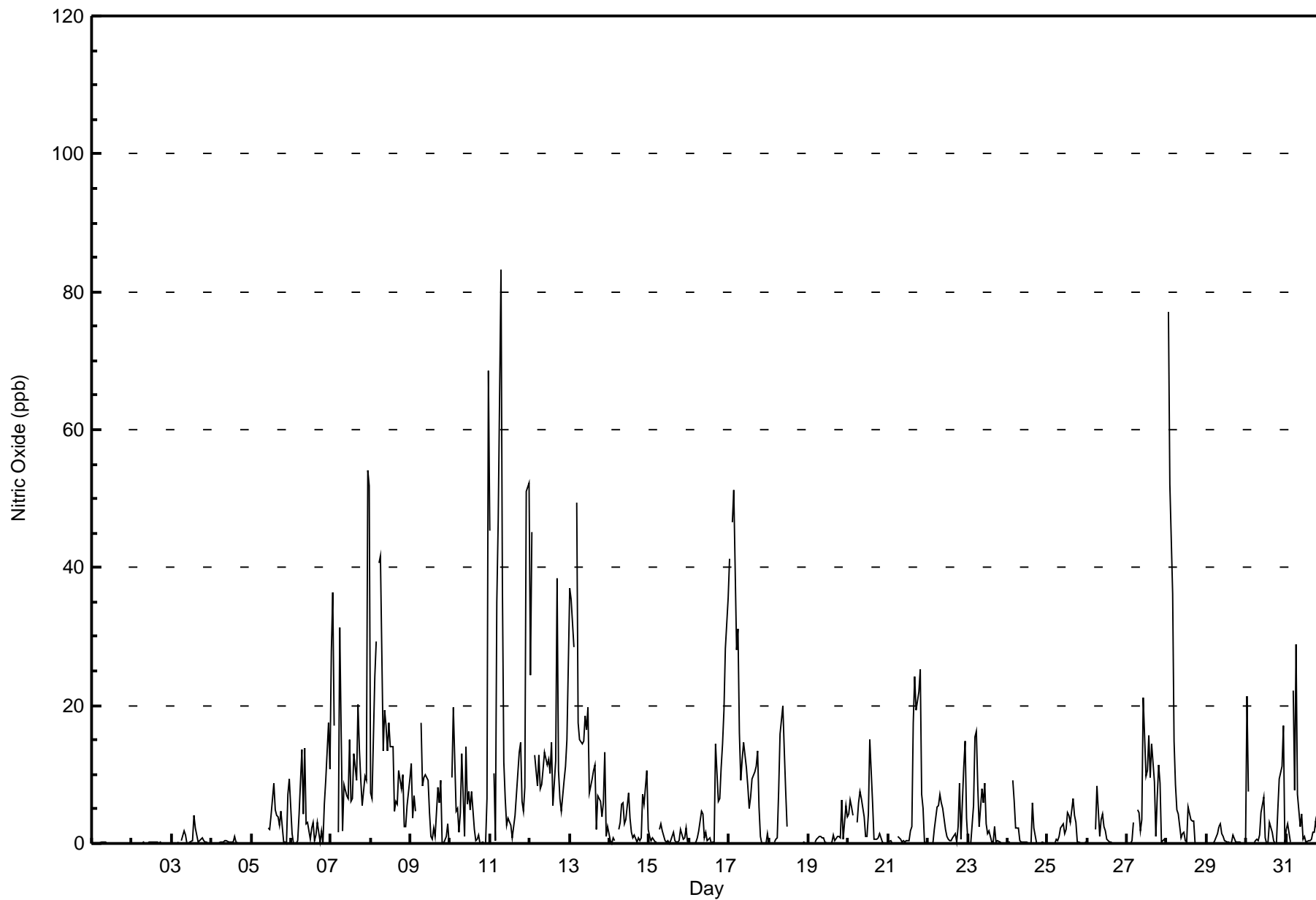


Maximum Value: 83 ppb on Jul 11 07:00														Maximum Daily Average: 19.6 ppb on Jul 11														Hours in Service: 744	
Minimum Value: 0 ppb on Jul 1 01:00														Minimum Daily Average: 0.1 ppb on Jul 1														Hours of Data: 693	
Maximum Diurnal Average: 10.2 ppb at hour 7														Minimum Diurnal Average: 2.9 ppb at hour 13														Hours of Missing Data: 51	
Monthly Average: 5.7 ppb														Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 7 P ₉₀ = 15 P ₉₉ = 52														Hours of Calibration: 33	
																												Percent Operational Time: 97.6	
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-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0			
2-Jul	0	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-Jul	0	0	0	0	0	Z	0	2	1	0	0	0	0	4	2	1	0	0	0	1	0	0	0	0	0.6	4			
4-Jul	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	PF	PF	PF	PF	PF	PF	--	1		
5-Jul	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	2	2	4	9	5	4	4	3	5	0	0	0	0	7	9	--	9		
6-Jul	1	0	Z	0	0	4	14	4	14	3	3	1	2	3	0	1	3	0	2	0	6	9	17	11	4.3	17			
7-Jul	28	37	17	Z	2	31	16	2	9	7	7	15	6	6	13	9	20	14	9	6	10	9	54	52	16.4	54			
8-Jul	7	7	24	29	Z	41	42	13	19	17	14	18	14	14	5	6	6	11	8	10	3	3	5	9	14.1	42			
9-Jul	12	4	7	5	PF	PF	18	8	10	10	9	5	1	1	2	1	8	6	9	0	0	1	3	0	5.4	18			
10-Jul	Z	10	20	5	5	2	4	13	1	14	6	8	5	8	2	0	1	1	0	0	0	0	7	69	7.7	69			
11-Jul	45	Z	10	0	35	47	83	37	12	6	3	4	3	1	2	4	7	13	15	6	5	8	51	52	19.6	83			
12-Jul	24	45	Z	13	8	13	8	9	11	13	11	12	10	15	5	12	38	11	6	5	9	11	15	26	14.4	45			
13-Jul	37	35	28	Z	49	17	15	14	15	19	16	20	7	9	11	11	2	7	6	4	6	13	1	2	15.1	49			
14-Jul	0	0	1	0	Z	2	3	6	6	3	3	7	4	2	1	1	0	1	0	1	7	6	11	2	2.9	11			
15-Jul	1	0	1	0	0	Z	2	3	2	0	0	0	0	0	2	0	0	0	0	2	1	1	2	0	0.9	3			
16-Jul	Z	0	0	0	0	1	2	5	4	1	2	0	1	0	0	0	14	6	6	11	14	19	28	36	6.6	36			
17-Jul	41	Z	47	51	28	31	16	9	12	15	11	8	5	7	9	10	11	13	5	1	0	0	0	1	14.5	51			
18-Jul	0	0	Z	0	1	1	7	16	20	14	8	2	C	C	C	C	0	0	0	0	0	0	0	0	3.6	20			
19-Jul	0	0	0	Z	0	1	1	1	1	1	0	0	0	0	0	1	0	1	1	1	6	1	5	4	1.1	6			
20-Jul	4	6	5	4	Z	3	6	7	7	4	1	1	4	15	6	1	1	1	1	1	0	0	0	0	3.4	15			
21-Jul	0	0	0	0	0	Z	1	1	0	0	0	0	0	2	2	18	24	19	22	25	7	5	0	0	5.6	25			
22-Jul	Z	0	0	0	2	5	6	7	6	5	2	1	1	0	0	1	1	0	2	9	1	11	15	4	3.5	15			
23-Jul	0	Z	0	6	15	16	8	2	8	6	9	3	1	2	0	0	3	0	0	0	0	0	0	0	3.5	16			
24-Jul	0	0	Z	9	6	2	2	0	0	0	0	0	0	0	0	6	2	0	0	0	0	0	0	0	1.3	9			
25-Jul	0	0	0	Z	0	1	0	1	2	3	2	2	4	4	3	6	4	3	0	0	0	0	0	0	1.6	6			
26-Jul	0	0	0	0	Z	2	8	1	3	4	2	2	1	0	0	0	0	0	0	0	0	0	0	0	1.1	8			
27-Jul	0	0	0	0	3	Z	5	4	2	3	21	10	11	16	10	14	9	1	7	11	9	0	1	0	6.0	21			
28-Jul	Z	77	52	36	15	9	5	4	1	1	2	0	0	5	3	3	3	0	0	0	0	0	0	0	9.5	77			
29-Jul	0	Z	0	0	0	0	1	3	3	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0.5	3			
30-Jul	21	8	Z	0	0	0	1	0	1	4	7	1	0	0	3	2	0	0	0	5	9	11	17	0	4.0	21			
31-Jul	2	3	0	Z	22	8	29	7	2	4	1	1	0	0	0	1	2	2	3	0	0	0	0	1	3.9	29			
																								Diurnal Average					
																								Diurnal Maximum					
9.1 8.9 8.5 6.7 8.1 9.5 10.2 6.0 5.7 5.3 4.6 4.0 2.9 4.1 3.0 3.9 5.4 3.7 3.7 3.3 3.1 3.6 8.0 9.3																													
45 77 52 51 49 47 83 37 20 19 21 20 14 16 13 18 38 19 22 25 14 19 54 69																													
Z - zerospan C - Calibration PF - Power Failure																													



Wood Buffalo Environmental Association
Hourly Averages

Nitric Oxide (NO) - ppb
Shell Muskeg River - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitric Oxide (NO) - ppb
Shell Muskeg River - July 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	651	93.94	93.94
21 - 40	25	3.61	97.55
41 - 80	16	2.31	99.86
81 - 159	1	0.14	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 693

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitric Oxide (NO) - ppb
Shell Muskeg River - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	61	65	77	34	16	8	19	40	74	77	34	42	35	24	26	19	651
21 - 40	8	3	0	0	0	0	0	1	0	0	0	0	0	0	0	13	25
41 - 80	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0	13	16
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	70	68	77	35	16	8	19	41	75	77	34	42	35	24	26	46	693

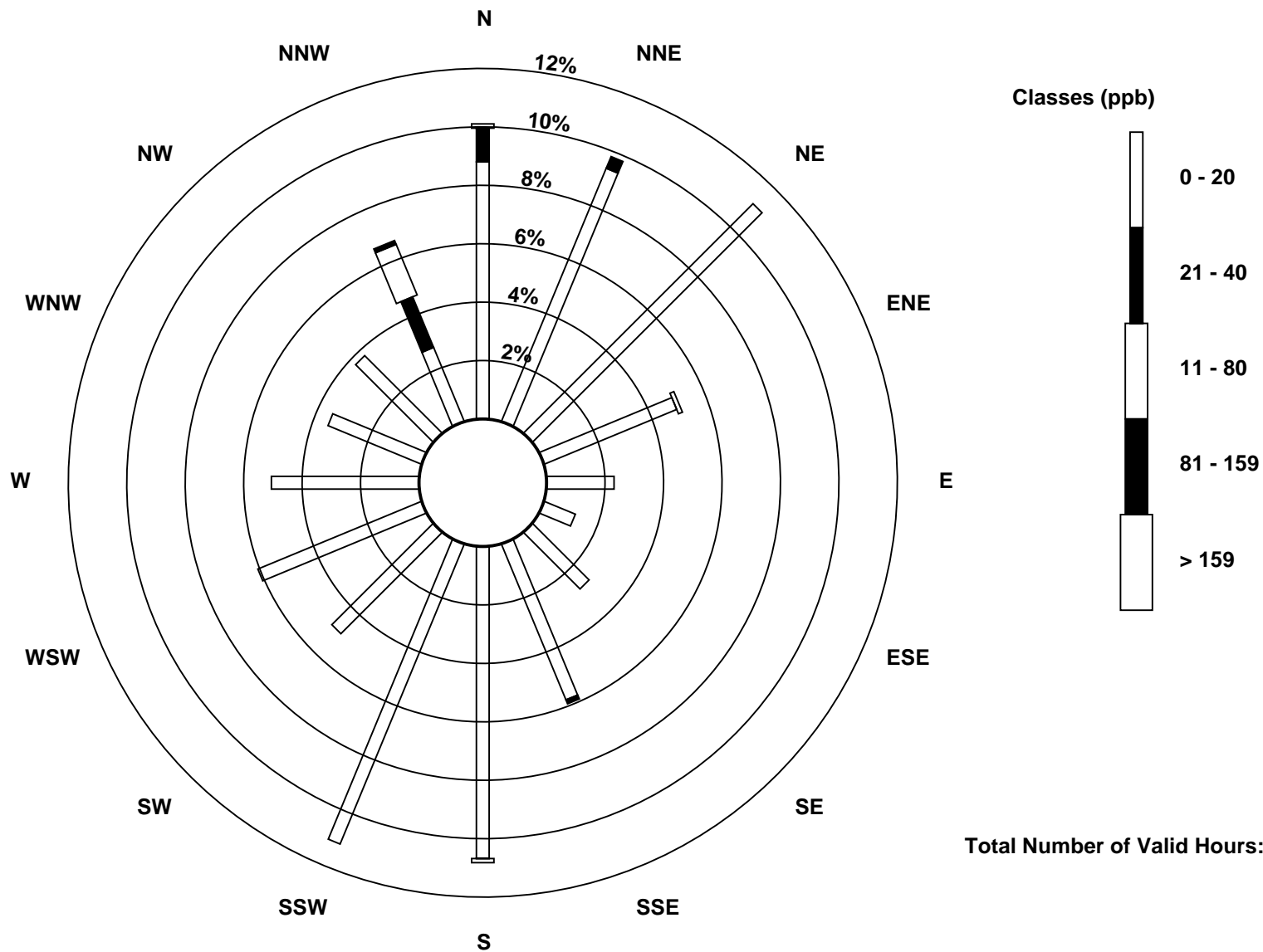
Total Number of Valid Hours: 693

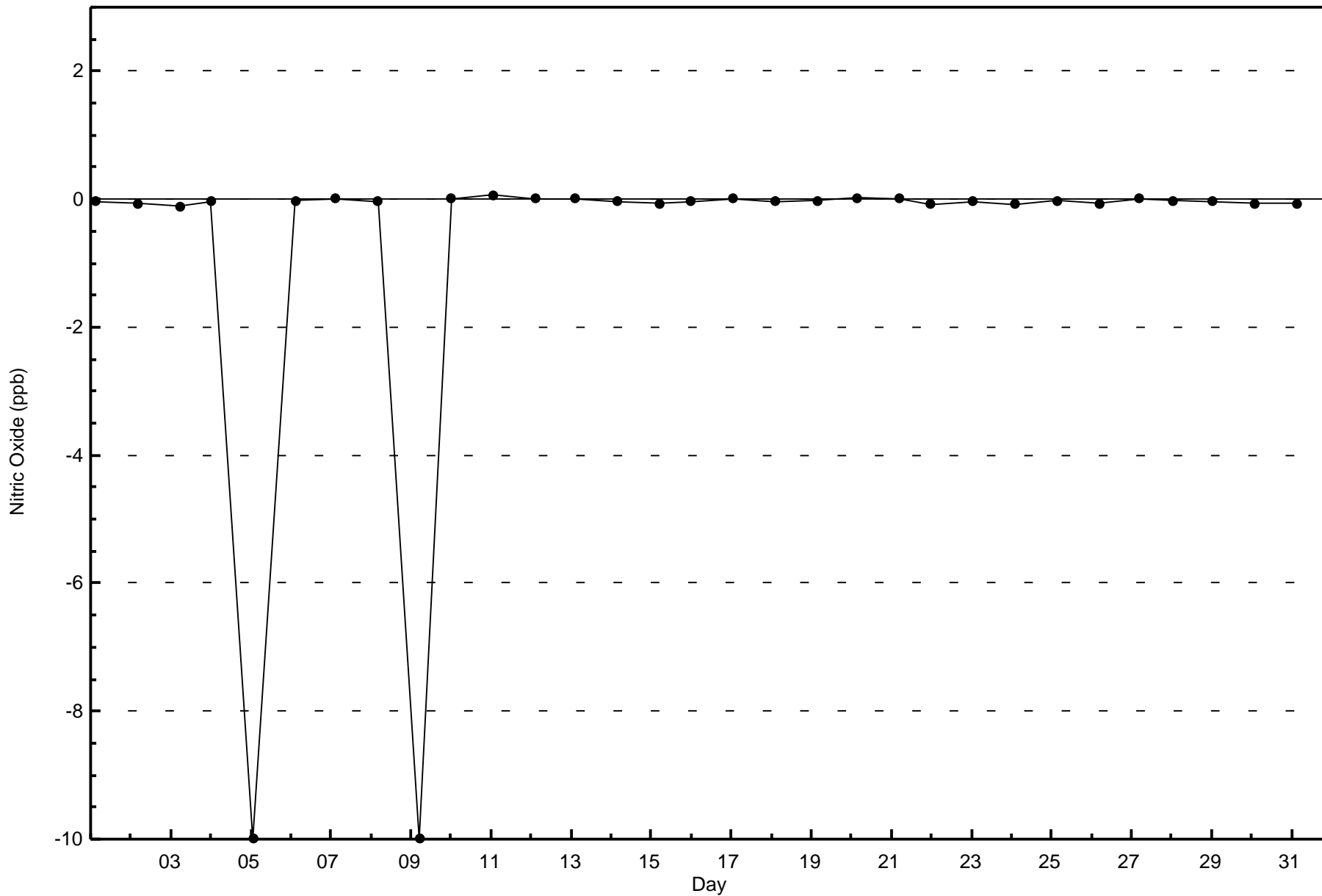
Total Number of Hours: 744

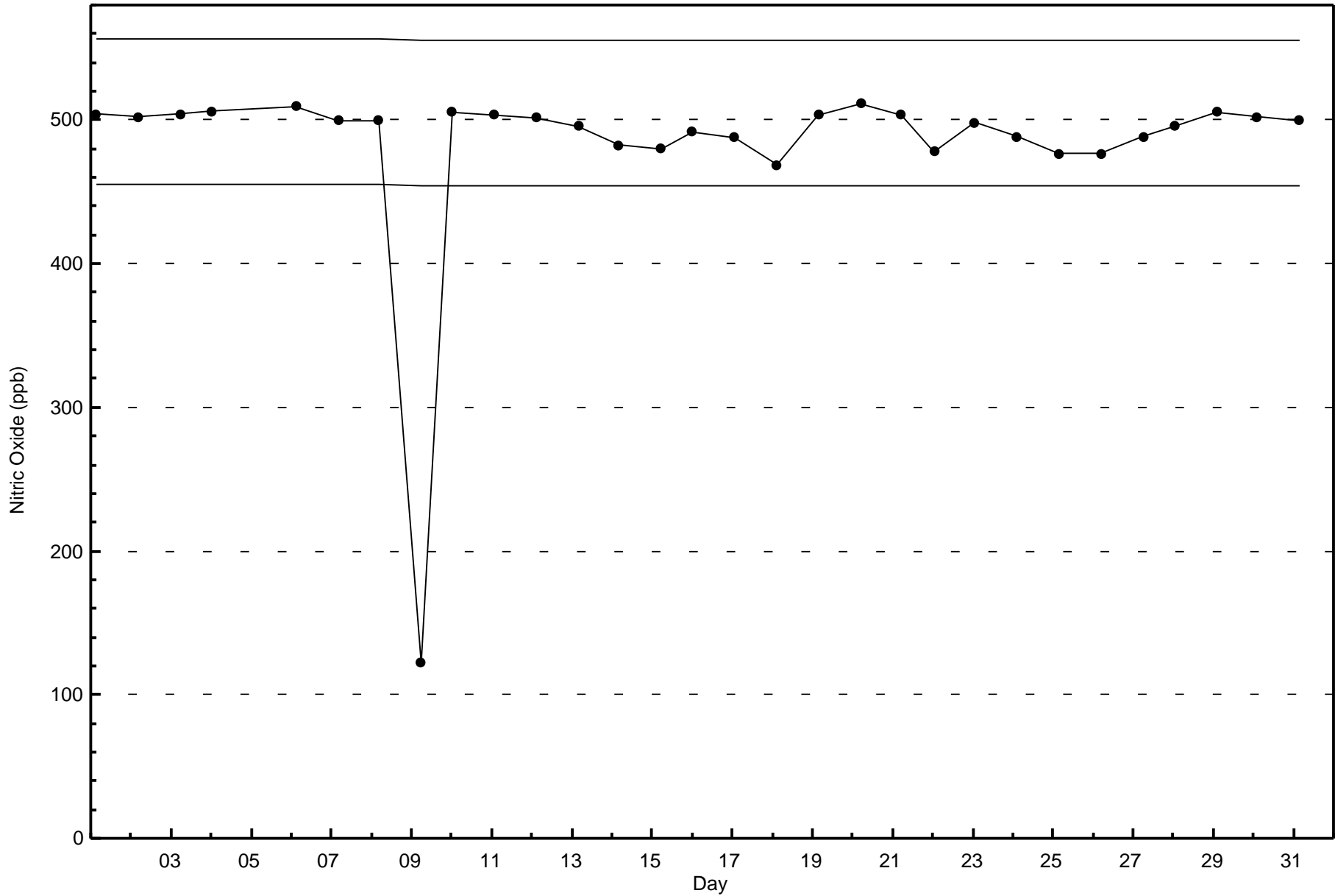


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Nitric Oxide (NO) - ppb
Shell Muskeg River (AMS 16)









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

Shell Muskeg River - July 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 29 ppb on Jul 17 04:00	Maximum Daily Average: 13.3 ppb on Jul 12		Hours of Data:	693
Minimum Value: 0 ppb on Jul 1 09:00	Minimum Daily Average: 0.4 ppb on Jul 2		Hours of Missing Data:	51
Maximum Diurnal Average: 9.0 ppb at hour 23	Minimum Diurnal Average: 3.3 ppb at hour 13		Hours of Calibration:	33
Monthly Average: 5.9 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 4 O ₃ = 8 P ₉₀ = 14 P ₉₉ = 24		Percent Operational Time:	97.6

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-Jul	1	3	3	Z	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0.5	3
2-Jul	0	2	2	2	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0.4	2
3-Jul	0	0	0	0	1	Z	0	4	3	0	0	3	2	7	7	6	1	2	5	8	8	5	1	1	2.7	8
4-Jul	Z	1	1	1	1	1	0	0	1	0	0	0	0	0	3	0	0	0	PF	PF	PF	PF	PF	PF	--	3
5-Jul	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	3	2	5	11	8	7	10	9	17	3	5	5	17	16	--	17
6-Jul	4	8	Z	4	3	7	9	3	7	3	3	2	2	2	1	2	2	0	3	1	7	12	16	15	5.0	16
7-Jul	22	22	18	Z	4	21	12	3	11	7	7	8	6	6	8	4	8	6	5	5	8	7	13	13	9.7	22
8-Jul	7	7	8	10	Z	11	10	6	8	7	5	7	8	10	7	10	7	9	5	7	3	3	5	13	7.4	13
9-Jul	13	5	8	7	PF	PF	7	5	5	6	8	7	3	3	5	4	10	6	7	1	1	4	3	2	5.3	13
10-Jul	Z	12	15	9	6	1	6	10	1	11	5	8	4	6	2	1	1	1	0	1	0	4	6	19	5.6	19
11-Jul	15	Z	9	2	13	15	23	18	10	4	2	3	3	3	5	7	6	11	13	12	11	14	24	23	10.6	24
12-Jul	21	22	Z	13	10	9	7	6	8	7	8	8	8	12	6	11	22	13	13	11	20	23	24	25	13.3	25
13-Jul	25	24	25	Z	24	18	14	9	8	10	9	10	8	9	8	7	2	6	6	7	15	21	6	4	12.0	25
14-Jul	1	1	4	5	Z	3	2	7	8	6	6	12	8	5	3	3	1	2	2	4	21	20	24	14	7.0	24
15-Jul	12	7	6	3	2	Z	2	3	2	1	0	0	0	0	4	1	0	0	3	11	8	14	17	6	4.4	17
16-Jul	Z	0	0	0	1	5	7	8	6	2	5	2	5	0	0	1	11	16	14	17	21	23	23	22	8.2	23
17-Jul	22	Z	29	29	26	25	18	12	9	9	7	6	4	7	8	10	12	14	7	1	0	0	2	6	11.4	29
18-Jul	4	4	Z	9	10	4	9	15	18	19	15	7	C	C	C	C	1	0	0	1	4	10	12	7	7.9	19
19-Jul	10	7	8	Z	5	4	5	5	4	4	1	0	0	0	1	6	3	7	7	6	18	6	8	5	5.3	18
20-Jul	7	7	12	16	Z	9	13	14	6	4	2	2	10	22	11	3	3	2	5	11	3	1	2	6	7.4	22
21-Jul	5	4	2	1	4	Z	4	3	1	1	1	1	1	3	5	12	10	12	11	15	9	9	4	3	5.2	15
22-Jul	Z	2	2	5	8	7	5	6	6	6	5	2	2	2	2	3	4	2	7	18	7	19	20	14	6.7	20
23-Jul	5	Z	1	3	8	10	5	1	4	4	9	5	4	7	2	2	7	1	1	1	1	1	1	1	3.5	10
24-Jul	5	4	Z	9	8	5	4	1	0	0	0	0	0	0	0	6	5	1	1	1	1	6	2	1	2.5	9
25-Jul	1	1	2	Z	1	2	1	1	3	2	2	3	5	5	4	5	3	2	1	1	2	1	2	4	2.3	5
26-Jul	6	5	4	2	Z	3	5	1	4	7	6	6	3	2	2	0	0	0	0	1	2	3	9	14	3.7	14
27-Jul	14	7	6	14	15	Z	10	10	8	12	21	6	6	9	5	7	6	1	4	7	7	1	2	2	7.8	21
28-Jul	Z	10	8	7	4	4	5	4	2	4	3	1	1	7	7	8	4	0	0	0	0	4	10	4	4.3	10
29-Jul	6	Z	9	1	1	1	2	4	4	3	3	2	1	1	0	1	5	2	2	5	5	3	1	2	2.7	9
30-Jul	16	14	Z	4	3	4	3	1	3	6	11	3	1	1	7	10	2	0	1	8	15	19	15	0	6.3	19
31-Jul	4	4	1	Z	17	11	16	6	4	8	2	5	1	1	0	2	8	11	11	2	1	1	0	7	5.3	17

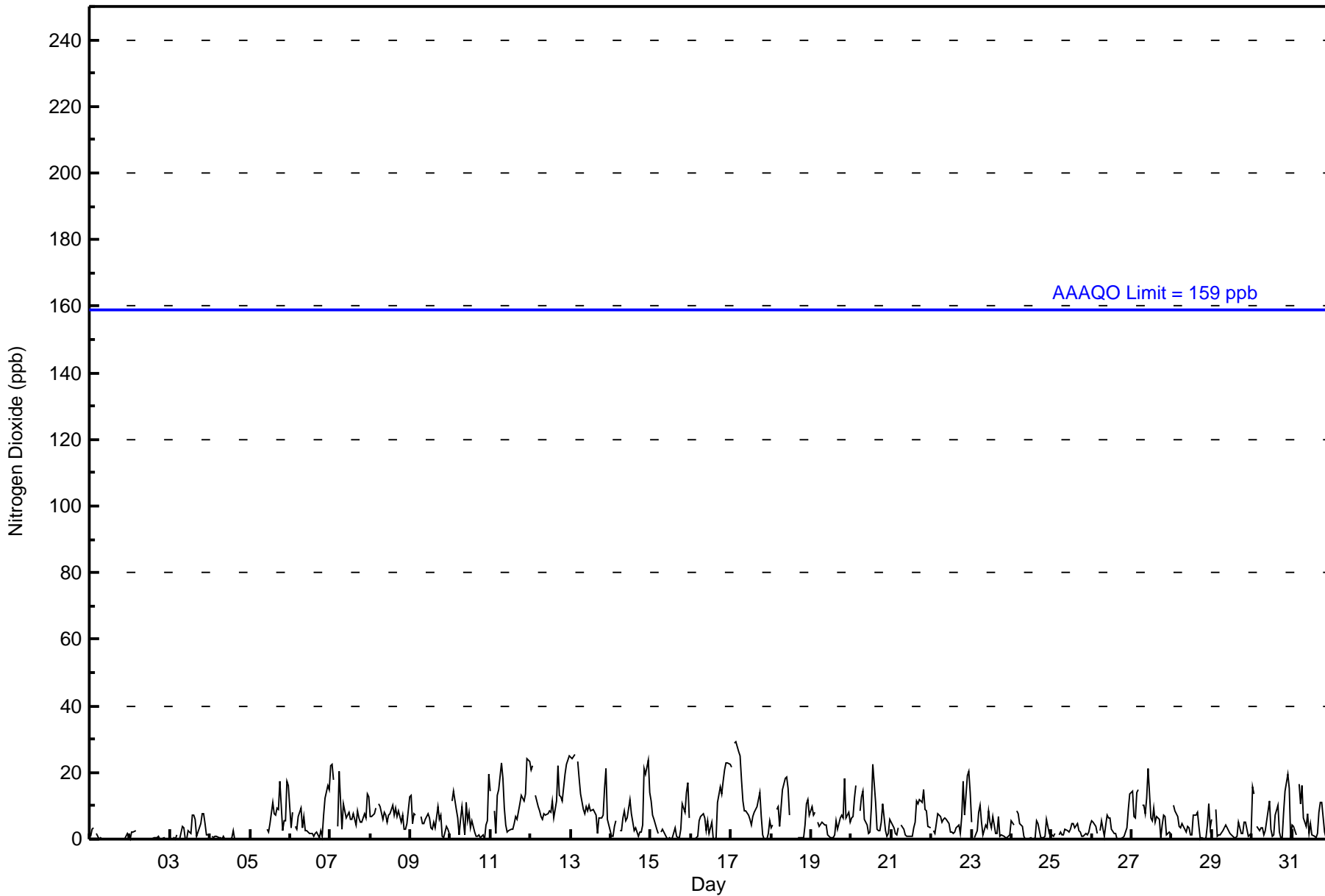
8.9	7.0	7.3	6.4	7.3	7.0	6.9	5.5	5.1	5.1	4.8	3.9	3.3	4.7	4.0	4.5	4.9	4.4	5.0	5.5	6.7	7.9	9.0	8.3	Diurnal Average	
25	24	29	29	26	25	23	18	18	19	21	12	10	22	11	12	22	16	17	18	21	23	24	25	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Shell Muskeg River - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Shell Muskeg River - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	664	95.82	95.82
21 - 40	29	4.18	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: 693

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Shell Muskeg River - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	67	67	77	35	16	8	19	41	75	77	34	42	35	24	24	23	664
21 - 40	3	1	0	0	0	0	0	0	0	0	0	0	0	0	2	23	29
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	70	68	77	35	16	8	19	41	75	77	34	42	35	24	26	46	693

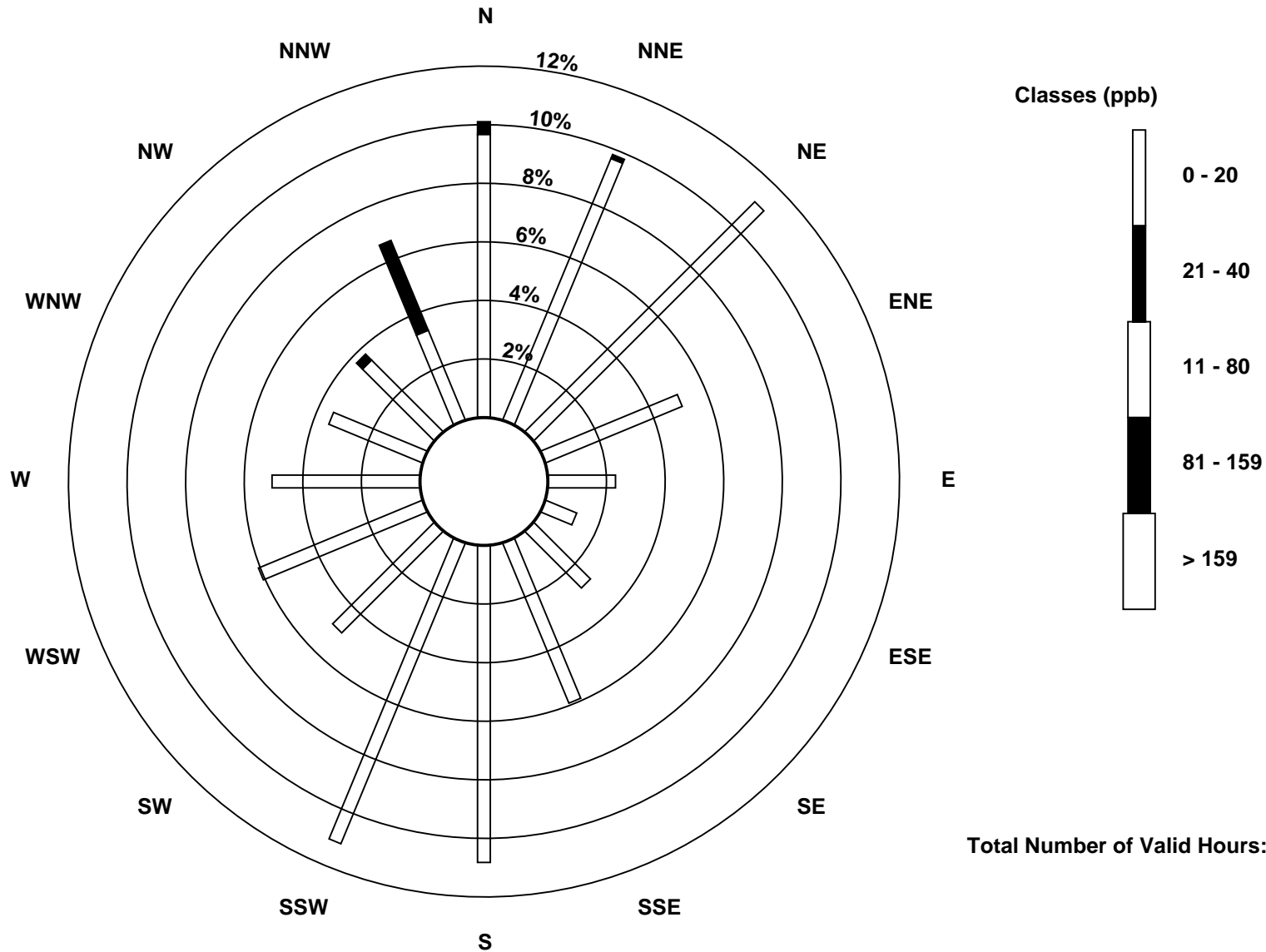
Total Number of Valid Hours: 693

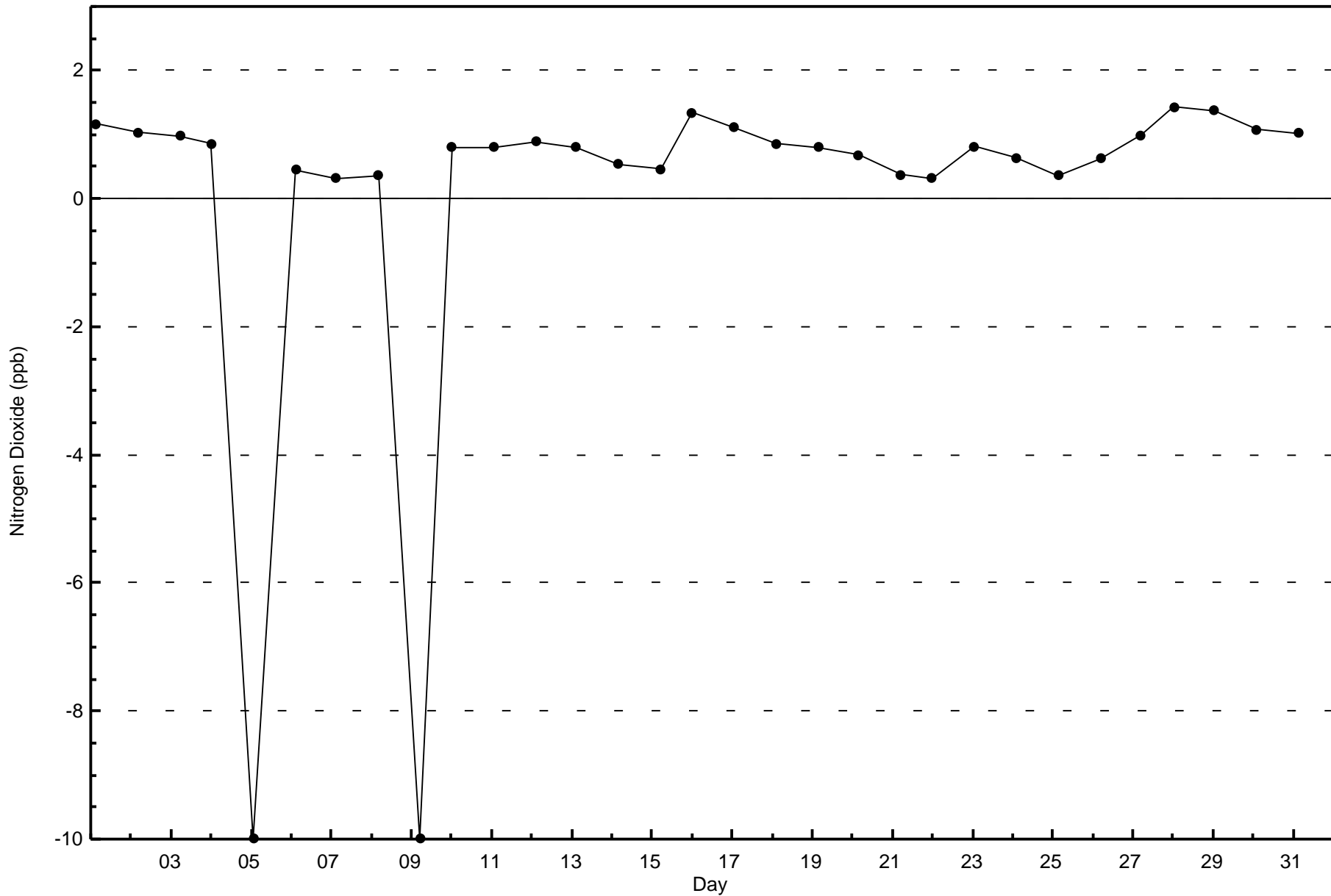
Total Number of Hours: 744

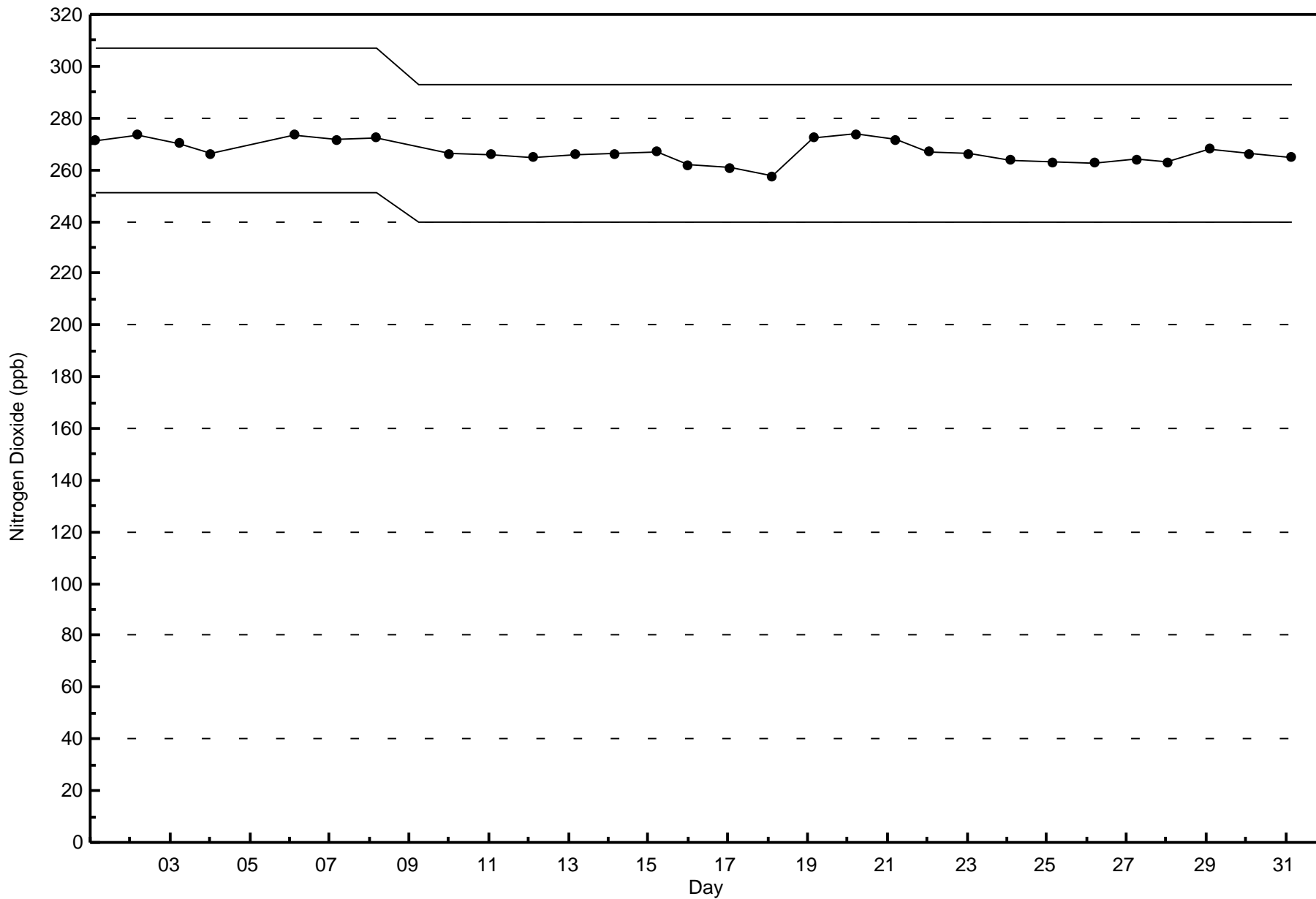


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Nitrogen Dioxide (NO₂) - ppb
Shell Muskeg River (AMS 16)









Wood Buffalo Environmental Association
Summary of Hour Averages

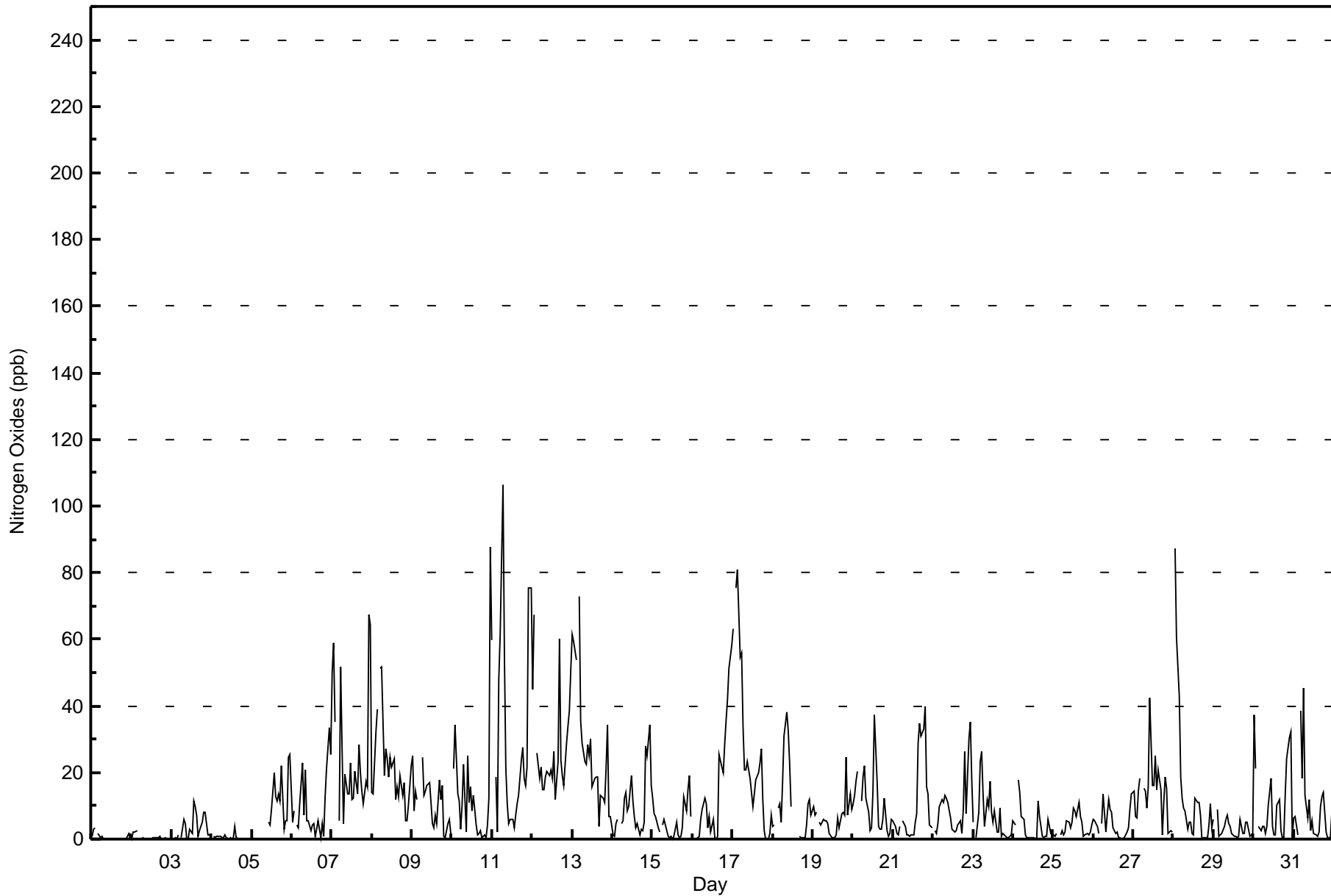
Nitrogen Oxides (NO_x) - ppb
Shell Muskeg River - July 2016

Maximum Value: 106 ppb on Jul 11 07:00		Maximum Daily Average: 30.1 ppb on Jul 11		Hours in Service:	744																																												
Minimum Value: 0 ppb on Jul 1 22:00		Minimum Daily Average: 0.5 ppb on Jul 2		Hours of Data:	693																																												
Maximum Diurnal Average: 17.9 ppb at hour 1		Minimum Diurnal Average: 6.2 ppb at hour 13		Hours of Missing Data:	51																																												
Monthly Average: 11.6 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 2 Median = 6 O ₃ = 16 P ₉₀ = 28 P ₉₉ = 75		Hours of Calibration:	33																																												
				Percent Operational Time:	97.6																																												
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-Jul	1	3	3	Z	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0.6	3																							
2-Jul	0	2	2	Z	Z	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0.5	2																							
3-Jul	0	0	0	0	1	Z	1	6	5	0	0	3	2	11	10	7	1	3	5	8	8	5	1	1	3.4	11																							
4-Jul	Z	1	1	1	1	1	1	0	1	1	0	0	1	4	0	0	0	PF	PF	PF	PF	PF	PF	PF	--	4																							
5-Jul	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	5	4	9	20	13	12	13	11	22	3	5	5	24	26	--	26																							
6-Jul	5	8	Z	4	3	11	23	7	21	5	6	2	4	5	1	3	5	0	5	1	13	21	34	26	9.3	34																							
7-Jul	50	59	35	Z	5	52	28	5	19	13	14	23	12	12	20	13	28	20	14	11	18	16	68	64	26.1	68																							
8-Jul	14	13	32	39	Z	51	52	19	27	24	19	25	22	24	12	16	13	19	13	17	6	5	10	22	21.5	52																							
9-Jul	25	8	14	12	PF	PF	24	13	14	16	17	11	5	3	7	4	18	12	16	1	1	5	6	2	10.7	25																							
10-Jul	Z	21	34	13	11	3	10	23	2	25	11	16	8	13	4	1	2	3	0	1	0	4	12	88	13.3	88																							
11-Jul	60	Z	19	2	48	62	106	55	21	11	5	6	6	3	7	11	13	24	28	18	16	22	75	76	30.1	106																							
12-Jul	45	67	Z	26	18	21	15	15	19	20	19	21	18	26	12	23	60	24	19	16	29	34	39	51	27.7	67																							
13-Jul	61	59	54	Z	73	35	29	23	23	28	25	30	16	18	19	18	4	13	12	11	21	34	7	7	27.0	73																							
14-Jul	1	1	5	6	Z	4	5	12	14	8	10	19	11	7	3	5	1	3	3	5	28	25	34	16	9.9	34																							
15-Jul	12	8	7	3	2	Z	4	6	4	1	0	1	0	1	5	1	1	1	3	13	8	15	19	7	5.3	19																							
16-Jul	Z	0	0	0	1	6	9	12	11	3	7	2	6	0	0	1	25	22	20	28	35	42	51	58	14.8	58																							
17-Jul	63	Z	75	81	54	56	34	21	21	23	18	14	10	14	18	20	23	27	12	3	0	0	2	7	25.9	81																							
18-Jul	4	4	Z	9	10	5	17	31	38	32	23	10	C	C	C	C	1	1	0	1	4	10	12	7	11.6	38																							
19-Jul	10	7	8	Z	5	4	6	6	5	5	2	0	0	0	1	7	3	8	8	7	24	7	14	9	6.4	24																							
20-Jul	11	13	17	20	Z	12	19	22	12	8	3	3	14	37	17	4	3	3	6	12	3	1	2	6	10.8	37																							
21-Jul	5	4	2	1	4	Z	5	4	1	1	1	1	1	5	7	29	35	31	33	40	16	14	4	3	10.8	40																							
22-Jul	Z	2	2	5	10	12	11	13	12	11	7	3	3	2	3	4	5	2	9	26	8	30	35	18	10.1	35																							
23-Jul	5	Z	1	8	23	26	13	4	12	10	17	8	5	9	2	2	9	1	2	1	1	1	1	1	7.0	26																							
24-Jul	5	4	Z	18	14	7	6	1	0	0	0	0	0	0	1	1	7	1	0	1	1	6	2	1	3.8	18																							
25-Jul	1	1	2	Z	1	3	1	2	5	5	4	5	9	9	7	11	7	5	1	1	2	1	2	4	3.9	11																							
26-Jul	6	5	4	2	Z	5	14	2	8	12	9	8	4	2	2	0	0	0	0	1	2	3	9	14	4.8	14																							
27-Jul	14	7	6	14	18	Z	15	15	9	16	42	16	16	25	15	21	15	1	11	19	15	1	3	2	13.8	42																							
28-Jul	Z	87	61	43	19	12	9	8	3	5	5	2	1	12	11	11	7	0	1	0	0	4	10	3	13.8	87																							
29-Jul	6	Z	9	1	1	2	4	6	7	5	4	2	1	1	0	1	6	2	2	5	5	3	1	2	3.2	9																							
30-Jul	37	21	Z	4	2	4	4	2	4	10	18	4	1	1	10	12	3	1	1	13	24	31	32	0	10.3	37																							
31-Jul	6	7	1	Z	39	18	45	13	6	12	3	6	2	1	1	2	10	13	14	2	1	1	0	8	9.1	45																							
																								17.9	15.9	15.8	13.1	15.3	16.5	17.0	11.6	10.9	10.4	9.4	7.9	6.2	8.8	7.0	8.4	10.3	8.0	8.7	8.8	9.8	11.5	17.0	17.6	Diurnal Average	
																								63	87	75	81	73	62	106	55	38	32	42	30	22	37	20	29	60	31	33	40	35	42	75	88	Diurnal Maximum	
Z - zerospan																								C - Calibration				PF - Power Failure																					



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Shell Muskeg River - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Shell Muskeg River - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	571	82.40	82.40
21 - 40	86	12.41	94.81
41 - 80	32	4.62	99.42
81 - 159	3	0.43	99.86
> 159	0	0.00	99.86

Total Number of Valid Hours: 693

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Shell Muskeg River - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	39	36	71	34	14	8	19	40	73	74	33	42	35	24	22	7	571
21 - 40	26	31	6	0	2	0	0	0	1	3	1	0	0	0	4	12	86
11 - 80	5	1	0	0	0	0	0	1	1	0	0	0	0	0	0	24	32
81 - 159	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	3
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	70	68	77	35	16	8	19	41	75	77	34	42	35	24	26	45	692

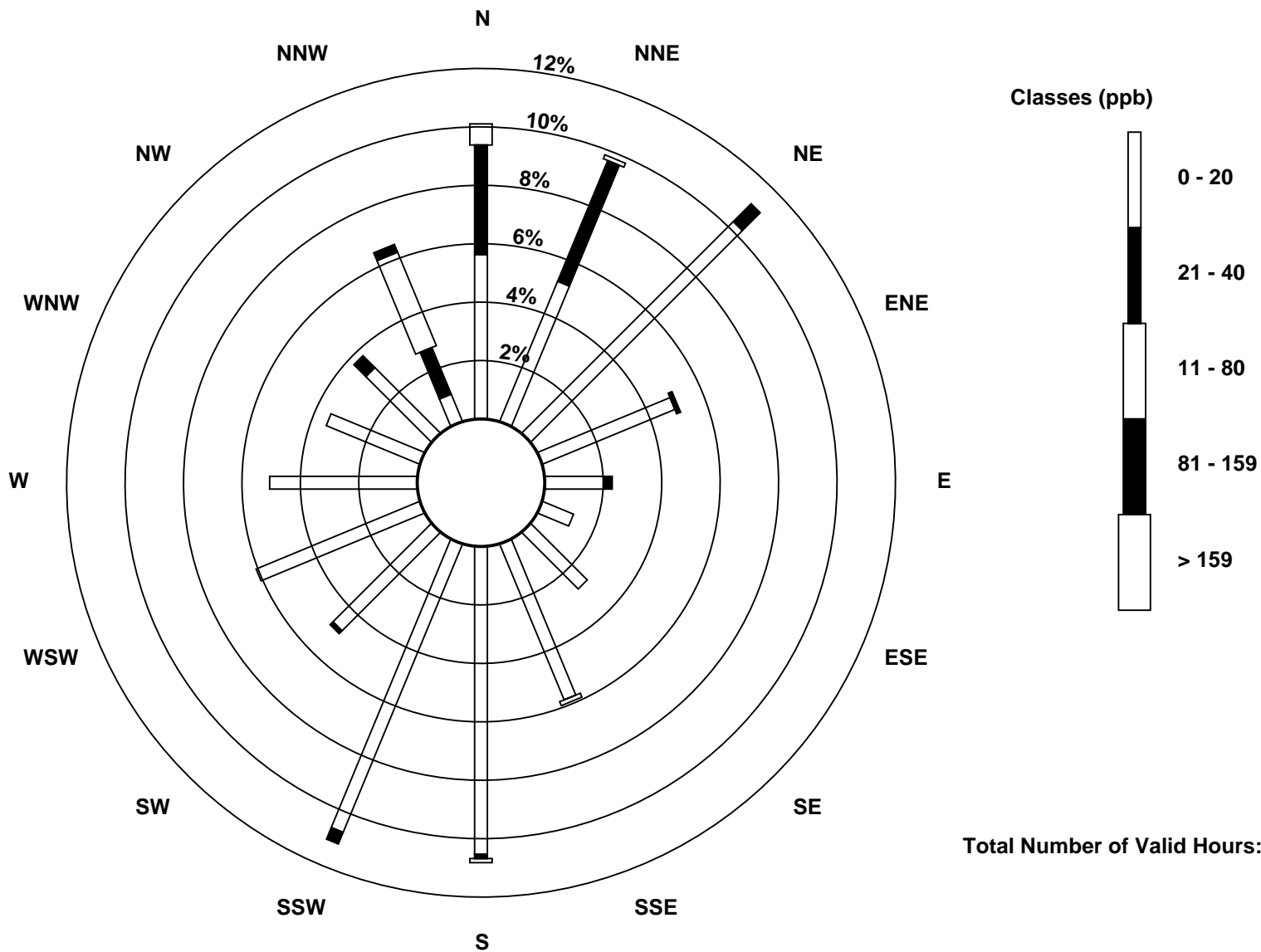
Total Number of Valid Hours: 693

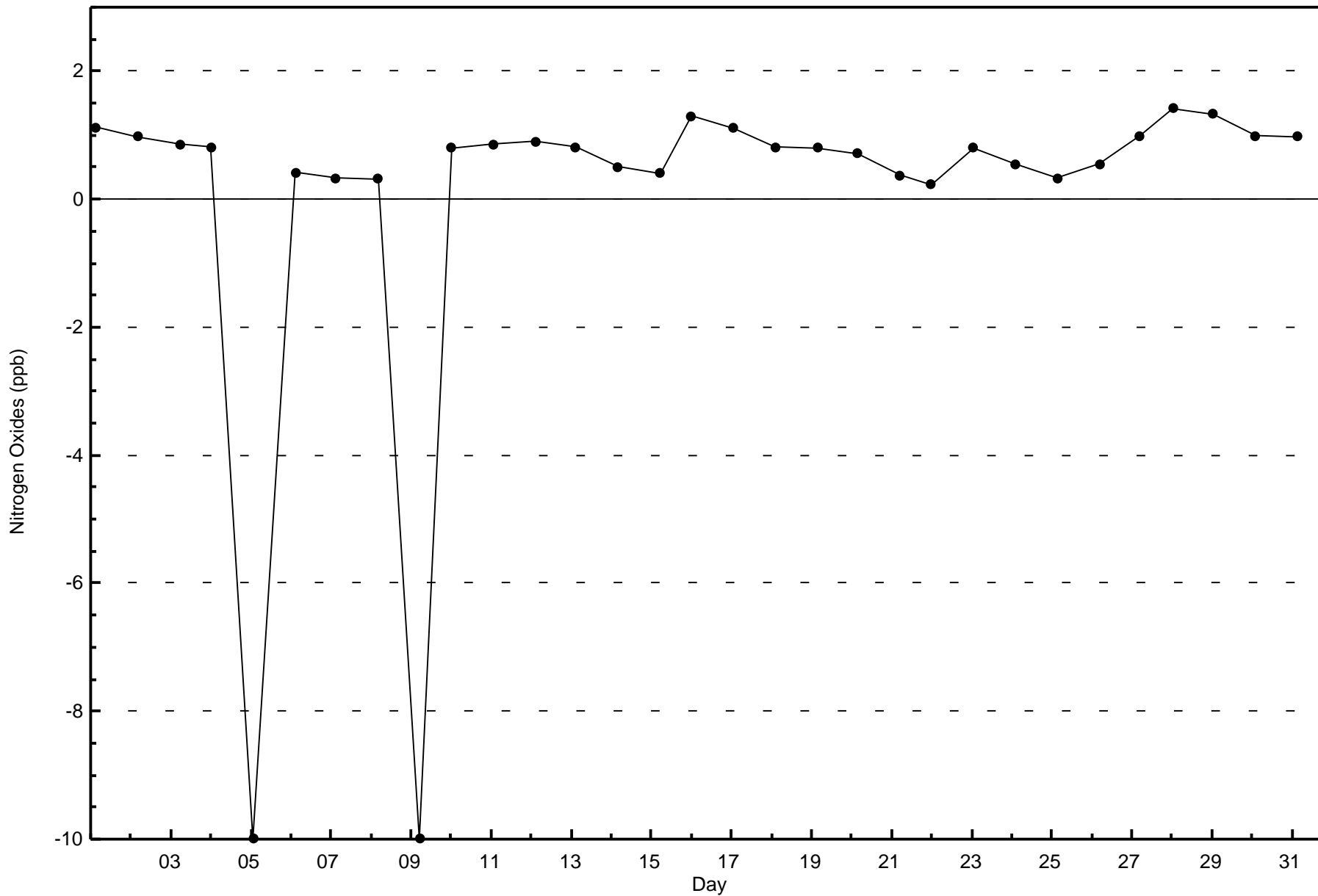
Total Number of Hours: 744

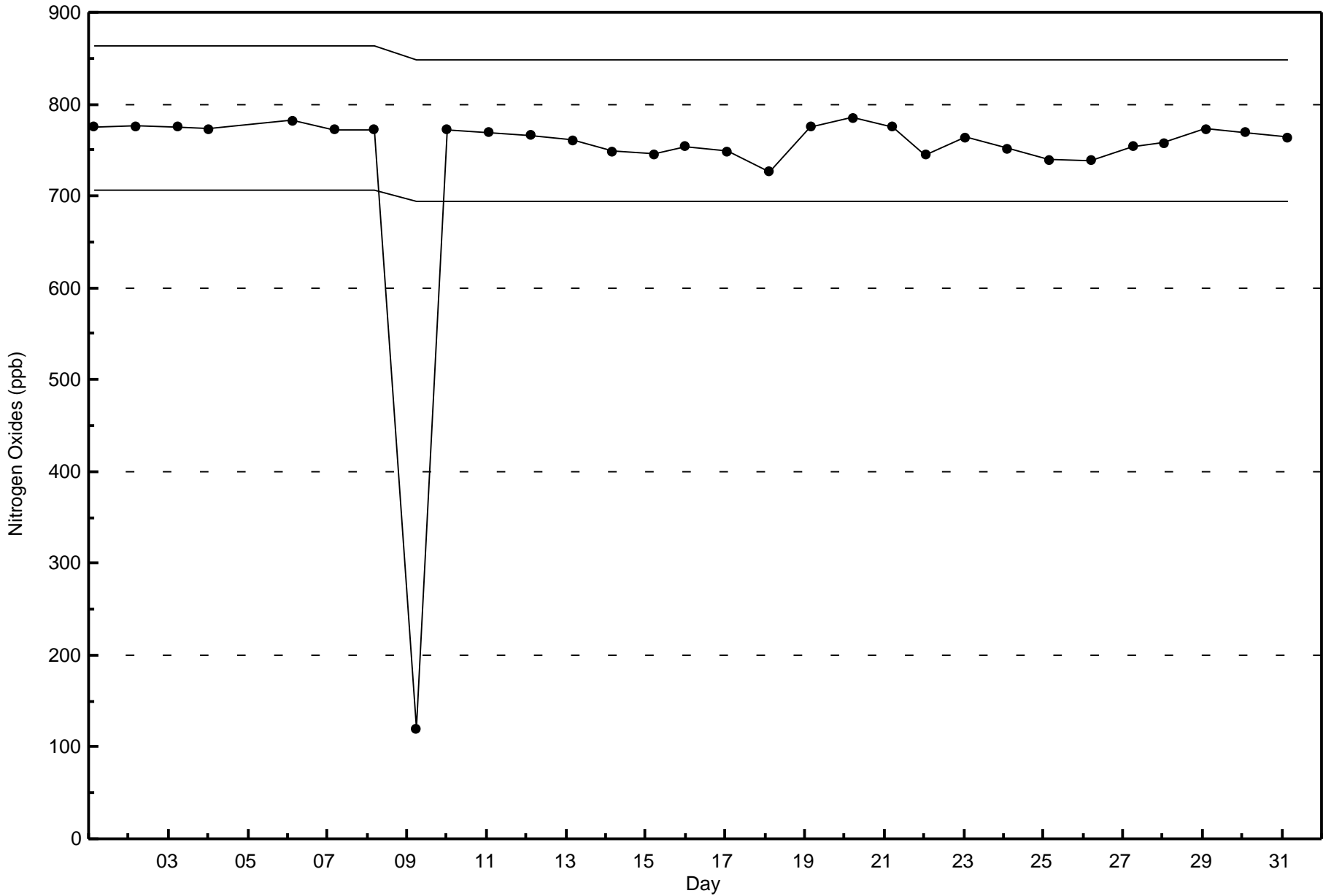


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Nitrogen Oxides (NO_x) - ppb
Shell Muskeg River (AMS 16)







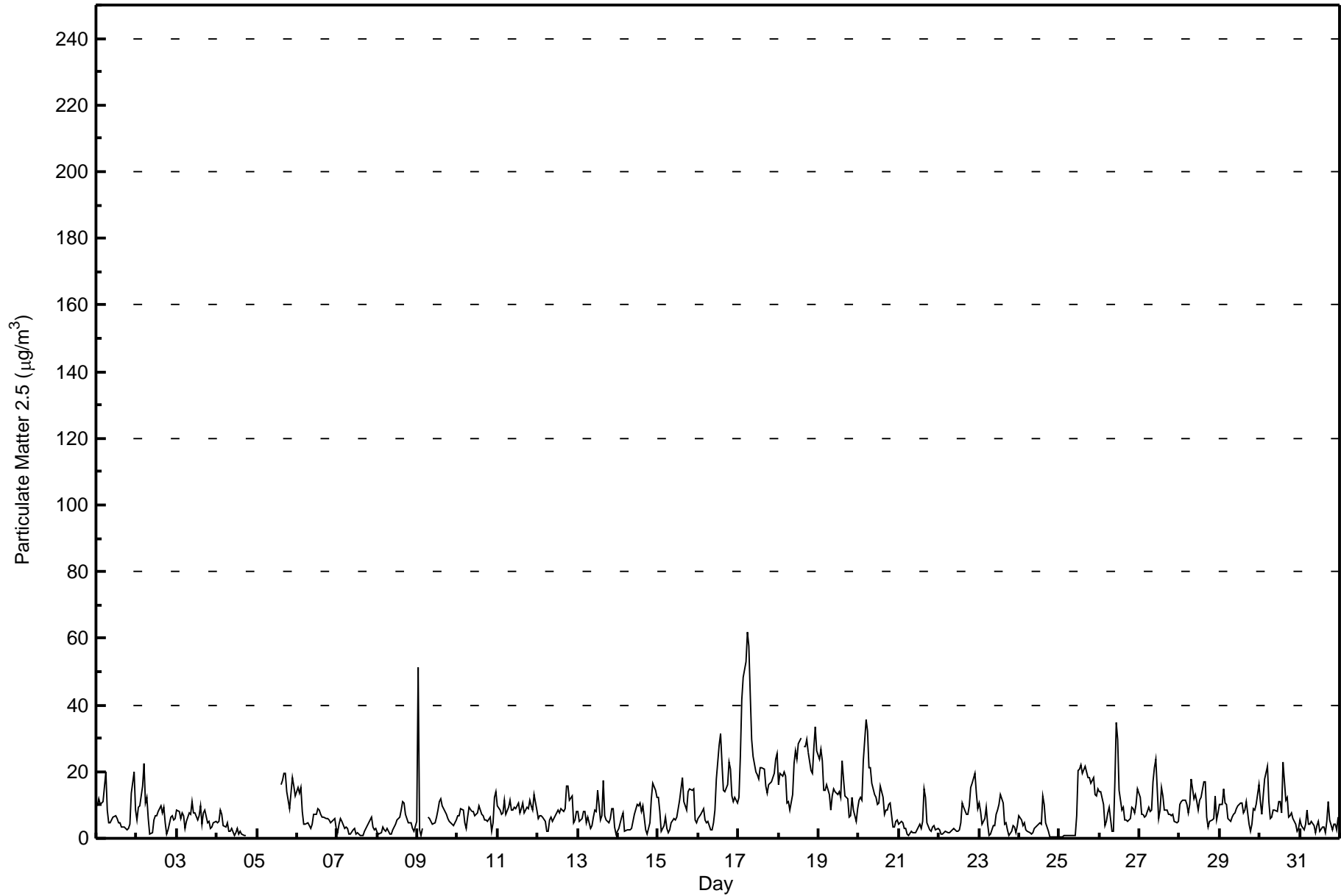


Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 61.7 µg/m ³ on Jul 17 06:00 Minimum Value: 0.3 µg/m ³ on Jul 24 21:00 Maximum Diurnal Average: 11.3 µg/m ³ at hour 15 Monthly Average: 8.94 µg/m ³		Maximum Daily Average: 27.7 µg/m ³ on Jul 17 Minimum Daily Average: 2.9 µg/m ³ on Jul 7 Minimum Diurnal Average: 6.5 µg/m ³ at hour 9 Percentiles: P ₁ = 0.6 P ₁₀ = 2.1 Q ₁ = 4.2 Median = 7.2 Q ₃ = 11.3 P ₉₀ = 18.1 P ₉₉ = 40.6		Hours in Service: 744 Hours of Data: 721 Hours of Missing Data: 23 Hours of Calibration: 1 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-Jul	9.7	11.8	10.2	10.5	10.9	19.8	8.3	4.6	4.8	5.4	6.2	6.7	6.0	4.8	4.6	3.6	3.6	2.8	2.6	2.8	4.3	13.7	19.9	8.5	7.8	19.9																							
2-Jul	5.7	9.2	9.5	15.5	22.3	10.4	12.2	5.9	1.4	1.9	5.4	6.6	6.8	8.3	9.6	7.7	9.5	4.6	1.1	2.6	6.3	6.7	5.5	6.0	7.5	22.3																							
3-Jul	8.5	8.1	5.9	7.6	6.6	3.0	5.1	7.4	7.1	10.9	7.8	7.7	5.6	6.6	9.8	4.1	7.5	8.3	4.9	5.2	3.1	3.6	4.7	5.2	6.4	10.9																							
4-Jul	4.7	5.1	8.6	7.3	3.6	3.4	4.8	2.2	2.1	3.0	1.0	1.5	3.0	1.3	2.0	1.1	1.0	1.0	PF	PF	PF	PF	UO	UO	3.2	8.6																							
5-Jul	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	16.1	17.3	19.5	19.6	14.0	8.8	13.4	18.1	15.6	12.7	--	19.6																							
6-Jul	15.3	13.4	15.2	8.0	4.4	4.3	4.6	3.8	3.0	4.2	7.2	7.2	9.0	8.3	7.2	6.3	6.3	5.8	5.8	5.5	4.8	5.2	5.9	3.0	6.8	15.3																							
7-Jul	1.8	4.4	5.8	5.2	2.8	3.3	3.0	1.2	1.4	2.6	2.8	1.1	1.6	1.2	0.7	0.9	2.1	2.8	4.0	4.7	6.5	3.3	2.5	2.9	2.9	6.5																							
8-Jul	1.9	1.4	1.6	3.3	2.7	2.0	3.0	1.3	1.2	2.6	3.4	4.1	5.6	6.3	8.7	11.1	10.6	7.1	4.7	4.5	4.7	3.1	2.0	4.9	4.2	11.1																							
9-Jul	51.4	2.5	1.0	2.8	PF	PF	6.2	6.0	5.3	4.2	4.5	6.6	8.4	10.9	11.7	9.9	8.0	7.2	5.7	5.0	4.6	3.9	4.8	5.7	8.0	51.4																							
10-Jul	6.6	6.6	8.8	8.4	4.8	2.8	6.2	9.5	8.0	7.9	6.9	7.1	7.8	9.9	7.3	6.8	5.5	5.5	5.2	6.4	2.1	4.7	12.1	14.2	7.1	14.2																							
11-Jul	9.7	8.5	7.3	7.7	11.6	7.3	9.2	11.2	8.5	8.3	9.2	8.7	10.7	7.5	8.8	10.5	7.7	9.2	8.7	11.5	9.7	8.4	12.9	8.3	9.2	12.9																							
12-Jul	5.8	6.9	7.0	6.2	5.2	2.0	2.2	5.4	6.3	5.3	6.9	7.6	8.4	7.5	8.7	8.1	8.8	15.7	15.5	11.3	12.8	4.8	5.5	8.2	7.6	15.7																							
13-Jul	7.9	5.0	6.0	8.1	8.1	4.7	6.4	2.9	3.9	6.5	8.5	8.2	14.6	5.6	6.7	17.5	6.8	5.6	4.6	6.1	9.1	9.0	3.2	1.2	6.9	17.5																							
14-Jul	2.8	4.7	6.3	7.4	2.2	2.4	2.4	2.7	2.9	5.0	7.4	10.1	9.6	10.6	7.9	9.7	2.7	1.2	2.8	4.8	11.8	16.7	14.4	12.2	6.7	16.7																							
15-Jul	12.4	8.1	2.3	3.7	6.2	3.0	1.9	2.4	4.5	5.7	5.4	6.4	8.8	11.5	18.1	11.1	9.6	8.3	14.1	14.7	14.3	14.7	5.7	4.7	8.2	18.1																							
16-Jul	5.9	7.0	8.2	8.7	5.6	4.5	5.2	2.6	2.7	4.6	8.5	18.0	27.9	31.2	22.6	14.5	14.1	16.2	22.7	20.8	12.7	11.0	12.5	10.5	12.4	31.2																							
17-Jul	12.3	24.7	41.7	48.3	53.1	61.7	57.8	43.2	29.8	24.4	20.0	19.3	17.8	21.2	21.3	20.6	15.8	13.6	16.0	16.5	16.8	19.7	23.9	25.2	27.7	61.7																							
18-Jul	16.0	19.5	18.6	20.1	18.6	10.4	10.9	8.3	12.9	22.7	26.4	23.6	28.4	30.1	C	27.7	27.7	29.7	25.9	20.2	19.5	27.1	33.3	26.4	21.9	33.3																							
19-Jul	23.7	26.7	23.4	14.6	14.4	16.1	13.1	8.5	12.9	14.8	14.1	13.0	14.0	12.4	23.1	17.9	12.8	12.1	6.3	7.0	12.3	8.7	5.2	8.8	14.0	26.7																							
20-Jul	11.5	12.4	11.6	23.2	35.5	32.0	21.1	21.3	16.4	12.9	12.3	10.3	10.8	15.7	12.1	7.3	8.6	8.6	10.0	10.7	3.2	3.5	5.2	5.6	13.4	35.5																							
21-Jul	4.2	4.9	4.9	2.9	2.9	1.4	0.9	2.1	1.6	1.8	1.8	2.6	4.1	2.9	5.3	14.7	12.3	4.7	2.4	2.3	3.4	4.0	2.5	3.0	3.9	14.7																							
22-Jul	2.6	1.4	1.2	1.5	2.0	1.9	1.8	2.1	2.6	2.9	2.1	2.1	2.5	4.8	10.6	9.2	7.2	7.4	9.8	15.3	16.5	19.4	13.6	9.0	6.2	19.4																							
23-Jul	10.5	8.0	4.3	6.0	9.4	4.2	1.0	1.4	3.8	3.9	7.1	8.5	10.2	13.0	10.8	4.2	4.7	2.6	1.0	2.1	3.9	3.4	1.7	3.7	5.4	13.0																							
24-Jul	6.7	5.4	4.0	4.5	2.5	2.0	1.5	1.1	1.6	2.9	3.3	4.4	4.6	4.1	12.5	10.1	4.7	2.1	0.5	0.3	0.3	0.4	0.5	0.6	3.4	12.5																							
25-Jul	0.6	0.5	0.5	0.7	0.8	0.8	0.7	0.9	0.8	0.8	6.6	20.3	20.6	22.2	19.4	21.7	19.8	18.1	18.4	16.4	18.3	13.1	12.7	15.0	10.4	22.2																							
26-Jul	14.1	13.9	10.1	3.9	5.2	7.8	9.5	2.1	2.3	16.6	34.8	29.7	14.2	8.4	9.3	5.7	5.3	4.9	5.9	9.5	9.0	7.5	10.2	14.7	10.6	34.8																							
27-Jul	12.4	7.3	7.3	6.3	6.6	9.4	7.9	8.7	16.9	21.3	23.6	6.0	8.6	15.1	12.9	8.4	8.5	7.3	7.1	6.9	7.2	5.3	4.6	5.3	9.6	23.6																							
28-Jul	10.1	10.9	11.3	11.5	10.3	7.6	10.0	17.8	11.9	13.2	11.2	8.4	11.4	12.2	17.1	16.9	6.1	3.4	4.9	5.4	6.0	12.5	5.7	7.5	10.1	17.8																							
29-Jul	10.0	10.3	14.9	10.4	10.3	6.0	5.0	6.5	7.0	7.8	8.9	9.7	10.5	10.4	7.6	8.6	10.9	4.1	2.1	4.2	8.7	8.4	10.1	16.2	8.7	16.2																							
30-Jul	11.2	7.2	12.6	18.0	21.6	10.9	6.1	6.2	8.7	8.3	8.2	10.9	10.9	7.8	22.7	11.7	12.4	6.4	6.9	7.7	5.9	4.0	2.2	3.0	9.6	22.7																							
31-Jul	5.4	3.7	2.5	4.2	8.5	4.3	4.4	5.0	4.0	1.9	3.6	4.9	2.1	3.6	3.5	1.6	5.0	10.9	5.7	2.6	4.4	4.2	2.4	6.5	4.4	10.9																							
																								10.0	8.7	9.1	9.5	10.3	8.6	7.7	6.8	6.5	7.8	9.2	9.4	10.1	10.5	11.3	10.5	9.2	8.3	8.0	8.1	8.5	8.9	8.7	8.6	Diurnal Average	
																								51.4	26.7	41.7	48.3	53.1	61.7	57.8	43.2	29.8	24.4	34.8	29.7	28.4	31.2	23.1	27.7	27.7	29.7	25.9	20.8	19.5	27.1	33.3	26.4	Diurnal Maximum	
C - Calibration UO - Unstable Operation PF - Power Failure Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m ³																																																	



Wood Buffalo Environmental Association
Hourly Averages

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Shell Muskeg River - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Shell Muskeg River - July 2016

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	251	34.81	34.81
6 - 15	348	48.27	83.08
16 - 25	76	10.54	93.62
26 - 80	25	3.47	97.09
> 81.0	0	0.00	97.09

Total Number of Valid Hours: 721

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - μg/m³
Shell Muskeg River - July 2016

Concentration Ranges (μg/m ³)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	27	27	28	10	6	2	10	17	28	27	15	20	14	3	5	12	251
6 - 15	30	34	35	22	9	6	9	25	37	39	17	10	17	18	15	25	348
16 - 25	11	7	10	4	1	0	1	2	13	8	1	2	2	1	6	7	76
26 - 80	4	1	0	0	0	0	0	0	3	7	4	1	0	0	0	5	25
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	72	69	73	36	16	8	20	44	81	81	37	33	33	22	26	49	700

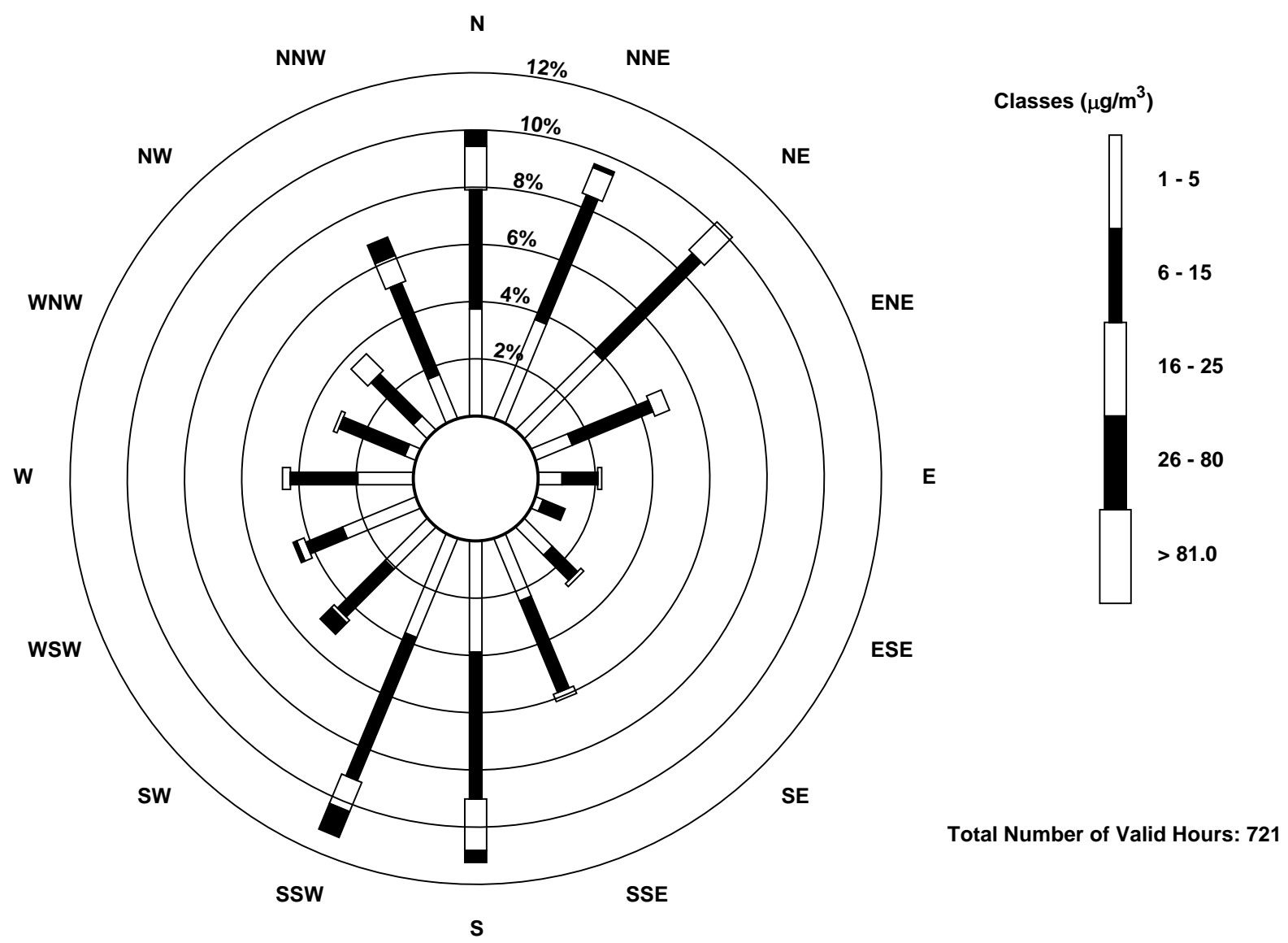
Total Number of Valid Hours: 721

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Shell Muskeg River (AMS 16)



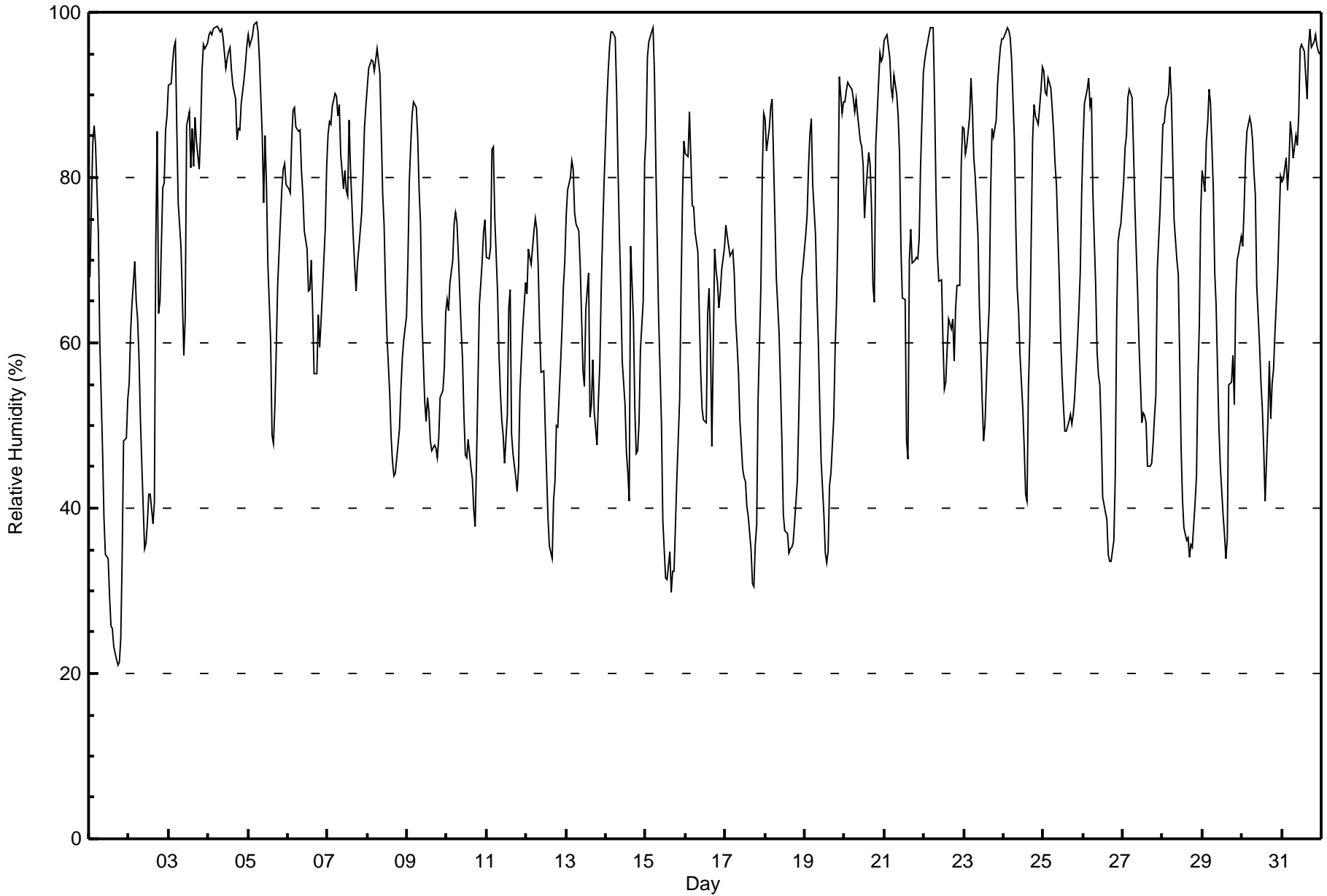


Wood Buffalo Environmental Association

Summary of Hour Averages

**Relative Humidity (RH) - %
Shell Muskeg River - July 2016**

Maximum Value: 99 % on Jul 5 06:00																		Maximum Daily Average: 94.0 % on Jul 4						Hours in Service: 744																				
Minimum Value: 21 % on Jul 1 18:00																		Minimum Daily Average: 46.5 % on Jul 1						Hours of Data: 744																				
Maximum Diurnal Average: 88.0 % at hour 5																		Minimum Diurnal Average: 52.2 % at hour 15						Hours of Missing Data: 0																				
Monthly Average: 69.1 %																		Percentiles: P ₁ = 29 P ₁₀ = 42 Q ₁ = 53 Median = 70 Q ₃ = 86 P ₉₀ = 94 P ₉₉ = 98						Hours of Calibration: 0																				
																		Percent Operational Time: 100.0																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																				
1-Jul	68	76	84	86	84	73	60	54	47	39	34	34	29	26	25	23	22	21	21	24	34	48	49	53	46.5	86																		
2-Jul	55	61	65	70	65	63	58	51	45	35	36	38	42	42	38	41	72	86	64	65	79	79	86	88	59.3	88																		
3-Jul	91	91	94	96	96	86	77	72	65	59	63	86	88	81	86	81	87	84	81	86	93	96	96	96	84.7	96																		
4-Jul	97	98	97	98	98	98	98	98	98	97	93	94	95	96	93	91	90	85	86	86	89	92	94	96	94.0	98																		
5-Jul	97	96	97	98	99	99	98	94	85	77	85	79	70	60	49	48	52	59	67	75	79	81	82	79	79.4	99																		
6-Jul	79	78	84	88	88	86	86	86	81	78	74	71	66	66	70	64	56	56	63	59	63	66	74	81	73.5	88																		
7-Jul	85	87	86	89	90	90	87	89	83	79	81	78	78	87	81	73	69	66	70	71	76	81	86	89	81.3	90																		
8-Jul	91	93	94	94	93	94	96	92	85	78	74	67	61	54	49	46	44	44	48	50	54	58	60	63	70.1	96																		
9-Jul	70	80	84	88	89	88	85	78	74	63	53	51	53	52	48	47	48	47	46	48	53	54	57	64	63.4	89																		
10-Jul	65	64	67	70	74	76	75	71	62	58	51	46	46	48	45	43	40	38	46	65	67	70	73	75	59.8	76																		
11-Jul	70	70	72	83	84	75	66	59	54	51	49	45	51	64	66	49	47	44	42	45	54	58	62	67	59.5	84																		
12-Jul	66	71	70	69	74	75	74	69	62	56	57	50	44	39	35	34	41	43	50	50	58	62	67	70	57.8	75																		
13-Jul	75	79	80	82	81	76	74	74	69	63	57	55	64	69	51	53	58	52	48	53	57	66	73	79	66.1	82																		
14-Jul	89	93	96	98	98	97	90	81	73	66	58	52	47	44	41	72	63	52	47	47	50	59	65	82	69.2	98																		
15-Jul	85	95	96	98	98	93	82	72	63	50	39	35	31	31	35	30	32	32	38	44	53	66	77	84	60.8	98																		
16-Jul	83	83	88	82	77	76	73	71	64	57	52	51	50	63	67	60	47	71	69	67	64	66	69	71	67.6	88																		
17-Jul	74	73	72	70	71	68	63	60	57	51	45	44	43	40	39	35	31	30	36	38	53	67	80	88	55.3	88																		
18-Jul	87	83	86	89	90	83	75	68	61	55	48	39	37	37	34	35	35	36	38	43	51	59	68	69	58.6	90																		
19-Jul	73	75	81	85	87	79	73	66	60	53	46	39	35	33	35	43	44	51	59	65	74	92	88	89	63.6	92																		
20-Jul	89	91	92	91	91	90	88	90	88	84	84	82	75	78	83	82	76	67	65	84	91	95	94	95	85.1	95																		
21-Jul	97	97	96	95	91	90	92	90	87	83	71	65	65	48	46	70	74	70	70	70	70	72	81	93	78.5	97																		
22-Jul	94	95	96	97	98	98	90	78	71	67	68	60	54	55	59	63	62	63	58	64	67	67	81	86	74.7	98																		
23-Jul	86	83	84	87	92	88	82	80	73	64	59	53	48	50	60	64	78	86	85	87	91	94	96	97	77.9	97																		
24-Jul	97	98	98	98	97	94	85	74	67	64	58	52	47	42	41	55	61	85	89	87	87	86	91	93	76.9	98																		
25-Jul	93	90	90	92	91	88	86	82	79	68	61	56	52	49	49	51	51	50	51	53	60	64	68	78	68.9	93																		
26-Jul	84	89	91	92	89	90	78	67	59	56	55	49	41	40	39	34	33	33	36	44	63	72	74	74	61.8	92																		
27-Jul	79	84	85	90	91	90	84	77	71	66	60	50	52	51	50	45	45	45	48	51	54	69	76	81	66.4	91																		
28-Jul	86	87	89	90	93	90	83	75	70	68	58	47	41	38	36	36	34	36	35	41	44	56	62	76	61.3	93																		
29-Jul	81	78	84	87	91	89	79	69	65	57	50	45	39	37	34	36	55	55	59	53	66	70	71	73	63.3	91																		
30-Jul	72	76	82	86	87	86	85	81	78	67	60	55	52	47	41	51	58	51	55	57	61	69	75	80	67.1	87																		
31-Jul	79	80	82	78	82	87	85	82	85	84	88	96	96	95	92	89	96	98	96	96	97	96	95	95	89.6	98																		
																		81.9	83.7	85.9	87.6	88.0	85.7	80.8	75.7	70.3	64.3	60.1	57.0	54.7	53.7	52.2	53.0	54.9	56.0	56.9	60.3	66.2	72.0	76.4	80.8	Diurnal Average		
																		97	98	98	98	99	99	98	98	98	97	93	96	96	96	93	91	96	98	96	96	97	96	96	97	97	Diurnal Maximum	





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Relative Humidity (RH) - %
Shell Muskeg River - July 2016**

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	64	8.60	8.60
40 - 60	184	24.73	33.33
60 - 80	229	30.78	64.11
80 - 100	267	35.89	100.00

Total Number of Valid Hours: 744

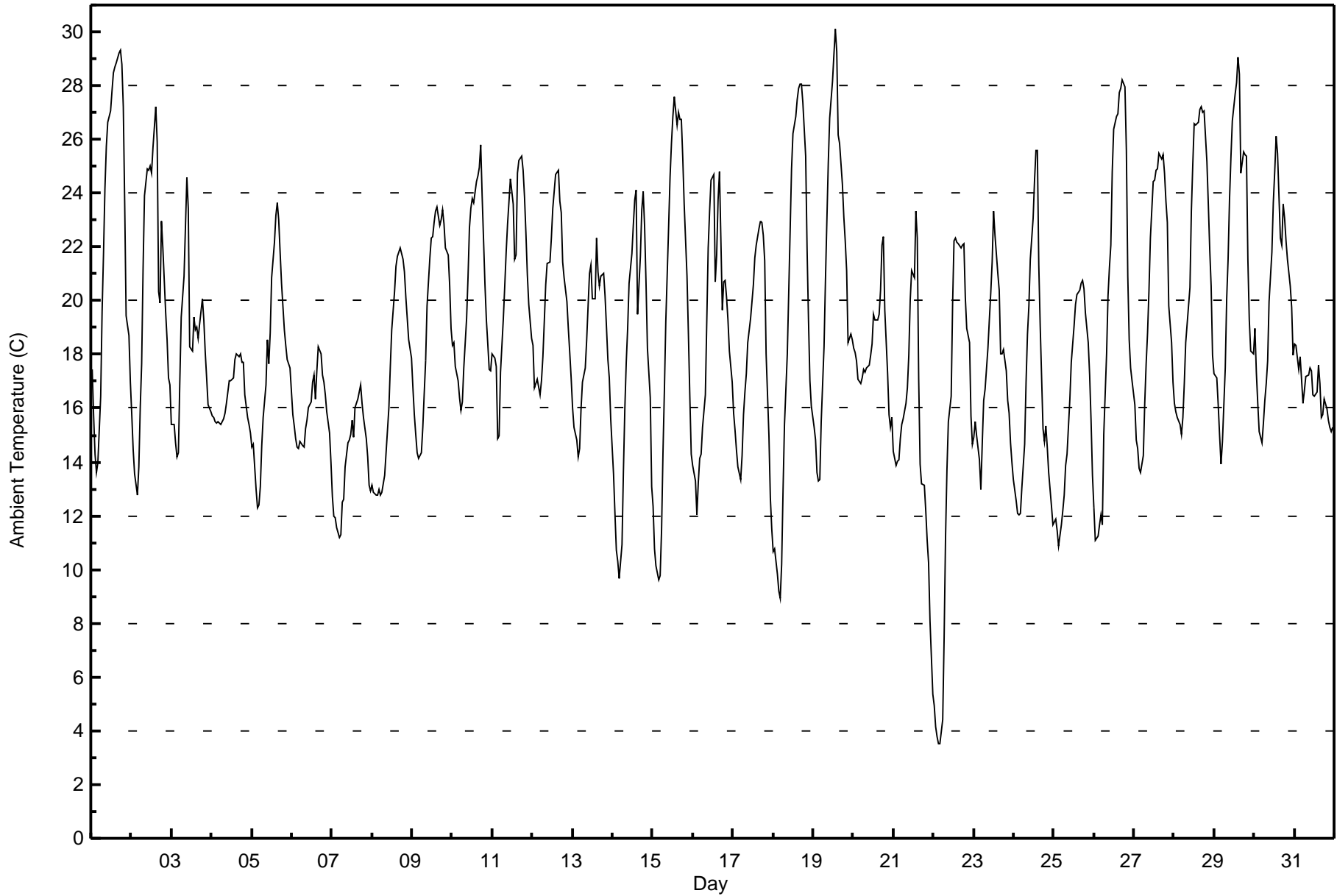
Total Number of Hours: 744



Wood Buffalo Environmental Association
Summary of Hour Averages

Ambient Temperature (AT) - C
Shell Muskeg River - July 2016

Maximum Value: 30.1 C on Jul 19 14:00		Maximum Daily Average: 22.6 C on Jul 1		Hours in Service: 744																																												
Minimum Value: 3.5 C on Jul 22 05:00		Minimum Daily Average: 14.1 C on Jul 7		Hours of Data: 744																																												
Maximum Diurnal Average: 23.2 C at hour 15		Minimum Diurnal Average: 13.3 C at hour 5		Hours of Missing Data: 0																																												
Monthly Average: 18.58 C		Percentiles: P ₁ = 7.4 P ₁₀ = 13.1 Q ₁ = 15.4 Median = 18.0 Q ₃ = 21.9 P ₉₀ = 25.1 P ₉₉ = 28.7		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-Jul	17.4	15.7	14.3	13.6	14.0	16.5	19.6	21.8	24.2	25.7	26.7	27.0	27.8	28.5	28.7	28.9	29.2	29.3	28.8	27.2	23.6	19.4	18.7	17.0	22.6	29.3																						
2-Jul	15.7	14.4	13.6	12.8	13.8	16.0	17.7	21.2	23.9	24.9	24.9	25.0	24.8	25.7	27.2	25.9	20.3	19.9	23.0	22.0	19.5	18.5	17.2	16.9	20.2	27.2																						
3-Jul	15.4	15.4	14.7	14.2	14.3	17.0	19.4	20.9	22.8	24.6	23.4	18.3	18.1	19.4	18.9	19.0	18.6	19.1	20.1	19.3	18.1	17.1	16.1	15.9	18.3	24.6																						
4-Jul	15.7	15.7	15.5	15.5	15.5	15.4	15.5	15.6	15.8	16.2	17.0	17.0	17.1	17.2	17.8	18.0	17.9	18.0	17.7	17.7	16.5	15.6	15.4	15.1	16.4	18.0																						
5-Jul	14.5	14.7	13.0	12.3	12.4	13.1	14.6	15.7	16.9	18.5	17.7	18.8	20.9	22.2	23.2	23.7	23.0	21.8	20.6	18.9	18.3	17.8	17.7	17.5	17.8	23.7																						
6-Jul	15.7	15.3	14.9	14.6	14.5	14.8	14.6	14.6	15.2	15.6	16.0	16.3	17.0	17.3	16.4	17.4	18.3	18.0	17.2	17.0	16.5	15.9	15.1	14.0	15.9	18.3																						
7-Jul	12.7	12.0	11.9	11.6	11.2	11.3	12.5	12.6	13.8	14.7	14.8	15.0	15.5	14.9	16.0	16.4	16.6	16.9	16.2	15.7	14.9	14.2	13.1	12.9	14.1	16.9																						
8-Jul	13.1	12.9	12.8	12.8	13.0	12.8	12.9	13.5	14.4	15.2	16.0	17.6	18.9	20.3	21.3	21.6	21.8	21.9	21.5	21.1	20.1	19.3	18.5	17.9	17.1	21.9																						
9-Jul	16.8	15.8	15.0	14.4	14.1	14.4	15.3	16.5	17.8	19.8	21.6	22.3	22.4	22.9	23.3	23.5	22.8	23.0	23.4	22.9	22.0	21.7	20.6	19.0	19.6	23.5																						
10-Jul	18.4	18.4	17.5	17.0	16.4	15.9	16.2	17.5	19.3	20.9	22.7	23.4	23.8	23.6	24.4	24.7	24.9	25.8	23.9	20.6	19.3	18.4	17.4	17.4	20.3	25.8																						
11-Jul	18.0	17.8	17.5	14.8	15.0	17.3	19.4	20.5	21.8	22.9	23.7	24.5	23.6	21.5	21.7	24.8	25.2	25.4	24.8	23.9	22.5	21.0	19.8	18.6	21.1	25.4																						
12-Jul	18.3	16.8	16.9	17.1	16.5	17.0	17.9	19.2	20.6	21.4	21.4	22.3	23.4	24.1	24.7	24.8	23.7	23.3	21.4	20.8	20.0	19.0	18.1	17.1	20.2	24.8																						
13-Jul	16.0	15.3	14.8	14.2	14.5	16.0	16.9	17.5	18.6	19.8	21.0	21.3	20.0	20.1	22.3	21.1	20.6	20.9	21.0	20.2	19.0	17.8	17.1	15.6	18.4	22.3																						
14-Jul	13.6	12.1	10.7	10.3	9.7	10.9	13.6	16.0	17.7	19.0	20.6	21.7	22.8	23.7	24.1	19.5	21.6	23.4	24.0	22.7	20.6	18.2	16.4	13.1	17.8	24.1																						
15-Jul	12.3	10.8	10.1	9.6	9.8	11.4	14.3	16.7	19.2	22.7	24.6	25.9	26.9	27.6	26.5	27.0	26.7	26.7	25.3	23.6	20.9	18.7	16.4	14.3	19.5	27.6																						
16-Jul	13.9	13.3	12.0	13.3	14.1	14.3	15.3	16.5	19.2	22.0	23.3	24.5	24.7	20.7	21.7	23.8	24.8	19.7	20.7	20.8	20.1	19.3	18.1	17.0	18.9	24.8																						
17-Jul	15.8	15.2	14.4	13.8	13.3	14.2	15.8	16.6	17.3	18.5	19.3	20.0	20.6	21.6	22.1	22.7	22.9	22.9	22.4	21.5	18.0	15.0	12.6	11.5	17.8	22.9																						
18-Jul	10.6	10.8	9.8	9.2	8.9	10.2	13.0	15.4	18.0	20.3	22.6	24.9	26.2	26.8	27.5	27.9	28.1	28.1	27.4	25.4	21.9	19.3	17.0	16.1	19.4	28.1																						
19-Jul	15.3	14.8	13.6	13.3	13.4	15.5	18.3	20.8	22.9	25.1	26.8	28.2	29.2	30.1	29.2	26.2	25.9	24.3	23.1	22.2	21.1	18.4	18.8	18.6	21.5	30.1																						
20-Jul	18.3	18.1	17.8	17.1	16.9	17.1	17.4	17.3	17.5	17.6	18.0	18.4	19.5	19.3	19.3	19.5	20.4	22.0	22.4	19.7	17.3	15.7	15.3	15.7	18.2	22.4																						
21-Jul	14.4	13.9	14.0	14.1	14.9	15.4	15.6	16.2	16.8	18.0	20.0	21.1	20.9	23.3	22.3	17.1	13.9	13.2	13.2	12.2	11.1	10.3	8.1	5.3	15.2	23.3																						
22-Jul	4.9	4.2	3.8	3.5	3.5	4.4	7.5	11.2	13.7	15.5	16.5	19.9	22.2	22.3	22.2	22.1	22.0	22.1	22.1	20.1	19.0	18.4	15.7	14.7	14.6	22.3																						
23-Jul	14.9	15.5	15.0	14.1	13.0	14.7	16.3	16.7	18.3	19.3	20.3	21.4	23.3	22.5	21.0	20.4	18.0	18.0	18.2	17.4	16.3	15.8	14.7	14.0	17.5	23.3																						
24-Jul	13.3	12.6	12.1	12.0	12.1	13.0	14.7	17.0	18.7	19.8	21.5	23.1	24.5	25.6	25.6	21.3	19.1	15.2	14.8	15.4	14.5	13.6	12.4	11.7	16.8	25.6																						
25-Jul	11.7	11.9	11.5	10.9	11.6	12.2	12.8	13.9	14.3	16.4	17.7	18.4	19.1	19.8	20.2	20.4	20.7	20.7	20.4	19.6	18.4	17.2	15.6	13.5	16.2	20.7																						
26-Jul	12.3	11.1	11.3	11.6	12.0	11.6	15.0	18.0	20.2	21.2	22.1	24.8	26.4	26.9	27.0	27.7	27.9	28.2	28.0	25.6	20.9	18.6	17.5	17.0	20.1	28.2																						
27-Jul	16.1	14.8	14.5	13.7	13.6	14.2	16.2	17.7	18.8	20.4	22.3	24.4	24.5	24.8	24.9	25.5	25.3	25.4	24.8	23.7	22.9	19.8	18.4	17.0	20.2	25.5																						
28-Jul	16.2	15.9	15.7	15.4	15.0	15.7	16.9	18.5	19.8	20.5	23.3	25.1	26.6	26.5	26.7	27.1	27.2	27.0	27.1	25.2	23.6	21.9	20.5	18.0	21.5	27.2																						
29-Jul	17.3	17.1	16.1	15.0	13.9	14.8	17.5	20.1	21.6	23.7	25.3	26.7	27.7	28.1	29.0	28.4	24.7	25.5	25.4	25.4	21.5	19.3	18.1	18.0	21.7	29.0																						
30-Jul	19.0	17.4	16.2	15.1	14.7	15.4	16.3	16.9	17.8	20.0	21.8	23.6	24.8	26.1	25.5	22.3	22.1	23.6	23.1	22.2	21.5	20.5	19.8	17.9	20.2	26.1																						
31-Jul	18.4	18.3	17.4	17.9	17.1	16.2	16.6	17.2	17.2	17.5	17.4	16.5	16.4	16.6	17.6	16.9	15.7	15.8	16.3	16.0	15.5	15.3	15.1	15.3	16.7	18.4																						
																								15.0	14.4	13.8	13.4	13.3	14.2	15.7	17.1	18.5	19.9	21.0	21.9	22.6	22.9	23.2	22.8	22.3	22.1	21.9	20.8	19.2	17.8	16.6	15.6	Diurnal Average
																								19.0	18.4	17.8	17.9	17.1	17.3	19.6	21.8	24.2	25.7	26.8	28.2	29.2	30.1	29.2	28.9	29.2	29.3	28.8	27.2	23.6	21.9	20.6	19.0	Diurnal Maximum





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Shell Muskeg River - July 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	15	2.02	2.02
10 - 20	457	61.42	63.44
> 20	272	36.56	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Barometric Pressure (BP) - inHg

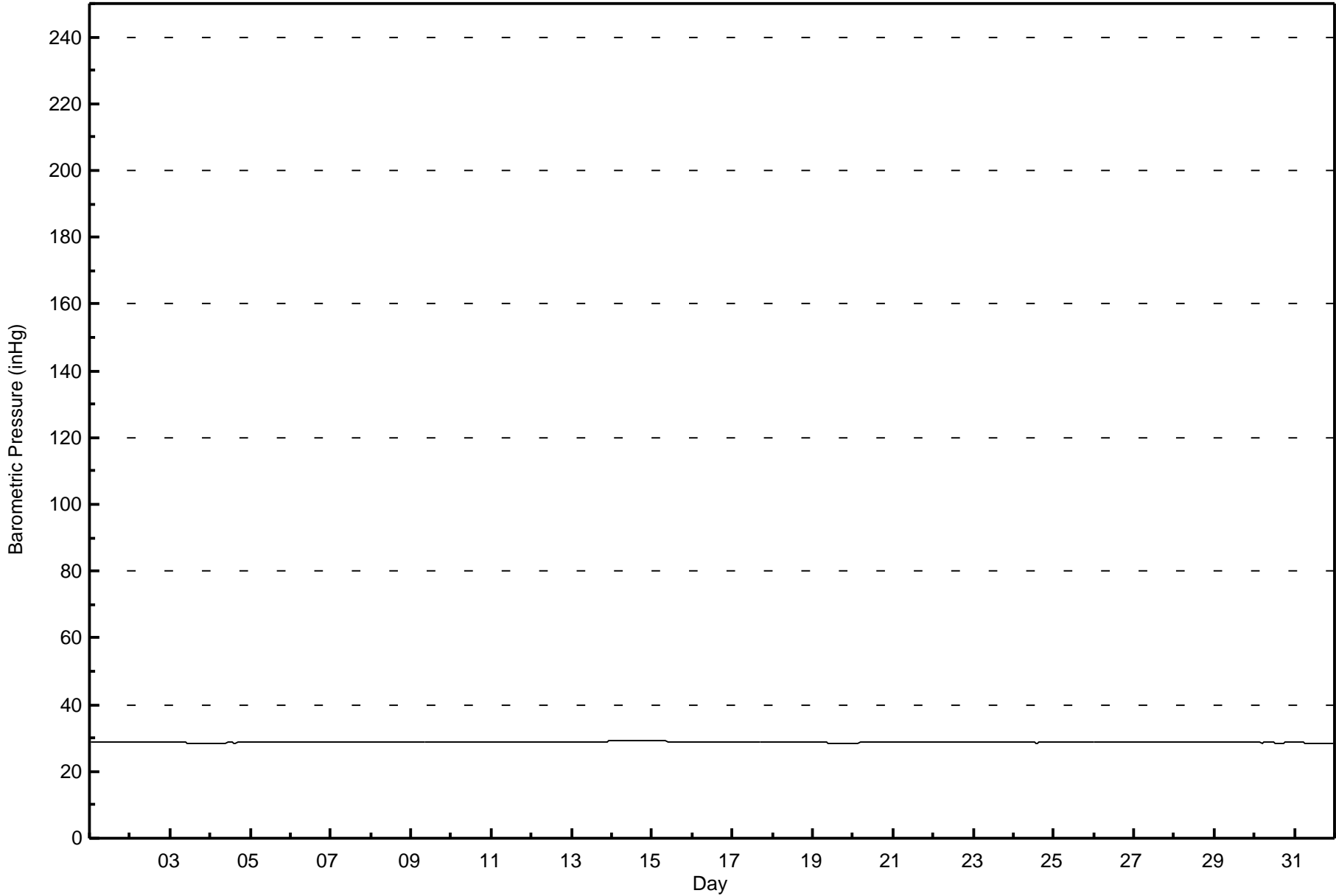
Shell Muskeg River - July 2016

Maximum Value: 29.1 inHg on Jul 14 08:00 Maximum Daily Average: 29.1 inHg on Jul 14																						Hours in Service:	744							
Minimum Value: 28.5 inHg on Jul 19 15:00 Minimum Daily Average: 28.6 inHg on Jul 19																						Hours of Data:	744							
Maximum Diurnal Average: 28.8 inHg at hour 7 Minimum Diurnal Average: 28.8 inHg at hour 18																						Hours of Missing Data:	0							
Monthly Average: 28.77 inHg Percentiles: P ₁ = 28.5 P ₁₀ = 28.6 Q ₁ = 28.7 Median = 28.7 Q ₃ = 28.9 P ₉₀ = 29.0 P ₉₉ = 29.1																						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-Jul	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.9	28.9			
2-Jul	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.8	28.8		
3-Jul	28.7	28.7	28.7	28.7	28.7	28.7	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.7	28.7		
4-Jul	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.7	28.7	
5-Jul	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	
6-Jul	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	
7-Jul	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	
8-Jul	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	
9-Jul	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.9	28.9	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.9	
10-Jul	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.8	
11-Jul	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	
12-Jul	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	
13-Jul	28.8	28.8	28.8	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	
14-Jul	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.0	29.0	29.0	29.0	29.0	29.0	29.1	29.1	29.1	29.1	
15-Jul	29.1	29.1	29.1	29.1	29.1	29.1	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.8	28.8	28.8	29.0	29.1	
16-Jul	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.7	28.8	28.7	28.7	28.7	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	
17-Jul	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	29.0	29.0	29.0	29.0	29.0	29.0	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	29.0	
18-Jul	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.8	28.9	
19-Jul	28.7	28.7	28.7	28.7	28.7	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.6	28.6	28.6	28.6	28.6	28.7	
20-Jul	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	
21-Jul	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.7	28.7	28.8	28.8	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	
22-Jul	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.8	28.8	28.8	28.8	28.7	28.7	28.7	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.8	28.9
23-Jul	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	
24-Jul	28.7	28.7	28.7	28.7	28.7	28.7	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.7	28.7
25-Jul	28.8	28.8	28.8	28.8	28.8	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	29.0	29.0
26-Jul	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.8	28.8	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9
27-Jul	28.9	28.9	28.9	28.9	28.9	28.9	28.9	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
28-Jul	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	29.0
29-Jul	28.9	28.9	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.6	28.6	28.6	28.6	28.6	28.6	28.7	28.9
30-Jul	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6
31-Jul	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6
																								Diurnal Average	28.8					
																								Diurnal Maximum	29.1					



Wood Buffalo Environmental Association
Hourly Averages

Barometric Pressure (BP) - inHg
Shell Muskeg River - July 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed (WS) - km/h

Shell Muskeg River - July 2016

Maximum Speed: 30 km/h on Jul 21 17:00	Maximum Daily Speed Average: 15.4 km/h on Jul 12	Hours in Service: 744
Minimum Speed Value: 0 km/h on Jul 23 05:00	Minimum Daily Speed Average: 2.0 km/h on Jul 28	Hours of Data: 744
Maximum Diurnal Speed Average: 5.5 km/h at hour 17	Minimum Diurnal Speed Average: 0.2 km/h at hour 10	Hours of Missing Data: 0
Monthly Average Velocity: 1.7 km/h 356.8 deg	Percentiles: P ₁ = 2 P ₁₀ = 4 Q ₁ = 6 Median = 9 Q ₃ = 13 P ₉₀ = 16 P ₉₉ = 23	Percent Operational Time: 100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Jul	S6	SE6	SSE6	S5	SSE4	SSE4	SSE7	S7	SSE13	SSE20	SSE20	SSE17	S15	S15	S13	SE13	SSE12	SE14	SE14	SE13	SE11	SSE11	SE12	SE10	SSE10.8	SSE20	
2-Jul	SSE10	S7	S5	S4	S6	S4	S6	SE3	SE10	SSE20	SSE22	S19	SSE18	SSE15	S16	S17	SSW15	SSE5	SSE14	SE11	SE7	SE10	SSE8	S7	SSE10.4	SSE22	
3-Jul	SSE10	SSE11	SSE7	SSE4	SSE2	SSE4	S4	S6	SE5	S6	SSW8	S15	W11	ENE9	E8	ENE10	ENE11	E8	E7	E6	ESE4	SSE6	S6	SSE5	SE4.5	S15	
4-Jul	S5	W6	SW6	SSW6	SSW6	WSW10	WSW7	WSW8	SW6	SW8	W7	W7	WSW5	W7	WNW6	WSW11	SW15	SW9	SSE10	SSE10	SSE11	SE9	SSE6	SE2	SW5.5	SW15	
5-Jul	E4	NE7	E3	ENE2	W2	SW5	NW5	N10	N7	NNE4	NE10	NE9	NE5	NNE11	NNE13	NE11	N16	N15	NNW12	NW13	NW14	NW11	N7	N16	N6.7	N16	
6-Jul	ENE11	ENE8	ENE13	ENE13	NE11	NE17	NNE17	N16	NNE19	N16	NE15	ENE5	NE15	NE19	ENE16	NE13	NE16	ENE9	E5	ENE10	NE17	NNE14	NNE20	N15	NE13.1	NNE20	
7-Jul	N12	NNW11	N14	N16	N14	NNW11	N14	N13	N11	N14	N11	NNE17	NW11	NNW13	N12	NNE14	NNE19	NNE16	NNE18	N16	N14	N14	NNW11	NNW10	N13.1	NNE19	
8-Jul	N14	N13	N10	NNW8	NNW7	NNW9	NNW7	N8	NNE7	NNE11	NE11	NE8	NE9	NNE8	NNW7	N8	NE11	NE11	NE16	NE18	NE19	NE17	NE14	NNE18	NNE10.3	NE19	
9-Jul	NNE16	NNE16	NNE14	NNE11	NNE13	NNE12	NE9	NNE8	NE10	NE10	NE7	WNW4	WSW9	WSW10	E3	ENE7	NE10	NNE13	NE14	ENE11	NE11	NE14	NE14	NE13	NNE8.8	NNE16	
10-Jul	NNE12	NNE13	NNE13	NNE11	NE8	NE10	NE8	NE9	ESE4	NE6	ENE7	NE7	NE14	NE8	NE10	ENE10	NE8	E5	ENE3	WSW12	WSW12	W9	NW9	NNW12	NNE5.9	NE14	
11-Jul	N11	NNE9	NE11	NE2	NNW2	NNW2	NNW4	N7	NE11	NE11	NE10	NE12	NW5	W14	NNW10	NW10	NNW12	N19	N19	N20	N18	N13	NNW12	NNW14	N9.2	N20	
12-Jul	N15	NNW8	N14	NNE12	NNE12	NNE13	N12	N12	N13	NNE16	NNE16	NNE17	N16	NNE18	N17	N18	NNE24	N23	N21	N19	N17	NNW16	NNW16	NNW12	N15.4	NNE24	
13-Jul	NNW11	NNW10	NNW10	NNW10	NNW11	NNW12	NNW11	NNE19	NNE18	NNE20	N18	NNE21	N18	NNE9	NNE19	NE20	NE18	NE19	NE19	NNE14	N13	N15	N13	ENE8	N13.6	NNE21	
14-Jul	ENE7	E3	SE4	W4	SSE4	SSW5	S4	SW3	SW5	W5	W5	NNE4	NE5	WNW7	NW6	S2	SW8	W10	W8	NNE5	NNW9	NW10	NW8	WSW3	WNW2.4	W10	
15-Jul	WNW5	SSW2	S6	SSW6	S7	SSW6	SSW5	SSW6	SSW8	SSW7	WSW7	WSW5	SW6	SW6	W8	NW20	NW13	W13	W12	NNW10	NW11	NNW8	WNW7	WSW5	SW7	W5.7	NW20
16-Jul	SW8	SW9	SW9	SSW9	SSW11	SSW10	SSW8	SSW8	SSW7	SW6	W6	WSW7	WSW3	S10	SSW7	SSW5	N16	N16	NNW11	NNW13	NNW13	NNW16	NNW12	NNW12	W3.9	N16	
17-Jul	NNW10	NNW12	NNW11	NNW10	NNW12	NNW10	NNW11	N12	N12	NNE15	N14	NNE12	NNE12	NNE12	NE14	NNE15	NNE17	NNE16	NE15	NE11	E3	S2	S5	S6	NNE9.2	NNE17	
18-Jul	S6	S7	S7	S8	S6	S7	S6	S7	SSW6	SW9	SSW10	SSW11	SSW11	SSW12	SSW12	SW11	SW11	SW12	SW12	SSW9	SSW9	SSW9	SSW8	S9	SSW8.6	SSW12	
19-Jul	S6	S4	SSW6	S7	SSE4	SSE7	S9	SSW9	SSW11	SSW11	SW14	SW17	SW18	SW16	W17	W18	W14	NW16	SSW5	W3	NNW6	ENE8	NE12	NE11	SW5.5	SW18	
20-Jul	NNE13	NNE13	N11	N14	N11	N14	N8	N6	N9	NE6	E5	W3	NW5	NW6	WNW6	WNW7	WNW5	W5	NW2	E6	S6	S6	SSW4	SSW5	N4.3	N14	
21-Jul	SSE6	SSW6	SSE5	S7	SSW8	S9	S7	SSW8	WSW11	SW6	SW12	W11	NNW14	NW19	NW24	N28	N30	N22	NNE22	NNE22	N19	N13	NNE3	SE5	NNW5.4	N30	
22-Jul	SSW8	SSW7	S7	S6	S6	S6	SSE8	S12	S12	S15	S17	SSE20	S18	S11	SSW8	W9	WNW8	SSW7	WNW7	NW7	NNW10	NNW10	SSW3	SSW6	SSW6.4	SSE20	
23-Jul	SW7	SW8	WSW9	WNW4	E0	NNE5	NE11	NE11	NE4	NE7	NNW3	W4	SSW4	W1	SW11	WSW6	NW9	S6	SSW9	SW8	SSW7	SSW8	SSW7	S7	SW2.2	NE11	
24-Jul	S7	S7	S9	S9	SSW9	SSW12	SSW13	WSW19	SW21	WSW22	WSW23	WSW21	WSW23	WSW23	WNW12	WNW27	W19	W15	WSW14	W12	W10	WSW11	SSW7	WSW12.6	WNW27		
25-Jul	WSW9	WSW11	WSW12	WSW12	WSW11	WSW12	WNW7	WNW8	NW7	NW8	NNW9	NNW7	NE8	NE13	NE12	ENE11	ENE12	ENE10	ENE13	ENE15	ENE13	ENE15	ENE13	ENE8	NNW2.4	ENE15	
26-Jul	ENE6	E6	ESE6	SSE6	W2	ESE4	SSE5	S8	SSW8	SSW10	SSW9	SSW11	SSW11	SSW13	SSW8	WSW10	SW10	SW10	SW7	S7	SSE8	S8	S8	S10	S6.3	SSW13	
27-Jul	SSE6	SSE8	S8	S6	SSW6	S6	S4	S4	S3	NNW3	NNE15	NNE15	NNE16	NNE16	NNE16	NNE12	NE12	NNE16	NNE17	NNE15	ENE3	NE6	ENE4	NE5.0	NNE17		
28-Jul	NNE3	ENE1	S2	SSE4	SSW5	SW5	SSW5	SSW4	S5	SSE5	SSE6	ESE6	SE7	NE7	NE8	NE8	NE8	ENE7	E7	ENE8	ENE7	WNW8	SW3	SSW7	ESE2.0	NE8	
29-Jul	SSW9	SSW9	SSW7	SSW8	S5	SSW7	SSW7	SSW7	SSW9	S10	S9	S11	S12	SSW12	SSW12	SSW6	W8	SE4	SE4	ESE5	ESE8	SSE9	SSE8	WSW2	S6.7	SSW12	
30-Jul	N8	E9	SE6	S6	SSW5	SW5	SSW4	SSW6	WSW5	NW4	ENE4	SSW3	W6	WNW4	NW15	ESE3	NE12	ENE9	E8	NNE15	N15	N14	NNE11	E8	NNE2.5	NNE15	
31-Jul	NE12	NE13	NE8	NNE10	N8	NW7	N13	N16	N14	N12	NNE4	W8	WSW13	W14	W14	NE8	NNE2	WSW4	NNW10	WSW8	WSW8	WSW8	W11	NNW10	NNW5.0	N16	

NNE1.9	NE1.1	NE0.5	NW0.3	NNW0.6	NNW0.7	NNW0.5	NW1.2	NNW0.3	N0.2	SW0.4	SW1.0	W2.2	NNW2.3	NW3.6	N3.7	N5.5	N4.7	NNE4.2	NNE4.5	N4.2	N3.4	N2.5	NNE1.8	Diurnal Average	
NNE16	NNE16	N14	N16	N14	NE17	NNE17	NNE19	NNE19	SW21	WSW22	WSW23	WSW21	WSW23	NW24	N28	N30	N23	NNE22	NNE22	NE19	NE17	NNE20	NNE18	Diurnal Maximum	

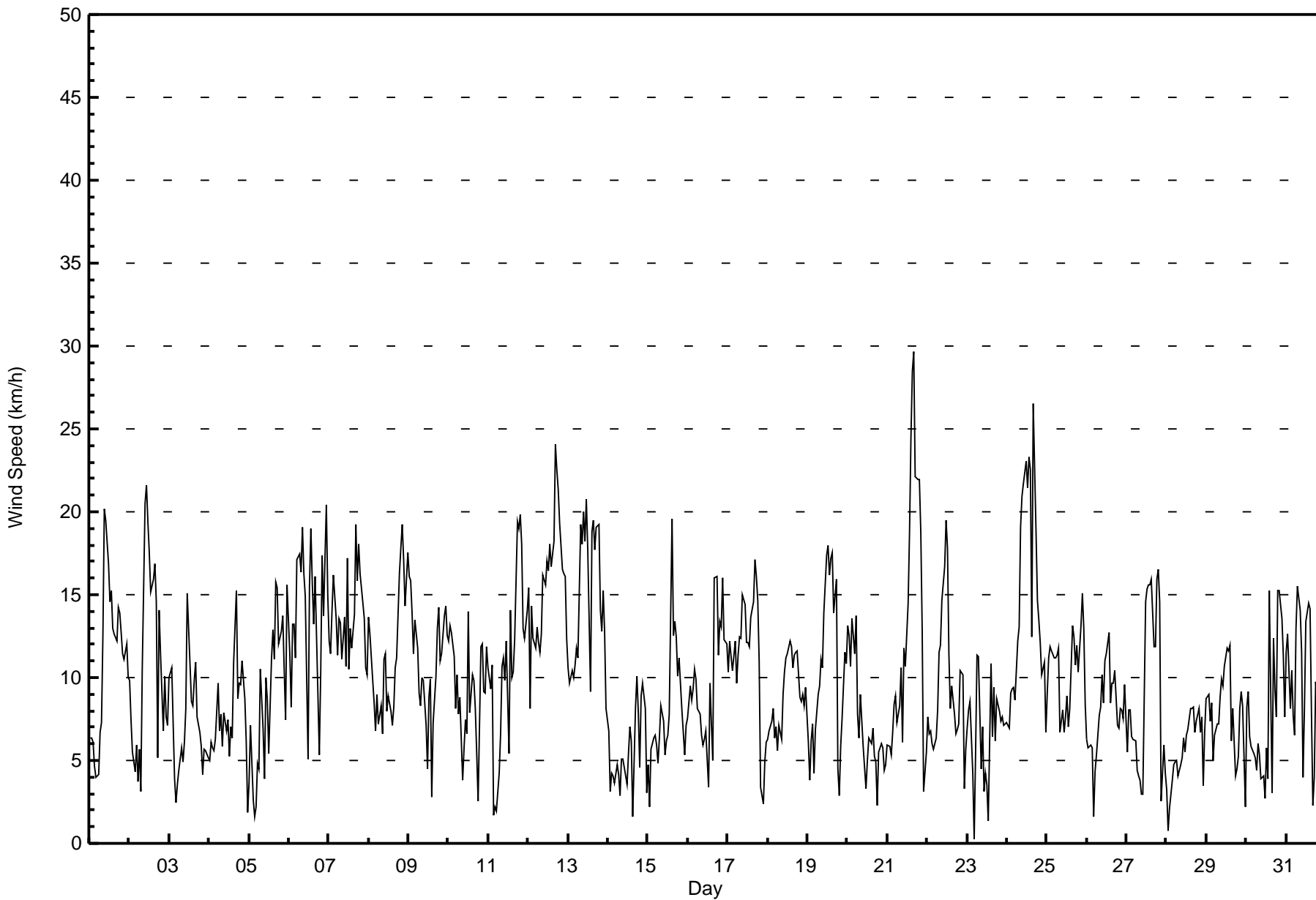
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Shell Muskeg River - July 2016

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Shell Muskeg River - July 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	125	16.80	16.80
6 - 11	369	49.60	66.40
12 - 19	224	30.11	96.51
20 - 28	25	3.36	99.87
29 - 38	1	0.13	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
Shell Muskeg River - July 2016**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	0	8	4	7	9	5	7	13	18	15	6	8	10	5	5	5	125
6 - 11	17	11	43	23	9	3	10	24	53	58	23	22	16	16	14	27	369
12 - 19	52	50	30	7	0	0	5	7	11	10	8	8	11	2	6	17	224
20 - 28	5	6	1	0	0	0	0	4	0	0	1	5	0	1	2	0	25
29 - 38	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	75	75	78	37	18	8	22	48	82	83	38	43	37	24	27	49	744

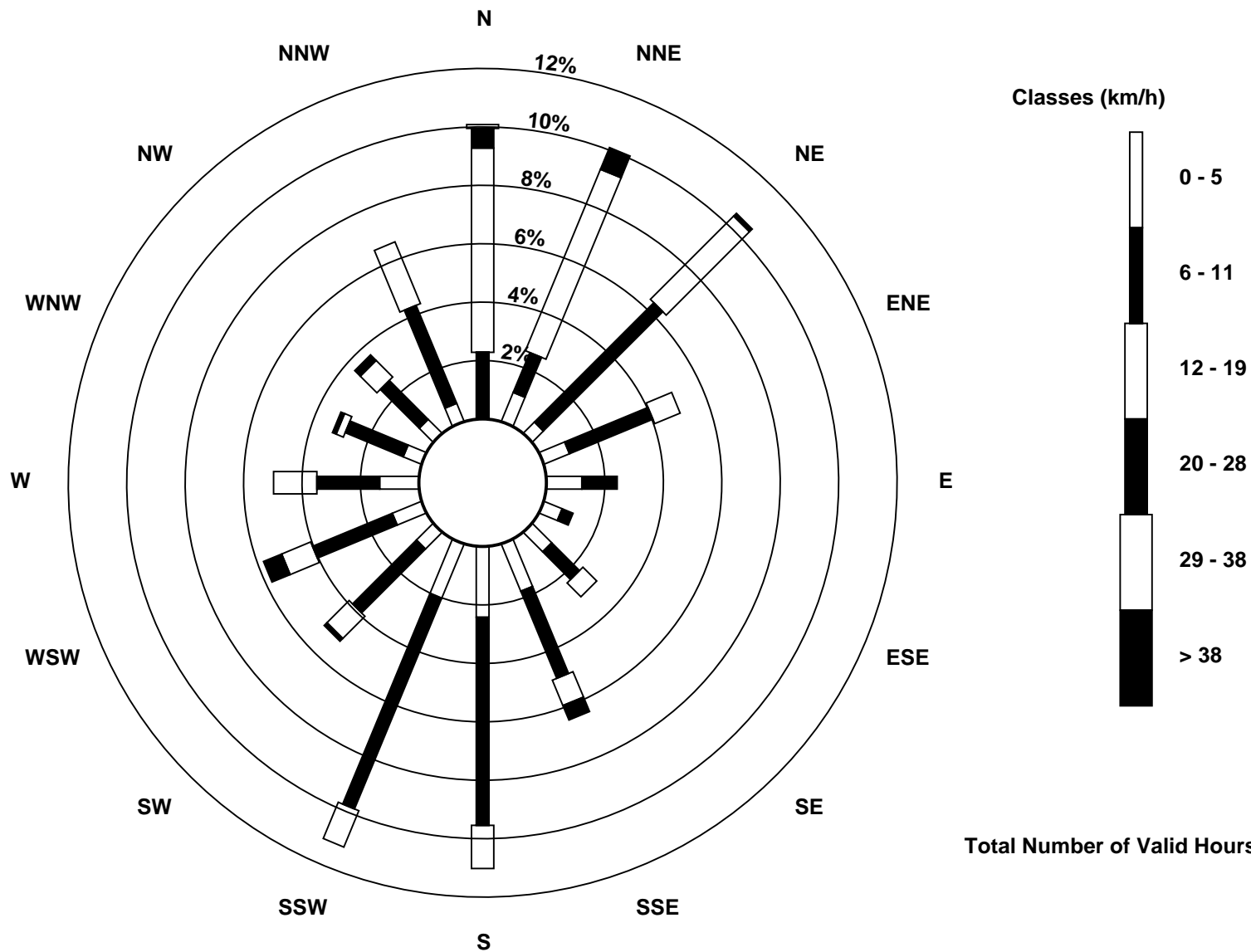
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

Wind Speed (WS) - km/h
Shell Muskeg River (AMS 16)





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Shell Muskeg River - July 2016

Direction of Maximum Speed: 6 deg on Jul 21 17:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 3.1 deg on Jul 12	Hours of Data: 744
Direction of Minimum Speed: 101 deg on Jul 23 05:00	Hours of Missing Data: 0
Direction of Minimum Daily Speed Average: 2.0 deg on Jul 28	Percent Operational Time: 100.0
Monthly Average Direction: 257.7 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Jul	187	144	160	184	152	155	151	181	151	159	162	156	175	176	173	136	148	136	137	142	145	149	135	143	154.6
2-Jul	159	172	171	171	184	185	174	127	142	159	168	169	168	155	185	188	196	148	147	143	132	138	158	181	165.0
3-Jul	160	162	160	165	161	150	172	187	138	170	196	187	280	66	89	70	74	95	95	95	114	148	178	155	141.4
4-Jul	171	262	226	208	211	248	242	239	217	231	264	267	242	271	298	249	216	233	156	155	153	144	162	141	218.6
5-Jul	93	56	86	57	259	226	305	352	1	33	44	45	46	25	26	34	10	9	332	308	308	314	357	1	3.2
6-Jul	60	73	59	61	53	38	28	6	33	10	41	61	45	47	57	55	53	76	81	72	36	25	20	11	41.6
7-Jul	351	348	360	7	355	345	360	355	354	7	353	26	316	342	354	23	12	15	26	5	356	4	340	345	0.5
8-Jul	10	2	351	345	340	337	337	4	26	32	40	45	46	24	334	6	46	37	36	38	43	43	39	24	22.7
9-Jul	20	17	24	17	22	30	44	30	44	42	34	294	244	238	85	78	42	15	36	57	50	41	43	46	31.8
10-Jul	29	29	21	23	38	44	53	48	106	36	64	51	47	52	50	70	53	79	62	257	255	279	312	342	29.3
11-Jul	2	31	34	38	332	340	347	8	36	37	40	44	316	275	301	313	341	4	8	2	1	360	344	344	359.5
12-Jul	353	344	2	17	13	21	8	358	4	23	16	17	4	13	351	2	22	357	353	359	350	346	346	348	3.1
13-Jul	339	330	333	336	335	340	343	17	18	12	7	19	356	13	12	52	47	37	36	18	5	356	0	57	11.0
14-Jul	62	98	137	263	162	198	182	222	223	266	280	19	36	286	319	181	221	265	277	13	336	314	321	258	283.7
15-Jul	297	210	182	203	183	194	192	210	216	240	238	230	223	260	322	305	266	281	290	319	295	294	250	228	260.9
16-Jul	222	224	220	210	206	210	198	204	204	218	264	244	253	186	196	211	356	352	334	337	337	344	342	344	275.4
17-Jul	341	339	337	337	344	342	343	351	8	14	11	17	31	27	36	29	28	20	45	54	95	173	187	176	12.1
18-Jul	179	169	182	171	173	170	172	186	201	214	208	193	201	205	209	222	215	221	220	212	202	196	193	185	198.8
19-Jul	189	177	199	190	160	153	183	200	194	203	219	220	226	219	262	275	275	313	213	263	335	67	38	48	228.2
20-Jul	12	23	360	349	351	4	356	349	7	43	83	275	325	318	297	303	301	281	313	96	173	187	199	209	349.4
21-Jul	153	196	164	180	204	189	171	208	238	235	234	259	293	316	324	3	6	9	16	18	5	8	28	128	337.6
22-Jul	200	196	186	169	174	179	159	174	191	180	175	167	183	185	194	261	298	212	286	325	293	341	192	209	197.7
23-Jul	214	230	250	286	101	32	41	38	42	49	340	278	211	274	219	240	310	184	206	214	210	200	192	172	228.0
24-Jul	179	171	175	181	180	197	207	213	238	235	250	242	244	246	241	285	294	273	264	254	264	277	253	211	242.1
25-Jul	244	241	248	246	255	256	257	257	284	299	310	308	330	348	38	43	52	60	67	76	62	65	68	70	345.0
26-Jul	61	79	111	158	262	121	160	178	193	204	211	209	205	205	199	238	215	222	215	180	165	173	185	186	191.1
27-Jul	158	167	182	182	192	169	190	178	189	180	336	33	31	30	30	24	28	47	33	30	32	73	38	62	47.2
28-Jul	23	66	188	163	207	231	202	192	176	164	167	119	132	34	38	46	51	77	86	68	77	285	232	197	112.6
29-Jul	208	212	206	210	179	198	205	203	198	190	189	190	191	200	201	194	273	127	133	104	118	153	157	251	190.0
30-Jul	7	93	135	188	199	223	199	211	249	308	72	199	269	301	319	119	56	71	86	20	11	351	18	85	25.7
31-Jul	44	49	54	27	357	310	355	10	3	359	27	269	247	262	261	41	21	250	302	248	254	252	261	296	324.1
24.5 42.8 44.8 305.1 288.0 297.9 327.2 325.2 332.2 4.8 230.1 214.0 265.1 289.5 318.3 5.7 3.3 7.4 22.2 20.2 7.4 1.7 5.1 23.2																									
Diurnal Average																									

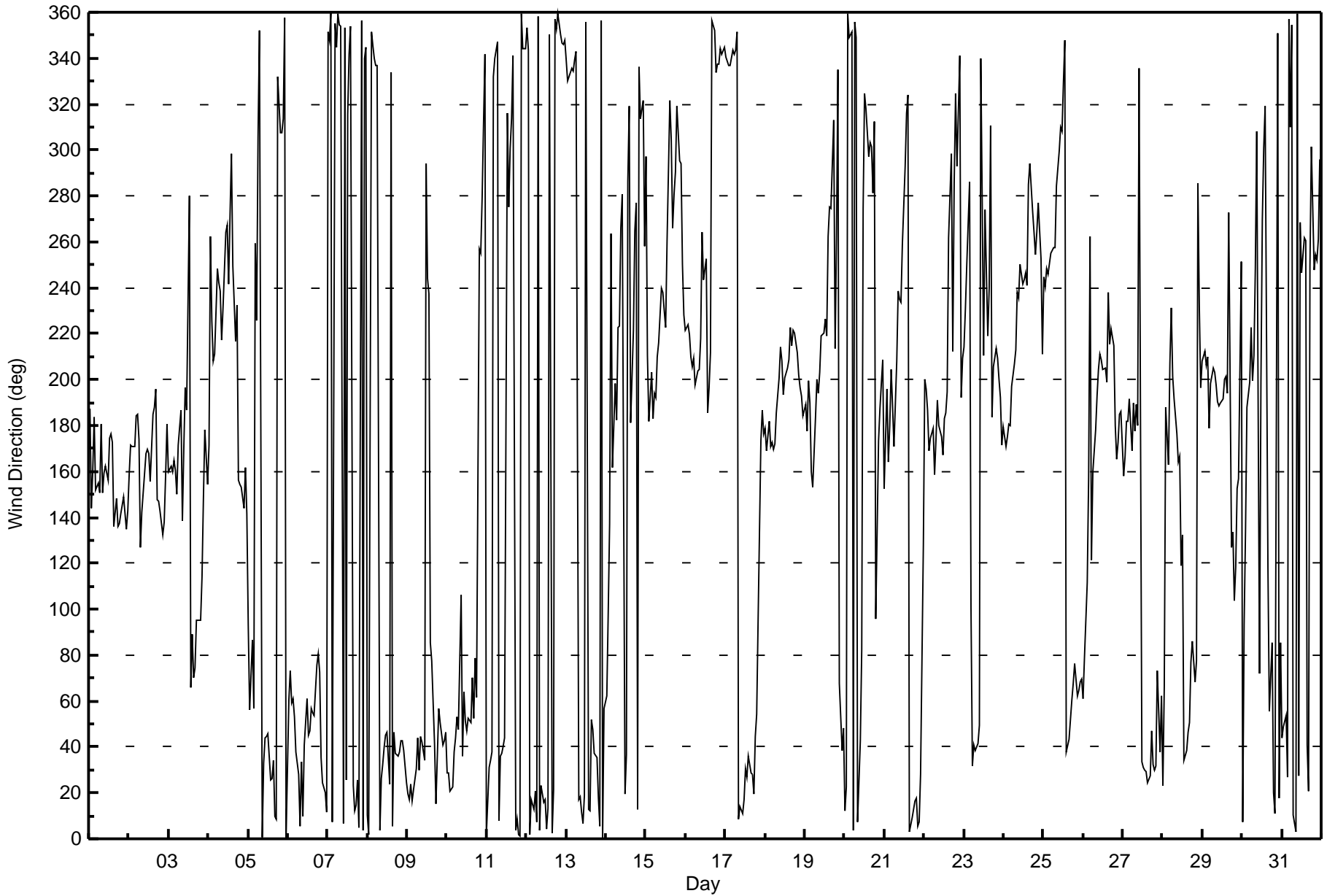
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
Shell Muskeg River - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 103 deg on Jul 23 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: 7 deg on Jul 9 22:00																									
Percentiles: P ₁ = 8 P ₁₀ = 14 Q ₁ = 17 Median = 22 Q ₃ = 31 P ₉₀ = 51 P ₉₉ = 90																									
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-Jul	16	12	10	17	29	23	22	26	20	18	21	21	26	27	35	29	26	19	17	15	10	11	11	12	35
2-Jul	17	14	18	24	29	25	23	57	35	18	20	21	18	20	28	25	22	37	15	13	15	16	15	18	57
3-Jul	9	10	14	33	27	23	40	31	48	47	30	27	32	47	27	20	20	22	25	19	34	38	23	25	48
4-Jul	26	28	26	18	19	13	21	18	36	39	18	18	39	23	80	38	24	36	11	13	11	11	40	63	80
5-Jul	57	38	81	81	71	22	42	20	75	88	20	39	54	30	28	32	25	18	24	14	15	20	48	22	88
6-Jul	24	20	15	19	20	9	13	18	16	22	19	70	17	16	18	23	19	27	40	19	13	13	14	26	70
7-Jul	16	15	15	16	17	17	17	17	27	22	24	17	29	28	32	30	17	22	21	18	16	21	19	20	32
8-Jul	18	14	21	23	42	21	27	36	32	16	19	36	33	38	45	38	18	27	18	12	7	8	10	7	45
9-Jul	14	14	8	14	9	13	11	29	12	17	41	75	27	24	92	29	24	19	15	20	13	7	9	12	92
10-Jul	13	14	10	10	25	15	26	16	47	44	39	65	18	62	39	25	31	51	77	18	17	23	25	15	77
11-Jul	21	29	17	79	91	98	46	36	22	23	27	17	66	14	28	29	39	19	19	16	14	16	18	17	98
12-Jul	18	31	16	21	22	21	21	28	27	22	24	22	24	21	27	24	15	21	20	16	18	17	19	19	31
13-Jul	20	20	21	22	20	21	27	19	19	21	24	19	31	68	23	21	14	14	12	23	19	15	17	31	68
14-Jul	22	51	30	23	47	22	21	39	26	36	58	75	70	39	53	89	27	15	36	59	23	15	13	52	89
15-Jul	36	54	15	13	14	22	31	24	18	27	51	45	48	54	26	23	18	17	18	26	17	25	17	10	54
16-Jul	18	17	16	17	18	19	21	21	22	29	31	33	94	33	25	45	44	30	31	26	23	18	21	20	94
17-Jul	18	16	17	18	16	19	23	19	28	26	26	34	31	34	27	29	21	20	21	23	53	45	14	14	53
18-Jul	23	9	14	8	13	12	21	23	26	22	24	28	27	27	27	26	24	25	17	19	16	16	15	15	28
19-Jul	15	56	29	19	36	17	22	24	26	26	27	24	19	22	39	17	20	28	45	66	63	40	16	16	66
20-Jul	20	21	22	18	20	18	26	34	22	35	38	53	45	27	30	24	35	34	82	45	13	19	75	56	82
21-Jul	20	36	25	29	19	21	22	23	20	30	24	25	25	26	26	18	17	17	19	16	17	19	74	19	74
22-Jul	16	16	21	17	20	18	17	20	25	21	19	18	23	20	22	30	29	22	58	23	22	31	62	29	62
23-Jul	18	25	14	43	103	95	16	15	58	30	77	69	80	83	22	54	60	28	23	23	21	20	22	17	103
24-Jul	19	19	17	17	17	21	22	21	14	13	14	14	17	15	17	48	19	17	17	15	12	16	19	41	48
25-Jul	22	11	9	8	9	10	11	15	24	30	50	41	33	49	48	18	21	29	18	16	15	11	7	8	50
26-Jul	18	18	15	47	81	52	15	29	27	25	22	26	34	28	44	30	29	24	23	17	8	12	17	17	81
27-Jul	22	12	15	19	27	13	24	24	29	31	94	21	20	21	20	20	26	11	13	11	12	88	29	30	94
28-Jul	48	87	57	34	18	23	28	40	26	22	37	51	55	42	46	68	38	36	24	13	60	56	69	21	87
29-Jul	18	18	18	19	24	18	20	26	26	28	28	33	30	32	32	56	54	37	13	18	17	14	22	80	80
30-Jul	38	22	27	40	31	32	44	29	47	50	79	89	61	86	42	83	24	29	20	29	16	18	30	20	89
31-Jul	28	18	33	21	91	59	19	19	18	19	88	21	14	14	14	83	94	51	15	16	29	17	14	27	94
	57	87	81	81	103	98	46	57	75	88	94	89	94	86	92	89	94	51	82	66	63	88	75	80	
	Diurnal Maximum																								





Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	July 8, 2016	Last Calibration	June 23, 2016
Station Name	Shell Muskeg River	Station Number	AMS 16
Reason:	Routine		
Start Time (MST)	9:50	End Time (MST)	13:10
Gas Cert Reference	LL104193	Station temp.	22 Deg C
Cal Gas Concentration	48.3 ppm	Cal Gas Exp Date	12-Feb-18
Calibrator Make/Model	API T700	Serial Number	493
ZAG Make/Model	API 701	Serial Number	2155
DACS make/model	Campbell Scientific CR3000	DACS serial No.	2632

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-710	-710
Analyzer IP address	192.168.1.43		Lamp voltage	801	796
Calculated slope	0.995096	0.997598	Chamber temp	45.0	45.2
Calculated intercept	1.419396	1.567266	Pressure	700.9	710.8
Analyzer Background	8.7	8.9	Flow	0.440	0.449
Analyzer Coefficient	1.059	1.059	Intensity	108	108

Analyzer make Thermo 43i Analyzer serial # 1118148498

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.3	----
as found span	5000	83.6	807.6	809.1	0.998
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	83.6	807.6	809.1	0.998
second point	5000	42.0	405.7	403.2	1.006
third point	5000	21.1	203.8	201.9	1.010
as left zero	5000	0.0	0.0	0.1	----
as left span	5000	83.6	807.6	804.8	1.003
Average Correction Factor					1.005

Corrected As found 808.9 Previous response 810.1 % change 0.2%

Notes:

Inlet filter changed after as founds. Adjusted zero.

Calibration Performed By: Evan Magill



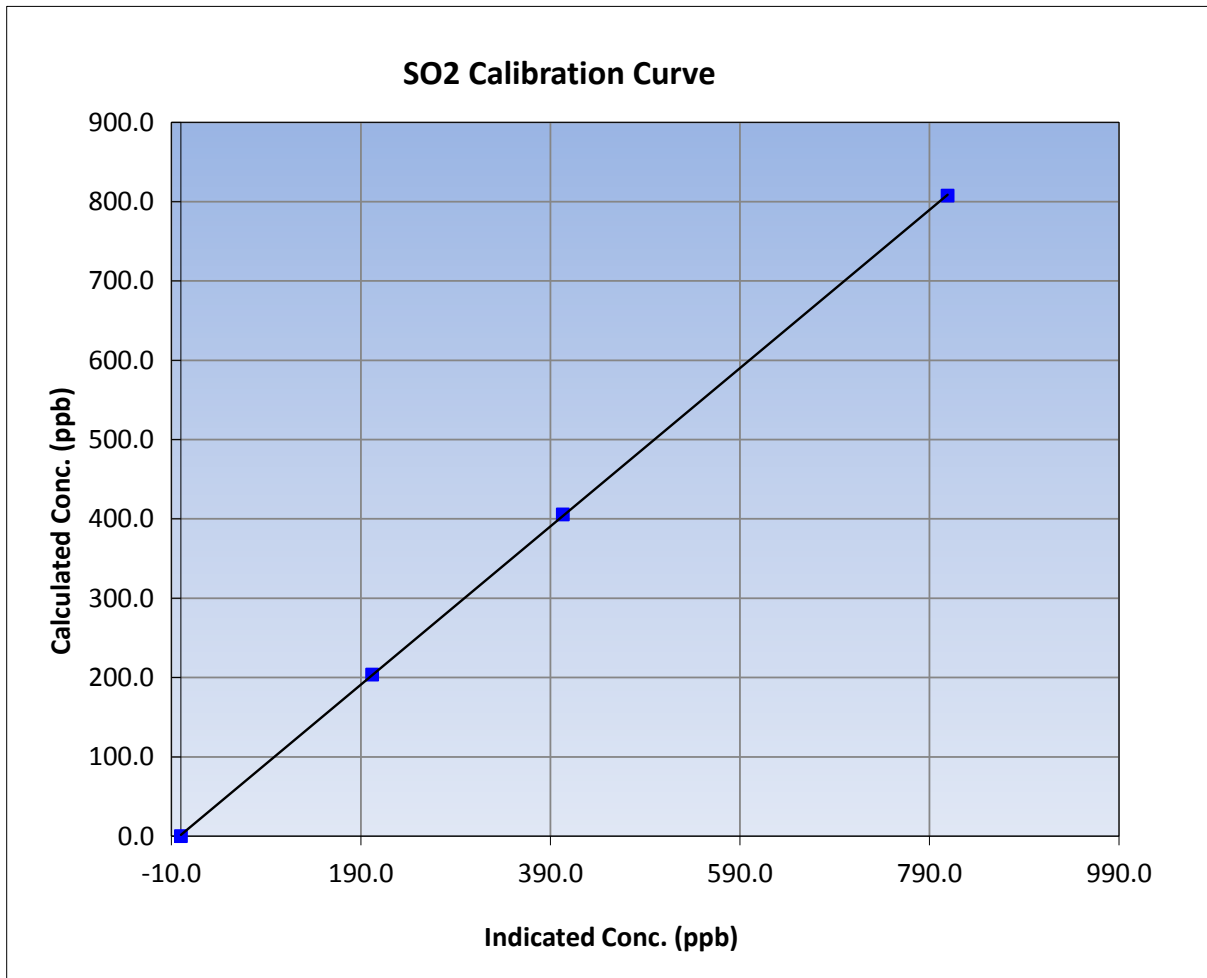
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	July 8, 2016	Previous Calibration	June 23, 2016
Station Name	Shell Muskeg River	Station Number	AMS 16
Start Time (MST)	9:50	End Time (MST)	13:10
Analyzer make	Thermo 43i	Analyzer serial #	1118148498

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999976
807.6	809.1	0.9981		
405.7	403.2	1.0063	Slope	0.997598
203.8	201.9	1.0095		
			Intercept	1.567266



SO2 Calibration Plot

Date: July 8, 2016





Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	July-08-16	Last Calibration	June-23-16
Station Name	Shell Muskeg River	Station Number	AMS 16
Reason:	Routine		
Start Time (MST)	9:50	End Time (MST)	13:10
Gas Cert Reference	LL104193	Cal Gas Expiry Date	12-Feb-18
CH4 Cal Gas Conc.	487 ppm	CH4 Equiv Conc.	1017.8 ppm
C3H8 Cal Gas Conc.	193 ppm	Station temp.	22 Deg C
Calibrator Make/Model	API T700	Serial Number	493
ZAG make/model	Teledyne API 701	Serial Number	2155
DACS make/model	Campbell Scientific CR3000	Serial Number	2632

Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 50 ppm		Sample Pressure	8.2	8.2
Analyzer IP address	192.168.1.51		Air or Bypass Press	34.9	34.9
Calculated slope	0.997609	1.012193	Fuel Pressure	24.2	24.2
Calculated intercept	0.020536	-0.131313	Analyzer Coeff	4.494	4.431
			Analyzer BKG	2.89	2.61

Analyzer make	Thermo 51i-LT	Analyzer serial #	1218153458
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Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	-0.30	----
as found span	5000	83.6	17.02	16.78	1.014
calibrator zero	5000	0.0	0.00	0.12	----
high point	5000	83.6	17.02	16.95	1.004
second point	5000	42.0	8.55	8.54	1.001
third point	5000	21.1	4.29	4.41	0.974
as left zero	5000	0.0	0.00	0.19	----
as left span	5000	83.6	17.02	16.98	1.002
Average Correction Factor					0.993

Corrected As found	17.08	Previous response	17.04	% change	-0.3%
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Notes:

Inlet filter changed after as founds. Adjusted zero. Did not adjust span, but used new values for high point.

Calibration Performed By:

Evan Magill



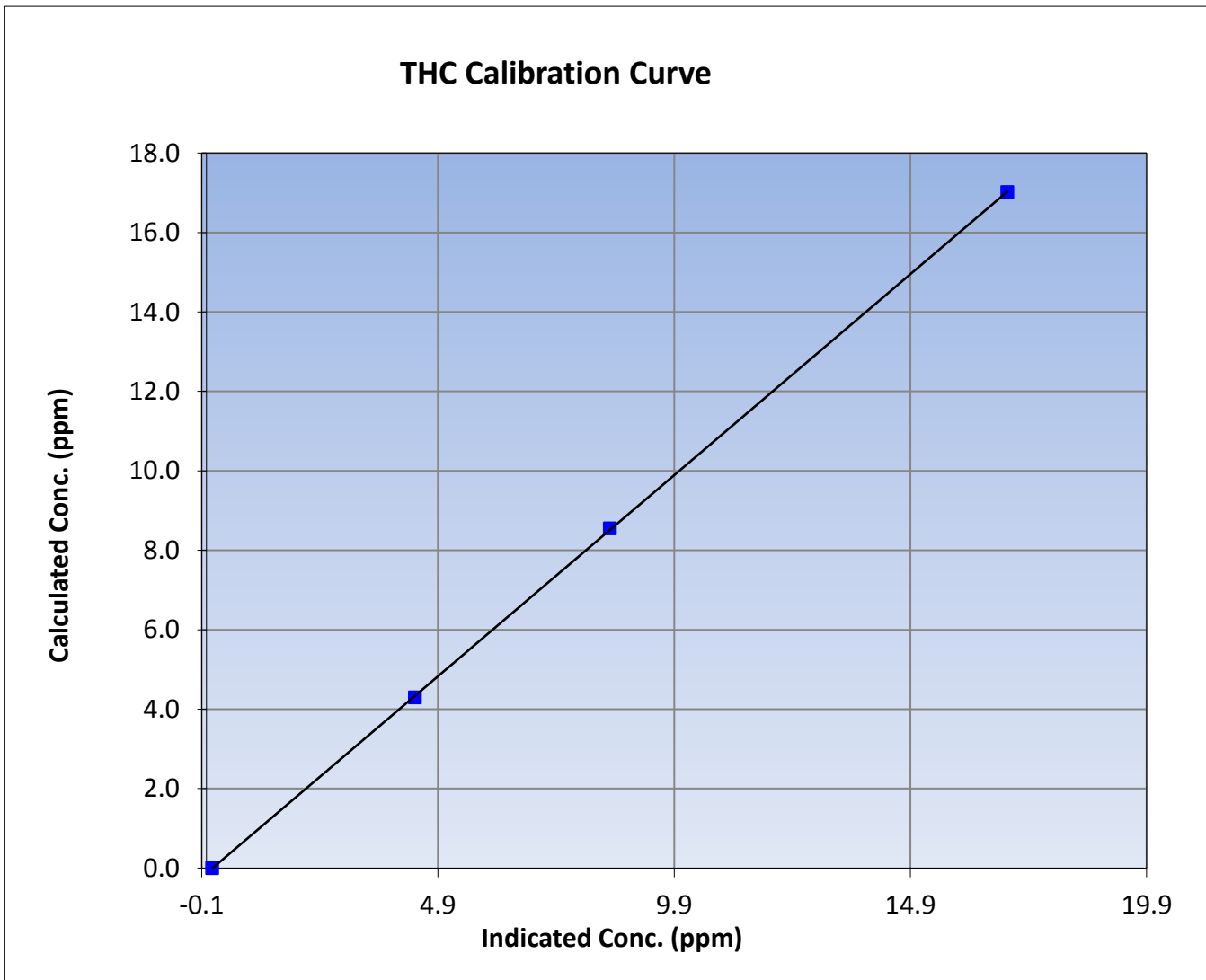
Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	July 8, 2016	Previous Calibration	June 23, 2016
Station Name	Shell Muskeg River	Station Number	AMS 16
Start Time (MST)	9:50	End Time (MST)	13:10
Analyzer make	Thermo 51i-LT	Analyzer serial #	1218153458

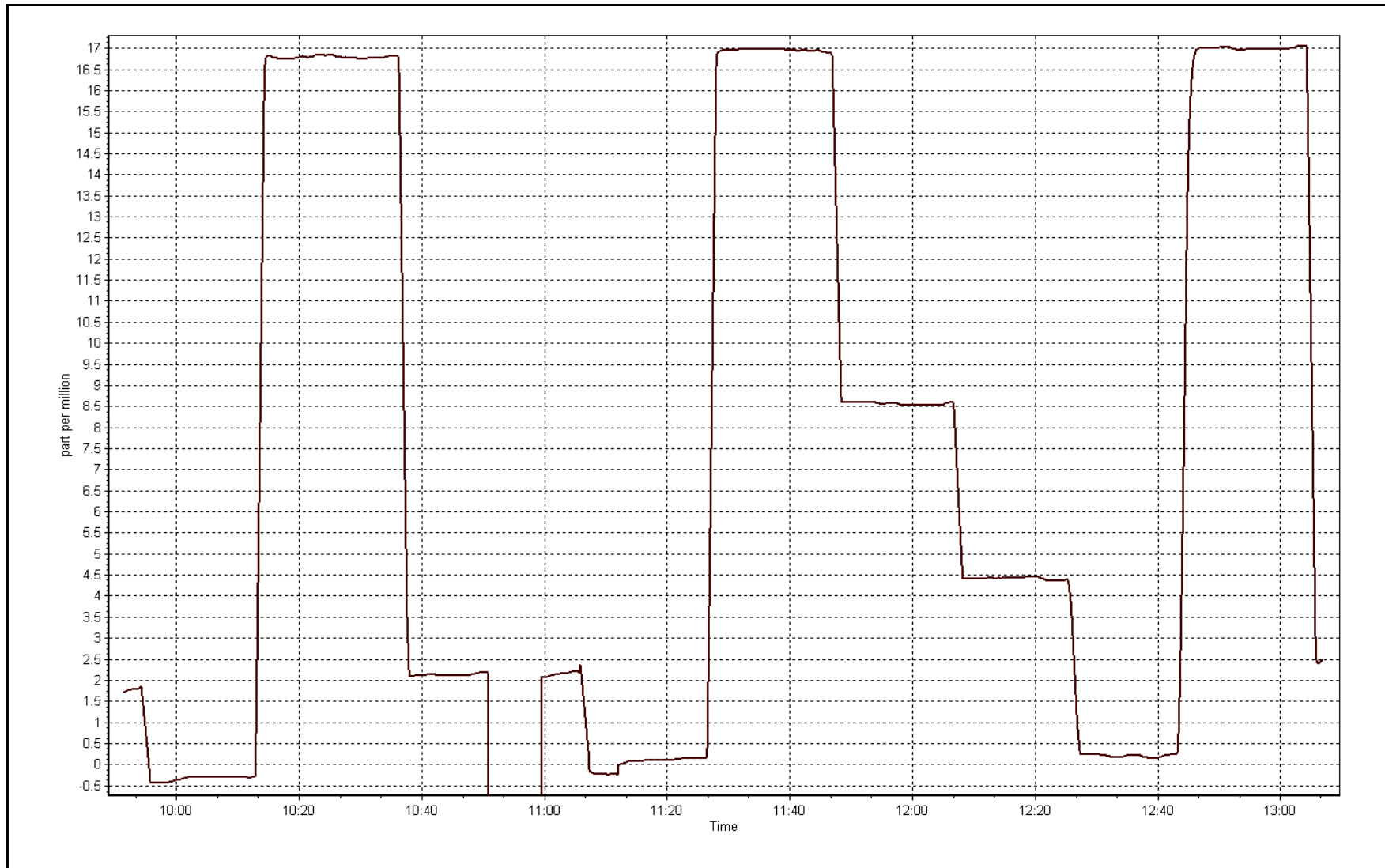
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.12	----	Correlation Coefficient	0.999982
17.02	16.95	1.0039		
8.55	8.54	1.0011	Slope	1.012193
4.29	4.41	0.9739		
			Intercept	-0.131313



THC Calibration Plot

Date: July 8, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	July 18, 2016	Previous Calibration	June 23, 2016
Station Name	Shell Muskeg River	Station Number	AMS 16
Reason:	Routine		
Start Time (MST)	12:04	End Time (MST)	15:58
NO Cal Gas Conc	48 ppm	Gas Cert Reference	LL104193
NOx Cal Gas Conc	48 ppm	Cal Gas Expiry Date	February 12, 2018
Calibrator	API T700	Serial Number	493
Zero air Generator	Teledyne API T701	Serial Number	2155

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	2632
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	1.000771	0.999935	0.996226
	Data Offset	0.466606	1.065473	0.754531
Current Calibration	Data Slope	1.000159	0.998787	0.997957
	Data Offset	0.169071	0.871668	-0.342191

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1426262593
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.43		192.168.1.43	
NO coefficient	1.094		1.159	
NOx coefficient	0.998		0.997	
NO2 coefficient	1.000		1.000	
NO bkgrnd	9.1		9.7	
NOx bkgrnd	9.2		9.8	
Chamber Temp	50.2	Deg C	50.4	Deg C
Moly Temp	326.3	Deg C	324.2	Deg C
PMT voltage	-744.4	V	-744.4	V
PMT Temp	-2.7	Deg C	-2.8	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	169.8	mmHg	177.7	mmHg
R Cell Press Nox	169.5	mmHg	177.4	mmHg
NO sample flow	0.87	lpm	0.858	lpm
Nox sample Flow	0.872	lpm	0.860	lpm

Notes:

Inlet filter changed after as founds. Adjusted span. 2nd GPT points used.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

July 18, 2016

Station Number:

AMS 16

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	0.2	0.0	0.2	----	----
as found span	5000	83.6	802.6	802.6	0.0	757.5	756.3	1.2	1.0595	1.0612
calibrator zero	5000	0.0	0.0	0.0	0.0	0.2	0.0	0.2	----	----
high point	5000	83.6	802.6	802.6	0.0	802.6	803.2	-0.6	1.0000	0.9992
second point	5000	42.0	403.2	403.2	0.0	402.5	402.1	0.4	1.0018	1.0026
third point	5000	21.1	202.6	202.6	0.0	202.2	201.2	1.0	1.0018	1.0067
as left zero	6000	0.0	0.0	0.0	0.0	2.3	0.1	2.2	----	----
as left span	5000	83.6	802.6	534.3	268.2	810.5	533.7	276.9	0.9902	1.0013
Average Correction Factor									1.0012	1.0028

Corrected As found

NO_x= 757.3

NO= 756.3

Percent Change

NO_x= 5.8%

NO= 6.0%

Previous Response

NO_x= 801.5

NO= 801.5

GPT Calibration Data

Dilution Flow

5000

ccm

Source Gas Flow

83.60

ccm

O3 Setpoint (ppb)	Indicated NO high point (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
Cal zero			0.0			0.2			N/A	
1st NO2 (300)	----	534.3	270.1	805.1	534.3	270.8	0.9804	1.0000	0.9974	100.3%
2nd NO2 (200)	----	619.2	185.2	805.4	619.2	186.2	0.9801	1.0000	0.9950	100.5%
3rd NO2 (100)	----	708.6	95.9	805.1	708.6	96.5	0.9804	1.0000	0.9932	100.7%
4th NO2 (0)	804.5	----	0.6	805.1	804.5	0.6	0.9805	1.0000	N/A	----
Average Correction Factor							0.9803	1.0000	0.9952	100.5%

Calibration Performed By:

Evan Magill



Wood Buffalo Environmental Association

NO_x Calibration Summary

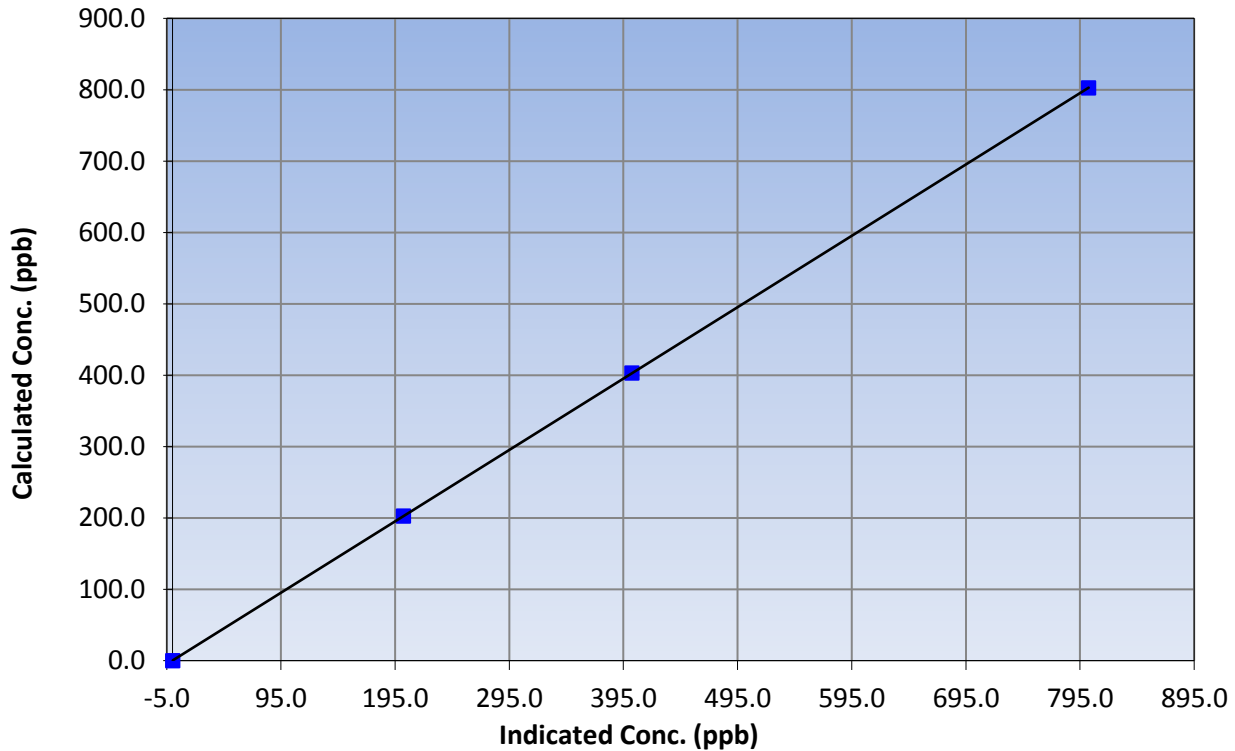
Station Information

Calibration Date	July 18, 2016	Previous Calibration	June 23, 2016
Station Name	Shell Muskeg River	Station Number	AMS 16
Start Time (MST)	12:04	End Time (MST)	15:58
Analyzer make	Thermo 42i	Analyzer serial #	1426262593

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	----	Correlation Coefficient	0.999999
802.6	802.6	1.0000		
403.2	402.5	1.0018	Slope	1.000159
202.6	202.2	1.0018		
			Intercept	0.169071

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

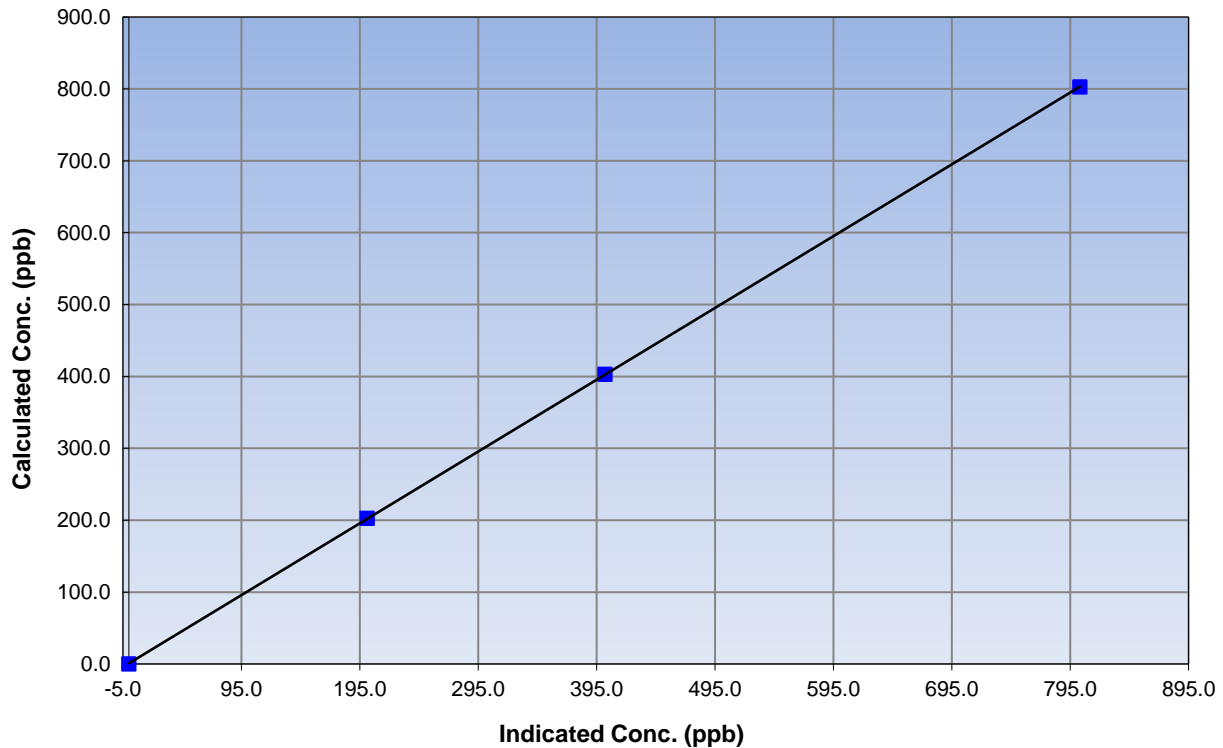
Station Information

Calibration Date	July 18, 2016	Previous Calibration	June 23, 2016
Station Name	Shell Muskeg River	Station Number	AMS 16
Start Time (MST)	12:04	End Time (MST)	15:58
Analyzer make	Thermo 42i	Analyzer serial #	1426262593

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	N/A	Correlation Coefficient	0.999994
802.6	803.2	0.9992		
403.2	402.1	1.0026	Slope	0.998787
202.6	201.2	1.0067		
			Intercept	0.871668

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

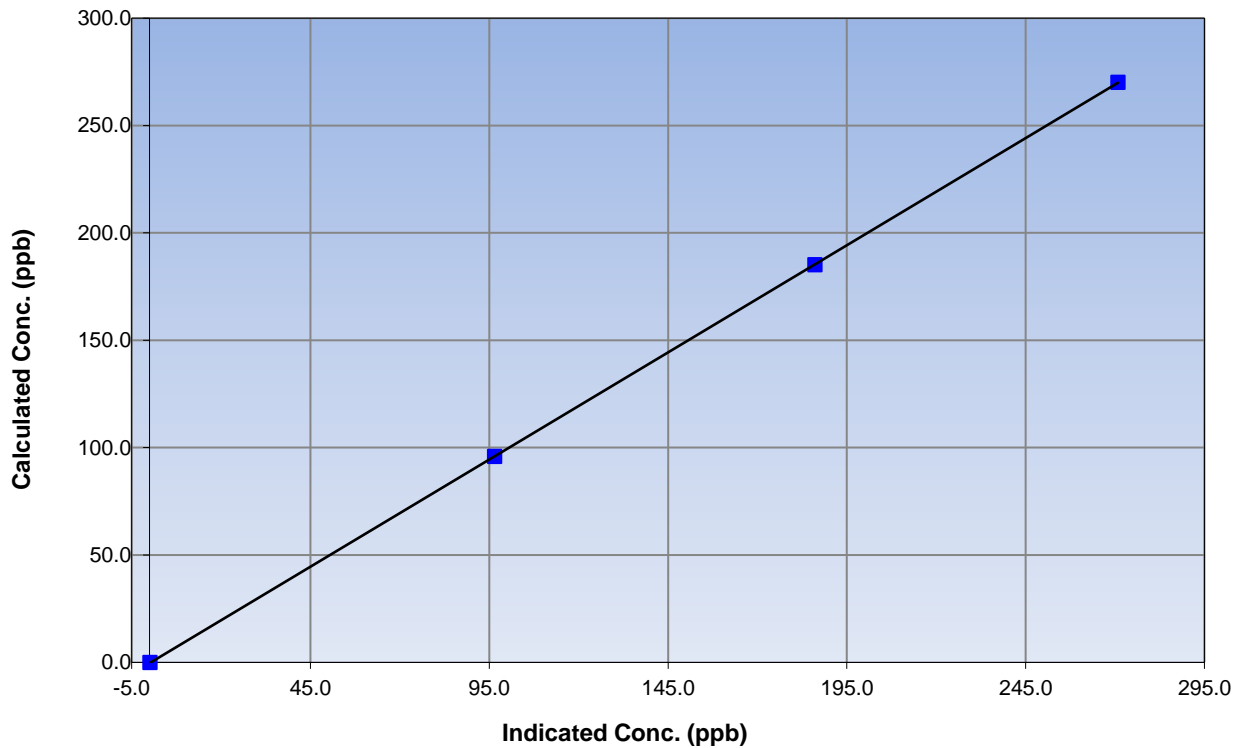
Station Information

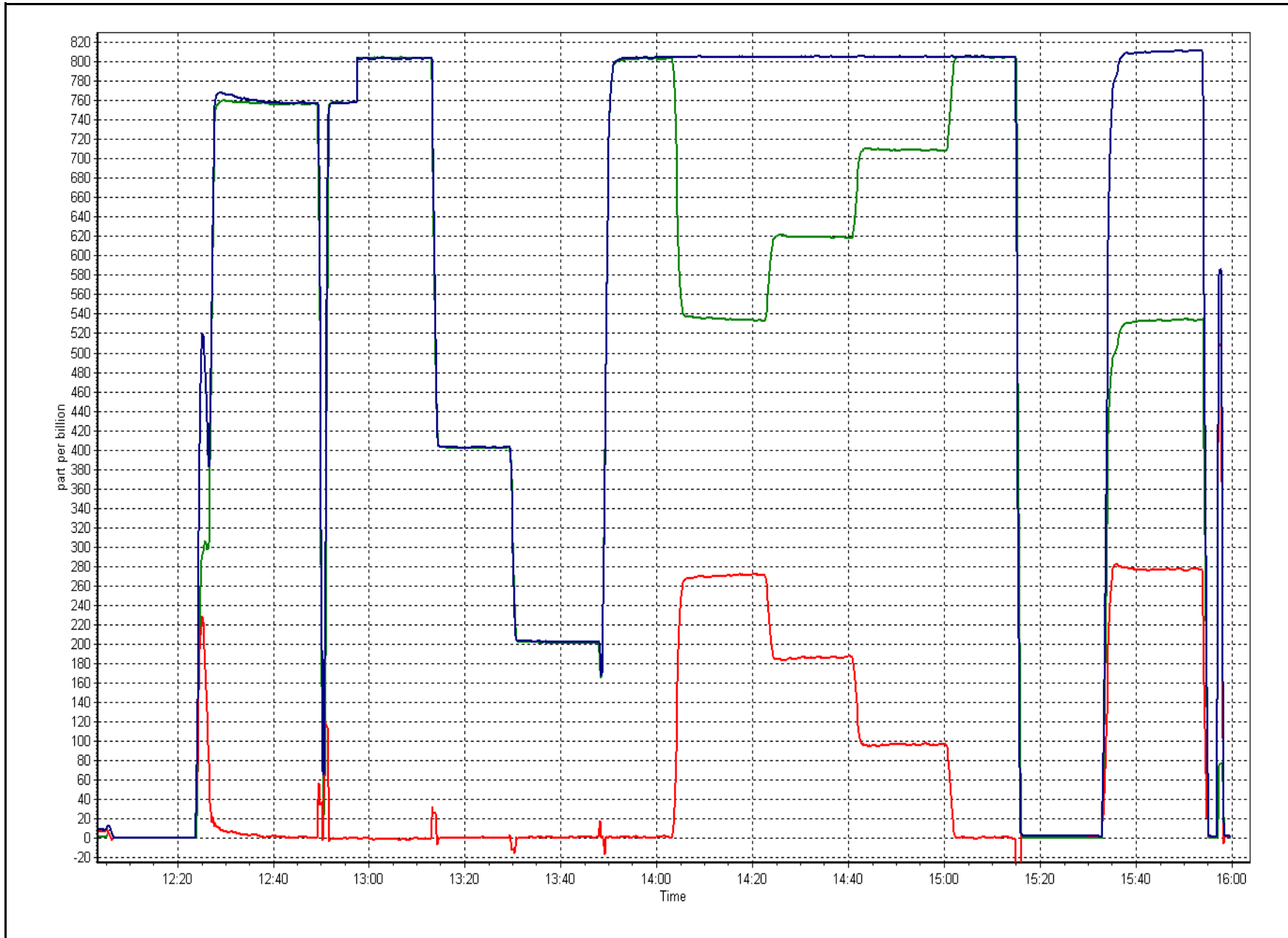
Calibration Date	July 18, 2016	Previous Calibration	June 23, 2016
Station Number	Shell Muskeg River	Station Number	AMS 16
Start Time (MST)	12:04	End Time (MST)	15:58
Analyzer make	Thermo 42i	Analyzer serial #	1426262593

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	N/A	Correlation Coefficient	0.999997
270.1	270.8	0.9974		
185.2	186.2	0.9950	Slope	0.997957
95.9	96.5	0.9932		
			Intercept	-0.342191

NO₂ Calibration Curve







Wood Buffalo Environmental Association

SHARP CALIBRATION

STATION INFORMATION			
Calibration Date:	<u>July 18, 2016</u>	Previous Calibration:	<u>June 24, 2016</u>
Station Name:	<u>Shell Muskeg River</u>	Station Number:	<u>AMS 16</u>
Start Time (MST):	<u>14:05</u>	End Time (MST):	<u>15:03</u>
Calibrator Make/Model:	<u>Delta Cal</u>	Calibrator Serial Number:	<u>954</u>

SHARP INFORMATION			
Particulate Fraction:	<u>PM2.5</u>		
Make/Model:	<u>Thermo / SHARP 5030</u>		
Serial Number	<u>E-798</u>		
C ₁₄ Source SN:	<u>4142</u>		
Confirmation of Time settings:	Yes <input checked="" type="checkbox"/>	No	<input type="checkbox"/>
Parameters Checked:	T1 <input checked="" type="checkbox"/>	T2 <input type="checkbox"/>	T3 <input type="checkbox"/>
	T4 <input type="checkbox"/>	P3 <input checked="" type="checkbox"/>	Main Flow <input checked="" type="checkbox"/>
		Beta <input type="checkbox"/>	Neph <input checked="" type="checkbox"/>

CALIBRATION DATA				
Temperature (°C)				
Sensor	Indicated	Measured	Difference (Limit +/- 2.0°C)	Final Indicated
T1	26.9	27.5	0.6	26.9
T2		na	na	
T3		na	na	
T4		na	na	
RH (%)		na	na	

Pressure (Hpa)				
Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	975	975.3	0.3	975

Main Flow (Lph)				
Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1001	1004	3	1004	1001

Nephelometer Calibration			
Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	549		550
Neph	2.6		-0.7
C14	52		45.2
Indicated Concentration (ug/m3)	1.0	yes	-0.3
Offset 1	550.4		
Offset 2	69		

Leak Check (Quarterly)			
Leak Check Date:	<u>June 24, 2016</u>	Previous Leak Check Date:	<u>January 25, 2016</u>
	Measured		Difference LPM (Limit +/- 0.42 LPM)
Flow without adaptor (LPM):	16.94		0.28
*Flow with adaptor (LPM):	16.66		
<i>*Note - do not attach adaptor without shutting off the pump first</i>			

Mass Foil Calibration (Annually)			
Foil Calibration Date:	<u>June 24, 2016</u>	Previous Foil Calibration:	<u>May 25, 2015</u>
Zeroed?:	<u>yes</u>		
Foil Mass:	<u>1336</u>		<u>Mass foil set S/N:</u> 2519
Previous Correction Factor:	<u>7066</u>		
New Correction Factor:	<u>6936</u>		

INSPECTION DATA		
Item	Condition	Date of install or rebuild
Cyclone	Good / cleaned	18/07/2016
Pump	Good	
Filter Tape	Good	<u>April 19, 2016</u>
Mass Foil Cal Set	Good	June 24, 2016
HEPA filter	Good	

NOTES:

Adjusted zero. Changed cyclone head.

Calibration Performed By: Evan Magill



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY MONITORING PROGRAM MONTHLY REPORT

**AMS 17
WAPASU
JULY 2016**

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

August 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - WAPASU (AMS 17)
 JULY 2016

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	705	37	39	99.73	18	0	3	0
H2S (ppb) Average	707	35	37	99.73	1	0	0	0
THC (ppm) Average	697	35	47	98.39	3.4	-	2.3	-
O3 (ppb) Average	668	39	76	95.03	55	0	36	-
NO2 (ppb) Average	704	37	40	99.60	14	0	3	-
NO (ppb) Average	704	37	40	99.60	11	-	1	-
NOX (ppb) Average	704	37	40	99.60	21	-	4	-
PM2.5 (ug/m3) Average	738	2	6	99.46	45.8	-	17.2	0
Temperature 2 m (C) Average	743	0	1	99.87	28.2	-	22	-
Relative Humidity (%) Average	743	0	1	99.87	99	-	96	-
Precipitation (mm) Total	731	0	13	98.25	10.1	-	24.7	-
Wind Speed 10 m (km/h) Average	743	0	1	99.87	23	-	12	-
Wind Direction 10 m (deg) Average	743	0	1	99.87	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - WAPASU (AMS 17)
 JULY 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	705	0.7	2	-	0	0	0	0	0	2	18
H2S (ppb) Average	707	0.1	0	-	0	0	0	0	0	0	1
THC (ppm) Average	697	2.16	0.1	-	2	2	2.1	2.1	2.2	2.3	3.4
O3 (ppb) Average	668	24.7	11	-	2	10	17	25	32	39	55
NO2 (ppb) Average	704	1.1	2	-	0	0	0	0	1	4	14
NO (ppb) Average	704	0.5	1	-	0	0	0	0	1	1	11
NOX (ppb) Average	704	1.6	2	-	0	0	0	1	2	5	21
PM2.5 (ug/m3) Average	738	6.71	5.8	-	0.1	1.4	3	5.1	8.5	14.3	45.8
Temperature 2 m (C) Average	743	17.23	4.9	-	2	11.4	14.1	16.8	21	23.7	28.2
Relative Humidity (%) Average	743	69.2	21	-	22	41	51	71	89	96	99
Precipitation (mm) Total	731	-	-	72.17	-	-	-	-	-	-	-
Wind Speed 10 m (km/h) Average	743	7.5	4	-	0	3	5	7	10	13	23
Wind Direction 10 m (deg) Average	743	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - WAPASU (AMS 17)
JULY 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
ALL PARAMETERS	20 Jul 2016 13:00	20 Jul 2016 13:00	1	Maintenance - wiring/data logger upgrades
NO2, NO, NOX	20 Jul 2016 12:00	20 Jul 2016 13:00	2	Maintenance - wiring/data logger upgrades
SO2, H2S, THC, NO2	21 Jul 2016 14:00	21 Jul 2016 14:00	1	Maintenance - Station operator on site
THC	21 Jul 2016 22:00	22 Jul 2016 07:00	10	Datalogger program upload - communications error
O3	20 Jul 2016 22:00	21 Jul 2016 14:00	17	Unstable Operation
O3	21 Jul 2016 15:00	21 Jul 2016 18:00	4	Maintenance - diagnose and repair
O3	21 Jul 2016 19:00	22 Jul 2016 10:00	16	Analyzer Failure - removed for replacement
PM2.5	22 Jul 2016 11:00	22 Jul 2016 13:00	3	Maintenance - inlet heater replacement
Precipitation Collector	21 Jul 2016 20:00	22 Jul 2016 07:00	12	Datalogger program upload - communications error



Summary of Hour Averages

Wapasu - July 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 18 ppb on Jul 28 10:00	Maximum Daily Average: 3.4 ppb on Jul 29		Hours of Data:	705
Minimum Value: 0 ppb on Jul 1 10:00	Minimum Daily Average: 0.0 ppb on Jul 20		Hours of Missing Data:	39
Maximum Diurnal Average: 1.5 ppb at hour 8	Minimum Diurnal Average: 0.2 ppb at hour 24		Hours of Calibration:	37
Monthly Average: 0.7 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 0 P ₉₀ = 2 P ₉₉ = 9		Percent Operational Time:	99.7

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
2-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
3-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0.2	1
4-Jul	0	0	0	0	0	Z	0	1	0	0	0	0	0	0	0	0	0	2	4	3	2	3	4	1	0.9	4
5-Jul	Z	0	0	1	1	1	4	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	4
6-Jul	0	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
7-Jul	0	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
8-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
9-Jul	0	1	0	0	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
10-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
11-Jul	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
12-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
13-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
14-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
15-Jul	0	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
16-Jul	0	0	0	0	0	Z	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	2
17-Jul	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
18-Jul	0	Z	0	0	0	0	0	0	2	2	1	1	1	1	9	4	4	5	5	3	0	0	0	0	1.7	9
19-Jul	1	1	Z	1	2	5	3	12	16	C	C	C	C	C	C	0	0	0	0	0	0	0	0	0	--	16
20-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	M	0	0	0	0	0	0	0	0	0	0	0	0.0	0
21-Jul	0	1	1	1	Z	3	3	4	3	1	0	0	0	M	0	0	0	0	0	0	0	0	0	0	0.9	4
22-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	1	4	0	0	0	0	0	0	0	0.4	4
23-Jul	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	10	3	1	0	0.8	10
24-Jul	1	Z	1	0	2	3	6	9	5	2	5	4	1	0	0	0	0	0	0	0	0	0	0	0	1.8	9
25-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
26-Jul	0	0	0	Z	1	0	0	1	1	0	0	1	1	1	4	4	4	2	2	2	2	1	0	0	1.3	4
27-Jul	0	0	0	0	Z	3	9	5	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.0	9
28-Jul	0	0	0	0	0	Z	0	0	7	18	13	5	1	0	0	0	0	0	0	0	0	1	1	0	2.1	18
29-Jul	Z	4	4	3	2	2	3	5	5	6	10	12	8	1	1	2	5	3	1	1	0	0	0	0	3.4	12
30-Jul	0	Z	0	0	1	4	1	2	1	0	4	2	1	3	5	1	0	0	0	0	0	0	0	0	1.1	5
31-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0

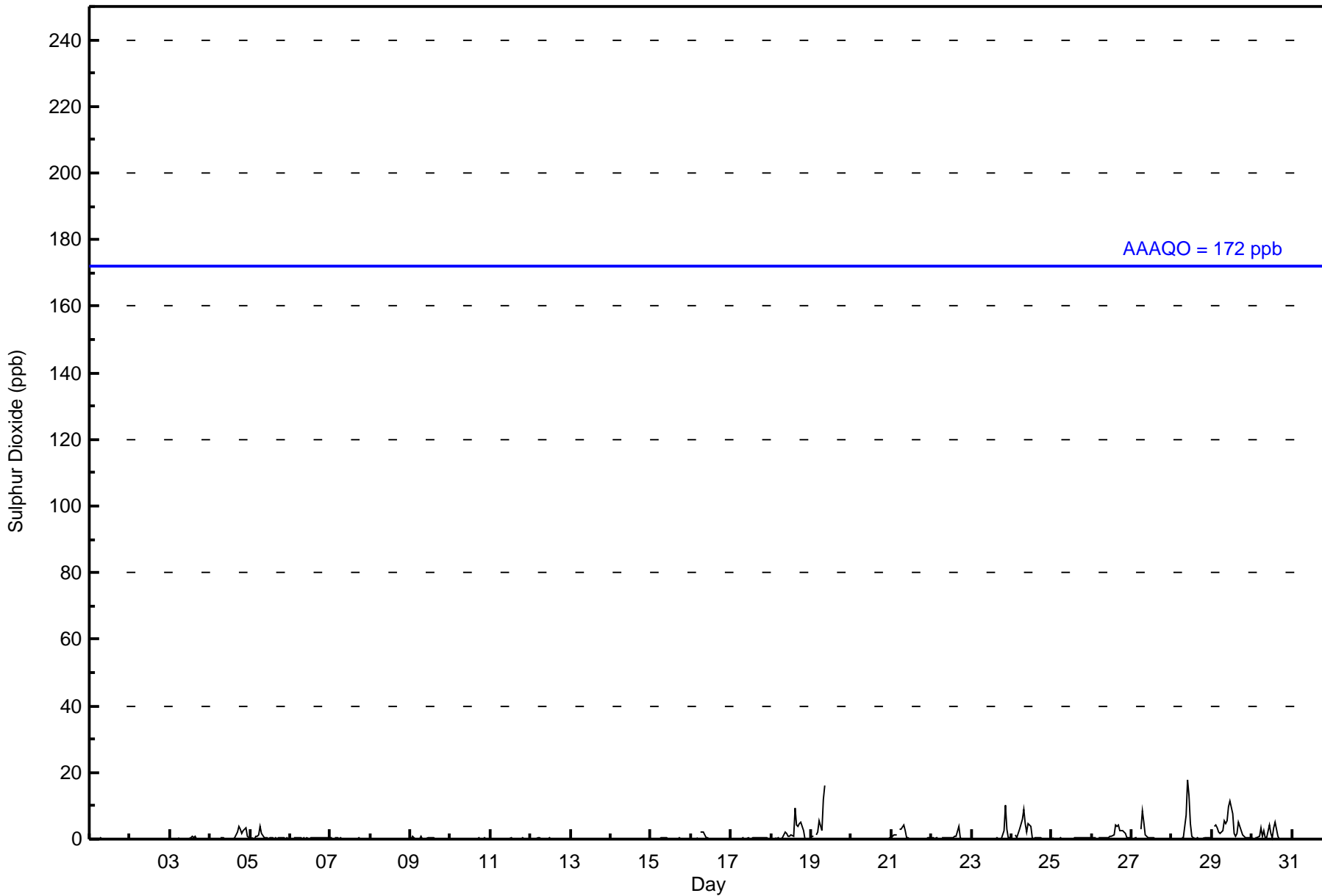
0.2	0.4	0.4	0.4	0.4	0.9	1.1	1.5	1.4	1.1	1.2	0.9	0.6	0.4	0.8	0.5	0.7	0.6	0.5	0.4	0.6	0.4	0.2	0.2	Diurnal Average
1	4	4	3	2	5	9	12	16	18	13	12	8	3	9	4	5	5	5	3	10	4	1	0	Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Wapasu - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Wapasu - July 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	700	99.29	99.29
11 - 20	5	0.71	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: 705

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Wapasu - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	64	42	30	27	30	36	80	74	37	31	38	23	20	28	38	102	700
11 - 20	0	0	0	0	0	0	0	0	1	4	0	0	0	0	0	0	5
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	64	42	30	27	30	36	80	74	38	35	38	23	20	28	38	102	705

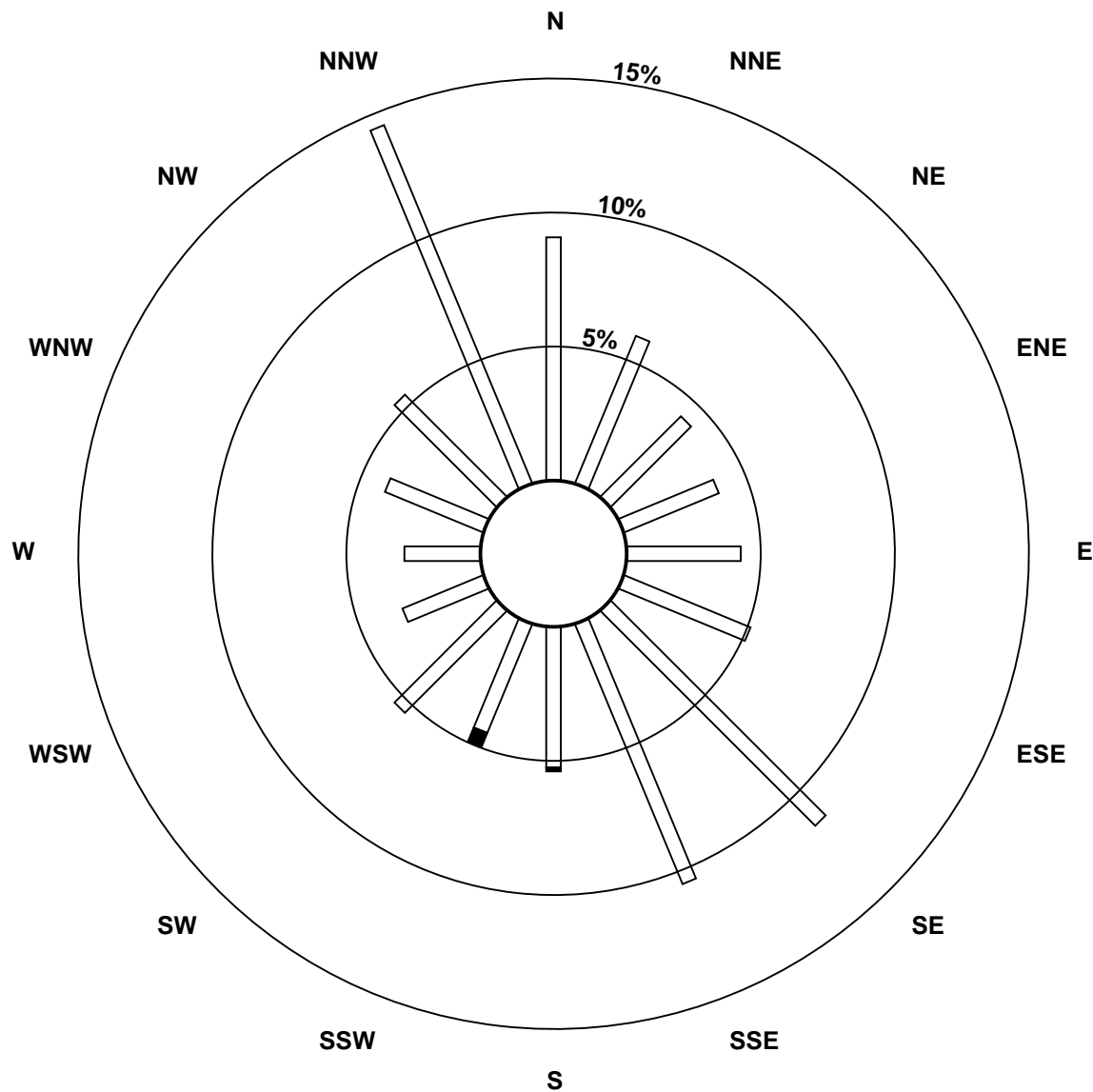
Total Number of Valid Hours: 705

Total Number of Hours: 744

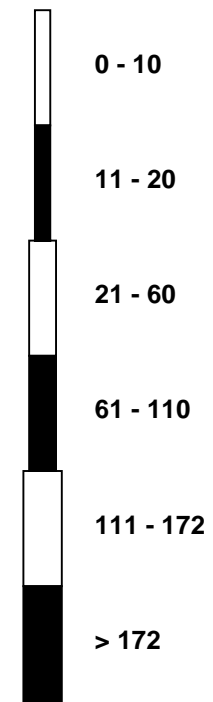


Wood Buffalo Environmental Association
Wind Rose Jul 2016

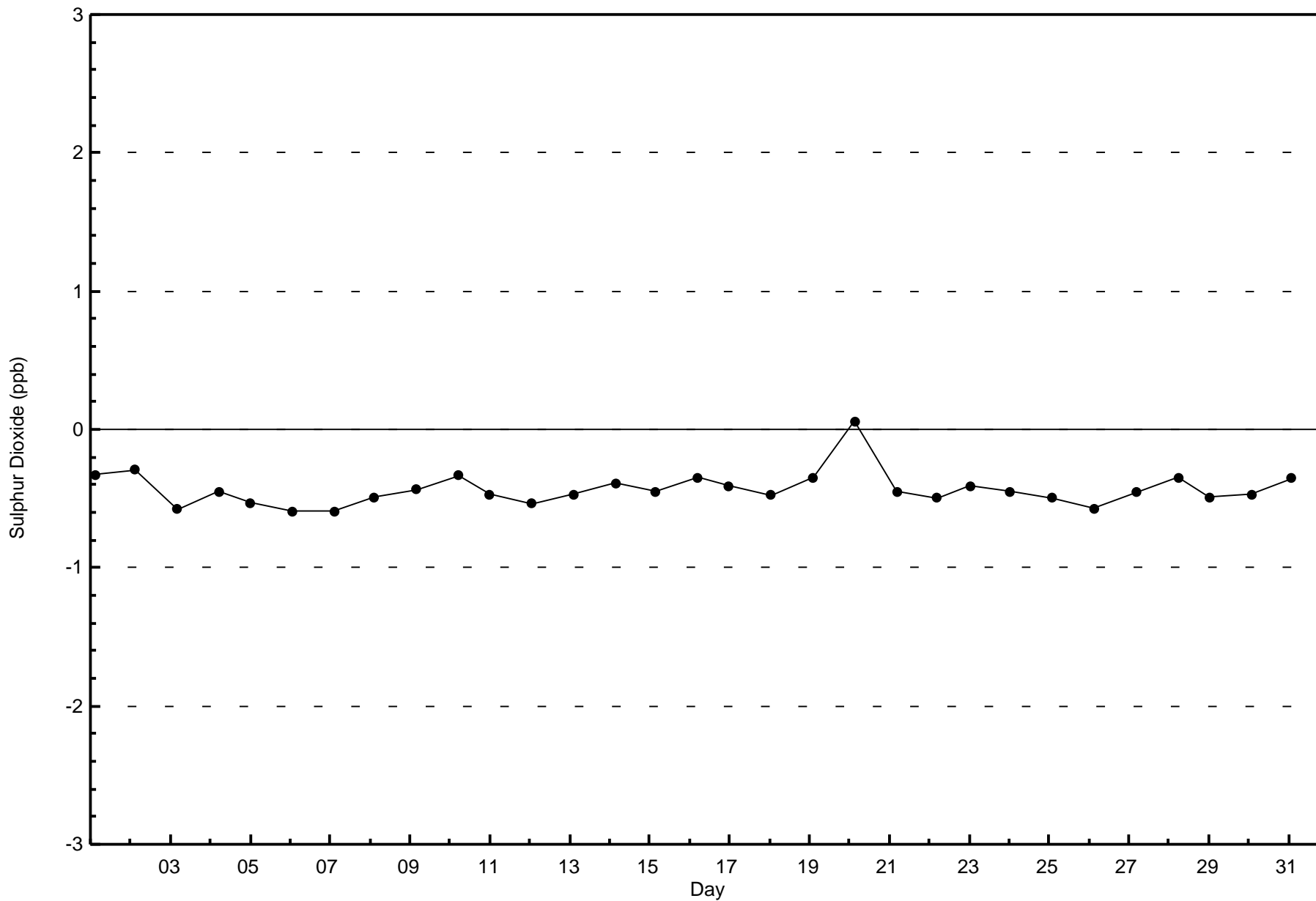
Sulphur Dioxide (SO₂) - ppb
Wapasu (AMS 17)

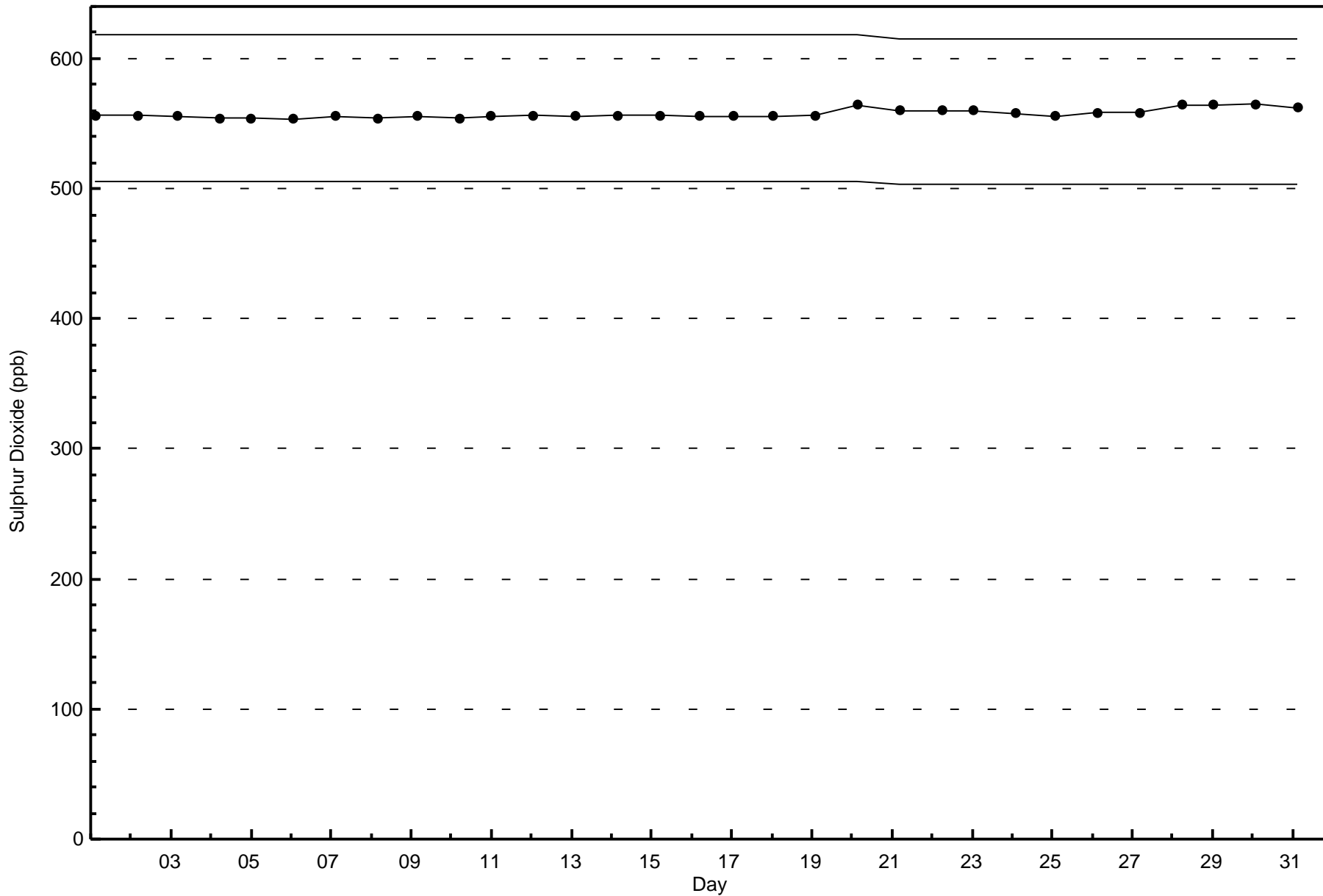


Classes (ppb)



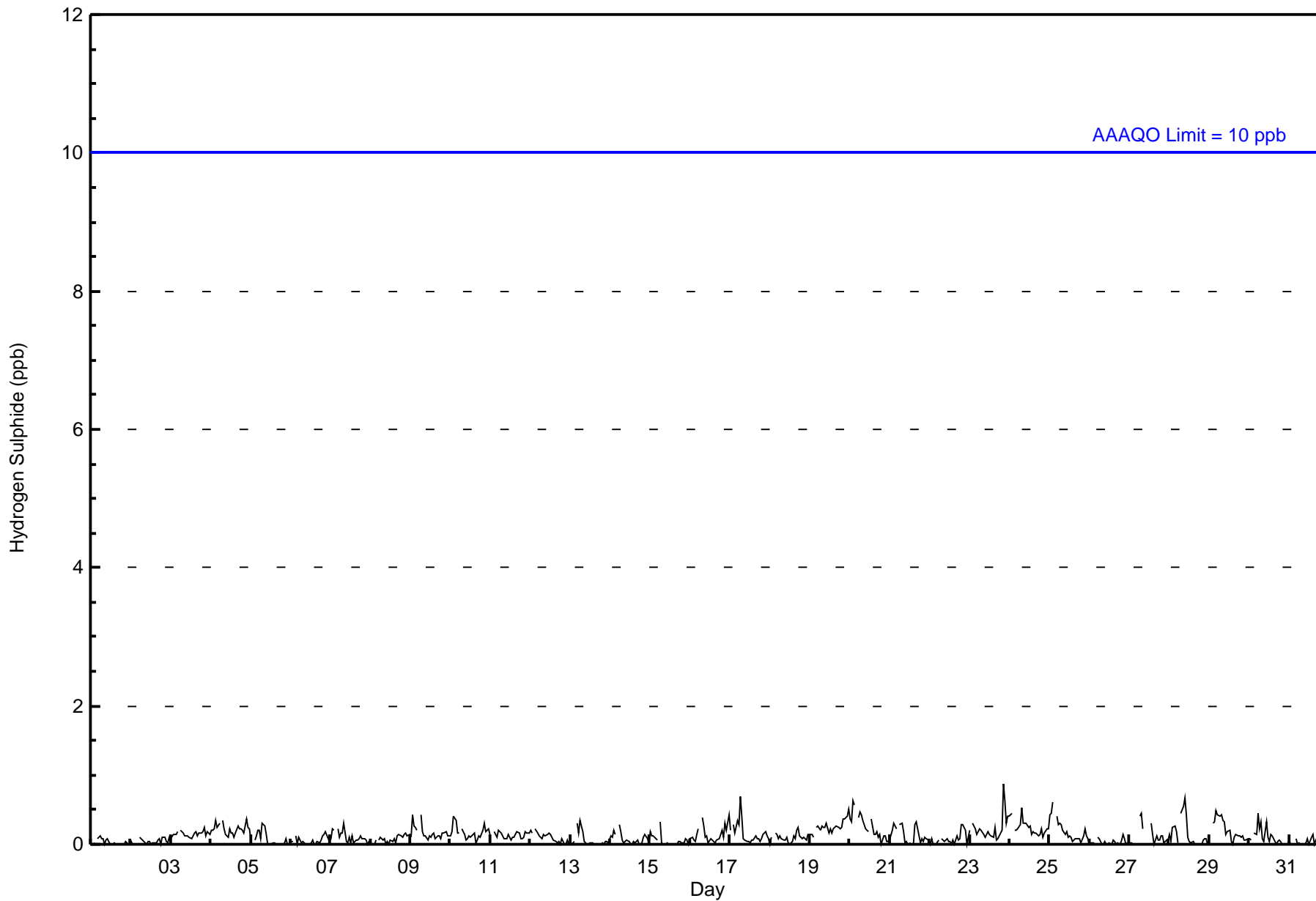
Total Number of Valid Hours: 705







Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																
Maximum Value: 1 ppb on Jul 23 21:00										Maximum Daily Average: 0.3 ppb on Jul 19										Hours of Data: 707						
Minimum Value: 0 ppb on Jul 1 01:00										Minimum Daily Average: 0.0 ppb on Jul 1										Hours of Missing Data: 37						
Maximum Diurnal Average: 0.2 ppb at hour 7										Minimum Diurnal Average: 0.1 ppb at hour 13										Hours of Calibration: 35						
Monthly Average: 0.1 ppb										Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 1										Percent Operational Time: 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-Jul	0	0	0	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-Jul	0	0	0	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-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
4-Jul	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
5-Jul	0	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
6-Jul	0	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
7-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
8-Jul	0	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
9-Jul	0	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
10-Jul	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
11-Jul	0	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
12-Jul	0	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-Jul	0	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
14-Jul	0	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
15-Jul	0	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
16-Jul	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
17-Jul	0	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
18-Jul	0	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-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.3	1
20-Jul	0	0	1	1	Z	0	0	0	0	0	0	M	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
21-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	M	0	0	0	0	0	0	0	0	0	0	0	0.1	0
22-Jul	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
23-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0.2	1
24-Jul	0	0	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
25-Jul	0	0	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
26-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
27-Jul	0	0	0	0	0	Z	0	0	0	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0.1	0
28-Jul	0	0	0	0	0	0	Z	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
29-Jul	0	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
30-Jul	0	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-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
0.1 0.1 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1																								Diurnal Average		
0 0 1 1 0 0 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 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
Cumulative Frequency Distribution

Hydrogen Sulphide (H₂S) - ppb
Wapasu - July 2016

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

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Wapasu - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	64	42	29	27	29	39	78	76	35	36	43	24	20	28	36	101	707
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	64	42	29	27	29	39	78	76	35	36	43	24	20	28	36	101	707

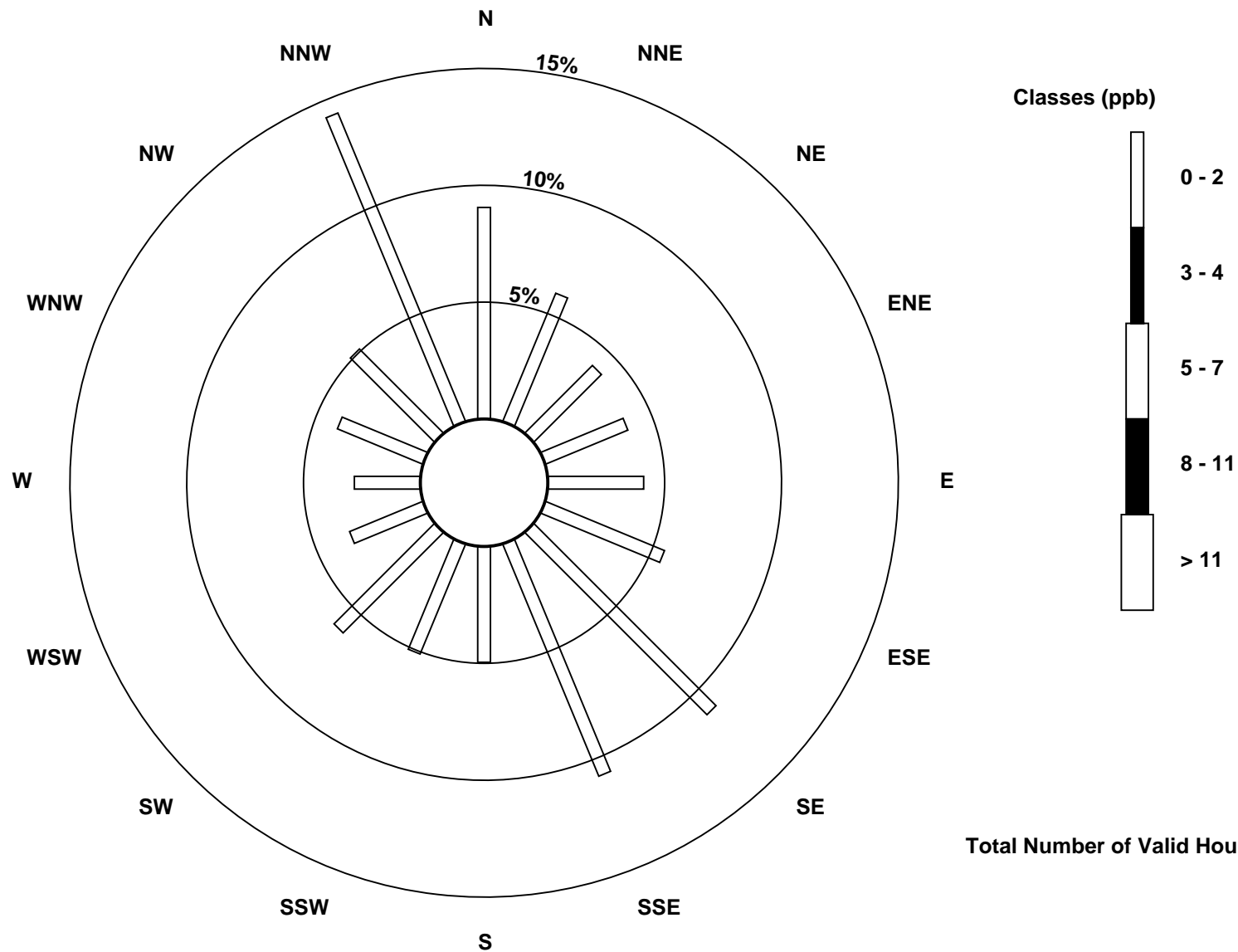
Total Number of Valid Hours: 707

Total Number of Hours: 744

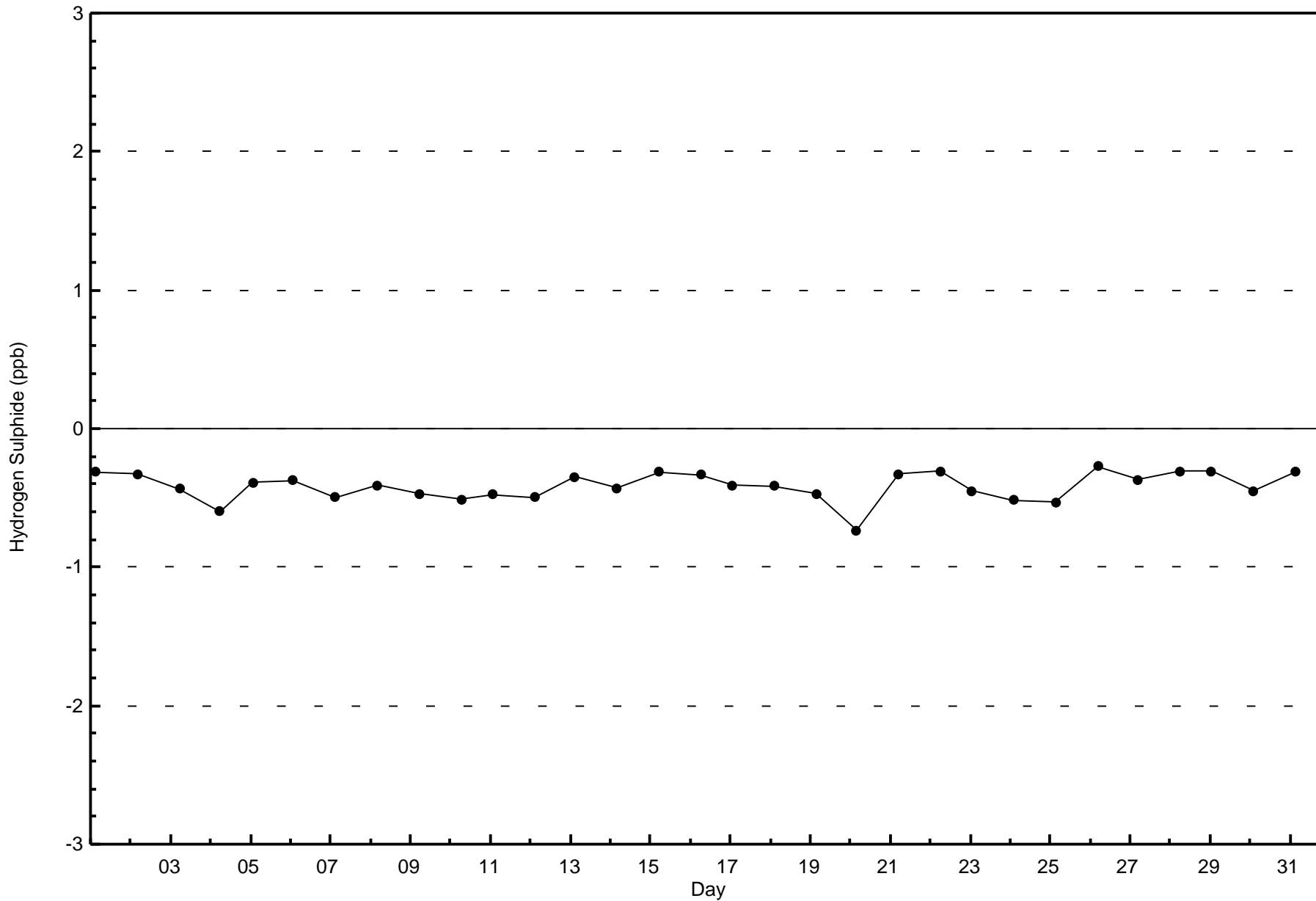


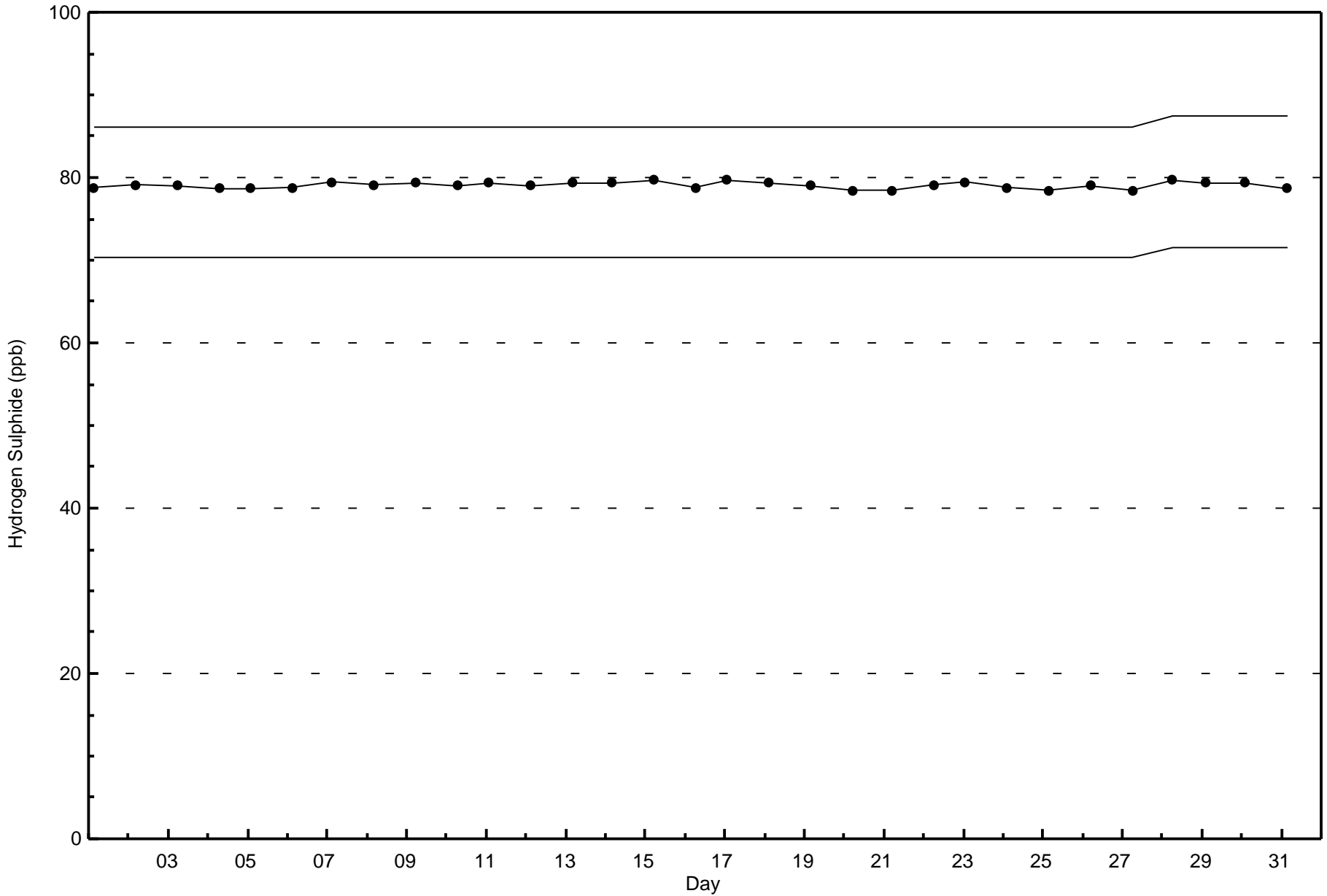
Wood Buffalo Environmental Association
Wind Rose Jul 2016

Hydrogen Sulphide (H₂S) - ppb
Wapasu (AMS 17)



Total Number of Valid Hours: 707







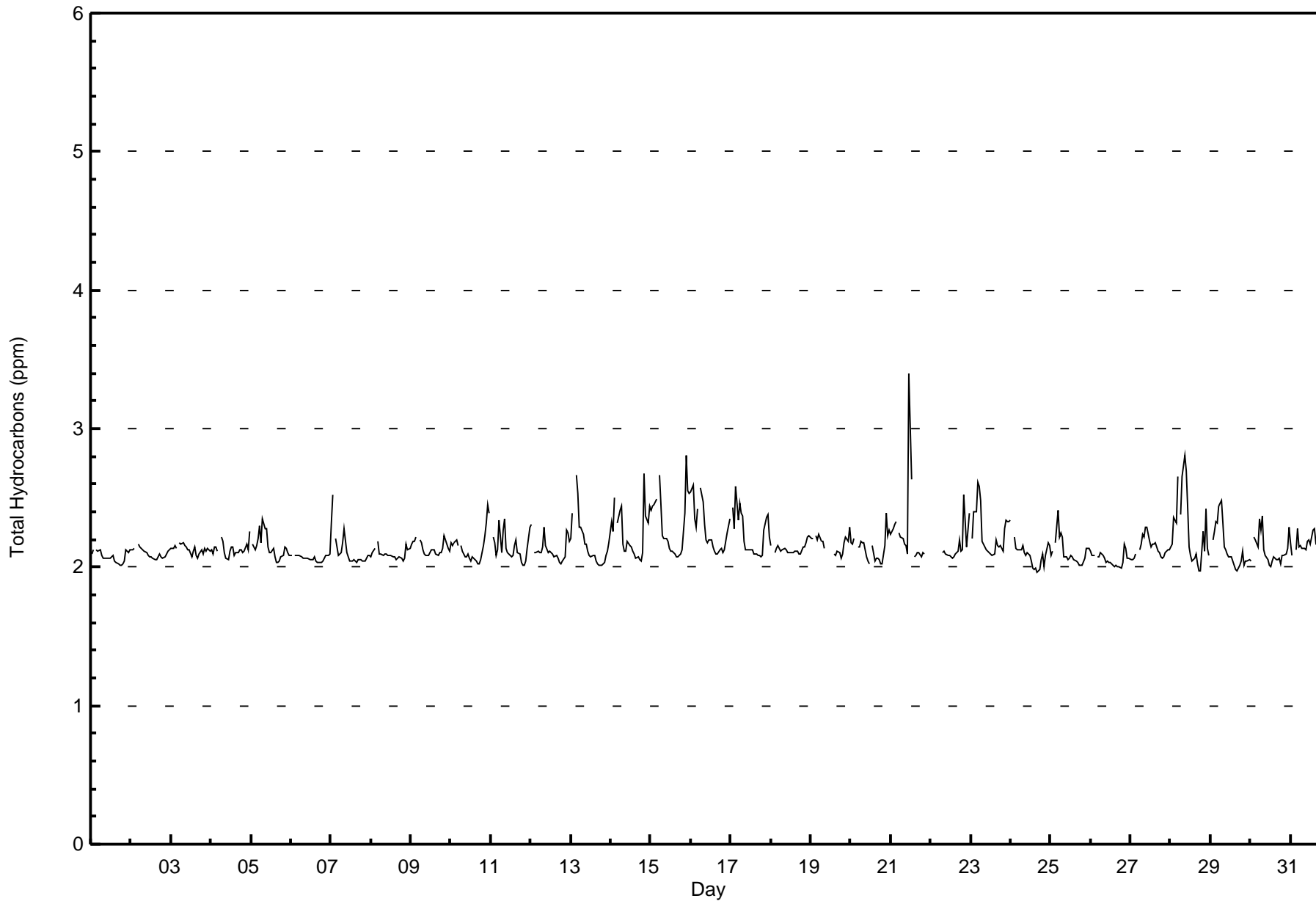
Maximum Value: 3.4 ppm on Jul 21 12:00		Maximum Daily Average: 2.3 ppm on Jul 15		Hours in Service: 744																								
Minimum Value: 2.0 ppm on Jul 24 17:00		Minimum Daily Average: 2.1 ppm on Jul 26		Hours of Data: 697																								
Maximum Diurnal Average: 2.2 ppm at hour 5		Minimum Diurnal Average: 2.1 ppm at hour 19		Hours of Missing Data: 47																								
Monthly Average: 2.16 ppm		Percentiles: P ₁ = 2.0 P ₁₀ = 2.0 Q ₁ = 2.1 Median = 2.1 Q ₃ = 2.2 P ₉₀ = 2.3 P ₉₉ = 2.7		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-Jul	2.1	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	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-Jul	2.1	2.1	2.1	Z	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
3-Jul	2.1	2.1	2.2	2.1	Z	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
4-Jul	2.1	2.1	2.1	2.1	2.1	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	2.2	2.1	2.3	2.1	2.3	2.1
5-Jul	Z	2.2	2.1	2.2	2.2	2.3	2.2	2.3	2.3	2.3	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
6-Jul	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	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1
7-Jul	2.3	2.5	Z	2.2	2.1	2.1	2.1	2.2	2.3	2.1	2.1	2.0	2.0	2.0	2.1	2.0	2.1	2.1	2.1	2.1	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1
8-Jul	2.1	2.1	2.1	Z	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.2	2.1	2.1	2.1	2.1	2.1
9-Jul	2.2	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	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
10-Jul	2.2	2.2	2.2	2.2	2.2	Z	2.2	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.0	2.0	2.0	2.0	2.1	2.2	2.2	2.3	2.4	2.4	2.1	2.4	2.1
11-Jul	Z	2.2	2.2	2.1	2.1	2.3	2.1	2.3	2.3	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.1	2.1	2.0	2.0	2.0	2.0	2.1	2.3	2.1	2.3	2.1	2.3
12-Jul	2.3	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.3	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.1	2.3	2.2	2.2	2.1	2.3	2.1
13-Jul	2.2	2.4	Z	2.7	2.5	2.3	2.3	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.2	2.2	2.2	2.2
14-Jul	2.3	2.3	2.5	Z	2.3	2.4	2.4	2.2	2.1	2.1	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.7	2.4	2.3	2.4	2.2	2.7	2.2
15-Jul	2.4	2.4	2.4	2.5	Z	2.7	2.5	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.4	2.8	2.5	2.5	2.3	2.8	2.3
16-Jul	2.5	2.6	2.3	2.3	2.4	Z	2.6	2.5	2.3	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.3	2.3	2.3	2.3	2.3
17-Jul	Z	2.4	2.3	2.6	2.3	2.5	2.4	2.4	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.3	2.4	2.4	2.2	2.2	2.2	2.2
18-Jul	2.2	Z	2.1	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.1	2.2
19-Jul	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.1	C	C	C	C	C	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.3	2.2	2.3	2.2
20-Jul	2.2	2.2	2.2	Z	2.1	2.1	2.2	2.2	2.2	2.1	2.0	2.0	M	2.2	2.0	2.1	2.1	2.1	2.1	2.0	2.0	2.2	2.4	2.2	2.3	2.1	2.4	2.1
21-Jul	2.2	2.3	2.3	2.3	Z	2.2	2.2	2.2	2.2	2.2	2.1	3.4	2.6	M	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	DF	DF	DF	2.3	3.4	2.3
22-Jul	DF	DF	DF	DF	DF	DF	DF	DF	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.5	2.1	2.3	2.4	--	2.5	2.1
23-Jul	Z	2.2	2.4	2.4	2.6	2.6	2.5	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.1	2.2	2.1	2.3	2.3	2.3	2.3	2.2	2.6	2.2	2.6
24-Jul	2.3	Z	2.2	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.1	2.2	2.2	2.2	2.1	2.3	2.1
25-Jul	2.1	2.1	Z	2.2	2.4	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1
26-Jul	2.1	2.1	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	2.0	2.0	2.0	2.2	2.1	2.1	2.1	2.1	2.1	2.1
27-Jul	2.1	2.1	2.1	2.1	Z	2.1	2.2	2.2	2.2	2.3	2.3	2.2	2.1	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
28-Jul	2.1	2.2	2.4	2.3	2.7	Z	2.4	2.7	2.8	2.7	2.4	2.1	2.1	2.0	2.1	2.1	2.0	2.0	2.0	2.0	2.3	2.1	2.4	2.1	2.1	2.3	2.8	2.3
29-Jul	Z	2.2	2.3	2.3	2.3	2.4	2.5	2.3	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.1	2.1	2.1	2.1
30-Jul	2.0	Z	2.2	2.2	2.1	2.4	2.3	2.4	2.1	2.1	2.1	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.3	2.1	2.4
31-Jul	2.2	2.1	Z	2.1	2.3	2.2	2.2	2.1	2.1	2.1	2.2	2.2	2.2	2.3	2.3	2.2	2.2	2.2	2.1	2.1	2.2	2.4	2.3	2.2	2.2	2.2	2.2	2.2
																								Diurnal Average				
																								Diurnal Maximum				
																								2.2				
																								2.5				

Z - zerospan C - Calibration M - Maintenance DF - DAS Failure



Wood Buffalo Environmental Association
Hourly Averages

Total Hydrocarbons (THC) - ppm
Wapasu - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Wapasu - July 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	86	12.34	12.34
2.1 - 3.0	610	87.52	99.86
3.1 - 10.0	1	0.14	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 697

Total Number of Hours: 744



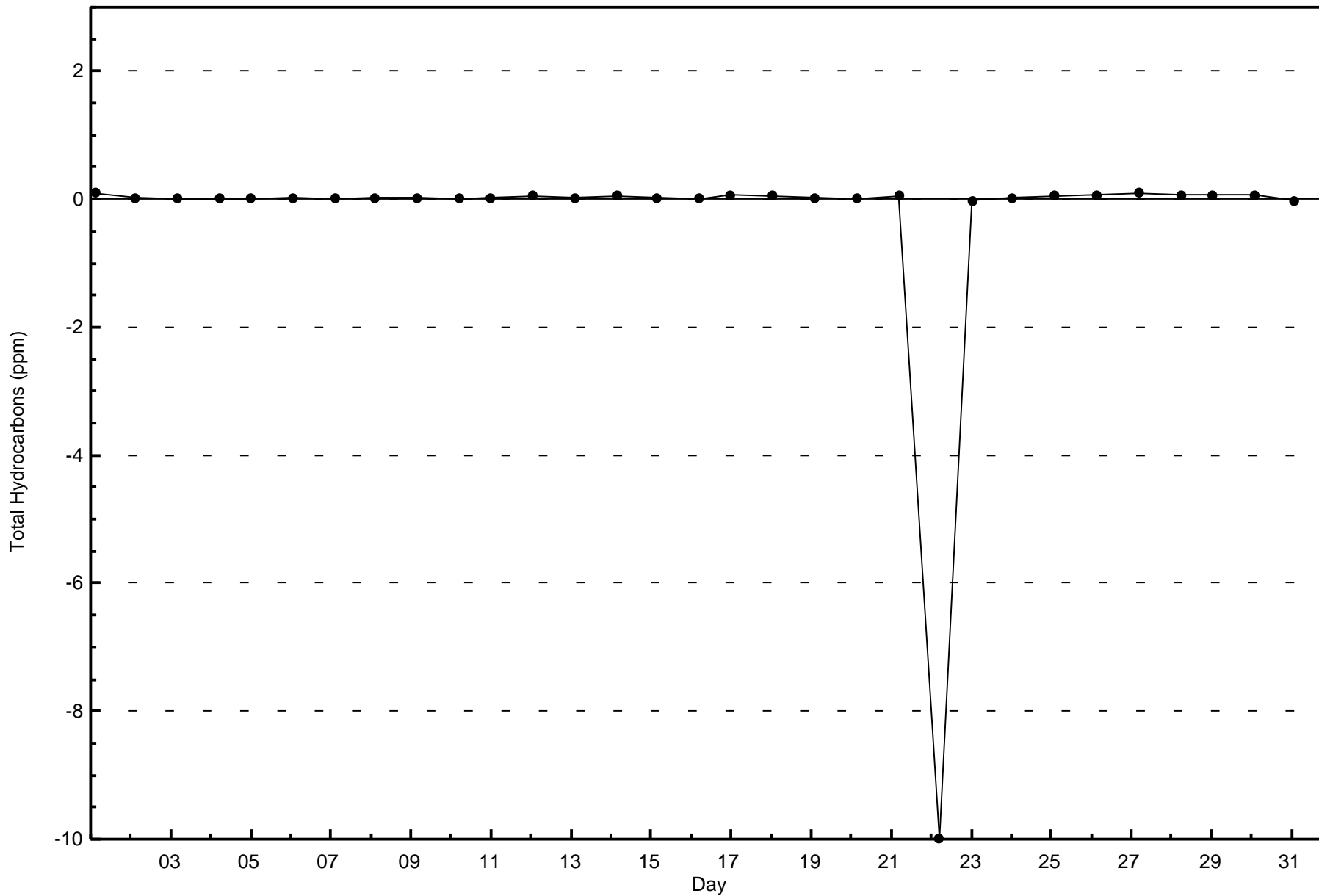
Wood Buffalo Environmental Association
Frequency Distribution

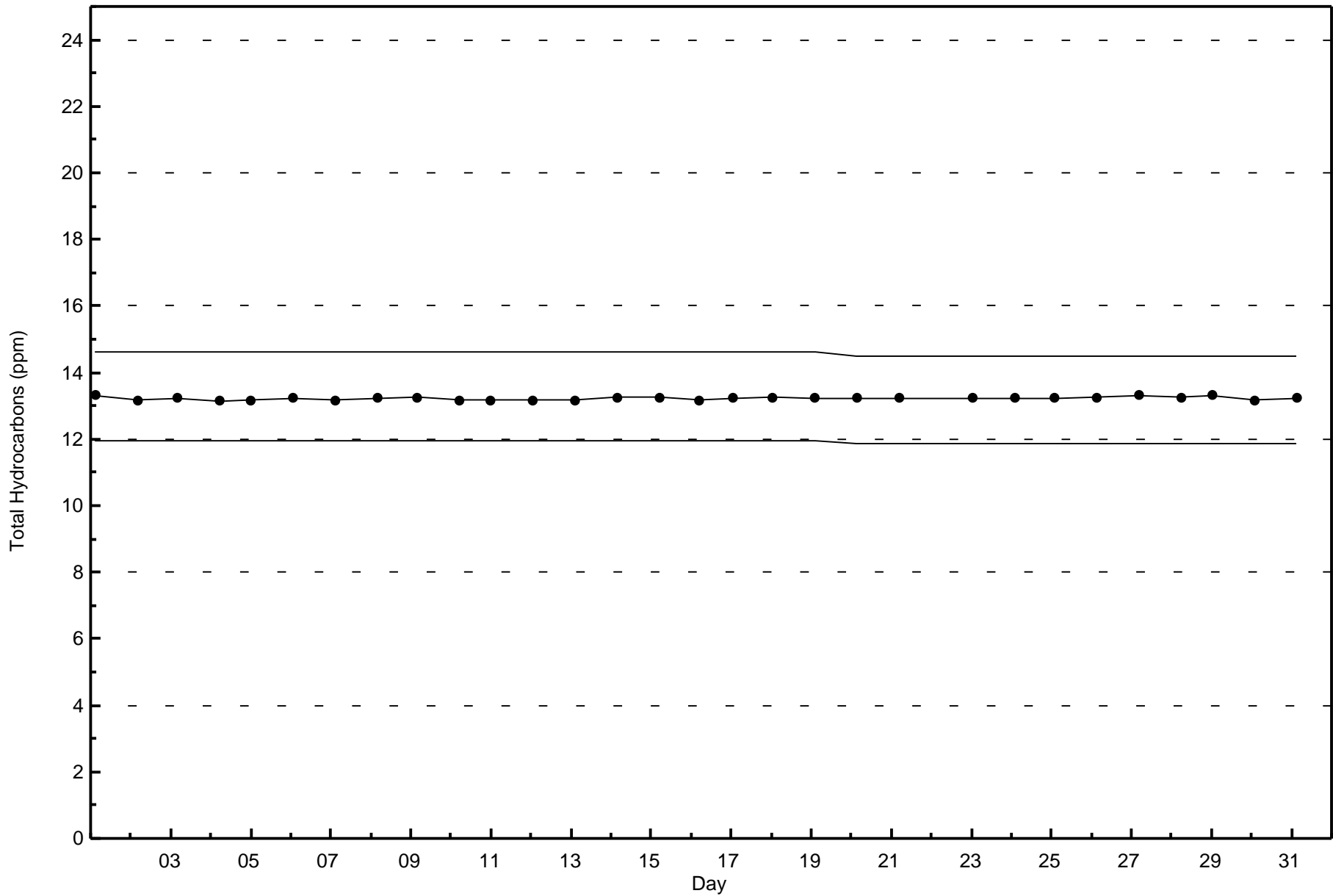
Total Hydrocarbons (THC) - ppm
Wapasu - July 2016

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	14	13	5	2	2	2	8	1	4	6	9	5	4	3	1	7	86
2.1 - 3.0	50	29	25	25	28	34	65	72	34	29	29	18	16	25	37	94	610
3.1 - 10.0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	64	42	30	27	30	36	73	73	38	35	38	24	20	28	38	101	697

Total Number of Valid Hours: 697

Total Number of Hours: 744







Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O₃) - ppb

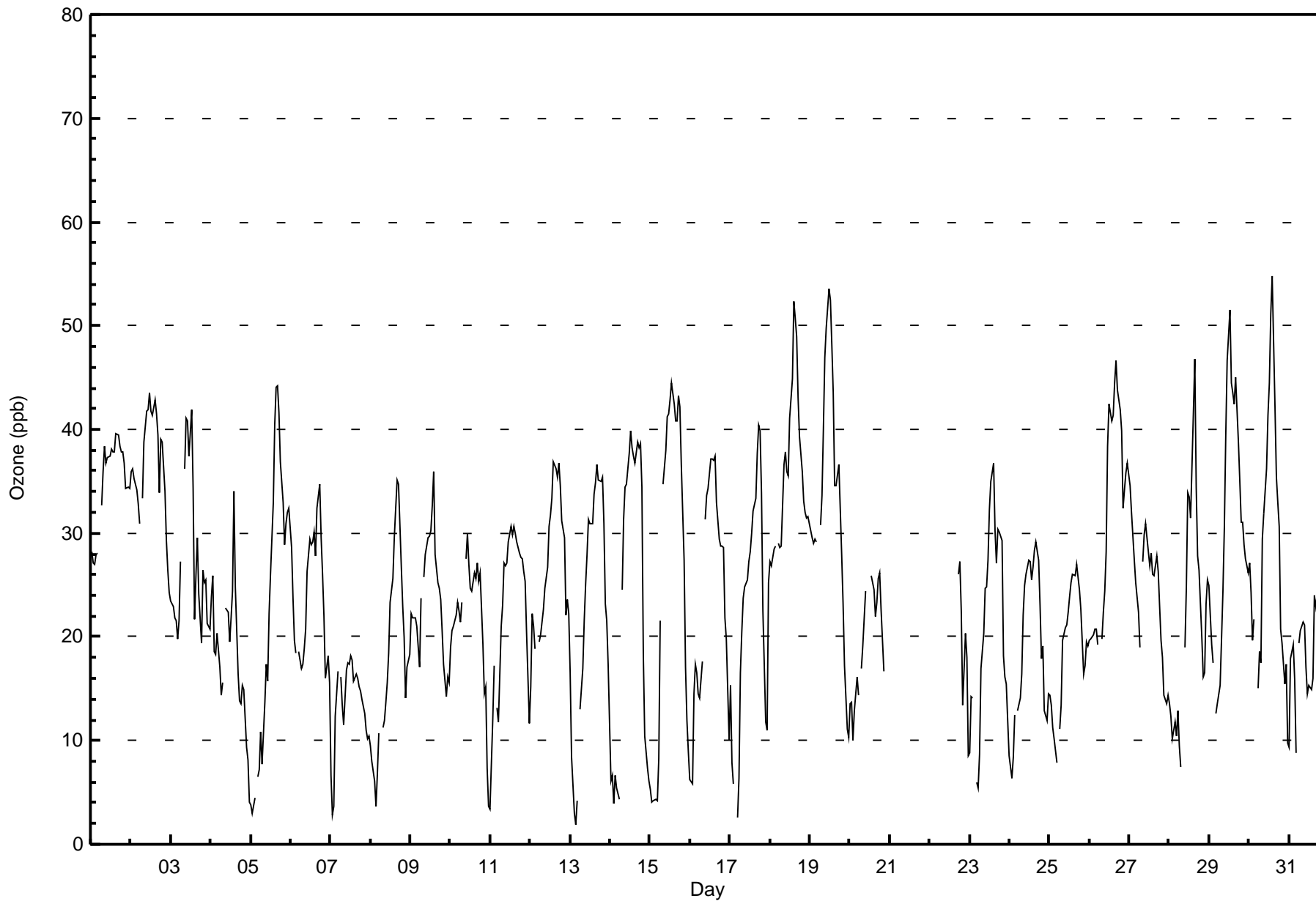
Wapasu - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																
Maximum Value: 55 ppb on Jul 30 15:00										Maximum Daily Average: 36.4 ppb on Jul 2										Hours of Data: 668						
Minimum Value: 2 ppb on Jul 13 04:00										Minimum Daily Average: 13.4 ppb on Jul 7										Hours of Missing Data: 76						
Maximum Diurnal Average: 34.4 ppb at hour 15										Minimum Diurnal Average: 14.9 ppb at hour 5										Hours of Calibration: 39						
Monthly Average: 24.7 ppb										Percentiles: P ₁ = 4 P ₁₀ = 10 Q ₁ = 17 Median = 25 Q ₃ = 32 P ₉₀ = 39 P ₉₉ = 51										Percent Operational Time: 95.0						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	28	27	27	28	28	Z	33	36	38	37	37	37	38	38	38	40	39	38	38	38	37	34	34	34	34.9	40
2-Jul	36	36	35	34	33	31	Z	33	39	42	42	44	42	41	43	42	39	34	39	39	34	29	26	24	36.4	44
3-Jul	23	23	22	22	20	22	27	Z	36	41	41	37	42	34	22	26	30	24	19	27	25	26	21	21	27.4	42
4-Jul	24	26	19	18	20	17	14	16	Z	23	22	19	22	24	34	25	16	14	14	15	15	9	8	4	18.2	34
5-Jul	4	3	4	Z	7	7	11	8	14	17	16	22	26	33	40	44	44	42	37	33	29	31	32	32	23.3	44
6-Jul	29	24	20	18	Z	19	17	17	19	21	26	29	29	29	30	28	32	35	30	26	22	16	18	16	23.9	35
7-Jul	7	3	4	12	17	Z	16	13	11	17	17	17	18	18	16	16	16	15	15	14	13	11	10	10	13.4	18
8-Jul	9	8	6	4	7	11	Z	11	12	14	16	18	23	26	30	32	35	35	27	23	20	14	17	18	18.1	35
9-Jul	22	22	22	22	21	17	24	Z	26	28	30	30	30	33	36	28	25	25	24	21	17	14	16	16	23.8	36
10-Jul	19	21	21	22	23	23	21	23	Z	28	30	27	25	24	26	26	27	25	26	19	14	15	7	4	21.6	30
11-Jul	3	12	17	Z	13	12	21	23	27	27	27	29	31	30	31	30	29	28	28	27	26	25	20	12	23.0	31
12-Jul	15	22	21	19	Z	19	20	21	23	25	27	31	32	33	37	36	35	37	35	31	30	22	24	22	26.8	37
13-Jul	17	8	3	2	4	Z	13	17	22	25	28	31	31	31	34	35	37	35	35	35	31	23	22	17	23.3	37
14-Jul	6	7	4	7	5	4	Z	25	31	34	35	38	40	38	37	37	39	38	39	34	18	10	7	6	23.5	40
15-Jul	5	4	4	4	4	8	22	Z	35	38	41	42	43	45	42	41	41	43	42	37	27	17	12	9	26.4	45
16-Jul	6	6	15	17	17	15	14	18	Z	31	34	34	37	37	37	37	33	29	29	29	29	22	20	10	24.1	37
17-Jul	15	8	6	Z	3	6	17	20	24	25	26	27	28	30	32	33	38	40	40	34	23	12	11	25	22.7	40
18-Jul	27	27	28	29	Z	29	29	29	37	38	36	36	41	45	52	51	49	43	39	36	33	32	31	32	36.0	52
19-Jul	30	30	29	29	29	Z	31	34	40	47	50	54	53	48	44	35	35	37	32	28	23	17	11	10	33.7	54
20-Jul	14	14	10	13	16	14	Z	17	19	24	C	C	C	26	25	22	23	26	26	23	17	UO	UO	UO	--	26
21-Jul	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	M	M	M	M	AF	AF	AF	AF	AF	AF	--	--
22-Jul	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	C	C	C	C	C	C	C	26	27	23	13	20	18	8	--	27
23-Jul	9	14	14	Z	6	5	9	17	20	25	25	27	32	35	37	30	27	30	30	29	18	16	15	12	21.1	37
24-Jul	8	6	8	13	Z	13	14	16	22	25	26	27	27	26	27	28	29	27	23	18	19	13	12	15	19.3	29
25-Jul	14	13	11	10	8	Z	11	13	20	21	21	22	24	25	26	26	27	26	25	23	16	17	19	19	19.1	27
26-Jul	20	20	20	21	21	19	Z	20	22	24	28	38	42	41	41	45	47	44	42	40	32	34	36	37	31.9	47
27-Jul	35	32	30	27	25	22	19	Z	27	30	31	28	27	28	26	26	28	26	23	20	18	14	14	14	24.8	35
28-Jul	14	12	10	12	10	13	9	7	Z	19	25	34	34	32	42	47	34	28	26	20	16	16	23	25	22.1	47
29-Jul	25	19	18	Z	13	14	15	20	24	31	39	47	52	44	43	42	45	39	35	31	31	29	28	26	30.8	52
30-Jul	27	24	20	22	Z	15	19	17	29	32	36	41	44	51	55	42	35	33	31	21	19	15	17	10	28.6	55
31-Jul	9	18	19	16	9	Z	19	21	21	21	17	14	15	15	16	24	23	24	24	21	18	16	17	17	18.1	24
																								Diurnal Average	Diurnal Maximum	
																								17.3	36	
																								16.9	36	
																								16.1	35	
																								17.5	34	
																								14.9	33	
																								15.5	31	
																								18.5	33	
																								19.7	36	
																								25.6	40	
																								27.9	47	
																								29.6	50	
																								31.5	54	
																								33.1	53	
																								33.1	51	
																								34.4	55	
																								33.6	51	
																								33.1	49	
																								31.5	44	
																								29.9	42	
																								27.1	40	
																								22.8	37	
																								19.8	34	
																								18.9	36	
																								17.5	37	
																								Z - zerospan C - Calibration M - Maintenance AF - Analyzer Failure UO - Unstable Operation		
																								Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb		



Wood Buffalo Environmental Association
Hourly Averages

Ozone (O₃) - ppb
Wapasu - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Ozone (O₃) - ppb
Wapasu - July 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	246	36.83	36.83
21 - 50	415	62.13	98.95
51 - 82	7	1.05	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 (O₃) - ppb
Wapasu - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	24	25	17	18	15	22	19	24	14	13	9	7	5	5	7	22	246
21 - 50	36	18	12	11	13	18	55	42	17	16	24	13	14	23	31	72	415
51 - 82	0	0	0	0	0	0	0	0	0	3	4	0	0	0	0	0	7
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	60	43	29	29	28	40	74	66	31	32	37	20	19	28	38	94	668

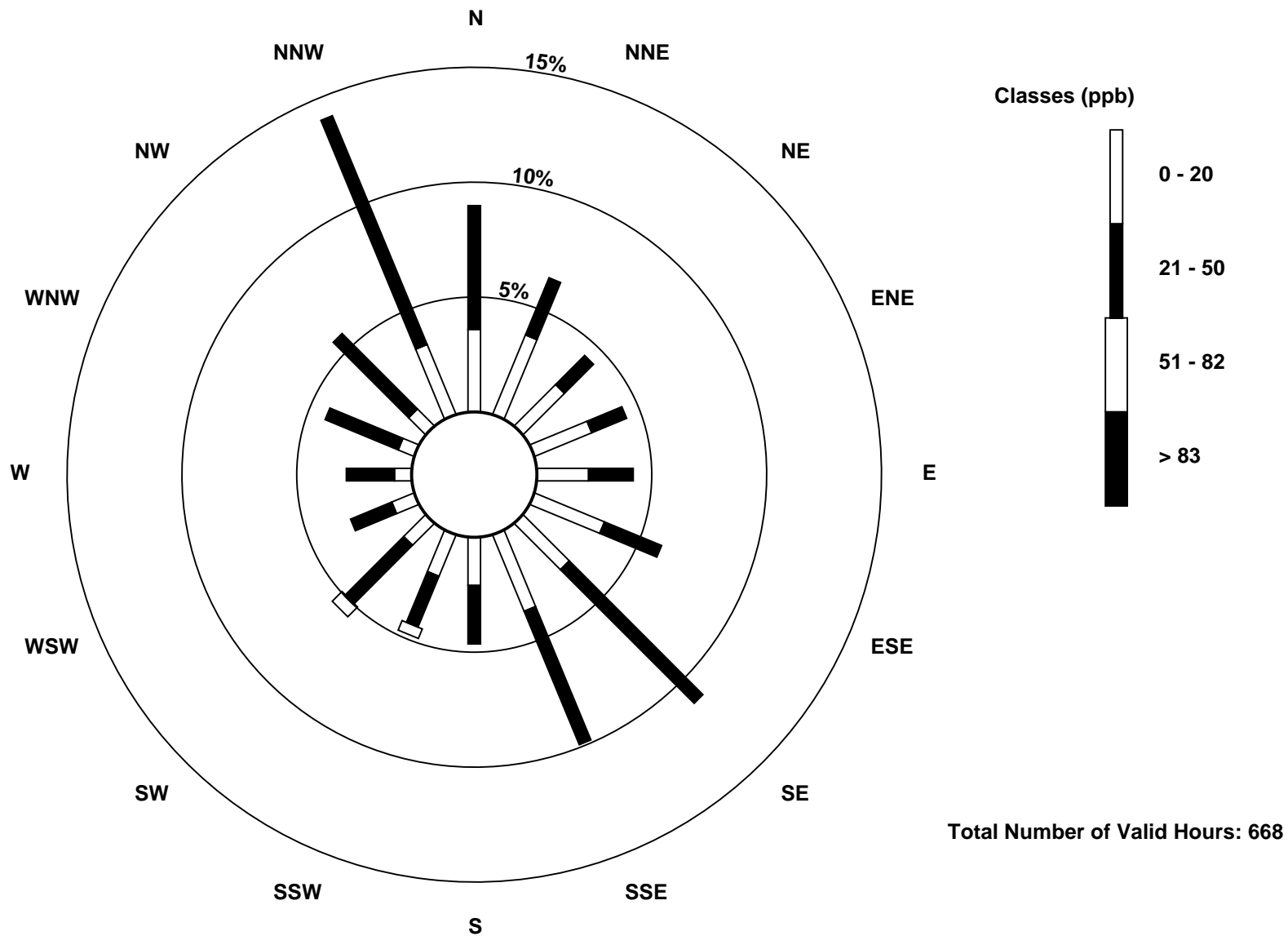
Total Number of Valid Hours: 668

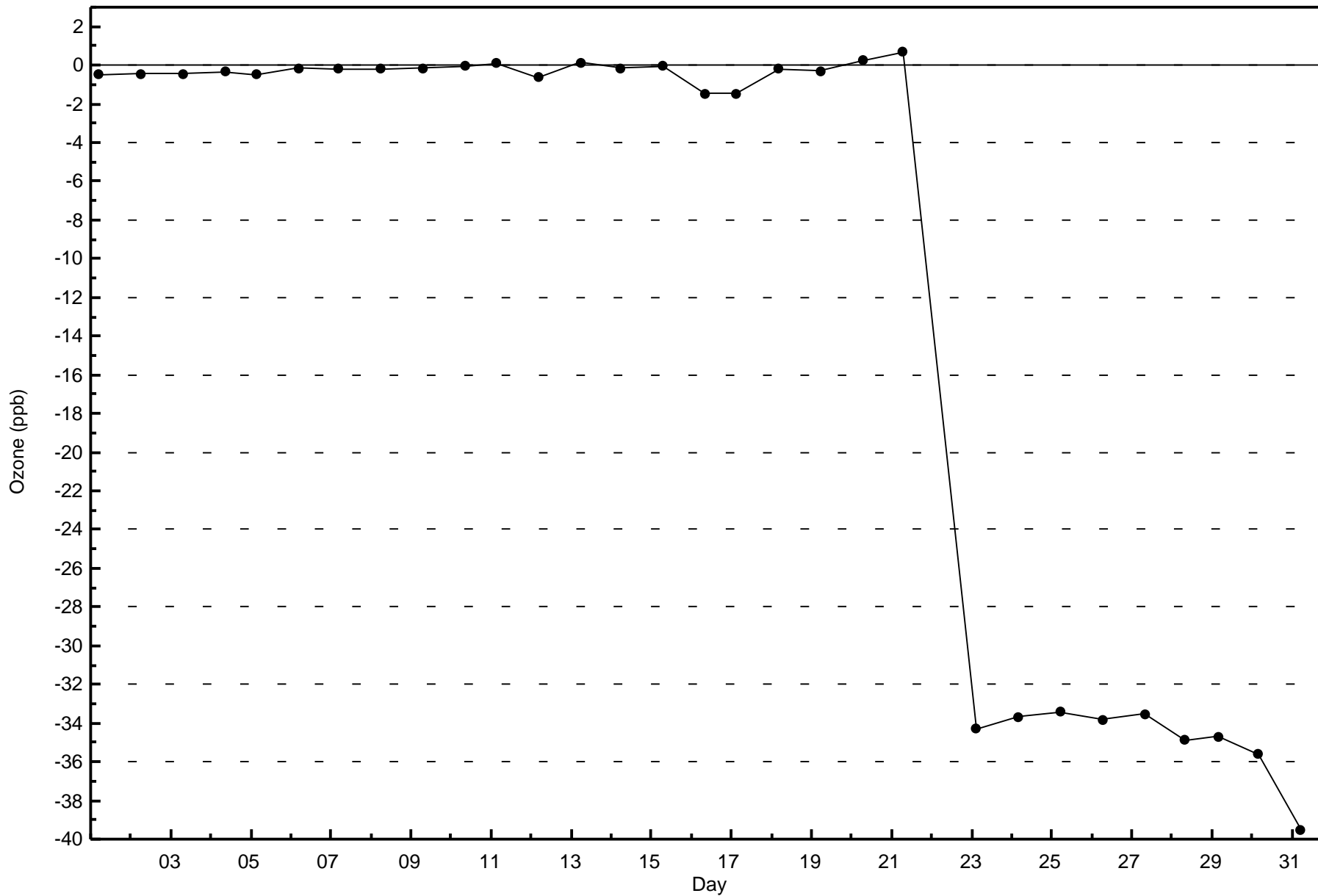
Total Number of Hours: 744

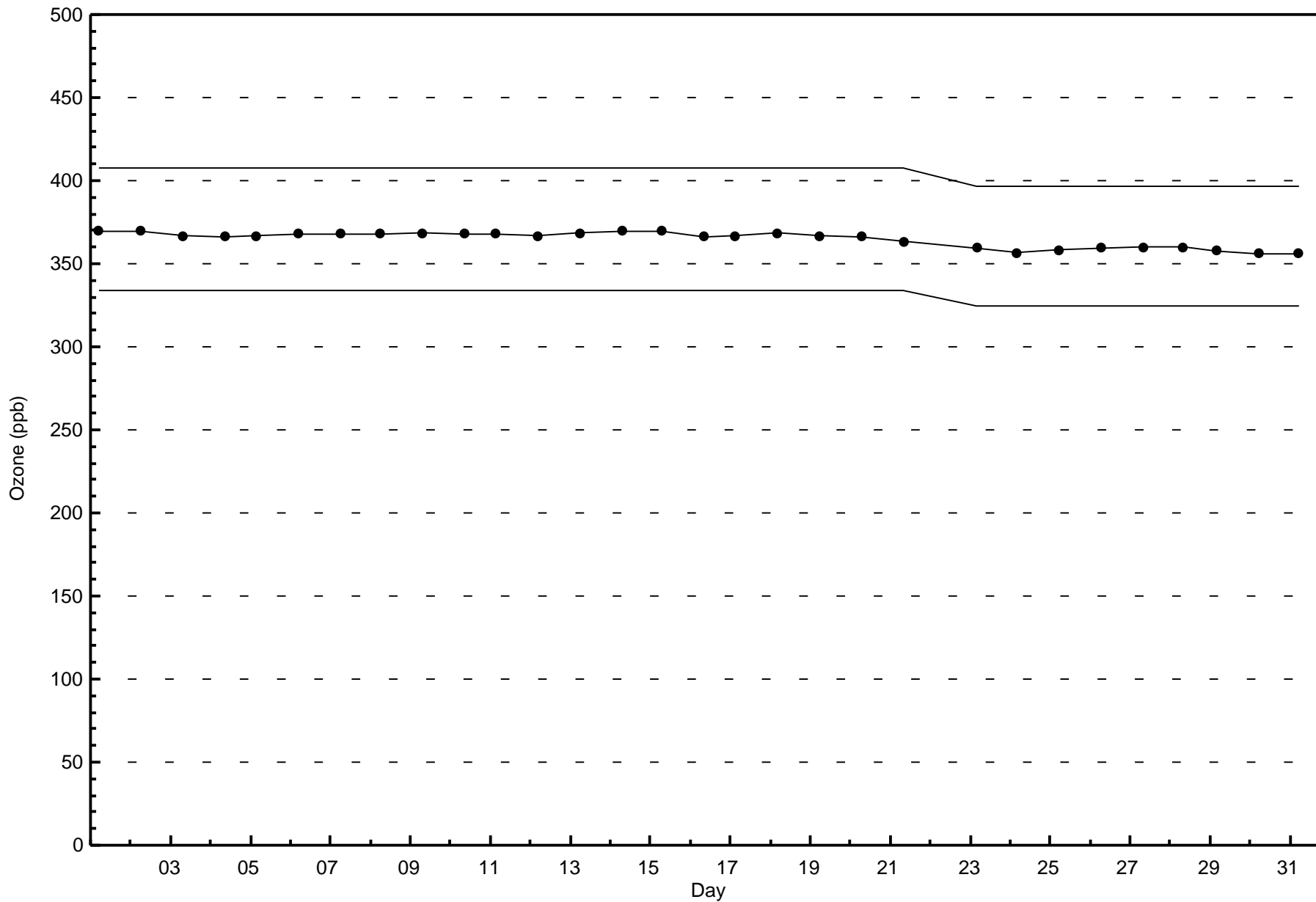


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Ozone (O₃) - ppb
Wapasu (AMS 17)









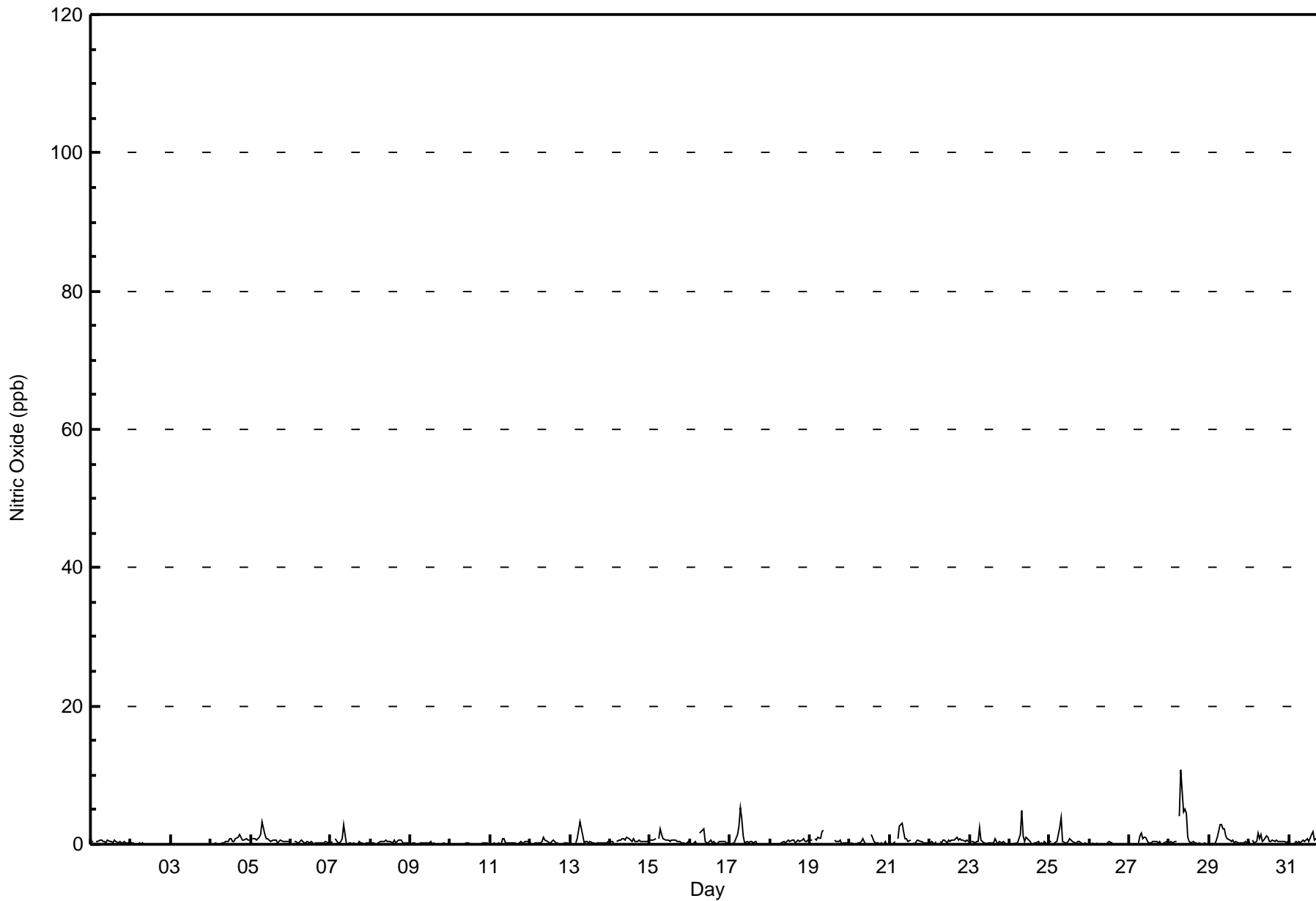
Maximum Value: 11 ppb on Jul 28 08:00																	Maximum Daily Average: 1.4 ppb on Jul 28																	Hours in Service: 744	
Minimum Value: 0 ppb on Jul 2 07:00																	Minimum Daily Average: 0.0 ppb on Jul 3																	Hours of Data: 704	
Maximum Diurnal Average: 1.6 ppb at hour 8																	Minimum Diurnal Average: 0.2 ppb at hour 3																	Hours of Missing Data: 40	
Monthly Average: 0.5 ppb																	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 1 P ₉₀ = 1 P ₉₉ = 4																	Hours of Calibration: 37	
																	Percent Operational Time: 99.6																		
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24											
1-Jul	0	0	Z	0	0	1	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0.4	1									
2-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0									
3-Jul	0	0	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-Jul	0	0	0	0	0	Z	0	0	0	0	0	1	1	0	0	1	1	1	1	1	1	1	1	1	0.5	1									
5-Jul	Z	1	1	1	1	1	1	3	1	1	1	1	0	1	1	1	1	0	0	1	0	0	0	0.8	3										
6-Jul	1	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1										
7-Jul	0	0	Z	1	0	0	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	3										
8-Jul	0	0	0	Z	0	0	0	0	0	1	0	0	0	0	1	0	0	1	1	0	0	0	0	0.3	1										
9-Jul	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										
10-Jul	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										
11-Jul	Z	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1										
12-Jul	0	Z	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0.3	1										
13-Jul	0	0	Z	0	1	2	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	3										
14-Jul	0	0	0	Z	0	1	1	1	1	1	1	1	1	0	1	0	0	1	0	0	0	0	1	0.5	1										
15-Jul	1	1	1	1	Z	1	2	1	1	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0.6	2										
16-Jul	0	0	0	0	0	Z	2	2	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.5	2										
17-Jul	Z	0	0	0	1	3	5	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	5										
18-Jul	0	Z	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	1	0	1	1	0	0	0.3	1										
19-Jul	1	1	Z	1	1	1	1	2	2	C	C	C	C	C	C	1	1	0	1	0	0	0	0	--	2										
20-Jul	0	0	0	Z	0	0	0	0	1	0	0	M	M	1	0	0	0	0	0	0	0	0	0	0.2	1										
21-Jul	0	0	0	0	Z	1	3	3	2	1	1	0	1	M	0	0	0	1	0	0	0	0	0	0.7	3										
22-Jul	0	0	0	0	0	Z	0	0	1	1	0	1	0	1	1	1	1	1	1	1	1	0	1	0.5	1										
23-Jul	Z	0	0	0	0	0	2	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.4	2										
24-Jul	0	Z	0	0	0	0	2	5	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0.5	5										
25-Jul	0	0	Z	0	0	1	3	4	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0.6	4										
26-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0										
27-Jul	0	0	0	0	Z	0	1	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2										
28-Jul	0	0	0	0	0	Z	4	11	5	5	4	1	0	0	0	0	0	0	0	0	0	0	0	1.4	11										
29-Jul	Z	0	0	0	1	1	3	3	2	2	1	1	1	0	1	0	0	0	0	0	0	0	0	0.8	3										
30-Jul	0	Z	1	0	0	2	1	1	0	1	1	1	0	1	1	0	1	0	0	0	0	0	0	0.6	2										
31-Jul	0	0	Z	0	0	0	0	0	1	1	1	1	0	1	2	1	1	1	0	1	1	0	0	0.6	2										
																	Diurnal Average		Diurnal Maximum																
																	0.2		1																
																	0.2		1																
																	0.2		1																
																	0.3		1																
																	0.4		1																
																	0.6		3																
																	1.2		5																
																	1.6		11																
																	0.9		5																
																	0.6		5																
																	0.6		4																
																	0.4		1																
																	0.4		1																
																	0.4		1																
																	0.4		2																
																	0.3		1																
																	0.3		1																
																	0.3		1																
																	0.3		1																
																	0.2		1																
																	0.2		1																
																	0.3		1																
																	0.2		1																
																	0.2		1																

Z - zerospan C - Calibration M - Maintenance



Wood Buffalo Environmental Association
Hourly Averages

Nitric Oxide (NO) - ppb
Wapasu - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb
Wapasu - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	704	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: 704

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitric Oxide (NO) - ppb
Wapasu - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	63	42	30	27	30	36	80	74	38	35	38	23	20	28	38	102	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
Totals	63	42	30	27	30	36	80	74	38	35	38	23	20	28	38	102	704

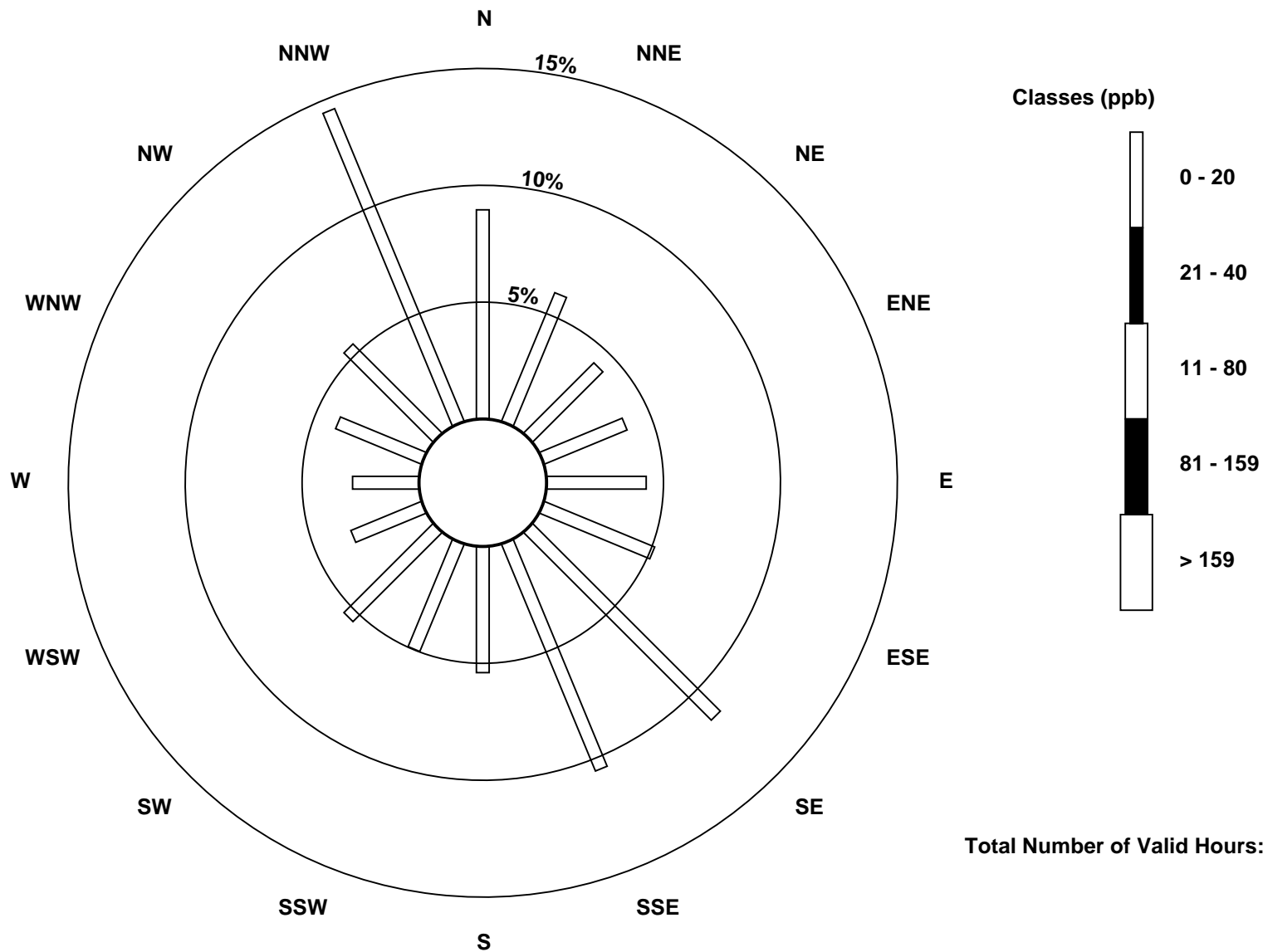
Total Number of Valid Hours: 704

Total Number of Hours: 744

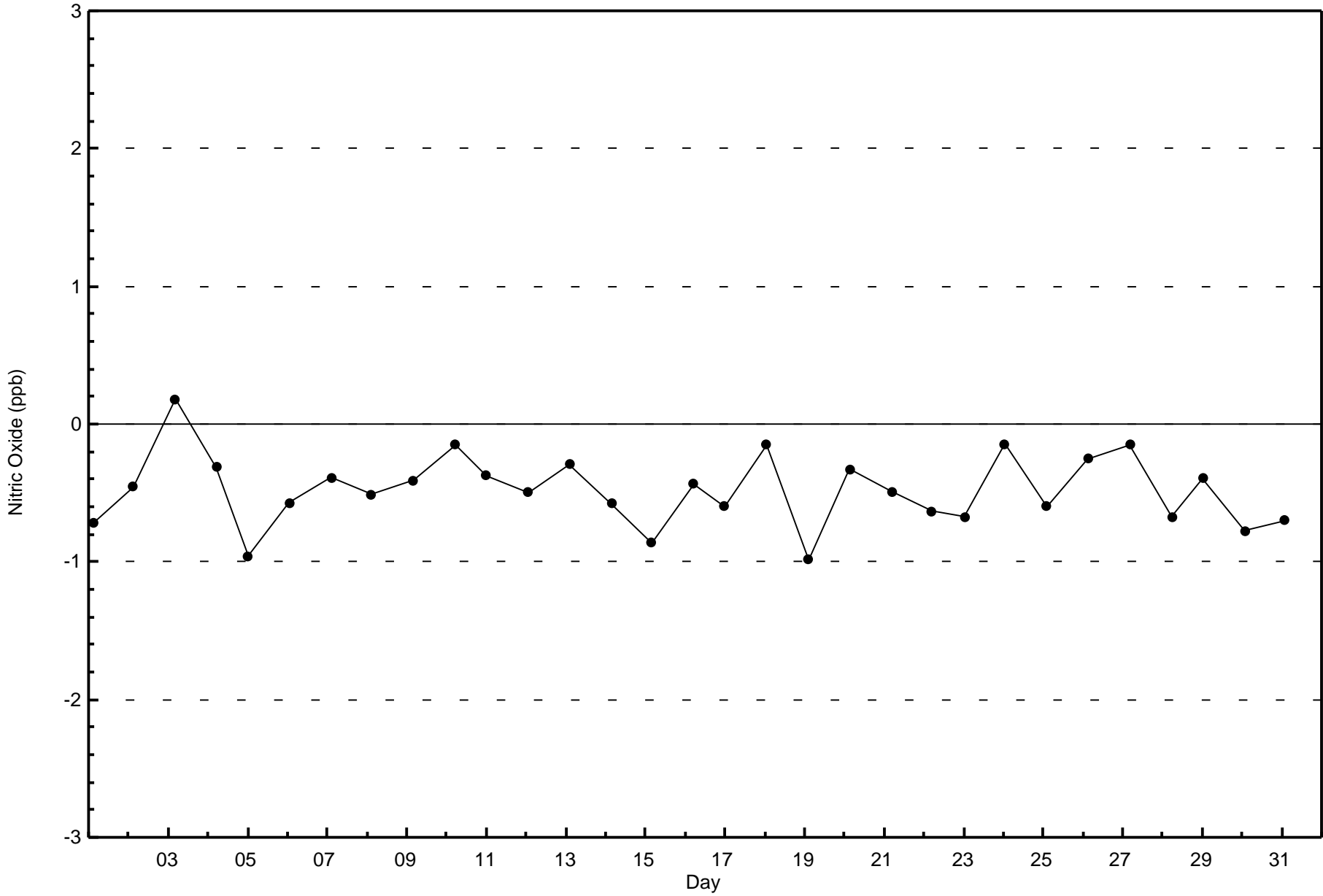


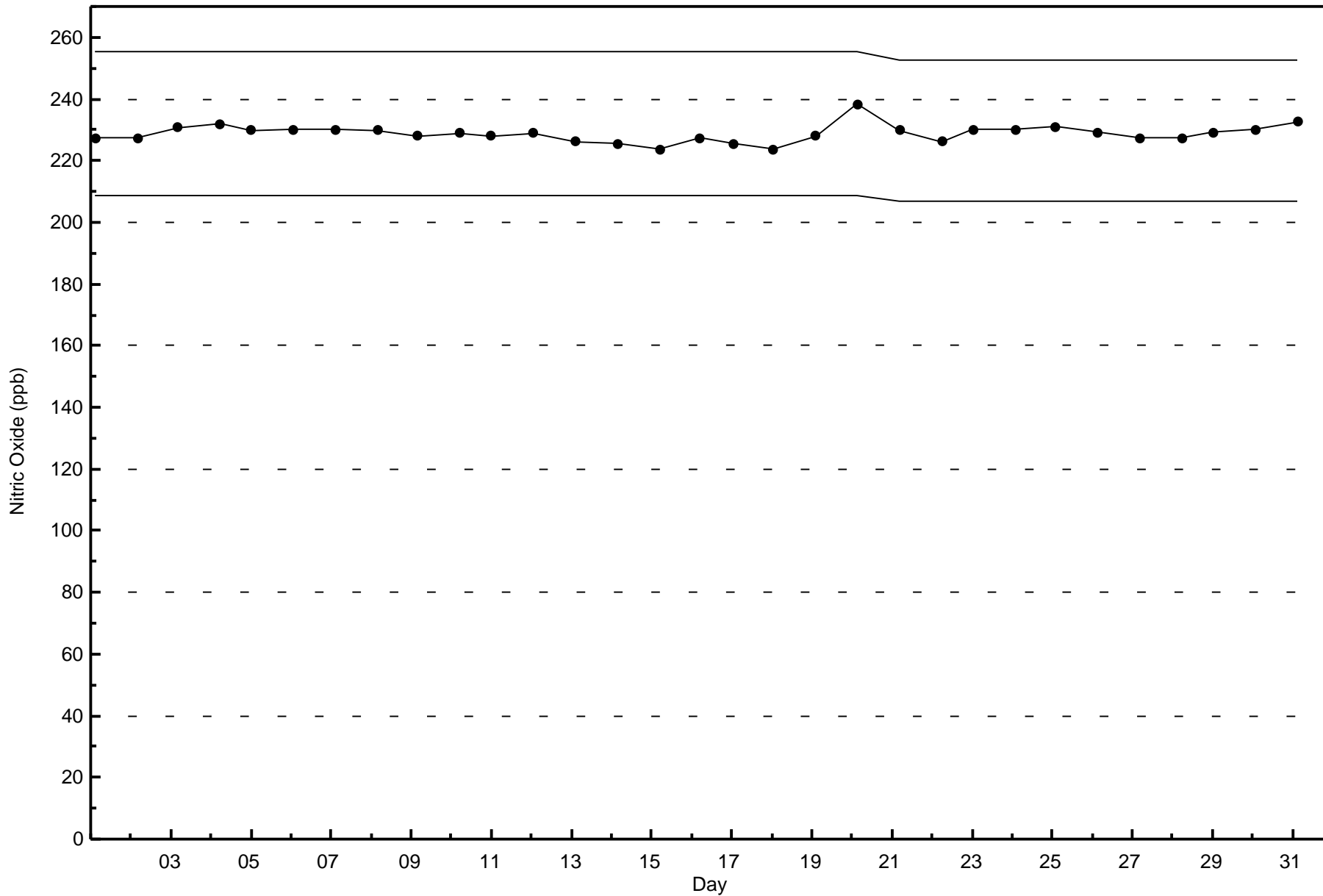
Wood Buffalo Environmental Association
Wind Rose Jul 2016

Nitric Oxide (NO) - ppb
Wapasu (AMS 17)



Total Number of Valid Hours: 704







Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

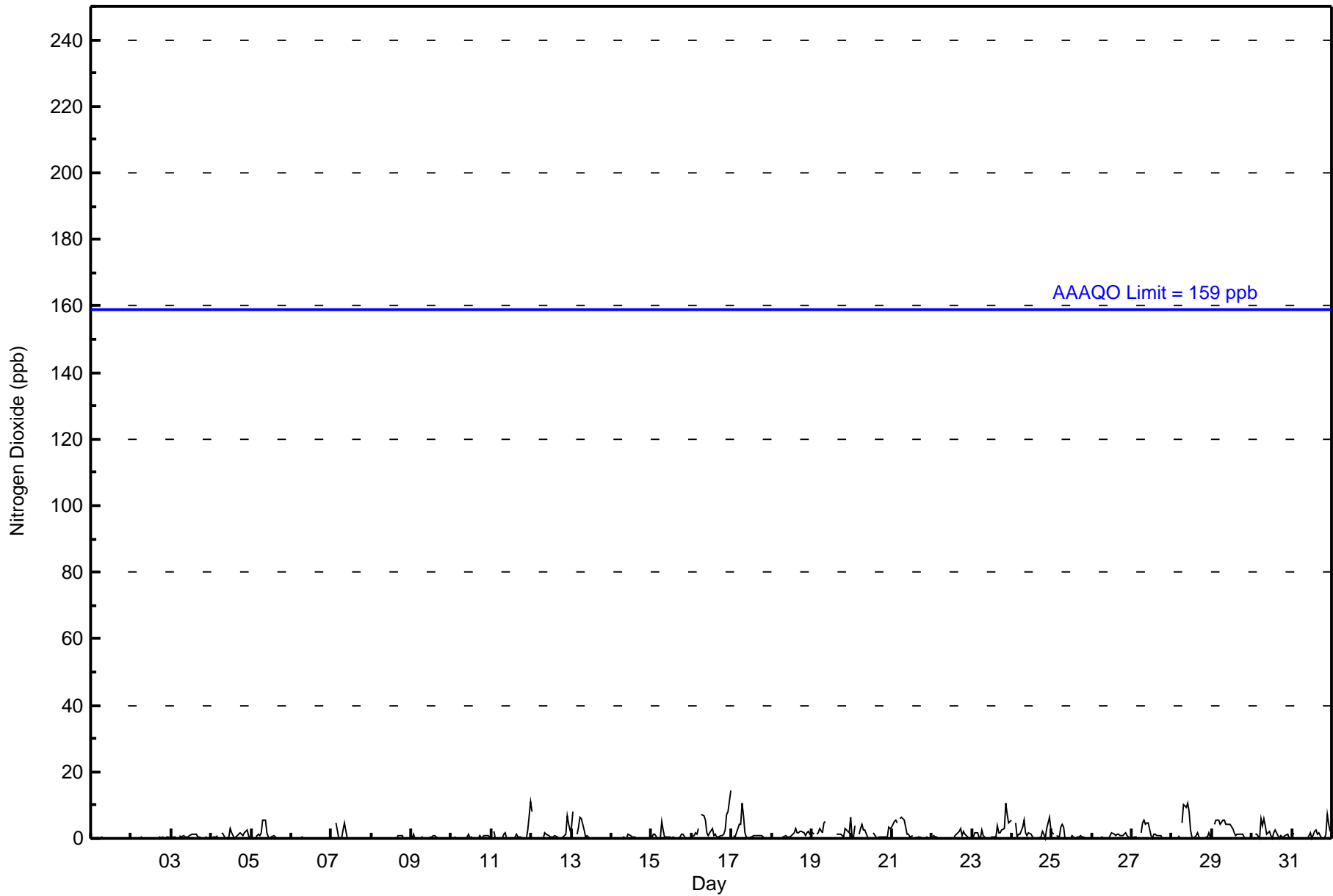
Wapasu - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																	
Maximum Value: 14 ppb on Jul 17 00:00										Maximum Daily Average: 3.2 ppb on Jul 16										Hours of Data: 704							
Minimum Value: 0 ppb on Jul 1 01:00										Minimum Daily Average: 0.0 ppb on Jul 6										Hours of Missing Data: 40							
Maximum Diurnal Average: 2.6 ppb at hour 8										Minimum Diurnal Average: 0.5 ppb at hour 20										Hours of Calibration: 37							
Monthly Average: 1.1 ppb										Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 1 P ₉₀ = 4 P ₉₉ = 9										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-Jul	0	0	Z	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-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.1	1	
3-Jul	0	0	0	0	Z	1	1	1	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.5	1	
4-Jul	0	0	0	1	1	Z	2	1	0	0	0	3	2	1	0	1	1	2	1	1	2	3	1	0	1.0	3	
5-Jul	Z	0	0	1	1	1	2	6	6	2	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0.9	6	
6-Jul	0	Z	0	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-Jul	0	0	Z	5	0	0	0	3	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	5	
8-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0.1	1	
9-Jul	0	1	0	0	Z	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0.2	1	
10-Jul	0	0	1	0	0	Z	0	0	0	0	1	0	0	0	0	0	0	1	0	1	1	1	1	0	0.3	1	
11-Jul	Z	2	0	0	0	0	0	1	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	3	11	0.9	11
12-Jul	8	Z	0	0	0	0	0	0	2	1	1	1	0	1	1	1	0	0	0	0	1	7	4	3	1.3	8	
13-Jul	3	8	Z	1	4	6	6	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.4	8	
14-Jul	0	0	0	Z	0	0	0	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
15-Jul	0	1	1	0	Z	0	5	2	0	0	1	1	0	0	0	0	0	1	1	1	0	0	0	0	0.7	5	
16-Jul	0	1	2	1	3	Z	7	7	6	2	1	2	3	1	1	0	1	1	1	1	2	7	8	14	3.2	14	
17-Jul	Z	1	1	2	4	4	11	7	2	1	0	1	1	1	1	1	1	1	1	0	0	0	0	0	1.6	11	
18-Jul	0	Z	0	0	0	0	0	1	1	1	1	0	1	2	3	2	2	2	2	2	2	1	2	2	1	1.1	3
19-Jul	2	1	Z	1	2	3	2	5	5	C	C	C	C	C	C	1	1	1	1	0	3	3	2	6	--	6	
20-Jul	0	1	4	Z	1	3	4	3	3	0	0	M	M	2	0	0	1	0	1	1	0	1	4	3	1.4	4	
21-Jul	4	5	6	5	Z	6	6	5	4	1	1	1	1	M	0	0	0	0	0	0	0	1	0	0	2.1	6	
22-Jul	0	1	1	0	0	Z	0	0	0	0	0	0	0	0	1	1	2	3	1	2	1	0	0	0	0.6	3	
23-Jul	Z	1	2	2	1	0	3	1	0	0	0	0	1	1	4	2	2	3	3	11	7	5	5	2.2	11		
24-Jul	5	Z	5	0	1	1	3	6	2	1	2	1	0	0	0	0	0	1	2	1	0	3	6	3	1.9	6	
25-Jul	2	1	Z	1	1	4	4	4	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0.9	4	
26-Jul	0	0	0	Z	0	0	0	0	0	0	0	1	2	1	1	1	1	1	1	1	2	1	0	0	0.6	2	
27-Jul	0	0	0	1	Z	2	5	6	4	5	5	1	0	1	1	1	1	1	0	0	0	0	0	0	1.4	6	
28-Jul	0	0	0	0	1	Z	5	10	9	11	8	3	1	0	1	2	1	0	0	0	1	1	2	0	2.3	11	
29-Jul	Z	4	6	6	6	4	6	5	4	4	4	4	3	2	1	1	1	1	1	1	0	0	0	0	2.8	6	
30-Jul	0	Z	1	1	0	6	4	6	4	1	2	1	0	2	3	1	0	1	0	0	1	1	0	0	1.5	6	
31-Jul	0	2	Z	0	0	0	0	0	0	0	1	2	0	2	3	1	2	1	0	0	1	7	4	2	1.2	7	
1.0 1.2 1.1 1.1 1.0 1.6 2.4 2.6 1.9 1.1 1.0 0.8 0.6 0.7 0.7 0.6 0.6 0.7 0.6 0.5 0.9 1.4 1.4 1.6																								Diurnal Average			
8 8 6 6 6 6 11 10 9 11 8 4 3 2 3 4 2 3 3 3 3 11 7 8 14																								Diurnal Maximum			
Z - zerospan C - Calibration M - Maintenance																											
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb																											



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Wapasu - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Wapasu - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	704	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: 704

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Wapasu - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	63	42	30	27	30	36	80	74	38	35	38	23	20	28	38	102	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
Totals	63	42	30	27	30	36	80	74	38	35	38	23	20	28	38	102	704

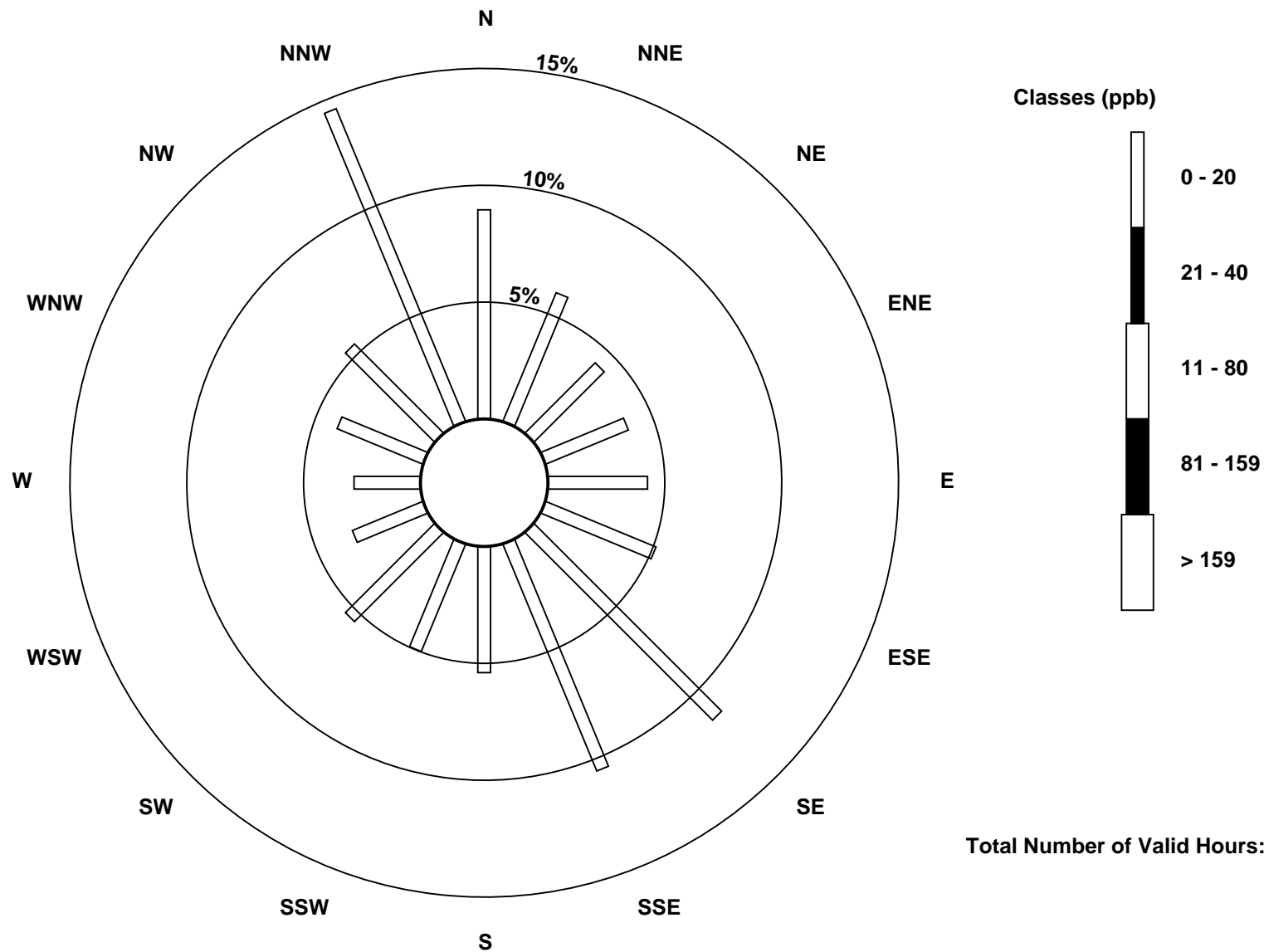
Total Number of Valid Hours: 704

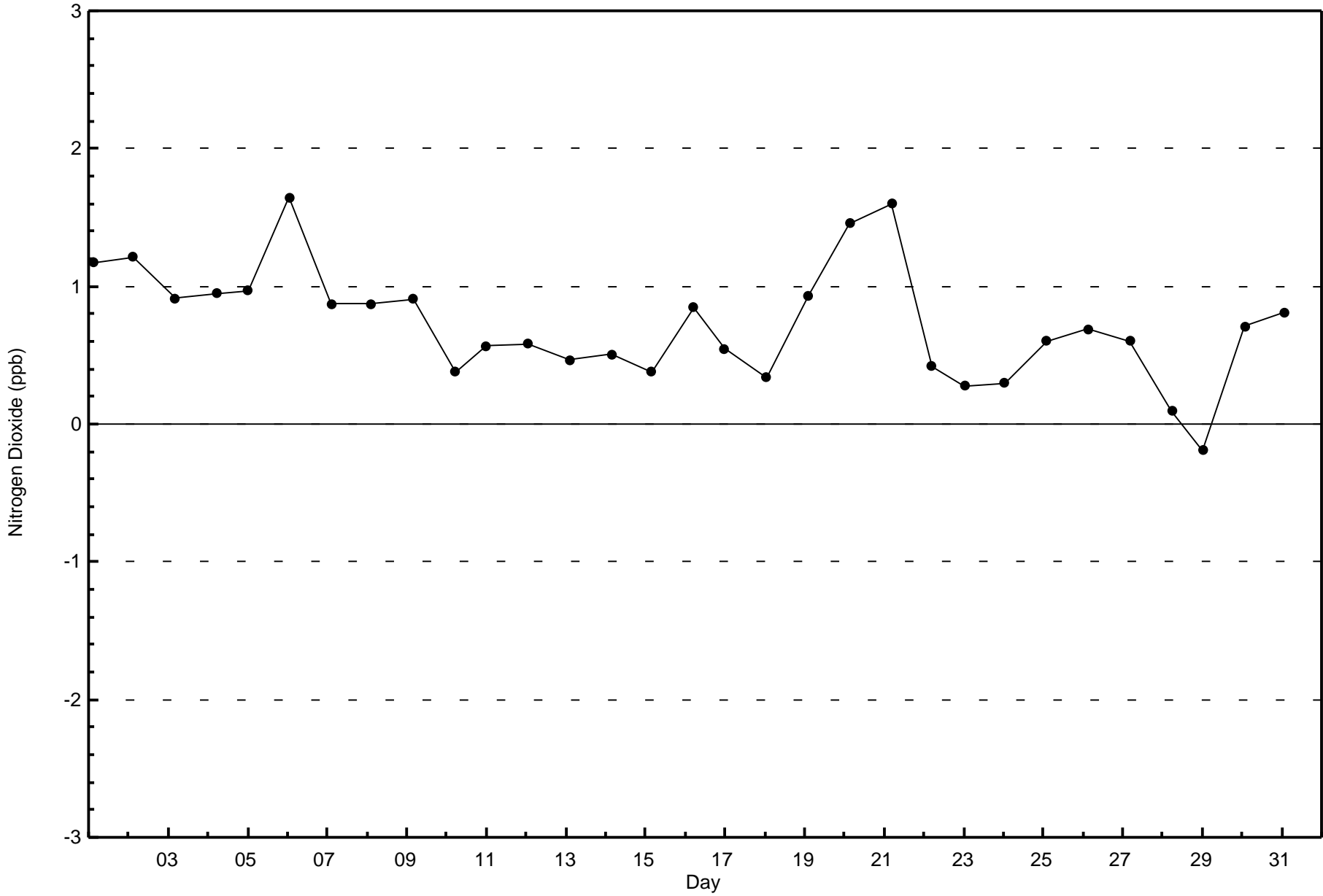
Total Number of Hours: 744

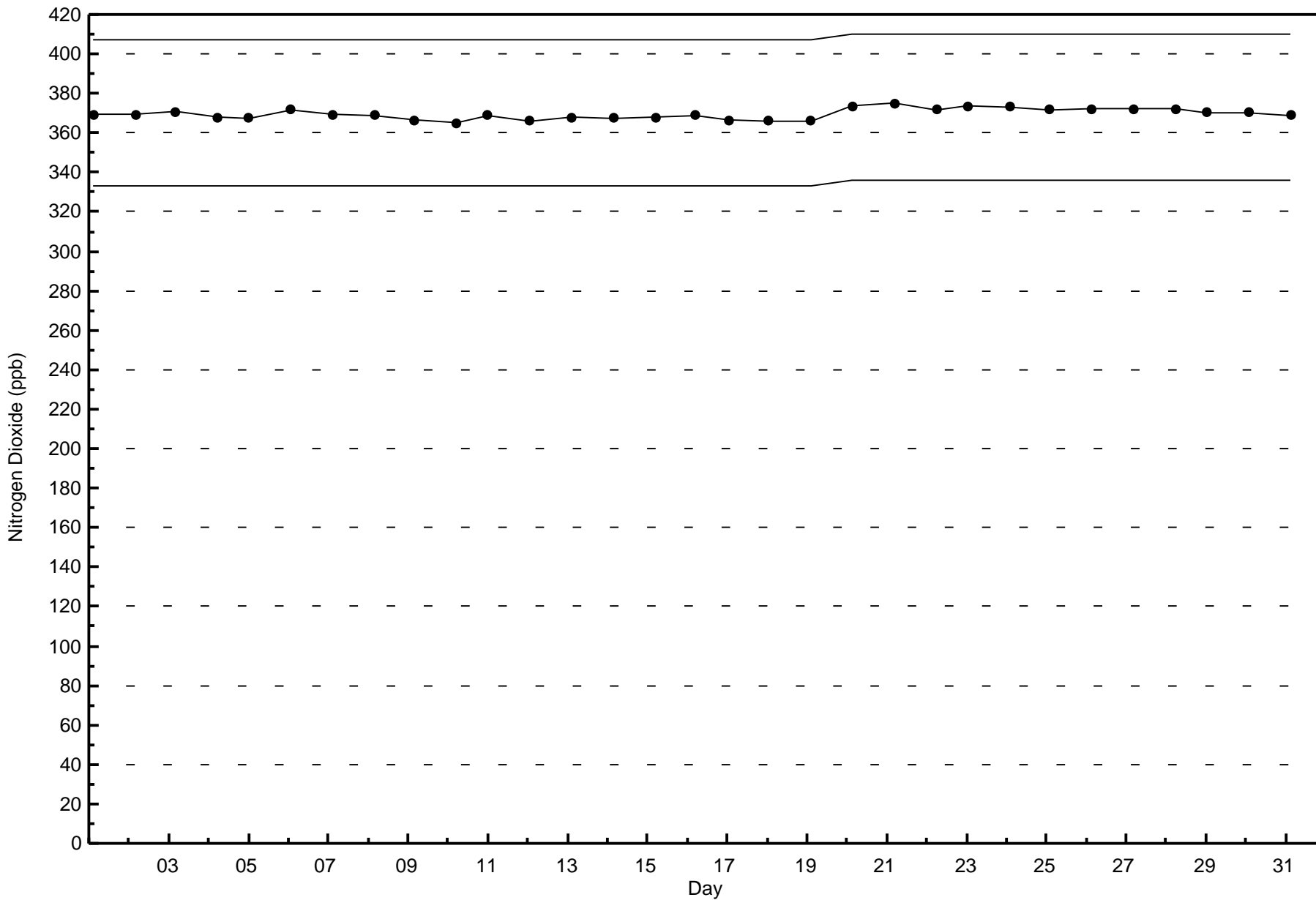


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Nitrogen Dioxide (NO₂) - ppb
Wapasu (AMS 17)









Wood Buffalo Environmental Association
Summary of Hour Averages

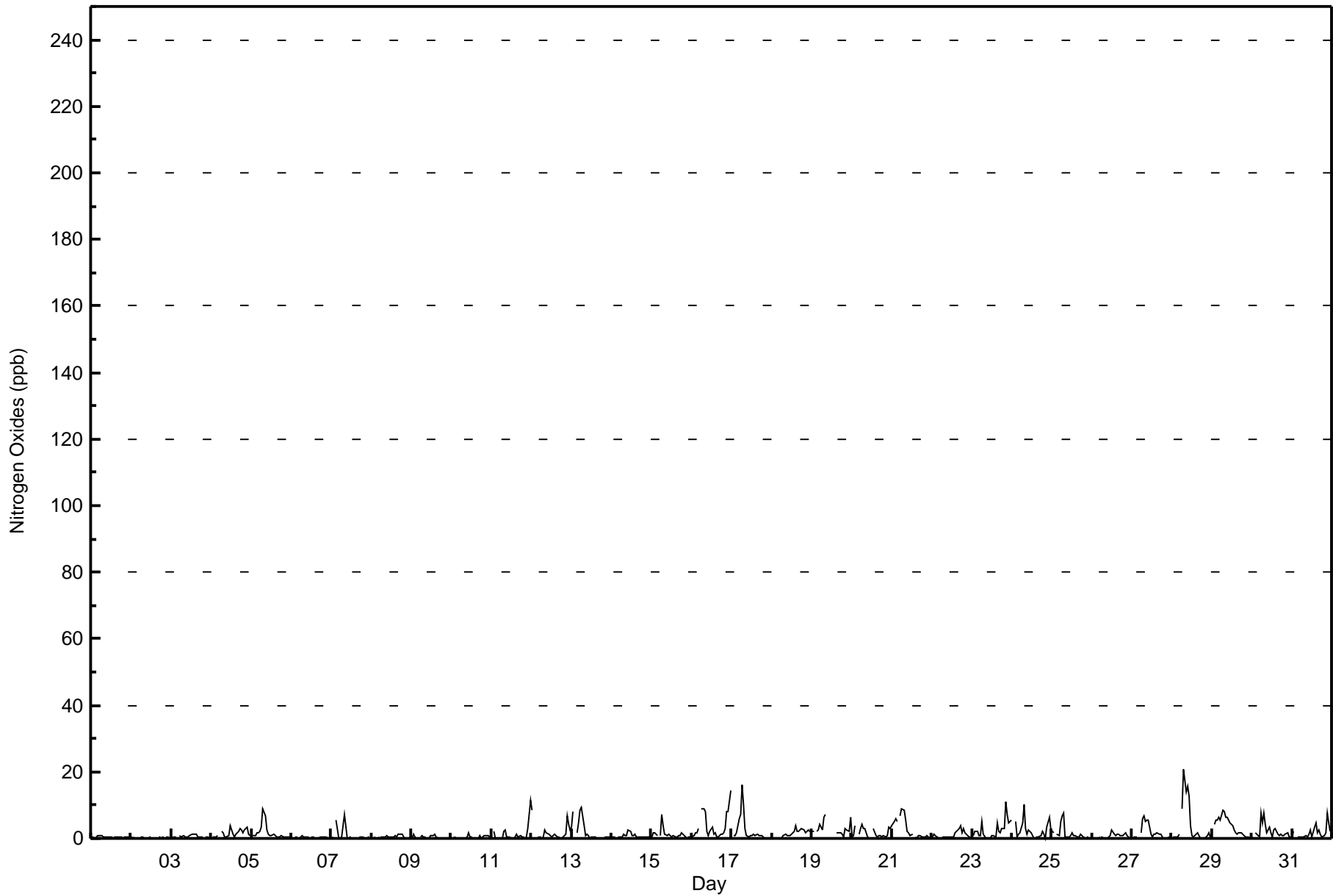
Nitrogen Oxides (NO_x) - ppb
Wapasu - July 2016

Maximum Value: 21 ppb on Jul 28 08:00																		Maximum Daily Average: 3.7 ppb on Jul 28						Hours in Service: 744																									
Minimum Value: 0 ppb on Jul 2 10:00																		Minimum Daily Average: 0.2 ppb on Jul 2						Hours of Data: 704																									
Maximum Diurnal Average: 4.2 ppb at hour 8																		Minimum Diurnal Average: 0.8 ppb at hour 20						Hours of Missing Data: 40																									
Monthly Average: 1.6 ppb																		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 O ₃ = 2 P ₉₀ = 5 P ₉₉ = 11						Hours of Calibration: 37																									
																		Percent Operational Time: 99.6																															
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Jul	0	0	Z	0	1	1	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0.4	1																							
2-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.2	1																							
3-Jul	0	0	0	0	Z	1	1	1	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0.5	1																								
4-Jul	0	0	1	1	1	Z	2	2	1	0	1	4	2	1	0	1	2	3	2	2	2	3	1	1	1.5	4																							
5-Jul	Z	1	1	2	2	2	3	9	7	3	1	1	1	1	1	1	0	1	2	3	1	0	0	0	1.6	9																							
6-Jul	1	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1																							
7-Jul	0	0	Z	5	0	0	0	4	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.9	7																							
8-Jul	0	0	0	Z	0	0	0	0	0	1	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0.4	1																							
9-Jul	0	1	0	0	Z	0	1	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0.4	1																							
10-Jul	0	0	1	0	0	Z	0	0	0	1	1	0	0	0	0	0	0	1	0	1	1	1	1	0	0.4	1																							
11-Jul	Z	2	0	0	0	0	0	2	2	1	0	0	0	1	1	0	1	0	0	0	0	0	3	12	1.2	12																							
12-Jul	8	Z	0	0	0	0	0	1	3	2	1	1	1	1	1	1	0	0	0	0	1	7	4	3	1.5	8																							
13-Jul	4	8	Z	2	5	8	9	4	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1.9	9																							
14-Jul	0	0	0	Z	0	1	1	1	1	1	3	2	1	1	1	0	1	1	0	0	0	0	0	1	0.8	3																							
15-Jul	1	2	2	1	Z	1	7	4	1	1	1	1	1	1	1	1	1	1	1	2	1	0	0	1	1.3	7																							
16-Jul	0	1	2	2	3	Z	9	9	8	2	1	2	3	1	2	1	1	1	1	2	3	8	8	15	3.6	15																							
17-Jul	Z	1	1	2	6	7	16	10	3	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	2.4	16																							
18-Jul	0	Z	0	0	0	0	0	1	1	1	1	1	1	2	4	2	2	3	3	2	2	2	3	2	1.4	4																							
19-Jul	2	2	Z	2	2	4	3	6	7	C	C	C	C	C	C	2	2	2	1	0	3	3	2	6	--	7																							
20-Jul	0	1	4	Z	1	3	4	3	3	0	0	M	M	3	1	0	1	1	0	1	0	1	3	3	1.6	4																							
21-Jul	4	5	6	5	Z	7	9	8	6	2	2	1	1	M	0	0	1	1	0	1	0	1	0	0	2.7	9																							
22-Jul	1	1	1	0	0	Z	0	0	1	1	0	1	0	1	2	2	3	4	2	3	2	1	1	0	1.1	4																							
23-Jul	Z	1	2	2	1	1	5	1	0	0	0	1	1	1	5	2	2	3	3	11	7	5	5	2.5	11																								
24-Jul	5	Z	5	0	1	2	5	10	3	1	3	2	1	0	0	0	0	1	2	1	0	3	7	3	2.4	10																							
25-Jul	2	2	Z	1	1	5	7	7	1	0	0	1	2	1	1	1	1	1	1	0	0	0	0	0	1.5	7																							
26-Jul	0	0	0	Z	0	0	0	0	0	0	0	1	2	1	1	1	1	1	1	1	2	1	0	0	0.7	2																							
27-Jul	0	0	0	0	Z	2	6	7	5	6	6	1	0	1	1	2	1	1	0	0	0	0	0	0	1.8	7																							
28-Jul	0	0	0	0	1	Z	9	21	14	16	13	4	1	0	1	2	1	0	0	0	1	1	2	0	3.7	21																							
29-Jul	Z	4	6	6	6	5	8	8	7	6	5	5	4	2	2	1	2	2	1	1	0	0	0	0	3.6	8																							
30-Jul	0	Z	2	1	1	8	5	7	4	2	3	2	1	2	3	1	1	1	1	1	1	2	0	0	2.1	8																							
31-Jul	1	2	Z	0	0	0	0	0	1	1	1	3	1	4	5	2	2	1	1	1	2	8	5	2	1.8	8																							
																								1.2	1.4	1.4	1.3	1.3	2.2	3.6	4.2	2.8	1.6	1.6	1.2	1.0	1.0	1.1	1.0	0.9	1.0	0.9	0.8	1.1	1.7	1.6	1.8	Diurnal Average	
																								8	8	6	6	6	8	16	21	14	16	13	5	4	4	5	5	3	4	3	3	11	8	8	15	Diurnal Maximum	
Z - zerospan																								C - Calibration						M - Maintenance																			



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Wapasu - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Wapasu - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	703	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: 704

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Wapasu - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	63	42	30	27	30	36	80	74	38	34	38	23	20	28	38	102	703
21 - 40	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	63	42	30	27	30	36	80	74	38	35	38	23	20	28	38	102	704

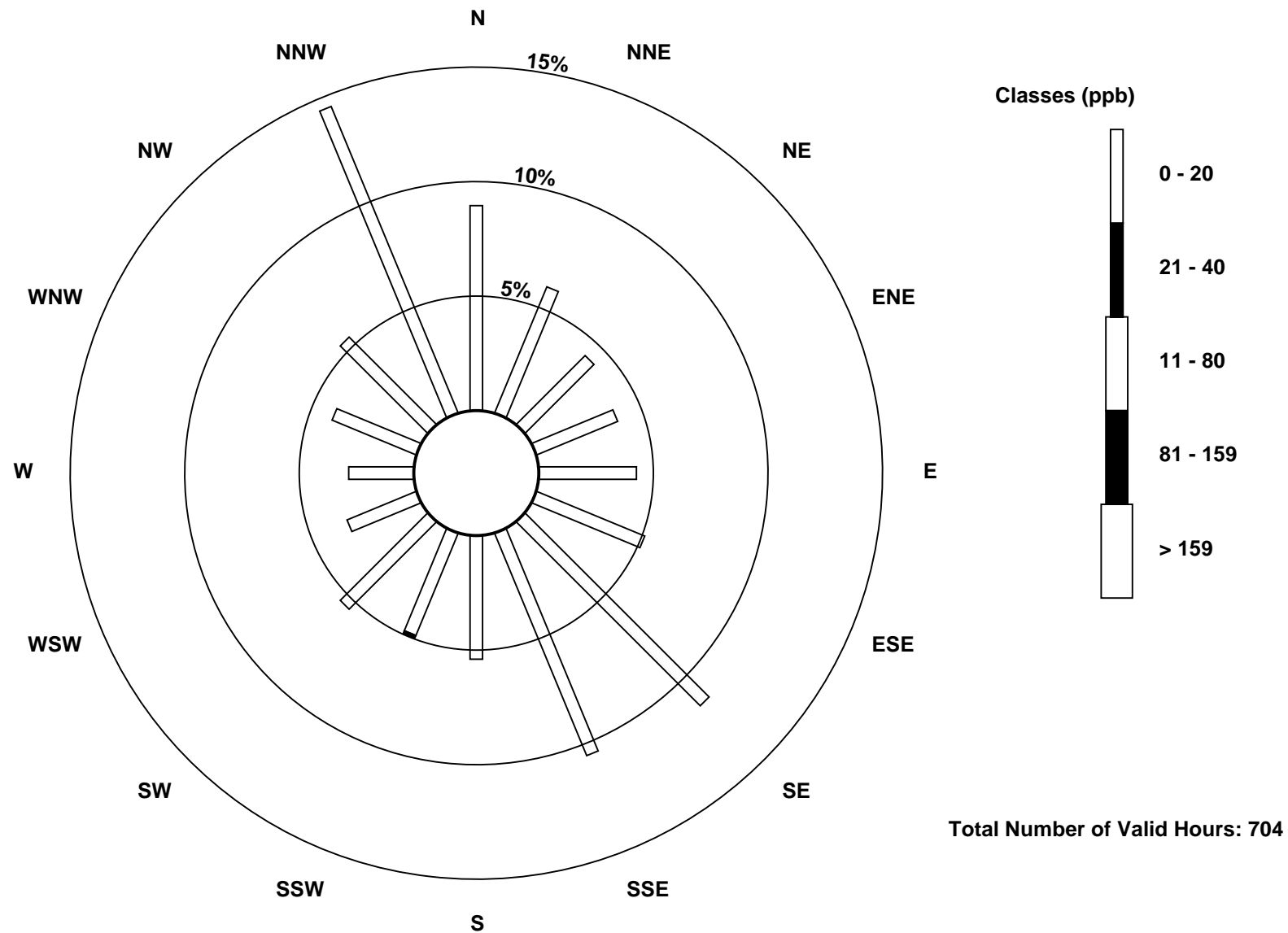
Total Number of Valid Hours: 704

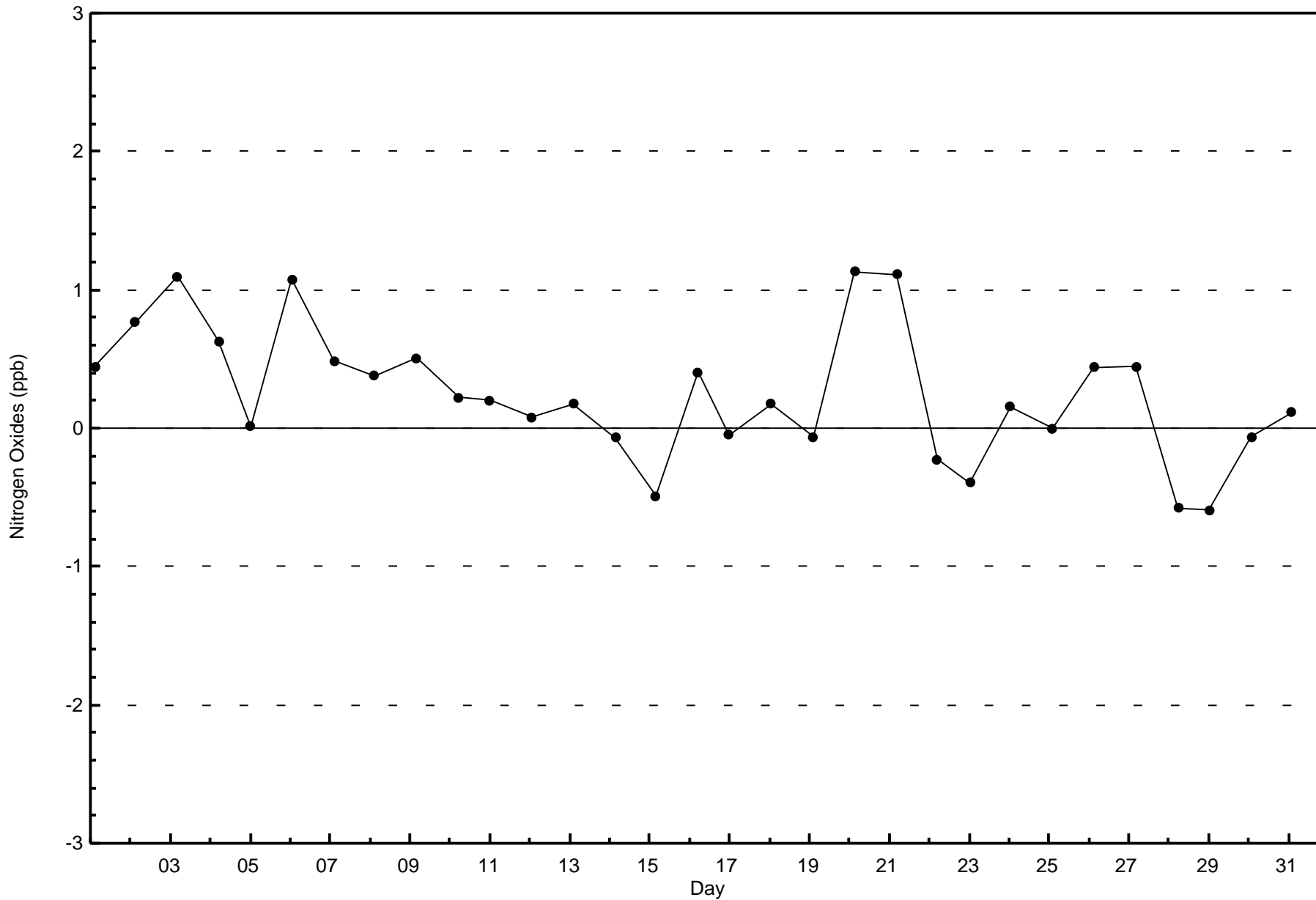
Total Number of Hours: 744

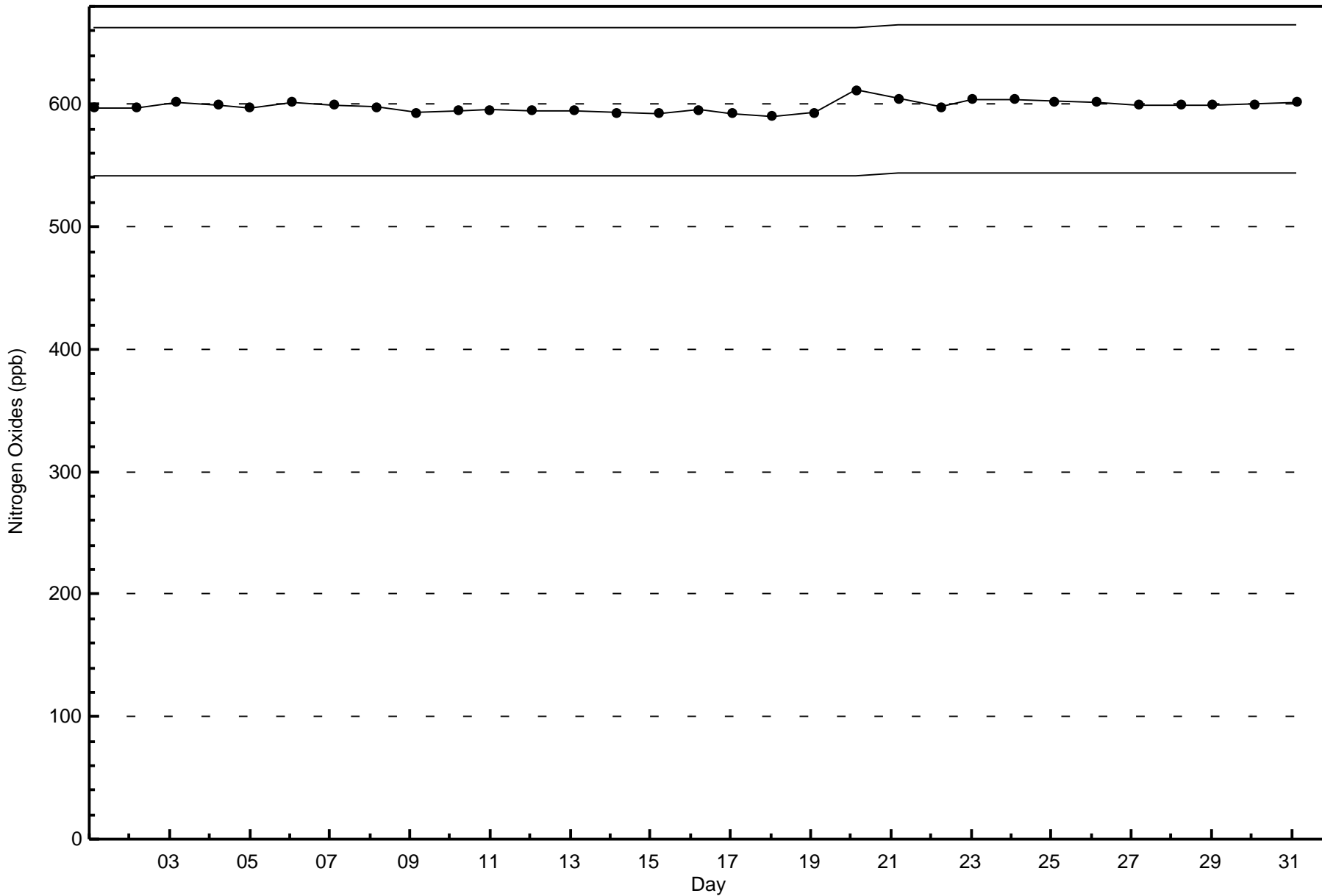


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Nitrogen Oxides (NO_x) - ppb
Wapasu (AMS 17)





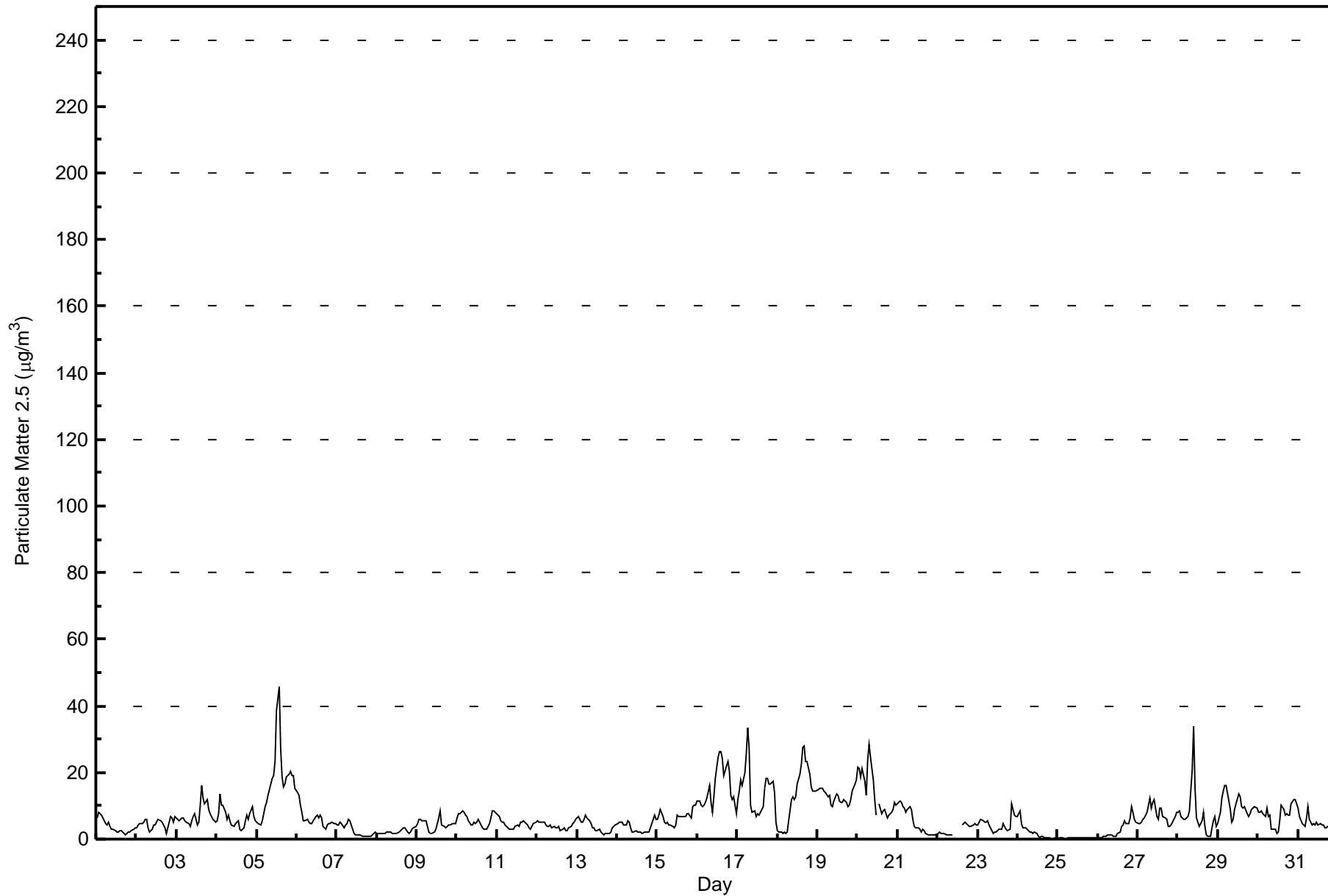




Summary of Hour Averages

Wapasu - July 2016

Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 45.8 µg/m ³ on Jul 5 14:00 Minimum Value: 0.1 µg/m ³ on Jul 24 21:00 Maximum Diurnal Average: 7.5 µg/m ³ at hour 14 Monthly Average: 6.71 µg/m ³		Maximum Daily Average: 17.2 µg/m ³ on Jul 5 Minimum Daily Average: 0.4 µg/m ³ on Jul 25 Minimum Diurnal Average: 5.8 µg/m ³ at hour 12 Percentiles: P ₁ = 0.2 P ₁₀ = 1.4 Q ₁ = 3.0 Median = 5.1 Q ₃ = 8.5 P ₉₀ = 14.3 P ₉₉ = 27.4		Hours in Service: 744 Hours of Data: 738 Hours of Missing Data: 6 Hours of Calibration: 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-Jul	6.3	7.9	7.6	7.3	6.2	4.6	4.2	5.0	3.7	3.2	2.8	2.5	2.3	2.2	2.4	2.5	1.6	1.3	1.8	2.1	2.0	2.7	3.1	3.2	3.7	7.9																							
2-Jul	3.5	4.1	4.5	4.8	5.2	5.8	6.0	3.5	2.0	2.9	4.1	4.3	5.0	5.8	5.5	5.0	4.1	3.2	1.8	3.4	6.6	6.5	5.1	6.8	4.6	6.8																							
3-Jul	6.4	5.4	5.8	6.5	6.3	5.4	5.0	4.8	3.8	5.7	6.8	7.8	4.0	5.1	10.1	16.1	12.3	10.7	11.8	8.8	7.7	6.8	5.9	5.1	7.2	16.1																							
4-Jul	5.6	7.6	13.7	10.2	10.3	8.1	6.1	7.1	5.5	4.1	3.8	4.8	5.2	5.5	3.1	2.6	3.6	5.5	7.1	5.8	7.5	9.8	6.6	5.5	6.4	13.7																							
5-Jul	5.2	4.7	4.4	5.4	7.7	9.9	10.8	13.0	16.5	18.3	19.3	23.2	38.5	45.8	27.3	18.6	15.8	16.4	18.9	19.6	20.2	19.3	18.9	15.4	17.2	45.8																							
6-Jul	13.9	13.1	10.1	7.8	5.7	5.6	6.0	5.2	4.6	4.6	5.7	6.9	7.0	6.3	7.1	6.5	3.6	3.1	4.3	4.7	4.6	5.1	4.7	4.5	6.3	13.9																							
7-Jul	4.4	4.2	5.0	4.8	3.4	4.0	4.7	5.7	5.3	2.8	1.6	1.2	1.1	1.3	1.4	1.0	1.0	1.0	1.0	1.0	1.0	1.4	1.8	2.2	2.6	5.7																							
8-Jul	1.8	1.8	1.6	1.7	1.7	1.8	1.9	2.0	2.0	1.9	1.8	1.8	1.9	2.1	2.5	2.8	3.3	3.2	2.1	1.8	2.1	3.0	3.5	3.6	2.3	3.6																							
9-Jul	4.8	5.9	5.9	5.6	5.5	5.3	3.8	2.2	1.8	1.7	1.9	3.0	4.5	6.5	8.5	4.3	3.7	3.6	3.8	4.1	4.3	4.7	4.8	4.6	4.4	8.5																							
10-Jul	6.5	7.6	7.6	8.5	7.9	7.2	6.6	5.6	4.3	4.3	5.1	4.5	5.3	5.9	4.2	3.6	2.9	2.8	3.0	4.5	6.5	8.6	8.6	8.1	5.8	8.6																							
11-Jul	7.8	6.8	5.5	5.0	4.9	4.4	3.5	2.8	2.8	2.8	2.9	4.0	4.2	3.9	5.3	5.0	5.4	4.6	4.1	3.3	3.0	3.9	4.7	5.0	4.4	7.8																							
12-Jul	5.4	5.1	5.2	5.1	5.0	4.3	3.7	3.6	4.1	3.5	3.7	3.5	3.4	3.6	2.7	2.9	3.3	2.5	2.7	3.3	3.9	4.5	4.9	5.8	4.0	5.8																							
13-Jul	6.5	6.8	5.2	4.9	6.1	7.0	6.5	5.3	4.6	3.6	3.2	2.6	2.4	3.0	2.1	1.9	1.5	1.5	1.7	1.8	2.2	3.3	3.9	4.1	3.8	7.0																							
14-Jul	4.8	5.2	4.9	5.2	4.2	4.2	5.3	5.2	3.2	2.1	2.3	2.4	2.0	2.3	2.0	1.9	2.0	2.0	2.0	2.1	3.6	4.5	7.4	6.1	3.6	7.4																							
15-Jul	6.1	7.3	8.7	6.6	5.3	4.5	5.3	4.4	4.4	3.8	3.5	4.2	7.1	6.9	7.0	6.6	6.6	6.8	7.6	7.4	6.5	10.0	10.0	10.2	6.5	10.2																							
16-Jul	11.3	11.5	10.4	9.6	10.0	11.1	12.4	16.2	10.9	8.0	12.7	18.1	24.7	26.4	26.5	24.1	19.0	21.9	23.5	20.5	13.2	11.9	12.6	7.4	15.6	26.5																							
17-Jul	11.7	14.6	17.7	16.2	19.8	25.8	33.4	27.3	10.2	8.2	8.5	6.9	7.5	7.0	8.1	9.6	15.4	18.2	18.2	16.7	16.5	17.5	13.9	4.9	14.7	33.4																							
18-Jul	2.7	2.2	2.3	1.8	2.0	1.9	2.1	5.4	12.0	12.6	11.7	12.6	16.5	19.6	22.6	27.7	28.1	23.1	23.4	19.3	15.6	14.3	14.3	14.5	12.8	28.1																							
19-Jul	14.6	15.2	15.2	15.1	14.3	13.8	12.6	13.1	10.0	9.7	11.6	13.5	13.0	11.5	11.2	10.9	11.9	10.9	9.7	10.1	12.0	14.3	16.6	17.8	12.9	17.8																							
20-Jul	21.5	21.2	18.7	21.2	17.2	13.3	23.6	28.4	24.7	17.6	11.9	7.3	M	10.8	7.5	8.5	9.0	7.8	6.5	7.2	8.1	9.0	11.1	10.3	14.0	28.4																							
21-Jul	10.4	11.3	10.9	9.9	9.2	8.0	8.7	9.7	8.8	6.1	3.9	3.2	3.2	2.8	2.1	2.9	2.4	1.8	1.4	1.3	1.2	1.2	1.1	1.3	5.1	11.3																							
22-Jul	1.6	1.9	1.8	1.7	1.6	1.5	1.4	1.2	1.2	1.5	M	M	M	C	C	4.4	5.0	4.7	4.2	3.7	3.6	4.3	4.6	4.4	2.9	5.0																							
23-Jul	4.4	5.0	5.8	5.7	5.0	5.0	5.6	4.1	2.7	1.8	1.9	2.2	2.7	2.8	3.1	4.7	3.6	3.2	2.6	2.9	10.5	9.0	7.2	6.6	4.5	10.5																							
24-Jul	6.7	8.4	4.8	3.5	3.2	3.4	2.5	2.0	1.9	1.9	2.0	1.9	1.0	0.5	0.9	0.8	0.2	0.3	0.2	0.2	0.1	0.2	0.2	0.1	2.0	8.4																							
25-Jul	0.1	0.3	0.4	0.2	0.2	0.2	0.3	0.4	0.2	0.2	0.3	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.4	0.4	0.4	0.4	0.4	0.6																							
26-Jul	0.5	0.5	0.6	0.8	0.9	0.9	1.2	1.3	1.2	1.0	1.0	1.1	1.6	2.1	3.8	4.1	5.4	4.7	4.8	6.5	9.6	8.0	6.1	5.1	3.0	9.6																							
27-Jul	4.6	4.7	5.2	5.8	6.2	8.2	10.3	12.2	9.2	10.9	12.0	6.9	5.9	9.4	9.4	6.7	6.5	5.9	3.9	3.8	4.3	5.2	7.0	7.9	7.2	12.2																							
28-Jul	8.0	8.6	6.9	6.0	5.8	6.3	6.8	8.6	20.6	34.0	15.2	6.4	5.2	3.7	5.7	8.2	3.8	1.3	1.0	1.0	3.2	5.3	6.7	3.9	7.6	34.0																							
29-Jul	4.8	8.1	12.3	14.5	16.2	16.2	11.3	8.7	5.2	6.0	9.1	10.6	13.7	12.5	9.7	9.5	9.7	7.6	6.6	7.8	8.8	9.3	9.7	9.4	9.9	16.2																							
30-Jul	7.9	8.1	8.3	7.7	6.6	9.2	6.6	7.4	3.1	2.8	2.8	1.9	2.1	5.6	10.1	8.7	7.1	7.7	7.2	7.4	10.4	11.9	12.0	10.4	7.2	12.0																							
31-Jul	9.1	6.9	4.8	4.1	3.8	6.4	9.6	5.8	4.3	4.6	4.4	5.0	4.2	4.5	4.1	4.1	3.4	3.4	3.7	4.3	5.7	6.8	4.4	3.6	5.0	9.6																							
																								6.7	7.2	7.1	6.9	6.7	6.9	7.4	7.3	6.3	6.2	5.9	5.8	6.7	7.5	7.2	7.0	6.5	6.2	6.2	6.0	6.6	7.2	7.2	6.4	Diurnal Average	
																								21.5	21.2	18.7	21.2	19.8	25.8	33.4	28.4	24.7	34.0	19.3	23.2	38.5	45.8	27.3	27.7	28.1	23.1	23.5	20.5	20.2	19.3	18.9	17.8	Diurnal Maximum	
C - Calibration M - Maintenance Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m ³																																																	





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Wapasu - July 2016

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	359	48.64	48.65
6 - 15	274	37.13	85.77
16 - 25	49	6.64	92.41
26 - 80	12	1.63	94.04
> 81.0	0	0.00	94.04

Total Number of Valid Hours: 738

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - μg/m³
Wapasu - July 2016

Concentration Ranges (μg/m ³)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	41	32	19	15	15	9	48	40	7	10	13	13	7	13	18	59	359
6 - 15	13	8	7	12	15	26	31	38	23	15	23	7	10	9	12	25	274
16 - 25	7	3	5	1	0	3	1	2	4	3	2	0	0	2	6	10	49
26 - 80	3	0	0	0	0	0	0	0	0	1	2	0	0	1	1	4	12
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	64	43	31	28	30	38	80	80	34	29	40	20	17	25	37	98	694

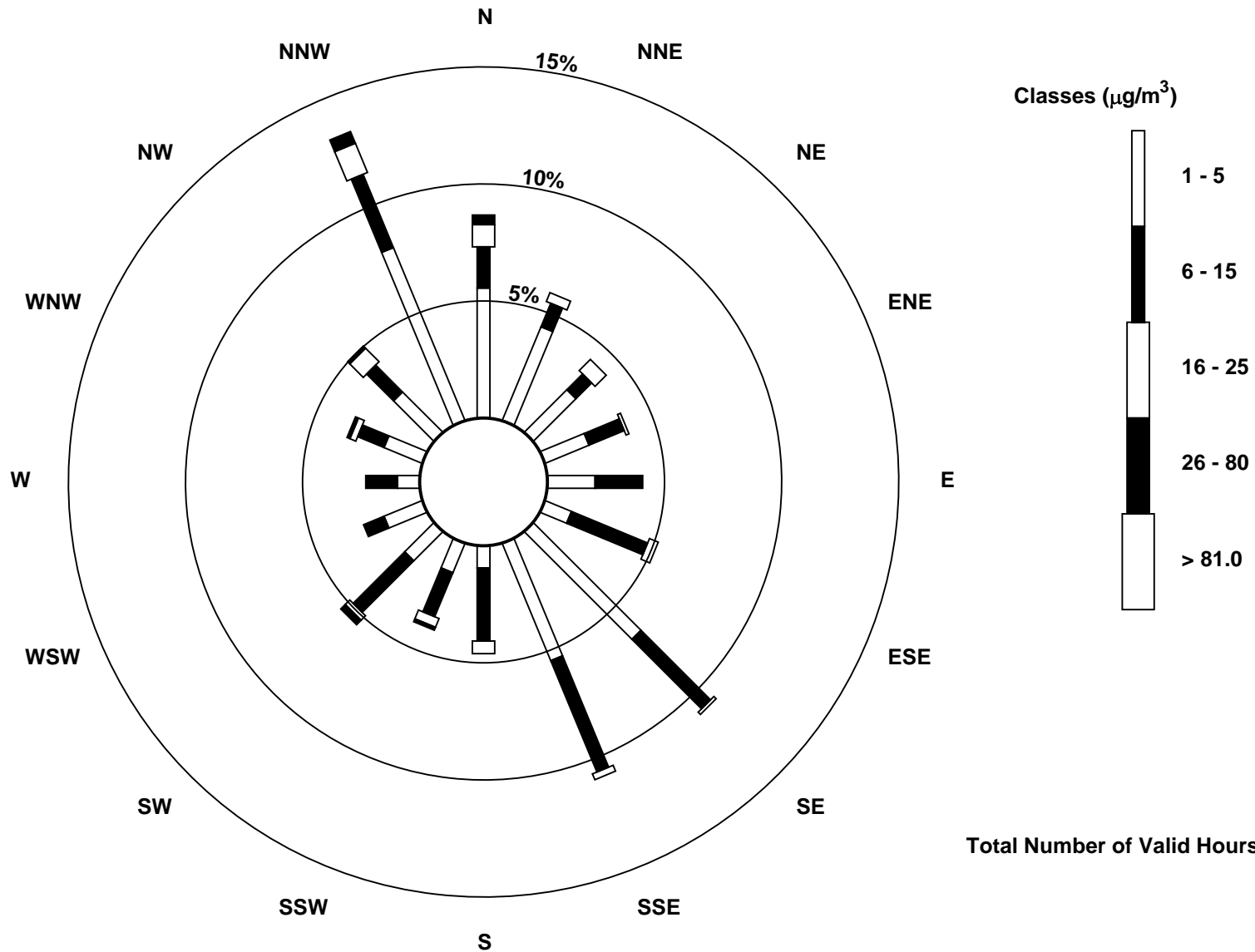
Total Number of Valid Hours: 738

Total Number of Hours: 744



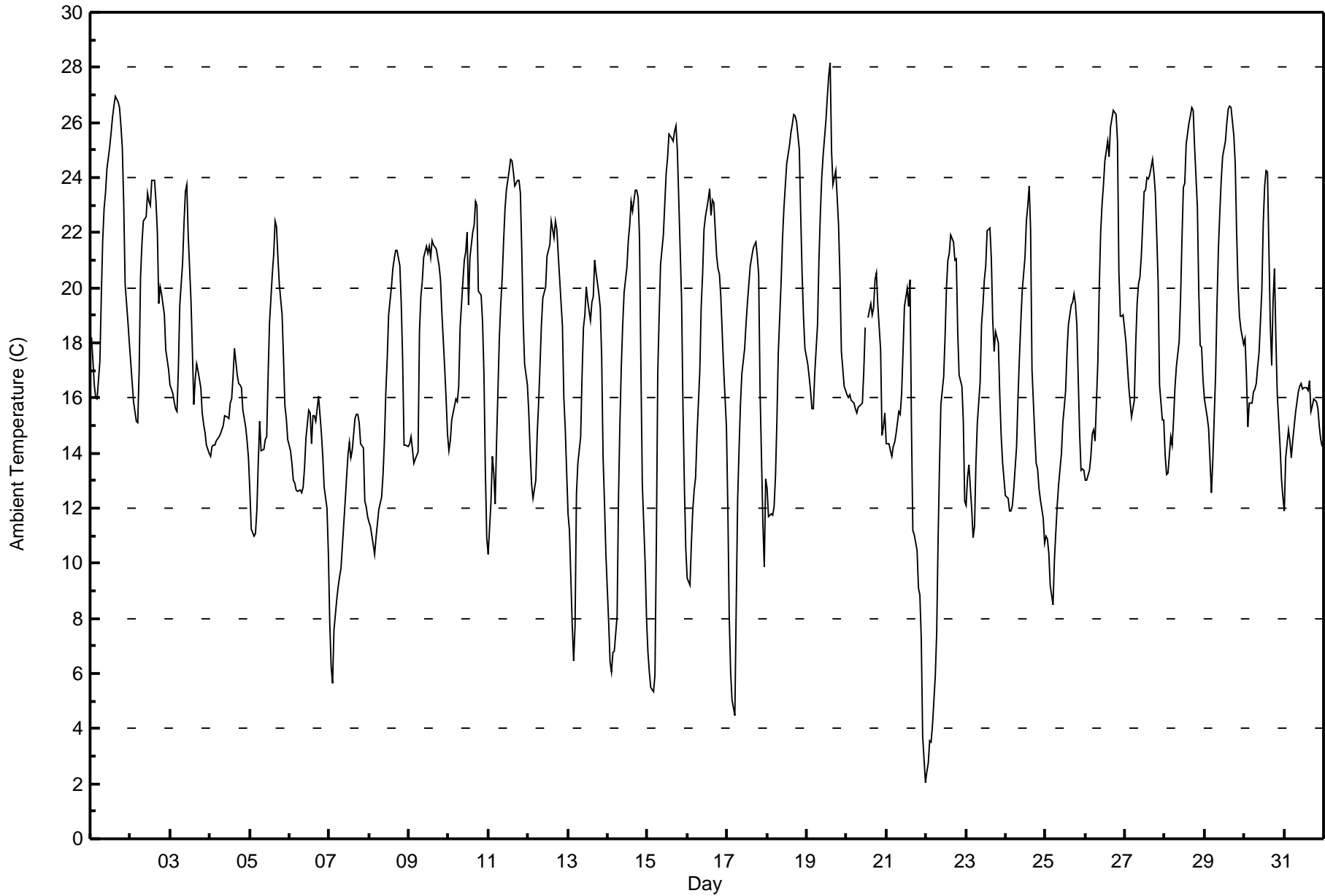
Wood Buffalo Environmental Association
Wind Rose Jul 2016

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Wapasu (AMS 17)





Maximum Value: 28.2 C on Jul 19 15:00																				Maximum Daily Average: 22.0 C on Jul 1					Hours in Service: 744																							
Minimum Value: 2.0 C on Jul 22 00:00																				Minimum Daily Average: 11.8 C on Jul 7					Hours of Data: 743																							
Maximum Diurnal Average: 21.9 C at hour 15																				Minimum Diurnal Average: 12.1 C at hour 4					Hours of Missing Data: 1																							
Monthly Average: 17.23 C																				Percentiles: P ₁ = 4.4 P ₁₀ = 11.4 Q ₁ = 14.1 Median = 16.8 Q ₃ = 21.0 P ₉₀ = 23.7 P ₉₉ = 26.5					Hours of Calibration: 0																							
																									Percent Operational Time: 99.9																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Jul	18.2	17.4	16.5	16.0	16.0	17.3	19.7	21.7	22.9	23.4	24.3	25.1	25.6	26.2	26.6	26.9	26.8	26.5	25.9	25.1	23.1	20.1	18.8	18.0	22.0	26.9																						
2-Jul	17.3	16.6	15.9	15.2	15.1	17.0	20.4	21.6	22.4	22.6	23.4	23.2	23.0	23.9	23.9	23.2	22.0	19.4	20.0	19.8	19.0	17.8	17.4	17.0	19.9	23.9																						
3-Jul	16.5	16.2	15.9	15.6	15.5	17.1	19.4	20.9	22.3	23.5	23.7	21.9	19.5	17.7	15.7	16.7	17.2	17.0	16.4	15.5	15.1	14.7	14.3	14.0	17.6	23.7																						
4-Jul	13.9	14.2	14.3	14.3	14.4	14.6	14.7	14.9	15.0	15.3	15.3	15.2	15.8	16.0	16.8	17.8	16.8	16.5	16.5	16.4	15.6	15.0	14.5	13.8	15.3	17.8																						
5-Jul	12.6	11.2	11.0	11.1	11.9	13.7	15.2	14.1	14.1	14.5	14.6	16.8	18.7	20.5	21.2	22.4	22.2	21.1	20.1	19.0	17.4	15.7	15.2	14.5	16.2	22.4																						
6-Jul	14.1	13.6	13.0	12.9	12.7	12.6	12.6	12.6	12.8	13.5	14.5	15.6	15.5	14.3	15.3	15.4	15.2	16.1	15.4	14.7	13.9	12.8	12.0	10.4	13.8	16.1																						
7-Jul	7.8	6.3	5.7	7.6	8.7	9.2	9.5	9.8	10.6	12.2	13.1	13.9	14.4	13.8	14.1	15.3	15.4	15.4	15.1	14.3	14.2	12.3	12.1	11.7	11.8	15.4																						
8-Jul	11.5	11.4	10.7	10.3	10.9	11.4	12.0	12.4	13.2	14.4	16.2	17.4	19.0	20.0	20.7	21.1	21.3	21.4	20.8	19.4	17.4	14.3	14.3	14.2	15.7	21.4																						
9-Jul	14.3	14.6	14.1	13.6	13.8	14.0	18.4	19.7	20.2	21.1	21.5	21.3	21.5	21.1	21.7	21.6	21.4	21.1	20.8	20.3	19.1	17.1	16.0	14.7	18.5	21.7																						
10-Jul	14.1	14.4	15.2	15.7	16.0	15.9	16.4	18.6	20.3	21.0	21.3	22.0	19.4	21.1	22.0	22.3	23.1	23.0	19.9	19.8	18.7	16.9	13.3	10.9	18.4	23.1																						
11-Jul	10.3	12.2	13.9	13.3	12.2	14.4	18.2	19.4	20.3	21.7	22.9	23.5	24.2	24.6	24.6	24.2	23.7	23.9	23.9	23.5	21.3	18.8	17.2	16.5	19.5	24.6																						
12-Jul	15.5	14.1	12.9	12.3	13.0	14.7	15.8	17.2	18.7	19.6	20.0	21.2	21.4	21.6	22.4	21.8	22.4	22.1	21.2	20.4	18.6	16.0	14.9	13.3	18.0	22.4																						
13-Jul	11.8	11.2	7.7	6.5	7.7	12.5	13.7	14.6	16.8	18.6	19.0	20.0	19.5	18.8	19.5	19.7	21.0	20.5	19.8	19.3	17.4	13.8	12.2	10.3	15.5	21.0																						
14-Jul	7.9	6.4	6.0	6.7	6.8	8.1	12.4	15.1	17.1	18.7	19.8	20.7	21.7	22.3	23.2	22.8	23.5	23.6	23.3	21.7	17.0	12.9	10.0	8.0	15.7	23.6																						
15-Jul	6.8	6.1	5.5	5.3	5.9	10.7	16.9	19.0	20.9	21.9	23.0	24.1	24.7	25.6	25.4	25.3	25.7	25.9	25.0	23.2	19.6	15.7	12.8	10.5	17.7	25.9																						
16-Jul	9.5	9.2	10.7	11.9	12.7	13.1	14.6	17.0	19.3	20.5	22.1	22.6	23.2	23.6	22.6	23.2	23.1	21.1	20.7	20.5	19.7	18.4	17.1	14.9	18.0	23.6																						
17-Jul	12.0	8.0	6.0	5.0	4.5	8.5	12.3	14.1	15.7	16.9	17.8	18.7	19.5	20.1	20.8	21.4	21.6	21.7	21.2	20.5	16.2	11.5	9.9	13.1	14.9	21.7																						
18-Jul	12.7	11.7	11.8	11.8	12.0	13.2	15.1	17.7	20.2	21.8	22.9	23.7	24.5	25.2	25.6	25.9	26.3	26.2	26.0	25.0	22.6	20.5	18.9	17.8	20.0	26.3																						
19-Jul	17.2	16.8	16.3	15.6	15.6	16.9	18.7	21.0	22.7	24.0	24.8	26.1	26.9	27.7	28.2	25.0	23.7	24.2	23.3	22.3	20.4	17.7	16.4	16.3	21.2	28.2																						
20-Jul	16.1	16.0	16.1	15.9	15.8	15.6	15.4	15.6	15.7	15.8	17.0	18.6	M	18.9	19.4	19.0	19.3	20.3	20.5	19.4	17.8	14.7	15.0	15.5	17.1	20.5																						
21-Jul	14.4	14.3	14.1	13.9	14.2	14.4	14.7	15.5	15.4	16.2	17.7	19.3	20.0	19.3	20.3	15.0	11.2	11.0	10.5	9.1	8.9	7.3	3.7	2.0	13.4	20.3																						
22-Jul	2.4	2.8	3.6	3.5	4.1	5.9	7.5	10.8	13.5	15.8	16.8	18.3	20.1	21.0	21.2	21.9	21.6	21.0	21.1	18.4	16.8	16.4	15.1	12.2	13.8	21.9																						
23-Jul	12.1	13.1	13.6	11.9	10.9	11.3	13.6	15.1	16.6	18.6	19.3	20.3	20.8	22.1	22.2	21.1	18.8	17.7	18.4	18.0	16.1	14.6	13.7	13.1	16.4	22.2																						
24-Jul	12.5	12.4	11.9	11.9	12.1	12.7	14.2	16.0	17.5	18.7	19.9	21.1	22.4	23.0	23.7	22.1	17.0	14.6	13.6	13.4	12.7	12.3	11.6	10.8	15.8	23.7																						
25-Jul	11.0	10.9	10.4	9.2	8.5	10.1	11.1	12.1	12.9	14.0	15.1	15.7	16.3	17.7	18.6	19.4	19.5	19.8	19.4	18.7	14.7	13.4	13.4	13.4	14.4	19.8																						
26-Jul	13.0	13.0	13.4	13.9	14.7	14.9	14.5	17.3	20.1	22.0	23.0	23.7	24.6	25.3	24.8	25.8	26.1	26.5	26.3	25.3	20.6	19.0	19.0	19.0	20.2	26.5																						
27-Jul	18.1	17.2	16.4	15.8	15.3	15.9	17.9	19.4	20.1	20.4	21.2	23.5	23.5	24.0	24.0	24.1	24.7	24.1	23.4	21.9	20.2	16.5	15.2	15.2	19.9	24.7																						
28-Jul	13.9	13.2	13.3	14.6	14.3	15.2	16.4	17.1	18.1	19.6	21.8	23.6	23.8	25.2	26.0	26.2	26.6	26.4	25.1	22.9	19.8	17.9	17.8	16.7	19.8	26.6																						
29-Jul	16.0	15.3	14.9	13.7	12.6	13.7	16.9	19.4	21.4	22.7	23.9	24.8	25.3	26.0	26.5	26.6	26.5	25.5	24.5	22.0	20.1	19.0	18.5	17.9	20.6	26.6																						
30-Jul	18.2	16.8	14.9	15.8	15.8	16.2	16.3	16.5	17.1	17.7	19.9	22.4	23.7	24.2	24.2	18.7	17.2	19.5	20.7	18.1	16.1	14.2	13.0	12.4	17.9	24.2																						
31-Jul	11.9	13.8	14.8	14.4	13.8	14.4	15.0	15.4	16.2	16.4	16.5	16.3	16.4	16.4	16.3	16.6	15.5	15.7	16.0	15.9	15.6	14.9	14.5	14.2	15.3	16.6																						
																								13.0	12.6	12.3	12.1	12.2	13.4	15.1	16.5	17.7	18.8	19.8	20.7	21.2	21.5	21.9	21.6	21.2	20.9	20.5	19.5	17.6	15.5	14.4	13.6	Diurnal Average
																								18.2	17.4	16.5	16.0	16.0	17.3	20.4	21.7	22.9	24.0	24.8	26.1	26.9	27.7	28.2	26.9	26.8	26.5	26.3	25.3	23.1	20.5	19.0	19.0	Diurnal Maximum
M - Maintenance																																																





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Wapasu - July 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	45	6.06	6.06
10 - 20	466	62.72	68.78
> 20	232	31.22	100.00

Total Number of Valid Hours: 743

Total Number of Hours: 744



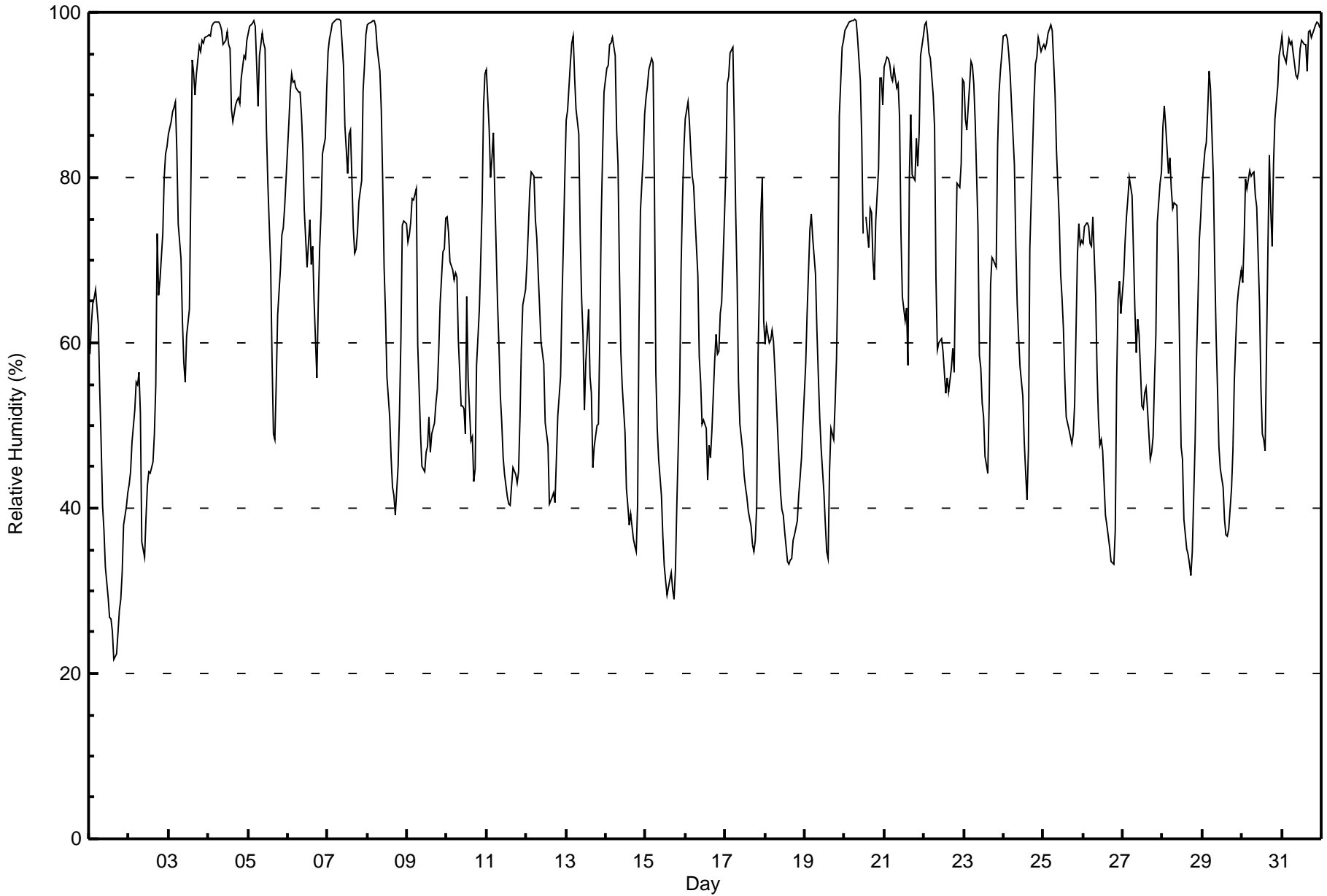
Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

Wapasu - July 2016

Maximum Value: 99 % on Jul 7 08:00																	Maximum Daily Average: 96.0 % on Jul 31										Hours in Service: 744															
Minimum Value: 22 % on Jul 1 16:00																	Minimum Daily Average: 40.7 % on Jul 1										Hours of Data: 743															
Maximum Diurnal Average: 86.6 % at hour 5																	Minimum Diurnal Average: 51.5 % at hour 15										Hours of Missing Data: 1															
Monthly Average: 69.2 %																	Percentiles: P ₁ = 29 P ₁₀ = 41 Q ₁ = 51 Median = 71 Q ₃ = 89 P ₉₀ = 96 P ₉₉ = 99										Hours of Calibration: 0															
																	Percent Operational Time: 99.9																									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																		
1-Jul	59	62	65	65	66	62	54	48	40	37	33	29	27	27	25	22	22	25	28	29	32	38	40	42	40.7	66																
2-Jul	43	44	48	52	55	55	56	52	36	34	39	43	44	44	46	49	55	73	66	68	73	80	83	84	55.0	84																
3-Jul	85	87	88	89	89	83	74	70	63	58	55	61	64	78	94	93	90	92	96	95	97	96	97	97	83.0	97																
4-Jul	97	97	98	99	99	99	99	99	98	96	97	98	96	96	88	87	89	89	90	89	92	95	94	97	94.8	99																
5-Jul	97	98	99	99	98	94	89	95	97	96	96	86	79	69	58	49	48	55	63	69	73	74	76	80	80.8	99																
6-Jul	87	90	92	92	92	91	90	90	88	83	76	69	72	75	70	72	65	56	65	72	76	83	85	91	80.0	92																
7-Jul	95	97	98	99	99	99	99	99	99	94	86	83	80	85	86	74	71	71	73	77	80	90	94	97	88.6	99																
8-Jul	98	99	99	99	99	98	96	93	88	80	69	64	56	51	46	42	41	39	45	52	61	74	75	74	72.4	99																
9-Jul	72	73	75	77	77	79	60	54	49	45	44	47	47	51	47	49	50	53	54	59	65	71	71	75	60.2	79																
10-Jul	75	73	70	69	68	69	68	60	52	52	52	49	66	56	48	49	43	45	57	64	70	77	89	93	63.0	93																
11-Jul	93	86	80	82	85	78	65	60	54	50	46	44	41	40	40	43	45	44	43	44	51	59	64	66	58.6	93																
12-Jul	70	74	79	81	80	75	73	68	64	60	57	50	49	48	41	41	42	41	46	51	56	65	72	80	60.9	81																
13-Jul	87	88	94	96	97	92	88	85	73	65	61	52	58	64	56	54	45	47	50	50	61	75	83	90	71.3	97																
14-Jul	93	94	96	96	97	95	86	82	69	59	55	49	42	40	38	39	36	35	35	41	63	76	83	88	66.1	97																
15-Jul	90	91	93	94	94	79	56	50	46	42	37	33	31	30	31	32	30	29	33	41	54	69	77	83	56.0	94																
16-Jul	87	89	87	83	80	79	75	68	58	55	50	51	50	43	48	46	49	58	61	59	59	64	65	75	64.1	89																
17-Jul	81	91	92	95	96	87	76	68	55	50	47	44	43	41	40	38	36	35	36	40	59	76	80	63	61.2	96																
18-Jul	60	62	60	60	61	60	57	53	45	42	40	39	37	34	33	34	34	36	37	38	41	44	46	50	46.0	62																
19-Jul	57	63	69	74	76	73	68	61	56	51	47	42	38	35	34	44	50	48	53	58	69	87	96	97	60.3	97																
20-Jul	98	98	99	99	99	99	99	99	97	92	85	73	M	75	72	76	76	70	68	75	81	92	92	89	87.0	99																
21-Jul	93	95	94	94	92	92	93	91	91	87	73	66	63	64	57	80	88	80	80	85	81	85	95	97	84.0	97																
22-Jul	98	99	97	95	94	90	86	68	59	60	60	59	56	54	56	54	57	59	56	69	79	79	82	92	73.3	99																
23-Jul	91	87	86	91	94	94	91	87	74	59	57	53	51	46	44	53	67	70	70	69	84	90	93	95	74.8	95																
24-Jul	97	97	97	95	92	89	81	72	65	61	57	54	48	44	41	47	71	83	89	94	95	97	95	96	77.4	97																
25-Jul	96	96	96	97	98	98	94	90	83	75	68	65	62	55	51	50	49	48	49	53	71	74	72	72	73.4	98																
26-Jul	72	74	75	74	72	72	75	66	57	51	48	48	47	39	38	37	35	34	33	37	55	65	67	64	55.6	75																
27-Jul	68	72	75	77	80	78	71	64	59	63	61	52	52	54	54	52	46	47	49	55	61	75	79	81	63.6	81																
28-Jul	86	89	86	81	82	79	76	77	77	70	59	47	46	39	35	34	33	32	35	48	58	65	72	75	61.7	89																
29-Jul	79	83	84	88	93	91	80	70	61	54	47	45	42	39	37	37	37	42	47	55	60	65	66	69	61.3	93																
30-Jul	67	72	80	79	81	80	80	81	78	76	65	55	49	48	47	72	83	76	72	82	87	91	95	96	74.6	96																
31-Jul	97	95	94	95	97	96	97	95	92	92	93	96	97	96	96	93	98	98	97	98	99	99	99	98	96.0	99																
																	82.9	84.4	85.3	86.0	86.6	83.9	79.2	74.6	68.5	64.2	60.0	56.3	54.5	53.6	51.5	52.9	54.3	55.2	57.2	61.8	69.1	76.4	79.9	82.1	Diurnal Average	
																	98	99	99	99	99	99	99	99	99	96	97	98	97	96	96	93	98	98	97	98	99	99	99	98	Diurnal Maximum	
M - Maintenance																																										





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity (RH) - %
Wapasu - July 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	66	8.88	8.88
40 - 60	206	27.73	36.61
60 - 80	206	27.73	64.33
80 - 100	265	35.67	100.00

Total Number of Valid Hours: 743

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Precipitation (PC) - mm

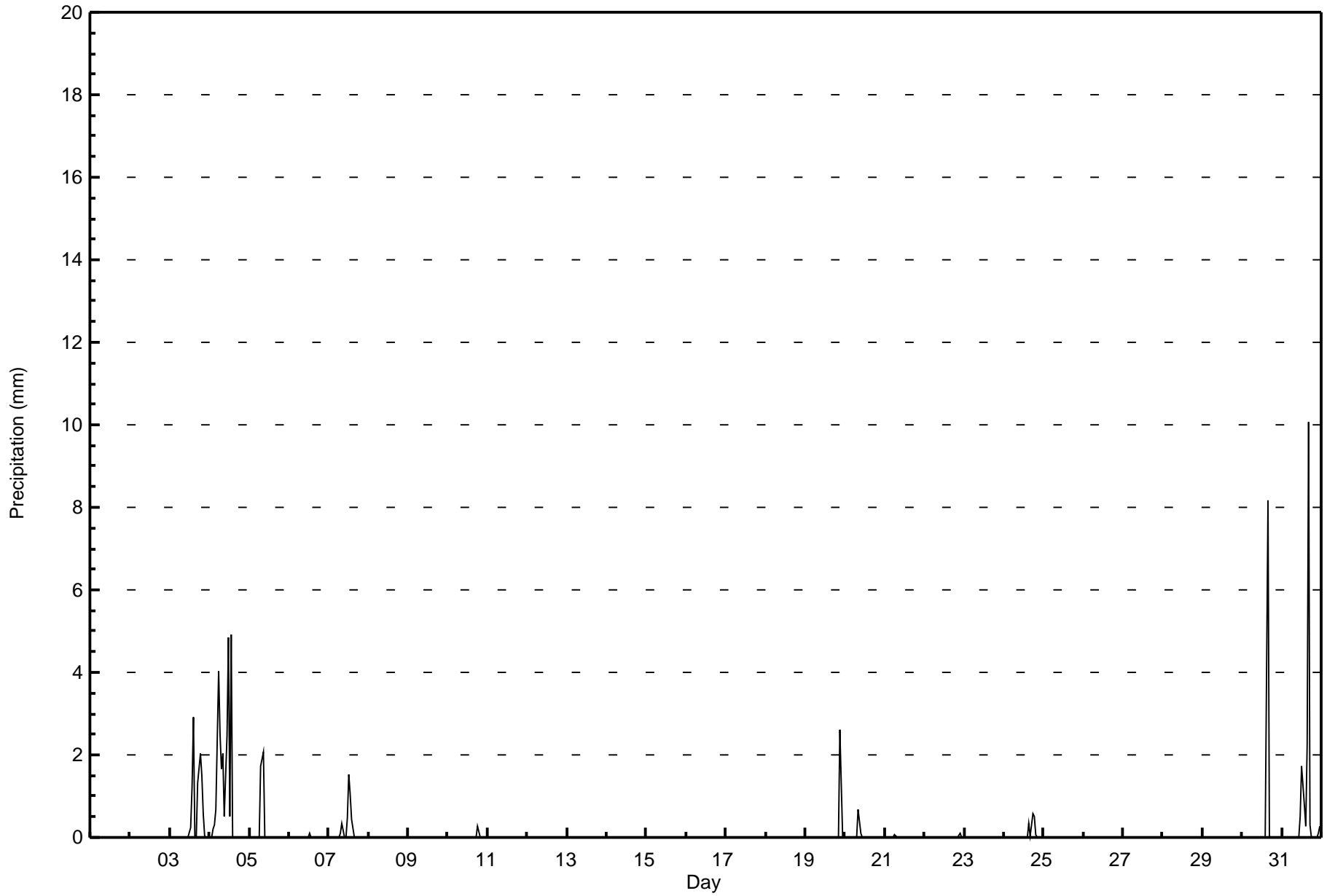
Wapasu - July 2016

Maximum Value: 10.1 mm on Jul 31 17:00		Maximum Daily Total: 24.7 mm on Jul 4		Hours in Service: 744																								
Minimum Value: 0.0 mm on Jul 1 01:00		Minimum Daily Total: 0.0 mm on Jul 1		Hours of Data: 731																								
Maximum Diurnal Total: 10.8 mm at hour 16		Minimum Diurnal Total: 0.0 mm at hour 1		Hours of Missing Data: 13																								
Monthly Total: 72.17 mm		Percentiles: P ₁ = 0.0 P ₁₀ = 0.0 Q ₁ = 0.0 Median = 0.0 Q ₃ = 0.0 P ₉₀ = 0.0 P ₉₉ = 2.3		Hours of Calibration: 0																								
				Percent Operational Time: 98.3																								
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24				
1-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.2	2.9	0.0	0.0	1.3	2.0	1.5	0.6	0.0	0.0	0.0	0.0	9.8	2.9	
4-Jul	0.0	0.0	0.2	0.3	0.7	4.0	2.5	1.7	2.1	0.5	2.5	4.9	0.5	4.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.7	4.9		
5-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	2.1	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	3.8	2.1		
6-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1		
7-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.0	0.0	0.5	1.5	1.1	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.9	1.5		
8-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.3	0.3		
11-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	2.6	2.6	
20-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.1	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	0.8	0.7		
21-Jul	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	DF	DF	DF	DF	DF	0.1	0.1		
22-Jul	DF	DF	DF	DF	DF	DF	DF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	--	0.1		
23-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.6	0.5	0.1	0.0	0.0	0.0	0.0	0.0	1.5	0.6		
25-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.2	8.2	8.2	
31-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	1.7	0.8	0.3	2.3	10.1	0.3	0.0	0.0	0.0	0.0	0.1	0.3	16.3	10.1		
																								Diurnal Average				
																								Diurnal Maximum				
M - Maintenance DF - DAS Failure																												



Wood Buffalo Environmental Association
Hourly Averages

Precipitation (PC) - mm
Wapasu - July 2016





Maximum Speed: 23 km/h on Jul 21 16:00	Maximum Daily Speed Average: 12.0 km/h on Jul 2	Hours in Service: 744
Minimum Speed Value: 0 km/h on Jul 19 22:00	Minimum Daily Speed Average: 0.9 km/h on Jul 28	Hours of Data: 743
Maximum Diurnal Speed Average: 4.4 km/h at hour 16	Minimum Diurnal Speed Average: 1.1 km/h at hour 21	Hours of Missing Data: 1
Monthly Average Velocity: 0.1 km/h 146.0 deg	Percentiles: P ₁ = 1 P ₁₀ = 3 Q ₁ = 5 Median = 7 Q ₃ = 10 P ₉₀ = 13 P ₉₉ = 17	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-Jul	SSE8	SSE7	SE7	SE9	SE7	SE9	SE12	SE13	SE16	SSE15	SE16	SSE14	SSE13	SSE12	SSE13	SE12	SE13	SE13	SE14	SE11	SE9	ESE9	SE10	SE10	SE11.1	SE16
2-Jul	SE11	SE11	SE8	SE8	SE9	SE9	SE8	SSE9	SE15	SE18	SSE16	SSE14	SSE16	SE15	SE16	SSE16	SSE13	SSE8	SE13	SSE13	SE11	SE10	SE12	SE11	SE12.0	SE18
3-Jul	SE11	SE11	SE10	SE10	SE10	SE8	SSE7	SE7	SSE9	SE14	SE14	S11	W7	SE4	ENE4	NE9	ENE7	SE7	ESE5	E6	ESE5	SSE4	SE5	SE5	SE6.4	SE14
4-Jul	SE5	S5	SSE4	S4	SSW4	SW5	SW5	SW4	SW7	W6	W6	WNW3	WNW6	WSW1	ESE11	S10	S9	SE6	SSE6	SSE7	SSE5	SE6	ESE3	SE1	S3.6	ESE11
5-Jul	ENE3	ENE4	ENE4	NE6	ENE3	ENE3	WNW4	N8	NW3	NNE5	NE4	NNE5	N8	N10	N8	N11	N9	N9	NNW7	N5	ENE4	ESE7	ESE11	ESE11	NNE4.2	ESE11
6-Jul	ESE12	ESE10	E9	ESE10	E7	E7	NE5	NE7	NE10	ENE9	ENE12	E10	NNE8	NE13	ENE8	NNE7	ENE11	NE8	NE9	NNE5	N3	NE4	N4	N4	ENE6.8	ENE13
7-Jul	ENE3	NNW0	N3	NNE6	NNE4	NNE4	NNW5	NNW6	NNW7	N5	NNE7	N8	NNE10	NNE8	NE9	N10	NNW10	N10	N8	NNE7	NNW7	N5	N5	N4	N5.9	NNW10
8-Jul	N3	WNW1	NNE1	ESE1	NE2	NNW4	N5	NNE4	N6	N5	NNE8	NNE7	NNW5	NNW6	NW6	NW6	NW8	NNW9	N9	NNE8	NNE5	NE4	ENE5	E6	N4.3	NNW9
9-Jul	E8	ESE8	ESE9	ESE7	E5	ENE4	E5	NNE5	NE7	NNE6	E5	NW6	NNW5	W6	WNW5	NNW5	NE5	E6	E5	ENE3	E4	E4	E5	ENE4	ENE3.5	ESE9
10-Jul	E6	E6	E7	ESE6	ESE8	ESE6	SE8	SE3	SW3	NNW5	NNE6	ENE6	ENE8	SE4	NNW5	ESE7	E6	E6	E7	SE3	SSW3	SW3	ESE2	E3	E3.6	ENE8
11-Jul	ENE4	NE5	NE5	NE5	NE3	NNE3	N4	N7	N10	NNW10	NNW10	NNW10	N11	N10	NNW11	NW13	NW13	NNW11	N13	N10	N8	N5	N6	NNW7	N7.4	N13
12-Jul	N6	NNE6	NNE5	NNE5	N6	N6	N8	NNW10	NNW10	NNW11	NNW14	NNW15	NNW15	NNW15	NNW14	NNW15	NNW17	N14	NNW16	NNW13	NNW13	NNW5	N6	N4	NNW10.1	NNW17
13-Jul	N5	NNW4	NNW3	NNW3	NNW4	NNW7	NNW8	NNW11	NNW13	NNW13	NNW13	N14	NNW15	NNW15	N15	NNE15	NNE13	NE12	NNE10	NNE8	N5	NNE5	NE5	ENE4	N8.3	NNW15
14-Jul	ESE3	E4	SE5	SE6	SE5	SE4	SSE2	WNW2	NW7	NW9	NW10	NW8	NW8	NNW9	NNW14	NNW12	N9	NNW10	NNW9	NNW4	ESE1	ESE3	ESE3	ESE4	NNW3.1	NNW14
15-Jul	ESE4	ESE4	ESE4	ESE4	ESE4	SE5	SSW4	SW8	SW10	WSW9	W8	W8	WSW8	W7	WNW12	WNW14	W10	W9	W8	NW8	SW1	WSW2	SE1	ESE4	WSW3.6	WNW14
16-Jul	SE4	SSE5	SSE5	SSE6	SSE5	SSE5	S5	S6	SW6	WSW6	NW9	WNW8	WNW9	NNW12	WNW6	WNW8	NNW13	NNW15	NNW15	NNW12	NNW11	NNW9	NNW8	NNW6	NW4.1	NNW15
17-Jul	NNE3	E3	N2	SE1	NE3	NNW4	NNW8	NNW9	NNW12	N13	NNW12	NNW12	NNW12	NNW11	NNW9	NW10	NW11	NW11	NW9	N5	NE3	ESE3	ESE6	SE8	NNW5.7	N13
18-Jul	SE7	SE6	SE6	SE6	SSE7	SSE8	SSE8	SSE6	S7	S9	SSW9	SSW9	SSW10	SSW10	SSW12	SW11	SW10	SW11	SW10	S6	S7	S8	SSE7	SSE7	S7.2	SSW12
19-Jul	SSE7	SSE7	S6	SSE8	SSE7	SSE6	SSE8	S9	SSW11	SW12	SW15	SW16	SW15	SW14	WSW13	NW11	NNW4	NW5	NW7	WNW3	NNW8	NNE0	NNE3	N5	SW4.7	SW16
20-Jul	NE4	NNW4	NNW3	NW7	NW6	NW7	NNW7	NW6	NNW6	NNW6	N4	N4	M	NW7	WNW8	WNW9	WNW6	WNW6	WNW6	W5	SW2	SE4	E3	S5	NW3.9	WNW9
21-Jul	SSE6	SSE6	S5	SSE6	S7	S7	S7	SSW10	SW11	WSW6	SW9	WSW13	W10	N8	NW15	NNW23	NNW22	NNW18	NNW17	NNW15	NNW11	NNW4	SE2	SE5	WNW4.1	NNW23
22-Jul	SE6	SE6	SE7	SE7	SE10	SSE13	SSE12	SSE14	SSE12	S14	S13	S15	SSE15	SSW12	SSW11	SSW11	WSW9	SW6	WSW9	NNW5	SSE1	NW6	NE1	SE3	S6.8	SSE15
23-Jul	SSE4	SSE4	S4	E2	ESE2	E1	NNE2	NE6	NNE4	NNW5	N3	NW4	W6	NW5	WNW8	NW10	NNW10	WSW4	S7	SW9	SW8	S5	S5	S6	WSW1.8	WNW10
24-Jul	SSE7	SSE7	SSE7	SSE9	SSE8	SSE7	SSW11	SSW17	SW17	SW15	SW16	SW19	SW18	SW17	SW16	WSW15	NW4	W7	WSW8	SSW4	WSW7	W5	SW7	SSW5	SW9.0	SW19
25-Jul	SSW8	SSW7	SSW7	S4	S3	SW5	WSW6	W8	WNW9	WNW10	NW9	NNW7	N7	NNW8	NNW8	WNW5	NNW6	N6	NNE5	NNE4	ENE5	E7	ESE9	ESE10	NW1.8	WNW10
26-Jul	SE11	SE11	SE11	SE11	SE11	SE8	SE8	SE10	SSE10	S10	S11	SSW13	SSW13	SSW13	WSW10	SW9	WSW9	SW8	WSW8	SW5	SSE4	SE8	SSE9	SSE11	S7.5	SSW13
27-Jul	SSE10	SSE9	SSE8	SSE8	SSE7	SSE5	SSE4	WSW3	NNW6	NW9	NW10	NNW10	N11	NNW12	NNW12	NNW11	NNW8	N6	N5	NNE5	NE5	ENE4	ENE4	E4	N2.4	NNW12
28-Jul	E4	E4	SE4	S3	SSE3	SE5	S4	SSW5	S4	SSW4	SSW2	NNW4	WSW2	NNW5	NNW8	N7	NE5	NNE5	NNW5	NE3	E4	SSE5	SSE7	S6	ESE0.9	NNW8
29-Jul	SSE6	S6	SSE5	SSE4	SSE5	SSE5	S7	SSW7	SSW7	SW9	SSW8	SSW10	SSW11	SW12	SSW11	SW10	SW8	W6	W3	ESE9	ESE11	SE11	SE9	SE9	S6.0	SW12
30-Jul	S3	NE3	ESE5	SE7	SSE7	SW6	SW10	SSW7	S6	SSE2	SSW3	S6	SSW9	SSW7	SW6	W3	N5	NE6	NE5	NNE4	NNE5	ENE4	ENE4	ENE3	SSE1.9	SW10
31-Jul	NE4	NNE6	NNE6	NNE4	N2	N5	N8	N8	NNW9	N8	WNW3	WNW4	W4	WSW7	W6	WNW4	WNW6	NW5	NW6	WNW4	WSW6	W8	WSW5	WSW7	NW3.7	NNW9

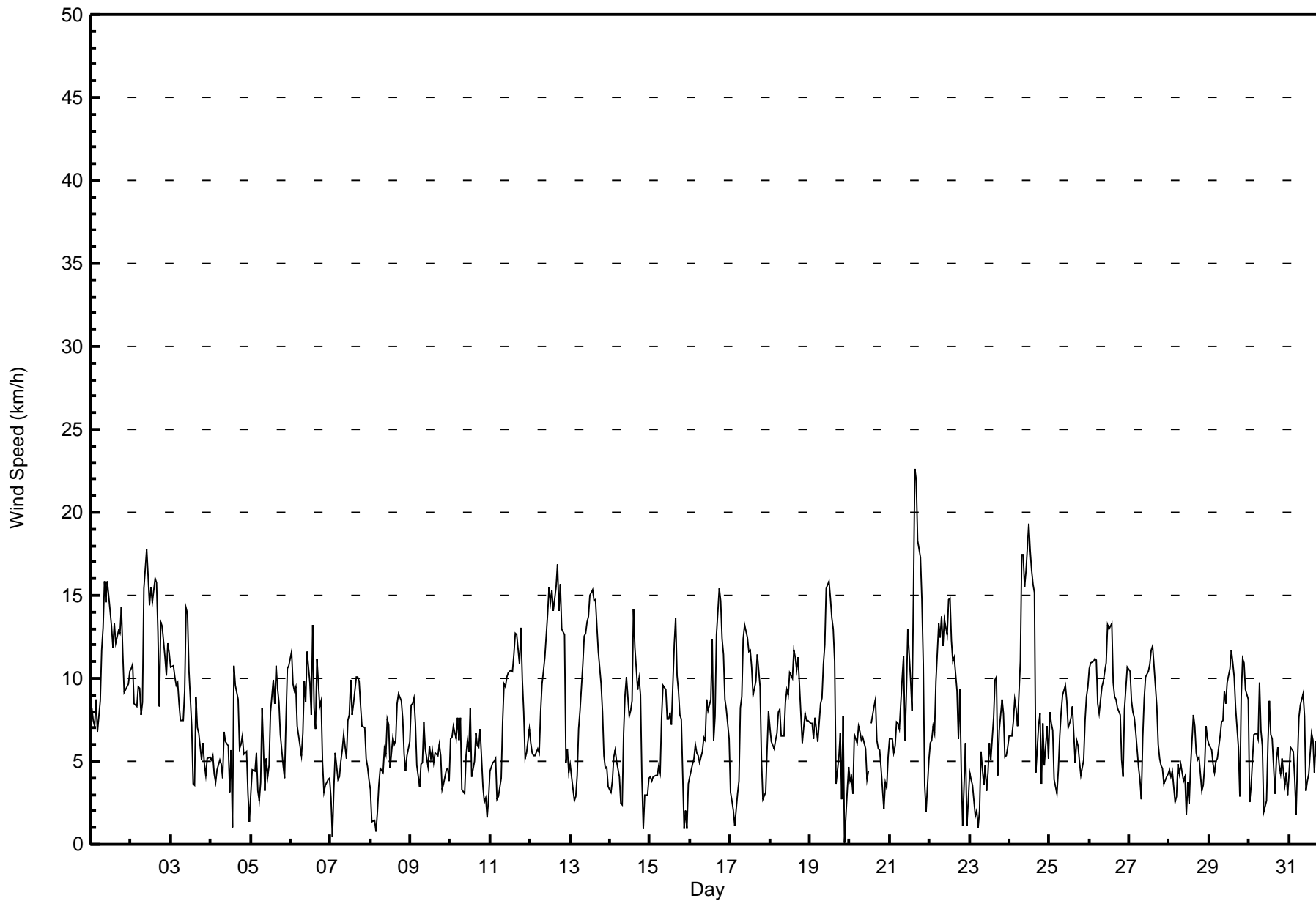
ESE4.2 SE3.9 SE3.8 SE3.9 SE3.7 SE2.8 SSE2.0 SSW1.3 WSW1.4 W1.5 W1.5 W2.5 W3.1 WNW3.0 WNW3.6 NW4.4 NNW4.2 NNW3.4 NNW3.2 N1.9 NE1.1 ESE1.8 ESE2.7 SE3.2	Diurnal Average
ESE12 SE11 SE11 SE11 SE11 SSE13 SSE12 SSW17 SW17 SE18 SW16 SW19 SW18 SW17 SE16 NNW23 NNW22 NNW18 NNW17 NNW15 NNW13 SE11 SE12 SE11	Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed (WS) - km/h
Wapasu - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Wapasu - July 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	255	34.32	34.32
6 - 11	382	51.41	85.73
12 - 19	104	14.00	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: 743

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Wapasu - July 2016**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	27	26	20	21	16	19	20	22	14	9	9	6	5	10	7	24	255
6 - 11	34	17	10	6	15	20	50	43	23	21	22	15	15	16	29	46	382
12 - 19	5	2	1	2	0	1	16	16	3	6	13	3	0	2	3	31	104
20 - 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	66	45	31	29	31	40	86	81	40	36	44	24	20	28	39	103	743

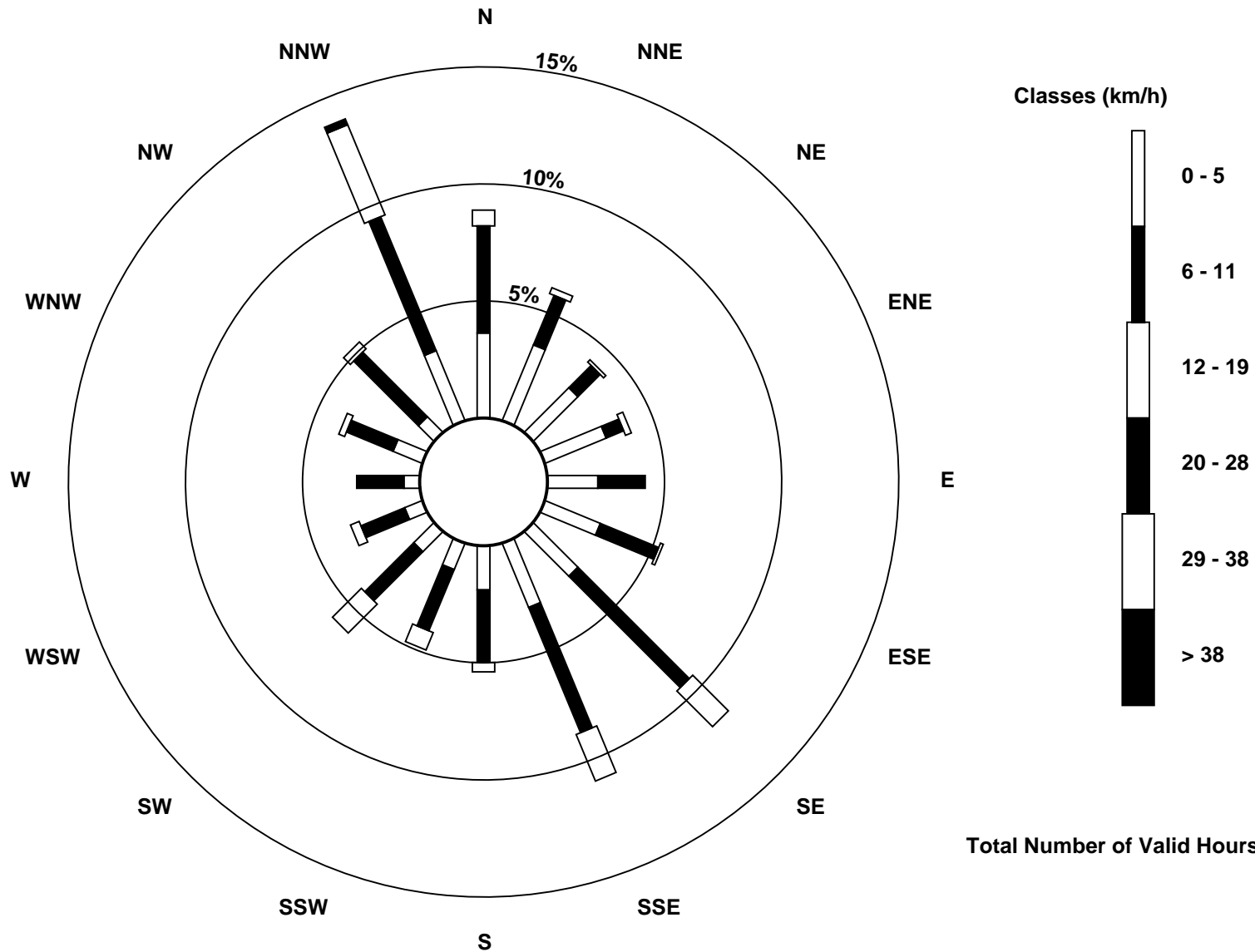
Total Number of Valid Hours: 743

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

Wind Speed (WS) - km/h
Wapasu (AMS 17)





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Wapasu - July 2016

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



Wood Buffalo Environmental Association
Summary of Hour Averages

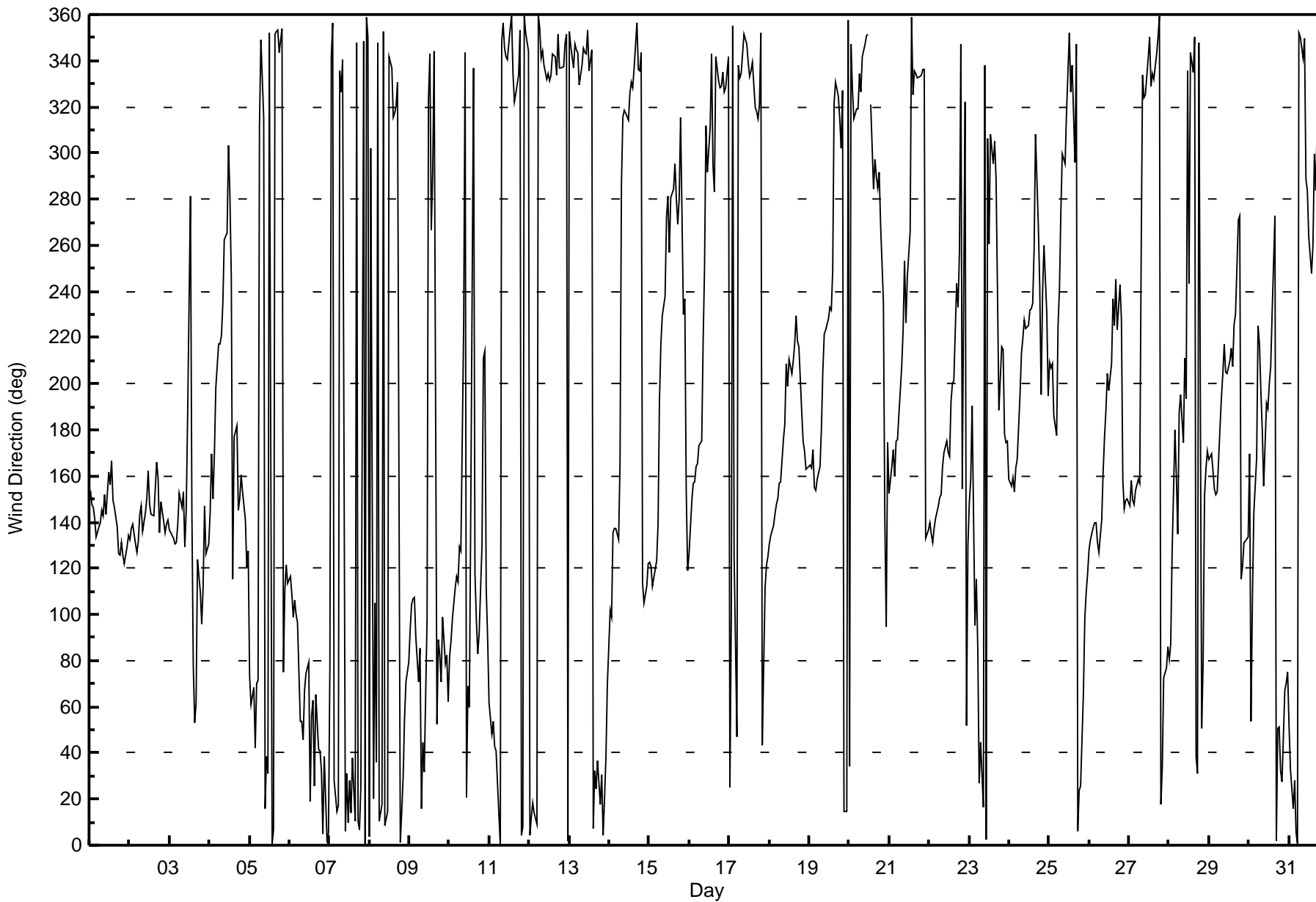
Wind Direction (WD) - deg
Wapasu - July 2016

Direction of Maximum Speed: 336 deg on Jul 21 16:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 143.8 deg on Jul 2	Hours of Data: 743
Direction of Minimum Speed: 15 deg on Jul 19 22:00	Direction of Minimum Daily Speed Average: 0.9 deg on Jul 28
Direction of Minimum Speed: 15 deg on Jul 19 22:00	Hours of Missing Data: 1
Monthly Average Direction: 299.6 deg	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-Jul	154	147	146	142	133	138	140	145	143	152	143	161	156	167	150	146	138	126	126	131	125	122	129	134	142.0
2-Jul	133	137	139	130	127	132	143	147	136	144	150	162	148	144	143	154	166	159	135	149	140	135	139	141	143.8
3-Jul	137	134	133	131	131	139	153	146	153	130	145	187	281	146	78	53	62	124	110	96	112	147	126	130	131.9
4-Jul	145	170	150	170	198	217	217	221	235	263	265	303	282	246	115	177	182	145	150	160	153	141	120	127	181.3
5-Jul	73	61	68	42	70	71	312	349	316	16	39	31	352	0	7	352	353	354	343	354	75	110	121	113	25.8
6-Jul	117	109	99	106	100	96	54	54	46	67	75	80	19	56	63	25	65	42	41	32	5	38	1	6	65.2
7-Jul	77	342	356	28	15	17	336	327	340	6	31	10	28	14	38	10	348	10	7	26	348	0	359	350	8.4
8-Jul	3	302	20	105	36	348	10	18	353	9	12	15	342	337	315	318	320	331	1	14	29	55	71	79	1.8
9-Jul	94	104	107	108	90	71	86	16	44	32	98	324	343	267	292	344	52	89	82	71	99	79	83	62	66.9
10-Jul	82	88	98	112	116	114	130	128	226	344	20	69	60	143	337	118	97	83	92	130	211	214	111	90	96.3
11-Jul	62	48	54	43	41	27	0	349	356	346	341	340	354	359	335	322	326	334	353	4	8	360	352	344	353.2
12-Jul	5	12	18	14	9	360	354	341	344	338	332	334	332	334	343	342	334	351	337	337	337	348	351	2	343.5
13-Jul	353	346	337	347	345	344	330	338	345	344	343	353	336	345	8	32	24	36	18	30	4	20	38	70	0.1
14-Jul	102	99	136	137	138	133	166	286	316	318	318	314	326	331	328	337	356	336	335	343	113	105	112	122	340.7
15-Jul	123	121	112	120	123	139	193	217	229	238	272	281	257	280	284	295	280	269	280	315	230	237	154	119	256.1
16-Jul	127	149	157	158	164	165	173	175	218	250	312	291	311	343	295	283	342	331	328	329	335	327	328	342	311.0
17-Jul	25	99	355	126	47	338	332	334	343	351	347	339	333	336	339	320	318	315	321	352	43	112	122	125	343.1
18-Jul	130	134	139	143	147	150	157	157	176	183	208	199	211	204	210	217	229	219	216	188	175	171	163	164	184.7
19-Jul	165	163	171	155	154	158	164	181	206	221	224	228	233	232	249	322	331	324	315	302	327	15	14	357	222.9
20-Jul	34	347	328	315	319	319	334	326	342	347	351	352	M	321	284	297	290	285	292	269	235	142	94	175	315.5
21-Jul	153	164	171	160	175	176	187	207	223	253	226	246	266	359	325	336	334	333	333	334	336	336	133	137	293.0
22-Jul	140	135	131	137	141	147	151	152	164	170	175	170	168	192	200	202	244	233	257	347	155	322	52	130	172.3
23-Jul	148	159	190	95	115	86	27	45	16	338	2	307	260	308	295	305	289	240	188	216	215	178	175	175	246.9
24-Jul	159	155	159	153	164	167	195	213	220	228	224	225	232	233	235	258	308	269	242	195	239	260	230	194	218.9
25-Jul	209	207	209	186	178	225	241	275	300	295	317	334	352	327	338	296	347	6	24	26	66	98	110	118	308.1
26-Jul	128	132	138	140	140	131	127	141	162	177	189	204	197	209	237	225	245	223	243	227	158	146	150	150	173.5
27-Jul	147	158	149	148	153	159	157	255	334	324	326	341	350	329	334	332	343	350	359	18	34	72	77	86	357.7
28-Jul	80	87	127	180	160	135	187	195	175	211	194	335	243	343	335	350	38	31	348	50	79	152	163	171	113.4
29-Jul	167	170	162	154	152	153	181	194	205	217	205	205	210	215	208	226	230	271	273	115	121	131	132	133	183.3
30-Jul	169	54	107	144	168	225	217	197	180	156	192	189	200	207	231	273	2	51	51	33	28	67	70	75	167.6
31-Jul	52	33	16	28	5	1	352	350	341	350	289	284	263	247	260	299	284	315	322	285	256	269	246	246	312.1

123.5	126.1	127.9	127.6	132.8	137.9	165.4	201.0	239.6	268.6	265.7	268.3	279.1	294.4	299.4	312.7	328.0	337.2	340.4	9.8	40.1	111.7	115.7	123.8
Diurnal Average																							

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





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
Wapasu - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 93 deg on Jul 19 22:00 Minimum Value: 6 deg on Jul 14 03:00 Percentiles: P ₁ = 9 P ₁₀ = 16 Q ₁ = 22 Median = 28 Q ₃ = 36 P ₉₀ = 51 P ₉₉ = 81																		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-Jul	22	17	16	16	14	15	19	24	26	31	29	34	37	39	31	41	27	31	24	20	16	14	13	15	41
2-Jul	14	15	16	14	15	17	22	27	24	27	30	32	28	28	27	27	31	26	22	23	20	17	17	17	32
3-Jul	17	16	17	17	16	19	26	31	32	25	29	41	43	51	44	24	27	23	24	27	30	37	23	19	51
4-Jul	20	27	23	26	23	20	22	26	26	30	28	58	29	92	22	41	29	29	24	26	26	28	50	59	92
5-Jul	27	12	12	16	23	28	77	31	54	33	30	44	35	38	35	33	30	29	27	30	47	17	19	18	77
6-Jul	20	21	23	23	30	27	39	28	28	30	30	34	40	31	40	40	26	30	23	30	28	20	35	22	40
7-Jul	27	89	21	20	35	35	25	20	24	40	36	38	37	35	32	32	27	33	31	28	30	28	31	36	89
8-Jul	34	46	61	70	65	39	36	36	30	46	43	48	78	57	62	64	41	32	34	29	22	18	16	16	78
9-Jul	17	18	17	15	44	30	36	56	46	62	73	65	59	44	61	43	32	24	21	25	22	17	15	13	73
10-Jul	15	16	13	17	17	17	15	68	78	60	42	55	23	45	40	41	44	42	32	38	62	41	49	31	78
11-Jul	14	22	18	14	37	43	29	28	29	31	38	35	41	40	30	23	22	25	31	35	34	23	26	26	43
12-Jul	26	22	22	21	25	27	26	27	29	31	25	31	25	25	30	27	26	30	25	22	20	29	28	18	31
13-Jul	24	24	30	32	29	26	22	23	27	31	28	30	26	27	34	28	33	31	30	24	27	21	24	33	34
14-Jul	22	22	6	8	6	7	31	62	30	31	33	58	50	36	27	31	43	34	25	32	81	21	9	10	81
15-Jul	13	14	14	10	12	11	31	18	25	29	47	46	48	65	42	25	30	33	29	24	78	51	84	17	84
16-Jul	20	12	10	12	14	18	24	28	28	31	35	31	37	28	41	34	32	25	20	19	25	15	17	26	41
17-Jul	40	39	62	82	41	23	18	26	26	33	35	34	43	42	56	44	28	26	24	32	23	11	11	16	82
18-Jul	11	9	11	13	15	20	24	30	32	33	32	35	32	33	30	30	27	25	21	29	26	25	18	20	35
19-Jul	22	21	26	20	18	25	27	31	28	25	24	27	29	29	32	45	64	45	41	74	27	93	60	33	93
20-Jul	28	30	67	19	23	21	19	22	29	27	56	55	M	33	30	27	36	43	39	30	62	18	52	22	67
21-Jul	19	21	23	24	28	28	30	26	21	31	30	28	45	41	23	22	22	19	19	19	20	18	47	9	47
22-Jul	8	14	13	16	18	22	23	25	31	32	31	30	32	30	28	29	37	28	39	70	74	24	69	36	74
23-Jul	13	23	24	64	40	44	45	27	56	73	88	76	61	71	40	35	30	52	28	24	19	27	24	29	88
24-Jul	20	20	23	21	32	32	30	20	19	24	19	20	27	26	24	37	62	36	48	46	22	30	18	24	62
25-Jul	18	16	15	36	35	23	27	37	29	31	37	47	45	51	42	72	46	45	40	35	18	16	18	16	72
26-Jul	16	16	18	19	17	21	19	23	32	34	33	30	33	31	26	33	25	33	30	34	21	17	21	22	34
27-Jul	21	30	19	16	17	33	29	40	29	27	23	34	33	24	27	28	35	33	32	24	16	16	14	13	40
28-Jul	11	24	8	55	25	15	41	29	32	39	80	82	81	81	58	50	73	56	32	21	11	32	27	27	82
29-Jul	26	22	21	15	11	18	33	28	35	29	40	35	34	34	34	40	37	46	79	17	18	16	15	14	79
30-Jul	90	57	33	24	27	44	24	28	30	71	88	64	41	55	36	84	52	30	27	32	21	16	24	38	90
31-Jul	19	20	23	36	63	30	27	25	25	53	41	29	33	29	39	48	40	23	17	33	27	27	26	26	63
90 89 67 82 65 44 77 68 78 73 88 82 81 92 62 84 73 56 79 74 81 93 84 59																									
Diurnal Maximum																									
M - Maintenance																									



Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	July 19, 2016	Last Calibration	June 22, 2016
Station Name	Wapasu	Station Number	AMS 17
Reason:	Routine		
Start Time (MST)	9:30	End Time (MST)	14:15
Gas Cert Reference	SA130010A	Station temp.	22 Deg C
Cal Gas Concentration	47.8 ppm	Cal Gas Exp Date	12/12/2016
Calibrator Make/Model	API T700	Serial Number	493
ZAG Make/Model	API 701	Serial Number	4427
DACS make/model	Campbell Scientific CR3000	DACS serial No.	6894

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-653	-654
Analyzer IP address	192.168.1.43		Lamp voltage	990	979
Calculated slope	1.002785	0.996473	Chamber temp	45.0	44.9
Calculated intercept	1.691844	2.241474	Pressure	685.3	684.7
Analyzer Background	8.9	9.0	Flow	0.450	0.450
Analyzer Coefficient	1.008	1.022	Intensity	92	91

Analyzer make Thermo 43i Analyzer serial # 1218153459

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.6	----
as found span	5000	60.4	577.4	565.6	1.021
calibrator zero	5000	0.0	0.0	-0.2	----
high point	5000	60.4	577.4	578.1	0.999
second point	5000	30.2	288.7	286.9	1.006
third point	5000	15.2	145.3	141.3	1.029
as left zero	5000	0.0	0.0	-0.1	----
as left span	5000	60.4	577.4	579.9	0.996
Average Correction Factor					1.011

Corrected As found 566.1 Previous response 574.1 % change 1.4%

Notes:

Inlet filter changed after as founds. Span adjusted.

Calibration Performed By: Devin Russell



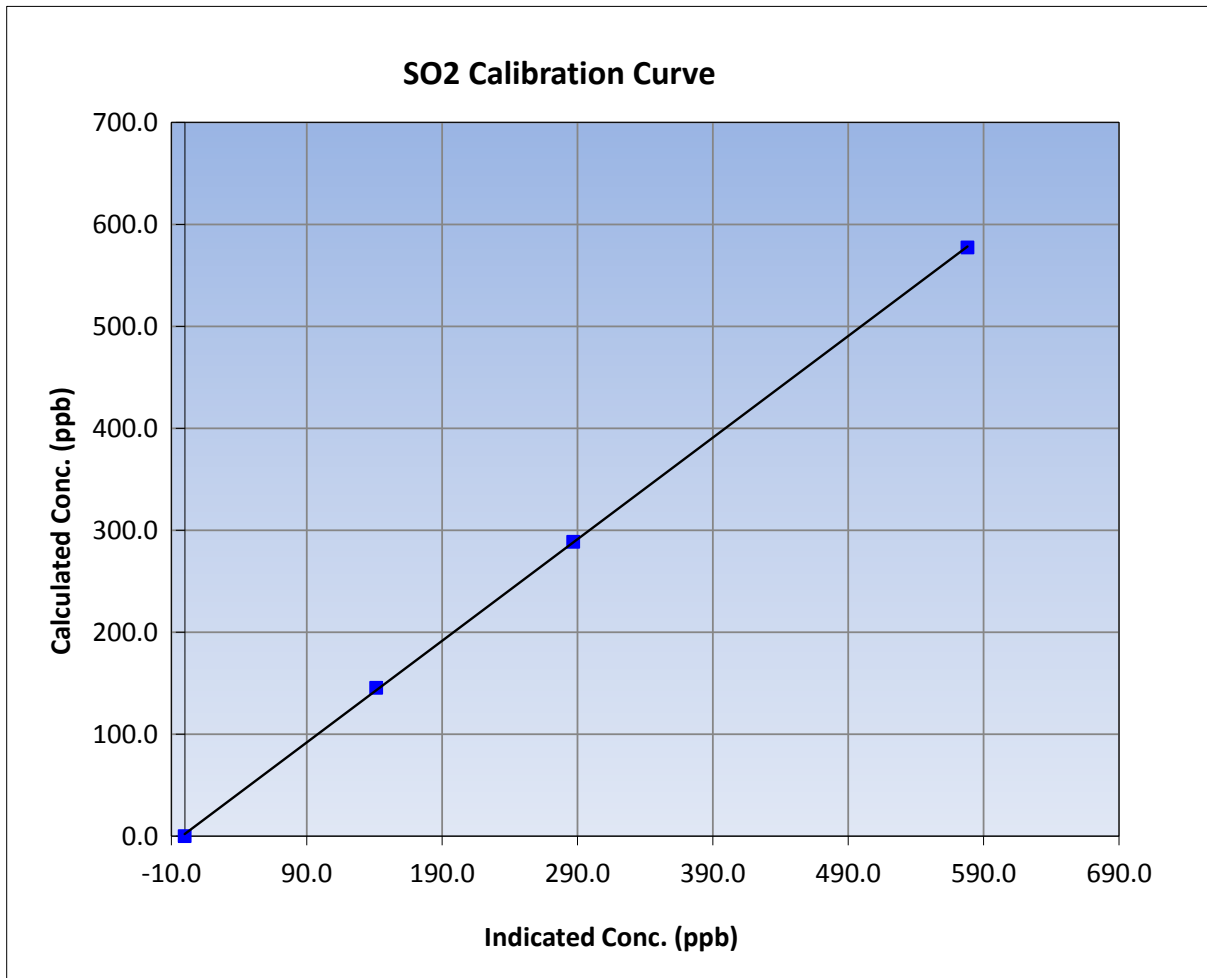
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	July 19, 2016	Previous Calibration	June 22, 2016
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	9:30	End Time (MST)	14:15
Analyzer make	Thermo 43i	Analyzer serial #	1218153459

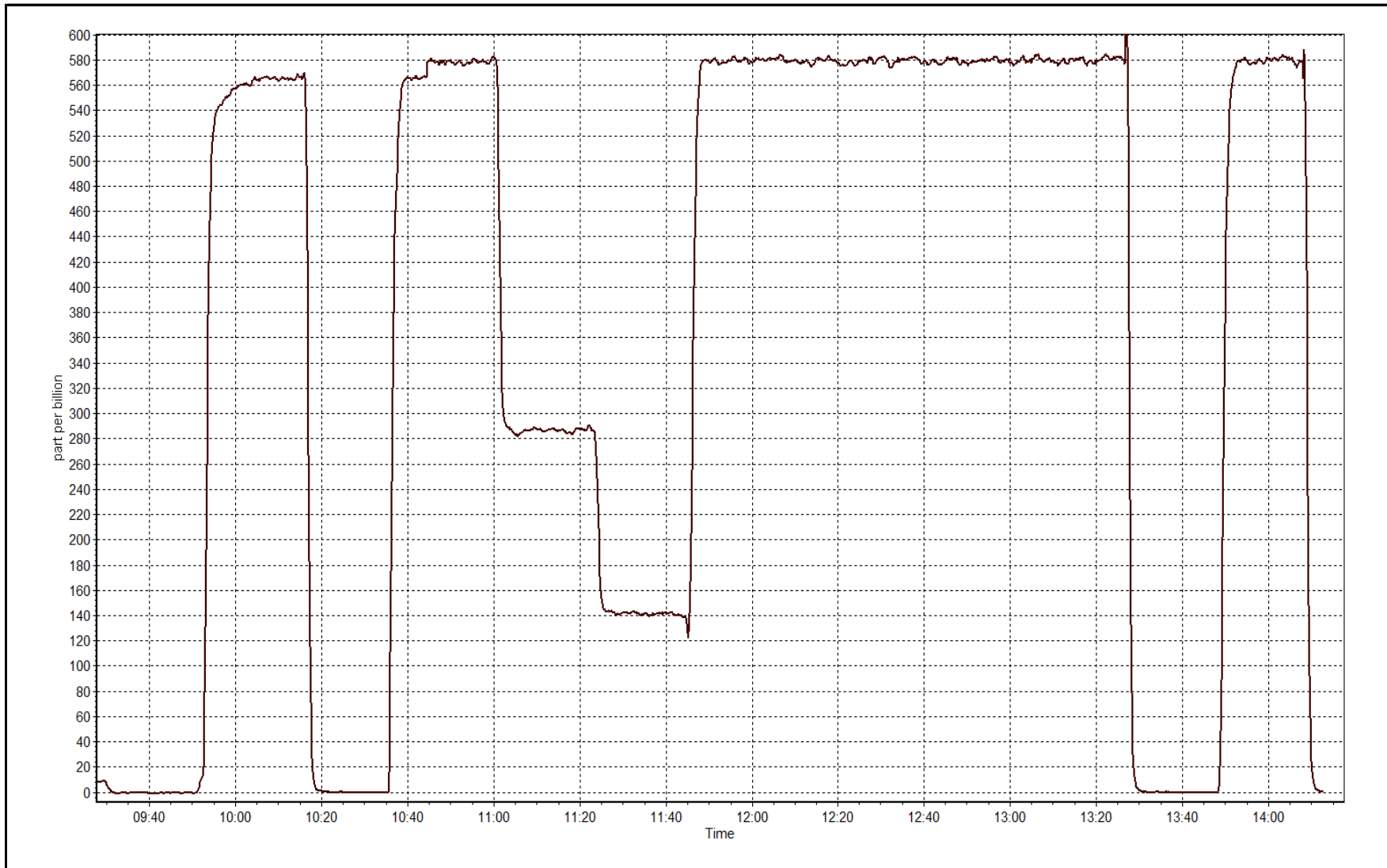
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	----	Correlation Coefficient	0.999942
577.4	578.1	0.9989		
288.7	286.9	1.0064	Slope	0.996473
145.3	141.3	1.0287		
			Intercept	2.241474



SO2 Calibration Plot

Date: July 19, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	July 27, 2016	Last Calibration	June 23, 2016
Station Name	Wapasu	Station Number	AMS 17
Reason:	Routine		
Start Time (MST)	8:55	End Time (MST)	12:40
Gas Cert Reference	CC107167	Station temp.	21 Deg C
Cal Gas Concentration	5.1 ppm	Cal Gas Exp Date	09/09/2017
Calibrator Make/Model	API T700	Serial Number	997
ZAG air Make/Model	API 701	Serial Number	4227
DACS make/model	Campbell Scientific CR3000	Serial Number	2633
SO2 gas concentration	47.8 ppm	SO2 gas cert/exp	SA130010A 12-Dec-16

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-651	-650
Analyzer IP address	192.168.1.45		Lamp voltage	791	788
Calculated slope	1.003881	0.993133	Chamber temp	45	45
Calculated intercept	-0.036098	0.341898	Pressure	551.0	559.1
Analyzer Background	14.7	14.6	Flow	0.994	0.988
Analyzer Coefficient	1.225	1.225	Intensity	112	112
			Converter temp.	339	338

Analyzer make/model	Thermo 450i	Analyzer serial #	1218153583
Converter make/model	na	Converter serial #	na

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.3	----
as found span	5000	78.4	80.0	79.8	1.002
SO2 scrubber check	5000	20.9	199.8	1.2	----
calibrator zero	5000	0.0	0.0	-0.2	----
high point	5000	78.4	80.0	80.3	0.996
second point	5000	39.3	40.1	39.8	1.007
third point	5000	19.7	20.1	19.8	1.015
as left zero	5000	0.0	0.0	0.1	----
as left span	5000	78.5	80.1	80.2	0.998
Average Correction Factor					1.006

Corrected As found	80.1	Previous response	79.7	% change	-0.5%
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Notes:

Inlet filter changed after as founds. Scrubber check completed after as founds.

Calibration Performed By: Devin Russell



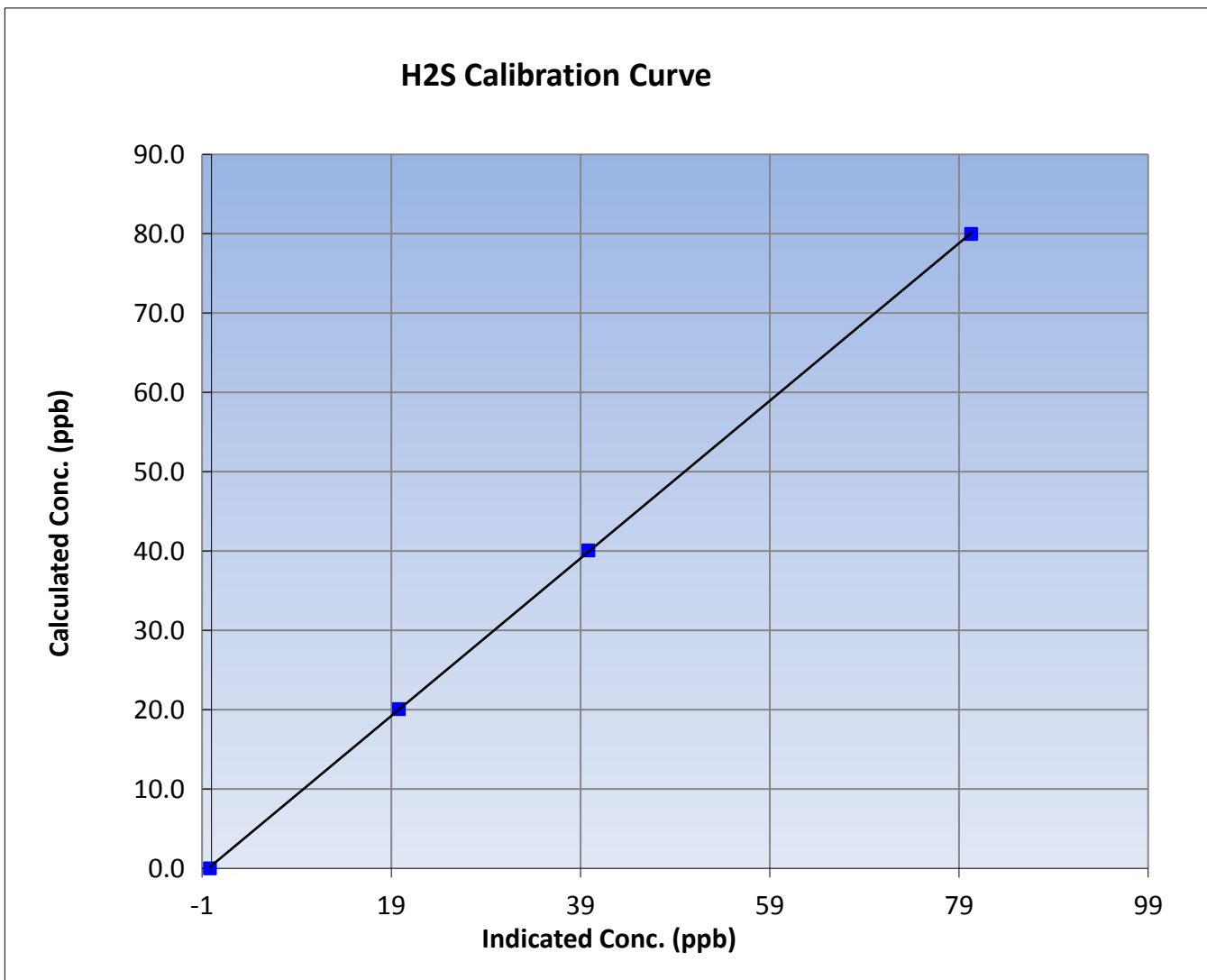
Wood Buffalo Environmental Association H2S Calibration Report

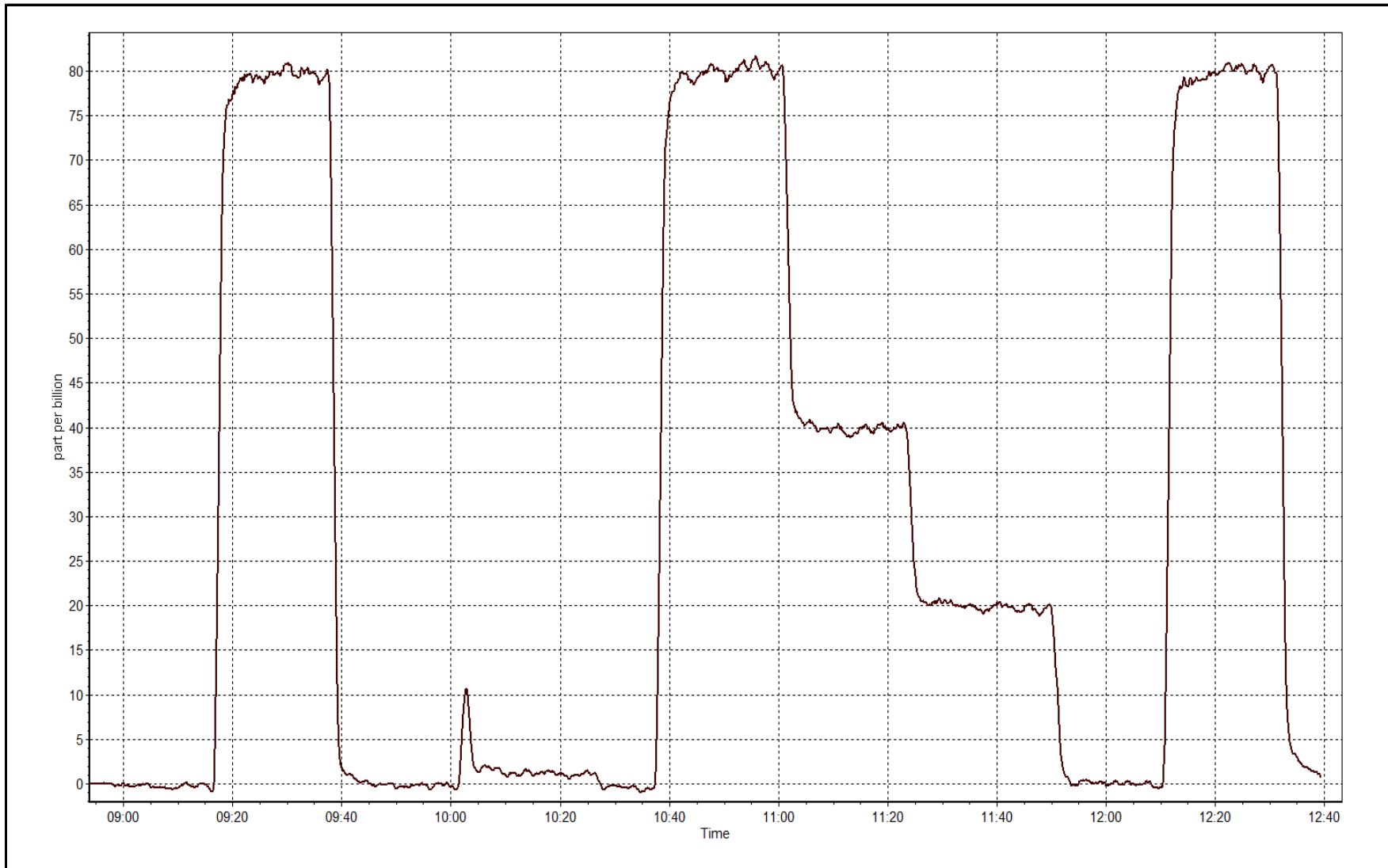
Station Information

Calibration Date	July 27, 2016	Previous Calibration	June 23, 2016
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	8:55	End Time (MST)	12:40
Analyzer make	Thermo 450i	Analyzer serial #	1218153583

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	----	Correlation Coefficient	0.999973
80.0	80.3	0.9959		
40.1	39.8	1.0067	Slope	0.993133
20.1	19.8	1.0154		
			Intercept	0.341898







Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	July 19, 2016	Last Calibration	June 22, 2016
Station Name	Wapasu	Station Number	AMS 17
Reason:	Routine		
Start Time (MST)	9:30	End Time (MST)	14:15
Gas Cert Reference	SA130010A	Cal Gas Expiry Date	12/12/2016
CH4 Cal Gas Conc.	512 ppm	CH4 Equiv Conc.	1092.3 ppm
C3H8 Cal Gas Conc.	211 ppm	Station temp.	22 Deg C
Calibrator Make/Model	API T700	Serial Number	493
ZAG make/model	Teledyne API 701	Serial Number	4427
DACS make/model	Campbell Scientific CR3000	Serial Number	6894

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 50 ppm		Sample Pressure	8.5	8.5
Analyzer IP address	192.168.1.51		Air or Bypass Press	41.0	41.0
Calculated slope	1.001953	1.002120	Fuel Pressure	24.8	24.8
Calculated intercept	-0.033324	-0.019259	Analyzer Coeff	4.3	4.3
			Analyzer BKG	2.920	2.940

Analyzer make Thermo 51i-LT Analyzer serial # 1218153352

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	0.01	----
as found span	5000	60.4	13.19	13.16	1.003
calibrator zero	5000	0.0	0.00	0.04	----
high point	5000	60.4	13.19	13.20	1.000
second point	5000	30.2	6.60	6.58	1.003
third point	5000	15.2	3.32	3.32	1.000
as left zero	5000	0.0	0.00	-0.03	----
as left span	5000	60.4	13.19	13.16	1.003
Average Correction Factor					1.001

Corrected As found 13.15 Previous response 13.20 % change 0.4%

Notes:

Inlet filter changed after as founds. Second zero and span point completed to document any change. Span adjusted slightly.

Calibration Performed By:

Devin Russell



Wood Buffalo Environmental Association THC Calibration Report

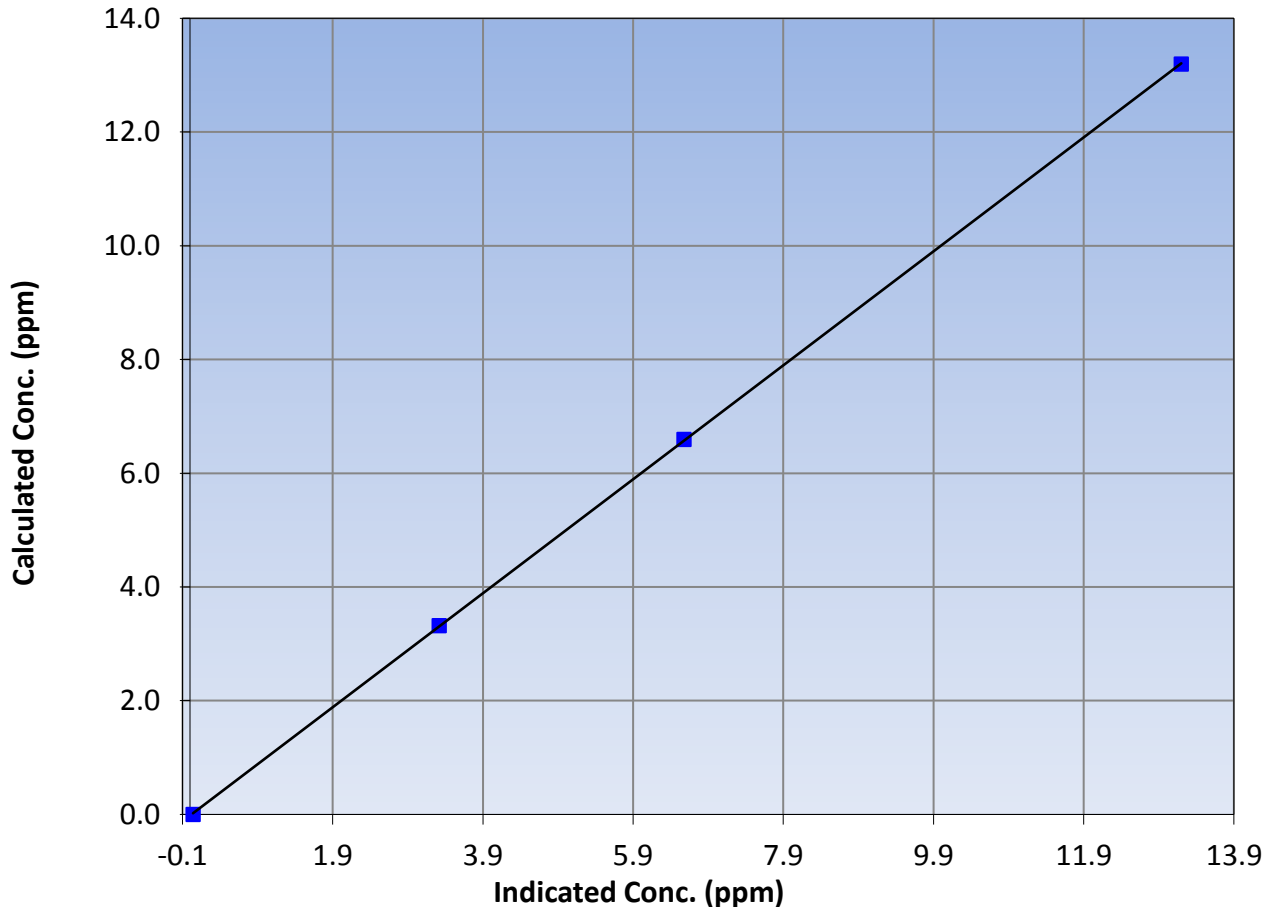
Station Information

Calibration Date	July 19, 2016	Previous Calibration	June 22, 2016
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	9:30	End Time (MST)	14:15
Analyzer make	Thermo 51i-LT	Analyzer serial #	1218153352

Calibration Data

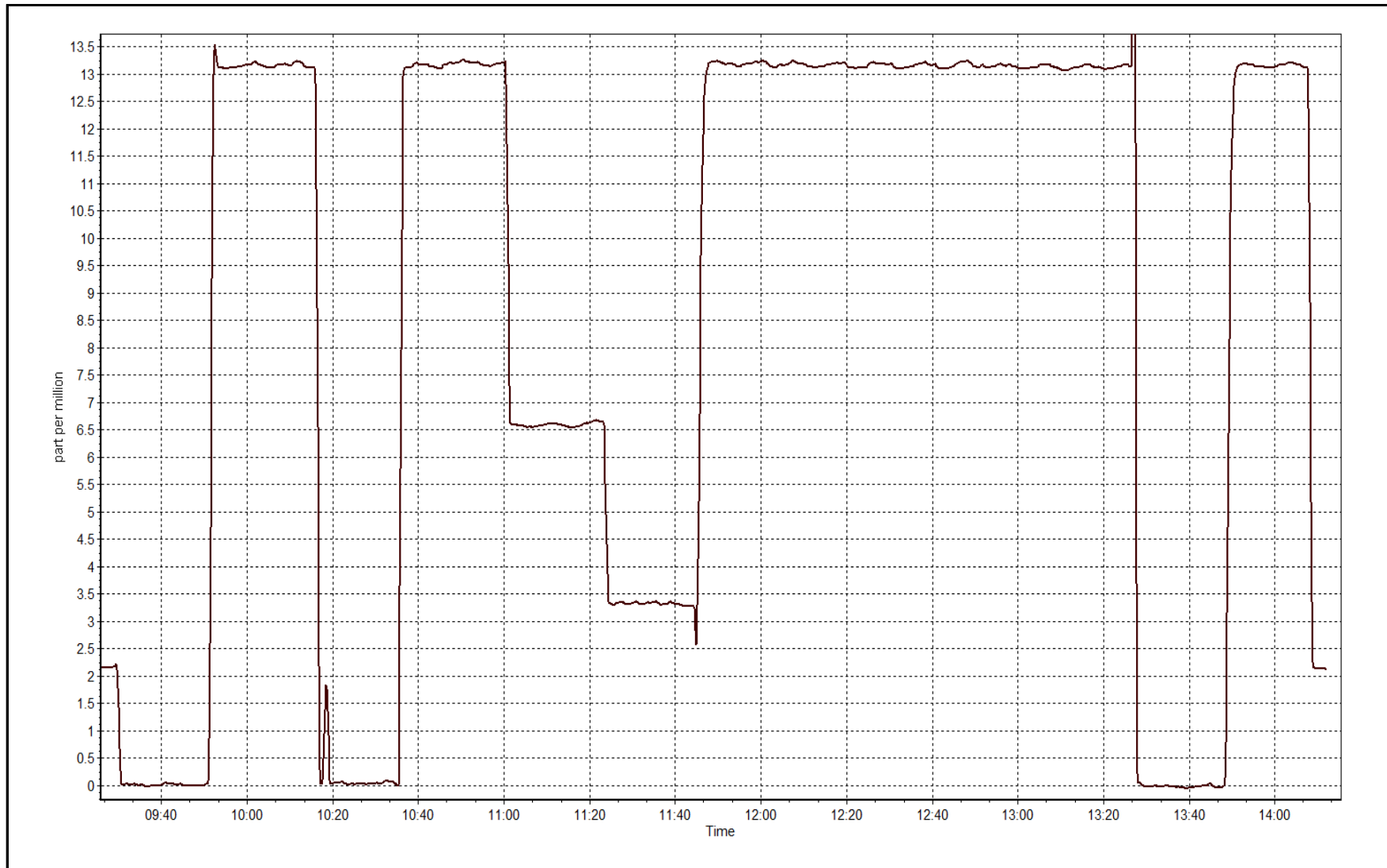
Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.04	----	Correlation Coefficient	0.999986
13.19	13.20	0.9996		
6.60	6.58	1.0026	Slope	1.002120
3.32	3.32	1.0001		
			Intercept	-0.019259

THC Calibration Curve



THC Calibration Plot

Date: July 19, 2016





Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	July 20, 2016	Previous Calibration	June 17, 2016
Station Name	Wapasu	Station Number	AMS 17
Reason:	Routine		
Start Time (MST)	9:50	End Time (MST)	12:30
NO2 GPT Ref date	July 19, 2016	Transfer Standard	23
		Station temp.	23 Deg C
Calibrator Make/Model	Teledyne API 700	Serial Number	997
ZAG make/model	Teledyne API 701	Serial Number	4427
DACS make/model	Campbell Scientific CR3000	Serial Number	6894

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Bench temp.	27.3	25.8
Analyzer IP address	192.168.1.72		Lamp temp.	58.0	58.0
Calculated slope	0.997746	0.999428	Pressure	25.9	25.9
Calculated intercept	-0.630062	-0.306452	Flow cell A	707	709
Analyzer Background	6.2	6.2	Flow cell B	707	726
Analyzer Coefficient	0.986	0.986	O3 measure	4422.3	4385.6
			O3 reference	4428.2	4401.6

Analyzer make	Teledyne API T400	Analyzer serial #	824
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Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator Lamp Intensity	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000		0.0	0.5	----
as found span	5000	713.6/1082.0	365.1	365.6	0.999
calibrator zero	5000		0.0	0.6	----
high point	5000	713.6/1082.0	365.1	365.6	0.999
second point	5000	496.5/973.6	246.8	247.6	0.997
third point	5000	260.3/849.3	127.5	127.2	1.002
as left zero	5000		0.0	0.9	----
as left span	5000	713.6/1082.0	365.1	367.8	0.993
Average Correction Factor					0.999

Corrected As found	365.1	Previous response	366.6	% change	0.4%
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Notes:

As founds completed. Inlet filter changed. No adjustments made.

Calibration Performed By:

Devin Russell



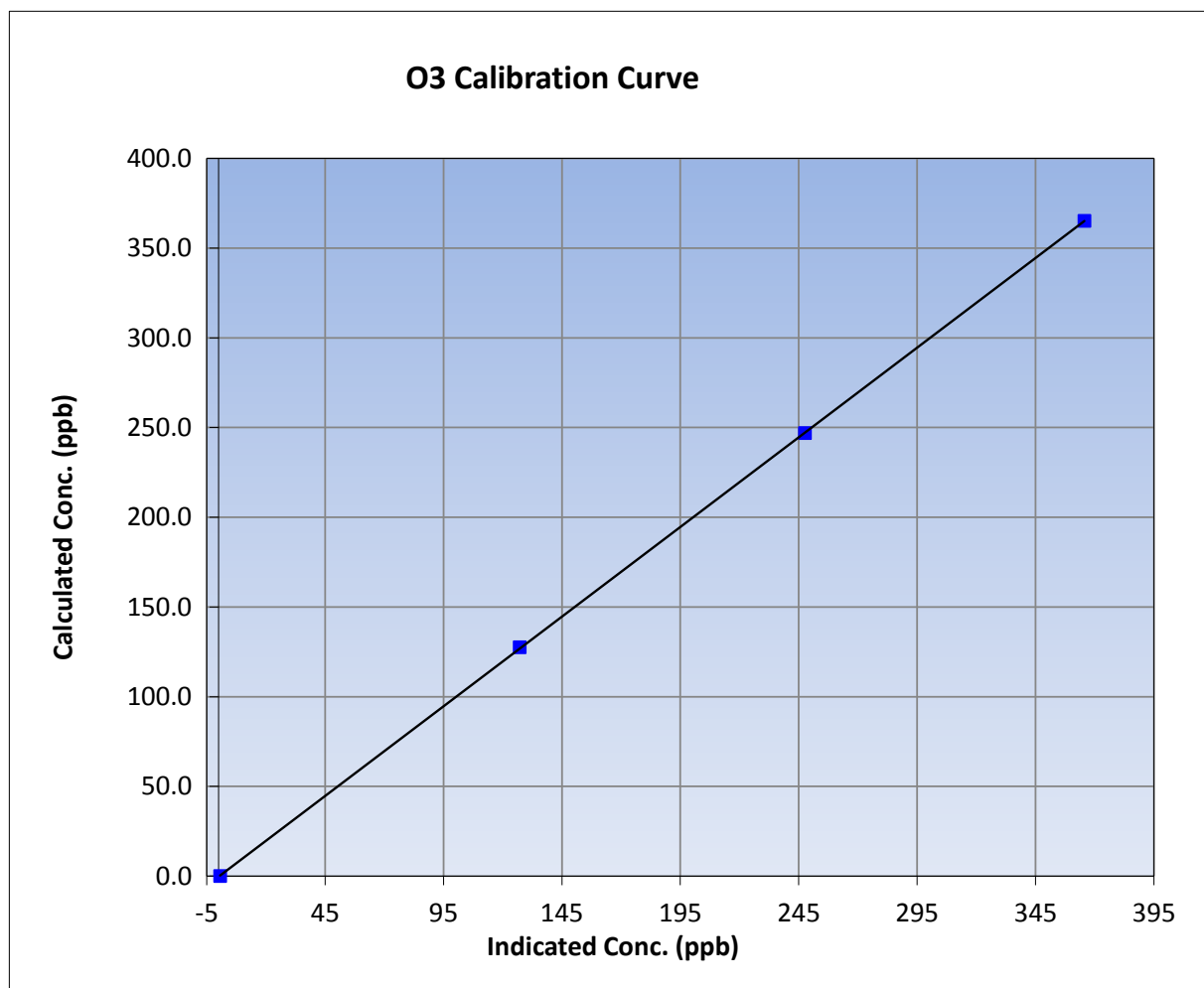
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	July-20-16	Previous Calibration	June 17, 2016
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	9:50	End Time (MST)	12:30
Analyzer make	Teledyne API T400	Analyzer serial #	824

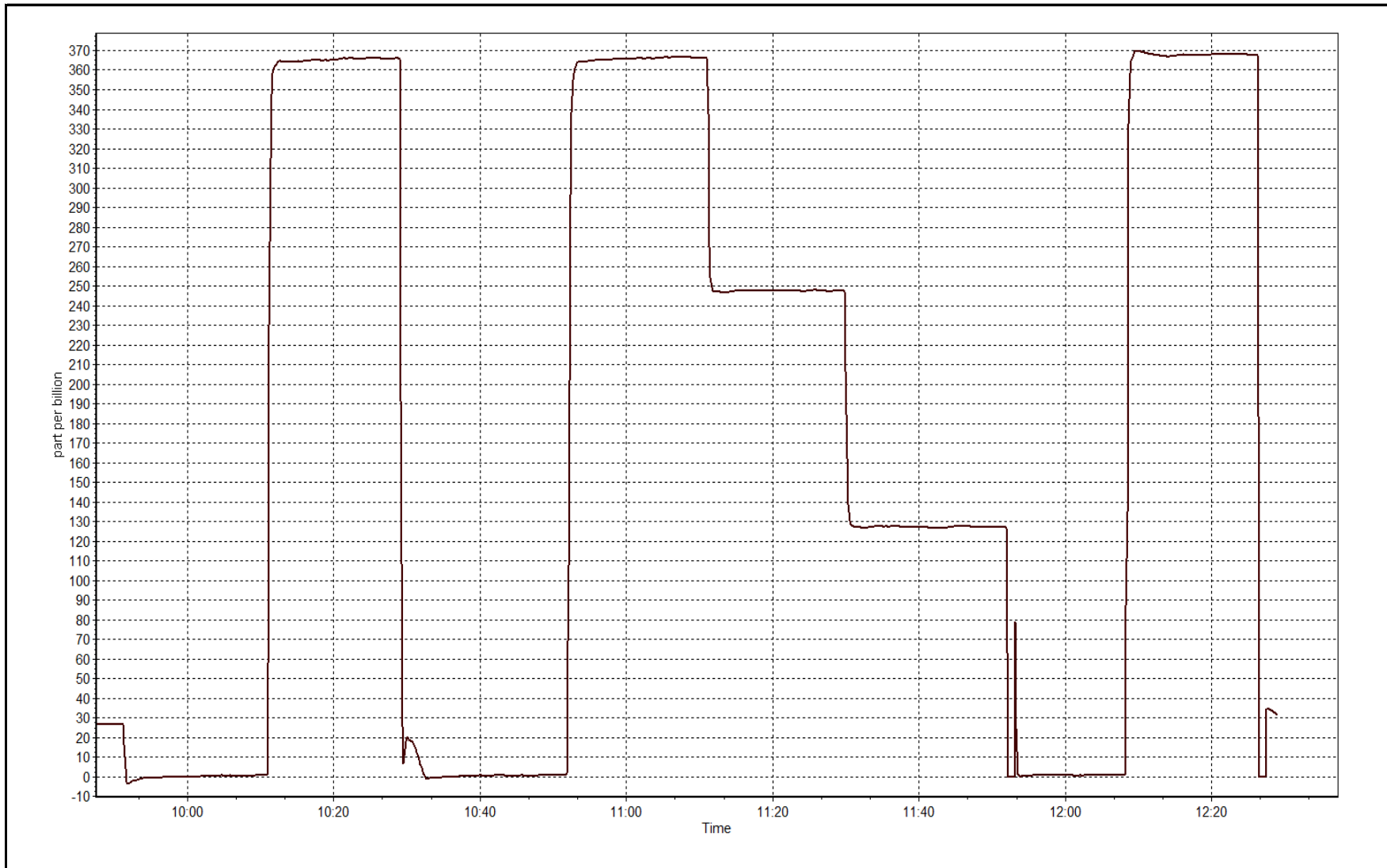
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.6	----	Correlation Coefficient	0.999991
365.1	365.6	0.9986		
246.8	247.6	0.9968	Slope	0.999428
127.5	127.2	1.0024		
			Intercept	-0.306452



O3 Calibration Plot

Date: July 20, 2016





Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	July 21, 2016	Previous Calibration	July 20, 2016
Station Name	Wapasu	Station Number	AMS 17
Reason:	Routine		
Start Time (MST)	14:35	End Time (MST)	15:10
NO2 GPT Ref date	July 19, 2016	Transfer Standard	23
		Station temp.	23 Deg C
Calibrator Make/Model	Teledyne API 700	Serial Number	997
ZAG make/model	Teledyne API 701	Serial Number	4427
DACS make/model	Campbell Scientific CR3000	Serial Number	2633

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Bench temp.	25.8	NA
Analyzer IP address	192.168.1.72		Lamp temp.	58.0	NA
Calculated slope	0.999428	0.996751	Pressure	25.9	NA
Calculated intercept	-0.306452	1.245939	Flow cell A	709	NA
Analyzer Background	6.2	NA	Flow cell B	726	NA
Analyzer Coefficient	0.986	NA	O3 measure	4385.6	NA
			O3 reference	4401.6	NA

Analyzer make	Teledyne API T400	Analyzer serial #	824
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Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator Lamp Intensity	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000		0.0	-1.3	----
as found span	5000	713.6/1082.0	365.1	365.0	1.000
calibrator zero	5000		0.0	-1.3	----
high point	5000	713.6/1082.0	365.1	365.0	1.000
second point					
third point					
as left zero					
as left span					
Average Correction Factor					1.000

Corrected As found	366.3	Previous response	365.6	% change	-0.2%
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Notes:

As founds completed. Analyzer removed for repairs at the FOC.

Calibration Performed By: Devin Russell



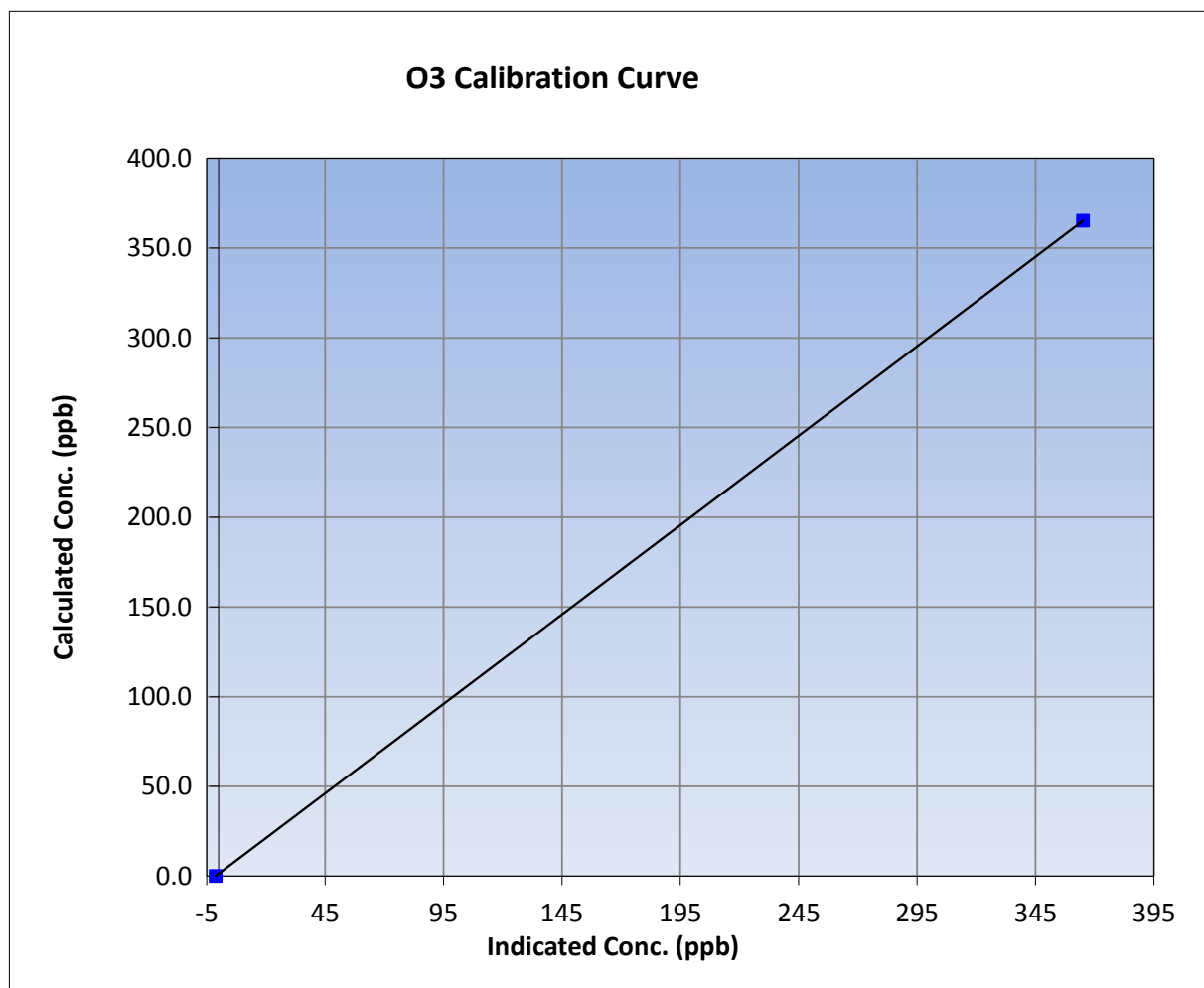
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	July-21-16	Previous Calibration	July 20, 2016
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	14:35	End Time (MST)	15:10
Analyzer make	Teledyne API T400	Analyzer serial #	824

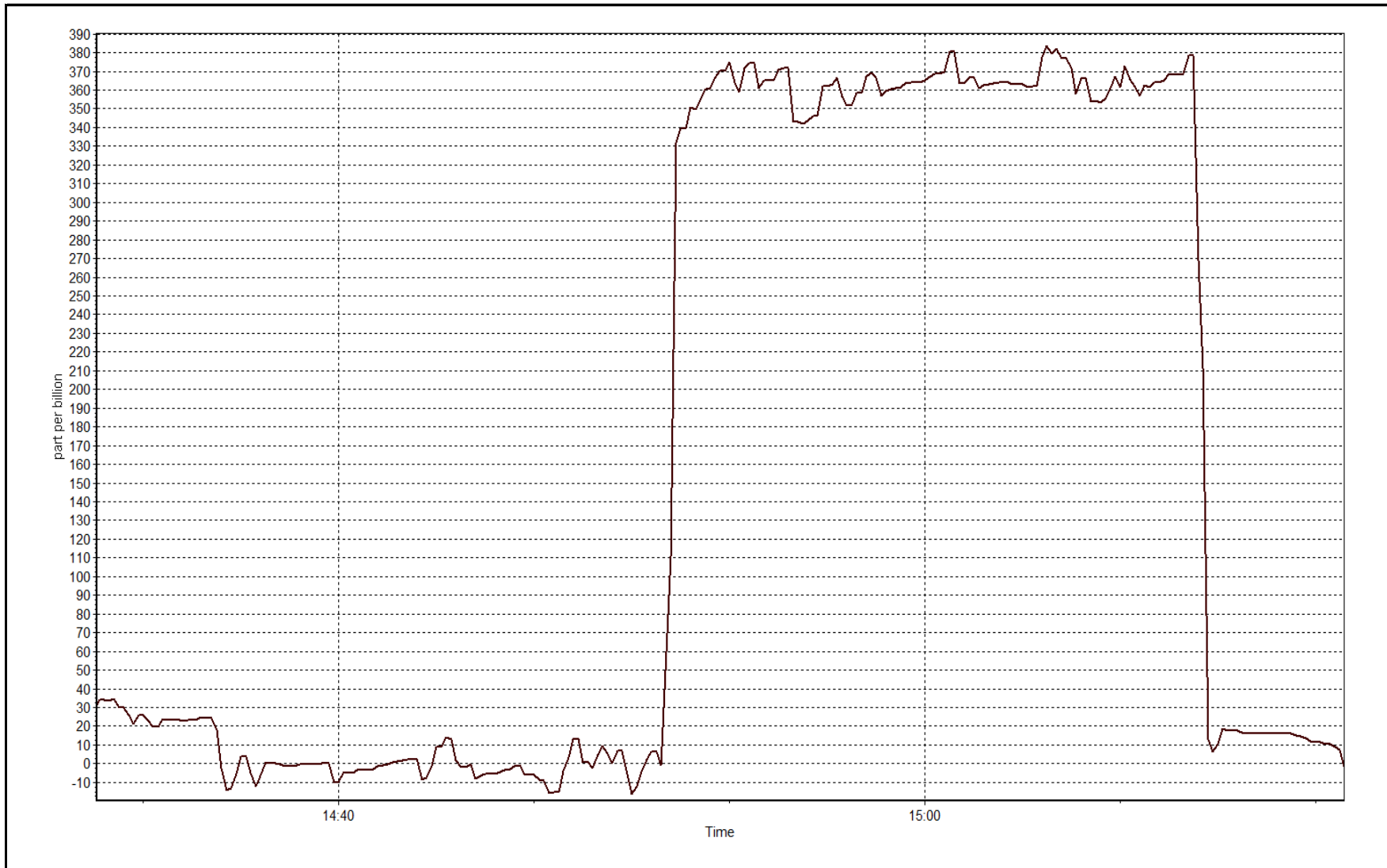
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-1.3	----	Correlation Coefficient	1.000000
365.1	365.0	1.0002		
			Slope	0.996751
			Intercept	1.245939



O3 Calibration Plot

Date: July 21, 2016





Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	July 22, 2016	Previous Calibration	July 21, 2016
Station Name	Wapasu	Station Number	AMS 17
Reason:	Install		
Start Time (MST)	9:45	End Time (MST)	16:45
NO2 GPT Ref date	July 19, 2016	Transfer Standard	NOX GPT
		Station temp.	23 Deg C
Calibrator Make/Model	Teledyne API 700	Serial Number	997
ZAG make/model	Teledyne API 701	Serial Number	4427
DACS make/model	Campbell Scientific CR3000	Serial Number	2633

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Bench temp.	NA	27.1
Analyzer IP address	192.168.1.49		Lamp temp.	NA	53.5
Calculated slope	NA	0.992843	Pressure	NA	694.0
Calculated intercept	NA	0.114162	Flow cell A	NA	0.7
Analyzer Background	NA	-3.4	Flow cell B	NA	0.7
Analyzer Coefficient	NA	1.001	O3 measure	NA	95755.0
			O3 reference	NA	103771.0

Analyzer make	Thermo 49i	Analyzer serial #	1300156233
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Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator Lamp Intensity	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero					
as found span					
calibrator zero	5000		0.0	-0.1	----
high point	5000	713.6/1082.0	365.1	367.5	0.993
second point	5000	496.5/973.6	246.8	248.6	0.993
third point	5000	260.3/849.3	127.5	128.3	0.994
as left zero	5000		0.0	2.4	----
as left span	5000	713.6/1082.0	365.1	372.4	0.980
Average Correction Factor					0.993

Corrected As found	NA	Previous response	NA	% change	NA
--------------------	----	-------------------	----	----------	----

Notes:

Installation calibration. Zero and span adjusted. As lefts delayed until zero/span valve could be brought from the FOC and installed. Zero/span valve installed and span ran for long period to condition valve.

Calibration Performed By:

Devin Russell



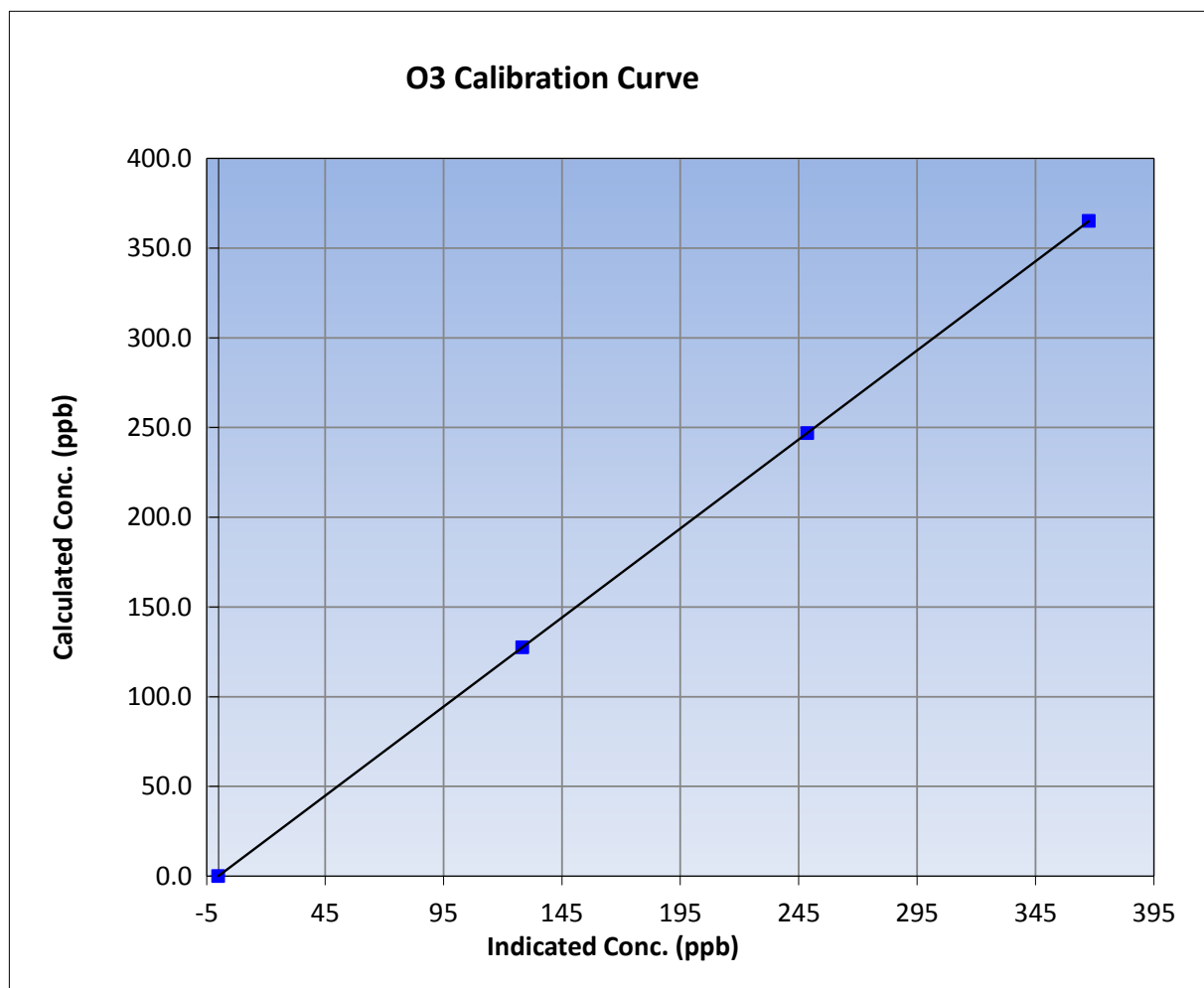
Wood Buffalo Environmental Association O3 Calibration Report

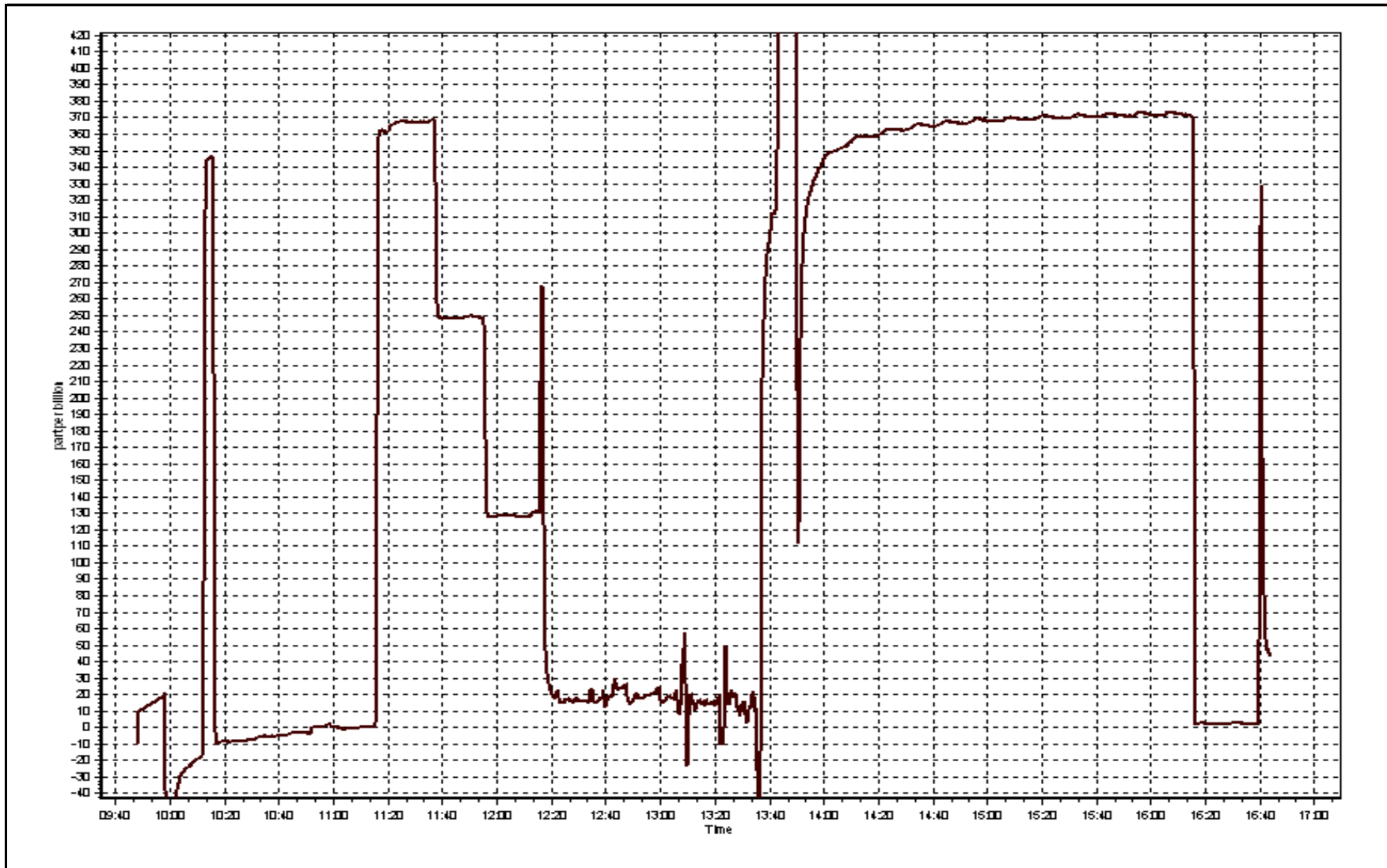
Station Information

Calibration Date	July 22, 2016	Previous Calibration	July 21, 2016
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	9:45	End Time (MST)	16:45
Analyzer make	Thermo 49i	Analyzer serial #	1300156233

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	1.000000
365.1	367.5	0.9934		
246.8	248.6	0.9927	Slope	0.992843
127.5	128.3	0.9940		
			Intercept	0.114162







Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	July 19, 2016	Previous Calibration	June 16, 2016
Station Name	Wapasu	Station Number	AMS 17
Reason:	Routine		
Start Time (MST)	9:30	End Time (MST)	14:10
NO Cal Gas Conc	49.7 ppm	Gas Cert Reference	SA130010A
NOx Cal Gas Conc	49.7 ppm	Cal Gas Expiry Date	12/12/2016
Calibrator	API T700	Serial Number	997
Zero air Generator	Teledyne API T701	Serial Number	4427

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	6894
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	1.003459	1.002991	1.003593
	Data Offset	2.277131	2.087607	0.137361
Current Calibration	Data Slope	0.999192	0.999451	1.001843
	Data Offset	2.850780	2.810988	0.698669

Analyzer Information

Analyzer make/model	API T200	Analyzer serial #	722
---------------------	----------	-------------------	-----

Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.72		192.168.1.72	
NO coefficient	1.016		1.032	
NOx coefficient	1.016		1.034	
NO2 coefficient	1.000		1.000	
NO bkgrnd	0.7		0.7	
NOx bkgrnd	1.4		1.4	
Chamber Temp	50	Deg C	50	Deg C
Moly Temp	315.9	Deg C	314.2	Deg C
PMT voltage	781	V	781	V
PMT Temp	7	Deg C	7	Deg C
O3 flow	71	ccm	71	ccm
R Cell press NO	6.1	mmHg	6.4	mmHg
R Cell Press Nox	6.1	mmHg	6.4	mmHg
NO sample flow	440	lpm	440	lpm
Nox sample Flow	435	lpm	439	lpm

Notes:

Inlet filter changed after as founds. Span adjusted.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

July 19, 2016

Station Number:

AMS 17

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	0.1	-0.4	0.5	----	----
as found span	5000	60.4	600.4	600.4	0.0	590.2	589.0	1.2	1.0173	1.0194
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.5	-0.6	0.1	----	----
high point	5000	60.4	600.4	600.4	0.0	599.1	598.9	0.2	1.0022	1.0025
second point	5000	30.2	300.2	300.2	0.0	296.7	296.7	0.0	1.0118	1.0119
third point	5000	15.2	151.1	151.1	0.0	145.8	146.1	-0.2	1.0361	1.0345
as left zero	5000	0.0	0.0	0.0	0.0	-0.2	-0.2	0.0	----	----
as left span	5000	60.4	600.4	232.3	368.1	597.2	232.8	364.4	1.0053	0.9978
Average Correction Factor									1.0167	1.0163

Corrected As found
Previous Response

NO_x= 590.1
NO_x= 596.0

NO= 589.4
NO= 596.5

Percent Change

NO_x= 1.0%

NO= 1.2%

GPT Calibration Data

Dilution Flow (total) 5000 ccm Source Gas Flow 60.40 ccm NOx ref calc conc = 600.4 ppb NO ref calc conc = 600.4 ppb

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
1st NO ref point		0.0	598.9	597.4	0.1	1.0025	1.0050	----	----
1st NO2 (300)	232.3	365.1	596.6	232.3	364.3	1.0063	----	1.0021	99.8%
2nd NO2 (200)	350.6	246.8	595.9	350.6	245.3	1.0074	----	1.0059	99.4%
3rd NO2 (100)	469.9	127.5	595.3	469.9	125.5	1.0085	----	1.0164	98.4%
2nd NO ref point	----	0.0	596.4	596.8	-0.4	1.0067	1.0060	----	----
Average Correction Factor						1.0072		1.0082	99.2%

Calibration Performed By: Devin Russell



Wood Buffalo Environmental Association

NO_x Calibration Summary

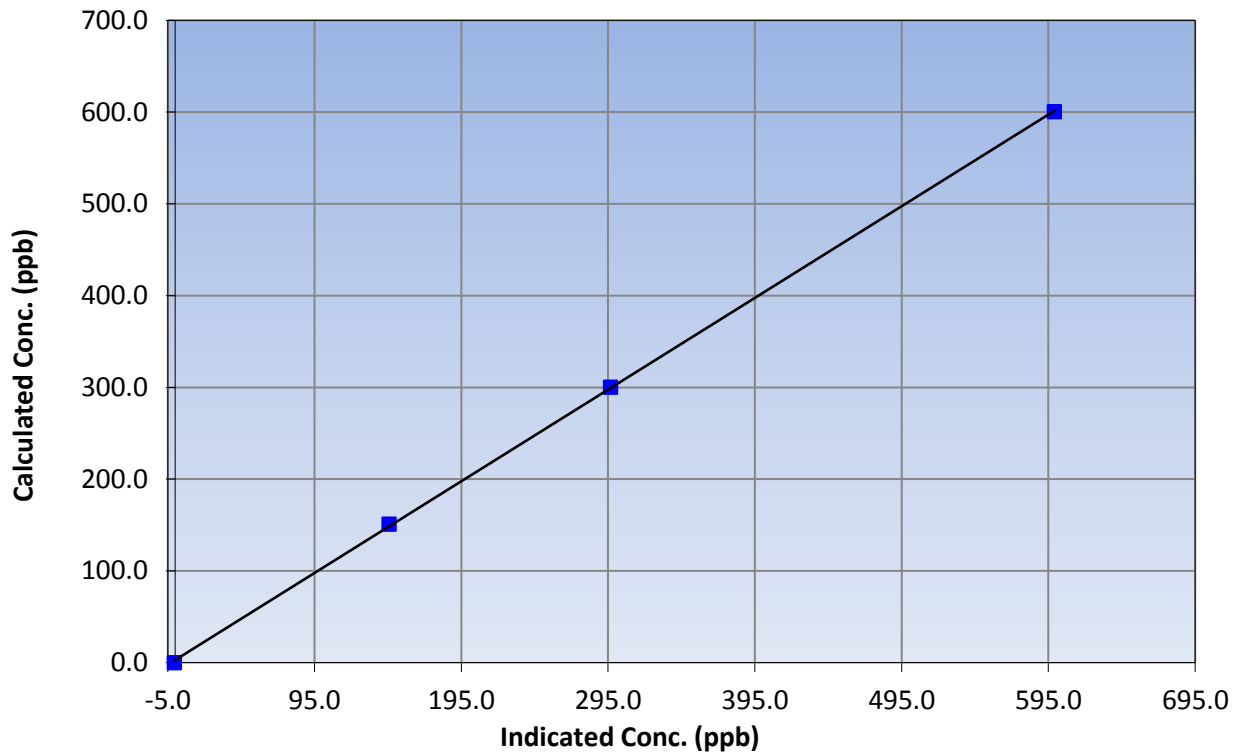
Station Information

Calibration Date	July 19, 2016	Previous Calibration	June 16, 2016
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	9:30	End Time (MST)	14:10
Analyzer make	API T200	Analyzer serial #	722

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.5	----	Correlation Coefficient	0.999930
600.4	599.1	1.0022		
300.2	296.7	1.0118	Slope	0.999192
151.1	145.8	1.0361		
			Intercept	2.850780

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

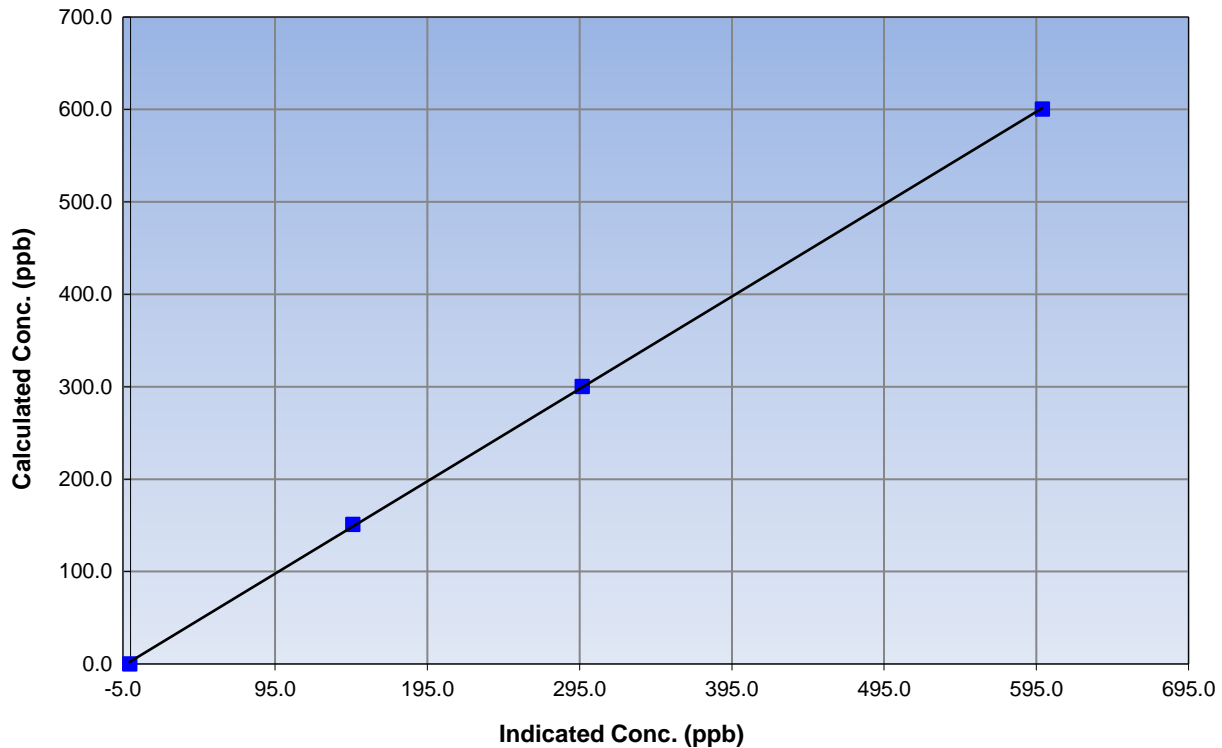
Station Information

Calibration Date	July 19, 2016	Previous Calibration	June 16, 2016
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	9:30	End Time (MST)	14:10
Analyzer make	API T200	Analyzer serial #	722

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.6	N/A	Correlation Coefficient	0.999940
600.4	598.9	1.0025		
300.2	296.7	1.0119	Slope	0.999451
151.1	146.1	1.0345		
			Intercept	2.810988

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

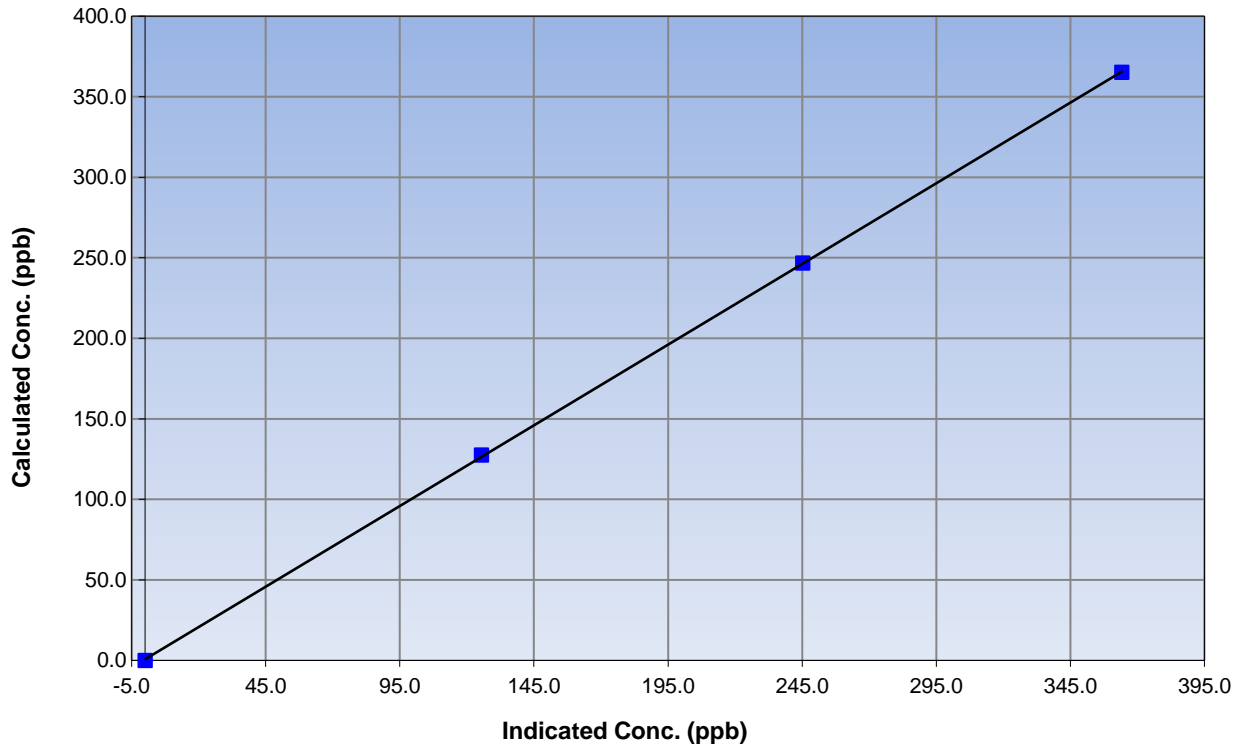
Station Information

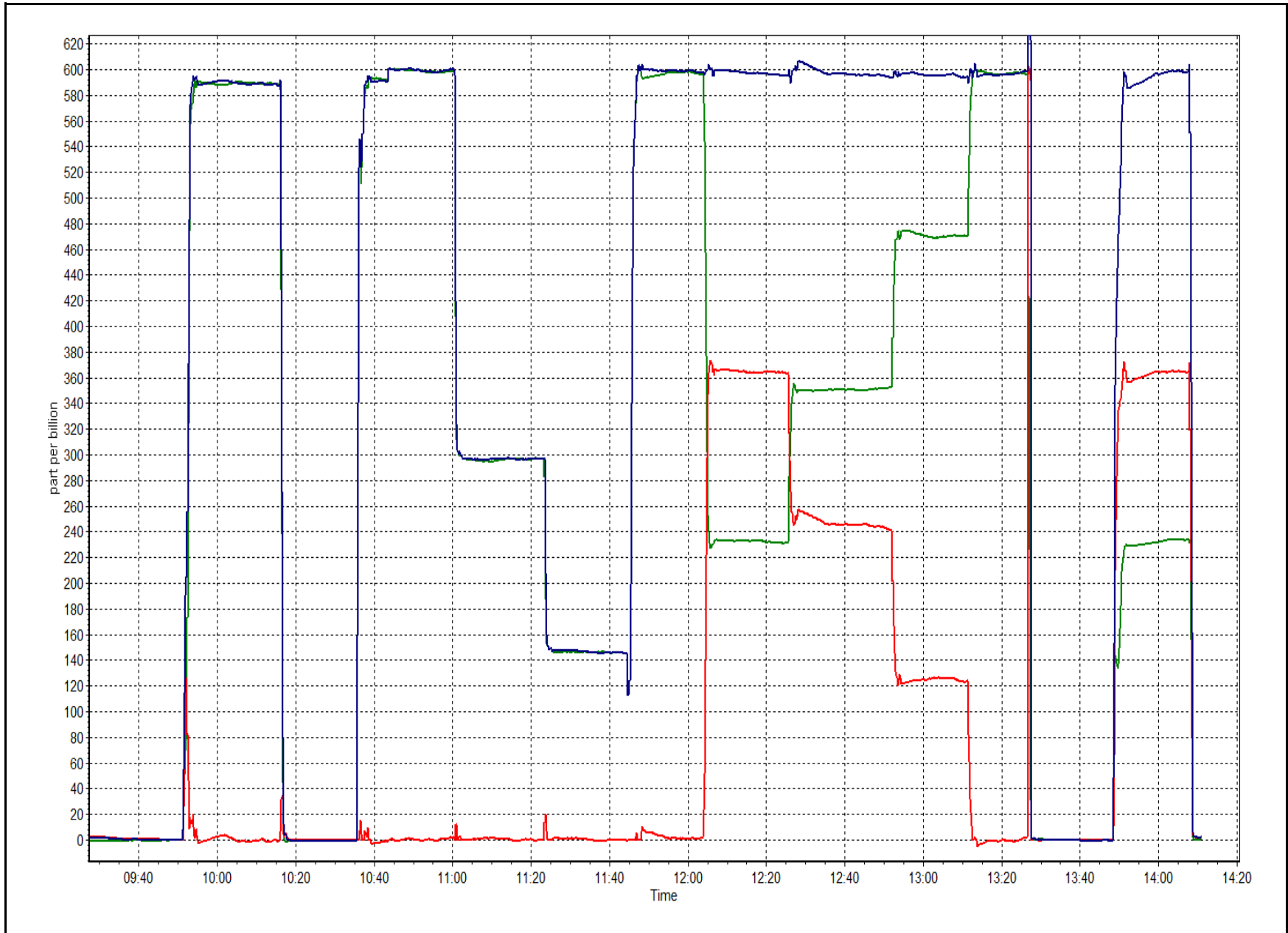
Calibration Date	July 19, 2016	Previous Calibration	June 16, 2016
Station Number	Wapasu	Station Number	AMS 17
Start Time (MST)	9:30	End Time (MST)	14:10
Analyzer make	API T200	Analyzer serial #	722

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	N/A	Correlation Coefficient	0.999967
365.1	364.3	1.0021		
246.8	245.3	1.0059	Slope	1.001843
127.5	125.5	1.0164		
			Intercept	0.698669

NO₂ Calibration Curve







Wood Buffalo Environmental Association

SHARP CALIBRATION

STATION INFORMATION

Calibration Date: July 22, 2016 Previous Calibration: June 23, 2016
 Station Name: Wapasu Station Number: AMS 17
 Start Time (MST): 9:45 End Time (MST): 10:35
 Calibrator Make/Model: Delta Cal Calibrator Serial Number: 141228

SHARP INFORMATION

Particulate Fraction: PM2.5
 Make/Model: Thermo / SHARP 5030
 Serial Number: E-1107
 C₁₄ Source SN: 2518
 Confirmation of Time settings: Yes No
 Parameters Checked: T1 T2 T3 T4 P3 Main Flow Beta Neph

CALIBRATION DATA

Temperature (°C)

Sensor	Indicated	Measured	Difference (Limit +/- 2.0°C)	Final Indicated
T1	16.0	15.6	-0.4	16.0
T2	22.0	NA	NA	22.0
T3	22.0	NA	NA	22.0
T4	23.0	NA	NA	23.0
RH (%)	37.0	NA	NA	37.0

Pressure (Hpa)

Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	951	949.9	-1.1	NA

Main Flow (Lph)

Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1000	1001	-1.4	NA	NA

Nephelometer Calibration

Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	212		NA
Neph	3.4		NA
C14	6.2		NA
Indicated Concentration (ug/m3)	1	no	NA
Offset 1	211.1		NA
Offset 2	33.6		NA

Leak Check (Quarterly)

Leak Check Date: _____ Previous Leak Check Date: June 23, 2016

Measured

Difference LPM (Limit +/- 0.42 LPM)

Flow without adaptor (LPM): _____ 0.00

*Flow with adaptor (LPM): _____

*Note - do not attach adaptor without shutting off the pump first

Mass Foil Calibration (Annually)

Foil Calibration Date: _____ Previous Foil Calibration: _____
 Zeroed?: _____
 Foil Mass: _____ Mass foil set S/N: _____
 Previous Correction Factor: _____
 New Correction Factor: _____

INSPECTION DATA

Item	Condition	Date of install or rebuild
Cyclone	Good / clean	03/05/2016
Pump	Good	
Filter Tape	Good	
Mass Foil Cal Set	na	
HEPA filter	Good	

NOTES:

As found checks completed. Heater module not working. Installed new heater module. When heater powered up, it blew a fuse in the 5030 analyzer. SHARP removed.

Calibration Performed By: Devin Russell



Wood Buffalo Environmental Association

SHARP CALIBRATION

STATION INFORMATION

Calibration Date:	<u>July 22, 2016</u>	Previous Calibration:	<u>NA</u>
Station Name:	<u>Wapasu</u>	Station Number:	<u>AMS 17</u>
Start Time (MST):	<u>12:45</u>	End Time (MST):	<u>14:20</u>
Calibrator Make/Model:	<u>Delta Cal</u>	Calibrator Serial Number:	<u>141228</u>

SHARP INFORMATION

Particulate Fraction:	<u>PM2.5</u>
Make/Model:	<u>Thermo / SHARP 5030</u>
Serial Number:	<u>CM-2390</u>
C ₁₄ Source SN:	<u>10391</u>
Confirmation of Time settings:	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Parameters Checked:	T1 <input checked="" type="checkbox"/> T2 <input type="checkbox"/> T3 <input type="checkbox"/> T4 <input type="checkbox"/> P3 <input checked="" type="checkbox"/> Main Flow <input checked="" type="checkbox"/> Beta <input type="checkbox"/> Neph <input checked="" type="checkbox"/>

CALIBRATION DATA

Temperature (°C)

Sensor	Indicated	Measured	Difference (Limit +/- 2.0°C)	Final Indicated
T1	20.0	19.7	-0.3	20.0
T2	22.0	NA	NA	22.0
T3	20.0	NA	NA	20.0
T4	19.0	NA	NA	19.0
RH (%)	53.0	NA	NA	53.0

Pressure (Hpa)

Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	948	947.3	-0.8	948

Main Flow (Lph)

Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1000	997	2.8	997	1000

Nephelometer Calibration

Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	142		142
Neph	-0.2		-0.2
C14	252.8		252.8
Indicated Concentration (ug/m3)	-0.2	no	-0.2
Offset 1			NA
Offset 2			NA

Leak Check (Quarterly)

Leak Check Date:		Previous Leak Check Date:	<u>NA</u>
------------------	--	---------------------------	-----------

Measured

Difference LPM (Limit +/- 0.42 LPM)

Flow without adaptor (LPM):		0.00
*Flow with adaptor (LPM):		

*Note - do not attach adaptor without shutting off the pump first

Mass Foil Calibration (Annually)

Foil Calibration Date:		Previous Foil Calibration:	
Zeroed?:			
Foil Mass:			<u>Mass foil set S/N:</u>
Previous Correction Factor:			
New Correction Factor:			

INSPECTION DATA

Item	Condition	Date of install or rebuild
Cyclone	Good / clean	22/07/2016
Pump	Good	22/07/2016
Filter Tape	Good	22/07/2016
Mass Foil Cal Set	na	
HEPA filter	Good	22/07/2016

NOTES:

Installation calibration. Flow adjusted. No other adjustments made.

Calibration Performed By:	<u>Devin Russell</u>
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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

AMS 18
STONY MOUNTAIN
JULY 2016

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

August 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONKLIN LOOKOUT (AMS 18)
JULY 2016

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2(ppb) Average	706	37	38	99.87	3	0	1	0
TRS(ppb) Average	708	35	36	99.87	0	0	0	0
THC(ppm) Average	706	36	38	99.73	2.2	-	2.1	-
NMHC(ppm) Average	706	36	38	99.73	0.188	-	0.134	-
CH4(ppm) Average	706	36	38	99.73	2.1	-	2	-
O3 (ppb) Average	709	34	35	99.87	54	0	44	-
NO2 (ppb) Average	707	36	37	99.87	5	0	1	-
NO (ppb) Average	707	36	37	99.87	4	-	0	-
NOX (ppb) Average	707	36	37	99.87	9	-	2	-
PM2.5 (ug/m3) Average	740	1	4	99.60	38	-	12.6	0
Wind Speed 10 m (km/h) Average	742	0	2	99.73	16	-	12	-
Wind Direction 10 m (deg) Average	742	0	2	99.73	-	-	-	-
Temperature 2 m (C) Average	743	0	1	99.87	28.1	-	21.7	-
Relative Humidity (%) Average	743	0	1	99.87	99	-	92.0	-
Precipitation (mm) Total	324	0	420	43.55	15.2	-	25.4	-
Leaf Wetness (% of range) Average	742	0	2	99.73	59	-	13.0	-
Global Solar Radiation (W/m2) Average	742	0	2	99.73	971	-	342.0	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONKLIN LOOKOUT (AMS 18)
 JULY 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	706	0.2	0	-	0	0	0	0	0	1	3
TRS (ppb) Average	708	0.3	0	-	0	0	0	0	0	0	0
THC (ppm) Average	706	2	0.1	-	1.9	1.9	2	2	2	2.1	2.2
NMHC(ppm) Average	706	0.095	0.029	-	0.033	0.1	0.1	0.1	0.1	0.1	0.188
CH4(ppm) Average	706	1.91	0	-	1.8	1.9	1.9	1.9	1.9	2	2.1
O3 (ppb) Average	709	32.3	8	-	12	22	27	32	38	42	54
NO2 (ppb) Average	707	0.7	1	-	0	0	0	1	1	1	5
NO (ppb) Average	707	0	0	-	0	0	0	0	0	0	4
NOX (ppb) Average	707	0.8	1	-	0	0	0	1	1	1	9
PM2.5 (ug/m3) Average	740	5.43	4.2	-	0.5	1.3	2.7	4.8	6.8	8.9	38
Wind Speed 10 m (km/h) Average	742	6	3	-	0	3	4	6	8	10	16
Wind Direction 10 m (deg) Average	742	-	-	-	-	-	-	-	-	-	-
Temperature 2 m (C) Average	743	17.12	4.1	-	6.5	12.2	13.8	16.6	20.1	22.9	28.1
Relative Humidity (%) Average	743	72	18	-	30	46	58	74	88	94	99
Precipitation (mm) Total	324	-	-	41.9	-	-	-	-	-	-	-
Surface Wetness (% of range) Average	742	4.6	8	-	0	0	1	1	3	13	59
Global Solar Radiation (W/m2) Average	742	243.5	287	-	0	0	1	98	459	721	971

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - STONY MOUNTAIN (AMS 18)
JULY 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
ALL PARAMETERS	14 Jul 2016 13:00	14 Jul 2016 13:00	1	Maintenance - wiring/data logger upgrades
NMHC, CH4, THC	21 Jul 2016 18:00	21 Jul 2016 18:00	1	Maintenance - replaced carrier gas
PM2.5	14 Jul 2016 13:00	14 Jul 2016 14:00	2	Maintenance - wiring/data logger upgrades
PM2.5	28 Jul 2016 12:00	28 Jul 2016 12:00	1	Maintenance - verify analyzer response
Wind Speed, Wind Direction	14 Jul 2016 23:00	14 Jul 2016 23:00	1	Flat line in sensor output signal
Precipitation Collector	14 Jul 2016 14:00	01 Aug 2016 00:00	419	Data logger program uploaded - data not recorded
Surface Leaf Wetness	14 Jul 2016 13:00	14 Jul 2016 14:00	2	Maintenance - wiring/data logger upgrades
Solar Global Radiation	14 Jul 2016 13:00	14 Jul 2016 14:00	2	Maintenance - wiring/data logger upgrades



Wood Buffalo Environmental Association
Summary of Hour Averages

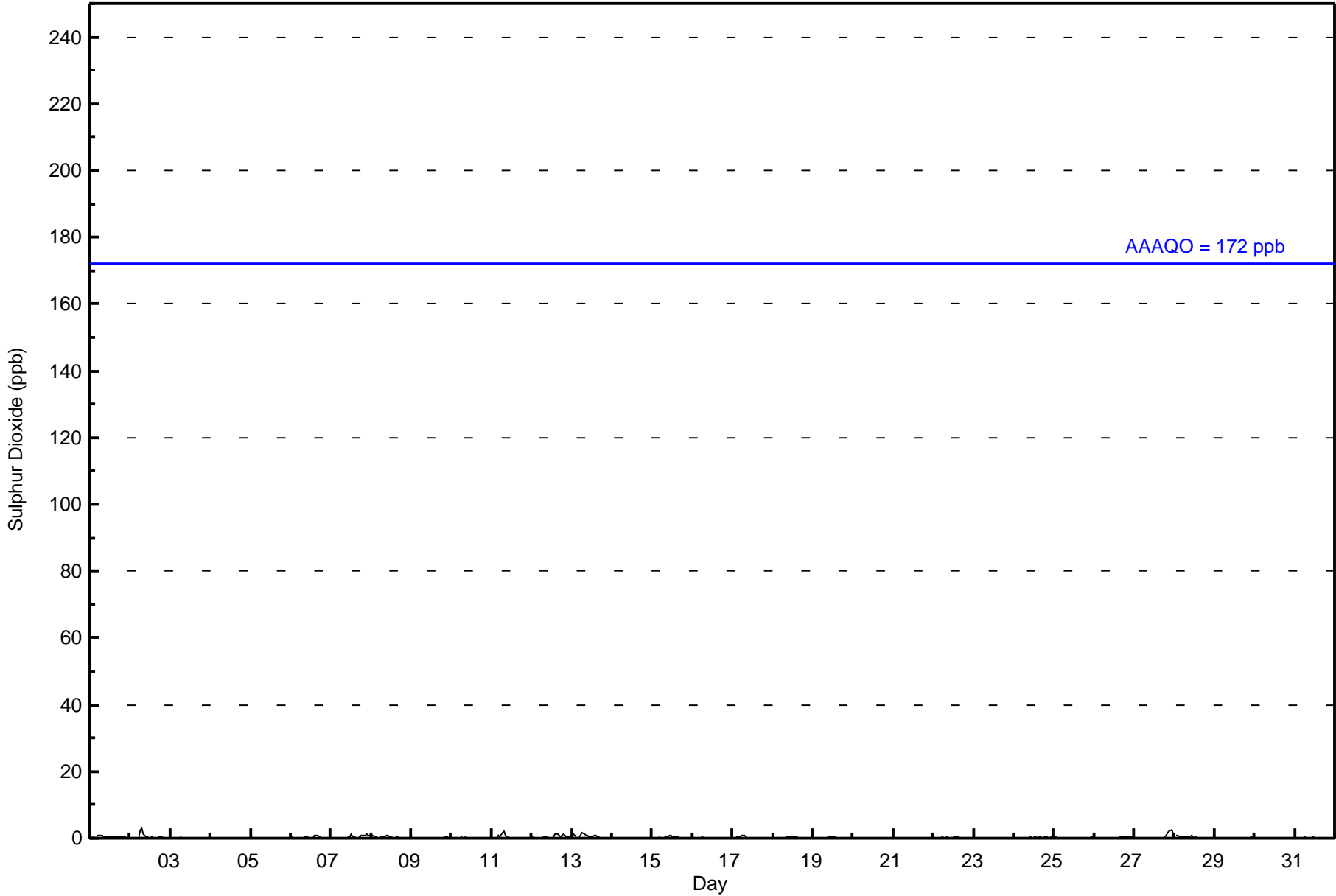
Sulphur Dioxide (SO₂) - ppb
Stony Mountain - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																																							
Maximum Value: 3 ppb on Jul 2 08:00										Maximum Daily Average: 0.5 ppb on Jul 13										Hours of Data: 706																													
Minimum Value: 0 ppb on Jul 3 14:00										Minimum Daily Average: 0.0 ppb on Jul 4										Hours of Missing Data: 38																													
Maximum Diurnal Average: 0.4 ppb at hour 8										Minimum Diurnal Average: 0.1 ppb at hour 4										Hours of Calibration: 37																													
Monthly Average: 0.2 ppb										Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 1										Percent Operational Time: 99.9																													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Jul	0	0	0	Z	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.4	1																							
2-Jul	0	0	0	0	Z	0	3	3	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0.5	3																							
3-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																							
4-Jul	Z	0	0	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-Jul	0	Z	0	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-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0.2	1																							
7-Jul	0	0	0	Z	0	0	0	0	0	0	1	1	1	0	0	0	0	0	1	1	1	1	1	1	0.4	1																							
8-Jul	1	1	0	0	Z	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1																							
9-Jul	0	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																							
10-Jul	Z	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																							
11-Jul	0	Z	0	0	1	0	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	2																							
12-Jul	0	0	Z	0	0	0	0	1	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	1	0.5	1																							
13-Jul	1	1	1	Z	1	1	2	1	1	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0.5	2																							
14-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	M	0	0	0	0	0	0	0	0	0	0	0	0.0	0																							
15-Jul	0	0	0	0	0	Z	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.2	1																							
16-Jul	Z	0	0	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-Jul	1	Z	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1																							
18-Jul	0	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1																							
19-Jul	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																							
20-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0																							
21-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0																							
22-Jul	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0.2	1																							
23-Jul	0	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																							
24-Jul	0	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																							
25-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																							
26-Jul	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																							
27-Jul	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																							
28-Jul	Z	1	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1																							
29-Jul	0	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-Jul	0	0	Z	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-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																							
																								0.2	0.2	0.2	0.1	0.2	0.2	0.3	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	Diurnal Average	
																								1	1	1	1	1	1	3	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	Diurnal Maximum
Z - zerospan C - Calibration M - Maintenance																																																	
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb																																																	



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Stony Mountain - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Stony Mountain - July 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	706	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: 706

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Stony Mountain - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	26	39	48	36	20	15	21	16	14	61	64	59	92	93	56	45	705
11 - 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	26	39	48	36	20	15	21	16	14	61	64	59	92	93	56	45	705

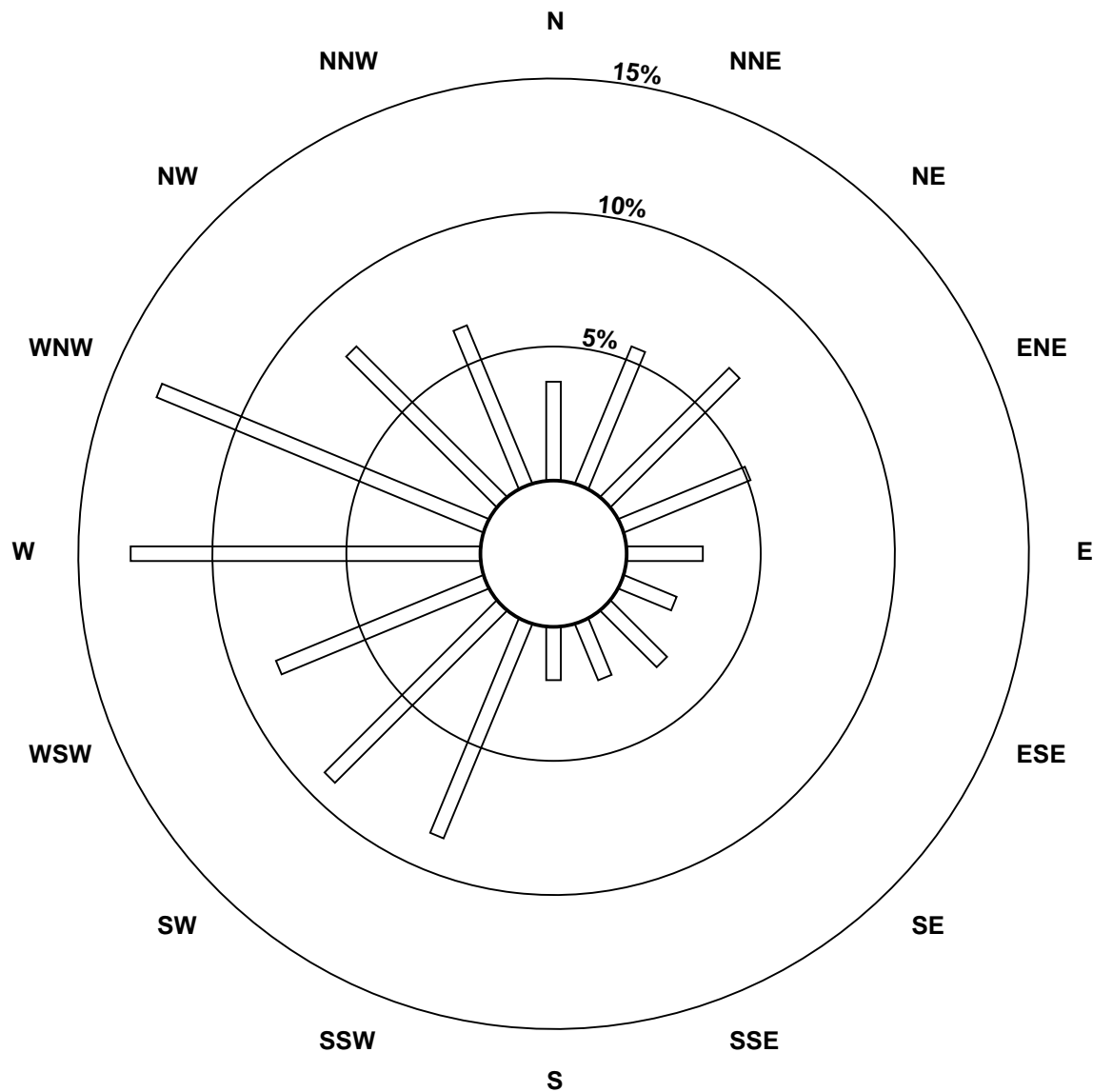
Total Number of Valid Hours: 705

Total Number of Hours: 744

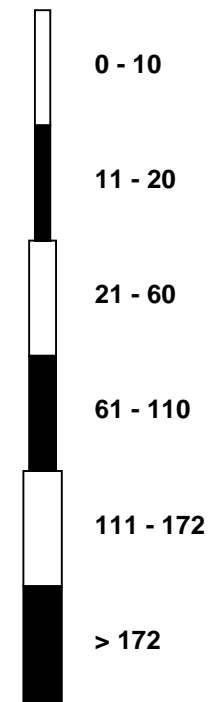


Wood Buffalo Environmental Association
Wind Rose Jul 2016

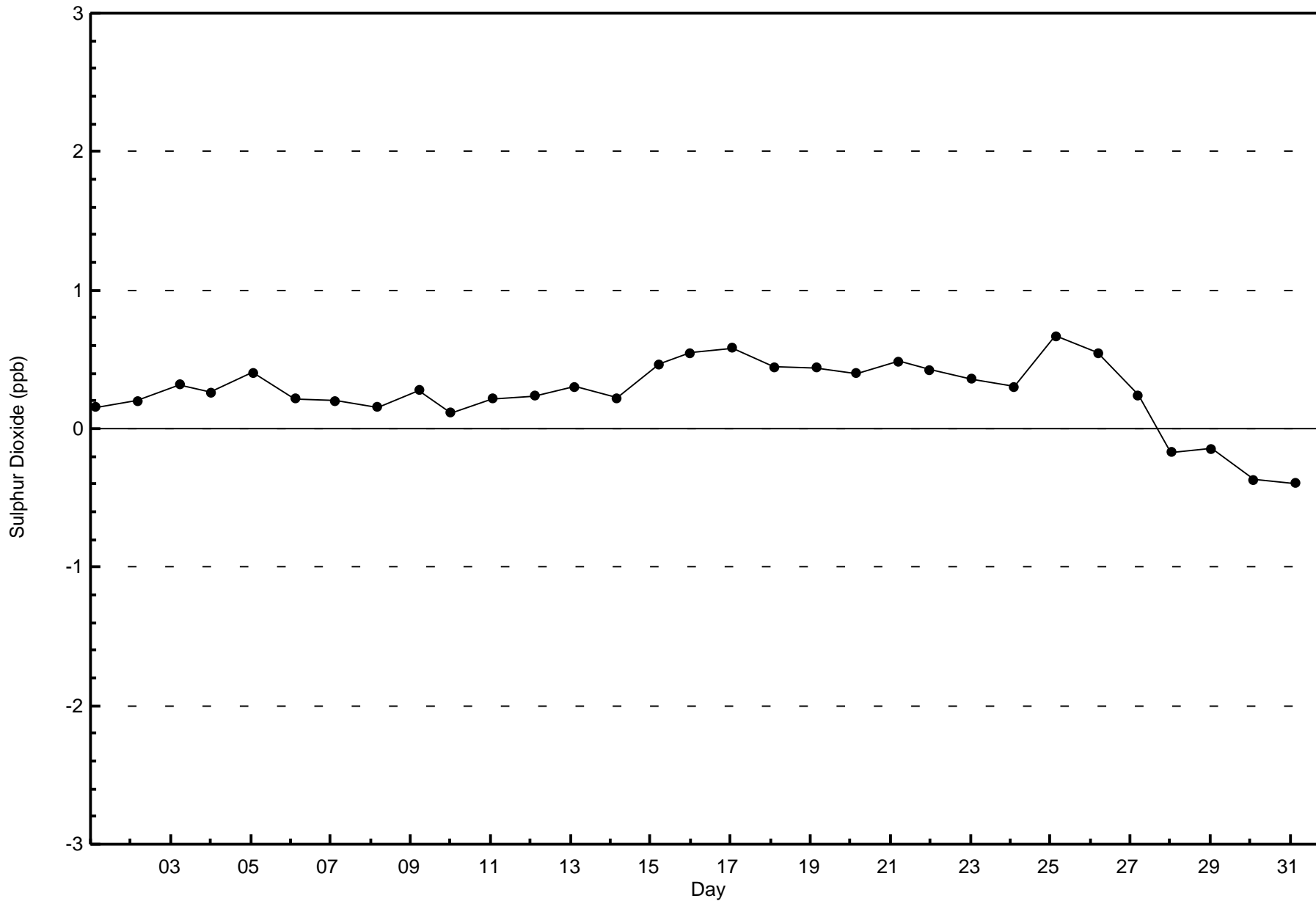
Sulphur Dioxide (SO₂) - ppb
Stony Mountain (AMS 18)

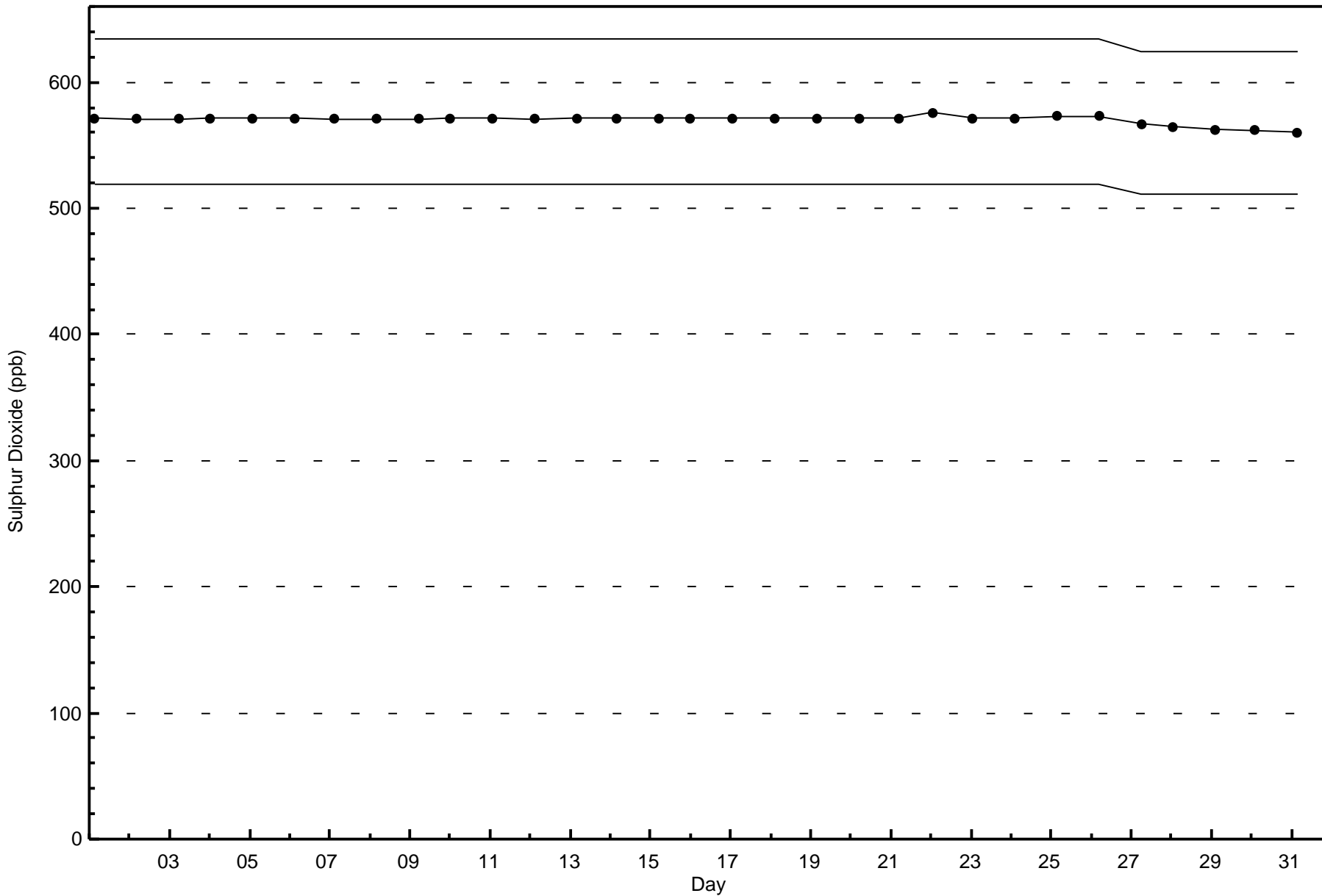


Classes (ppb)



Total Number of Valid Hours: 705





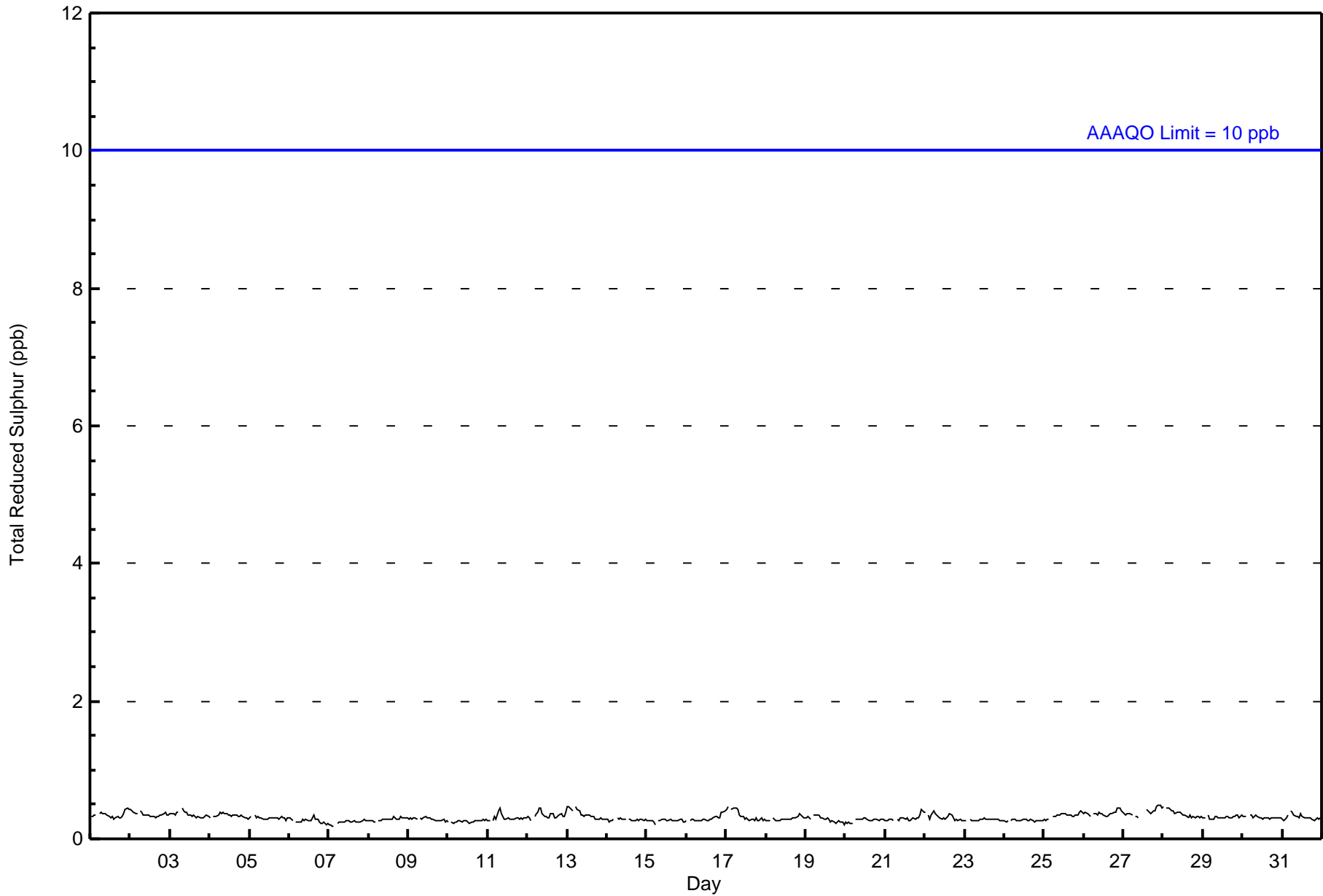


Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																																							
Maximum Value: 0 ppb on Jul 27 22:00										Maximum Daily Average: 0.4 ppb on Jul 27										Hours of Data: 708																													
Minimum Value: 0 ppb on Jul 7 04:00										Minimum Daily Average: 0.2 ppb on Jul 7										Hours of Missing Data: 36																													
Maximum Diurnal Average: 0.3 ppb at hour 7										Minimum Diurnal Average: 0.3 ppb at hour 18										Hours of Calibration: 35																													
Monthly Average: 0.3 ppb										Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 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-Jul	0	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																							
2-Jul	0	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																							
3-Jul	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																							
4-Jul	0	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-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																							
6-Jul	0	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-Jul	0	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-Jul	0	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-Jul	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																							
10-Jul	0	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-Jul	0	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																							
12-Jul	0	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-Jul	0	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																							
14-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	M	0	0	0	0	0	0	0	0	0	0	0	0.3	0																							
15-Jul	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																							
16-Jul	0	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																							
17-Jul	0	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-Jul	0	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-Jul	0	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																							
20-Jul	0	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-Jul	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																							
22-Jul	0	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-Jul	0	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																							
24-Jul	0	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-Jul	0	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-Jul	0	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																							
27-Jul	0	0	0	0	0	0	Z	0	0	0	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0.4	0																							
28-Jul	0	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																							
29-Jul	0	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																							
30-Jul	0	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																							
31-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																							
																								0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	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	Diurnal Maximum
Z - zerospan C - Calibration M - Maintenance																																																	
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb 24-hr 3 ppb																																																	



Wood Buffalo Environmental Association
Hourly Averages

Total Reduced Sulphur (TRS) - ppb
Stony Mountain - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Reduced Sulphur (TRS) - ppb
Stony Mountain - July 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	708	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb
Stony Mountain - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	27	38	48	36	21	14	20	17	13	65	66	59	91	93	53	46	707
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	27	38	48	36	21	14	20	17	13	65	66	59	91	93	53	46	707

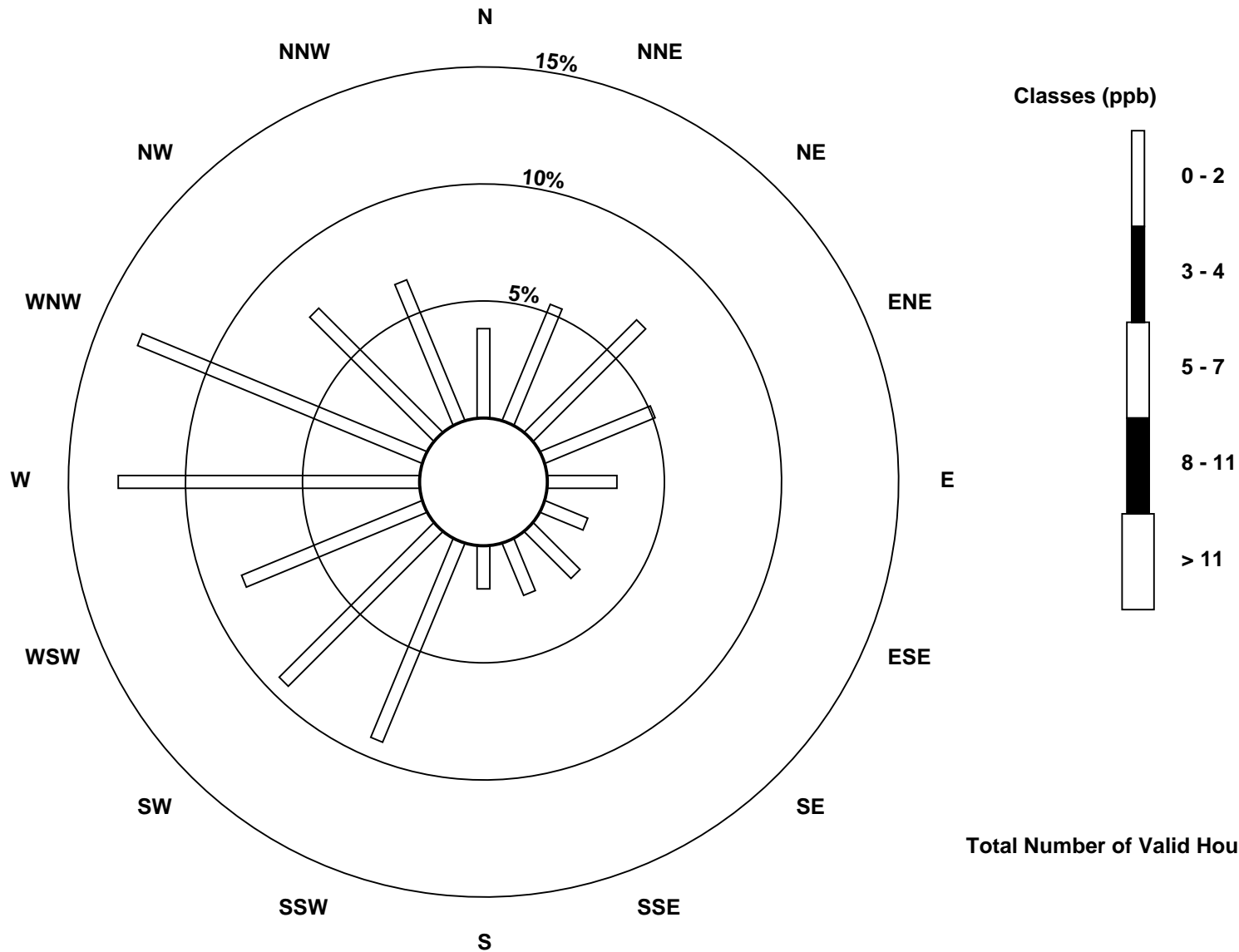
Total Number of Valid Hours: 707

Total Number of Hours: 744

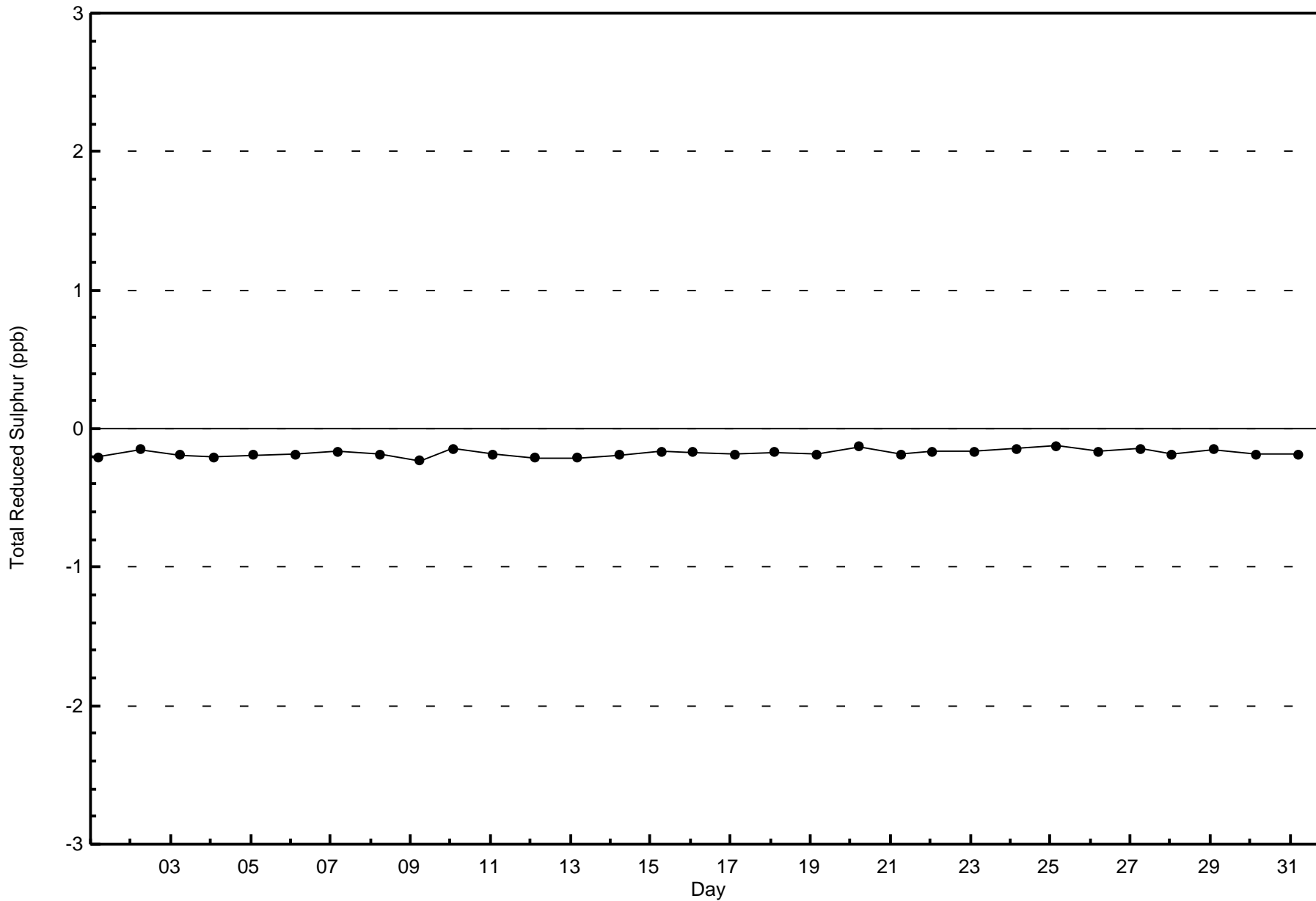


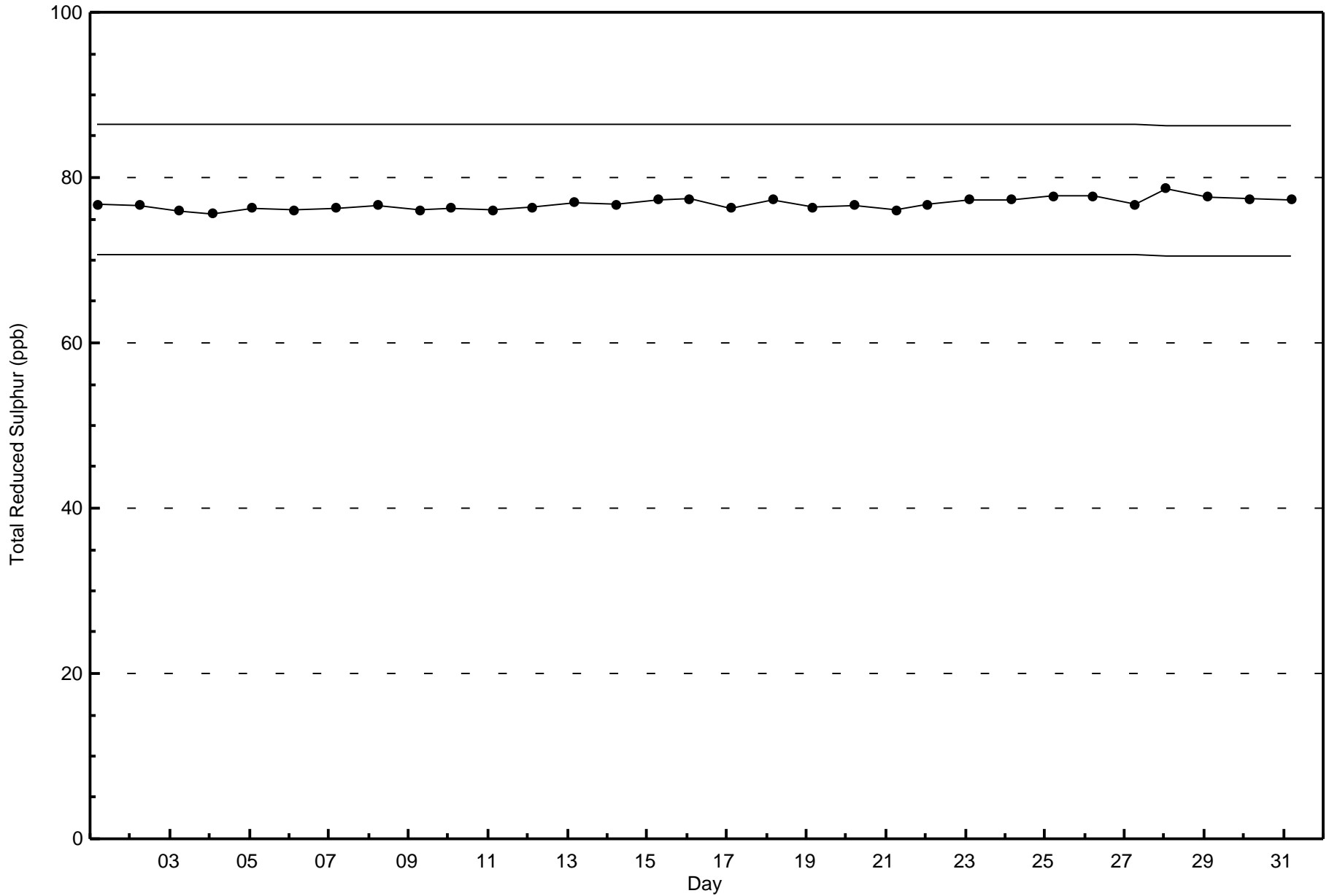
Wood Buffalo Environmental Association
Wind Rose Jul 2016

Total Reduced Sulphur (TRS) - ppb
Stony Mountain (AMS 18)



Total Number of Valid Hours: 707







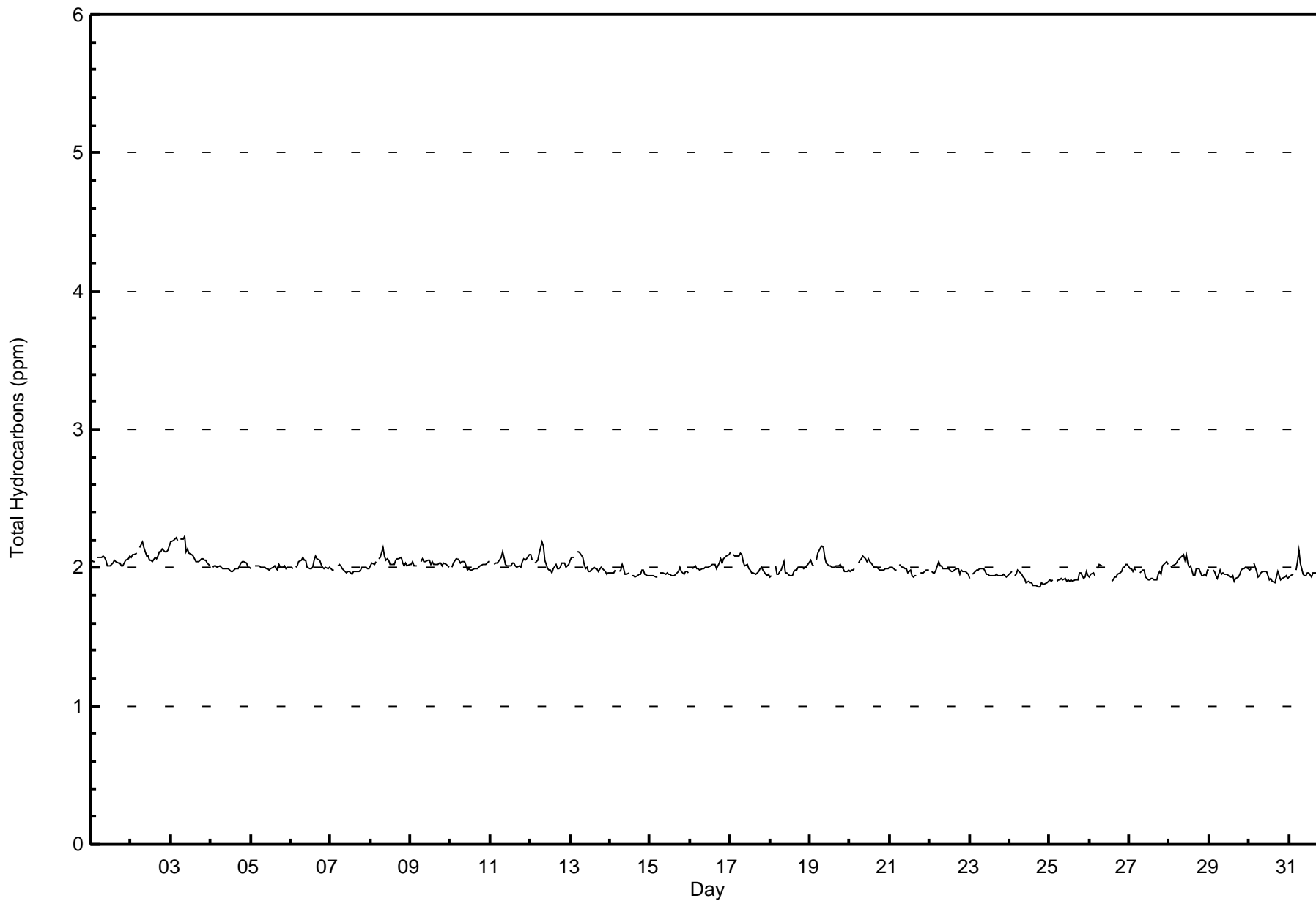
Wood Buffalo Environmental Association

Summary of Hour Averages

Total Hydrocarbons (THC) - ppm

Stony Mountain - July 2016

Maximum Value: 2.2 ppm on Jul 3 09:00																			Maximum Daily Average: 2.1 ppm on Jul 3						Hours in Service: 744	
Minimum Value: 1.9 ppm on Jul 24 19:00																			Minimum Daily Average: 1.9 ppm on Jul 24						Hours of Data: 706	
Maximum Diurnal Average: 2.0 ppm at hour 8																			Minimum Diurnal Average: 2.0 ppm at hour 14						Hours of Missing Data: 38	
Monthly Average: 2.00 ppm																			Percentiles: P ₁ = 1.9 P ₁₀ = 1.9 Q ₁ = 2.0 Median = 2.0 Q ₃ = 2.0 P ₉₀ = 2.1 P ₉₉ = 2.2						Hours of Calibration: 36	
																									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-Jul	2.0	2.0	2.0	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.0	2.1
2-Jul	2.1	2.1	2.1	2.1	Z	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1
3-Jul	2.2	2.2	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.1
4-Jul	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
5-Jul	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
6-Jul	2.0	2.0	Z	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
7-Jul	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
8-Jul	2.0	2.0	2.0	2.0	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0
9-Jul	2.0	2.0	2.0	2.0	2.0	Z	2.0	2.1	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
10-Jul	Z	2.0	2.0	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
11-Jul	2.0	Z	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.0
12-Jul	2.1	2.1	Z	2.0	2.1	2.1	2.1	2.2	2.2	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
13-Jul	2.1	2.1	2.1	Z	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
14-Jul	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	1.9	2.0	M	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	1.9	1.9	1.9	1.9	2.0
15-Jul	1.9	1.9	1.9	1.9	1.9	Z	2.0	2.0	2.0	1.9	2.0	2.0	2.0	1.9	1.9	2.0	2.0	2.0	2.0	2.0	1.9	2.0	2.0	2.0	2.0	2.0
16-Jul	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.0
17-Jul	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	2.0	2.0	2.0
18-Jul	1.9	1.9	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
19-Jul	2.1	2.0	2.0	Z	2.1	2.1	2.1	2.2	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.2
20-Jul	2.0	2.0	2.0	2.0	Z	2.0	2.1	2.1	2.1	2.1	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
21-Jul	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	1.9	1.9	1.9	1.9	M	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
22-Jul	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	1.9	1.9	2.0
23-Jul	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	2.0	1.9	1.9	1.9	1.9	1.9	1.9	2.0
24-Jul	2.0	2.0	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
25-Jul	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	1.9	1.9	2.0	1.9	1.9	1.9
26-Jul	1.9	2.0	2.0	1.9	Z	2.0	2.0	2.0	C	C	C	C	C	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
27-Jul	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	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
28-Jul	Z	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	1.9	1.9	2.0	2.0	2.0	1.9	1.9	2.0	1.9	2.0	2.0
29-Jul	2.0	Z	2.0	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	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
30-Jul	2.0	2.0	Z	2.0	2.0	1.9	1.9	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	2.0
31-Jul	1.9	1.9	1.9	Z	2.0	2.0	2.1	2.0	2.0	1.9	1.9	2.0	2.0	1.9	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan C - Calibration M - Maintenance																										





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Stony Mountain - July 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	580	82.15	82.15
2.1 - 3.0	126	17.85	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 - July 2016**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	25	33	43	27	12	10	8	10	10	43	63	54	85	80	37	39	579
2.1 - 3.0	1	6	5	9	8	5	13	6	4	18	2	5	7	12	19	6	126
3.1 - 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	26	39	48	36	20	15	21	16	14	61	65	59	92	92	56	45	705

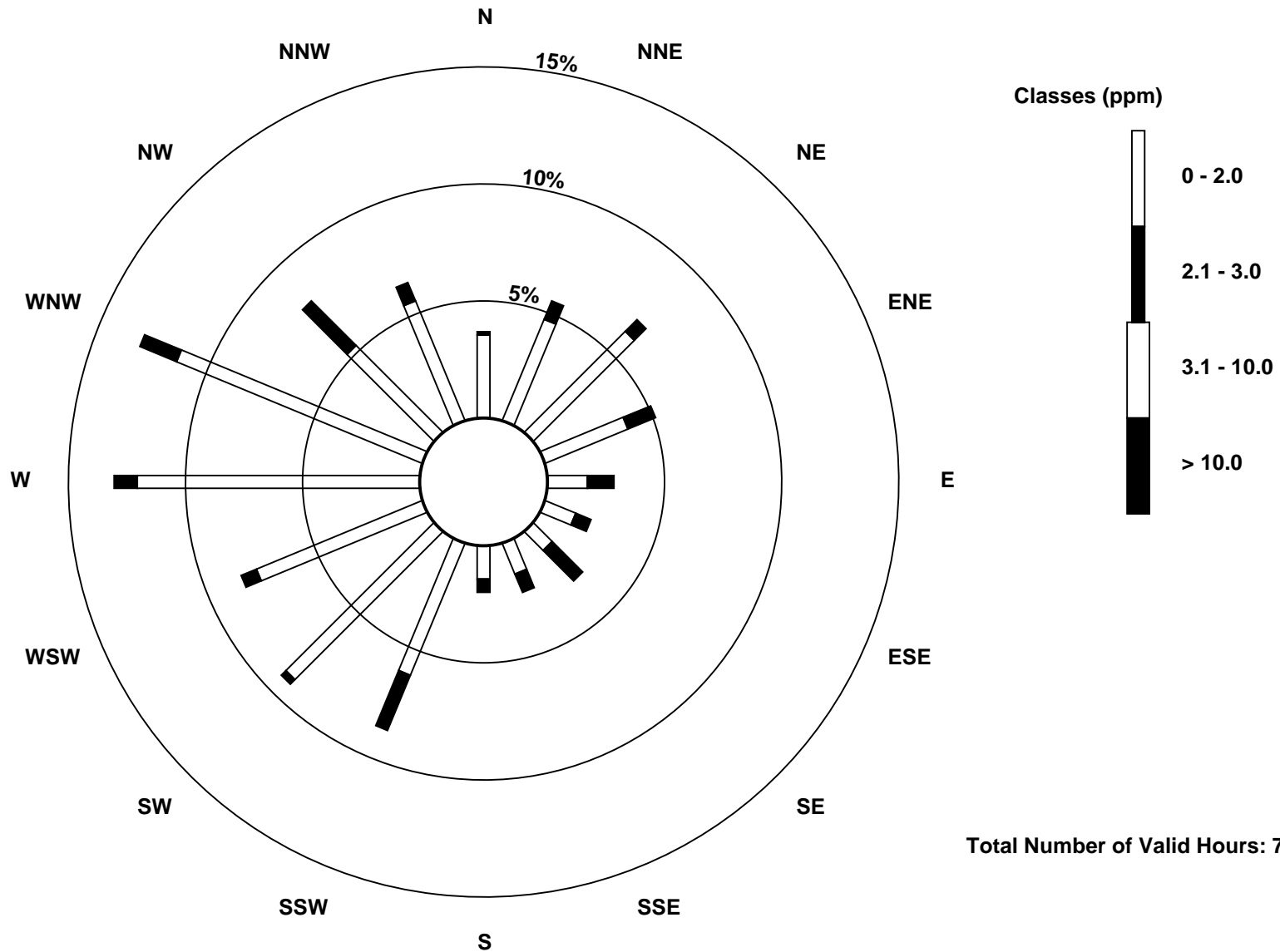
Total Number of Valid Hours: 705

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

Total Hydrocarbons (THC) - ppm
Stony Mountain (AMS 18)

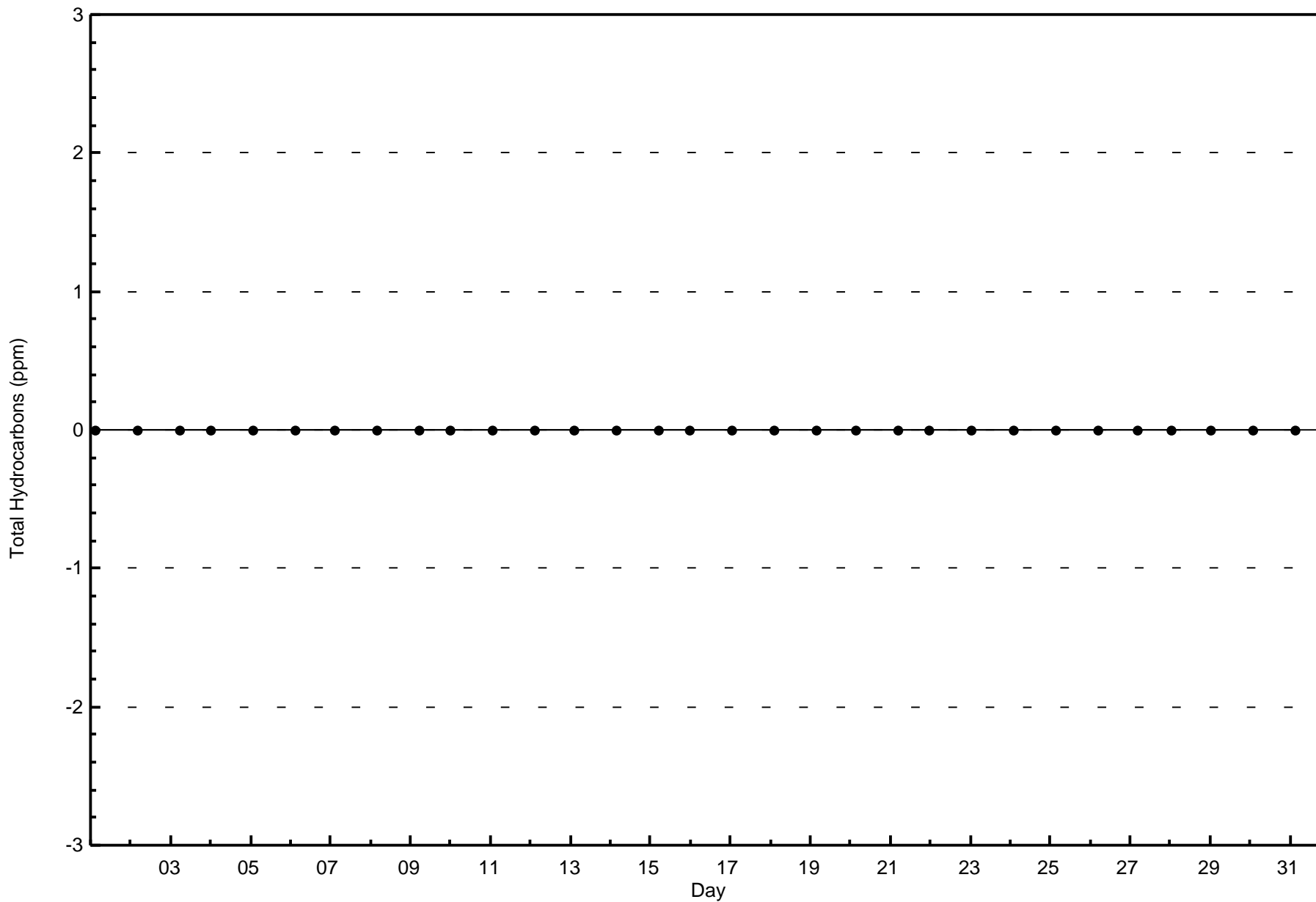


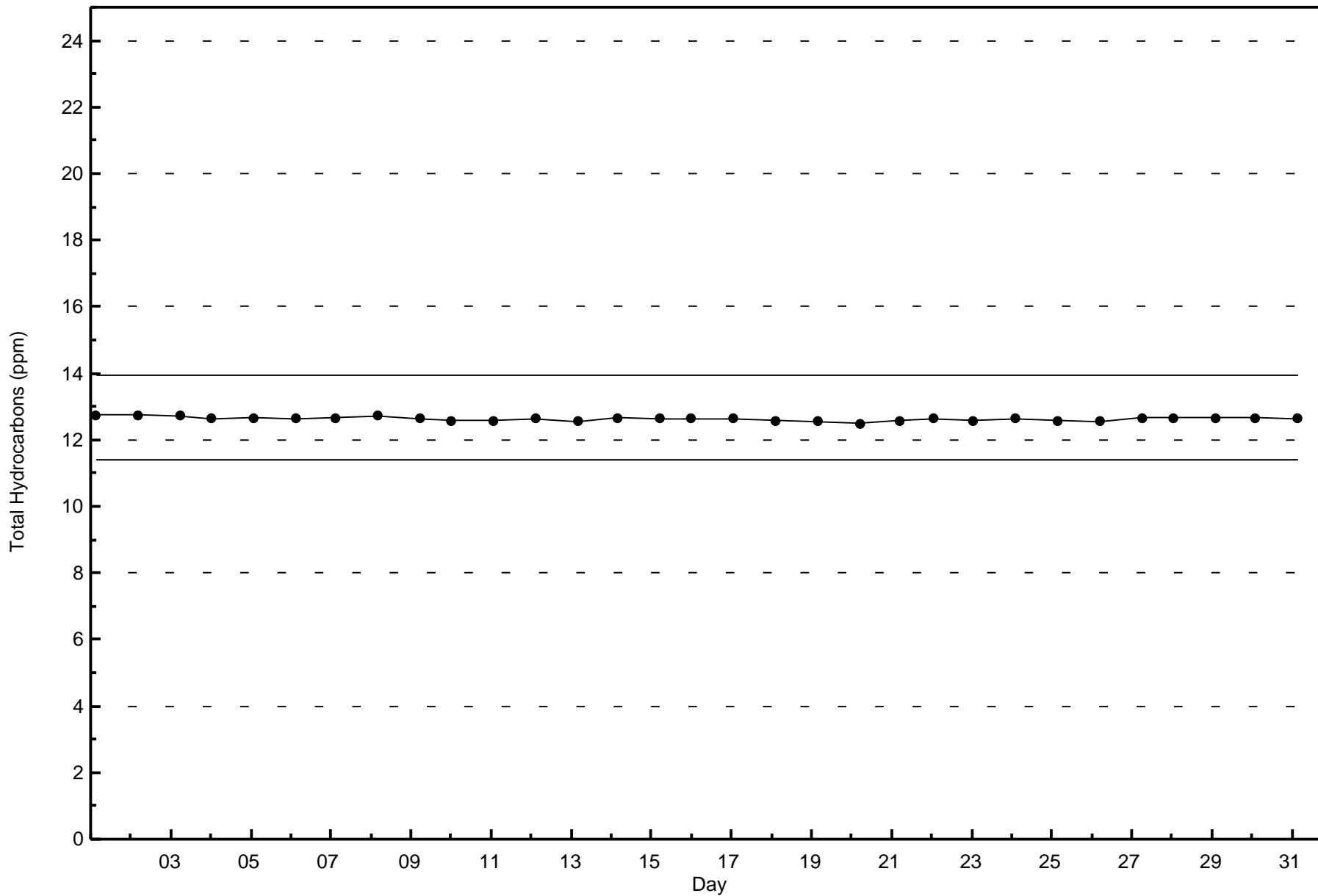
Total Number of Valid Hours: 705



Wood Buffalo Environmental Association
Zero Responses

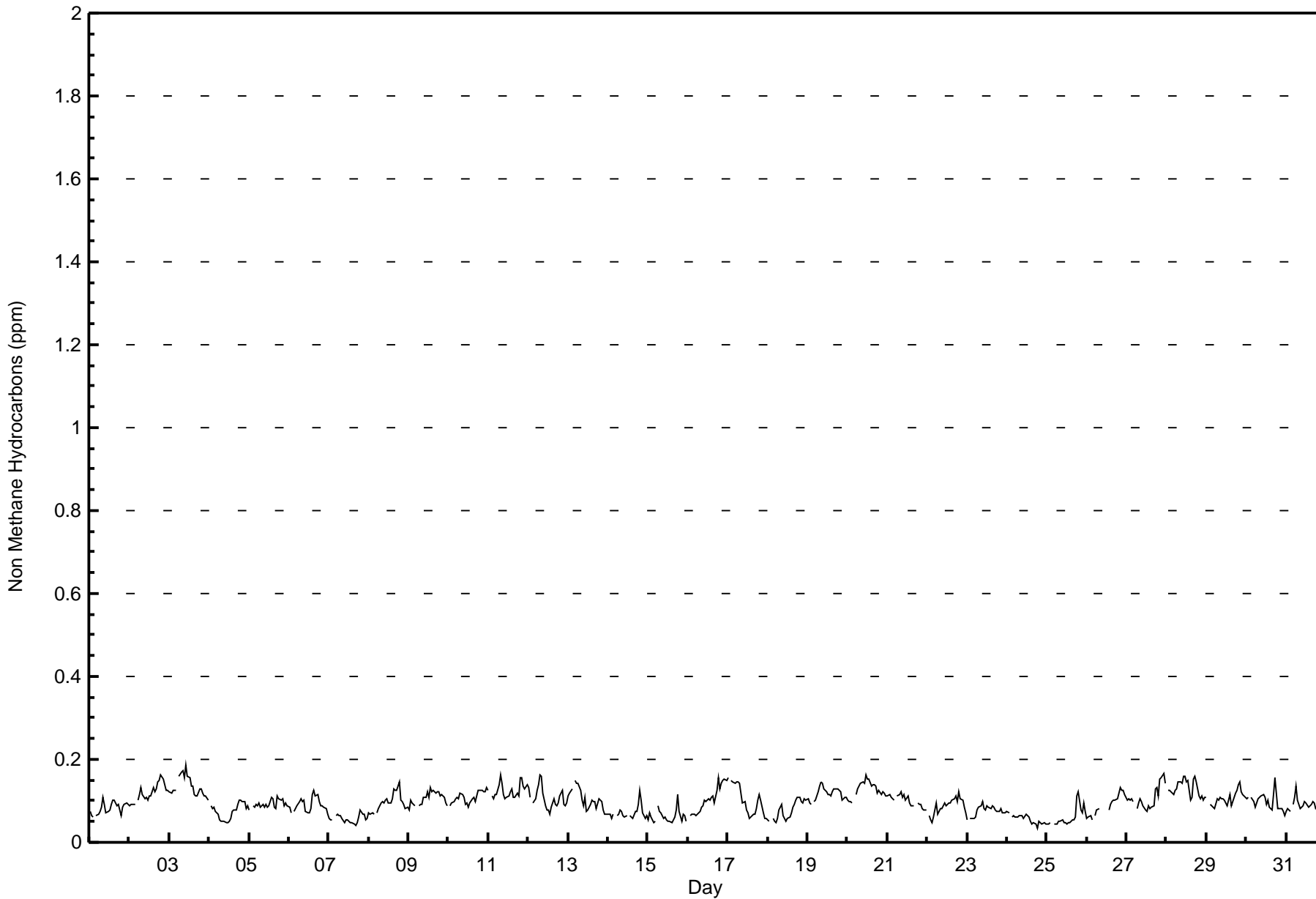
Total Hydrocarbons (THC) - ppm
Stony Mountain - July 2016







Maximum Value: 0.188 ppm on Jul 3 11:00																								Maximum Daily Average: 0.134 ppm on Jul 3																								Hours in Service: 744	
Minimum Value: 0.033 ppm on Jul 24 19:00																								Minimum Daily Average: 0.056 ppm on Jul 24																								Hours of Data: 706	
Maximum Diurnal Average: 0.109 ppm at hour 19																								Minimum Diurnal Average: 0.085 ppm at hour 2																								Hours of Missing Data: 38	
Monthly Average: 0.095 ppm																								Percentiles: P ₁ = 0.0 P ₁₀ = 0.1 Q ₁ = 0.1 Median = 0.1 Q ₃ = 0.1 P ₉₀ = 0.1 P ₉₉ = 0.2																								Hours of Calibration: 36	
																								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-Jul	0.074	0.066	0.061	Z	0.065	0.066	0.075	0.086	0.107	0.093	0.072	0.075	0.079	0.091	0.102	0.100	0.089	0.092	0.079	0.066	0.084	0.093	0.094	0.092	0.083	0.107																							
2-Jul	0.090	0.091	0.092	0.091	Z	0.101	0.116	0.132	0.116	0.107	0.108	0.103	0.112	0.112	0.132	0.121	0.130	0.147	0.148	0.161	0.153	0.140	0.127	0.124	0.120	0.161																							
3-Jul	0.123	0.119	0.125	0.125	0.125	Z	0.159	0.169	0.173	0.155	0.188	0.158	0.154	0.135	0.136	0.116	0.114	0.111	0.129	0.128	0.118	0.113	0.112	0.102	0.134	0.188																							
4-Jul	Z	0.088	0.081	0.085	0.074	0.067	0.055	0.052	0.050	0.051	0.048	0.048	0.050	0.058	0.073	0.079	0.079	0.092	0.103	0.100	0.097	0.097	0.082	0.087	0.074	0.103																							
5-Jul	0.077	Z	0.087	0.086	0.093	0.089	0.093	0.086	0.091	0.086	0.091	0.086	0.087	0.108	0.104	0.085	0.081	0.113	0.105	0.103	0.105	0.088	0.094	0.088	0.092	0.113																							
6-Jul	0.084	0.072	Z	0.076	0.081	0.090	0.099	0.105	0.099	0.100	0.075	0.070	0.073	0.081	0.115	0.126	0.113	0.115	0.099	0.087	0.088	0.083	0.080	0.069	0.090	0.126																							
7-Jul	0.056	0.054	0.054	Z	0.064	0.067	0.063	0.064	0.056	0.047	0.053	0.055	0.051	0.048	0.047	0.046	0.041	0.049	0.061	0.079	0.067	0.068	0.054	0.057	0.057	0.079																							
8-Jul	0.070	0.069	0.072	0.068	Z	0.072	0.083	0.096	0.098	0.095	0.103	0.104	0.094	0.096	0.104	0.128	0.126	0.127	0.145	0.103	0.097	0.092	0.080	0.086	0.096	0.145																							
9-Jul	0.079	0.103	0.095	0.091	0.090	Z	0.090	0.091	0.091	0.108	0.110	0.121	0.108	0.131	0.123	0.125	0.119	0.122	0.121	0.112	0.115	0.107	0.094	0.090	0.106	0.131																							
10-Jul	Z	0.090	0.095	0.099	0.105	0.109	0.106	0.118	0.115	0.108	0.093	0.094	0.086	0.094	0.104	0.108	0.099	0.113	0.126	0.124	0.124	0.124	0.123	0.131	0.108	0.131																							
11-Jul	0.125	Z	0.112	0.106	0.116	0.116	0.140	0.161	0.144	0.116	0.105	0.108	0.113	0.123	0.129	0.108	0.109	0.118	0.113	0.155	0.155	0.136	0.130	0.139	0.125	0.161																							
12-Jul	0.134	0.110	Z	0.095	0.104	0.126	0.139	0.163	0.160	0.120	0.087	0.078	0.078	0.067	0.084	0.106	0.091	0.087	0.095	0.112	0.126	0.091	0.089	0.094	0.106	0.163																							
13-Jul	0.112	0.120	0.129	Z	0.148	0.143	0.144	0.124	0.101	0.088	0.109	0.076	0.080	0.090	0.102	0.098	0.099	0.083	0.106	0.103	0.098	0.079	0.068	0.068	0.103	0.148																							
14-Jul	0.068	0.067	0.059	0.069	Z	0.064	0.067	0.076	0.076	0.063	0.060	0.064	M	0.063	0.061	0.059	0.076	0.074	0.091	0.124	0.101	0.072	0.058	0.063	0.072	0.124																							
15-Jul	0.055	0.072	0.061	0.048	0.050	Z	0.087	0.074	0.070	0.056	0.061	0.054	0.052	0.052	0.047	0.056	0.061	0.077	0.115	0.076	0.049	0.067	0.065	0.050	0.063	0.115																							
16-Jul	Z	0.064	0.068	0.069	0.068	0.065	0.068	0.076	0.084	0.089	0.100	0.099	0.104	0.103	0.110	0.112	0.096	0.126	0.155	0.128	0.142	0.151	0.152	0.148	0.103	0.155																							
17-Jul	0.155	Z	0.149	0.145	0.141	0.144	0.145	0.142	0.118	0.096	0.099	0.078	0.070	0.058	0.061	0.069	0.069	0.081	0.102	0.114	0.103	0.070	0.058	0.059	0.101	0.155																							
18-Jul	0.056	0.052	Z	0.058	0.050	0.048	0.057	0.079	0.093	0.064	0.059	0.052	0.059	0.061	0.070	0.085	0.090	0.102	0.107	0.108	0.099	0.097	0.104	0.101	0.076	0.108																							
19-Jul	0.106	0.096	0.090	Z	0.099	0.101	0.121	0.137	0.146	0.141	0.128	0.123	0.116	0.116	0.113	0.120	0.130	0.130	0.128	0.124	0.123	0.103	0.108	0.107	0.118	0.146																							
20-Jul	0.101	0.100	0.097	0.095	Z	0.117	0.129	0.136	0.143	0.144	0.142	0.162	0.152	0.151	0.137	0.139	0.139	0.135	0.120	0.127	0.115	0.124	0.118	0.113	0.128	0.162																							
21-Jul	0.113	0.114	0.108	0.104	0.101	Z	0.113	0.116	0.121	0.109	0.114	0.103	0.114	0.094	0.087	0.088	0.089	M	0.096	0.092	0.091	0.083	0.078	0.079	0.100	0.121																							
22-Jul	Z	0.064	0.056	0.049	0.061	0.095	0.068	0.076	0.081	0.082	0.094	0.089	0.090	0.094	0.096	0.101	0.105	0.113	0.097	0.121	0.104	0.103	0.085	0.071	0.087	0.121																							
23-Jul	0.053	Z	0.057	0.059	0.056	0.061	0.077	0.084	0.089	0.097	0.083	0.077	0.087	0.084	0.083	0.087	0.086	0.076	0.076	0.076	0.083	0.071	0.071	0.070	0.076	0.097																							
24-Jul	0.076	0.073	Z	0.062	0.063	0.062	0.062	0.064	0.065	0.064	0.059	0.066	0.066	0.061	0.051	0.045	0.048	0.043	0.033	0.050	0.046	0.046	0.049	0.044	0.056	0.076																							
25-Jul	0.043	0.045	0.046	Z	0.044	0.045	0.043	0.052	0.052	0.056	0.047	0.048	0.045	0.049	0.048	0.056	0.054	0.061	0.113	0.124	0.078	0.073	0.097	0.073	0.060	0.124																							
26-Jul	0.058	0.060	0.063	0.053	Z	0.065	0.079	0.083	C	C	C	C	C	0.078	0.090	0.099	0.101	0.100	0.105	0.119	0.131	0.125	0.126	0.116	0.092	0.131																							
27-Jul	0.101	0.107	0.102	0.106	0.097	Z	0.081	0.094	0.107	0.100	0.089	0.077	0.076	0.087	0.083	0.086	0.088	0.128	0.133	0.113	0.153	0.157	0.166	0.143	0.108	0.166																							
28-Jul	Z	0.125	0.124	0.118	0.116	0.127	0.127	0.145	0.147	0.143	0.159	0.160	0.146	0.148	0.101	0.109	0.152	0.160	0.147	0.110	0.104	0.112	0.103	0.108	0.130	0.160																							
29-Jul	0.109	Z	0.093	0.087	0.084	0.080	0.106	0.103	0.107	0.105	0.104	0.103	0.088	0.103	0.116	0.088	0.099	0.118	0.124	0.140	0.145	0.122	0.114	0.107	0.106	0.145																							
30-Jul	0.105	0.108	Z	0.109	0.097	0.086	0.094	0.105	0.110	0.112	0.114	0.109	0.090	0.102	0.084	0.078	0.116	0.154	0.117	0.080	0.080	0.082	0.074	0.064	0.099	0.154																							
31-Jul	0.074	0.080	0.074	Z	0.091	0.109	0.136	0.102	0.081	0.083	0.088	0.099	0.096	0.085	0.088	0.092	0.098	0.094	0.083	0.083	0.075	0.073	0.071	0.073	0.088	0.136																							
																								Diurnal Average																									
																								Diurnal Maximum																									
Z - zerospan C - Calibration M - Maintenance																																																	





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm
Stony Mountain - July 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 0.005	0	0.00	0.00
0.006 - 0.05	58	8.22	8.22
0.06 - 0.1	619	87.68	95.89
> 0.1	29	4.11	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 - July 2016**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 0.005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.006 - 0.05	0	1	1	0	0	0	0	1	0	0	6	1	19	14	7	8	58
0.06 - 0.1	25	36	42	36	18	14	19	14	13	61	57	54	73	76	46	34	618
> 0.1	1	2	5	0	2	1	2	1	1	0	2	4	0	2	3	3	29
Totals	26	39	48	36	20	15	21	16	14	61	65	59	92	92	56	45	705

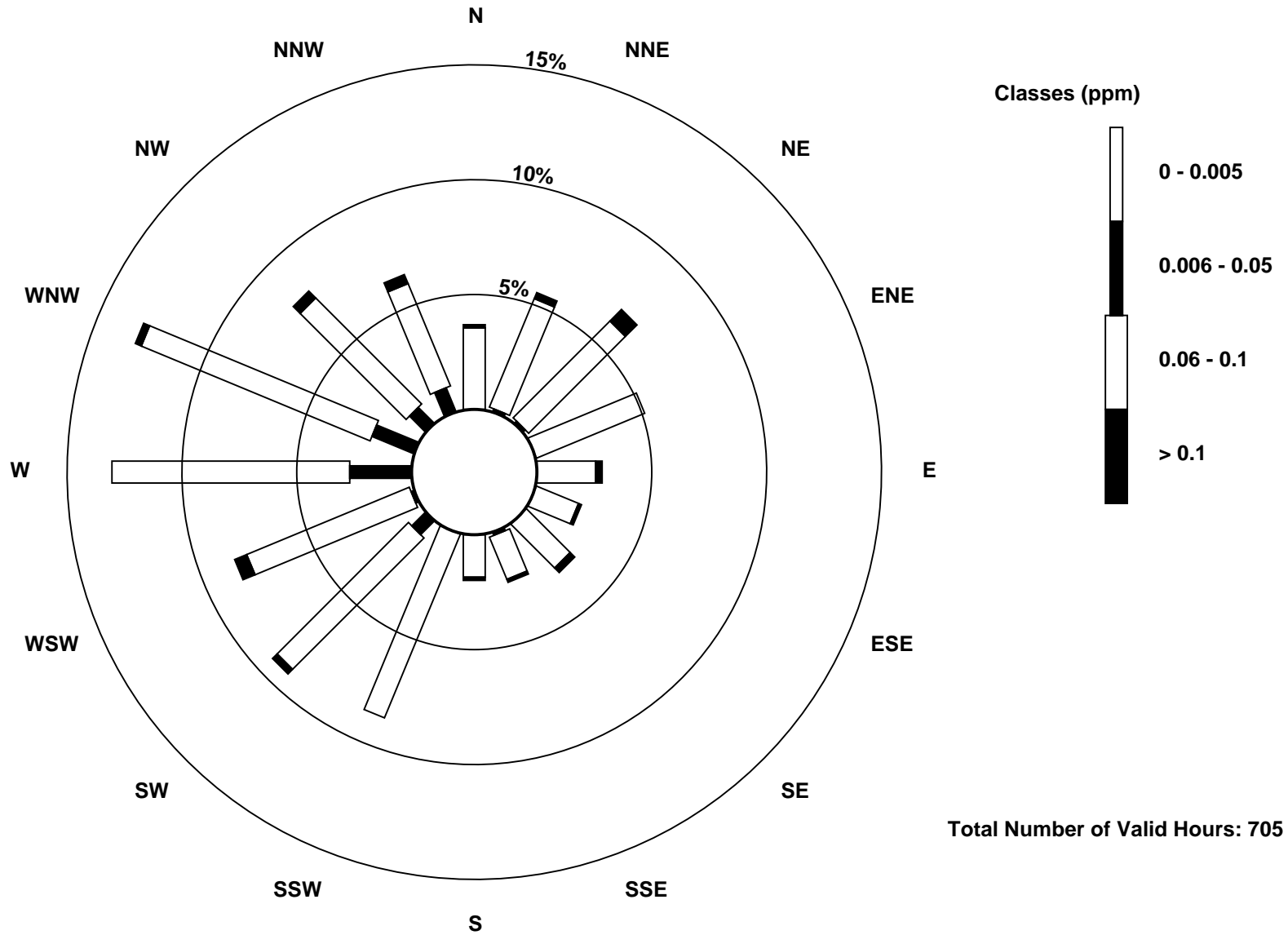
Total Number of Valid Hours: 705

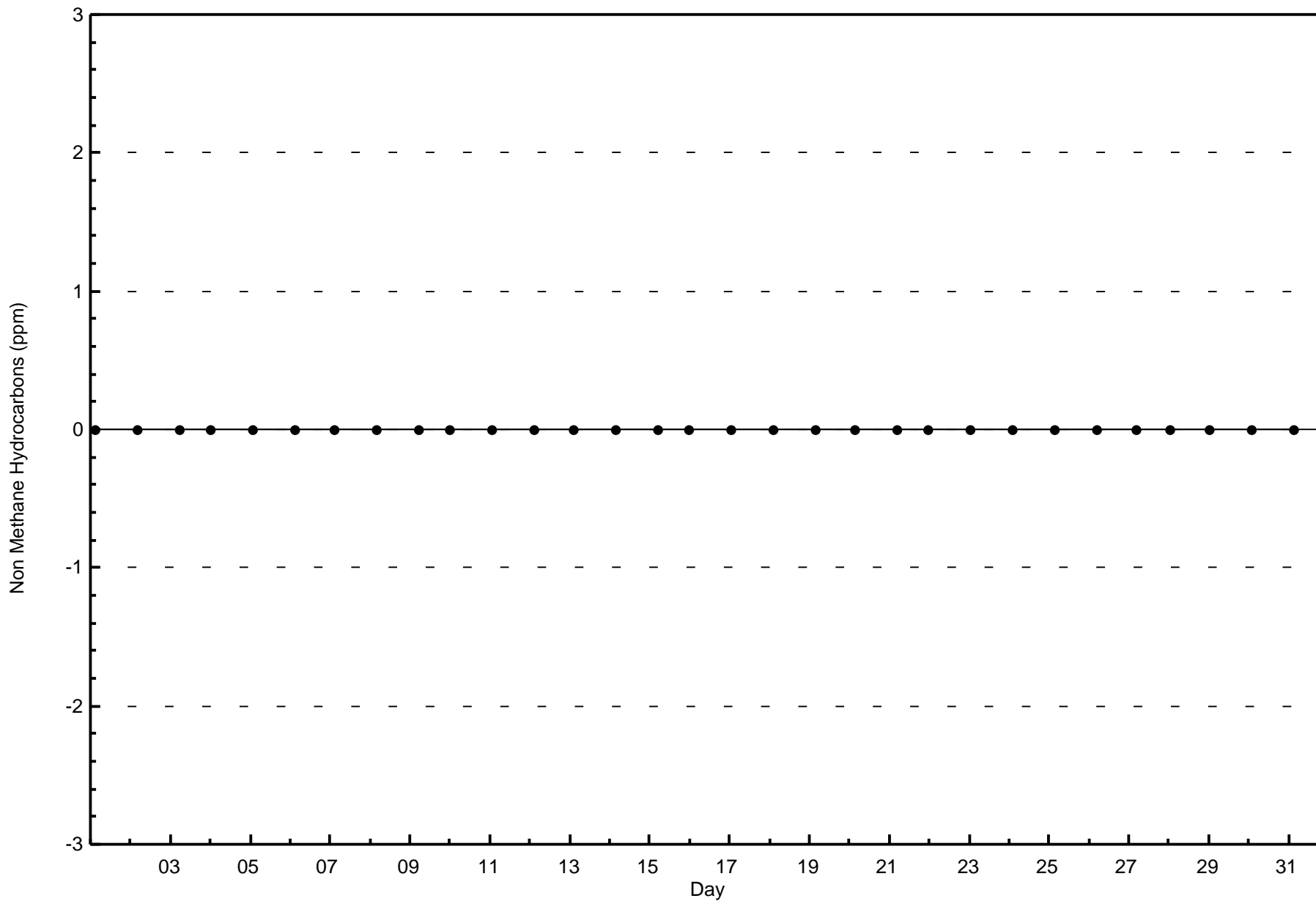
Total Number of Hours: 744

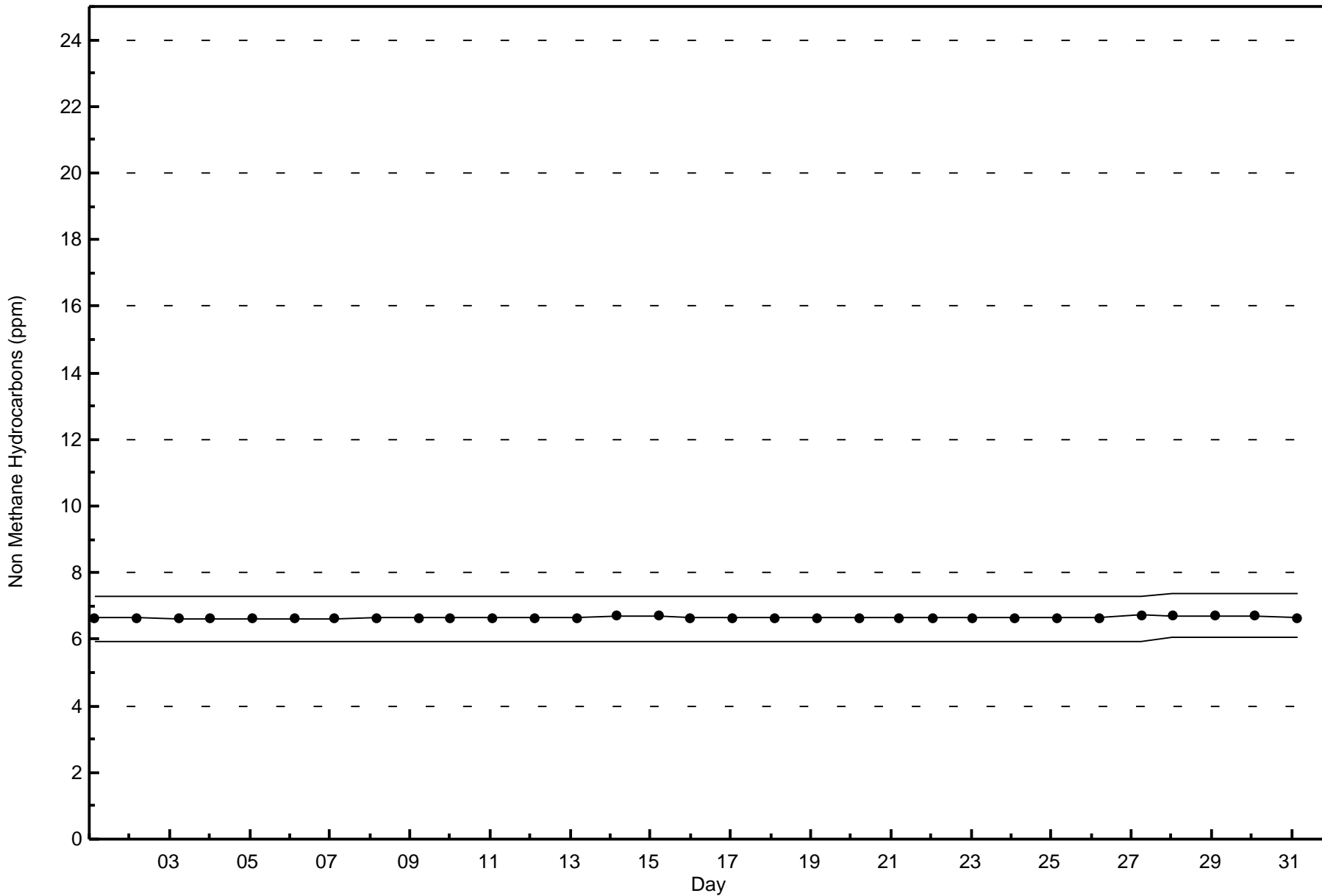


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Non Methane Hydrocarbons (NMHC) - ppm
Stony Mountain (AMS 18)









Wood Buffalo Environmental Association

Summary of Hour Averages

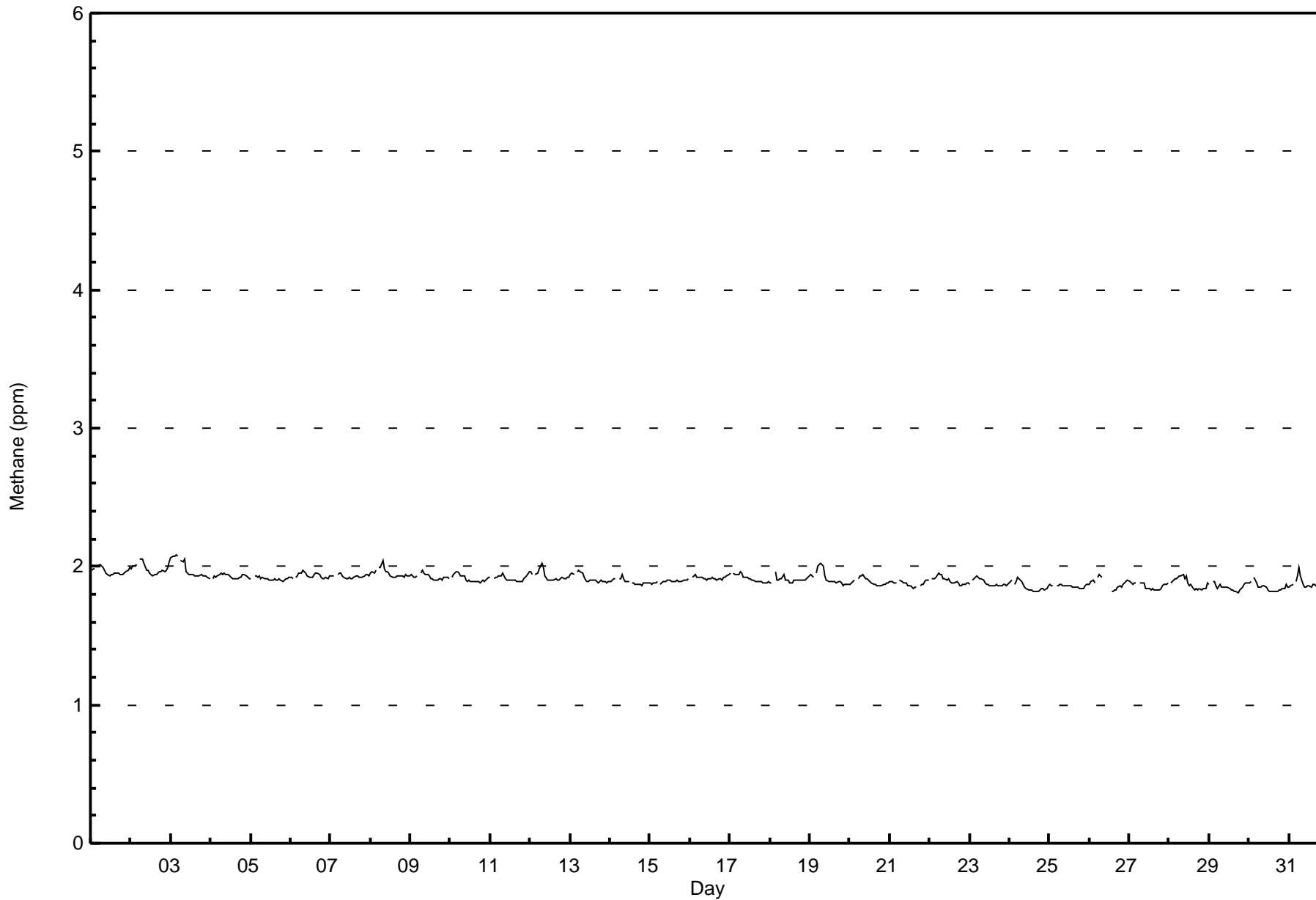
Methane (CH₄) - ppm
Stony Mountain - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0																			Hours in Service: 744									
Maximum Value: 2.1 ppm on Jul 3 04:00																			Maximum Daily Average: 2.0 ppm on Jul 2					Hours of Data: 706				
Minimum Value: 1.8 ppm on Jul 29 18:00																			Minimum Daily Average: 1.8 ppm on Jul 30					Hours of Missing Data: 38				
Maximum Diurnal Average: 1.9 ppm at hour 7																			Minimum Diurnal Average: 1.9 ppm at hour 17					Hours of Calibration: 36				
Monthly Average: 1.91 ppm																			Percentiles: P ₁ = 1.8 P ₁₀ = 1.9 Q ₁ = 1.9 Median = 1.9 Q ₃ = 1.9 P ₉₀ = 2.0 P ₉₉ = 2.1					Percent Operational Time: 99.7				
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24				
1-Jul	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
2-Jul	2.0	2.0	2.0	2.0	Z	2.0	2.1	2.1	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
3-Jul	2.1	2.1	2.1	2.1	2.1	Z	2.0	2.0	2.1	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
4-Jul	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
5-Jul	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
6-Jul	1.9	1.9	Z	1.9	1.9	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
7-Jul	1.9	1.9	1.9	Z	1.9	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	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-Jul	1.9	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
9-Jul	1.9	1.9	1.9	1.9	1.9	Z	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
10-Jul	Z	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	1.9	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-Jul	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	2.0
12-Jul	2.0	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
13-Jul	1.9	2.0	1.9	Z	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
14-Jul	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	M	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
15-Jul	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
16-Jul	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
17-Jul	2.0	Z	2.0	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	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0
18-Jul	1.9	1.9	Z	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0
19-Jul	1.9	1.9	1.9	Z	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0
20-Jul	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
21-Jul	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	1.8	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
22-Jul	Z	1.9	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0
23-Jul	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
24-Jul	1.9	1.9	Z	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	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9
25-Jul	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	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9
26-Jul	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	C	C	C	C	C	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
27-Jul	1.9	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9
28-Jul	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	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9
29-Jul	1.9	Z	1.9	1.9	1.9	1.8	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	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9
30-Jul	1.9	1.9	Z	1.9	1.9	1.8	1.9	1.9	1.9	1.9	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9
31-Jul	1.9	1.9	1.9	Z	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.8	1.9	1.9	1.9	1.9	1.8	1.8	1.8	1.8	1.9	1.9	1.9	1.9	1.9	1.9	2.0
1.9																								Diurnal Average				
2.1																								Diurnal Maximum				
Z - zerospan		C - Calibration				M - Maintenance																						



Wood Buffalo Environmental Association
Hourly Averages

Methane (CH₄) - ppm
Stony Mountain - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Methane (CH₄) - ppm
Stony Mountain - July 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	698	98.87	98.87
2.1 - 3.0	8	1.13	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 (CH₄) - ppm
Stony Mountain - July 2016**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	26	39	47	36	20	15	20	15	13	57	65	59	92	92	56	45	697
2.1 - 3.0	0	0	1	0	0	0	1	1	1	4	0	0	0	0	0	0	8
3.1 - 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	26	39	48	36	20	15	21	16	14	61	65	59	92	92	56	45	705

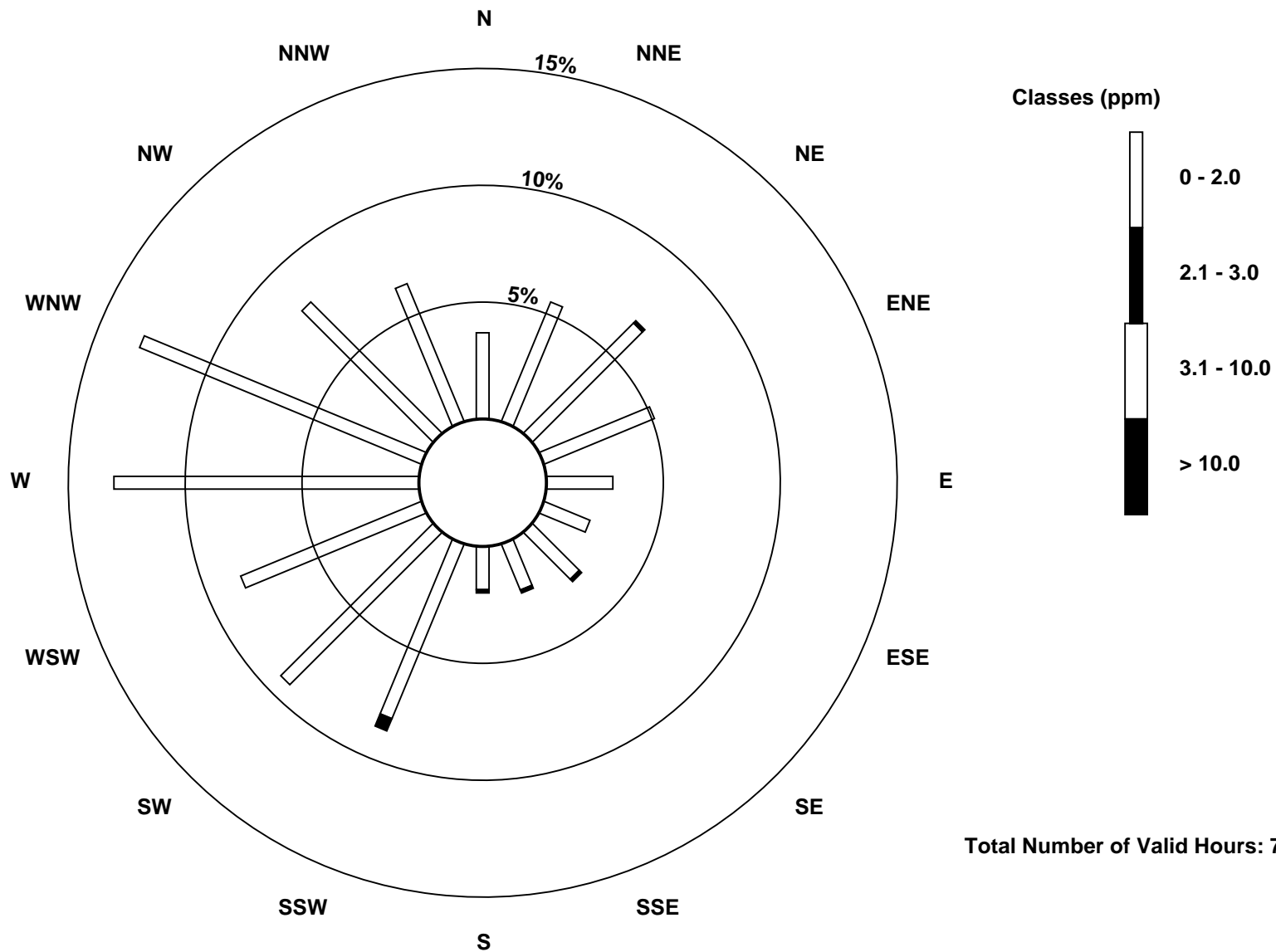
Total Number of Valid Hours: 705

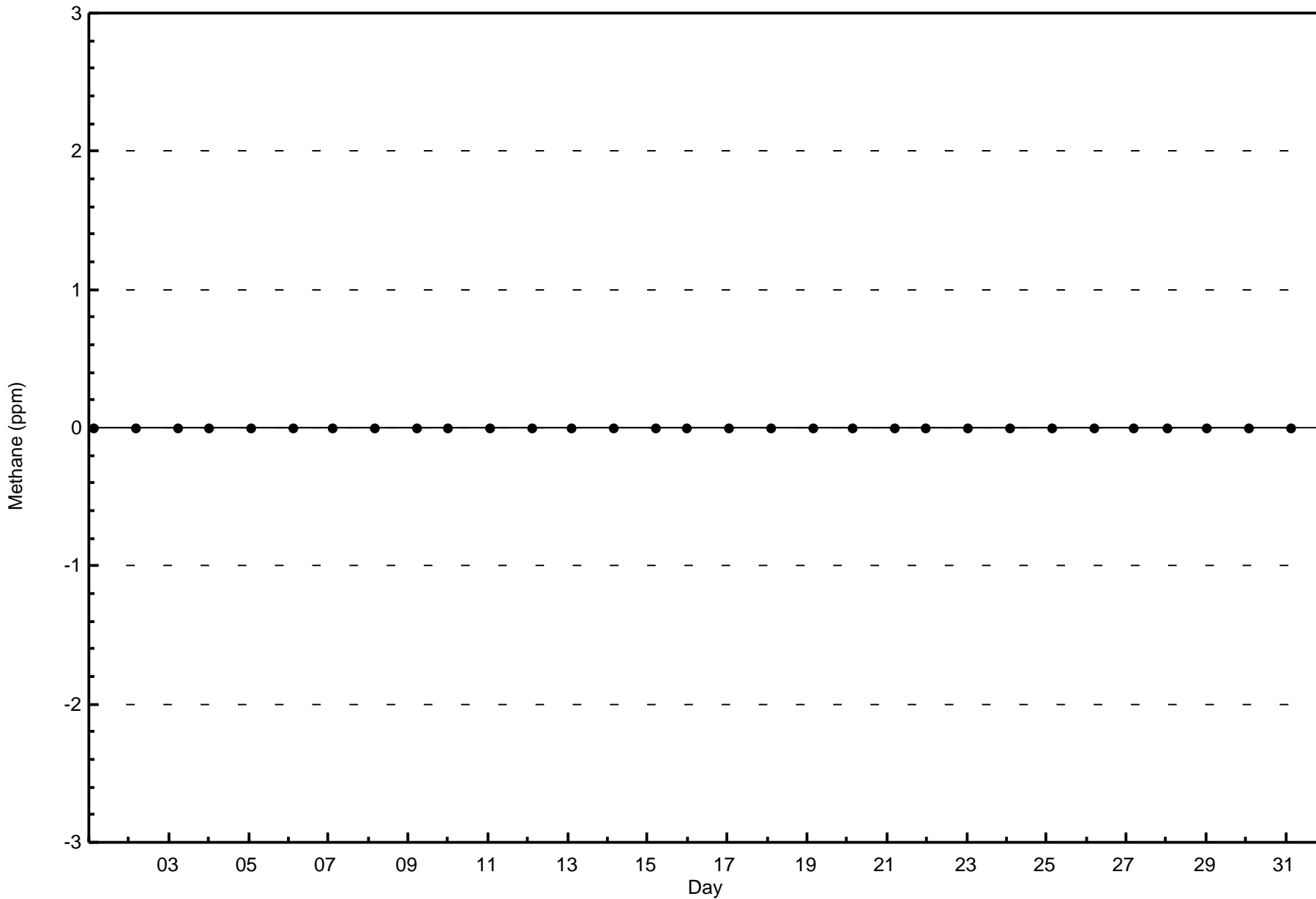
Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

Methane (CH₄) - ppm
Stony Mountain (AMS 18)

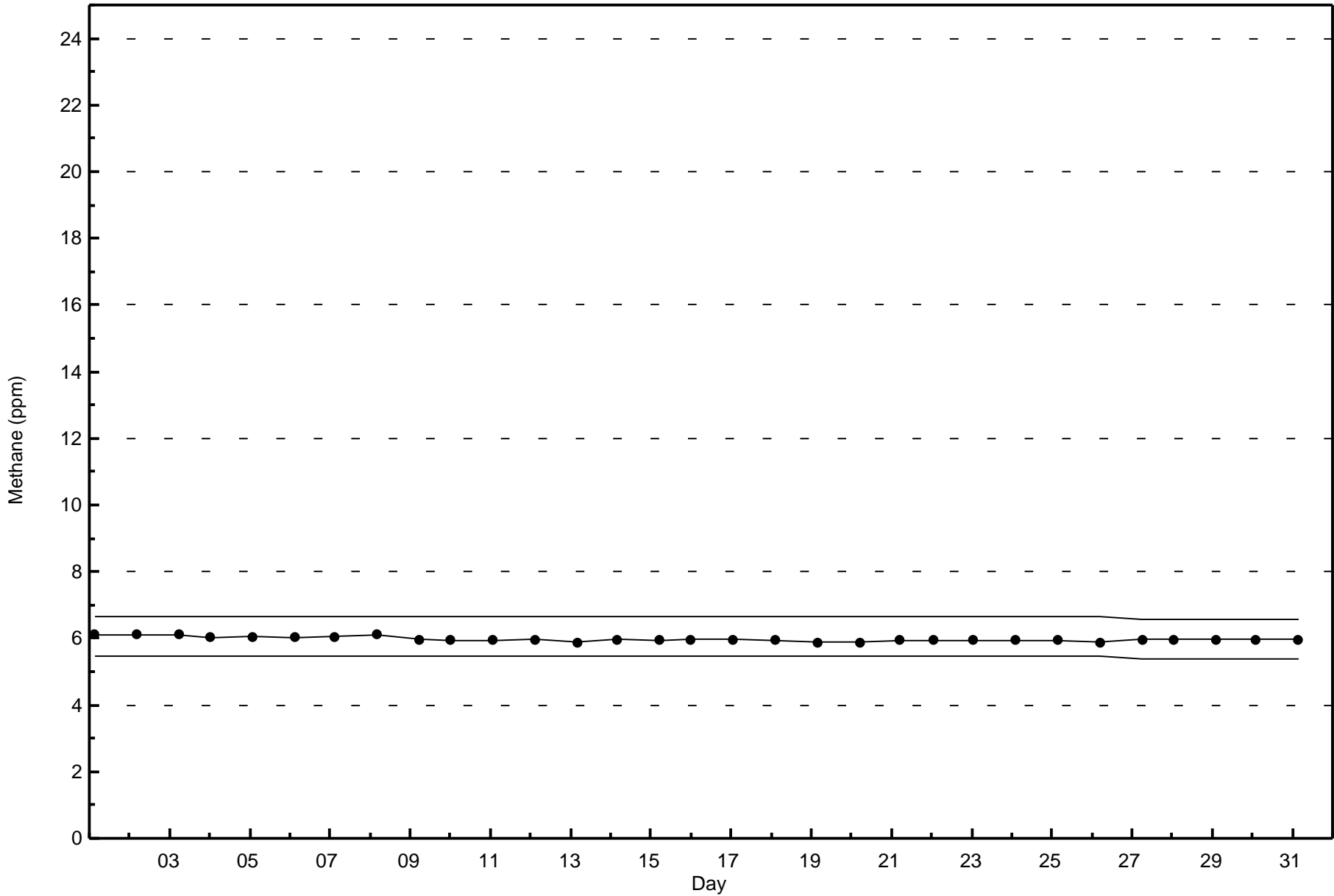






Wood Buffalo Environmental Association
Span Responses

Methane (CH₄) - ppm
Stony Mountain - July 2016





Wood Buffalo Environmental Association
Summary of Hour Averages

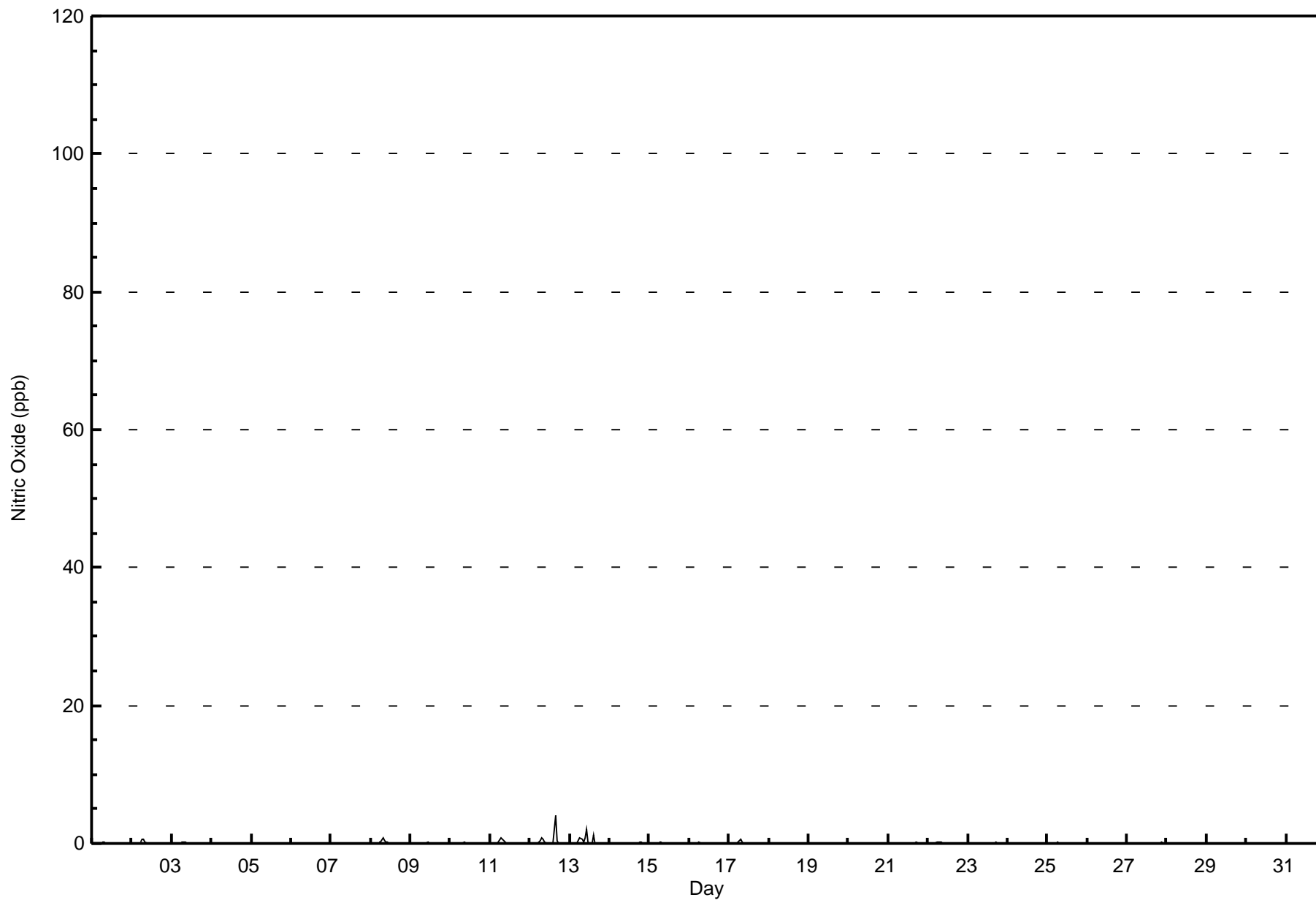
Nitric Oxide (NO) - ppb
Stony Mountain - July 2016

Maximum Value: 4 ppb on Jul 12 16:00 Maximum Daily Average: 0.3 ppb on Jul 12																	Hours in Service: 744 Hours of Data: 707 Hours of Missing Data: 37 Hours of Calibration: 36 Percent Operational Time: 99.9																																	
Minimum Value: 0 ppb on Jul 1 01:00 Minimum Daily Average: 0.0 ppb on Jul 29 Maximum Diurnal Average: 0.2 ppb at hour 8 Minimum Diurnal Average: 0.0 ppb at hour 1 Monthly Average: 0.0 ppb Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 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-Jul	0	0	0	Z	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-Jul	0	0	0	0	Z	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1																							
3-Jul	0	0	0	0	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-Jul	Z	0	0	0	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-Jul	0	Z	0	0	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-Jul	0	0	Z	0	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-Jul	0	0	0	Z	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-Jul	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	0.1	1																							
9-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0																							
10-Jul	Z	0	0	0	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-Jul	0	Z	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1																							
12-Jul	0	0	Z	0	0	0	0	1	1	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0.3	4																							
13-Jul	0	0	0	Z	0	0	1	1	0	1	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.3	2																							
14-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	M	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0																							
15-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0																							
16-Jul	Z	0	0	0	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-Jul	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	0.1	1																							
18-Jul	0	0	Z	0	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-Jul	0	0	0	Z	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-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0																							
21-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0																							
22-Jul	Z	0	0	0	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-Jul	0	Z	0	0	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-Jul	0	0	Z	0	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-Jul	0	0	0	Z	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-Jul	0	0	0	0	Z	0	0	0	C	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0																							
27-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0																							
28-Jul	Z	0	0	0	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-Jul	0	Z	0	0	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-Jul	0	0	Z	0	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-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0																							
																								0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Diurnal Average
																								0	0	0	0	0	0	1	1	1	1	2	0	0	0	1	4	0	0	0	0	0	0	0	0	0	0	Diurnal Maximum
Z - zerospan C - Calibration M - Maintenance																																																		



Wood Buffalo Environmental Association
Hourly Averages

Nitric Oxide (NO) - ppb
Stony Mountain - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitric Oxide (NO) - ppb
Stony Mountain - July 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	707	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitric Oxide (NO) - ppb
Stony Mountain - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	26	39	48	36	20	15	21	16	14	61	65	59	92	93	56	45	706
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	26	39	48	36	20	15	21	16	14	61	65	59	92	93	56	45	706

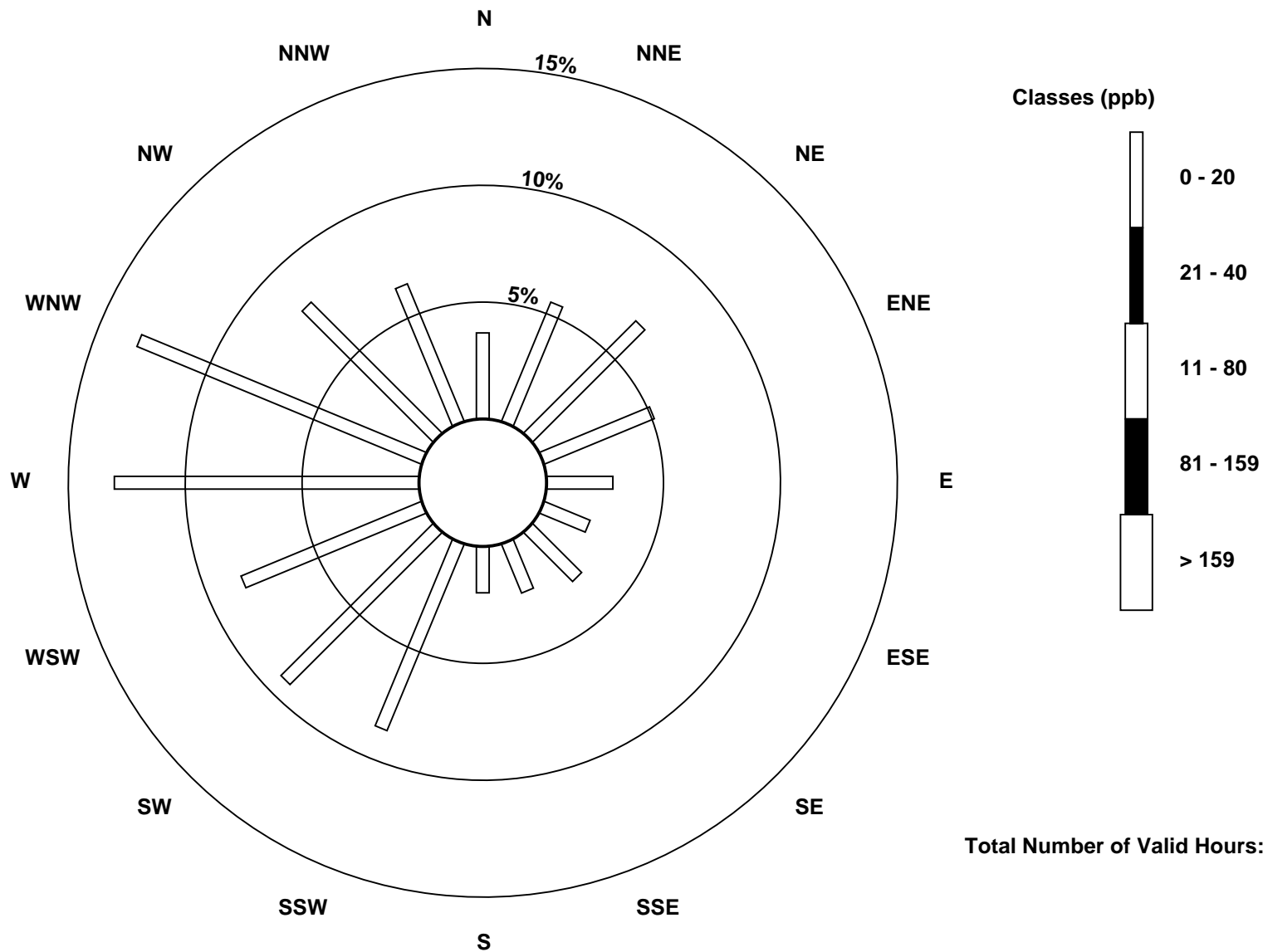
Total Number of Valid Hours: 706

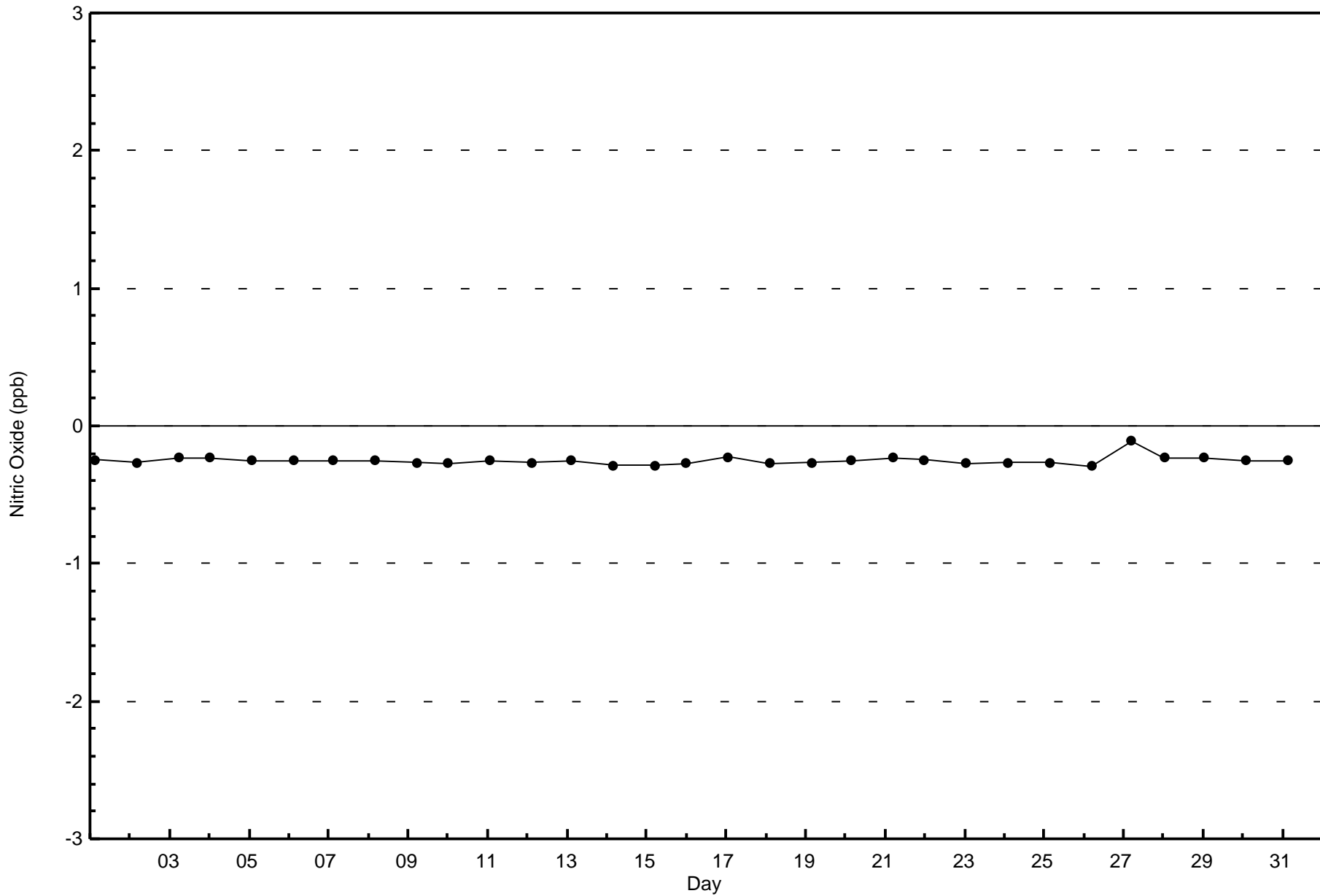
Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

Nitric Oxide (NO) - ppb
Stony Mountain (AMS 18)

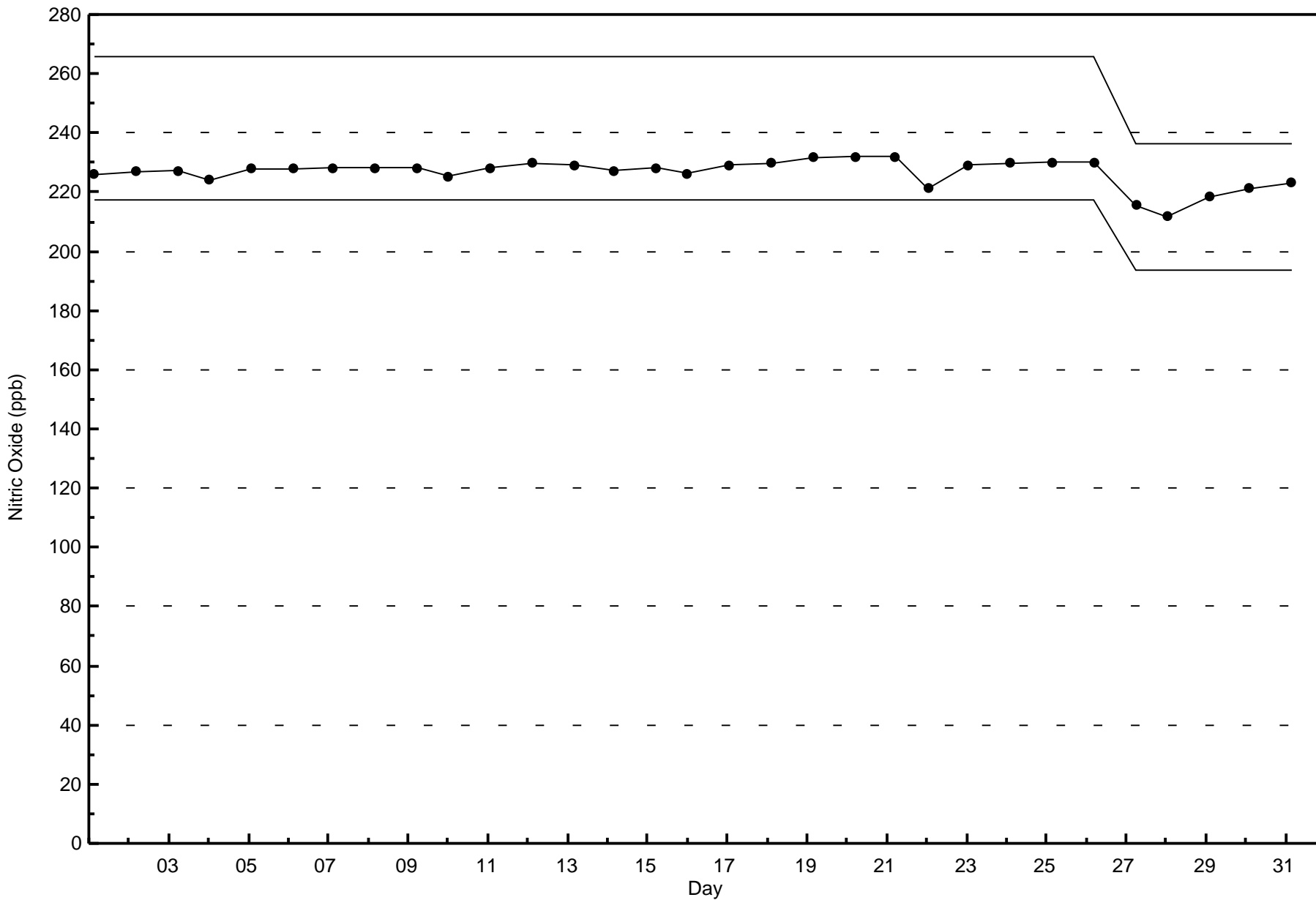






Wood Buffalo Environmental Association
Span Responses

Nitric Oxide (NO) - ppb
Stony Mountain - July 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

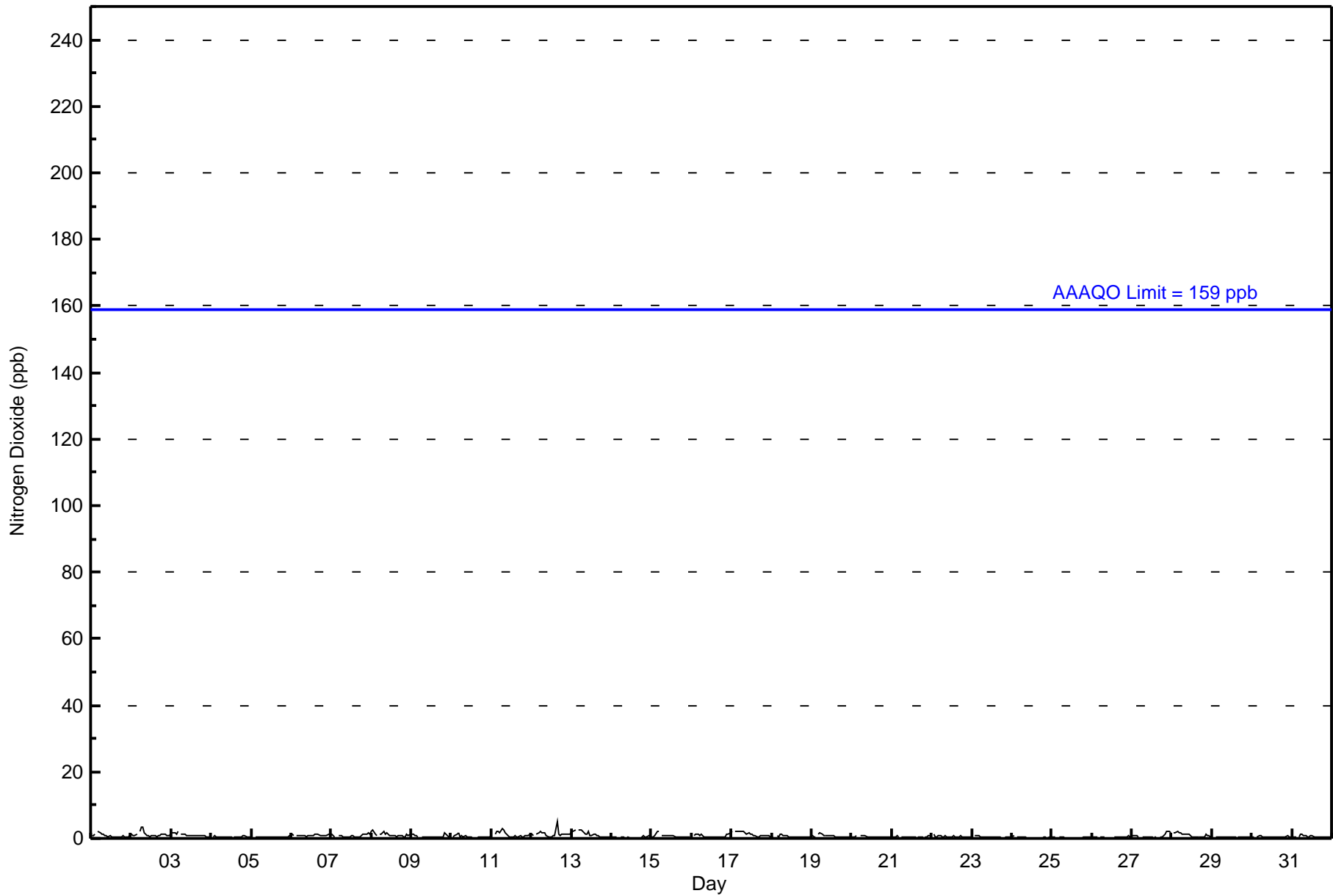
Stony Mountain - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 5 ppb on Jul 12 16:00 Maximum Daily Average: 1.4 ppb on Jul 12																	Hours in Service: 744 Hours of Data: 707																																
Minimum Value: 0 ppb on Jul 24 14:00 Minimum Daily Average: 0.3 ppb on Jul 24 Maximum Diurnal Average: 1.1 ppb at hour 5 Minimum Diurnal Average: 0.5 ppb at hour 17 Monthly Average: 0.7 ppb Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 1 P ₉₀ = 1 P ₉₉ = 3																	Hours of Missing Data: 37 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-Jul	1	1	1	Z	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	2																							
2-Jul	1	1	1	1	Z	2	3	3	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.2	3																							
3-Jul	2	2	2	1	2	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1.0	2																							
4-Jul	Z	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0.4	1																							
5-Jul	0	Z	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.4	1																							
6-Jul	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1																							
7-Jul	1	1	0	Z	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	2	1	0.8	2																							
8-Jul	2	3	1	1	Z	1	1	2	1	2	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1.1	3																							
9-Jul	1	1	1	1	1	Z	1	1	1	0	1	0	1	0	1	0	0	1	0	0	2	1	1	1	0.6	2																							
10-Jul	Z	1	1	1	2	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.5	2																							
11-Jul	1	Z	1	2	2	2	3	3	2	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1.1	3																							
12-Jul	1	1	Z	1	2	2	2	2	2	1	0	1	1	1	1	5	1	1	1	1	1	1	1	1	1.4	5																							
13-Jul	2	2	3	Z	3	3	3	2	1	1	2	1	1	1	1	1	1	1	0	1	1	0	1	1	1.3	3																							
14-Jul	0	1	0	0	Z	0	0	0	0	0	0	0	M	0	0	0	0	0	1	1	0	1	1	1	0.4	1																							
15-Jul	0	0	1	2	2	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	2																							
16-Jul	Z	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	2	0.7	2																							
17-Jul	2	Z	2	2	2	2	2	2	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1.3	2																							
18-Jul	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																							
19-Jul	1	1	1	Z	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0	0.7	2																							
20-Jul	0	1	1	1	Z	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1																							
21-Jul	1	1	1	1	0	Z	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	1	0.5	1																							
22-Jul	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0.6	1																							
23-Jul	0	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.4	1																							
24-Jul	0	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1																							
25-Jul	0	1	1	Z	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.3	1																							
26-Jul	0	0	1	0	Z	1	1	1	C	C	C	C	C	0	0	0	0	0	1	1	1	1	1	1	0.5	1																							
27-Jul	1	1	1	1	1	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	2	2	2	0.7	2																							
28-Jul	Z	2	2	2	2	2	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1.0	2																							
29-Jul	1	Z	1	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1																							
30-Jul	0	0	Z	1	1	1	1	1	1	1	1	0	0	1	0	0	0	0	1	1	1	1	1	0	0.5	1																							
31-Jul	0	0	0	Z	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.5	1																							
																								0.9	0.9	0.9	1.0	1.1	1.1	1.0	0.9	0.8	0.7	0.6	0.5	0.5	0.5	0.5	0.6	0.5	0.5	0.5	0.5	0.6	0.6	0.7	0.7	0.8	Diurnal Average
																								2	3	3	2	3	3	3	3	2	2	2	1	1	1	1	5	1	1	1	1	1	2	2	2	2	Diurnal Maximum
Z - zerospan C - Calibration M - Maintenance Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb																																																	



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Stony Mountain - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Stony Mountain - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	707	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Stony Mountain - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	26	39	48	36	20	15	21	16	14	61	65	59	92	93	56	45	706
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	26	39	48	36	20	15	21	16	14	61	65	59	92	93	56	45	706

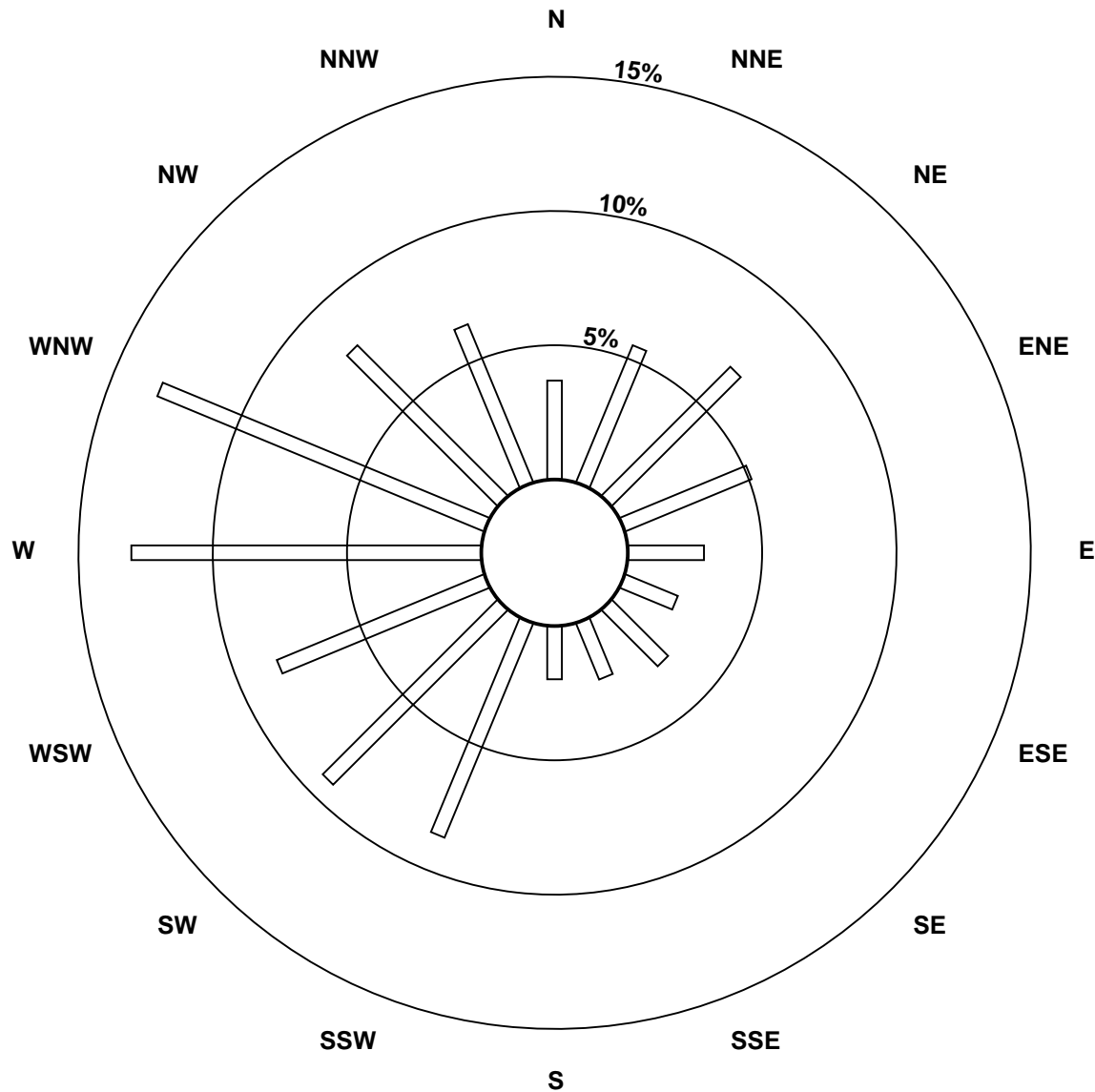
Total Number of Valid Hours: 706

Total Number of Hours: 744

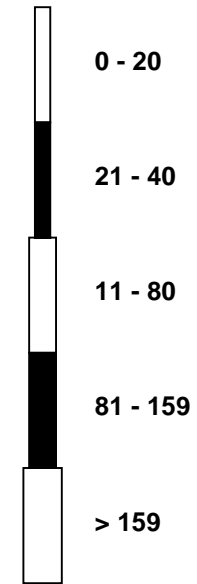


Wood Buffalo Environmental Association
Wind Rose Jul 2016

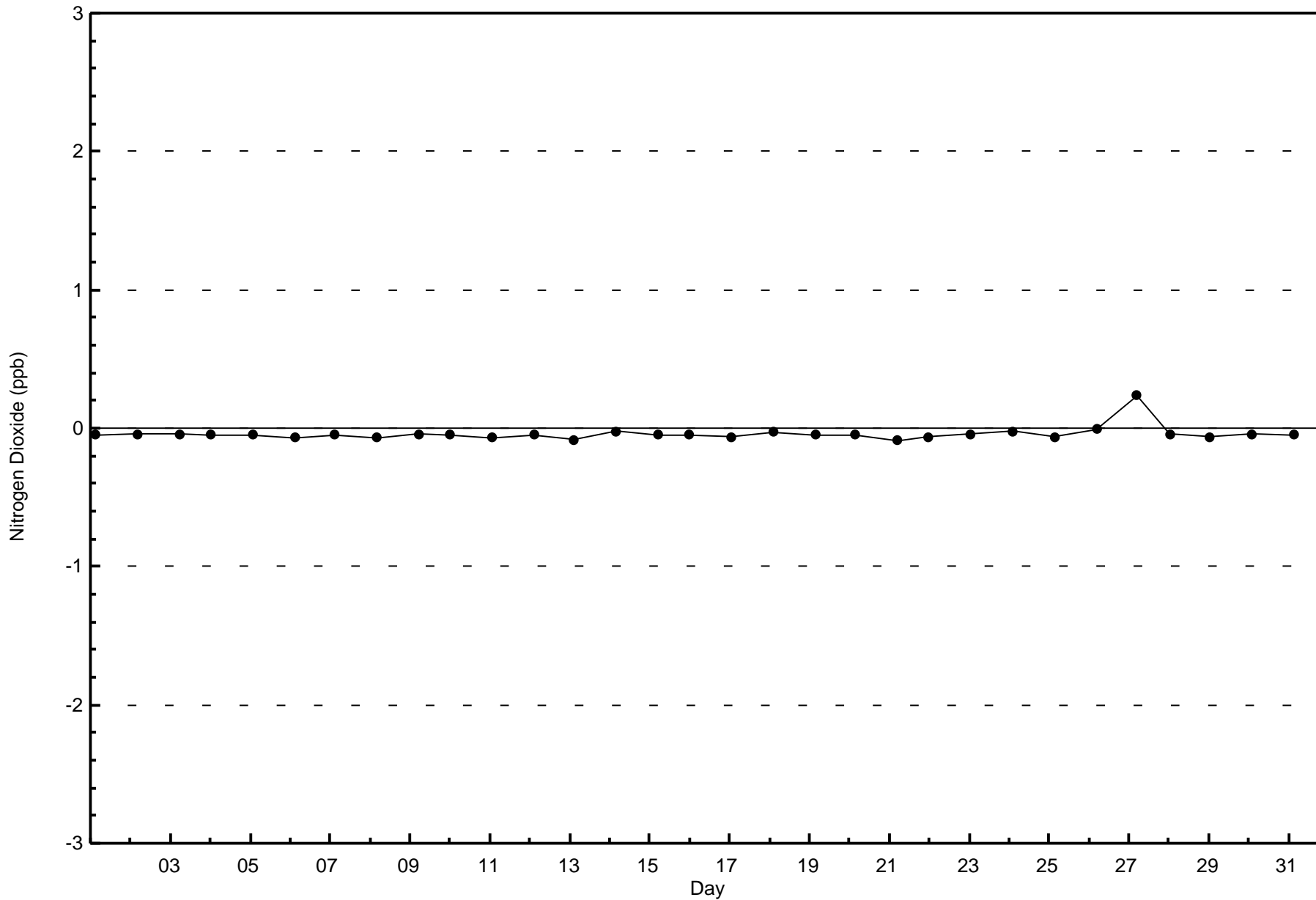
Nitrogen Dioxide (NO₂) - ppb
Stony Mountain (AMS 18)

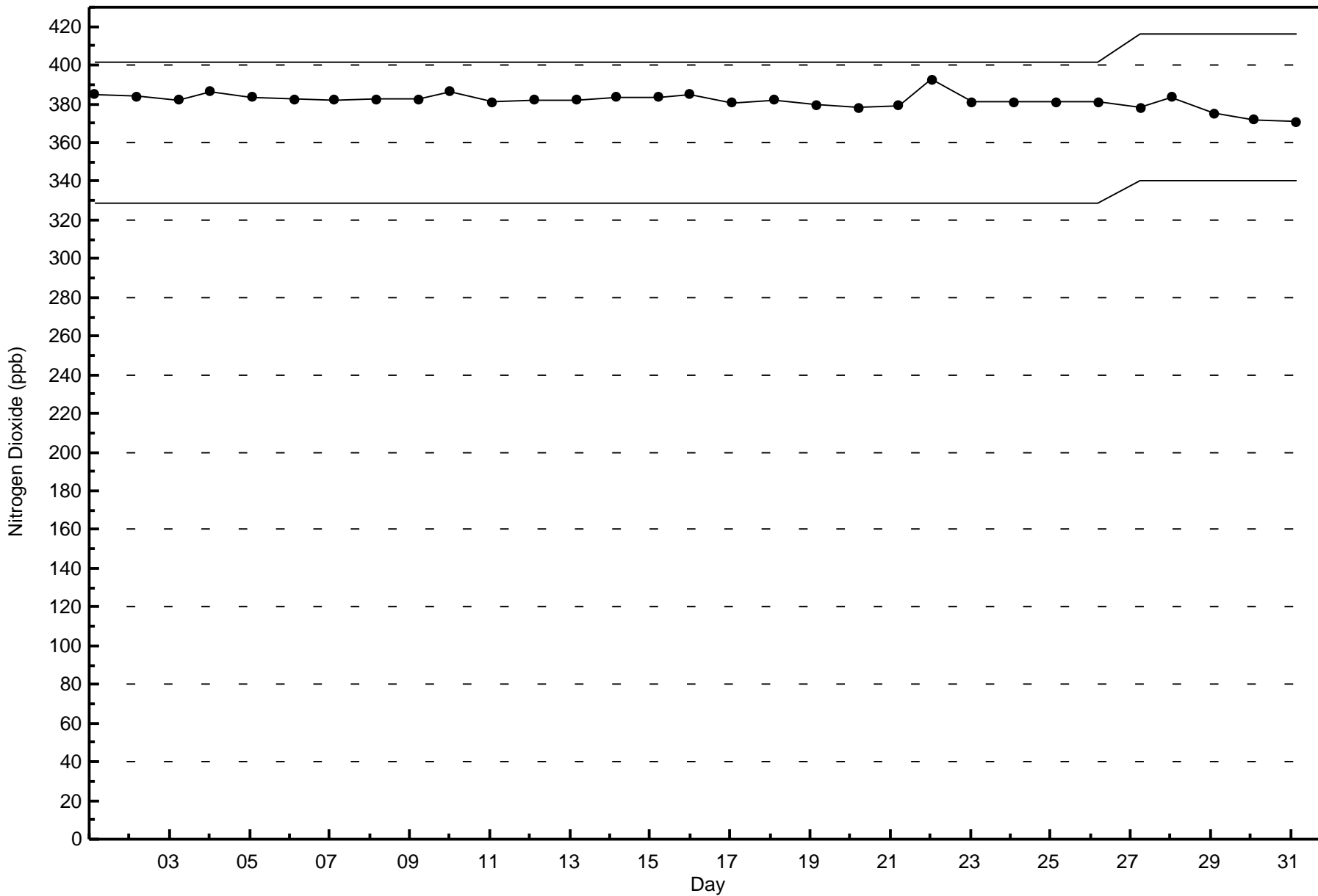


Classes (ppb)



Total Number of Valid Hours: 706







Wood Buffalo Environmental Association
Summary of Hour Averages

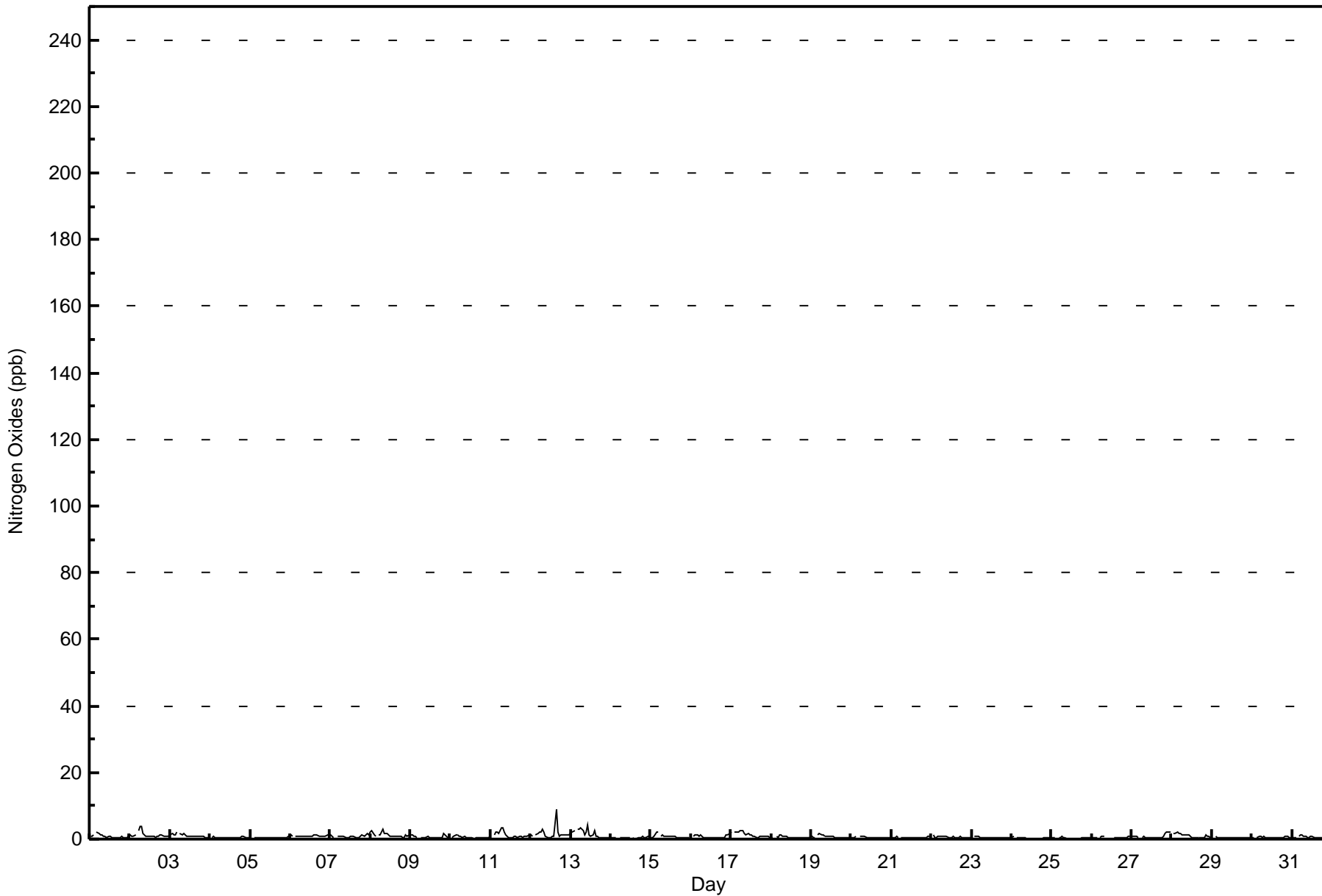
Nitrogen Oxides (NO_x) - ppb
Stony Mountain - July 2016

Maximum Value: 9 ppb on Jul 12 16:00																	Maximum Daily Average: 1.7 ppb on Jul 12																	Hours in Service: 744	
Minimum Value: 0 ppb on Jul 24 17:00																	Minimum Daily Average: 0.3 ppb on Jul 24																	Hours of Data: 707	
Maximum Diurnal Average: 1.2 ppb at hour 7																	Minimum Diurnal Average: 0.5 ppb at hour 17																	Hours of Missing Data: 37	
Monthly Average: 0.8 ppb																	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 1 P ₉₀ = 1 P ₉₉ = 3																	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-Jul	1	1	1	Z	2	2	1	1	1	1	1	1	1	1	1	1	0	1	0	1	0	1	1	1	0.9	2									
2-Jul	1	1	1	1	Z	2	4	4	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.3	4									
3-Jul	1	2	1	1	2	Z	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1.0	2									
4-Jul	Z	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0.4	1									
5-Jul	0	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0.4	1									
6-Jul	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1									
7-Jul	1	1	0	Z	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	2	1	0.8	2									
8-Jul	2	3	1	1	Z	1	1	3	2	2	2	1	1	1	1	1	1	1	1	0	0	1	1	1	1.2	3									
9-Jul	1	1	1	1	1	Z	1	1	1	0	1	1	1	1	0	0	0	1	0	0	1	1	0	1	0.7	1									
10-Jul	Z	0	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									
11-Jul	1	Z	1	2	2	2	4	3	2	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1.2	4									
12-Jul	1	1	Z	1	2	2	2	3	2	1	0	0	0	1	1	9	2	1	1	1	1	1	1	1	1.7	9									
13-Jul	2	2	2	Z	3	3	3	2	1	2	4	1	1	1	2	1	1	0	0	0	1	0	0	1	1.6	4									
14-Jul	0	0	0	0	Z	0	0	1	0	0	0	0	M	0	0	0	0	0	1	1	0	1	1	1	0.4	1									
15-Jul	0	0	1	2	2	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	0.8	2									
16-Jul	Z	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	2	0.7	2									
17-Jul	2	Z	2	2	2	2	3	3	2	1	2	1	1	1	1	1	0	1	1	1	1	1	1	1	1.3	3									
18-Jul	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	1	0.6	1									
19-Jul	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	0	0	0	0.7	1									
20-Jul	0	0	0	1	Z	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1									
21-Jul	1	1	1	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0.5	1									
22-Jul	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.6	1									
23-Jul	0	Z	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1									
24-Jul	0	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1									
25-Jul	0	1	0	Z	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.3	1									
26-Jul	0	0	1	0	Z	1	1	1	C	C	C	C	C	0	0	0	0	0	0	1	1	1	1	1	0.5	1									
27-Jul	1	1	1	1	1	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	1	2	2	2	2	0.7	2									
28-Jul	Z	2	2	2	2	2	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1.0	2									
29-Jul	1	Z	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1									
30-Jul	0	0	Z	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0.5	1									
31-Jul	0	0	0	Z	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.5	1									
0.9 0.9 0.9 1.0 1.1 1.2 1.2 1.1 0.9 0.7 0.7 0.6 0.5 0.5 0.5 0.7 0.5 0.5 0.5 0.6 0.6 0.7 0.7 0.7																	Diurnal Average																		
2 3 2 2 3 3 4 4 2 2 4 1 1 1 2 9 2 1 1 1 2 2 2 2																	Diurnal Maximum																		
Z - zerospan																	C - Calibration		M - Maintenance																



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Stony Mountain - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Stony Mountain - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	707	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Stony Mountain - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	26	39	48	36	20	15	21	16	14	61	65	59	92	93	56	45	706
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	26	39	48	36	20	15	21	16	14	61	65	59	92	93	56	45	706

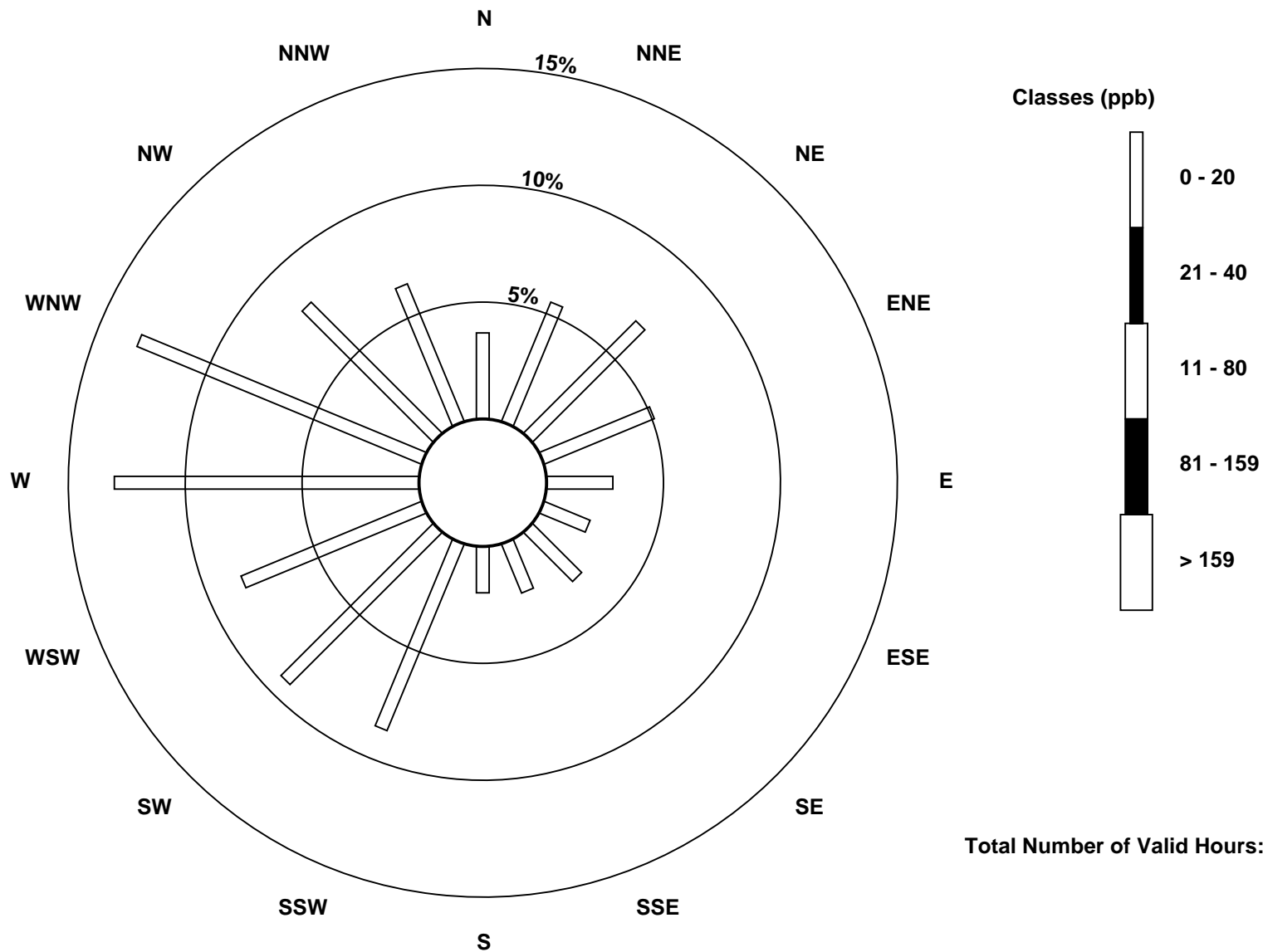
Total Number of Valid Hours: 706

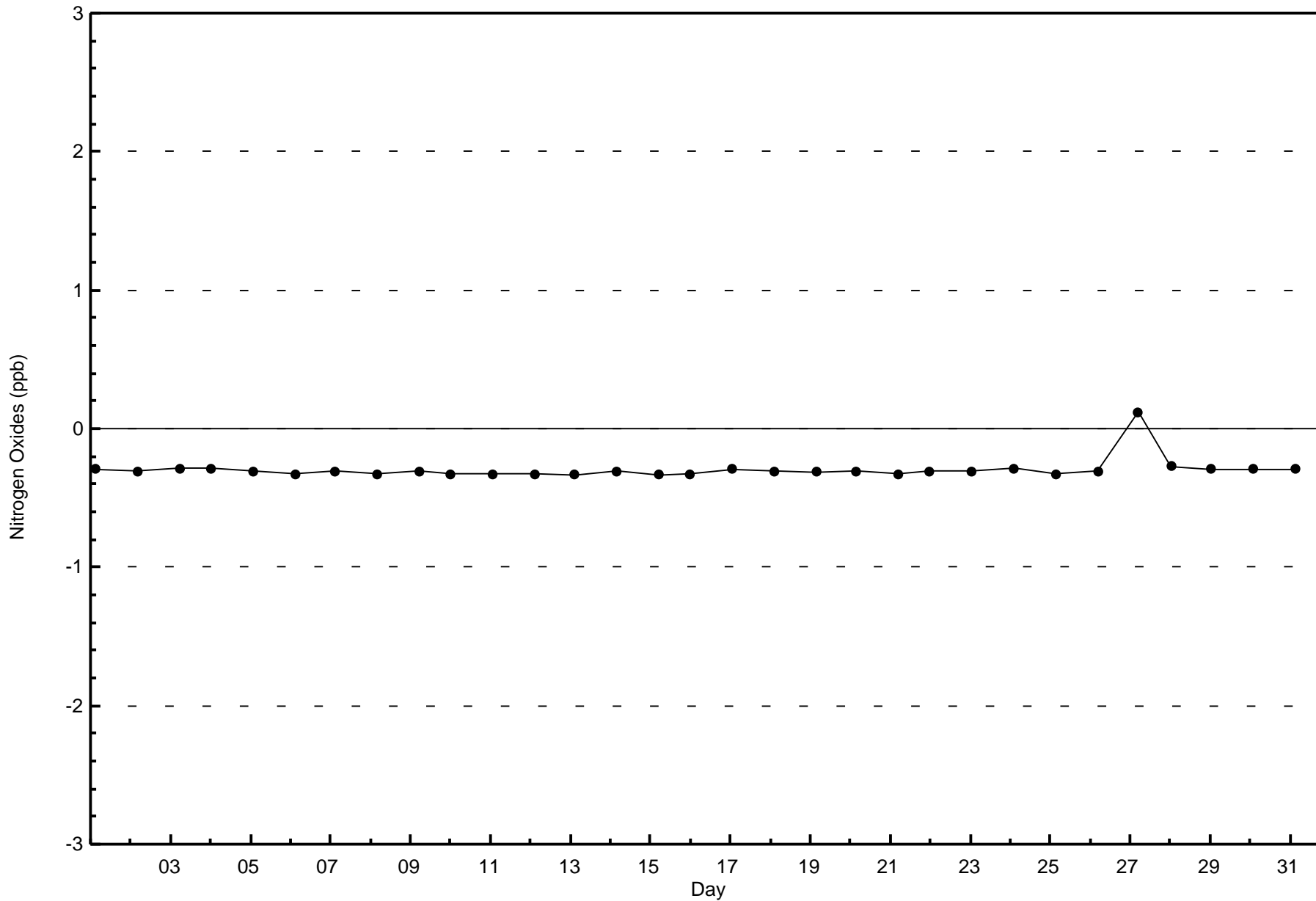
Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

Nitrogen Oxides (NO_x) - ppb
Stony Mountain (AMS 18)

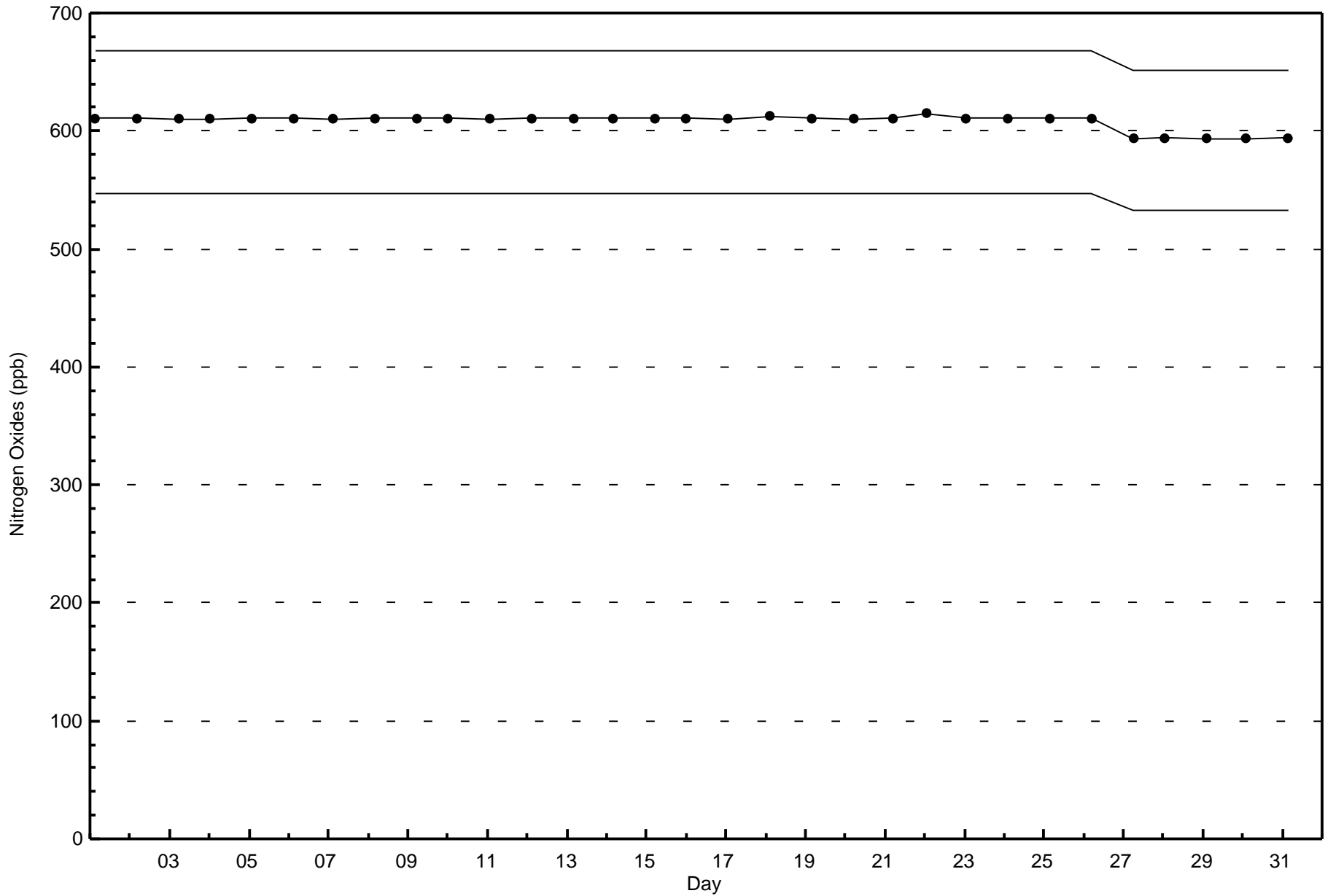






Wood Buffalo Environmental Association
Span Responses

Nitrogen Oxides (NO_x) - ppb
Stony Mountain - July 2016



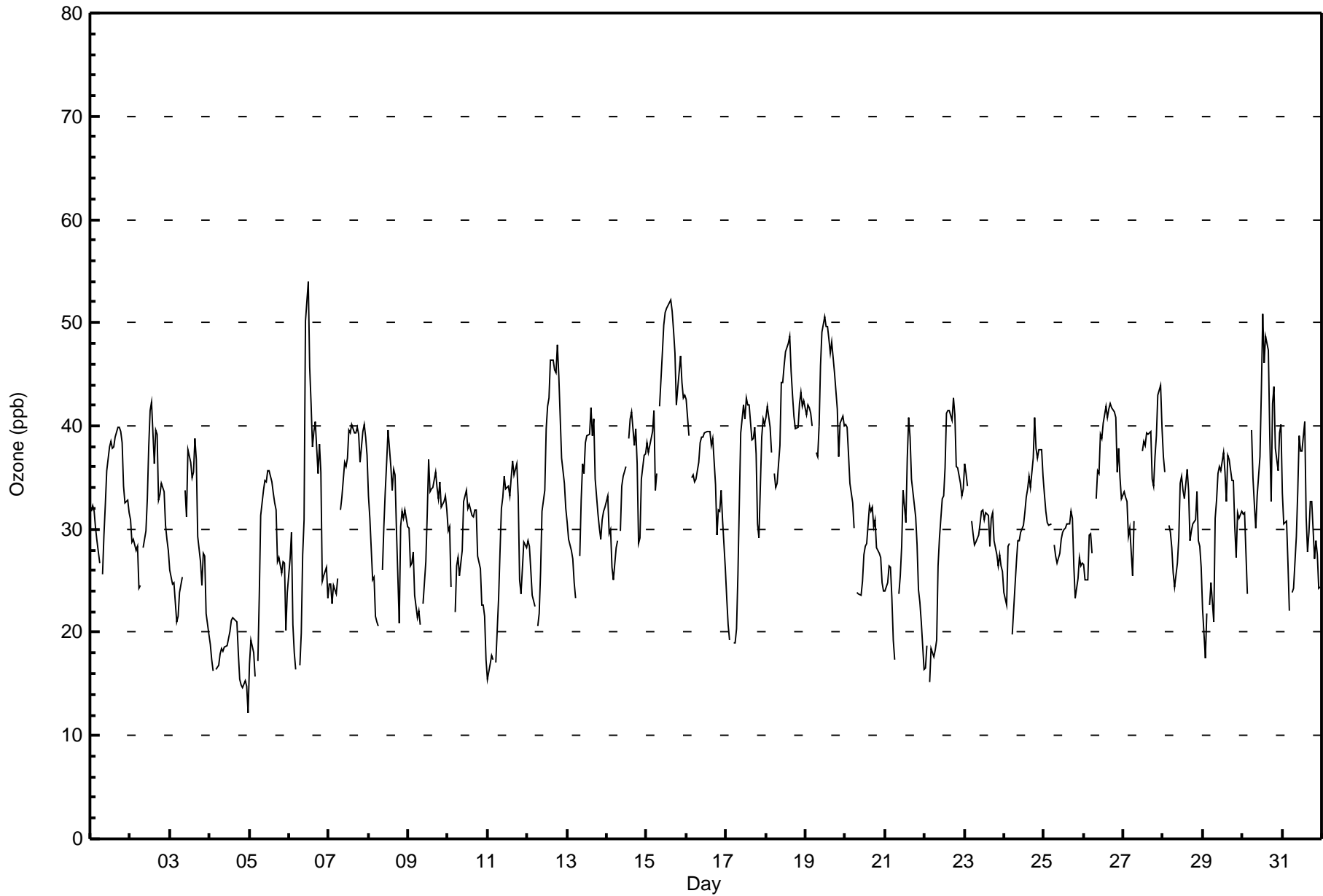


Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																																							
Maximum Value: 54 ppb on Jul 6 12:00										Maximum Daily Average: 44.3 ppb on Jul 15										Hours of Data: 709																													
Minimum Value: 12 ppb on Jul 5 00:00										Minimum Daily Average: 17.7 ppb on Jul 4										Hours of Missing Data: 35																													
Maximum Diurnal Average: 37.9 ppb at hour 15										Minimum Diurnal Average: 25.2 ppb at hour 6										Hours of Calibration: 34																													
Monthly Average: 32.3 ppb										Percentiles: P ₁ = 15 P ₁₀ = 22 Q ₁ = 27 Median = 32 Q ₃ = 38 P ₉₀ = 42 P ₉₉ = 51										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-Jul	32	32	32	30	29	27	Z	26	29	32	36	38	39	38	38	39	40	40	40	38	34	33	33	32	34.1	40																							
2-Jul	31	29	29	28	28	24	25	Z	28	30	33	38	41	42	36	40	39	33	33	34	34	30	29	28	32.3	42																							
3-Jul	26	25	25	23	21	22	24	25	Z	34	31	38	36	35	36	39	37	29	27	25	28	27	22	20	28.4	39																							
4-Jul	19	17	16	Z	16	17	18	18	18	19	19	20	21	21	21	21	18	15	15	15	15	15	12	12	17.7	21																							
5-Jul	17	19	18	16	Z	17	24	31	34	35	35	36	36	35	34	33	32	27	27	26	27	27	20	24	27.2	36																							
6-Jul	27	30	21	18	16	Z	17	20	28	31	50	54	46	42	38	40	40	35	38	35	25	26	26	23	31.6	54																							
7-Jul	25	25	23	25	24	25	Z	32	33	36	36	37	40	39	40	39	39	40	39	37	39	40	39	37	34.3	40																							
8-Jul	33	31	25	25	22	21	21	Z	26	30	34	37	40	36	34	36	35	30	21	30	32	31	32	30	30.0	40																							
9-Jul	30	26	27	28	24	21	22	21	Z	23	27	31	37	34	34	34	36	34	33	35	32	33	33	32	29.8	37																							
10-Jul	30	30	24	Z	22	26	27	26	28	33	33	34	32	32	31	31	32	32	27	26	23	23	22	17	27.9	34																							
11-Jul	15	17	18	17	Z	17	23	28	32	33	35	34	34	33	35	37	35	36	33	25	24	26	29	28	28.1	37																							
12-Jul	29	28	26	24	23	Z	21	22	26	32	34	40	42	43	46	46	45	45	48	45	37	36	34	32	34.9	48																							
13-Jul	31	29	28	27	25	23	Z	27	33	36	35	38	39	39	42	39	41	35	31	30	29	31	32	32	32.7	42																							
14-Jul	33	30	30	26	25	28	29	Z	30	34	35	36	M	39	41	41	38	40	36	29	29	35	37	37	33.6	41																							
15-Jul	38	37	38	40	41	34	35	Z	42	47	50	51	51	52	52	51	49	47	42	44	47	44	43	43	44.3	52																							
16-Jul	43	39	Z	35	35	35	35	36	38	39	39	39	39	39	38	39	34	29	32	32	34	31	26	35.9	43																								
17-Jul	23	21	19	Z	19	19	20	26	33	39	42	41	43	42	42	39	39	40	37	30	29	39	41	40	33.1	43																							
18-Jul	41	42	40	37	Z	35	34	34	38	44	44	46	47	48	49	45	43	41	40	40	42	43	42	42	41.7	49																							
19-Jul	41	42	42	41	40	Z	37	37	40	46	49	51	50	50	48	47	48	45	43	42	37	40	41	40	43.3	51																							
20-Jul	40	40	37	34	33	30	Z	24	24	24	25	27	28	29	32	32	32	30	31	28	28	27	25	24	29.7	40																							
21-Jul	24	25	26	26	23	19	17	Z	24	25	28	34	31	37	41	39	35	34	31	28	24	23	21	16	27.5	41																							
22-Jul	17	19	Z	15	18	18	18	19	26	29	33	33	36	41	42	41	41	43	41	36	36	34	33	34	30.6	43																							
23-Jul	36	35	34	Z	31	30	29	29	29	30	32	32	31	32	31	28	31	32	29	27	26	27	26	26	30.2	36																							
24-Jul	24	23	28	29	Z	20	25	27	29	29	30	30	32	33	34	35	34	37	41	38	37	38	38	35	31.4	41																							
25-Jul	33	32	31	30	31	Z	29	27	27	28	29	30	30	30	31	31	32	31	26	23	25	27	26	27	28.9	33																							
26-Jul	27	25	25	29	30	28	Z	33	36	35	39	39	40	42	41	42	42	42	41	41	36	38	35	33	35.5	42																							
27-Jul	34	33	33	29	30	26	31	C	C	C	C	38	39	38	39	39	39	35	34	37	39	43	44	40	36.0	44																							
28-Jul	37	36	Z	30	30	28	26	24	27	29	34	35	34	33	36	34	29	30	31	31	34	29	28	26	30.9	37																							
29-Jul	22	17	22	Z	23	25	21	31	33	35	36	36	37	36	33	37	37	35	35	30	27	32	31	32	30.5	37																							
30-Jul	31	32	28	24	Z	40	35	32	30	33	37	43	51	46	49	47	39	33	42	44	38	36	39	40	37.8	51																							
31-Jul	34	31	31	27	22	Z	24	24	29	34	39	38	38	40	31	28	30	33	33	27	29	28	24	24	30.2	40																							
																								29.7	28.9	27.7	27.5	26.2	25.2	25.6	27.2	30.3	32.8	35.3	37.1	37.9	37.9	37.9	37.7	37.1	35.3	34.1	32.5	31.3	32.1	31.3	30.1	Diurnal Average	
																								43	42	42	41	41	40	37	37	42	47	50	54	51	52	52	51	49	47	48	45	47	44	44	43	Diurnal Maximum	
Z - zerospan C - Calibration M - Maintenance																																																	
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb																																																	



Wood Buffalo Environmental Association
Hourly Averages

Ozone (O₃) - ppb
Stony Mountain - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ozone (O₃) - ppb
Stony Mountain - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	52	7.33	7.33
21 - 50	649	91.54	98.87
51 - 82	8	1.13	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Ozone (O₃) - ppb
Stony Mountain - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	3	0	4	2	0	0	1	4	2	1	3	0	9	11	8	4	52
21 - 50	24	37	42	36	21	15	18	14	12	61	62	58	82	82	45	39	648
51 - 82	0	0	0	0	0	0	0	0	0	0	2	1	0	2	1	2	8
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	27	37	46	38	21	15	19	18	14	62	67	59	91	95	54	45	708

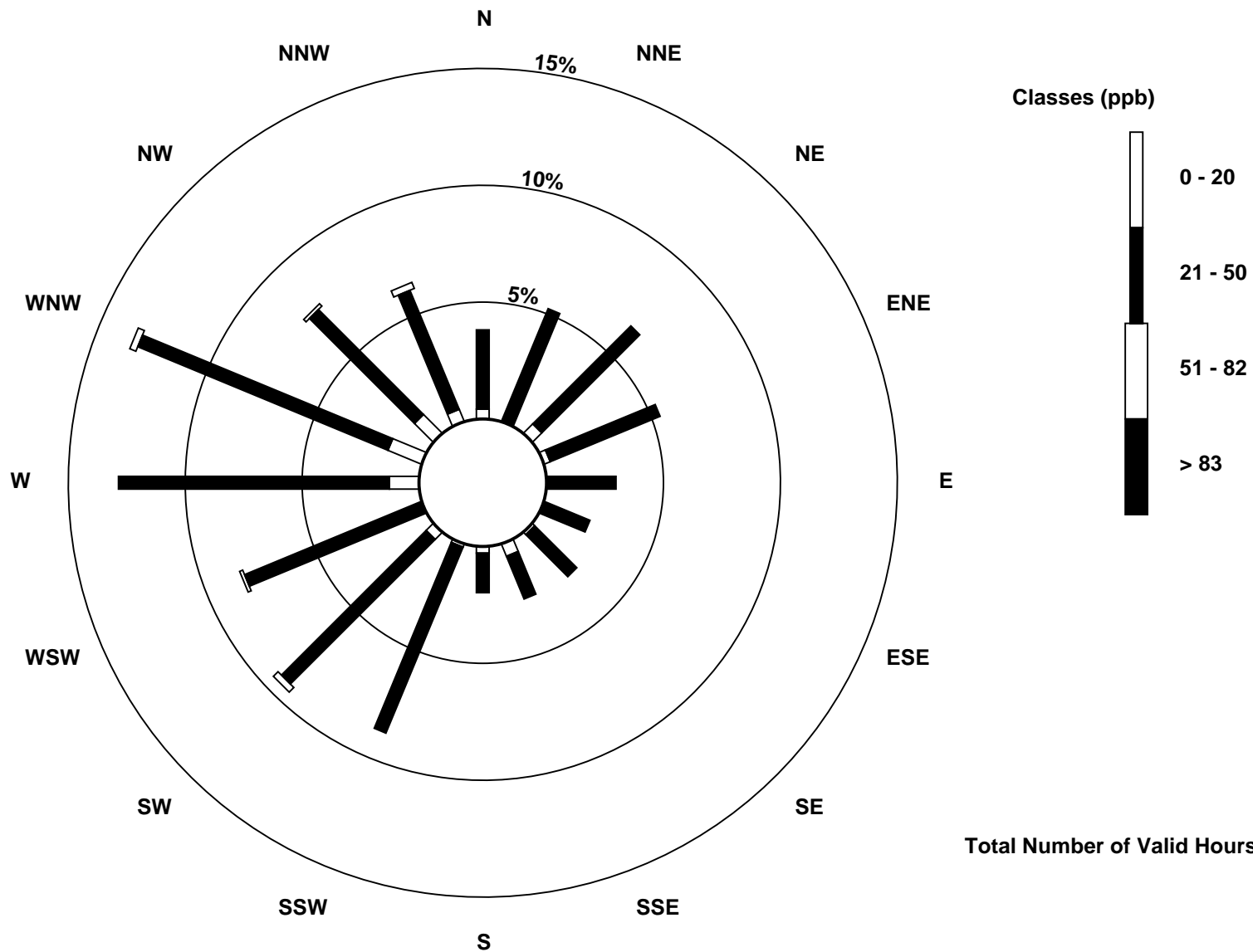
Total Number of Valid Hours: 708

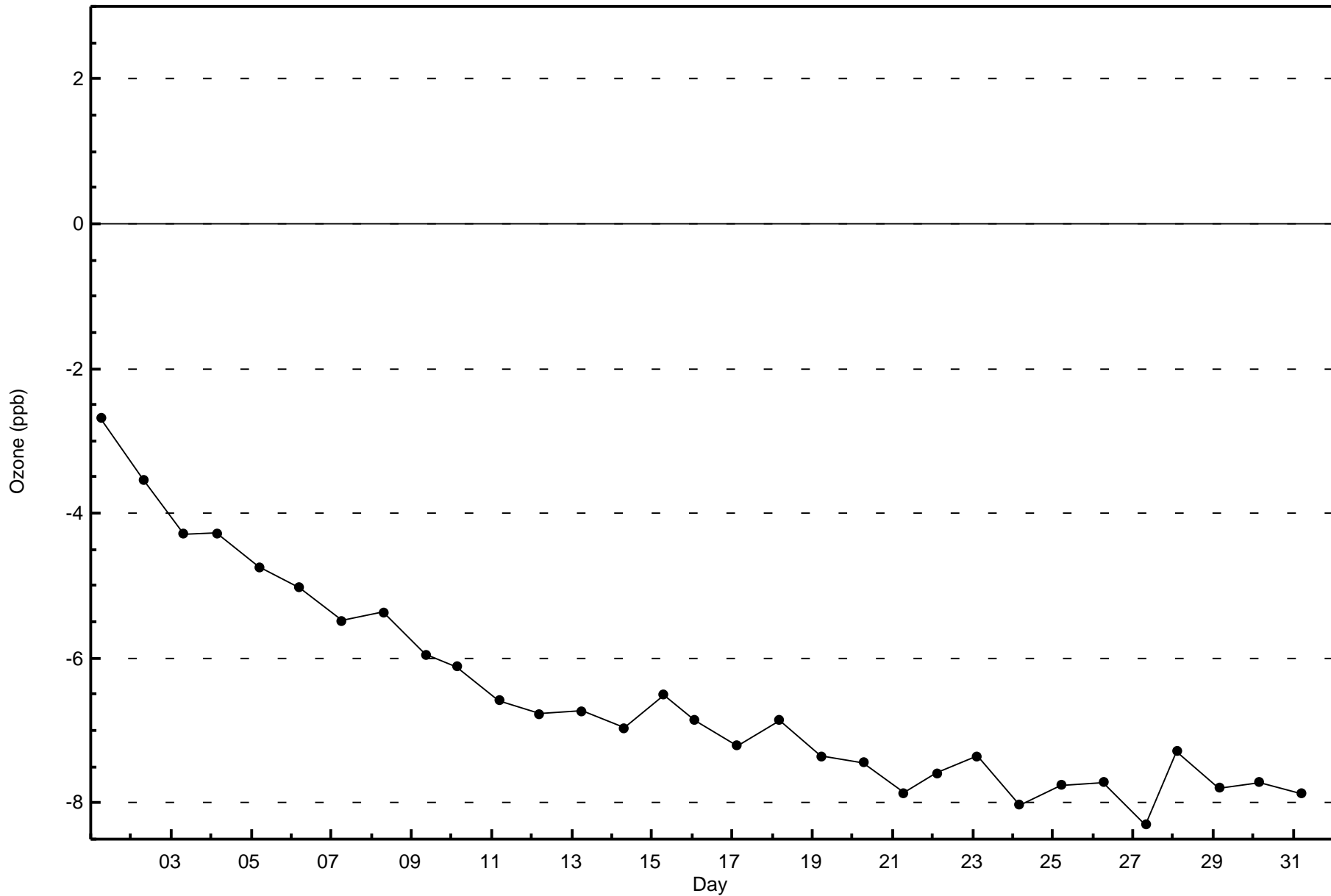
Total Number of Hours: 744

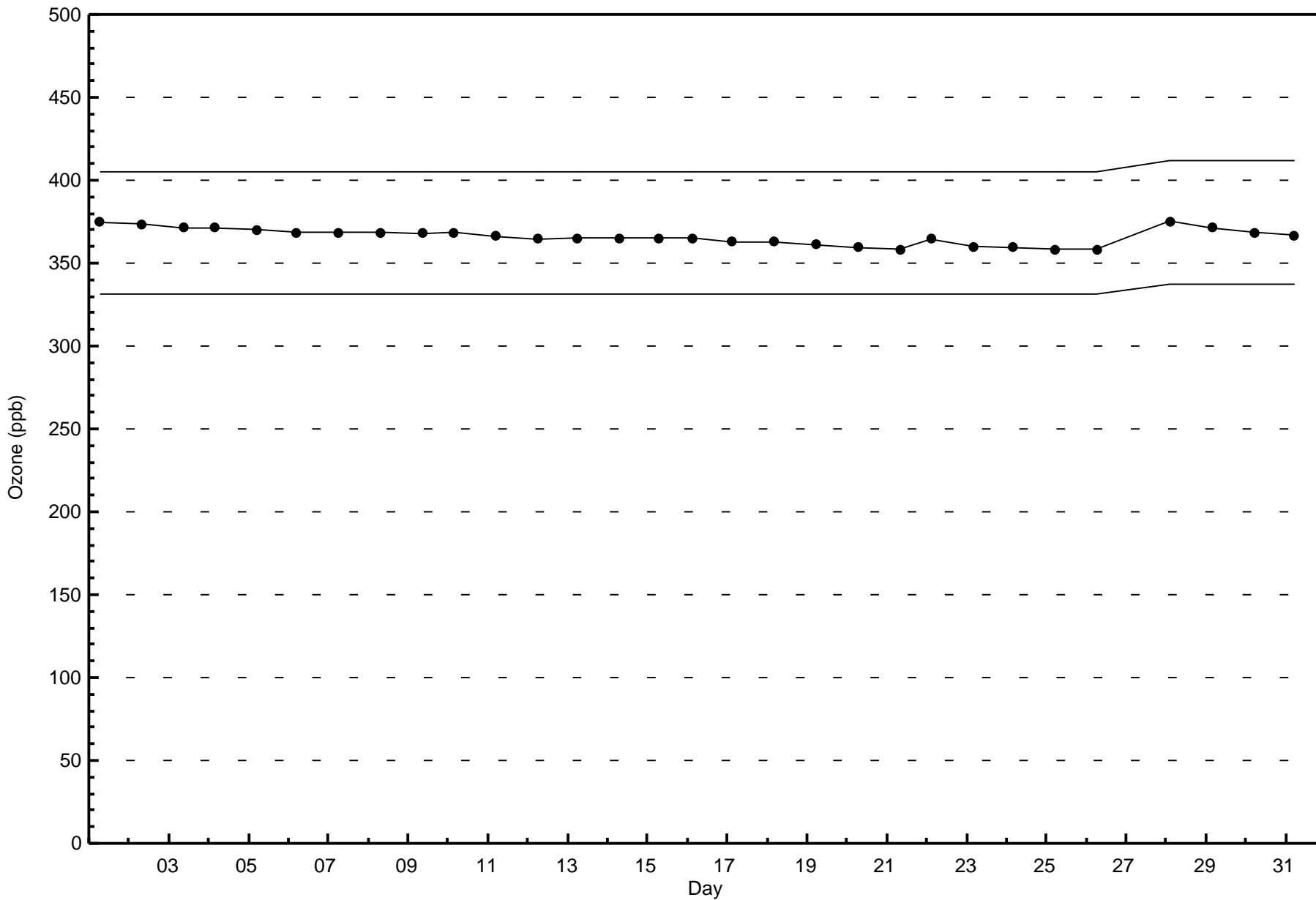


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Ozone (O₃) - ppb
Stony Mountain (AMS 18)







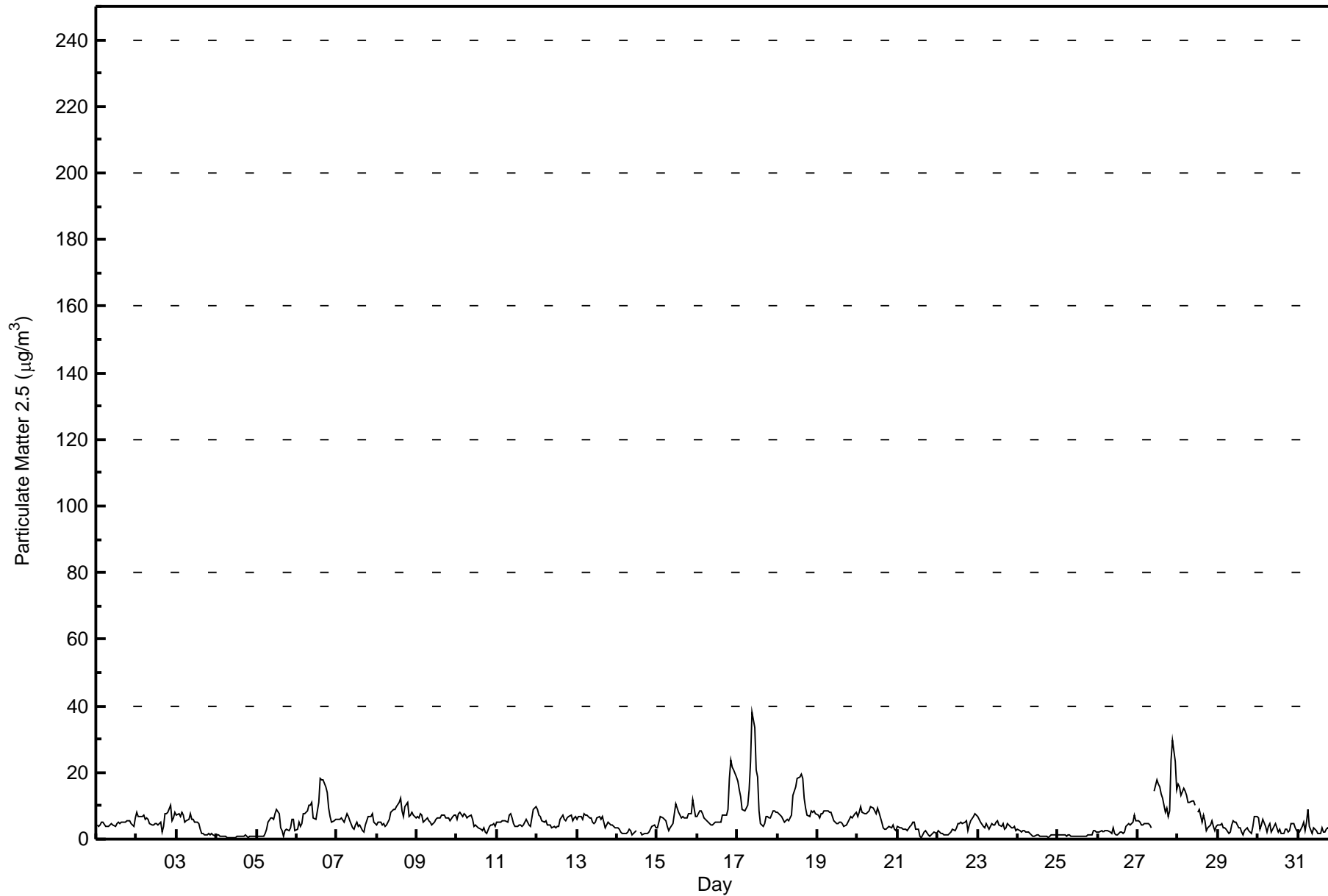


Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 38.0 µg/m ³ on Jul 17 10:00 Minimum Value: 0.5 µg/m ³ on Jul 4 12:00 Maximum Diurnal Average: 6.3 µg/m ³ at hour 22 Monthly Average: 5.43 µg/m ³		Maximum Daily Average: 12.6 µg/m ³ on Jul 17 Minimum Daily Average: 0.8 µg/m ³ on Jul 4 Minimum Diurnal Average: 4.4 µg/m ³ at hour 17 Percentiles: P ₁ = 0.6 P ₁₀ = 1.3 Q ₁ = 2.7 Median = 4.8 Q ₃ = 6.8 P ₉₀ = 8.9 P ₉₉ = 23.0		Hours in Service: 744 Hours of Data: 740 Hours of Missing Data: 4 Hours of Calibration: 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-Jul	4.1	3.8	4.3	5.0	5.0	3.8	3.7	3.6	4.2	4.5	4.1	3.8	4.5	5.3	4.6	4.9	5.3	5.1	5.6	5.7	5.6	4.7	3.8	6.2	4.6	6.2
2-Jul	8.1	6.9	6.8	6.9	7.1	6.1	6.5	6.0	4.8	4.4	4.1	4.8	4.7	4.4	4.9	2.3	3.8	7.4	7.7	8.0	10.3	5.7	6.4	7.9	6.1	10.3
3-Jul	7.4	7.6	6.8	8.0	7.1	4.9	5.4	5.8	7.8	5.8	5.8	4.9	4.9	4.5	2.9	1.6	1.6	1.4	1.4	1.9	1.4	1.5	1.1	0.7	4.3	8.0
4-Jul	1.1	1.2	1.0	0.9	0.9	0.7	0.6	0.5	0.5	0.5	0.5	1.0	0.8	0.8	0.8	0.8	1.2	0.8	0.5	0.7	1.0	0.9	0.9	0.8	0.8	1.2
5-Jul	0.9	0.9	0.9	0.9	0.9	1.6	3.0	5.0	6.4	6.5	5.8	7.5	9.0	7.7	3.6	2.7	0.9	2.5	2.8	2.4	3.5	6.1	5.9	2.4	3.7	9.0
6-Jul	3.0	4.9	3.8	4.6	7.5	7.5	8.5	10.4	10.2	10.8	6.5	6.1	8.3	10.8	18.3	17.8	17.6	15.5	14.0	9.4	6.8	5.1	5.4	5.8	9.1	18.3
7-Jul	5.9	6.1	6.1	6.2	5.1	6.2	7.5	6.9	5.6	3.6	3.1	4.2	5.3	4.0	4.1	2.5	2.3	4.4	5.6	6.6	6.8	7.7	4.9	4.7	5.2	7.7
8-Jul	4.3	5.0	4.9	4.4	4.8	4.0	4.3	5.9	8.0	8.4	9.0	8.9	9.7	10.8	12.4	8.4	6.6	9.7	10.9	6.6	7.1	8.1	7.0	6.5	7.3	12.4
9-Jul	7.0	6.5	7.4	7.2	4.9	6.0	6.2	5.4	5.0	4.2	4.9	5.8	6.5	6.4	6.3	7.4	7.0	6.2	6.5	6.3	5.6	6.7	7.1	7.1	6.2	7.4
10-Jul	6.1	7.7	8.3	6.6	7.5	7.1	6.2	6.8	7.1	5.8	3.8	4.2	3.8	3.5	2.9	2.5	3.3	2.2	1.8	3.6	4.3	4.3	4.9	3.9	4.9	8.3
11-Jul	5.0	5.2	5.2	5.7	5.6	5.6	5.1	7.1	7.5	6.2	4.7	3.8	3.8	4.3	4.1	3.8	4.1	5.8	5.3	4.4	3.9	6.3	8.7	9.7	5.4	9.7
12-Jul	8.7	7.2	6.9	5.3	5.2	5.6	4.4	4.3	4.0	3.5	3.8	3.3	3.8	3.9	5.8	7.2	5.9	5.5	6.3	6.7	7.1	5.6	6.6	6.6	5.5	8.7
13-Jul	6.1	6.9	6.8	6.1	7.5	7.3	7.2	6.3	6.2	5.1	4.7	4.9	6.3	6.9	5.8	6.6	5.1	3.6	5.0	4.8	4.2	4.4	3.9	3.3	5.6	7.5
14-Jul	3.3	2.9	2.3	1.6	1.8	1.8	2.1	2.9	2.5	1.4	1.5	2.7	M	M	2.2	1.5	1.6	1.6	1.7	2.2	2.9	3.8	4.3	3.6	2.4	4.3
15-Jul	3.4	4.9	6.9	6.1	5.7	5.7	3.6	2.4	3.5	4.7	7.8	10.6	9.5	8.0	6.5	6.8	6.6	6.5	6.4	7.7	7.7	12.0	9.3	6.7	6.6	12.0
16-Jul	6.8	8.3	8.6	7.8	6.4	6.0	5.5	4.5	4.2	4.2	4.6	4.9	5.3	5.2	5.2	7.2	7.1	7.4	9.0	18.2	23.6	21.7	21.0	18.6	9.2	23.6
17-Jul	17.2	14.9	12.6	8.7	8.3	9.3	10.1	14.8	23.3	38.0	33.6	20.8	18.8	8.5	4.7	4.0	4.7	6.6	6.8	6.2	6.3	8.3	8.4	8.0	12.6	38.0
18-Jul	7.9	7.6	6.7	6.0	5.3	5.3	5.9	5.4	7.3	13.0	14.4	15.8	18.1	18.5	19.6	18.2	12.2	9.4	7.1	6.7	8.5	8.0	8.6	7.5	10.1	19.6
19-Jul	7.0	6.4	7.7	7.5	8.4	8.3	8.7	8.0	8.0	6.7	5.6	4.7	4.6	5.1	5.1	4.5	3.7	4.1	4.9	6.1	6.7	6.3	7.7	8.1	6.4	8.7
20-Jul	6.8	8.1	9.6	8.2	7.8	7.8	8.1	8.5	9.7	9.4	8.4	7.6	9.3	8.0	4.9	3.5	3.1	3.0	3.6	3.6	3.3	4.2	3.0	2.7	6.3	9.7
21-Jul	3.9	3.5	3.3	2.9	2.9	2.8	2.6	3.9	4.1	4.9	4.9	3.1	2.8	0.8	0.6	1.4	2.1	2.4	1.1	1.0	1.4	1.8	1.9	1.8	2.6	4.9
22-Jul	2.6	2.1	1.8	1.7	1.4	1.1	1.3	1.6	2.0	2.8	2.4	3.2	4.6	4.7	5.3	4.7	4.9	5.6	2.6	4.3	5.4	6.8	7.5	7.3	3.7	7.5
23-Jul	6.8	6.1	5.2	3.7	3.5	4.8	3.7	3.1	4.7	4.1	4.2	5.2	5.4	4.2	3.7	4.8	3.2	3.2	4.7	3.9	3.4	3.5	3.6	2.6	4.2	6.8
24-Jul	2.8	2.5	2.1	2.4	2.5	2.3	2.2	1.6	1.2	1.0	1.0	1.2	1.1	0.9	0.8	0.8	0.7	0.7	0.6	1.0	1.1	1.1	1.1	1.2	1.4	2.8
25-Jul	1.1	1.2	1.1	1.1	1.2	1.0	1.1	1.1	1.0	0.8	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.2	1.5	1.4	2.5	2.4	2.0	1.2	2.5
26-Jul	2.1	2.3	2.3	2.2	2.4	2.5	2.7	2.0	1.8	3.2	1.5	1.3	1.5	2.1	2.3	1.7	2.3	3.8	4.6	4.3	4.7	5.0	7.4	5.5	3.0	7.4
27-Jul	5.4	5.0	4.4	4.3	4.5	4.7	4.8	4.4	3.5	C	14.6	17.6	16.6	15.5	13.7	12.2	8.1	9.4	7.0	8.6	23.7	29.5	23.2	14.7	11.1	29.5
28-Jul	16.3	15.6	13.2	15.5	14.5	13.2	11.0	11.1	11.6	11.6	10.2	M	8.0	8.9	5.1	7.4	5.5	2.3	3.5	4.4	5.7	3.9	2.4	3.7	8.9	16.3
29-Jul	4.3	4.1	4.8	3.6	3.4	3.1	1.6	2.1	4.4	5.3	5.1	4.9	3.6	3.2	2.1	1.3	2.6	3.3	2.3	2.0	1.9	3.8	6.7	6.7	3.6	6.7
30-Jul	6.5	3.1	4.0	5.9	3.9	2.0	3.9	4.6	2.2	3.0	4.7	3.6	2.2	3.0	1.8	1.8	2.8	2.8	2.2	2.7	4.6	4.7	3.4	2.5	3.4	6.5
31-Jul	2.3	2.2	3.8	5.3	2.6	5.0	8.7	4.0	1.7	3.3	2.8	2.5	1.7	1.6	3.6	2.0	1.9	2.9	3.2	2.5	1.1	1.2	1.4	1.3	2.9	8.7
																								Diurnal Average		
5.6 5.5 5.5 5.2 5.0 4.9 5.0 5.2 5.6 6.2 6.1 5.8 6.2 5.7 5.3 4.9 4.4 4.7 4.7 5.0 5.8 6.3 6.1 5.5																								Diurnal Maximum		
17.2 15.6 13.2 15.5 14.5 13.2 11.0 14.8 23.3 38.0 33.6 20.8 18.8 18.5 19.6 18.2 17.6 15.5 14.0 18.2 23.7 29.5 23.2 18.6																										
C - Calibration M - Maintenance																										
Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m ³																										



Wood Buffalo Environmental Association
Hourly Averages

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Stony Mountain - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Stony Mountain - July 2016

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	398	53.78	53.78
6 - 15	269	36.35	90.14
16 - 25	24	3.24	93.38
26 - 80	3	0.41	93.78
> 81.0	0	0.00	93.78

Total Number of Valid Hours: 740

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - μg/m³
Stony Mountain - July 2016

Concentration Ranges (μg/m ³)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	17	22	21	16	3	8	15	15	11	36	47	35	59	47	27	18	397
6 - 15	8	13	21	19	18	7	5	3	4	30	17	22	26	30	22	24	269
16 - 25	1	3	4	2	0	0	1	0	0	0	5	0	1	1	5	1	24
26 - 80	2	0	1	0	0	0	0	0	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
Totals	28	38	47	37	21	15	21	18	15	66	69	57	86	78	54	43	693

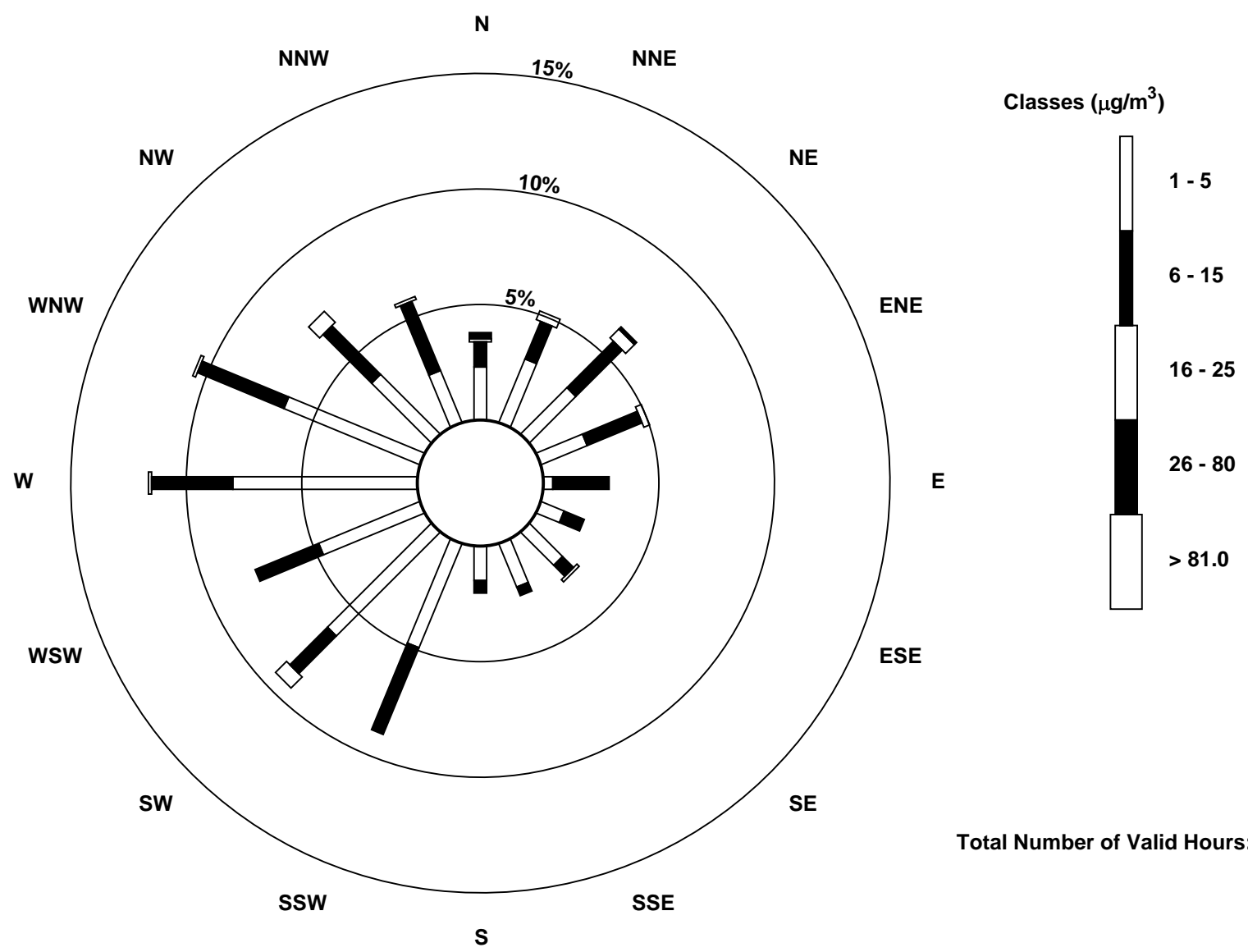
Total Number of Valid Hours: 739

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Stony Mountain (AMS 18)



Total Number of Valid Hours: 739

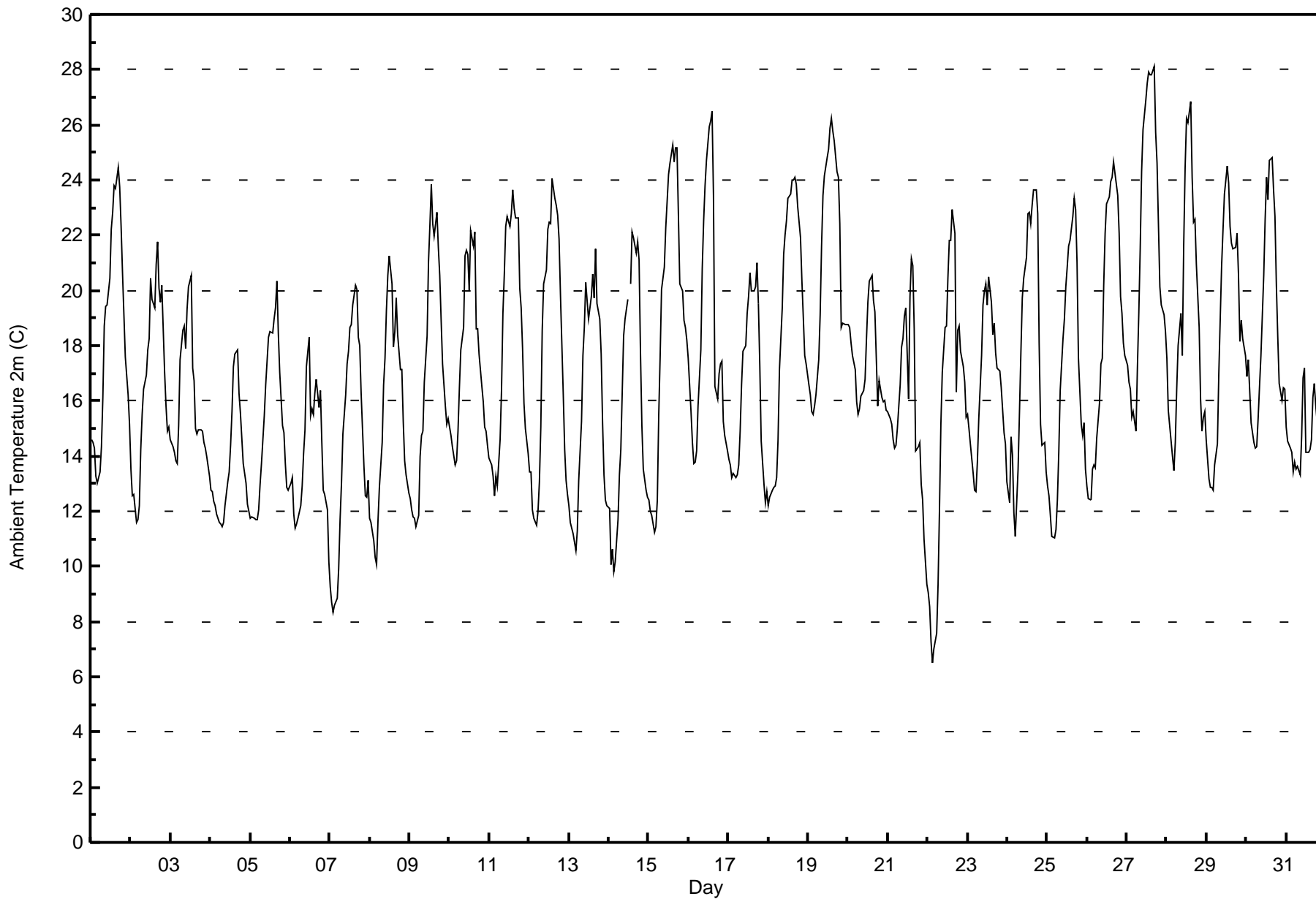


Maximum Value: 28.1 C on Jul 27 17:00																				Maximum Daily Average: 21.7 C on Jul 27					Hours in Service: 744																							
Minimum Value: 6.5 C on Jul 22 04:00																				Minimum Daily Average: 13.6 C on Jul 4					Hours of Data: 743																							
Maximum Diurnal Average: 21.7 C at hour 15																				Minimum Diurnal Average: 12.5 C at hour 5					Hours of Missing Data: 1																							
Monthly Average: 17.12 C																				Percentiles: P ₁ = 8.7 P ₁₀ = 12.2 Q ₁ = 13.8 Median = 16.6 Q ₃ = 20.1 P ₉₀ = 22.9 P ₉₉ = 26.9					Hours of Calibration: 0																							
																									Percent Operational Time: 99.9																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Jul	14.6	14.5	14.3	13.3	13.0	13.4	14.3	16.1	18.7	19.4	19.5	20.4	22.2	22.8	23.8	23.7	24.5	23.7	22.3	20.7	19.1	17.6	16.2	15.2	18.5	24.5																						
2-Jul	13.5	12.5	12.6	11.6	11.7	12.2	14.3	15.5	16.4	16.9	17.8	18.2	20.4	19.7	19.4	21.0	21.8	20.1	19.6	20.2	17.0	15.8	14.9	15.1	16.6	21.8																						
3-Jul	14.6	14.4	14.2	13.8	13.8	15.1	17.5	18.6	18.7	17.9	19.3	20.1	20.5	17.2	16.7	15.0	14.8	14.9	15.0	14.9	14.5	14.3	14.0	13.3	16.0	20.5																						
4-Jul	12.8	12.7	12.4	12.2	11.9	11.6	11.6	11.4	11.6	12.2	13.0	13.4	14.4	15.6	17.2	17.7	17.8	16.3	15.6	14.6	13.7	13.0	12.3	12.0	13.6	17.8																						
5-Jul	11.8	11.8	11.7	11.7	11.7	12.0	13.0	13.7	15.4	16.6	17.4	18.3	18.5	18.5	19.0	19.4	20.3	18.5	17.1	15.1	14.8	13.7	12.9	12.8	15.2	20.3																						
6-Jul	13.0	13.2	11.9	11.4	11.6	11.8	12.2	12.9	14.1	14.9	17.2	18.3	15.5	15.7	15.5	16.2	16.8	15.7	16.4	14.5	12.8	12.6	12.0	10.2	14.0	18.3																						
7-Jul	9.3	8.7	8.3	8.6	8.9	9.9	11.7	13.0	14.8	16.2	17.3	17.8	18.6	18.8	19.5	20.2	20.1	18.3	18.0	16.3	13.6	12.6	12.5	13.1	14.4	20.2																						
8-Jul	11.8	11.6	10.9	10.3	10.1	11.6	12.8	14.5	16.6	17.6	19.3	20.6	21.2	20.2	18.0	18.5	19.7	18.4	17.2	17.2	15.3	13.8	13.3	12.7	15.5	21.2																						
9-Jul	12.4	12.1	11.8	11.8	11.4	11.9	14.0	14.7	14.9	16.7	18.3	21.1	22.4	23.8	22.4	22.0	22.8	21.6	20.5	18.9	17.4	15.8	15.1	15.4	17.0	23.8																						
10-Jul	15.0	14.8	14.4	13.7	13.8	14.9	16.5	17.9	18.7	21.3	21.5	21.3	20.0	22.2	21.6	22.1	18.6	18.6	17.7	16.5	16.0	15.0	14.9	14.4	17.6	22.2																						
11-Jul	13.9	13.7	13.3	12.6	13.3	12.9	14.6	16.4	19.2	20.6	22.3	22.7	22.3	22.8	23.6	23.0	22.6	22.6	20.1	19.4	17.9	15.9	15.0	14.1	18.1	23.6																						
12-Jul	13.4	13.4	12.1	11.7	11.5	12.0	13.1	15.1	18.6	20.2	20.7	22.2	22.5	22.4	24.1	23.4	23.1	22.7	21.8	19.8	16.2	14.2	13.1	12.6	17.5	24.1																						
13-Jul	12.2	11.6	11.2	10.9	10.6	11.3	13.1	15.3	17.6	18.6	20.3	19.6	19.0	19.8	20.6	19.7	21.5	19.5	19.0	17.7	15.2	13.3	12.4	12.2	15.9	21.5																						
14-Jul	12.1	10.1	10.6	9.8	10.2	11.7	13.3	14.2	16.3	18.4	19.0	19.7	M	20.2	22.1	21.9	21.4	21.7	21.1	17.7	15.1	13.5	12.8	12.5	15.9	22.1																						
15-Jul	12.4	12.0	11.8	11.2	11.5	12.4	15.5	17.6	20.0	20.9	22.3	23.2	24.2	24.6	25.3	24.7	25.2	25.2	22.8	20.2	20.0	18.9	18.7	18.2	19.1	25.3																						
16-Jul	17.5	15.6	14.5	13.7	13.8	14.2	15.8	17.8	20.8	22.5	23.8	24.7	25.9	26.1	26.5	23.4	16.5	16.1	17.0	17.3	17.4	15.3	14.8	14.2	18.6	26.5																						
17-Jul	13.9	13.7	13.2	13.4	13.2	13.3	13.7	14.9	16.6	17.8	18.0	19.2	19.8	20.6	20.0	20.0	20.1	21.0	19.5	17.3	14.5	13.0	12.3	12.7	16.3	21.0																						
18-Jul	12.2	12.5	12.8	12.9	12.9	13.2	14.6	17.1	19.4	21.3	22.0	22.5	23.3	23.5	24.0	24.0	24.1	23.8	23.0	21.9	20.3	19.0	17.6	17.3	19.0	24.1																						
19-Jul	16.6	16.2	15.6	15.5	15.8	16.2	17.5	19.1	21.6	23.5	24.1	24.8	25.1	25.9	26.2	25.8	25.4	24.3	24.1	22.4	18.6	18.8	18.8	18.8	20.9	26.2																						
20-Jul	18.7	18.6	18.1	17.6	17.1	15.9	15.5	15.7	16.1	16.4	16.8	18.3	19.6	20.3	20.6	19.6	19.2	17.6	15.8	16.7	16.1	16.0	16.0	15.7	17.4	20.6																						
21-Jul	15.6	15.4	15.2	14.6	14.3	14.4	15.0	16.6	18.0	18.3	19.1	19.4	16.1	19.8	21.1	20.9	18.6	14.2	14.3	14.5	13.0	12.4	11.0	9.3	15.9	21.1																						
22-Jul	9.0	8.6	7.3	6.5	7.0	7.6	9.4	12.0	15.1	17.0	18.7	18.7	20.4	21.8	21.8	22.9	22.1	16.3	18.5	18.7	17.8	17.3	16.7	15.4	15.3	22.9																						
23-Jul	15.5	15.0	14.4	13.4	12.8	12.7	13.8	15.3	17.7	19.5	20.0	20.3	19.5	20.5	19.6	18.4	18.8	17.7	17.2	17.1	16.5	15.6	14.8	14.4	16.7	20.5																						
24-Jul	13.1	12.3	14.7	14.0	11.9	11.1	13.5	15.6	17.7	19.7	20.4	21.2	22.8	22.8	22.4	23.1	23.6	23.6	22.8	18.1	15.2	14.4	14.5	13.4	17.6	23.6																						
25-Jul	12.9	12.6	11.8	11.1	11.0	11.3	12.4	14.2	16.4	18.2	19.0	20.1	20.8	21.6	21.8	22.7	23.3	22.9	21.0	17.6	15.1	14.8	15.2	13.5	16.7	23.3																						
26-Jul	12.9	12.5	12.4	13.5	13.7	13.6	14.7	15.9	17.4	17.6	20.2	22.1	23.1	23.4	23.9	24.1	24.7	24.2	23.5	22.0	19.8	19.1	18.1	17.7	18.7	24.7																						
27-Jul	17.3	16.7	16.4	15.4	15.6	14.9	17.2	19.2	21.5	24.3	25.8	26.9	27.5	27.9	27.8	27.8	28.1	25.7	24.6	22.4	20.1	19.5	19.1	18.5	21.7	28.1																						
28-Jul	17.5	15.7	15.1	14.0	13.5	14.5	16.4	18.0	19.2	17.7	21.6	24.5	26.2	26.1	26.9	24.1	22.5	22.6	21.0	18.7	16.1	14.9	15.4	15.6	19.1	26.9																						
29-Jul	14.6	13.2	12.9	12.9	12.8	13.7	14.4	17.0	19.0	20.9	22.2	23.5	24.5	23.9	22.3	21.7	21.5	21.6	22.0	20.6	18.1	18.9	18.3	17.6	18.7	24.5																						
30-Jul	16.9	17.5	16.4	15.2	14.5	14.3	14.3	15.4	16.5	17.7	20.6	22.6	24.1	23.3	24.7	24.8	23.7	22.7	20.2	18.3	16.6	16.0	16.5	16.4	18.7	24.8																						
31-Jul	15.1	14.6	14.3	14.1	13.4	13.8	13.5	13.6	13.3	14.7	16.8	17.2	14.2	14.1	14.2	14.6	16.1	16.6	15.8	14.6	14.0	13.8	13.2	13.0	14.5	17.2																						
																								13.9	13.5	13.1	12.7	12.5	12.9	14.2	15.6	17.4	18.6	19.8	20.7	21.2	21.5	21.7	21.5	21.3	20.3	19.5	18.1	16.4	15.4	14.9	14.4	Diurnal Average
																								18.7	18.6	18.1	17.6	17.1	16.2	17.5	19.2	21.6	24.3	25.8	26.9	27.5	27.9	27.8	27.8	28.1	25.7	24.6	22.4	20.3	19.5	19.1	18.8	Diurnal Maximum
M - Maintenance																																																



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature 2m (AT 2m) - C
Stony Mountain - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature 2m (AT 2m) - C
Stony Mountain - July 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	15	2.02	2.02
10 - 20	536	72.14	74.16
> 20	192	25.84	100.00

Total Number of Valid Hours: 743

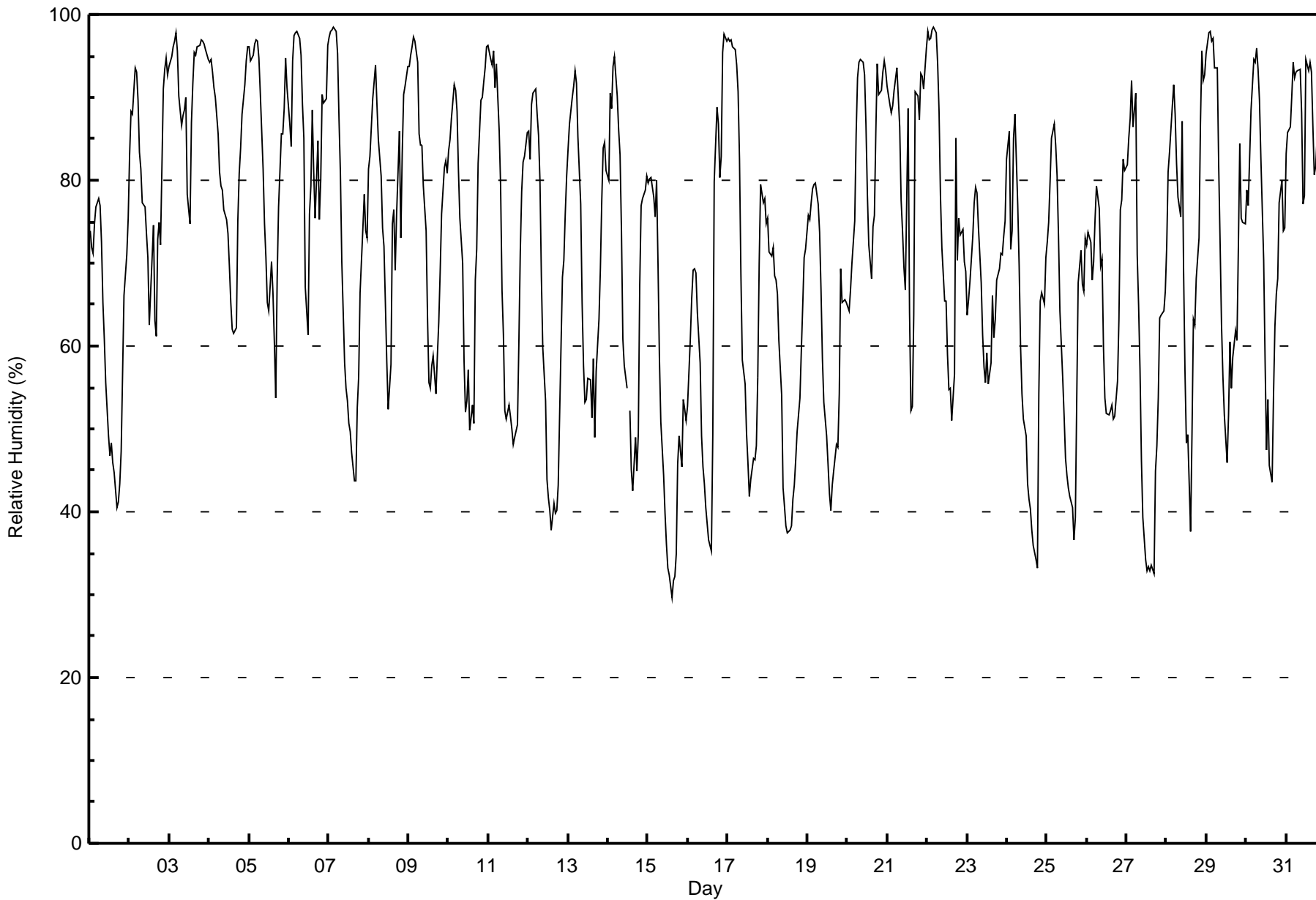
Total Number of Hours: 744



Wood Buffalo Environmental Association
Summary of Hour Averages

Relative Humidity (RH) - %
Stony Mountain - July 2016

Maximum Value: 99 % on Jul 22 05:00 Maximum Daily Average: 92.2 % on Jul 3																		Hours in Service: 744 Hours of Data: 743 Hours of Missing Data: 1 Hours of Calibration: 0 Percent Operational Time: 99.9											
Minimum Value: 30 % on Jul 15 15:00 Minimum Daily Average: 52.7 % on Jul 15 Maximum Diurnal Average: 88.3 % at hour 5 Minimum Diurnal Average: 53.9 % at hour 15 Monthly Average: 72.0 % Percentiles: P ₁ = 33 P ₁₀ = 46 Q ₁ = 58 Median = 74 Q ₃ = 88 P ₉₀ = 94 P ₉₉ = 98																													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Jul	74	72	71	75	77	78	77	73	65	61	56	49	47	48	46	45	40	41	43	47	57	66	71	75	60.6	78			
2-Jul	83	88	88	93	93	90	83	81	77	77	74	71	62	67	75	63	61	73	75	72	91	93	95	93	79.9	95			
3-Jul	94	95	96	97	98	96	90	87	88	88	90	78	75	87	92	95	95	96	96	97	97	96	96	95	92.2	98			
4-Jul	94	95	93	91	90	86	81	79	79	76	75	74	70	65	62	62	75	81	84	88	92	94	96	96	81.0	96			
5-Jul	96	94	95	96	97	97	95	91	81	75	71	65	64	70	66	60	54	68	77	86	86	89	95	91	81.6	97			
6-Jul	87	84	94	98	98	98	97	95	89	85	67	61	76	79	88	81	75	85	75	80	90	89	90	96	85.8	98			
7-Jul	97	98	98	99	98	95	88	81	70	58	55	53	51	50	47	44	44	53	56	66	74	78	74	73	70.8	99			
8-Jul	81	83	90	92	94	89	85	81	74	72	65	58	52	58	75	76	69	76	86	73	83	90	91	94	78.7	94			
9-Jul	94	95	96	97	97	94	86	84	84	79	74	63	56	55	58	59	54	59	63	69	76	82	82	81	76.5	97			
10-Jul	84	85	87	91	91	88	81	75	70	58	52	53	57	50	53	51	68	72	82	90	90	92	94	96	75.4	96			
11-Jul	96	95	94	96	91	94	86	79	67	61	52	51	53	51	50	48	49	51	60	71	79	82	83	86	71.9	96			
12-Jul	86	82	89	91	91	88	85	80	68	60	53	44	42	40	38	41	40	40	43	52	68	70	76	80	64.5	91			
13-Jul	84	87	90	91	93	92	85	77	65	58	53	54	56	56	51	58	49	57	63	69	78	84	85	81	71.5	93			
14-Jul	80	91	89	94	95	90	86	83	74	61	58	55	M	52	45	43	49	45	50	67	77	78	79	81	70.4	95			
15-Jul	80	80	80	78	76	80	70	59	51	44	40	36	33	32	30	32	32	35	46	49	45	53	52	51	52.7	80			
16-Jul	53	61	66	69	69	69	64	58	49	45	43	40	37	36	35	49	80	89	87	80	83	95	98	97	64.7	98			
17-Jul	97	97	97	96	96	94	91	83	69	58	55	49	46	42	44	47	46	48	56	70	79	77	78	75	70.4	97			
18-Jul	75	71	71	72	68	68	66	61	54	43	41	38	38	38	38	41	43	46	50	54	60	65	71	72	56.0	75			
19-Jul	76	75	77	79	79	80	77	74	67	58	53	49	46	42	40	43	45	48	48	54	69	65	66	65	61.5	80			
20-Jul	65	64	67	70	75	86	92	94	95	94	93	87	78	72	68	74	76	86	94	90	91	93	94	93	83.0	95			
21-Jul	91	89	88	89	91	92	94	86	78	74	69	67	89	64	52	53	64	91	90	87	93	93	91	96	82.1	96			
22-Jul	98	97	97	98	99	98	94	88	78	72	65	65	59	55	55	51	57	85	70	75	73	74	70	69	76.8	99			
23-Jul	64	66	68	73	77	79	78	74	68	61	58	56	59	55	58	66	61	63	68	69	71	71	73	75	67.2	79			
24-Jul	83	86	72	74	85	88	77	70	60	54	51	49	43	42	40	38	36	34	33	54	65	66	65	71	59.9	88			
25-Jul	73	75	80	85	87	84	80	73	64	56	52	46	44	43	42	41	37	39	54	68	71	68	67	73	62.6	87			
26-Jul	72	74	73	68	70	75	79	77	70	71	60	54	52	52	52	53	51	52	56	63	76	78	83	81	66.2	83			
27-Jul	82	85	87	92	86	91	71	65	57	46	39	34	33	33	33	34	33	45	48	54	63	64	64	67	58.6	92			
28-Jul	72	81	83	89	92	88	82	78	76	87	69	57	48	49	38	50	63	63	68	73	87	96	92	93	73.9	96			
29-Jul	95	98	98	97	97	94	94	82	72	63	56	52	46	52	60	55	59	62	61	72	84	75	75	75	73.8	98			
30-Jul	79	77	83	88	95	94	96	93	90	83	70	58	47	54	46	44	54	62	66	68	77	80	74	74	73.0	96			
31-Jul	83	86	86	90	94	92	93	93	93	88	77	78	95	93	94	93	87	81	82	88	87	87	93	93	88.7	95			
																		Diurnal Average						Diurnal Maximum					
82.8 84.0 85.3 87.4 88.3 87.9 84.0 79.1 72.3 66.7 60.9 56.3 55.1 54.3 53.9 54.5 55.9 61.9 65.4 70.8 77.8 80.1 80.9 81.9																		98 98 98 99 99 98 97 95 95 94 93 87 95 93 94 95 95 96 96 97 97 96 98 97											
M - Maintenance																													





Wood Buffalo Environmental Association

Summary of Hour Averages

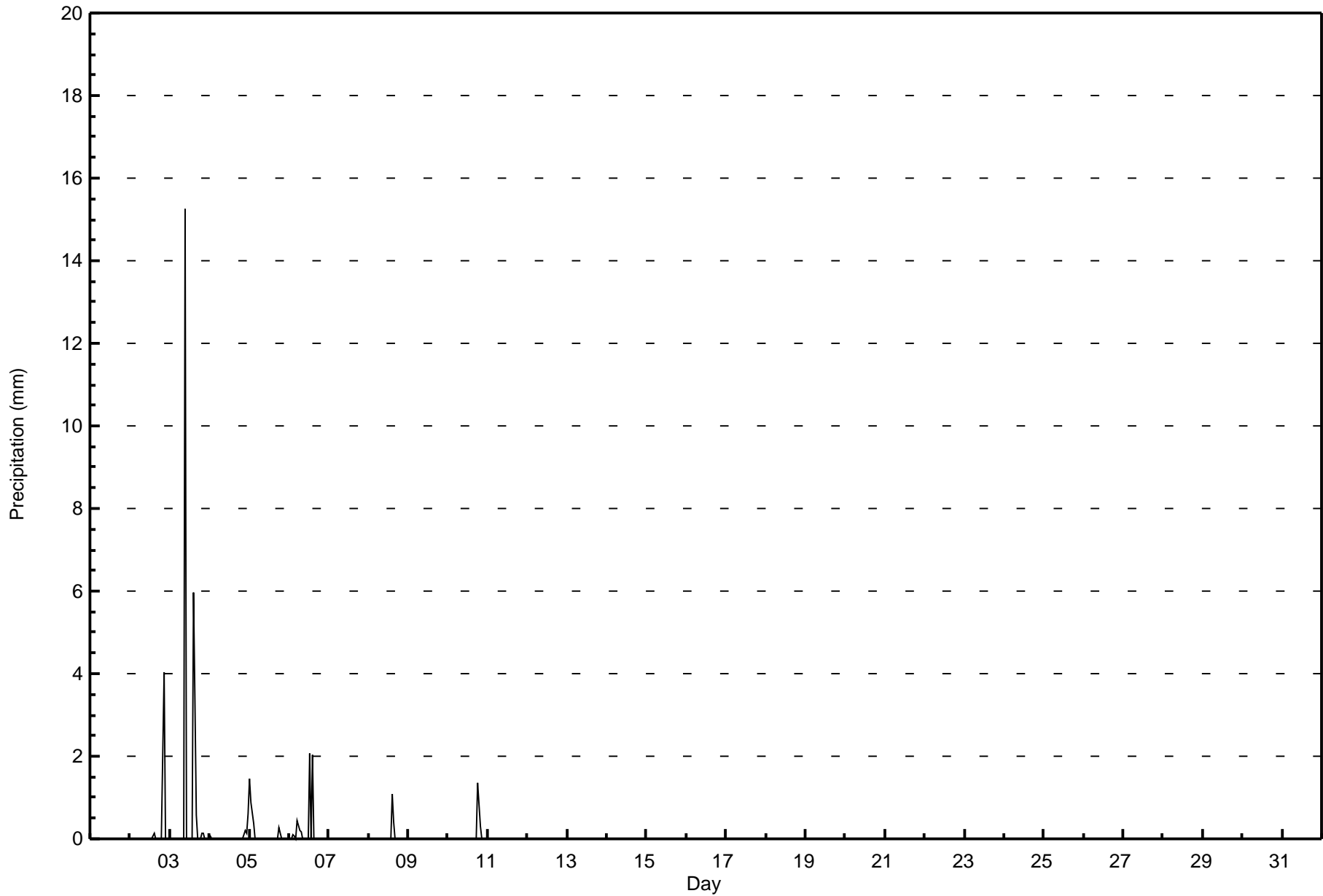
Precipitation (PC) - mm
Stony Mountain - July 2016

Maximum Value: 15.2 mm on Jul 3 10:00		Maximum Daily Total: 25.4 mm on Jul 3		Hours in Service:	744																																												
Minimum Value: 0.0 mm on Jul 1 01:00		Minimum Daily Total: 0.0 mm on Jul 1		Hours of Data:	324																																												
Maximum Diurnal Total: 15.2 mm at hour 10		Minimum Diurnal Total: 0.0 mm at hour 5		Hours of Missing Data:	420																																												
Monthly Total: 41.90 mm		Percentiles: P ₁ = 0.0 P ₁₀ = 0.0 Q ₁ = 0.0 Median = 0.0 Q ₃ = 0.0 P ₉₀ = 0.0 P ₉₉ = 2.6		Hours of Calibration:	0																																												
				Percent Operational Time:	43.6																																												
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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	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	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.2	4.0																
3-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.2	0.0	0.0	0.0	6.0	3.4	0.6	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.4	15.2																	
4-Jul	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.6	0.0	0.0	0.0	0.0	0.0	1.0	0.6																		
5-Jul	1.5	0.9	0.4	0.0	0.0	0.0	0.0	0.0	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	3.0	1.5																		
6-Jul	0.0	0.0	0.1	0.1	0.0	0.4	0.2	0.2	0.0	0.0	0.0	0.0	2.1	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	0.0	0.0	5.1	2.1																		
7-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	1.1																		
9-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	1.4																		
11-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jul	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	M	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF																	
16-Jul	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF																	
17-Jul	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF																	
18-Jul	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF																	
19-Jul	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF																	
20-Jul	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF																	
21-Jul	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF																	
22-Jul	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF																	
23-Jul	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF																	
24-Jul	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF																	
25-Jul	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF																	
26-Jul	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF																	
27-Jul	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF																	
28-Jul	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF																	
29-Jul	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF																	
30-Jul	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF																	
31-Jul	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF	DF																	
																								1.5	0.9	0.5	0.1	0.0	0.4	0.2	0.2	0.0	15.2	0.0	0.0	2.1	0.0	9.2	3.8	0.6	0.0	1.6	0.4	4.2	0.2	0.1	0.6	Diurnal Average	
																								1.5	0.9	0.4	0.1	0.0	0.4	0.2	0.2	0.0	15.2	0.0	0.0	2.1	0.0	6.0	3.4	0.6	0.0	1.4	0.3	4.0	0.2	0.1	0.6	Diurnal Maximum	
M - Maintenance																								DF - DAS Failure																									



Wood Buffalo Environmental Association
Hourly Averages

Precipitation (PC) - mm
Stony Mountain - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Precipitation (PC) - mm
Stony Mountain - July 2016**

Concentration Ranges (mm)	Number of Hours	%	Cumulative %
0 - 0.3	309	95.37	95.37
0.4 - 0.5	3	0.93	96.30
0.6 - 0.7	2	0.62	96.91
0.8 - 1.4	3	0.93	97.84
1.5 - 10	5	1.54	99.38
> 10	1	0.31	99.69

Total Number of Valid Hours: 324

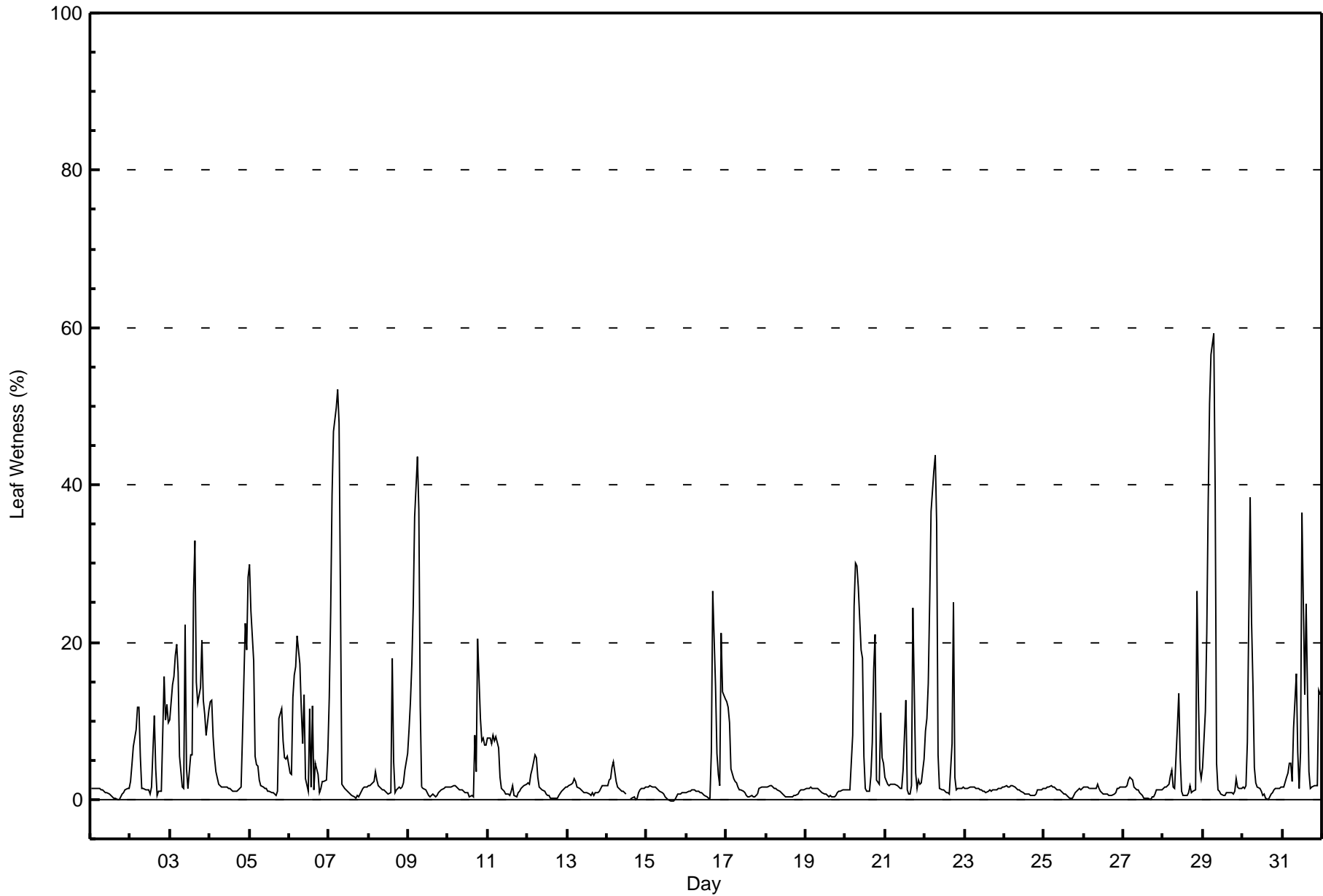
Total Number of Hours: 744



Wood Buffalo Environmental Association
Summary of Hour Averages

Leaf Wetness (LW) - %
Stony Mountain - July 2016

Maximum Value: 59 % on Jul 29 07:00														Maximum Daily Average: 13.1 % on Jul 7														Hours in Service: 744	
Minimum Value: 0 % on Jul 15 15:00														Minimum Daily Average: 0.8 % on Jul 15														Hours of Data: 742	
Maximum Diurnal Average: 11.2 % at hour 6														Minimum Diurnal Average: 1.3 % at hour 14														Hours of Missing Data: 2	
Monthly Average: 4.6 %														Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 1 Q ₃ = 3 P ₉₀ = 13 P ₉₉ = 46														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-Jul	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	0.9	1			
2-Jul	2	4	7	9	12	12	5	1	1	1	1	1	2	11	4	0	1	1	1	16	10	12	10	5.2	16				
3-Jul	10	15	16	18	20	16	6	2	1	22	4	1	6	6	26	33	15	12	14	20	13	11	8	11	12.7	33			
4-Jul	12	13	8	5	4	2	2	2	2	2	1	1	1	1	1	1	1	1	1	2	8	22	19	28	5.9	28			
5-Jul	30	24	18	5	4	4	3	2	2	1	1	1	1	1	1	0	1	10	12	7	5	5	5	6.1	30				
6-Jul	3	3	13	16	17	21	17	11	7	13	3	1	11	2	12	1	5	3	1	1	2	2	2	6	7.3	21			
7-Jul	13	24	39	47	50	52	48	26	2	1	1	1	1	1	0	0	0	1	0	1	1	2	2	2	13.1	52			
8-Jul	2	2	2	2	3	2	2	1	1	1	1	1	1	1	18	5	1	1	2	1	2	2	4	6	2.7	18			
9-Jul	9	12	17	25	36	44	37	12	2	1	1	1	1	0	1	1	0	1	1	1	1	1	2	2	8.6	44			
10-Jul	2	2	2	2	2	2	1	1	1	1	1	1	1	0	0	0	8	4	21	10	7	8	7	7	3.8	21			
11-Jul	8	8	7	8	8	8	7	3	1	1	1	1	1	1	2	1	0	1	1	1	2	2	2	2	3.1	8			
12-Jul	2	2	3	4	6	5	3	2	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	2	1.6	6			
13-Jul	2	2	2	2	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1.4	3			
14-Jul	2	2	3	4	5	2	2	1	1	1	1	1	M	M	0	0	0	0	0	1	1	1	1	2	1.5	5			
15-Jul	2	2	2	2	2	2	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	0.8	2			
16-Jul	1	1	1	1	1	1	1	1	1	1	1	0	0	0	6	26	14	6	3	2	21	14	13	4.9	26				
17-Jul	12	12	10	4	3	2	2	2	1	1	1	1	0	0	0	0	0	0	0	1	1	2	2	2	2.5	12			
18-Jul	2	2	2	2	2	1	1	1	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1.0	2			
19-Jul	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1.0	1			
20-Jul	1	1	1	1	8	25	30	30	27	19	18	6	1	1	1	3	7	17	21	2	2	11	5	5	10.2	30			
21-Jul	3	2	2	2	2	2	2	2	2	1	1	4	13	1	1	1	2	24	3	1	2	2	2	5	3.4	24			
22-Jul	9	10	15	25	37	42	44	35	6	1	1	1	1	1	1	7	25	3	1	1	1	1	1	2	11.3	44			
23-Jul	1	1	1	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1.3	2			
24-Jul	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1.1	2			
25-Jul	1	1	2	2	2	2	2	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1.1	2			
26-Jul	2	2	2	1	1	1	1	1	2	1	1	1	1	1	1	0	1	1	1	1	1	1	2	2	1.2	2			
27-Jul	2	2	2	3	3	3	2	1	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1.1	3			
28-Jul	1	2	2	2	3	4	2	1	9	13	5	1	1	1	0	1	2	1	1	1	27	13	4	3	4.1	27			
29-Jul	4	11	21	38	50	57	59	39	5	1	1	1	0	1	1	1	1	1	1	1	3	1	1	1	12.5	59			
30-Jul	2	1	2	7	38	23	15	4	2	2	1	1	1	1	0	0	0	1	1	1	1	1	1	2	4.5	38			
31-Jul	2	2	3	3	5	5	2	9	16	6	1	6	37	13	25	13	4	1	2	2	2	2	14	13	7.8	37			
4.7														5.4														Diurnal Average	
30														24														Diurnal Maximum	
M - Maintenance																													





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Leaf Wetness (LW) - %
Stony Mountain - July 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 0.3	41	5.58	5.58
0.4 - 0.5	42	5.71	11.29
0.6 - 0.7	43	5.85	17.14
0.8 - 1.4	232	31.56	48.71
1.5 - 10	236	32.11	80.82
> 10	105	14.29	95.10

Total Number of Valid Hours: 735

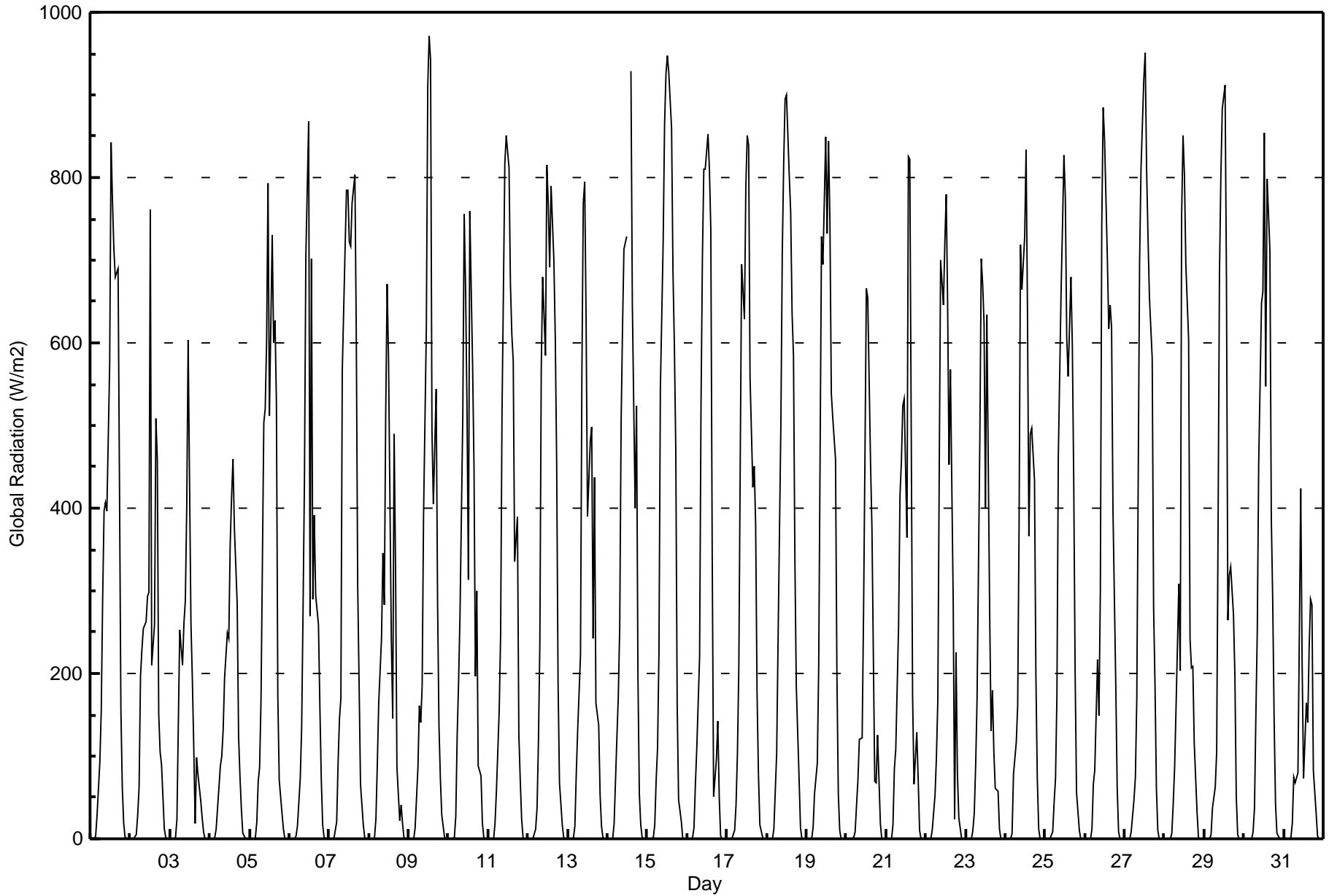
Total Number of Hours: 744



Wood Buffalo Environmental Association
Summary of Hour Averages

Global Radiation (GR) - W/m2
Stony Mountain - July 2016

Maximum Value: 971 W/m2 on Jul 9 13:00		Maximum Daily Average: 341.8 W/m2 on Jul 15		Hours in Service: 744																							
Minimum Value: 0 W/m2 on Jul 1 01:00		Minimum Daily Average: 101.0 W/m2 on Jul 31		Hours of Data: 742																							
Maximum Diurnal Average: 705.3 W/m2 at hour 12		Minimum Diurnal Average: 0.0 W/m2 at hour 1		Hours of Missing Data: 2																							
Monthly Average: 243.5 W/m2		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 98 Q ₃ = 459 P ₉₀ = 721 P ₉₉ = 925		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-Jul	0	0	0	4	29	93	156	291	396	406	396	575	842	771	714	680	690	429	158	63	19	2	0	0	279.7	842	
2-Jul	0	0	0	5	28	62	196	230	255	263	294	298	761	209	259	508	460	151	105	90	11	1	0	0	174.5	761	
3-Jul	0	0	0	1	23	139	252	210	261	289	401	604	261	194	112	19	98	78	45	25	8	0	0	0	125.8	604	
4-Jul	0	0	0	1	12	63	89	99	132	196	249	243	357	413	459	376	285	124	75	36	6	0	0	0	133.9	459	
5-Jul	0	0	0	1	20	69	87	167	503	520	602	793	512	730	601	627	527	172	71	30	11	1	0	0	251.9	793	
6-Jul	0	0	0	0	3	15	72	134	276	433	705	867	269	702	290	391	294	259	161	72	16	1	0	0	206.8	867	
7-Jul	0	0	0	1	21	91	146	169	567	713	785	786	722	717	770	803	609	307	187	65	16	2	0	0	311.5	803	
8-Jul	0	0	0	1	24	90	165	243	346	282	515	671	581	243	145	490	329	87	23	41	19	1	0	0	179.0	671	
9-Jul	0	0	0	1	13	87	160	141	185	391	619	911	971	942	494	405	543	288	137	73	29	1	0	0	266.3	971	
10-Jul	0	0	0	1	28	125	190	269	511	756	664	522	313	760	572	450	197	301	89	76	19	1	0	0	243.5	760	
11-Jul	0	0	0	1	19	58	156	247	516	663	817	851	811	670	609	577	335	389	127	72	24	1	0	0	289.4	851	
12-Jul	0	0	0	1	12	37	119	238	569	680	585	815	768	692	790	699	606	455	189	67	17	1	0	0	305.8	815	
13-Jul	0	0	0	1	15	80	131	221	563	769	795	628	389	481	498	242	438	165	137	52	16	1	0	0	234.2	795	
14-Jul	0	0	0	1	19	125	173	257	505	619	714	729	M	M	930	648	400	524	196	54	17	1	0	0	268.7	930	
15-Jul	0	1	0	1	16	72	110	225	545	722	864	926	948	927	860	687	597	472	163	47	21	1	0	0	341.8	948	
16-Jul	0	1	0	1	14	66	109	220	522	702	810	810	853	811	738	345	51	97	143	51	4	0	0	0	264.6	853	
17-Jul	0	0	0	0	11	40	103	209	455	694	629	789	850	840	557	425	450	379	176	78	17	1	0	0	279.3	850	
18-Jul	0	0	0	1	13	58	103	241	501	708	818	895	899	802	758	636	585	339	185	73	13	1	0	0	317.8	899	
19-Jul	0	0	0	1	14	54	91	209	466	728	695	849	732	843	747	539	510	460	196	54	10	0	0	0	299.9	849	
20-Jul	0	0	0	0	2	9	40	72	120	122	273	461	666	655	454	374	222	70	67	125	19	0	0	0	156.3	666	
21-Jul	0	0	0	1	16	85	108	258	416	456	523	532	364	825	821	504	172	66	129	71	11	0	0	0	223.3	825	
22-Jul	0	0	0	0	10	53	99	168	440	700	646	720	780	647	452	568	284	24	226	79	26	0	0	0	246.8	780	
23-Jul	0	0	0	0	10	31	88	167	485	701	671	625	400	634	275	130	179	105	61	58	12	0	0	0	193.1	701	
24-Jul	0	0	0	0	7	77	117	162	381	718	665	729	833	636	366	490	497	434	196	73	12	0	0	0	266.4	833	
25-Jul	0	0	0	0	8	44	73	173	463	665	743	826	776	606	559	680	596	433	200	55	10	0	0	0	288.0	826	
26-Jul	0	0	0	0	11	67	83	218	150	301	741	884	846	702	616	645	618	399	187	62	8	0	0	0	272.4	884	
27-Jul	0	0	0	0	8	47	75	169	433	699	811	918	950	811	729	656	582	280	186	60	9	0	0	0	309.4	950	
28-Jul	0	0	0	1	6	43	86	158	309	203	755	851	804	695	604	242	207	209	115	32	1	0	0	0	221.7	851	
29-Jul	0	0	0	0	5	37	62	105	374	683	802	883	911	673	265	319	329	271	198	51	6	0	0	0	248.9	911	
30-Jul	0	0	0	0	1	9	37	150	252	454	648	663	855	548	798	711	387	288	147	42	6	0	0	0	249.8	855	
31-Jul	0	0	0	0	2	19	74	68	79	246	425	211	73	164	141	231	290	283	84	30	4	0	0	0	101.0	425	
0.0		0.1	0.1	0.9	13.5	62.7	114.6	189.9	386.4	531.7	634.1	705.3	670.0	644.8	547.8	487.0	399.0	268.9	140.7	59.9	13.5	0.7	0.1	0.1	Diurnal Average		
0		1	0	5	29	139	252	291	569	769	864	926	971	942	930	803	690	524	226	125	29	2	0	0	Diurnal Maximum		
M - Maintenance																											





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Global Radiation (GR) - W/m2
Stony Mountain - July 2016**

Concentration Ranges (W/m2)	Number of Hours	%	Cumulative %
0 - 20	274	36.93	36.93
21 - 100	99	13.34	50.27
101 - 300	131	17.65	67.92
301 - 600	102	13.75	81.67
601 - 900	126	16.98	98.65
> 900	10	1.35	100.00

Total Number of Valid Hours: 742

Total Number of Hours: 744



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Speed (WS) - km/h
Stony Mountain - July 2016

Maximum Speed: 16 km/h on Jul 22 16:00	Maximum Daily Speed Average: 10.8 km/h on Jul 24	Hours in Service: 744
Minimum Speed Value: 0 km/h on Jul 25 19:00	Minimum Daily Speed Average: 0.6 km/h on Jul 28	Hours of Data: 742
Maximum Diurnal Speed Average: 3.4 km/h at hour 4	Minimum Diurnal Speed Average: 1.3 km/h at hour 20	Hours of Missing Data: 2
Monthly Average Velocity: 2.5 km/h 267.4 deg	Percentiles: P ₁ = 1 P ₁₀ = 3 Q ₁ = 4 Median = 6 Q ₃ = 8 P ₉₀ = 10 P ₉₉ = 14	Percent Operational Time: 99.7

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Jul	SSE4	SSE4	SSE5	SSE5	SSE5	SSE5	S4	SE4	SE5	SE7	SSE7	SE7	SE7	ESE7	E6	SE7	ESE8	ESE8	ESE7	SE6	SSW4	SSW5	SSW6	SSW6	SE5.1	ESE8	
2-Jul	SSW5	SSW5	SSW5	SSE3	SSE3	SE5	SSE4	SE4	SE6	ESE7	SE6	SSE6	SE6	SE5	WSW3	SE3	ESE5	E4	ENE4	E4	SE3	SE5	S4	SSW8	SSE3.7	SSW8	
3-Jul	SSW6	SSW6	SSW6	SSW5	S4	S6	S6	SW1	NE3	ESE3	NNW1	SE3	SSE2	NW6	W4	W8	W7	S1	W4	NW2	WNNW5	W8	WNNW8	WNNW8	WSW2.6	W8	
4-Jul	WNNW9	W9	W10	W9	W11	WNNW13	WNNW12	WNNW9	WNNW9	W9	W7	W9	WNNW9	WNNW8	WNNW5	NW3	NW2	NE4	NE3	ENE3	NE3	NNW4	WNNW2	SW2	WNNW5.8	WNNW13	
5-Jul	W5	WNNW8	WNNW7	NW5	NW4	NW4	N5	NNE9	NNE10	NNE8	NE10	NE15	NE13	N9	NNE12	NE10	NNE5	NW3	NNW3	WNNW4	NW5	NW2	S1	SSE5	N4.8	NE15	
6-Jul	SSW4	SW4	ENE1	S1	WNNW2	SSW1	W3	NW3	W2	W4	NW4	WNNW6	NW4	ENE5	ENE5	SE5	ENE3	NE4	NE3	NE6	NNE4	NNE4	NNE3	NNW2	N1.1	NE6	
7-Jul	NW2	WNNW3	NW2	WNNW3	NW3	NW3	NNW3	NNW3	N4	NW4	NW5	NNW6	NNW4	NNW6	NNW6	NW6	NNW5	NNE5	NE6	ENE4	ENE5	ENE5	NE5	NE5	N3.0	NW6	
8-Jul	NE4	NE6	ENE5	E4	ENE4	ENE5	ENE4	NE5	ENE6	E4	E5	E6	E7	ENE4	SSW2	NNW2	NE4	NNE3	NNE3	NE8	NE10	ENE6	NE6	ENE4	ENE4.4	NE10	
9-Jul	ENE4	NNE3	NE4	NNW3	NW3	NNW3	NE7	ENE6	NE5	NE7	NE7	E6	E7	E8	ENE8	E6	E6	NE7	ENE7	E6	E5	ESE5	ESE5	E4	ENE4.7	E8	
10-Jul	E4	ESE3	N2	NNE3	NNW3	NW4	NNW4	ENE5	ENE5	E7	ESE8	ENE8	ENE9	ENE8	NE8	NE7	SSE6	SW7	WNNW3	W5	W3	WNNW5	NW3	NW3	NE2.1	ENE9	
11-Jul	NNW3	N3	N3	NNW3	NNE4	NNW2	NNE4	NE5	NNE3	NE4	NE4	NNW4	WNNW9	NNW5	NW5	NNE9	N6	NNE8	NNE5	NNW1	WNNW3	WNNW3	WNNW3	WNNW3	N3.3	NNE9	
12-Jul	NW3	NNW3	NW3	NW4	NW4	NW5	NW4	NW5	NNW4	NNE8	NNE9	N8	N8	N8	NNW7	N8	NNW7	NNW6	NNW5	NNE4	SW2	WSW2	W2	WNNW3	NNW4.4	NNE9	
13-Jul	WNNW3	WNNW4	WNNW4	WNNW5	NW5	WNNW6	NW6	NW6	NNW6	NNE9	NNE7	NNE9	NNE8	N5	N4	NNW3	NNW3	NNE3	WNNW4	NNW2	WNNW3	WNNW2	NNW2	N4	NNW3.8	NNE9	
14-Jul	NNE5	N3	NNE6	NNE4	N4	NNE5	NE5	N3	NE5	ENE7	ENE7	NE7	M	NE4	ENE6	N5	ENE4	NE6	NE3	NW1	N3	ENE2	AF	SSW2	NE3.8	ENE7	
15-Jul	SW3	NW2	WNNW4	WNNW3	NNW1	NW0	NW2	NW3	NNW2	SW3	SW3	SW2	NW3	NW3	NNW2	WSW2	W4	WNNW3	W4	WSW6	WSW6	WSW9	W9	W10	W3.1	W10	
16-Jul	W9	WNNW7	WNNW7	WNNW7	WNNW7	WNNW7	WNNW6	WNNW7	WNNW8	WNNW9	WNNW9	WNNW8	WNNW8	WNNW7	NW6	WSW9	NNW2	SW5	W6	WNNW9	N4	NW4	NW4	WNNW6.4	WSW9		
17-Jul	NW3	NW3	NW3	NW3	NW3	NW3	NW4	NNW3	NNE5	N6	N6	N5	NNE6	N6	NE6	NNE5	NNE5	NNW3	NNE4	NE2	ENE3	ENE2	S3	SSW4	N2.9	N6	
18-Jul	SSW5	SW5	SW6	SW7	SW7	SW7	SW7	SW6	SSW5	WSW3	SW4	SW5	SW5	SW8	SW8	SW7	WSW9	WSW6	SW7	SW7	SW7	SW6	SSW7	SW8	SW6.2	WSW9	
19-Jul	SSW7	SSW7	SSW7	SSW8	SSW8	SSW8	SSW9	SSW9	SSW7	SSW8	SW10	SW12	SW12	WSW12	WSW11	WSW10	WSW10	SW12	WSW9	W6	WNNW2	W9	WSW9	WSW8	SW8.3	WSW12	
20-Jul	WSW8	W10	W10	W11	W9	W8	W7	WSW7	WSW7	WSW7	WSW8	WSW10	WSW10	WSW10	WSW11	WNNW6	WNNW6	WNNW6	WNNW5	WSW6	WSW6	WSW7	WSW7	WSW9	WSW8	W7.5	W11
21-Jul	W10	W10	W9	WSW9	WSW8	SW9	SW8	WSW10	WSW10	W11	W13	W12	WNNW9	WNNW11	WNNW11	WNNW12	NW6	WNNW8	WNNW7	WNNW6	WNNW5	N4	NNE5	N2	W7.5	W13	
22-Jul	NE4	ENE4	SE3	SSE4	SE5	SSE5	SSE5	SSE7	SSW11	SSW11	SSW12	SSW13	SSW14	SW15	SW13	SW16	SSW13	WSW8	SW10	SW9	SW11	W9	W6	WSW6	SSW7.2	SW16	
23-Jul	W7	W9	W9	W8	W10	W9	W8	W8	W8	W8	W9	W11	WNNW9	W10	W8	W5	WNNW8	W9	W5	WSW5	WSW6	WSW8	WSW8	WSW8	W7.8	W11	
24-Jul	SW9	SW9	WSW12	WSW10	SW9	SSW9	SW10	SW11	WSW12	WSW13	WSW14	WSW13	WSW15	WSW14	W12	W14	W14	W16	W14	NW11	WNNW6	W9	W12	W10	WSW10.8	W16	
25-Jul	W11	W9	W10	W10	W11	W12	W10	WNNW9	WNNW8	WNNW8	WNNW11	WNNW10	WNNW9	WNNW7	WNNW6	NNE5	NW5	NNW3	SW3	N2	E2	ESE5	SE4	S3	WNNW5.6	W12	
26-Jul	S4	SSW6	SSW7	SW8	SW9	SW11	SSW9	SSW11	SW13	SSW11	SSW12	SSW11	SW11	SW11	SW12	SW10	SW10	SSW9	SSW5	SSW6	SSW7	SSW8	SW10	SSW9.3	SW13		
27-Jul	SW10	SW10	SW9	SW8	SW7	SW6	W7	W6	W5	W6	W6	NW3	NW3	W5	WNNW5	WNNW5	WNNW5	WNNW2	N4	NE5	NE6	NE5	NNE5	NE5	W3.0	SW10	
28-Jul	NE4	NE3	NE2	NNW2	E2	ENE3	ENE3	ESE3	ESE3	W1	E2	WSW3	W6	W3	W10	WNNW7	WNNW4	NNE3	NE5	ENE3	ENE2	S5	SSW8	SW10	W0.6	SW10	
29-Jul	NW2	W3	SW4	SW5	WSW4	W4	W2	WNNW4	WNNW2	N1	ESE1	W1	WSW4	SW7	SW7	SW9	SSW8	SSW6	SSW7	SSW5	S4	SW8	SSW8	SSW8	SW4.1	SW9	
30-Jul	SSW7	SW8	WSW3	WSW6	SSW6	SSW7	WSW2	WSW4	WSW6	WSW6	W6	WNNW6	WNNW3	NNW2	NW2	W3	NNW1	NE1	S7	SSW7	S4	SSW6	SSW9	SW3	SW3.8	SSW9	
31-Jul	SSW1	SSW4	SSW5	W3	WNNW3	WNNW6	WNNW7	W10	WNNW10	NW6	WNNW7	NW5	WNNW7	WNNW7	W8	W7	W6	WNNW7	WNNW6	W5	W7	W8	W7	W9	W5.9	W10	

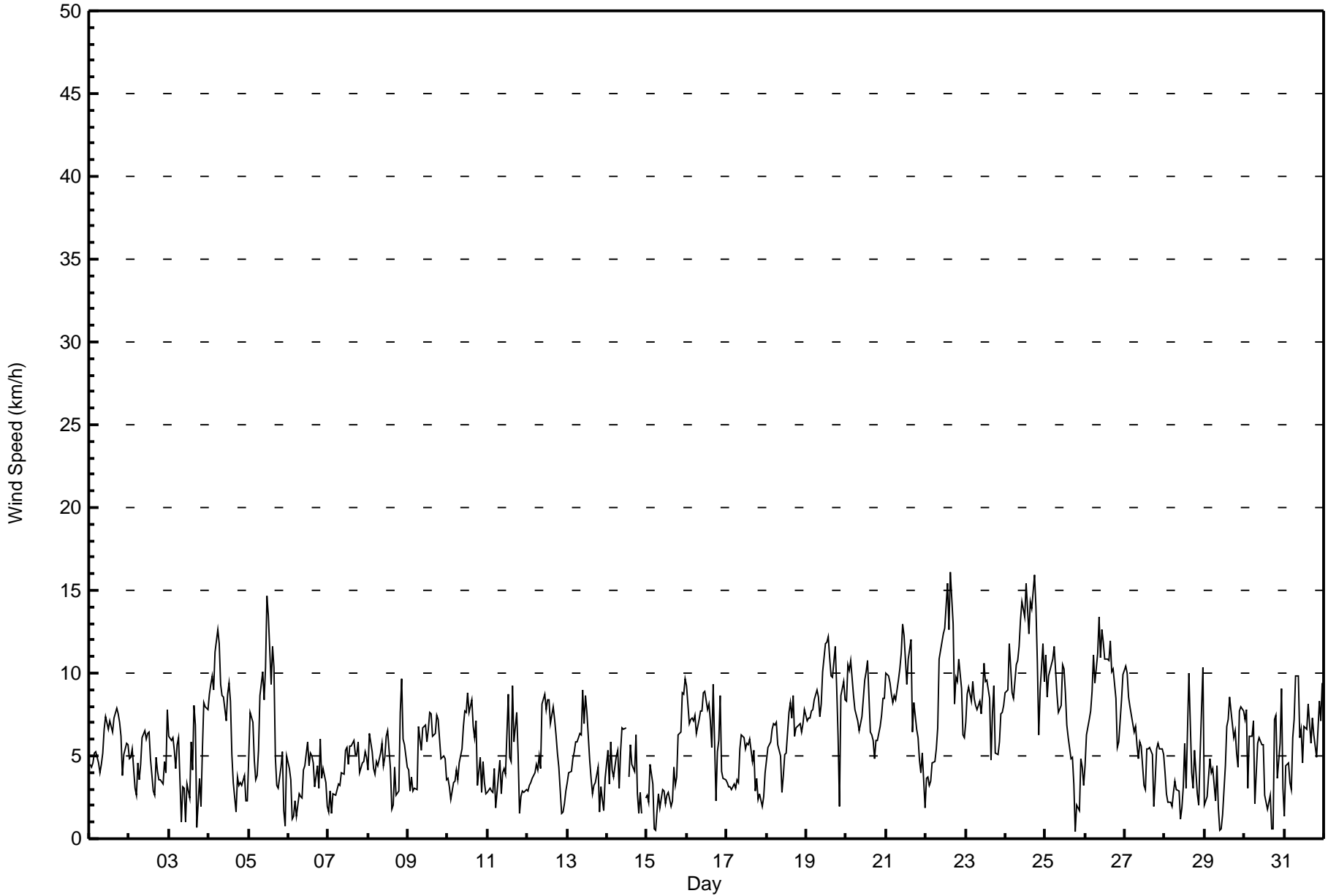
WSW2.7	WSW3.1	W3.2	W3.4	WSW3.2	WSW3.1	W2.6	W2.5	W2.1	W1.8	W2.1	W2.3	WNNW2.7	WNNW2.8	WNNW3.1	WNNW2.7	W2.3	WNNW2.0	W1.7	W1.3	W1.5	WSW2.2	WSW2.8	WSW3.2	Diurnal Average
W11	W10	WSW12	W11	W11	WNNW13	WNNW12	SSW11	SW13	WSW13	WSW14	NE15	WSW15	SW15	SW13	SW16	W14	W16	W14	NW11	WSW11	W9	W12	SW10	Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed (WS) - km/h
Stony Mountain - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Wind Speed (WS) - km/h
Stony Mountain - July 2016

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	357	48.11	48.11
6 - 11	348	46.90	95.01
12 - 19	37	4.99	100.00
20 - 28	0	0.00	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 742

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Stony Mountain - July 2016**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	19	25	30	27	11	9	13	14	12	18	17	12	23	37	51	39	357
6 - 11	9	13	18	11	10	6	8	4	3	42	45	41	66	57	8	7	348
12 - 19	0	1	2	0	0	0	0	0	0	6	8	8	9	3	0	0	37
20 - 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	28	39	50	38	21	15	21	18	15	66	70	61	98	97	59	46	742

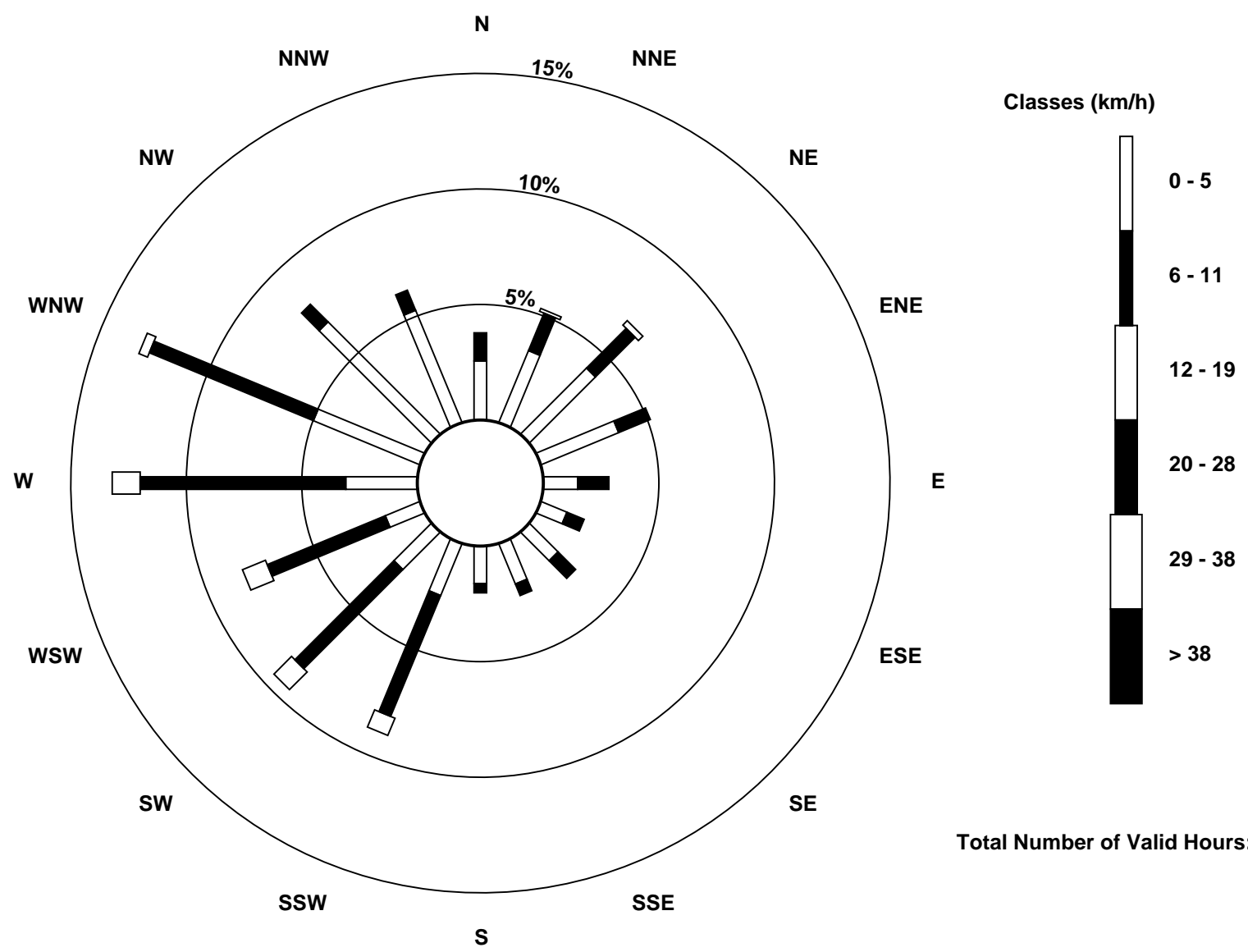
Total Number of Valid Hours: 742

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

Wind Speed (WS) - km/h
Stony Mountain (AMS 18)





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Stony Mountain - July 2016

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



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Stony Mountain - July 2016

Direction of Maximum Speed: 217 deg on Jul 22 16:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 253.8 deg on Jul 24	Hours of Data: 742
Direction of Minimum Speed: 215 deg on Jul 25 19:00	Direction of Minimum Daily Speed Average: 0.6 deg on Jul 28
Direction of Minimum Speed: 215 deg on Jul 25 19:00	Hours of Missing Data: 2
Monthly Average Direction: 276.0 deg	Percent Operational Time: 99.7

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Jul	149	165	158	152	152	166	169	135	133	134	147	133	137	112	96	125	121	114	119	133	195	202	206	206	143.5
2-Jul	204	201	206	154	165	138	151	129	141	122	132	148	138	137	249	134	116	93	73	101	125	134	186	202	148.6
3-Jul	195	196	196	193	183	186	189	227	38	111	347	136	152	320	274	269	279	188	273	310	286	277	287	290	244.2
4-Jul	288	277	274	280	278	284	287	285	283	278	281	273	286	288	300	316	322	45	49	64	39	327	299	215	288.3
5-Jul	277	290	300	308	314	323	9	28	33	23	35	35	36	9	30	43	14	326	344	302	305	323	179	155	7.6
6-Jul	212	231	72	179	284	195	270	306	271	271	311	282	323	67	76	125	66	48	39	37	23	29	18	337	358.4
7-Jul	315	301	314	302	310	326	331	327	6	312	317	341	336	343	333	311	348	28	54	63	71	74	55	52	355.4
8-Jul	51	38	64	80	76	62	74	56	67	89	96	88	80	70	208	348	39	32	19	44	52	59	50	62	61.2
9-Jul	63	27	36	340	322	341	47	60	41	53	50	83	99	80	75	80	80	55	74	99	89	102	108	79	67.0
10-Jul	93	110	357	16	334	321	348	60	58	93	109	72	58	68	49	52	154	229	288	271	275	294	316	322	47.6
11-Jul	341	9	359	342	18	332	32	46	33	52	38	345	300	331	318	28	6	17	16	345	294	289	293	298	357.0
12-Jul	317	345	313	316	315	314	313	306	341	23	26	357	10	11	344	355	347	332	342	17	235	254	267	284	344.6
13-Jul	295	303	303	303	304	301	304	309	341	20	14	21	21	6	360	338	336	14	285	342	293	288	327	359	336.8
14-Jul	19	357	20	14	4	27	46	6	36	60	70	55	M	53	57	9	75	51	36	322	2	72	AF	199	37.5
15-Jul	224	319	296	302	328	307	322	311	337	220	231	216	323	326	327	250	279	294	273	258	239	241	265	272	271.1
16-Jul	276	292	284	294	300	296	293	289	286	287	289	292	296	294	291	323	256	327	223	262	292	359	308	310	289.5
17-Jul	308	312	308	308	311	324	306	343	19	6	1	349	18	10	37	24	28	327	30	45	64	74	189	212	358.3
18-Jul	209	218	219	219	221	218	216	220	209	257	227	222	235	220	228	221	237	247	227	219	227	214	209	214	222.4
19-Jul	210	212	208	211	213	213	212	211	213	213	215	222	232	240	245	249	240	229	237	277	284	276	258	237	230.0
20-Jul	248	273	268	275	277	273	267	256	246	239	242	254	243	249	291	294	301	303	256	247	246	256	239	249	260.7
21-Jul	269	278	272	253	237	224	215	244	257	275	269	276	293	292	288	284	311	293	290	285	291	355	20	11	274.7
22-Jul	51	75	124	154	140	148	156	168	196	201	212	209	204	221	215	217	205	240	229	220	236	262	270	255	210.9
23-Jul	265	276	279	279	279	275	281	279	277	280	276	278	283	273	280	276	282	280	281	258	253	256	243	239	272.9
24-Jul	224	228	258	243	222	210	222	227	242	253	245	243	256	252	263	262	261	265	276	310	288	264	280	280	253.8
25-Jul	277	267	274	279	269	273	281	295	288	293	285	292	296	300	301	348	312	331	215	352	94	121	136	171	285.2
26-Jul	186	203	206	214	216	215	211	211	222	209	201	200	207	215	228	217	219	221	212	210	203	213	208	217	212.1
27-Jul	220	221	228	224	231	225	269	272	259	274	275	322	313	273	298	290	290	297	10	45	44	39	28	39	270.1
28-Jul	45	49	49	348	98	70	66	104	114	270	91	254	269	279	275	284	282	28	41	72	72	187	213	218	268.9
29-Jul	318	271	229	232	252	273	272	283	284	2	102	265	249	219	219	226	211	203	210	207	184	215	213	210	226.6
30-Jul	208	231	254	249	211	201	238	256	247	256	276	288	295	334	307	278	329	41	189	204	181	198	213	234	232.0
31-Jul	211	207	212	275	291	298	301	267	289	306	300	308	293	286	272	267	280	284	286	274	273	278	272	271	279.2

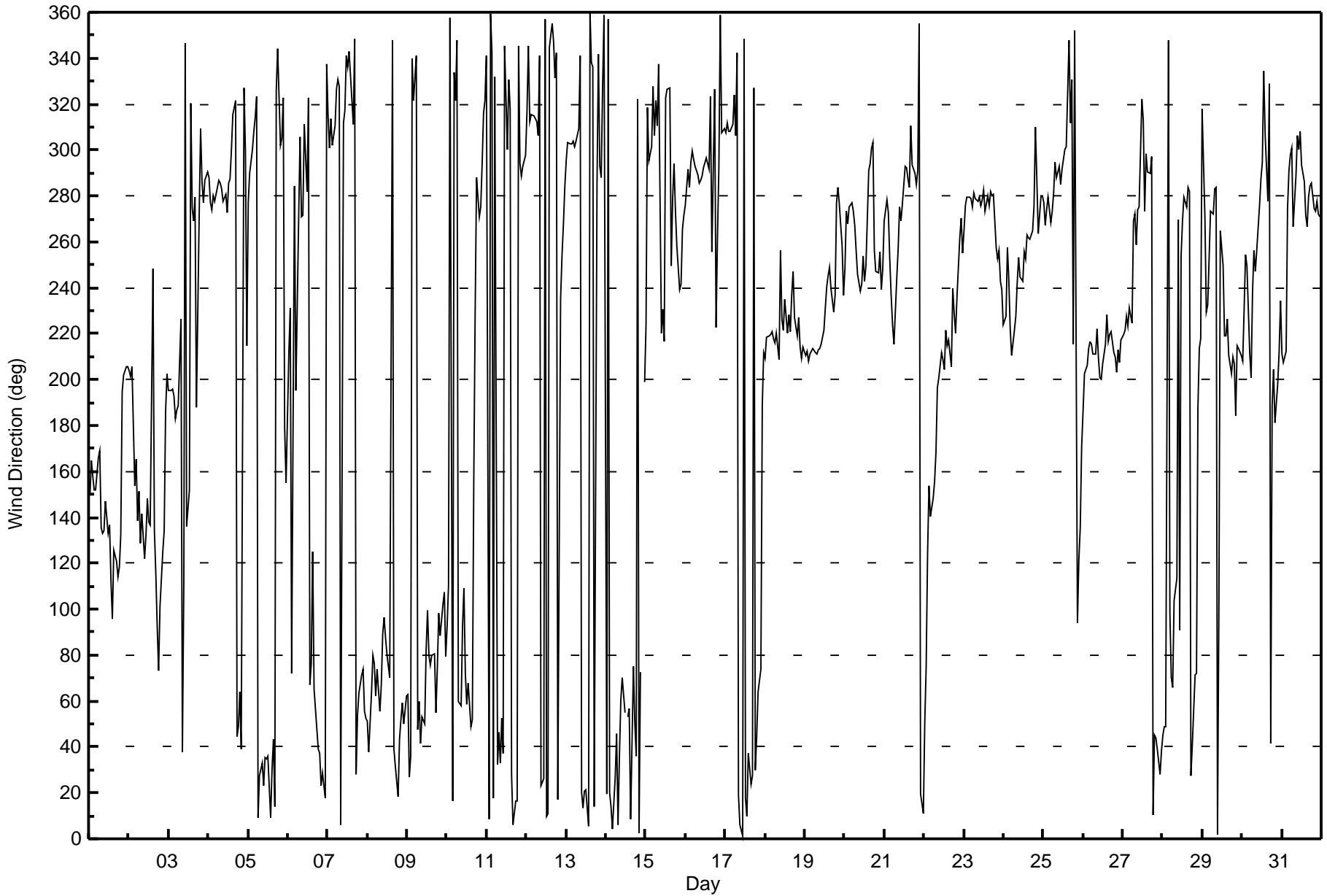
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 Diurnal Average

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



Wood Buffalo Environmental Association
Hourly Averages

Wind Direction (WD) - deg
Stony Mountain - July 2016





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
Stony Mountain - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0																			Hours in Service: 744						
Maximum Value: 110 deg on Jul 29 10:00																			Hours of Data: 742						
Minimum Value: 10 deg on Jul 18 00:00																			Hours of Missing Data: 2						
Percentiles: P ₁ = 13 P ₁₀ = 19 Q ₁ = 26 Median = 33 Q ₃ = 45 P ₉₀ = 64 P ₉₉ = 96																			Hours of Calibration: 0						
																			Percent Operational Time: 99.7						
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Jul	28	34	34	28	30	35	36	33	35	34	34	37	44	38	43	41	37	34	25	28	34	17	14	14	44
2-Jul	12	12	15	26	26	23	37	26	39	27	40	39	48	42	39	73	41	33	24	33	44	22	25	17	73
3-Jul	20	17	16	18	27	25	31	99	70	75	85	89	92	41	55	41	34	97	46	49	26	30	30	26	99
4-Jul	28	30	30	32	29	29	27	28	30	30	32	32	33	38	50	68	71	22	19	22	18	50	48	32	71
5-Jul	25	30	35	46	41	42	50	28	26	36	35	31	29	49	36	32	63	50	44	20	24	88	94	39	94
6-Jul	54	62	88	60	35	79	69	38	68	39	58	50	59	42	32	37	78	31	55	21	22	18	31	34	88
7-Jul	38	15	50	21	18	29	42	64	57	63	61	63	71	54	55	57	59	53	29	22	21	23	15	25	71
8-Jul	20	19	23	21	28	20	28	24	36	34	35	35	35	38	91	67	27	27	29	20	23	21	19	14	91
9-Jul	17	33	28	35	16	26	28	25	26	30	34	46	41	37	34	34	33	32	31	32	25	24	23	32	46
10-Jul	24	18	63	45	32	33	48	36	34	38	35	38	33	42	27	34	55	31	44	27	68	19	27	22	68
11-Jul	24	28	32	33	24	36	29	40	74	54	64	72	38	63	56	34	59	48	38	50	22	40	29	33	74
12-Jul	40	39	17	26	14	17	28	35	53	45	37	63	55	55	62	62	62	64	68	56	88	78	41	31	88
13-Jul	26	24	21	20	21	26	34	48	64	48	57	44	41	65	63	60	63	82	34	64	24	23	53	28	82
14-Jul	22	26	23	25	31	32	30	54	47	38	43	38	M	34	52	60	62	29	49	34	36	59	AF	24	62
15-Jul	42	26	16	14	22	24	31	39	76	55	73	89	91	89	98	87	58	58	25	25	23	26	32	30	98
16-Jul	30	21	20	19	22	23	27	27	29	39	36	40	46	47	61	67	40	95	23	25	47	53	32	36	95
17-Jul	41	38	28	35	30	37	32	53	45	58	55	59	66	65	59	54	40	79	65	31	12	20	16	10	79
18-Jul	12	12	12	14	15	16	18	23	37	78	75	63	65	49	42	41	34	32	30	21	21	16	15	18	78
19-Jul	16	15	15	16	17	20	19	23	25	33	30	28	33	35	37	35	32	25	29	55	63	29	31	28	63
20-Jul	29	31	32	29	27	27	32	34	32	30	31	33	33	34	55	45	54	66	32	30	28	33	28	32	66
21-Jul	32	27	31	34	27	24	22	33	37	34	33	40	33	39	37	33	69	35	33	29	28	51	35	34	69
22-Jul	34	26	24	27	17	24	33	39	28	31	27	27	28	28	24	28	37	54	24	22	27	34	29	27	54
23-Jul	30	28	29	29	28	26	27	32	32	42	38	35	33	34	34	46	36	32	32	31	28	31	28	27	46
24-Jul	20	22	33	30	19	19	26	29	33	35	32	34	35	35	36	35	35	34	33	52	36	33	29	30	52
25-Jul	31	32	30	29	31	29	31	34	38	41	37	38	47	50	53	64	58	64	97	20	48	13	18	24	97
26-Jul	20	14	13	15	20	22	23	22	25	25	26	36	34	32	32	30	32	27	23	18	14	16	18	22	36
27-Jul	22	20	22	20	22	18	31	30	38	35	50	73	89	47	53	51	49	106	83	18	15	16	16	15	106
28-Jul	14	16	38	42	27	46	37	38	44	81	87	70	54	81	37	57	41	58	28	56	103	30	19	21	103
29-Jul	77	37	50	21	26	28	82	31	90	110	106	106	72	54	22	27	25	22	21	28	38	17	18	16	110
30-Jul	14	32	57	32	42	31	75	46	35	41	44	38	86	77	87	87	96	87	38	19	35	17	20	89	96
31-Jul	77	15	28	39	34	33	28	33	29	37	39	58	42	30	33	34	34	32	29	28	29	29	32	31	77
77 62 88 60 42 79 82 99 90 110 106 106 92 89 98 87 96 106 97 64 103 88 94 89																									
Diurnal Maximum																									
M - Maintenance AF - Analyzer Failure																									



Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	July 26, 2016	Last Calibration	June 21, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Reason:	Routine		
Start Time (MST)	8:35	End Time (MST)	13:15
Gas Cert Reference	EY0000368	Station temp.	22 Deg C
Cal Gas Concentration	49 ppm	Cal Gas Exp Date	10/06/2016
Calibrator Make/Model	API T700	Serial Number	1222
ZAG Make/Model	API 701	Serial Number	5610
DACS make/model	Campbell Scientific CR3000	DACS serial No.	9035

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-601	-601
Analyzer IP address	192.168.1.43		Lamp voltage	887	887
Calculated slope	0.998851	0.998898	Chamber temp	45.1	45.1
Calculated intercept	-0.735203	1.025893	Pressure	664.2	664.2
Analyzer Background	21.0	21.1	Flow	0.379	0.379
Analyzer Coefficient	0.910	0.887	Intensity	86	86

Analyzer make Thermo 43i Analyzer serial # JC1501301453

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.6	----
as found span	5000	58.6	574.3	580.0	0.990
calibrator zero	5000	0.0	0.0	-0.3	----
high point	5000	58.6	574.3	574.5	1.000
second point	5000	29.3	287.1	285.3	1.006
third point	5000	14.6	143.1	142.0	1.008
as left zero	5000	0.0	0.0	0.1	----
as left span	5000	58.6	574.3	573.8	1.001
Average Correction Factor					1.005

Corrected As found 579.4 Previous response 575.7 % change -0.6%

Notes:

zero and span adjusted, no maintenance done, filter changed out

Calibration Performed By: Melissa Lemay



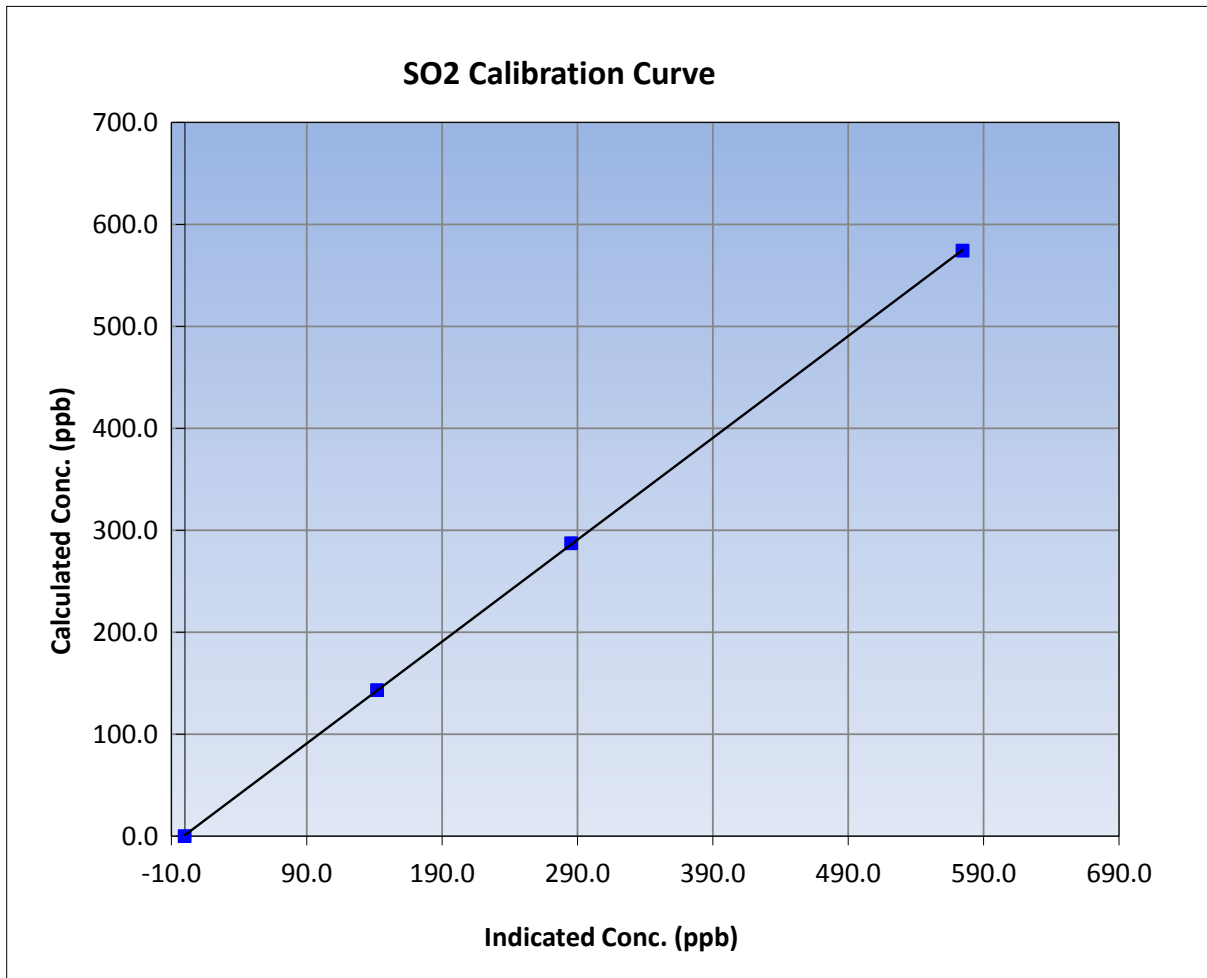
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	July 26, 2016	Previous Calibration	June 21, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	8:35	End Time (MST)	13:15
Analyzer make	Thermo 43i	Analyzer serial #	JC1501301453

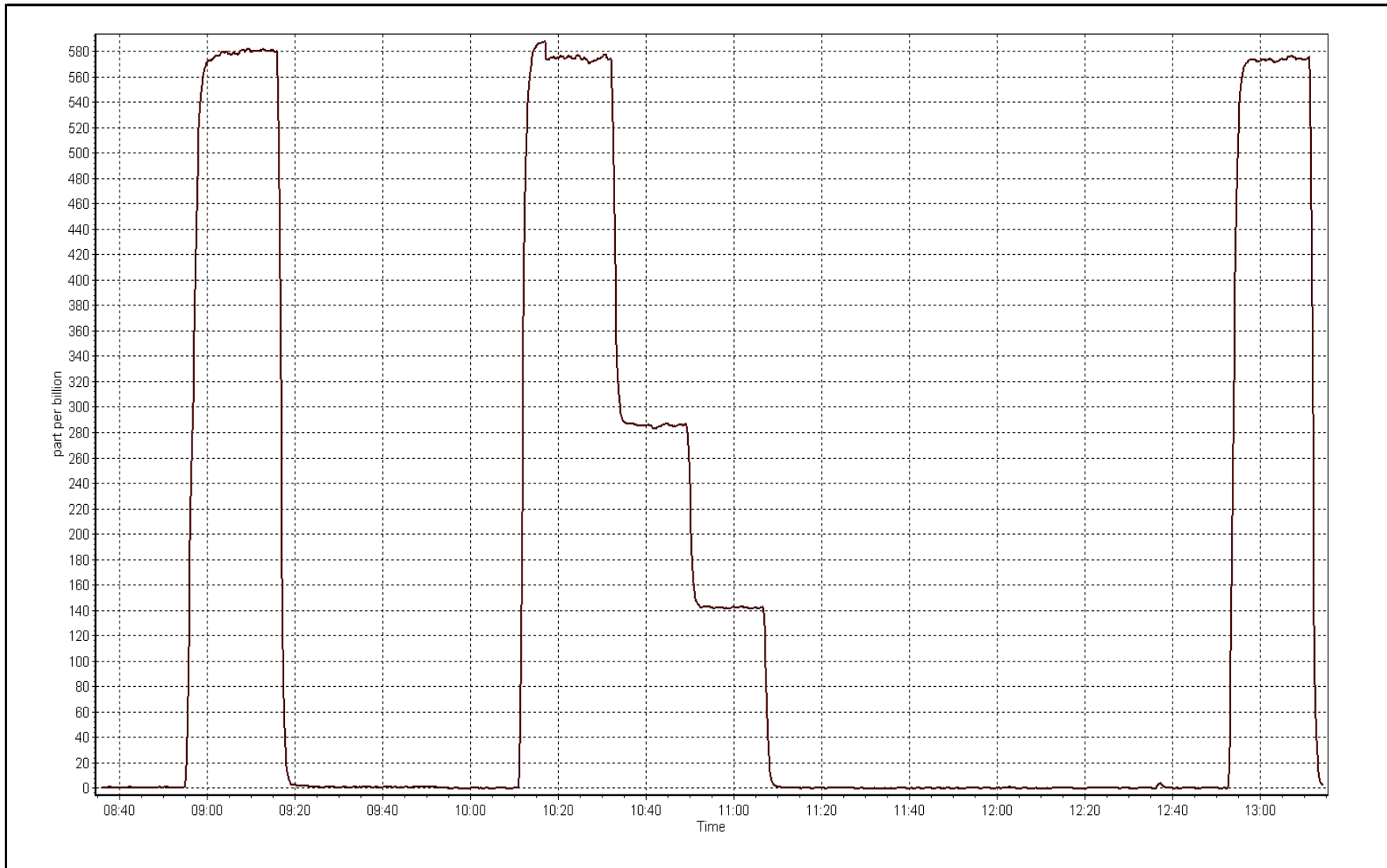
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.3	----	Correlation Coefficient	0.999988
574.3	574.5	0.9996		
287.1	285.3	1.0064	Slope	0.998898
143.1	142.0	1.0076		
			Intercept	1.025893



SO2 Calibration Plot

Date: July 26, 2016





Wood Buffalo Environmental Association

TRS Calibration Report

Station Information

Calibration Date	July 27, 2016	Last Calibration	June 22, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Reason:	Routine		
Start Time (MST)	10:35	End Time (MST)	13:05
Gas Cert Reference	CC233389	Station temp.	22 Deg C
Cal Gas Concentration	4.88 ppm	Cal Gas Exp Date	06/10/2014
Calibrator Make/Model	API 700	Serial Number	1222
Dil air Make/Model	API 701	Serial Number	5610
DACS make/model	Campbell Scientific CR3000	DACS serial No.	9035
SO2 gas concentration	49 ppm	SO2 gas cert/exp	EY0000368 10/Jun/15

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-699	-699
Analyzer IP address	192.168.1.44		Lamp voltage	1003	1003
Calculated slope	0.989871	0.996839	Chamber temp	45	45
Calculated intercept	0.150748	0.099712	Pressure	639.9	639.9
Analyzer Background	2.84	2.84	Flow	0.414	0.414
Analyzer Coefficient	1.086	1.086	Intensity	90	90
			Converter temp.	800	800
Analyzer make/model	Thermo 43i-TLE		Analyzer serial #	1336160090	
Converter make/model	CDN-101		Converter serial #	522	

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.1	----
as found span	5000	82.0	80.0	78.5	1.020
SO2 scrubber check	5000	19.5	191.1	0.7	----
calibrator zero	5000	0.0	0.0	-0.1	----
high point	5000	82.0	80.0	80.2	0.998
second point	5000	41.0	40.0	40.0	1.000
third point	5000	20.5	20.0	20.0	1.000
as left zero	5000	0.0	0.0	0.0	----
as left span	5000	82.0	80.0	80.0	1.000
Average Correction Factor					1.000

Corrected As found	78.6	Previous response	80.7	% change	2.7%
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Notes:

no maintenance or adjustments done, filter changed out,

Calibration Performed By:

Melissa Lemay



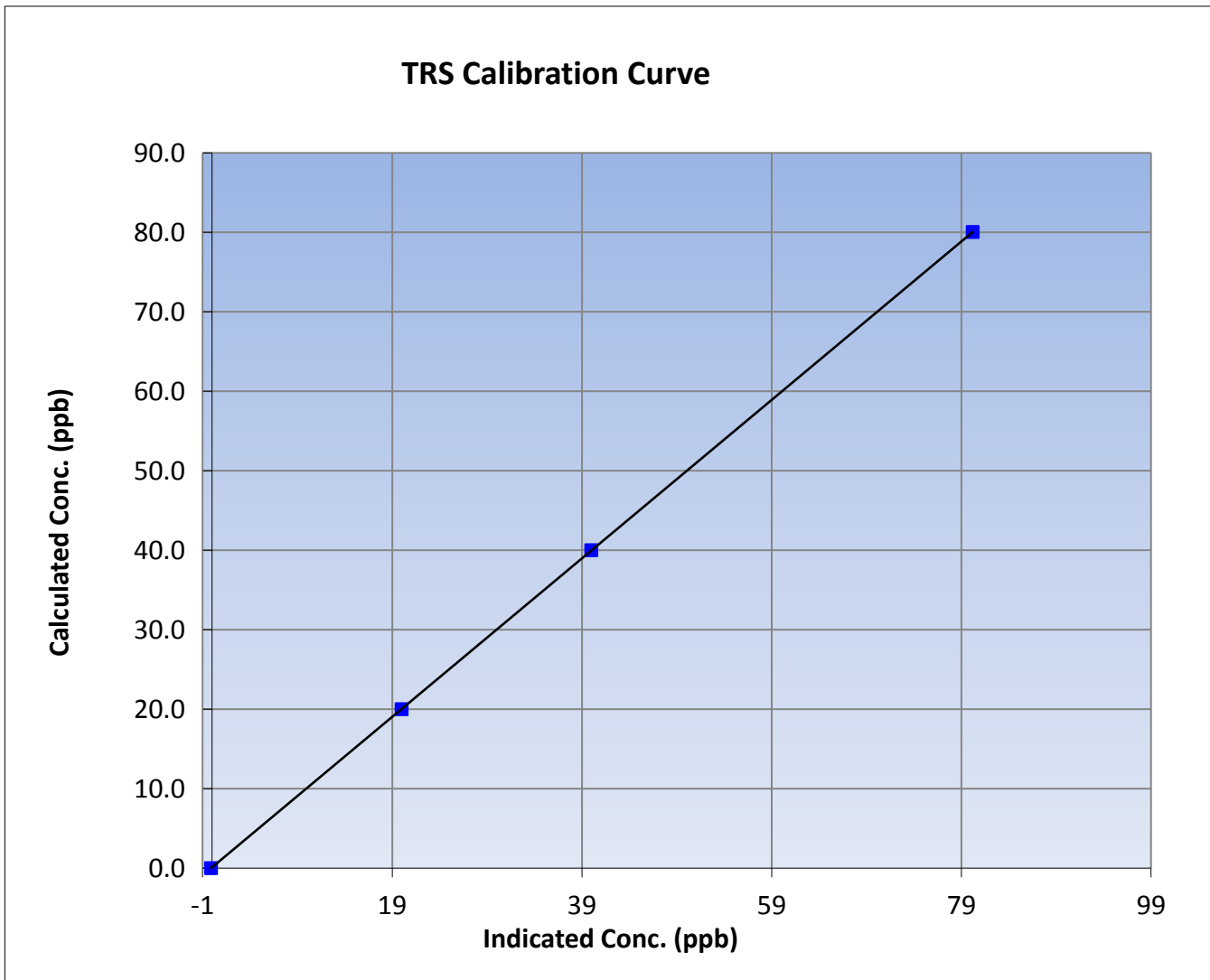
Wood Buffalo Environmental Association TRS Calibration Report

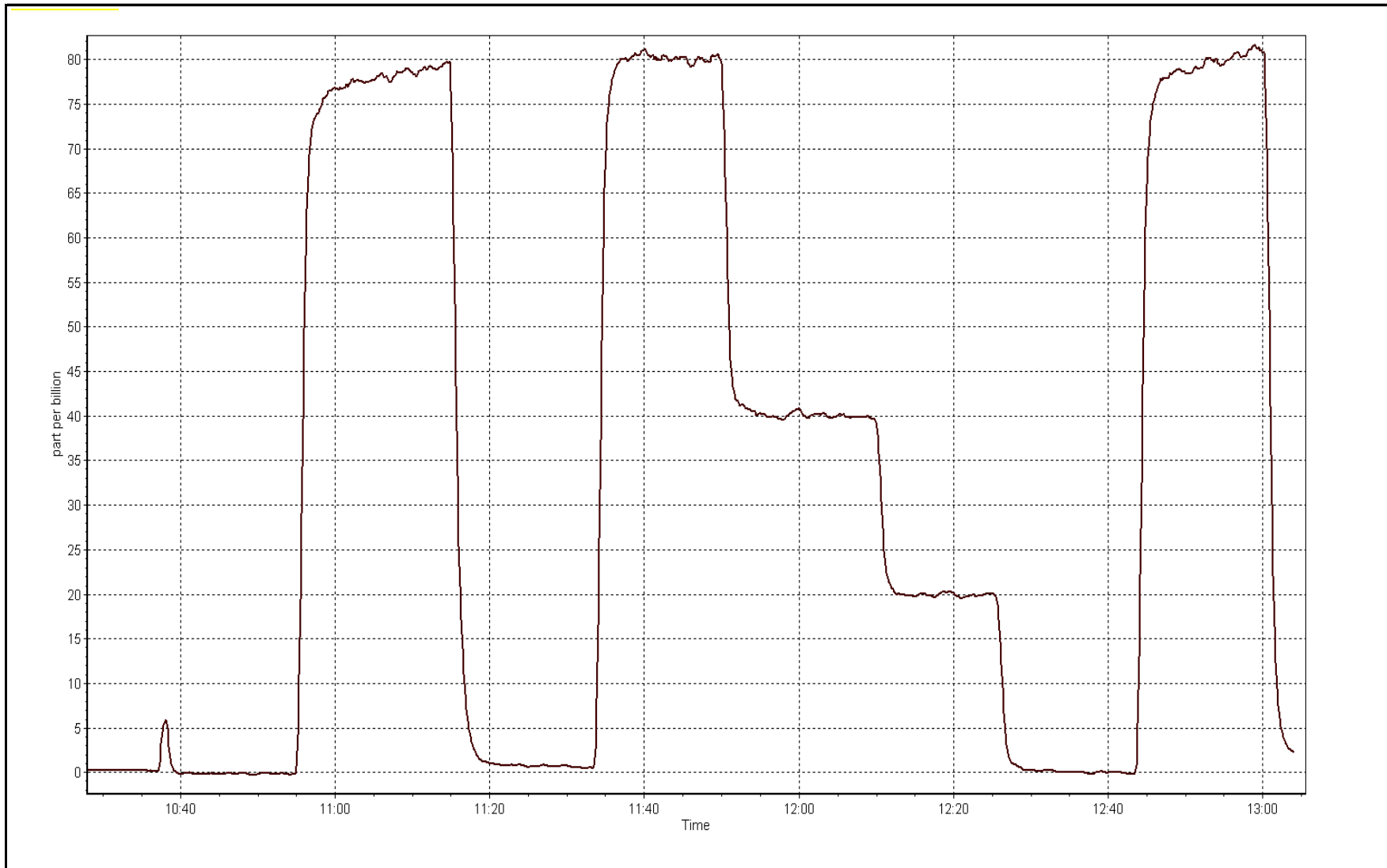
Station Information

Calibration Date	July 27, 2016	Previous Calibration	June 22, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	10:35	End Time (MST)	13:05
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1336160090

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999999
80.0	80.2	0.9979		
40.0	40.0	1.0004	Slope	0.996839
20.0	20.0	1.0004		
			Intercept	0.099712







Wood Buffalo Environmental Association THC / NMHC Calibration Report

Station Information

Calibration Date	July 26, 2016	Last Calibration	June 21, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Reason:	Routine		
Start Time (MST)	8:35	End Time (MST)	13:15
Gas Cert Reference	EY0000368	Cal Gas Expiry Date	June 10, 2016
CH4 Cal Gas Conc.	518.0 ppm	CH4 Equiv Conc.	1076.3 ppm
C3H8 Cal Gas Conc.	203.0 ppm	Station temp.	22 Deg C
Calibrator Model	API T700	Serial Number	1222
ZAG make/model	Teledyne API 701	Serial Number	5610
DACS make/model	Campbell Scientific CR3000	Serial Number	9035

Analyzer Information

	Before	After		Before	After
THC Range (ppm)	0 - 50 ppm		Column Temp	75.0	75.0
NMHC Range (ppm)	0 - 25 ppm		Detector Temp	175.0	175.0
Analyzer IP address	192.168.1.55		Flame Temp	405.0	405.0
THC Calc slope	0.997402	1.002559	Carrier Pressure	30.9	30.9
THC Calc intercept	0.010913	0.024999	Fuel Pressure	44.3	44.3
NMHC Calc slope	0.995947	0.982956	Air Pressure	34.4	34.4
NMHC Calc intercept	-0.009182	0.008668			

Analyzer make Thermo 55i Analyzer serial # 1218153354

THC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	0.01	----
as found span	5000	58.6	12.61	12.47	1.012
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	58.6	12.61	12.57	1.003
second point	5000	29.3	6.31	6.25	1.009
third point	5000	14.8	3.19	3.13	1.018
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	58.6	12.61	12.69	0.994
Average Correction Factor					1.010

Corrected As found 12.46 Previous response 12.64 % change 1.4%

Notes:

zero and span adjusted, no maintenance done, filter changed out

Calibration Performed By: Melissa Lemay



Wood Buffalo Environmental Association THC / NMHC Calibration Report

NMHC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0	0.00	0.00	----
as found span	5000	58.6	6.54	6.60	0.991
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	58.6	6.54	6.65	0.984
second point	5000	29.3	3.27	3.32	0.985
third point	5000	14.8	1.65	1.66	0.995
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	58.6	6.54	6.72	0.974
Average Correction Factor					0.988

Corrected As found 6.60 Previous response 6.58 % change -0.3%

CH4 Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0	0.00	0.01	----
as found span	5000	58.6	6.07	5.86	1.036
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	58.6	6.07	5.92	1.026
second point	5000	29.3	3.04	2.93	1.036
third point	5000	14.8	1.53	1.47	1.043
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	58.6	6.07	5.97	1.017
Average Correction Factor					1.035

Corrected As found 5.85 Previous response 6.06 % change 3.5%



Wood Buffalo Environmental Association

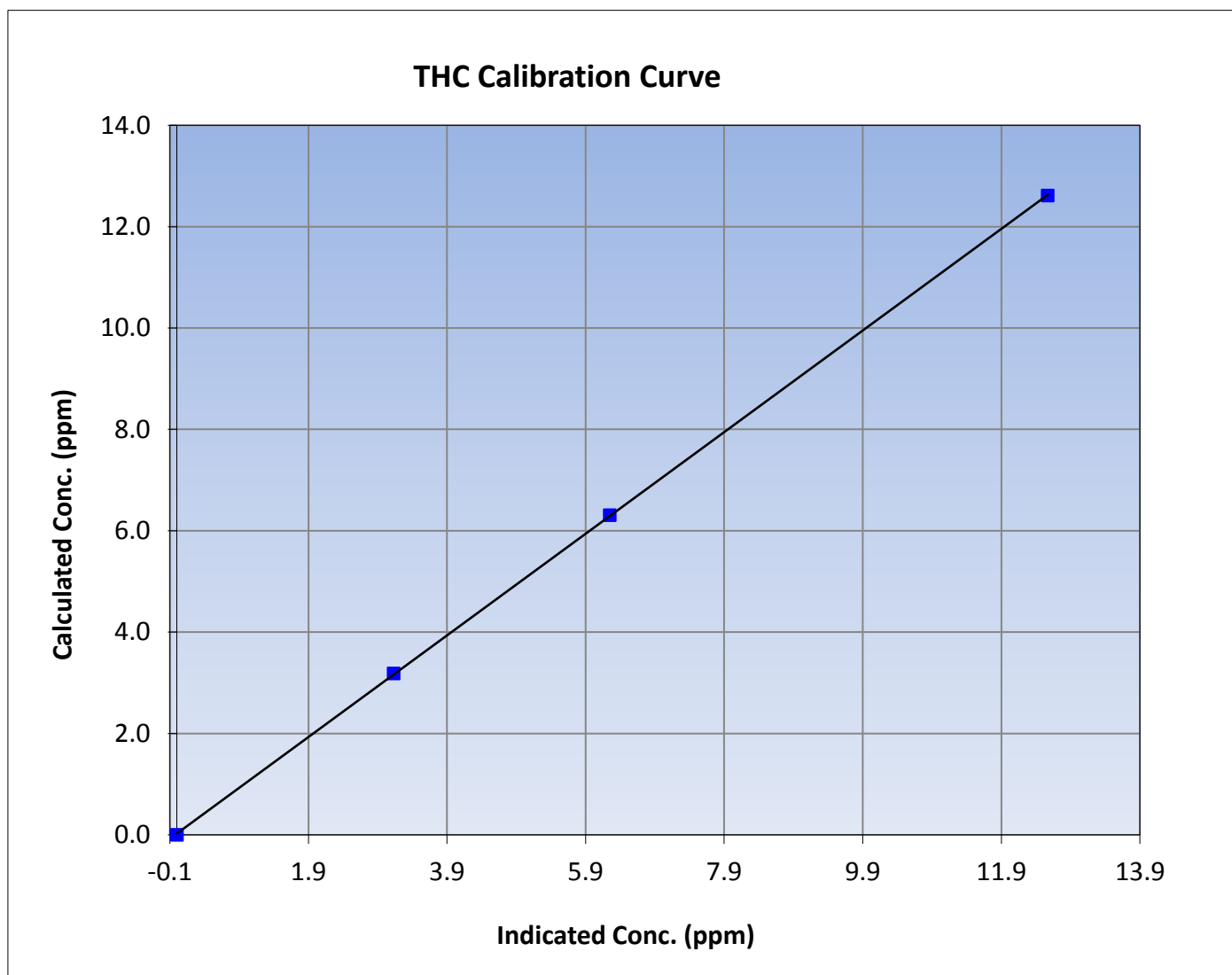
THC Calibration Summary

Station Information

Calibration Date	July 26, 2016	Previous Calibration	June 21, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	8:35	End Time (MST)	13:15
Analyzer make	Thermo 55i	Analyzer serial #	1218153354

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999982
12.61	12.57	1.0035		
6.31	6.25	1.0091	Slope	1.002559
3.19	3.13	1.0178		
			Intercept	0.024999





Wood Buffalo Environmental Association

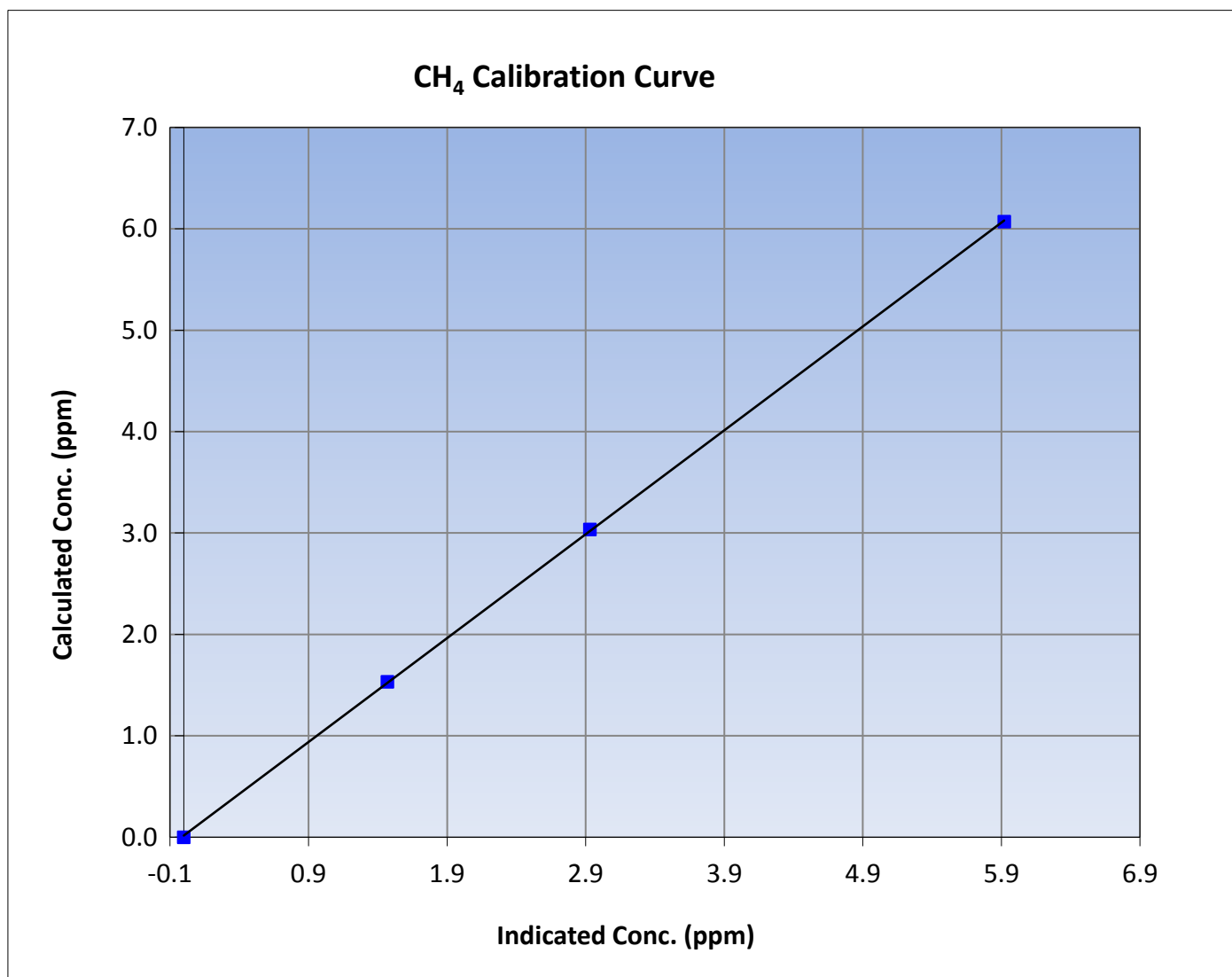
CH₄ Calibration Summary

Station Information

Calibration Date	July 26, 2016	Previous Calibration	June 21, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	8:35	End Time (MST)	13:15
Analyzer make	Thermo 55i	Analyzer serial #	1218153354

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999960
6.07	5.92	1.0255		
3.04	2.93	1.0360	Slope	1.024568
1.53	1.47	1.0430		
			Intercept	0.016545





Wood Buffalo Environmental Association

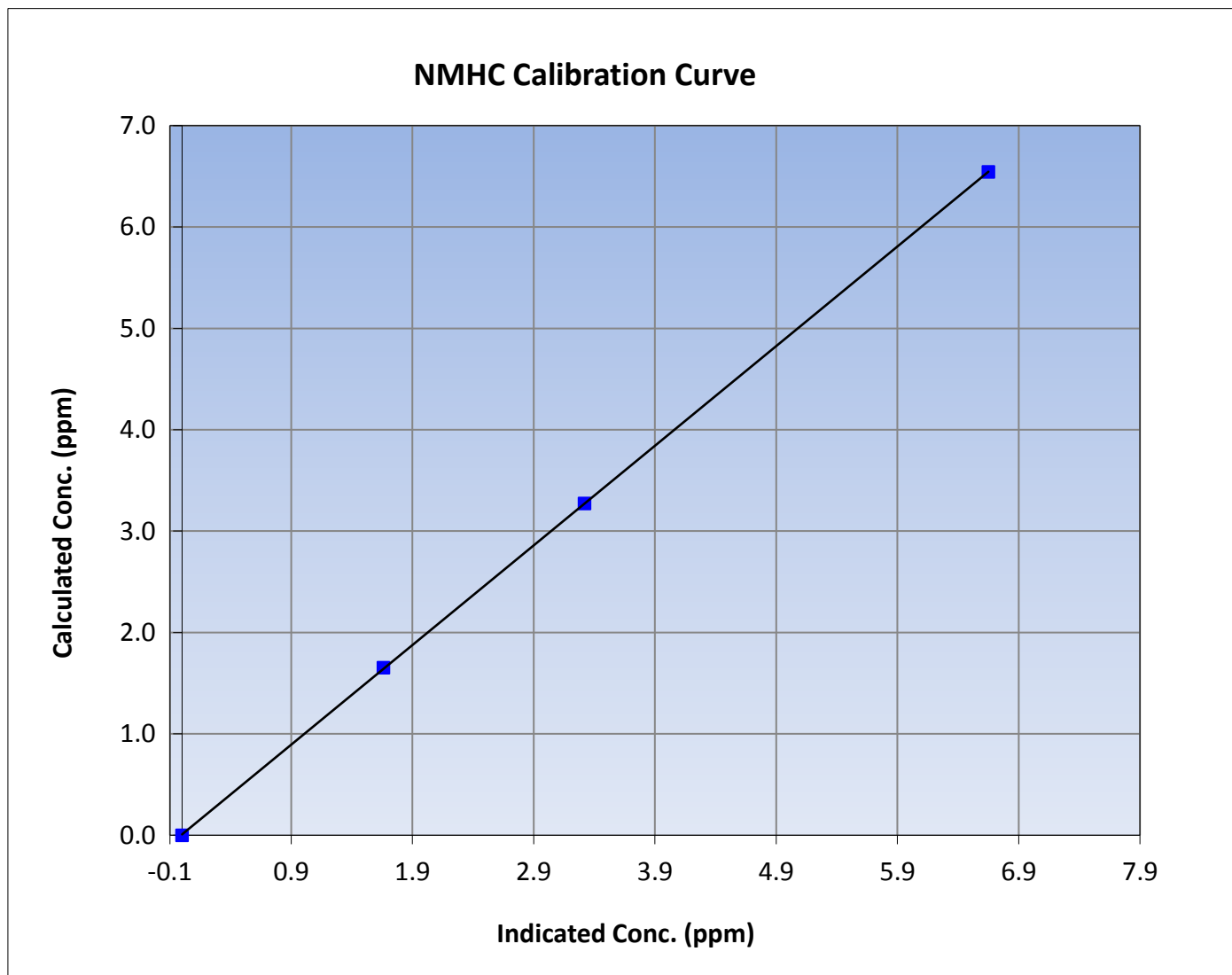
NMHC Calibration Summary

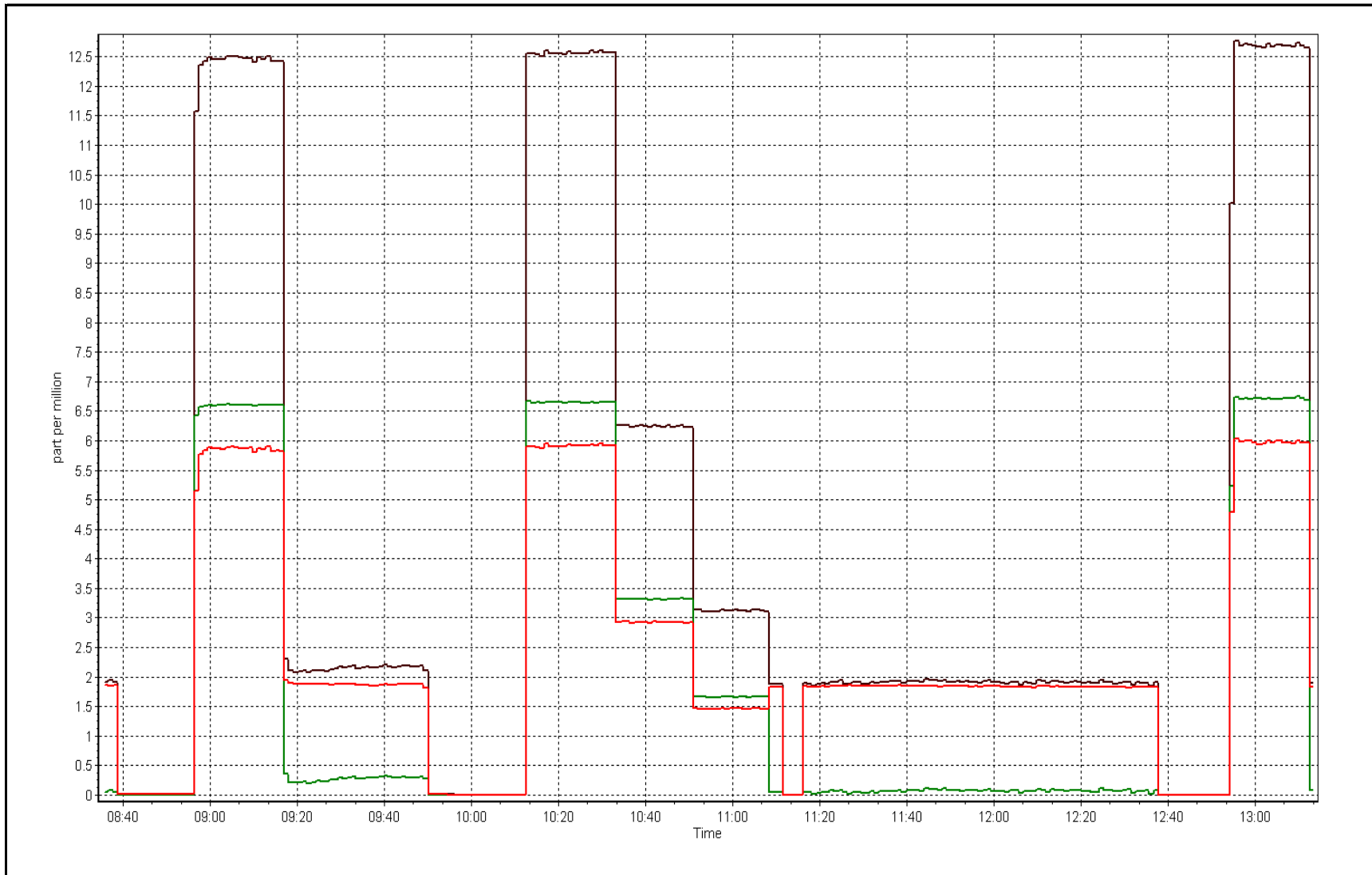
Station Information

Calibration Date	July 26, 2016	Previous Calibration	June 21, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	8:35	End Time (MST)	13:15
Analyzer make	Thermo 55i	Analyzer serial #	1218153354

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999990
6.54	6.65	0.9839		
3.27	3.32	0.9853	Slope	0.982956
1.65	1.66	0.9954		
			Intercept	0.008668







Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	July 27, 2016	Previous Calibration	June 22, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Reason:	Routine		
Start Time (MST)	7:40	End Time (MST)	10:39
NO2 GPT Ref date	July-26-16	Transfer Standard	GPT
		Station temp.	22 Deg C
Calibrator Make/Model	Teledyne API 700	Serial Number	1222
ZAG make/model	Teledyne API 701	Serial Number	5610
DACS make/model	Campbell Scientific CR3000	Serial Number	9305

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Bench temp.	28.8	28.8
Analyzer IP address	192.168.1.48		Lamp temp.	53.3	53.3
Calculated slope	0.999413	1.005349	Pressure	615.8	615.8
Calculated intercept	-0.416034	0.395812	Flow cell A	0.691	0.691
Analyzer Background	-0.2	-1.3	Flow cell B	0.691	0.691
Analyzer Coefficient	1.281	1.300	Cell A Intensity	59590	59590
			Cell B Intensity	58654	58654

Analyzer make	Thermo 49i	Analyzer serial #	1501663733
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Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator Lamp O3 Gen Drive	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.00	0.0	-2.8	----
as found span	5000	1076	381.9	370.6	1.030
calibrator zero	5000	0.00	0.0	0.0	----
high point	5000	1076	381.9	380.0	1.005
second point	5000	968	259.5	257.1	1.009
third point	5000	816	133.9	132.5	1.011
as left zero	5000	0.00	0.0	0.3	----
as left span	5000	1076	381.9	382.4	0.999
Average Correction Factor					1.008

Corrected As found	373.4	Previous response	382.5	% change	2.4%
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Notes:

Zero and span adjusted, filter changed out

Calibration Performed By:

Melissa Lemay



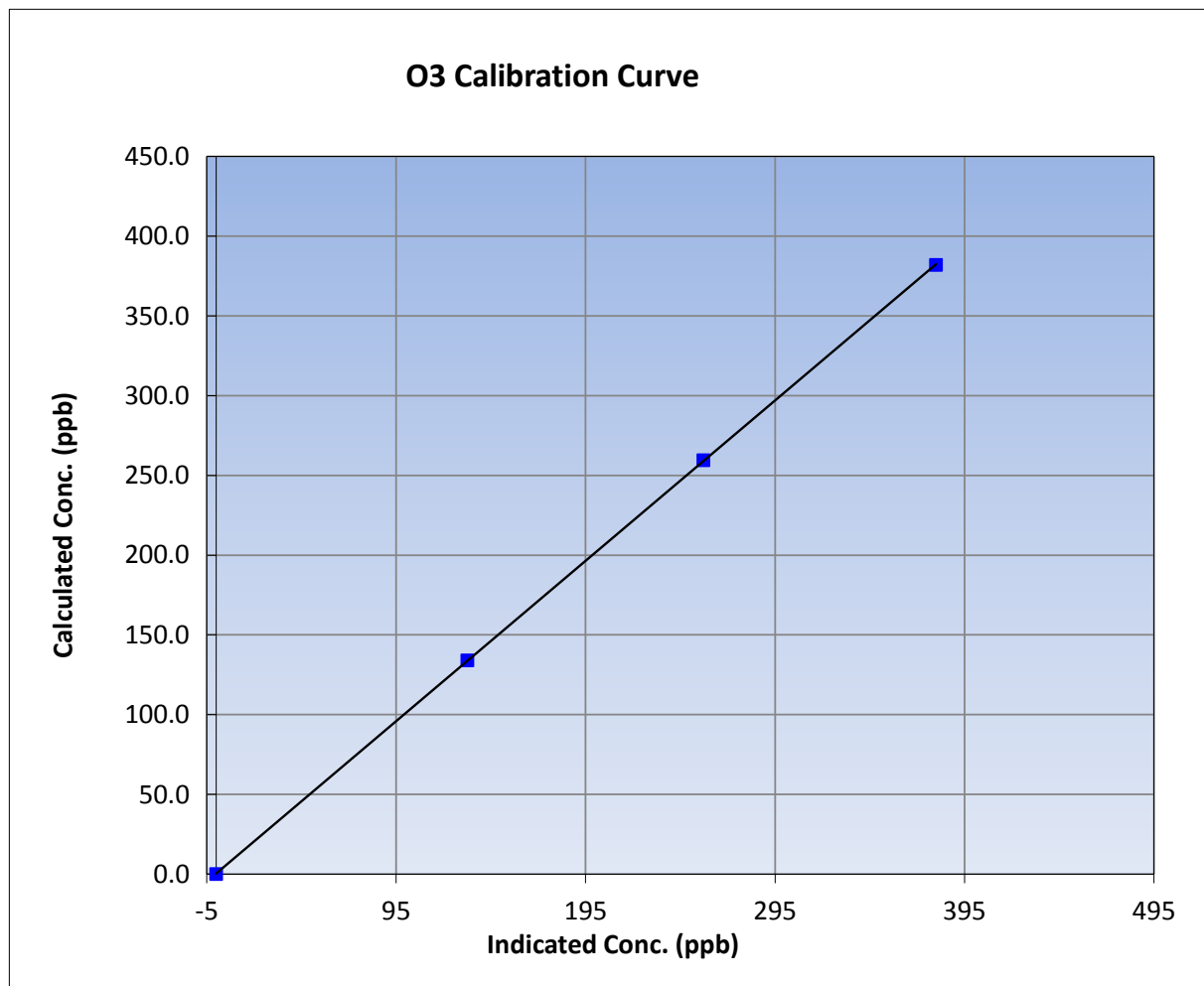
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	July-27-16	Previous Calibration	June 22, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	7:40	End Time (MST)	10:39
Analyzer make	Thermo 49i	Analyzer serial #	1501663733

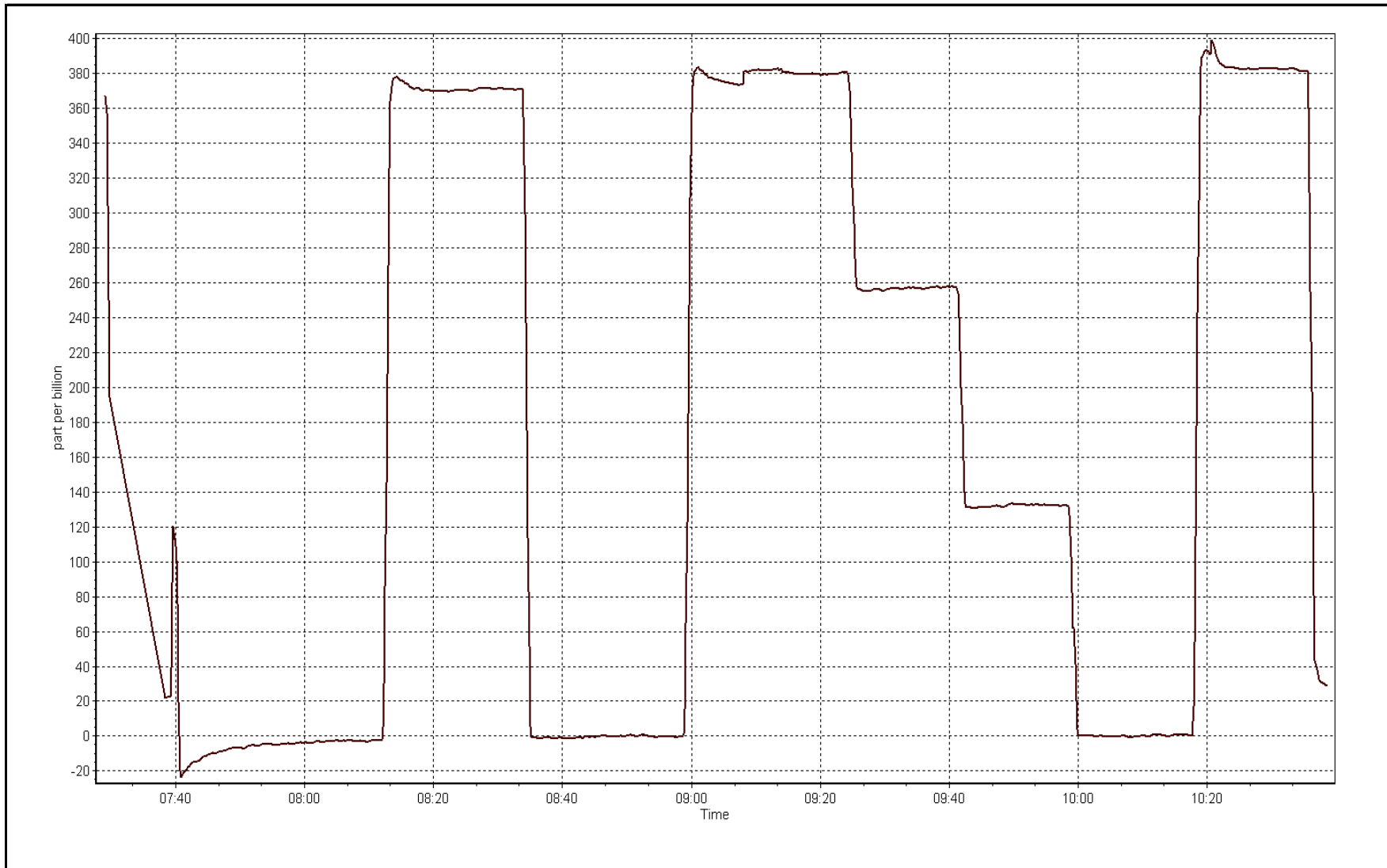
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999989
381.9	380.0	1.0050		
259.5	257.1	1.0093	Slope	1.005349
133.9	132.5	1.0106		
			Intercept	0.395812



O3 Calibration Plot

Date: July 27, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	July 26, 2016	Previous Calibration	June 21, 2016	
Station Name	Stony Mountain	Station Number	AMS 18	
Reason:	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Routine</td> </tr> </table>			Routine
Routine				
Start Time (MST)	8:35	End Time (MST)	13:15	
NO Cal Gas Conc	51.2 ppm	Gas Cert Reference	EY0000368	
NOx Cal Gas Conc	51.2 ppm	Cal Gas Expiry Date	10/06/2016	
Calibrator	API T700	Serial Number	1222	
Zero air Generator	Teledyne API T701	Serial Number	5610	

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	9035
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	1.002565	1.001026	0.996260
	Data Offset	-1.199459	-1.062481	-0.293798
Current Calibration	Data Slope	0.999921	0.998370	1.001566
	Data Offset	0.595793	1.176571	-0.103249

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1336160088
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Test Point	before		after	
	Concentration range	ppb	Concentration range	ppb
Analyzer IP	0-1000		0-1000	
	192.168.1.42		192.168.1.42	
NO coefficient	1.033		0.991	
NOx coefficient	0.999		0.997	
NO2 coefficient	0.996		0.999	
NO bkgrnd	1.9		1.8	
NOx bkgrnd	2.0		1.9	
Chamber Temp	50.6	Deg C	50.6	Deg C
Moly Temp	325.3	Deg C	325.3	Deg C
PMT voltage	-814	V	-814	V
PMT Temp	-2.7	Deg C	-2.7	Deg C
O3 flow	Ok	ccm	Ok	ccm
R Cell press NO	154.1	mmHg	154.1	mmHg
R Cell Press Nox	154.1	mmHg	154.1	mmHg
NO sample flow	0.979	lpm	0.979	lpm
Nox sample Flow	0.979	lpm	0.979	lpm

Notes:

span adjusted, no maintenance done, filter changed out



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

July 26, 2016

Station Number:

AMS 18

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	-0.3	-0.3	0.0	----	----
as found span	5000	58.6	600.1	600.1	0.0	616.7	616.7	0.0	0.9730	0.9730
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.3	-0.3	0.0	----	----
high point	5000	58.6	600.1	600.1	0.0	599.8	600.5	-0.7	1.0004	0.9993
second point	5000	29.3	300.0	300.0	0.0	298.9	298.3	0.6	1.0038	1.0058
third point	5000	14.6	149.5	149.5	0.0	148.9	148.1	0.9	1.0041	1.0095
as left zero	5000	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	----	----
as left span	5000	58.6	600.1	217.6	382.5	599.6	212.4	387.2	1.0008	1.0245
Average Correction Factor									1.0028	1.0049

Corrected As found
Previous Response

NO_x= 617.0
NO_x= 599.7

NO= 617.0
NO= 600.5

Percent Change

NO_x= -2.8%

NO= -2.7%

GPT Calibration Data

Dilution Flow (total) 5000 ccm Source Gas Flow 58.60 ccm NOx ref calc conc = 600.1 ppb NO ref calc conc = 600.1 ppb

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
1st NO ref point		0.0	598.7	599.5	0.0	1.0023	1.0009	----	----
1st NO2 (300)	217.6	381.9	599.2	217.6	381.5	1.0014	----	1.0010	99.9%
2nd NO2 (200)	340.0	259.5	598.9	340.0	258.9	1.0019	----	1.0023	99.8%
3rd NO2 (100)	465.6	133.9	599.1	465.6	134.1	1.0016	----	0.9985	100.1%
2nd NO ref point		0.0	597.8	598.4	-0.6	1.0038	1.0028	----	----
Average Correction Factor						1.0022		1.0006	99.9%

Calibration Performed By: Melissa Lemay



Wood Buffalo Environmental Association

NO_x Calibration Summary

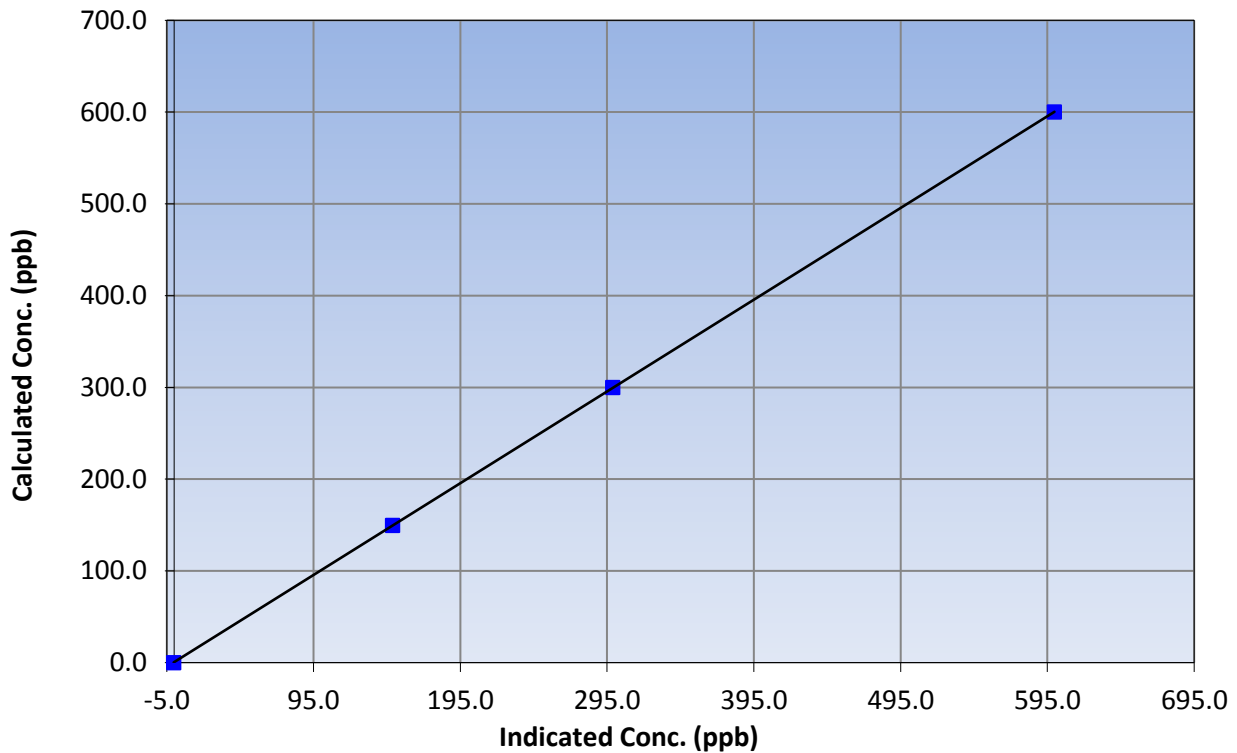
Station Information

Calibration Date	July 26, 2016	Previous Calibration	June 21, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	8:35	End Time (MST)	13:15
Analyzer make	Thermo 42i	Analyzer serial #	1336160088

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.3	----	Correlation Coefficient	0.999998
600.1	599.8	1.0004		
300.0	298.9	1.0038	Slope	0.999921
149.5	148.9	1.0041		
			Intercept	0.595793

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

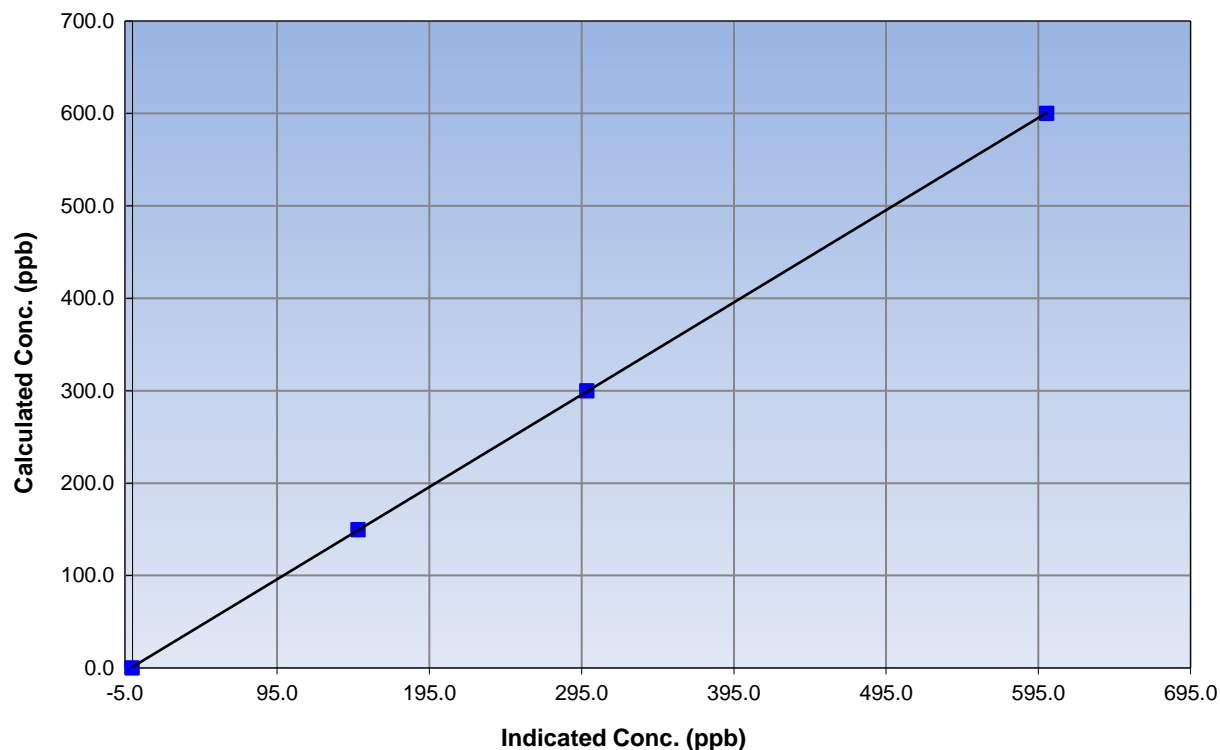
Station Information

Calibration Date	July 26, 2016	Previous Calibration	June 21, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	8:35	End Time (MST)	13:15
Analyzer make	Thermo 42i	Analyzer serial #	1336160088

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.3	N/A	Correlation Coefficient	0.999987
600.1	600.5	0.9993		
300.0	298.3	1.0058	Slope	0.998370
149.5	148.1	1.0095		
			Intercept	1.176571

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

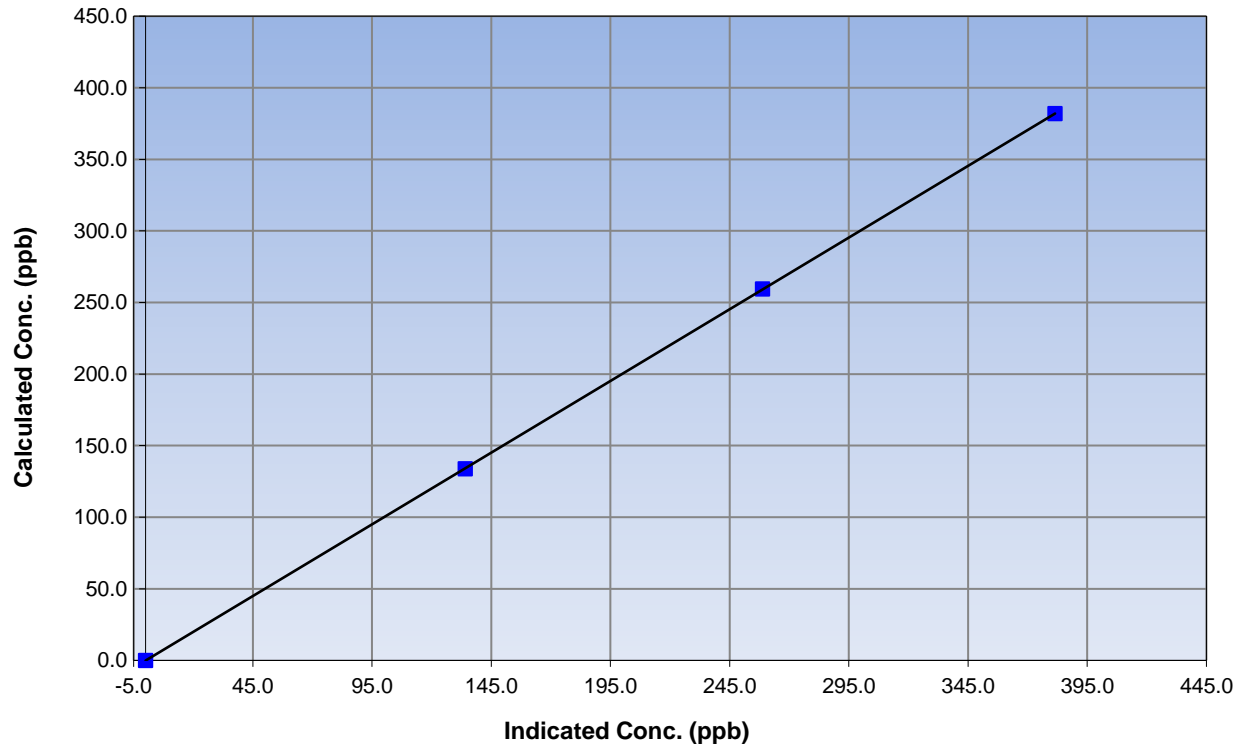
Station Information

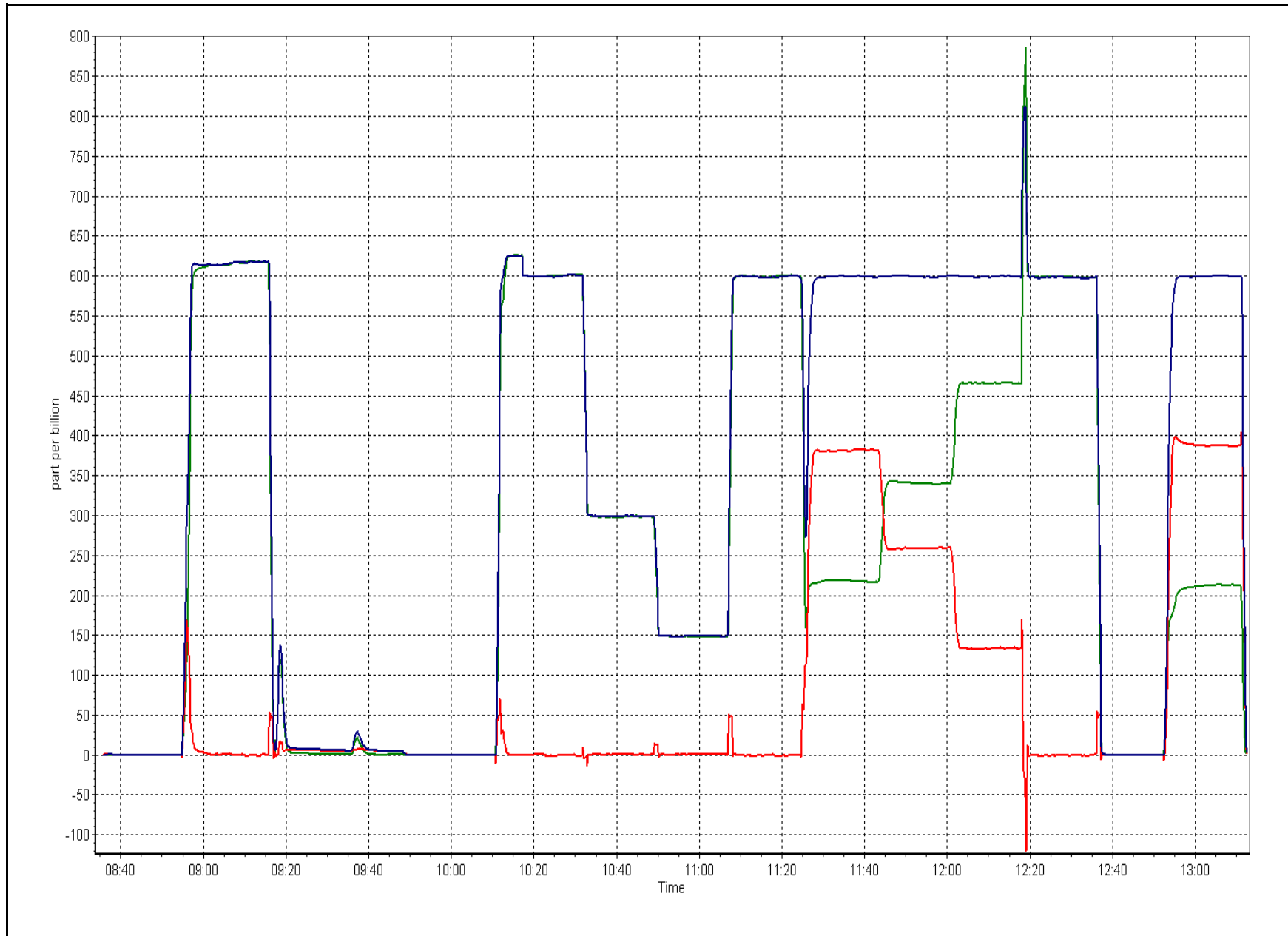
Calibration Date	July 26, 2016	Previous Calibration	June 21, 2016
Station Number	Stony Mountain	Station Number	AMS 18
Start Time (MST)	8:35	End Time (MST)	13:15
Analyzer make	Thermo 42i	Analyzer serial #	1336160088

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	N/A	Correlation Coefficient	0.999997
381.9	381.5	1.0010		
259.5	258.9	1.0023	Slope	1.001566
133.9	134.1	0.9985		
			Intercept	-0.103249

NO₂ Calibration Curve







Wood Buffalo Environmental Association

SHARP CALIBRATION

STATION INFORMATION			
Calibration Date:	<u>July 27, 2016</u>	Previous Calibration:	<u>June 22, 2016</u>
Station Name:	<u>Stony Mountain</u>	Station Number:	<u>AMS 18</u>
Start Time (MST):	<u>9:31</u>	End Time (MST):	<u>10:02</u>
Calibrator Make/Model:	<u>Delta Cal</u>	Calibrator Serial Number:	<u>1450</u>

SHARP INFORMATION			
Particulate Fraction:	<u>PM2.5</u>		
Make/Model:	<u>Thermo / SHARP 5030</u>		
Serial Number	<u>E-781</u>		
C ₁₄ Source SN:			
Confirmation of Time settings:	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Parameters Checked:	T1 <input checked="" type="checkbox"/>	T2 <input type="checkbox"/>	T3 <input type="checkbox"/>
	T4 <input type="checkbox"/>	P3 <input type="checkbox"/>	Main Flow <input checked="" type="checkbox"/>
		Beta <input type="checkbox"/>	Neph <input checked="" type="checkbox"/>

CALIBRATION DATA

Temperature (°C)				
Sensor	Indicated	Measured	Difference (Limit +/- 2.0°C)	Final Indicated
T1	23.0	23.7	0.7	23.0
T2	30.0	na	#VALUE!	30.0
T3	28.0	na	#VALUE!	28.0
T4	36.0	na	#VALUE!	36.0
RH (%)	35.0	na	na	35.0

Pressure (Hpa)				
Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	943	940.0	-3.0	943

Main Flow (Lph)				
Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1000	1000	0	1000	1000

Nephelometer Calibration			
Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	305		305
Neph	0.3		0.3
C14	280.4		280.4
Indicated Concentration (ug/m3)	0.3	No	0.3
Offset 1			
Offset 2			

Leak Check (Quarterly)

Leak Check Date:	<u>June 22, 2016</u>	Previous Leak Check Date:	<u>March 13, 2016</u>
	Measured	Difference LPM (Limit +/- 0.42 LPM)	
Flow without adaptor (LPM):	16.99	0.09	
*Flow with adaptor (LPM):	16.90		
<i>*Note - do not attach adaptor without shutting off the pump first</i>			

Mass Foil Calibration (Annually)			
Foil Calibration Date:	<u>June 22, 2016</u>	Previous Foil Calibration:	<u>March 13, 2016</u>
Zeroed?:	<u>Yes</u>		
Foil Mass:	<u>1337</u>		
Previous Correction Factor:	<u>7027</u>	Mass foil set S/N:	<u>5872</u>
New Correction Factor:	<u>6985</u>		

INSPECTION DATA		
Item	Condition	Date of install or rebuild
Cyclone	Good / cleaned	27-Jul-16
Pump	Good	Jun 30,2015
Filter Tape	Good	13-Mar-16
Mass Foil Cal Set	na	NA
HEPA filter	Good	Jun 30,2015

NOTES:

No adjustments done, cyclone head cleaned

Calibration Performed By: Melissa Lemay



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

AMS 19
SUNCOR FIREBAG
JULY 2016

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

August 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FIREBAG (AMS 19)
 JULY 2016

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	705	37	39	99.73	30	0	3	0
H2S (ppb) Average	708	34	36	99.73	2	0	0	0
THC (ppm) Average	684	37	60	96.91	3.4	-	2.4	-
NO2 (ppb) Average	705	37	39	99.73	13	0	3	-
NO (ppb) Average	705	37	39	99.73	11	-	1	-
NOX (ppb) Average	705	37	39	99.73	24	-	5	-
Temperature 2 m (C) Average	742	0	2	99.73	27	-	21.5	-
Relative Humidity (%) Average	742	0	2	99.73	100	-	95	-
Wind Speed 10 m (km/h) Average	740	0	4	99.46	30	-	18	-
Wind Direction 10 m (deg) Average	740	0	4	99.46	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FIREBAG (AMS 19)
 JULY 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	705	0.7	2	-	0	0	0	0	0	2	30
H2S (ppb) Average	708	0.2	0	-	0	0	0	0	0	0	2
THC (ppm) Average	684	2.23	0.1	-	1.9	2.1	2.2	2.2	2.3	2.3	3.4
NO2 (ppb) Average	705	1.3	2	-	0	0	0	1	2	3	13
NO (ppb) Average	705	0.4	1	-	0	0	0	0	0	1	11
NOX (ppb) Average	705	1.7	2	-	0	0	0	1	2	4	24
Temperature 2 m (C) Average	742	16.92	4.2	-	5.1	11.7	14	16.5	20.1	22.6	27
Relative Humidity (%) Average	742	69.7	20	-	20	43	53	71	88	97	100
Wind Speed 10 m (km/h) Average	740	11.3	5	-	0	5	8	11	14	19	30
Wind Direction 10 m (deg) Average	740	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FIREBAG (AMS 19)
JULY 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
ALL PARAMETERS	21 Jul 2016 11:00	21 Jul 2016 12:00	2	Maintenance - wiring/data logger upgrades
THC	10 Jul 2016 11:00	10 Jul 2016 11:00	1	Power spike
THC	31 Jul 2016 05:00	01 Aug 2016 00:00	20	Analyzer Failure - sample pump failed
Wind Speed, Wind Direction	14 Jul 2016 22:00	14 Jul 2016 23:00	2	Flat line in sensor output signal



Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 30 ppb on Jul 28 10:00	Maximum Daily Average: 3.2 ppb on Jul 24		Hours of Data:	705
Minimum Value: 0 ppb on Jul 1 22:00	Minimum Daily Average: 0.0 ppb on Jul 8		Hours of Missing Data:	39
Maximum Diurnal Average: 1.6 ppb at hour 10	Minimum Diurnal Average: 0.2 ppb at hour 24		Hours of Calibration:	37
Monthly Average: 0.7 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 0 P ₉₀ = 2 P ₉₉ = 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-Jul	0	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
2-Jul	0	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-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.3	1
4-Jul	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	3	6	6	5	4	8	1	0	1.7	8
5-Jul	0	Z	1	1	3	6	2	5	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	1.1	6
6-Jul	1	0	Z	2	1	4	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0.5	4
7-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
8-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
9-Jul	0	2	2	0	0	Z	3	3	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.6	3
10-Jul	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	1	0	0	0.2	1
11-Jul	0	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
12-Jul	0	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-Jul	0	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
14-Jul	0	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
15-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
16-Jul	Z	0	0	0	0	1	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	2
17-Jul	0	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-Jul	0	0	Z	0	0	0	0	0	3	2	1	0	1	0	0	0	2	6	1	0	0	0	0	0	0.8	6
19-Jul	0	0	0	Z	1	5	3	7	4	0	4	5	4	3	3	0	0	0	0	0	0	0	0	0	1.9	7
20-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2	1
21-Jul	0	2	2	2	5	Z	3	3	4	1	M	M	0	0	0	0	0	0	0	0	0	0	0	0	1.1	5
22-Jul	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	2	0	0	0	0	0	0	0	0.3	2
23-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	7	6	1	0	0.7	7
24-Jul	2	5	Z	0	1	2	4	7	7	8	10	8	7	2	4	4	0	0	0	0	0	0	0	0	3.2	10
25-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
26-Jul	0	0	0	0	Z	0	0	0	1	C	C	C	C	C	C	3	5	6	6	4	2	0	0	0	--	6
27-Jul	0	0	0	0	1	Z	11	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	11
28-Jul	Z	0	0	0	0	0	1	3	11	30	9	4	3	1	0	0	0	0	0	0	0	0	0	0	2.8	30
29-Jul	0	Z	4	10	5	3	2	5	2	4	7	6	1	1	1	0	1	4	4	1	0	0	0	0	2.8	10
30-Jul	0	0	Z	0	1	4	4	3	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	0.9	4
31-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0

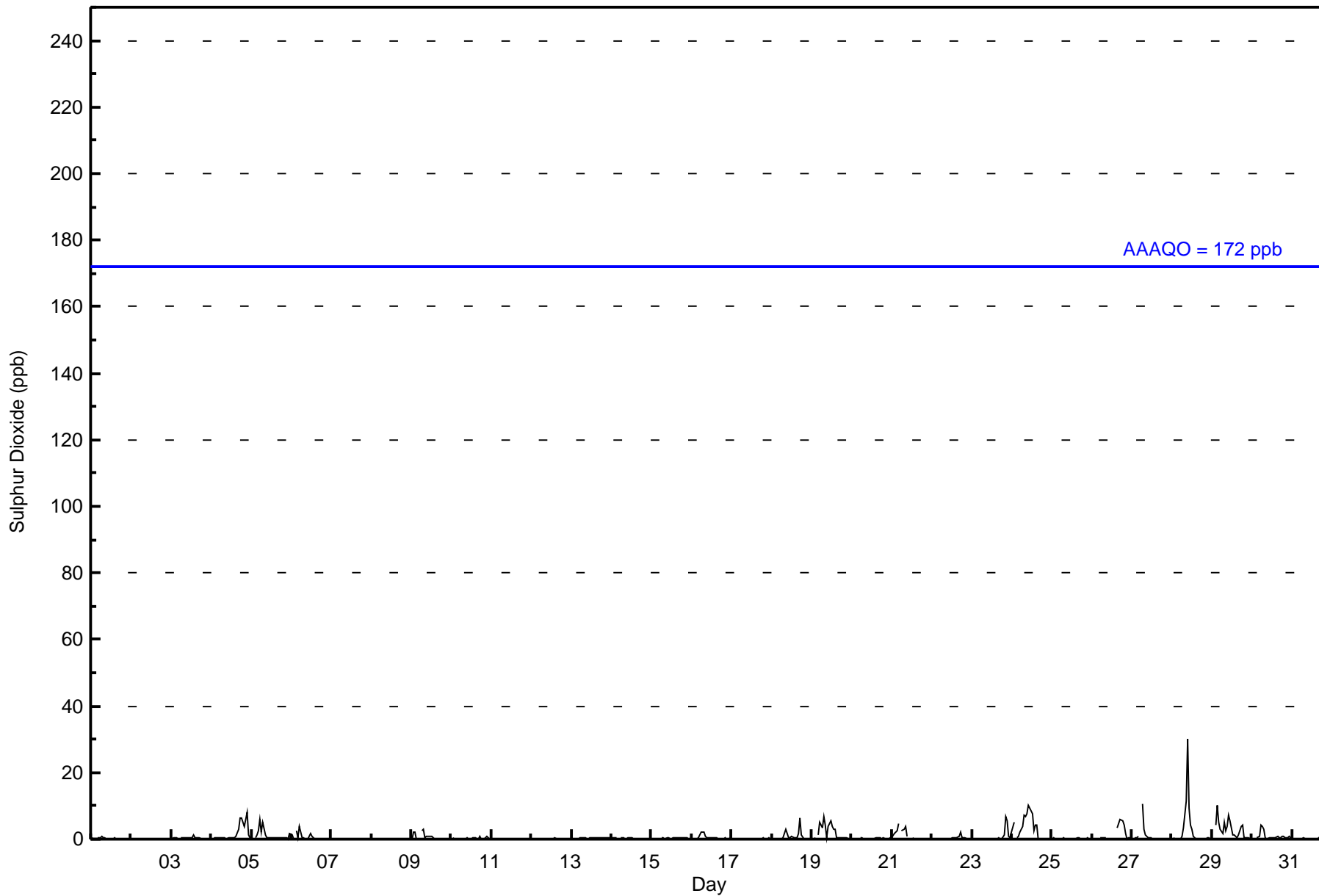
0.3	0.5	0.4	0.8	0.7	1.1	1.2	1.5	1.2	1.6	1.2	1.1	0.7	0.5	0.5	0.5	0.5	0.5	0.9	0.7	0.5	0.5	0.6	0.2	0.2	Diurnal Average
2	5	4	10	5	6	11	7	11	30	10	8	7	3	4	4	4	5	6	6	5	7	8	1	2	Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Firebag - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Firebag - July 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	702	99.57	99.57
11 - 20	2	0.28	99.86
21 - 60	1	0.14	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 705

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Firebag - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	108	80	31	23	14	23	23	56	47	39	56	47	21	37	36	59	700
11 - 20	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	2
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	108	80	31	23	14	23	23	56	47	39	57	47	23	37	36	59	703

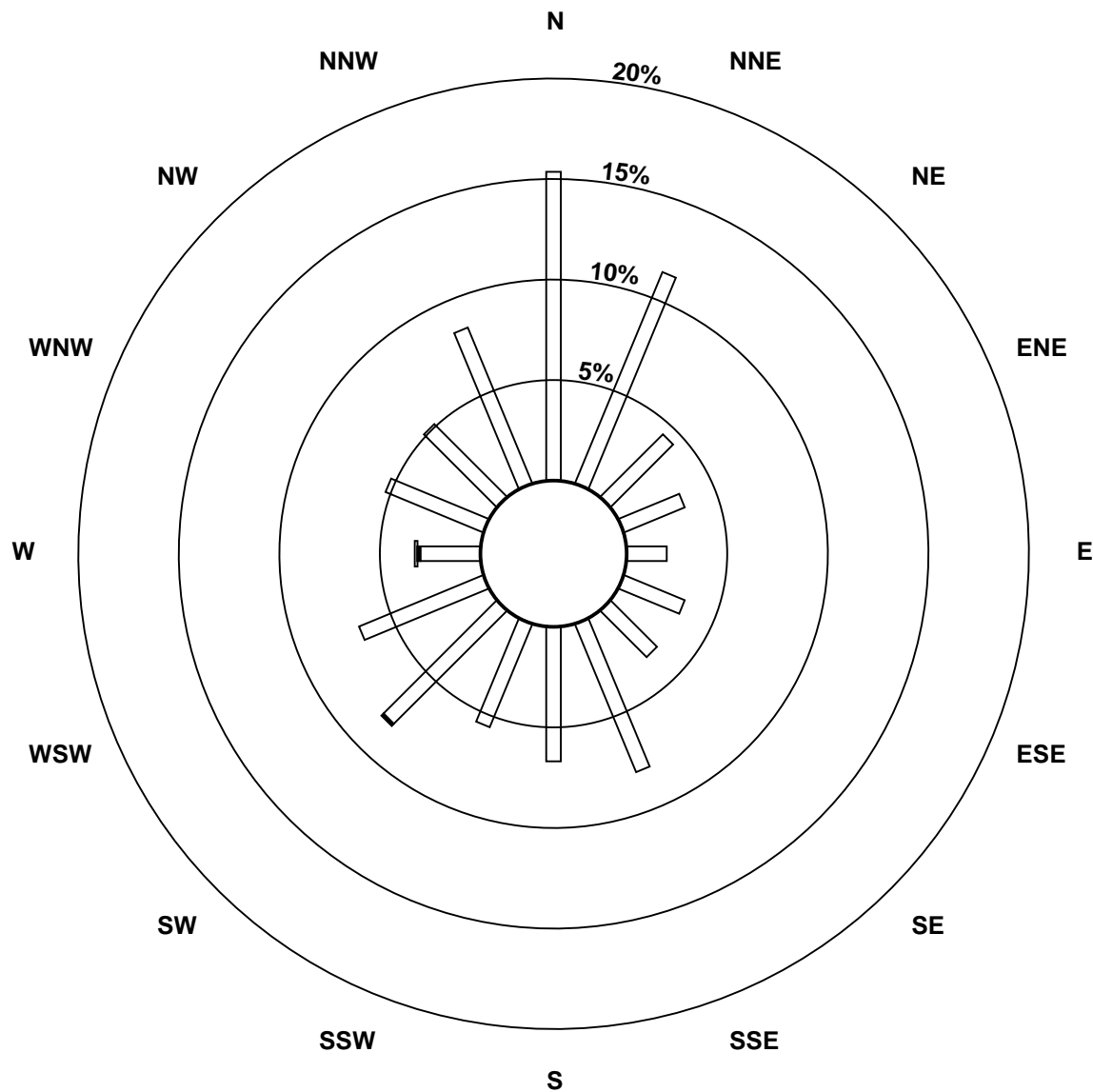
Total Number of Valid Hours: 703

Total Number of Hours: 744

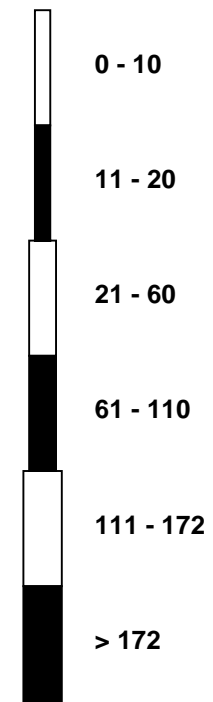


Wood Buffalo Environmental Association
Wind Rose Jul 2016

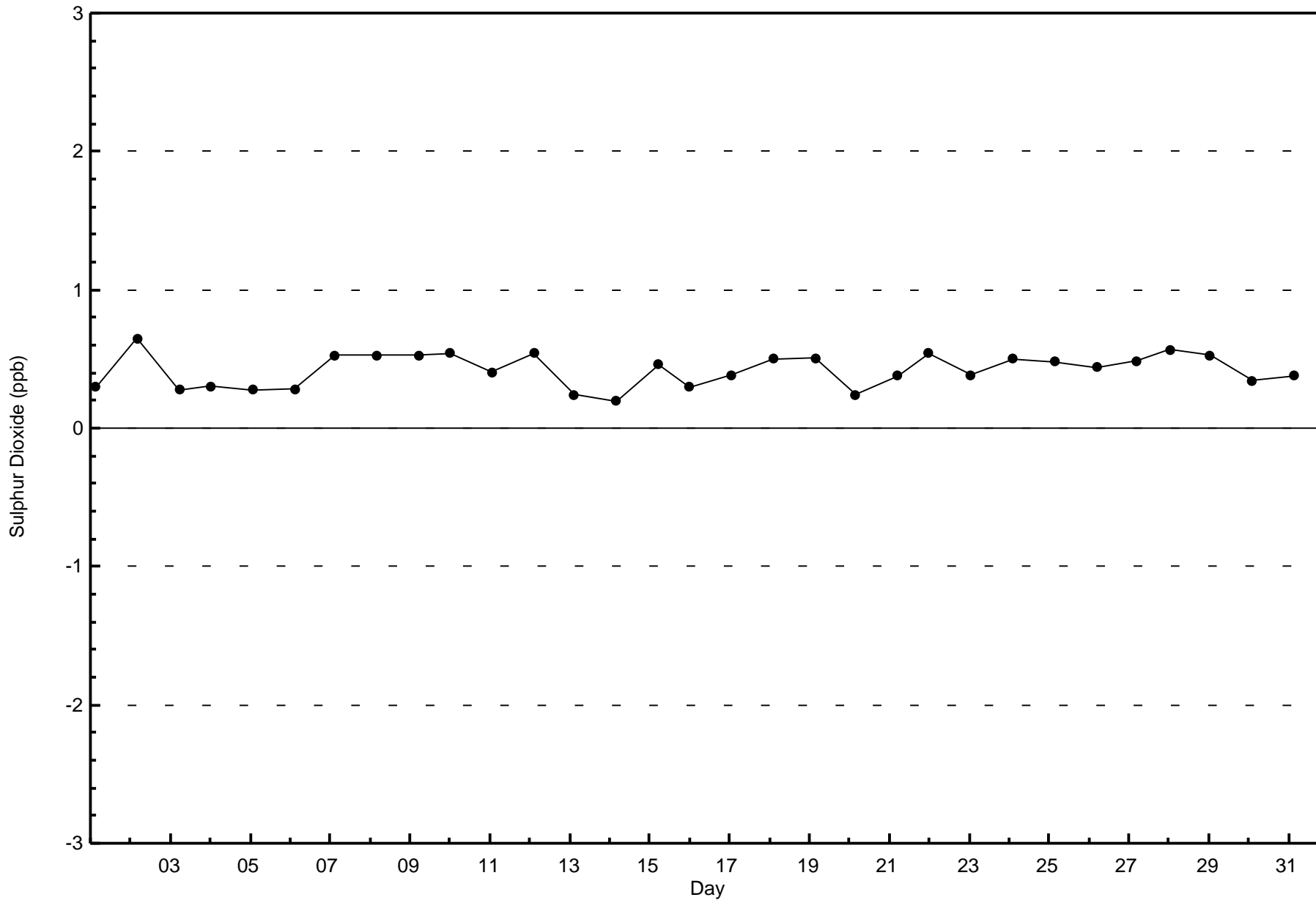
Sulphur Dioxide (SO₂) - ppb
Firebag (AMS 19)

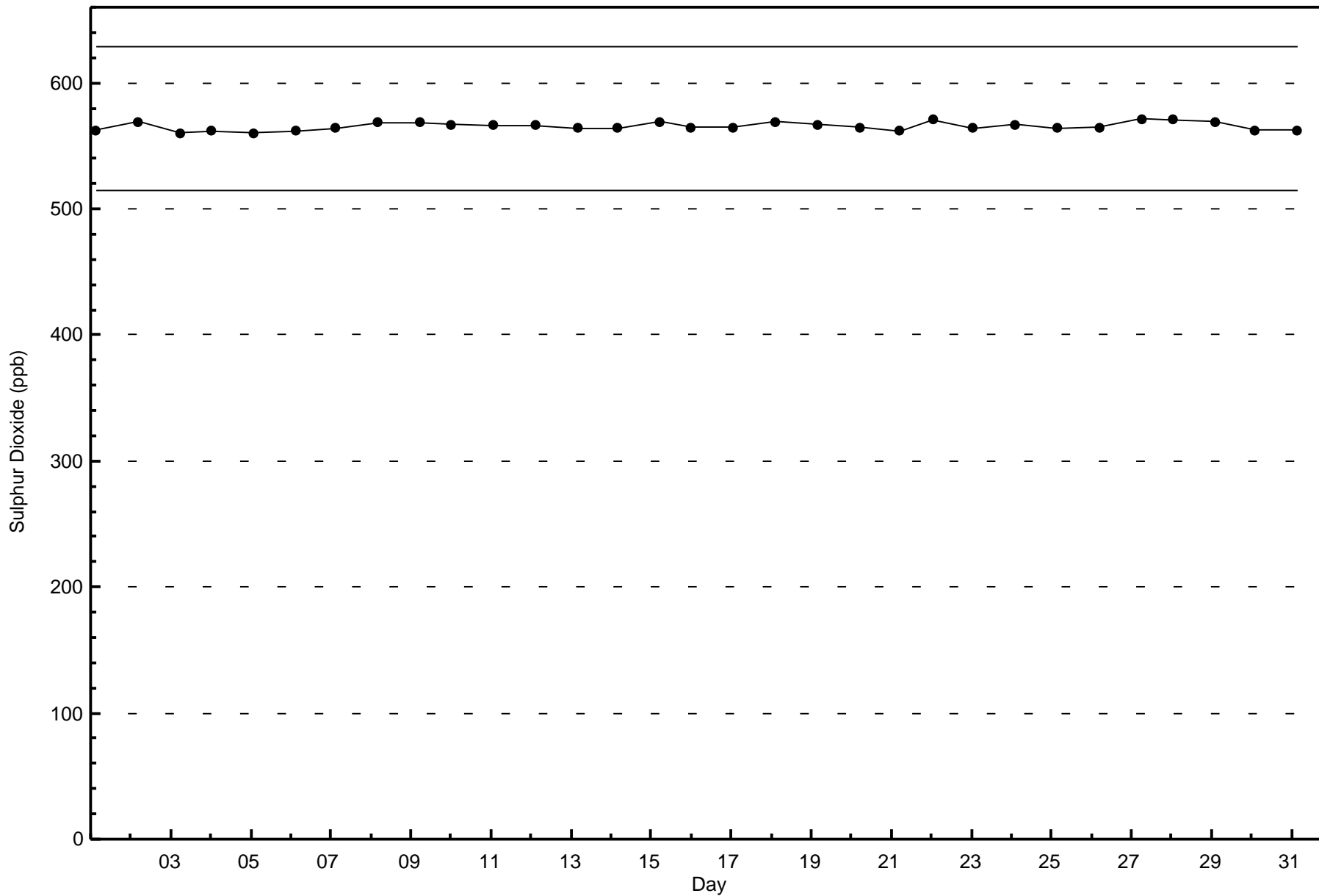


Classes (ppb)



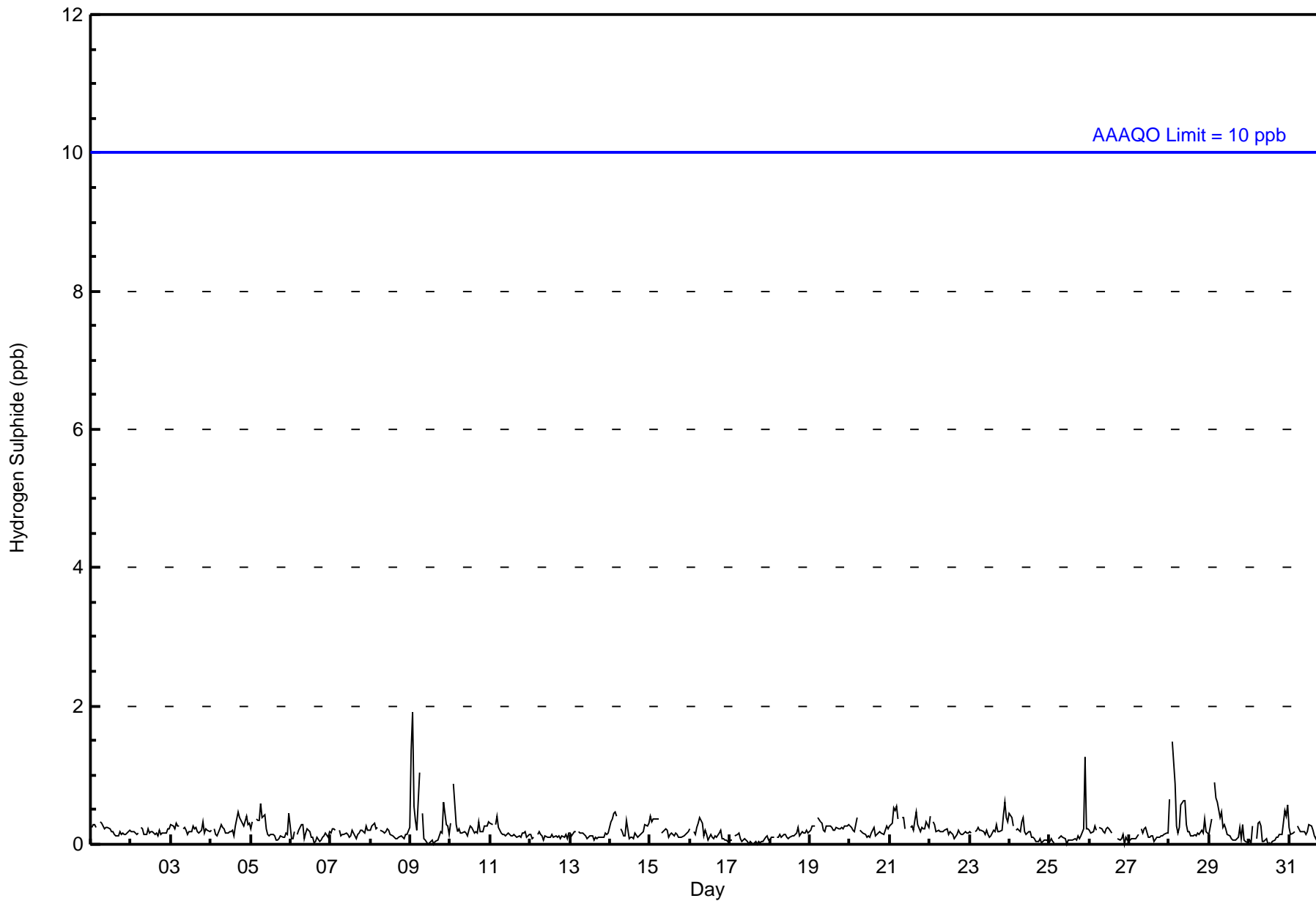
Total Number of Valid Hours: 703







Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																	
Maximum Value: 2 ppb on Jul 9 02:00										Maximum Daily Average: 0.3 ppb on Jul 28										Hours of Data: 708							
Minimum Value: 0 ppb on Jul 17 12:00										Minimum Daily Average: 0.1 ppb on Jul 17										Hours of Missing Data: 36							
Maximum Diurnal Average: 0.3 ppb at hour 3										Minimum Diurnal Average: 0.1 ppb at hour 15										Hours of Calibration: 34							
Monthly Average: 0.2 ppb										Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 1										Percent Operational Time: 99.7							
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-Jul	0	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-Jul	0	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-Jul	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	
4-Jul	0	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-Jul	0	0	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
6-Jul	0	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-Jul	0	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-Jul	0	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-Jul	1	2	1	0	0	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.3	2	
10-Jul	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
11-Jul	0	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-Jul	0	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-Jul	0	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-Jul	0	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-Jul	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	
16-Jul	0	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-Jul	0	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-Jul	0	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-Jul	0	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	
20-Jul	0	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-Jul	0	0	1	0	1	0	Z	0	0	0	M	M	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
22-Jul	0	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-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.2	1	
24-Jul	0	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-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.1	1	
26-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	C	C	C	0	0	0	0	0	0	0	0.2	0	
27-Jul	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	
28-Jul	1	Z	1	1	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
29-Jul	0	0	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
30-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2	1	
31-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.2	0.2	0.2	0.2	Diurnal Average		
	1	2	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	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
Cumulative Frequency Distribution

Hydrogen Sulphide (H₂S) - ppb
Firebag - July 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	708	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Firebag - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	107	81	30	23	14	24	23	56	48	41	59	47	20	37	35	61	706
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	107	81	30	23	14	24	23	56	48	41	59	47	20	37	35	61	706

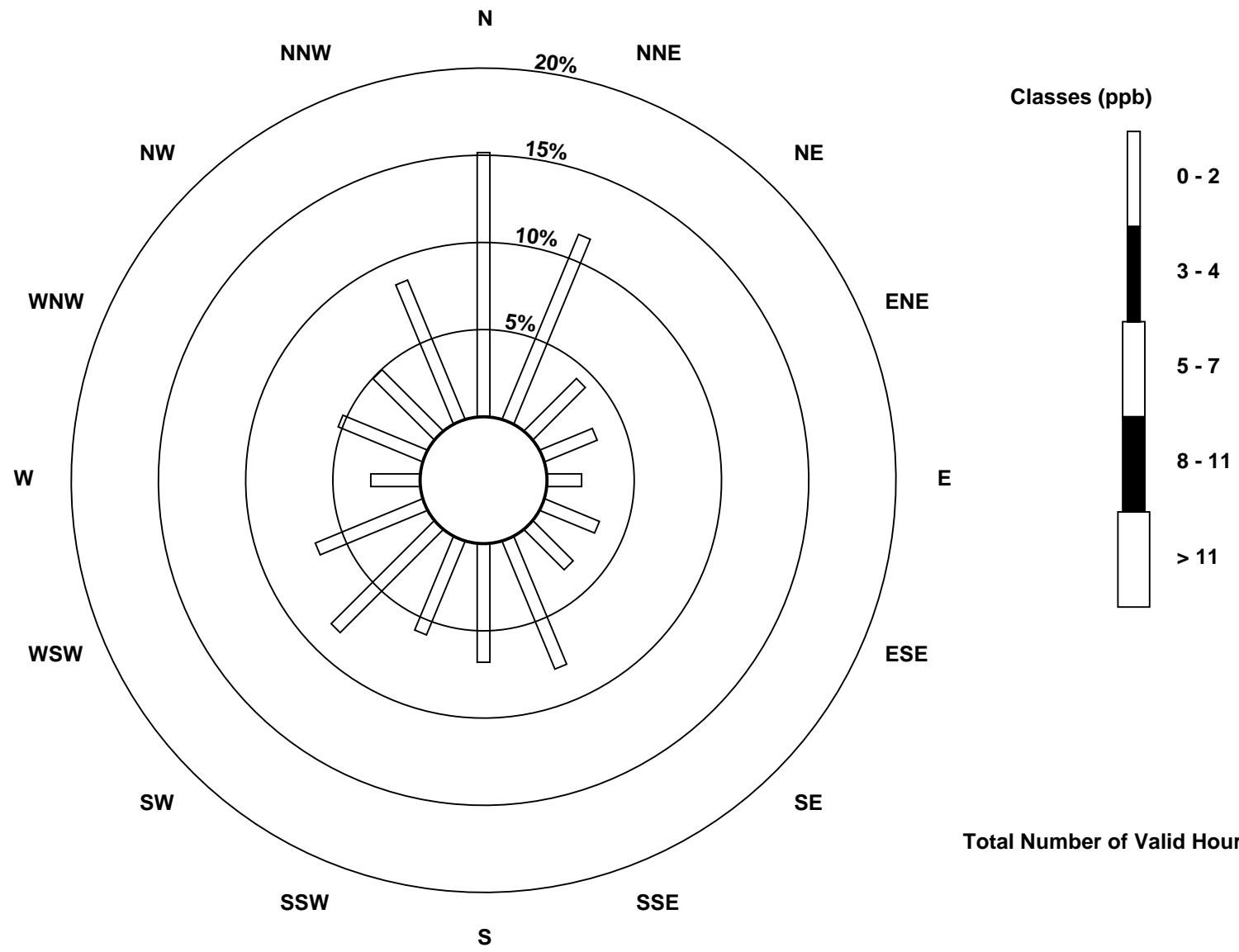
Total Number of Valid Hours: 706

Total Number of Hours: 744

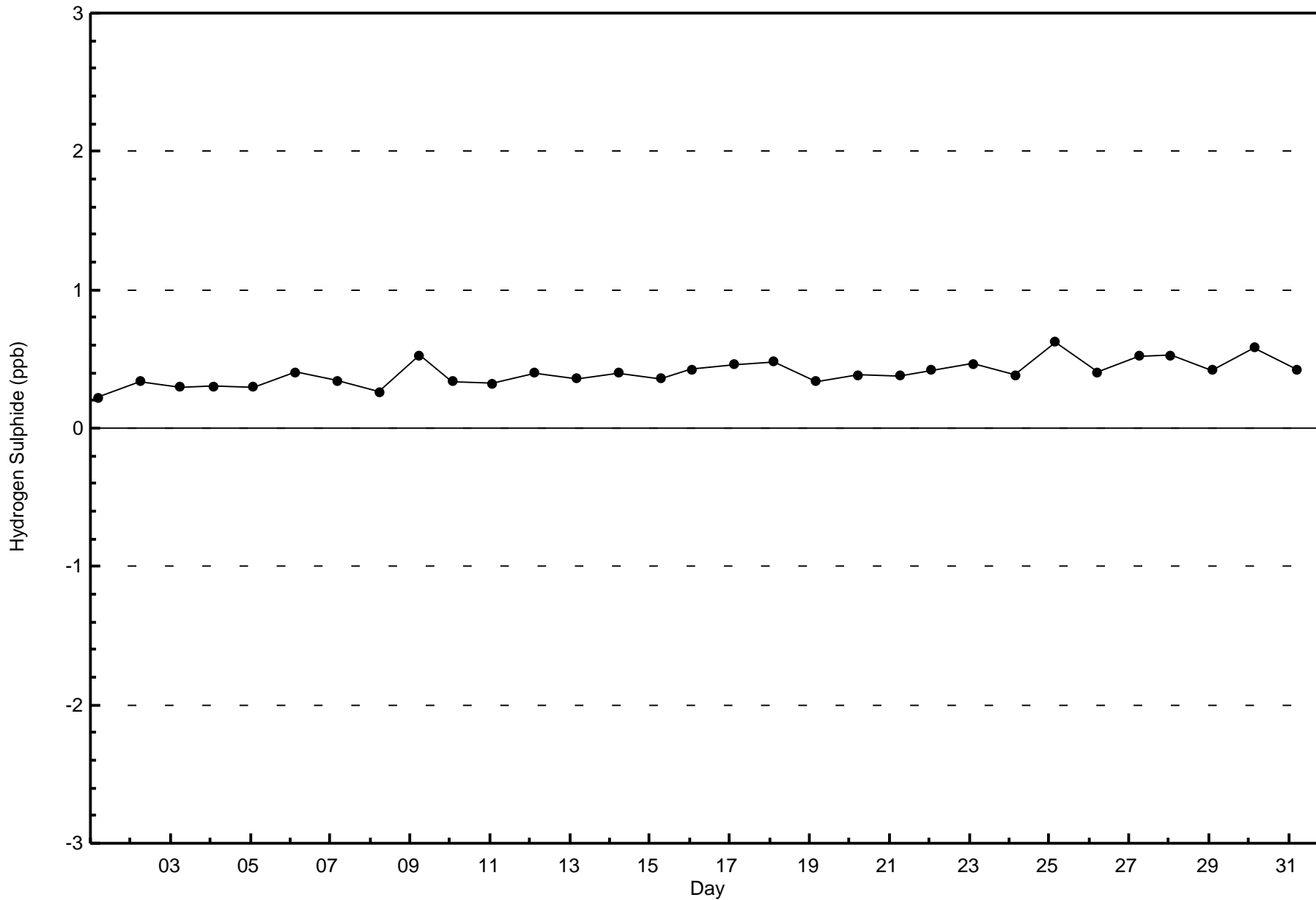


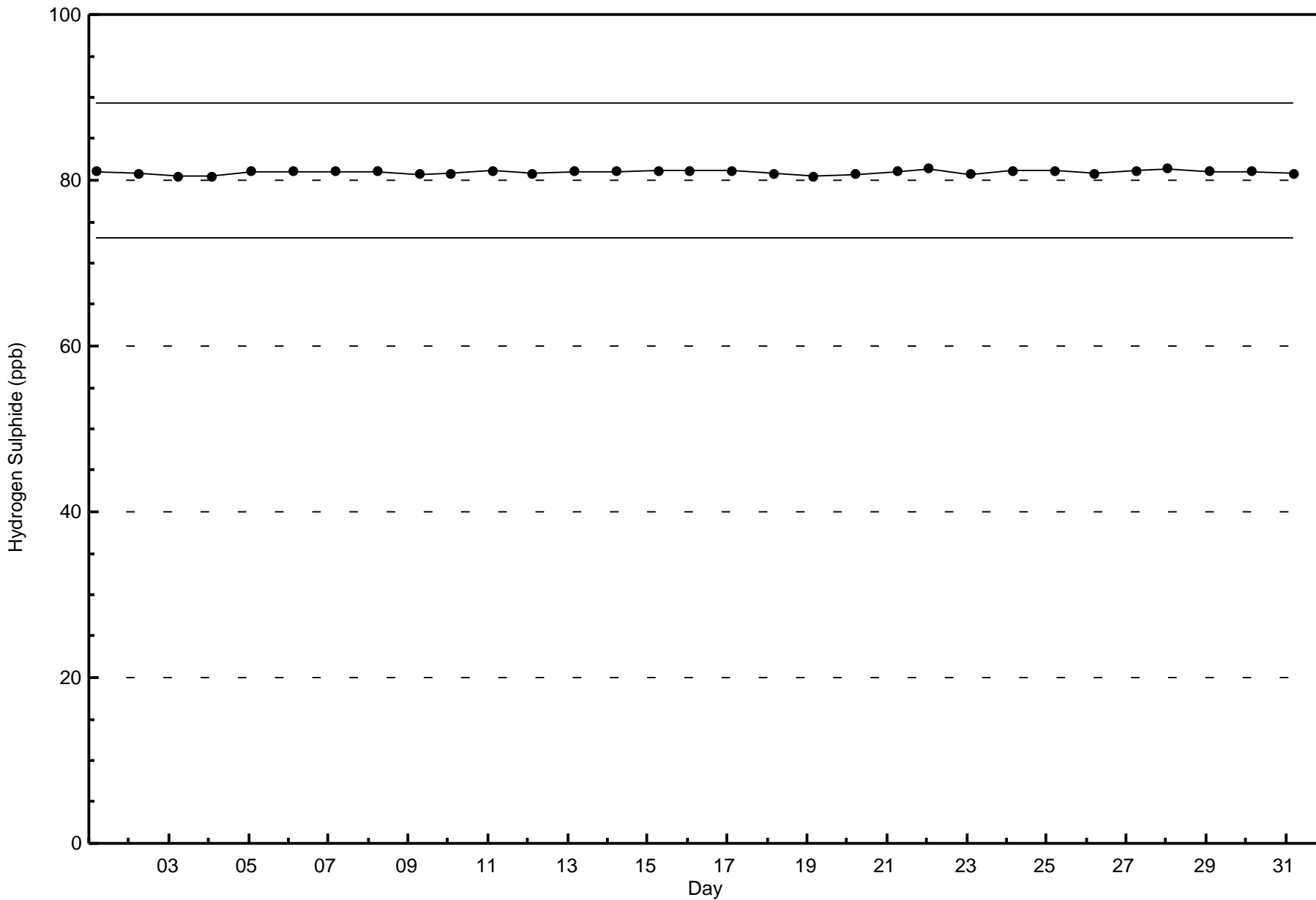
Wood Buffalo Environmental Association
Wind Rose Jul 2016

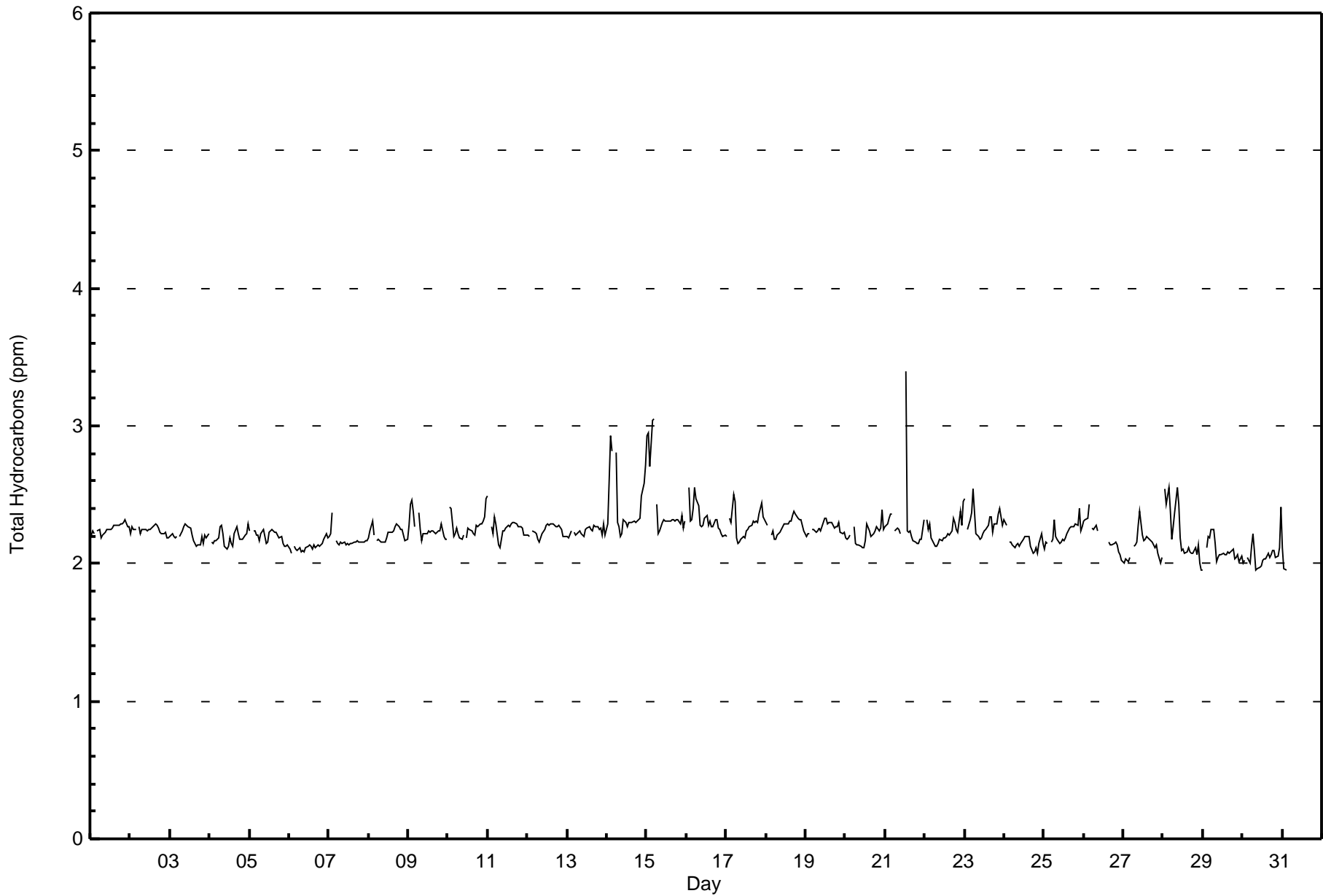
Hydrogen Sulphide (H₂S) - ppb
Firebag (AMS 19)



Total Number of Valid Hours: 706









Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Firebag - July 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	32	4.68	4.68
2.1 - 3.0	651	95.18	99.85
3.1 - 10.0	1	0.15	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 684

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Total Hydrocarbons (THC) - ppm
Firebag - July 2016

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	1	2	0	3	1	1	1	3	8	7	3	1	0	0	1	0	32
2.1 - 3.0	103	73	30	20	13	22	22	53	39	32	54	46	23	30	33	56	649
3.1 - 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	104	75	30	23	14	23	23	56	47	39	57	47	23	31	34	56	682

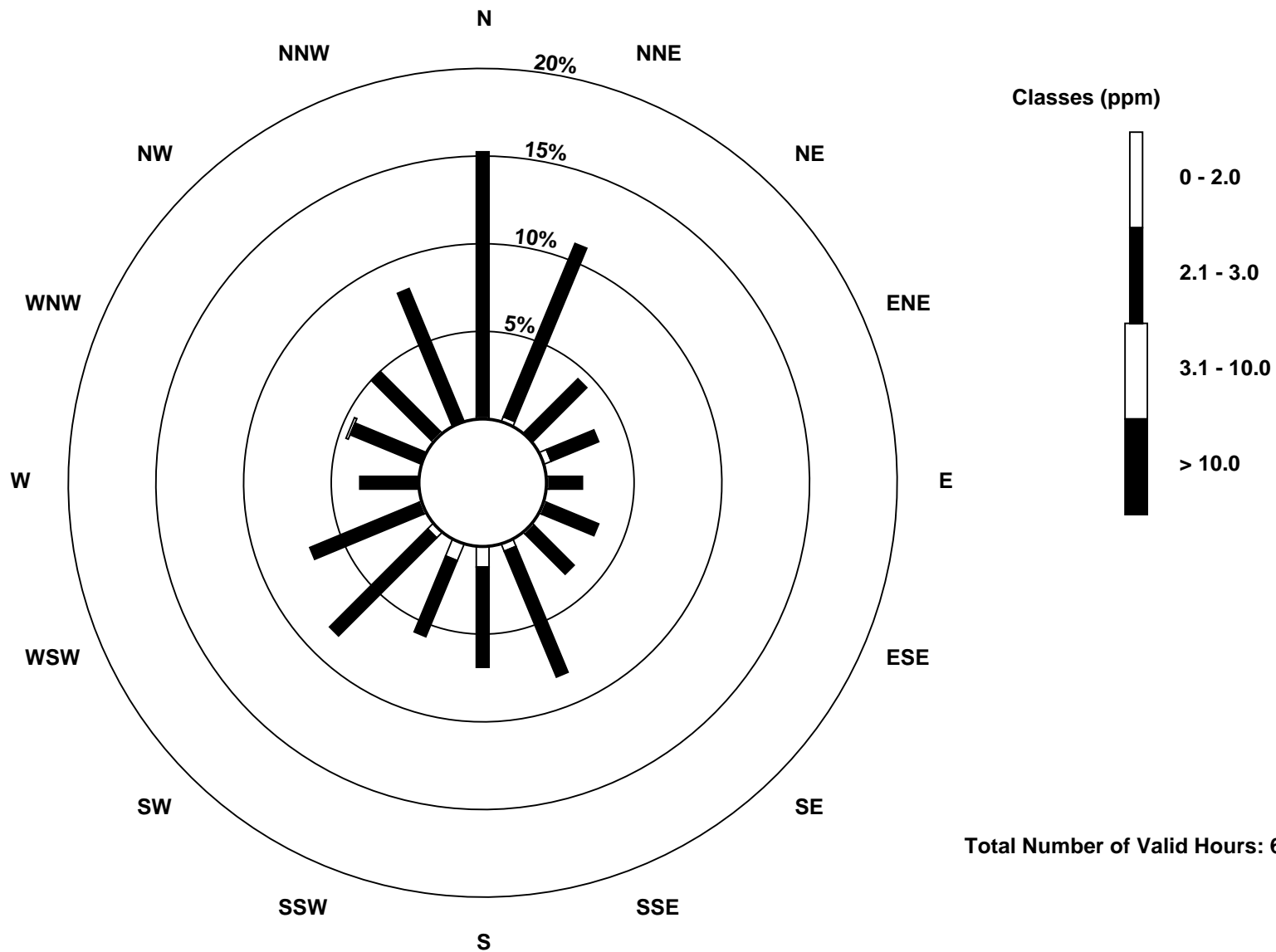
Total Number of Valid Hours: 682

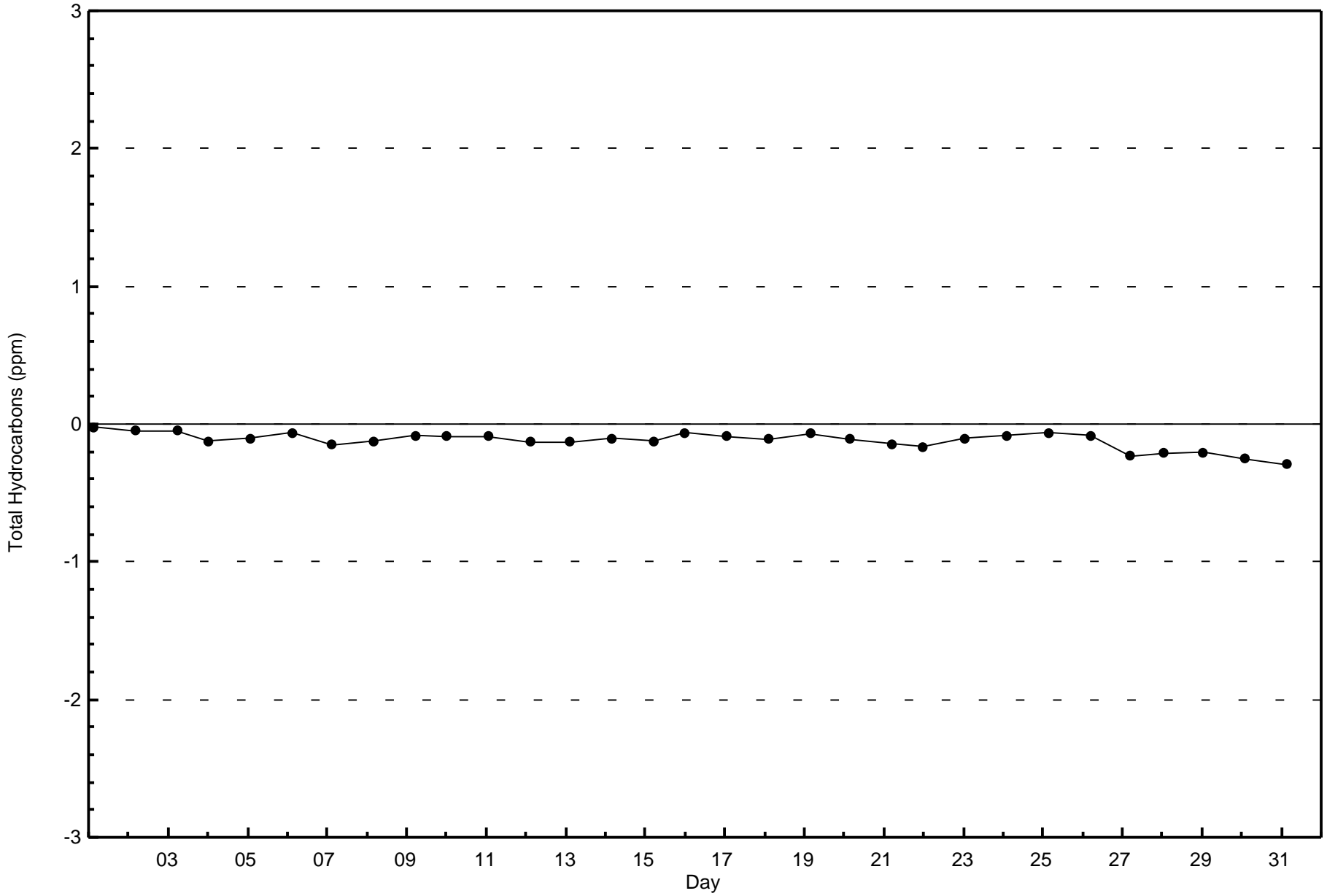
Total Number of Hours: 744

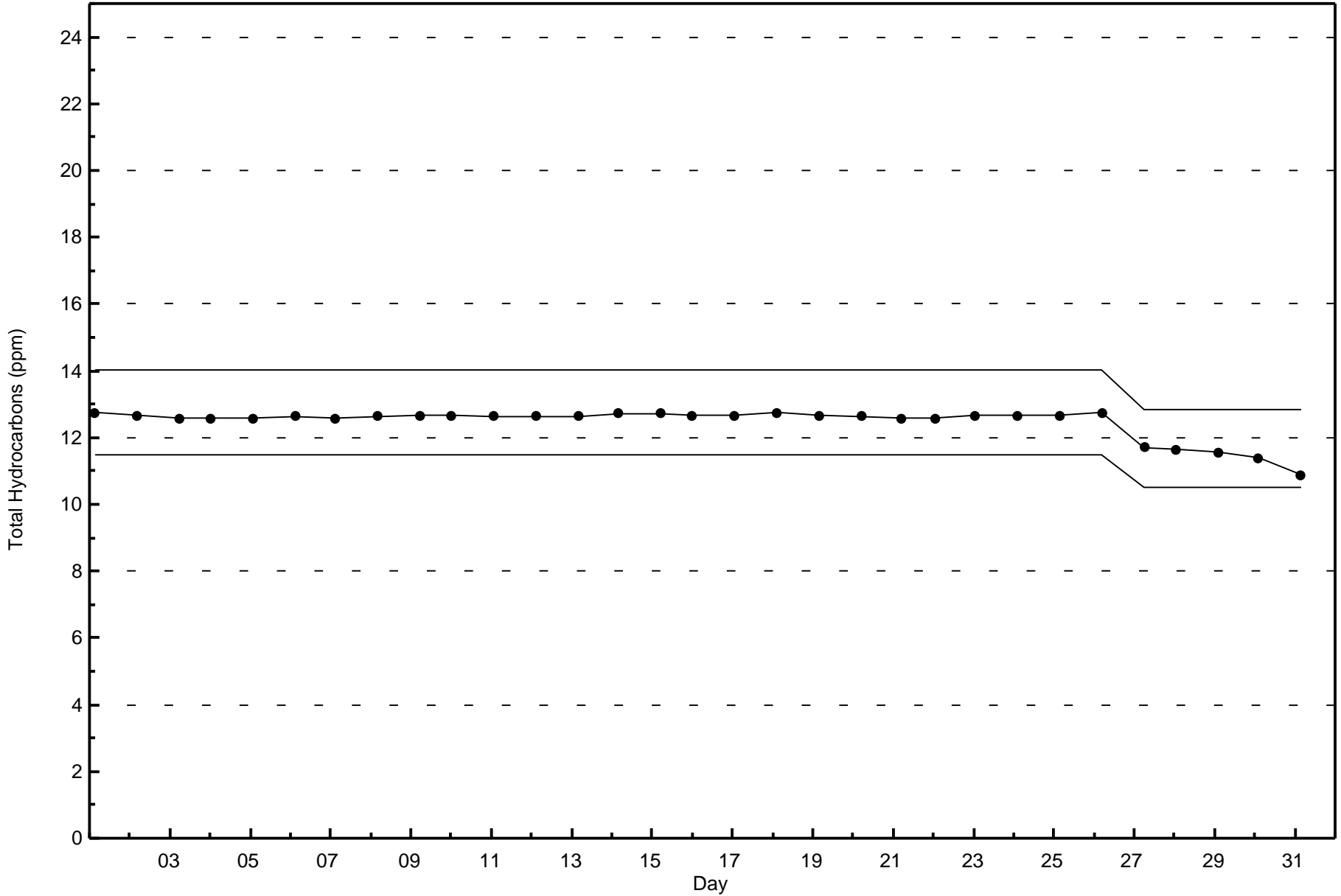


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Total Hydrocarbons (THC) - ppm
Firebag (AMS 19)







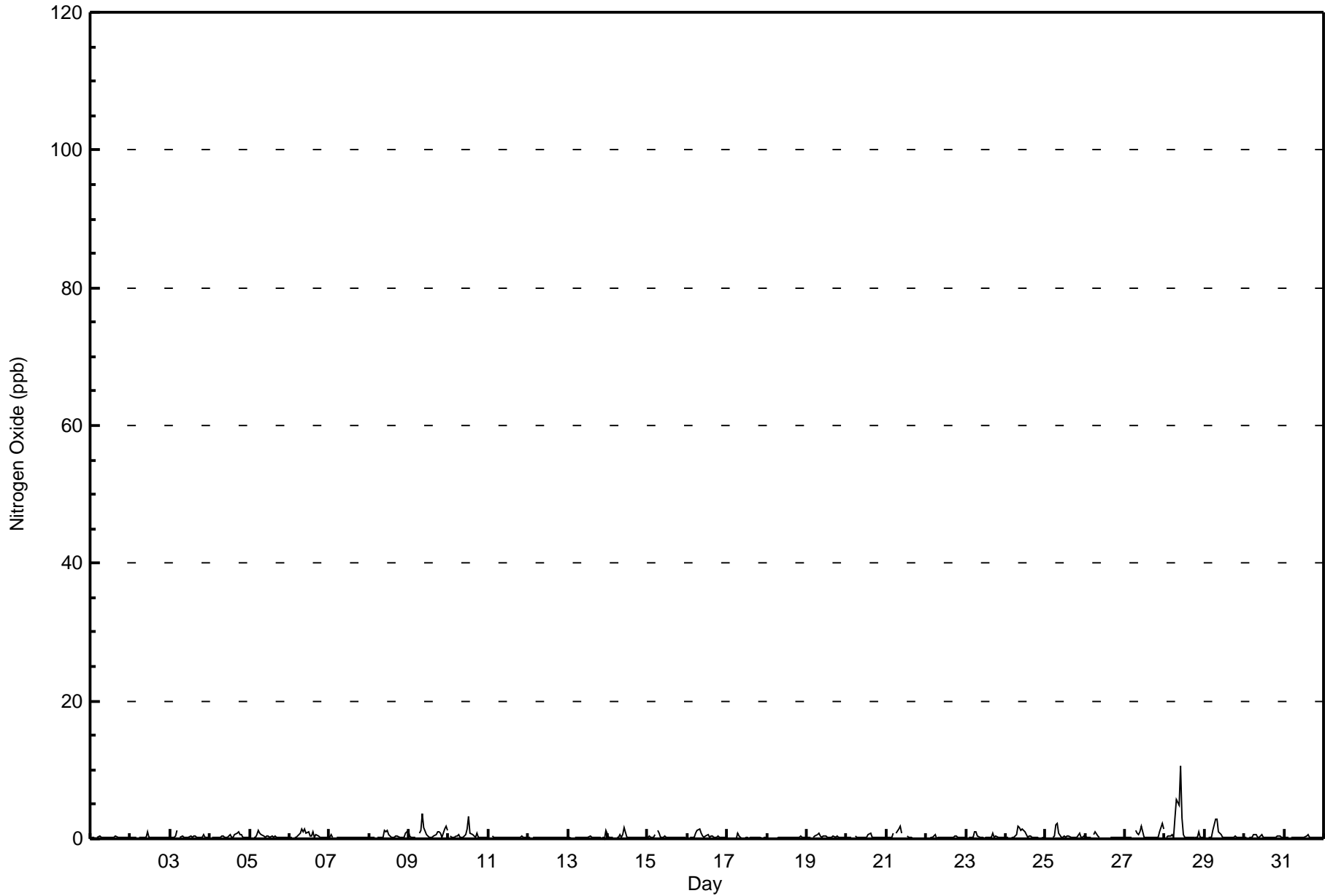


Maximum Value: 11 ppb on Jul 28 10:00																	Maximum Daily Average: 1.4 ppb on Jul 28																	Hours in Service: 744			
Minimum Value: 0 ppb on Jul 18 04:00																	Minimum Daily Average: 0.1 ppb on Jul 12																	Hours of Data: 705			
Maximum Diurnal Average: 0.8 ppb at hour 8																	Minimum Diurnal Average: 0.2 ppb at hour 1																	Hours of Missing Data: 39			
Monthly Average: 0.4 ppb																	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 0 P ₉₀ = 1 P ₉₉ = 3																	Hours of Calibration: 37			
																																		Percent Operational Time: 99.7			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24													
1-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0											
2-Jul	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											
3-Jul	0	0	0	0	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.3	1												
4-Jul	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	1	1	0	0	0	0.3	1												
5-Jul	0	Z	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1												
6-Jul	0	0	Z	0	0	0	1	1	1	1	1	1	0	0	1	0	1	0	0	0	0	0	0	0.5	1												
7-Jul	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												
8-Jul	0	0	0	0	Z	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	1	1	0.4	1											
9-Jul	0	0	0	0	0	Z	1	1	4	2	1	1	0	0	0	0	1	1	1	1	0	1	2	1	0.8	4											
10-Jul	Z	0	0	0	0	0	1	0	0	0	1	2	3	1	1	0	0	1	0	0	0	0	0	0.5	3												
11-Jul	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-Jul	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-Jul	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												
14-Jul	0	0	0	0	Z	0	0	1	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0.3	2												
15-Jul	0	1	0	0	1	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1												
16-Jul	Z	0	0	0	0	1	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.4	1												
17-Jul	0	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1												
18-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0												
19-Jul	0	0	0	Z	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1												
20-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0.2	1												
21-Jul	0	0	0	0	1	Z	1	1	2	1	M	M	0	0	0	0	0	0	0	0	0	0	0	0.4	2												
22-Jul	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1												
23-Jul	0	Z	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.3	1												
24-Jul	0	0	Z	0	0	0	1	2	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.5	2												
25-Jul	0	0	0	Z	0	1	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.4	2												
26-Jul	0	0	0	0	Z	1	1	0	0	C	C	C	C	C	C	0	0	0	0	0	0	0	0	--	1												
27-Jul	0	0	0	0	0	Z	1	1	1	1	2	0	0	0	0	0	0	0	0	0	0	1	2	1	0.6	2											
28-Jul	Z	0	0	0	1	0	3	6	5	11	3	1	0	0	0	0	0	0	0	0	1	0	0	1.4	11												
29-Jul	0	Z	0	0	0	1	3	3	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.5	3												
30-Jul	0	0	Z	0	0	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1												
31-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.2	1												
																	0.2 0.2 0.2 0.2 0.3 0.4 0.7 0.8 0.6 0.8 0.6 0.4 0.4 0.3 0.3 0.2 0.3 0.3 0.3 0.2 0.2 0.2 0.3 0.3																	Diurnal Average			
																	0 1 0 0 1 1 3 6 5 11 3 2 3 1 1 1 1 1 1 1 1 1 1 2 1																	Diurnal Maximum			
Z - zerospan																	C - Calibration							M - Maintenance													



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxide (NO) - ppb
Firebag - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxide (NO) - ppb
Firebag - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	705	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: 705

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxide (NO) - ppb
Firebag - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	108	80	31	23	14	23	23	56	47	39	57	47	23	37	36	59	703
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	108	80	31	23	14	23	23	56	47	39	57	47	23	37	36	59	703

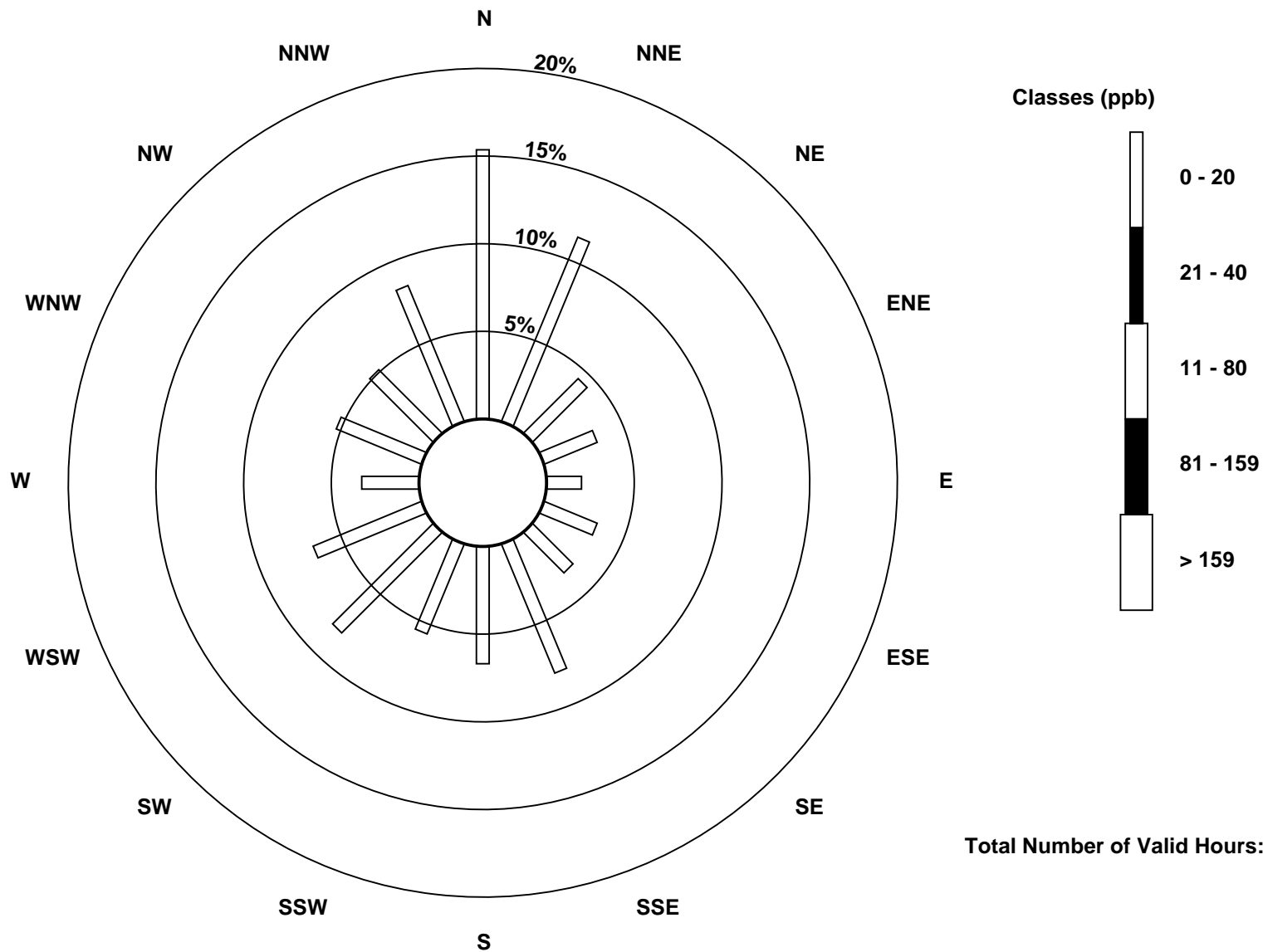
Total Number of Valid Hours: 703

Total Number of Hours: 744

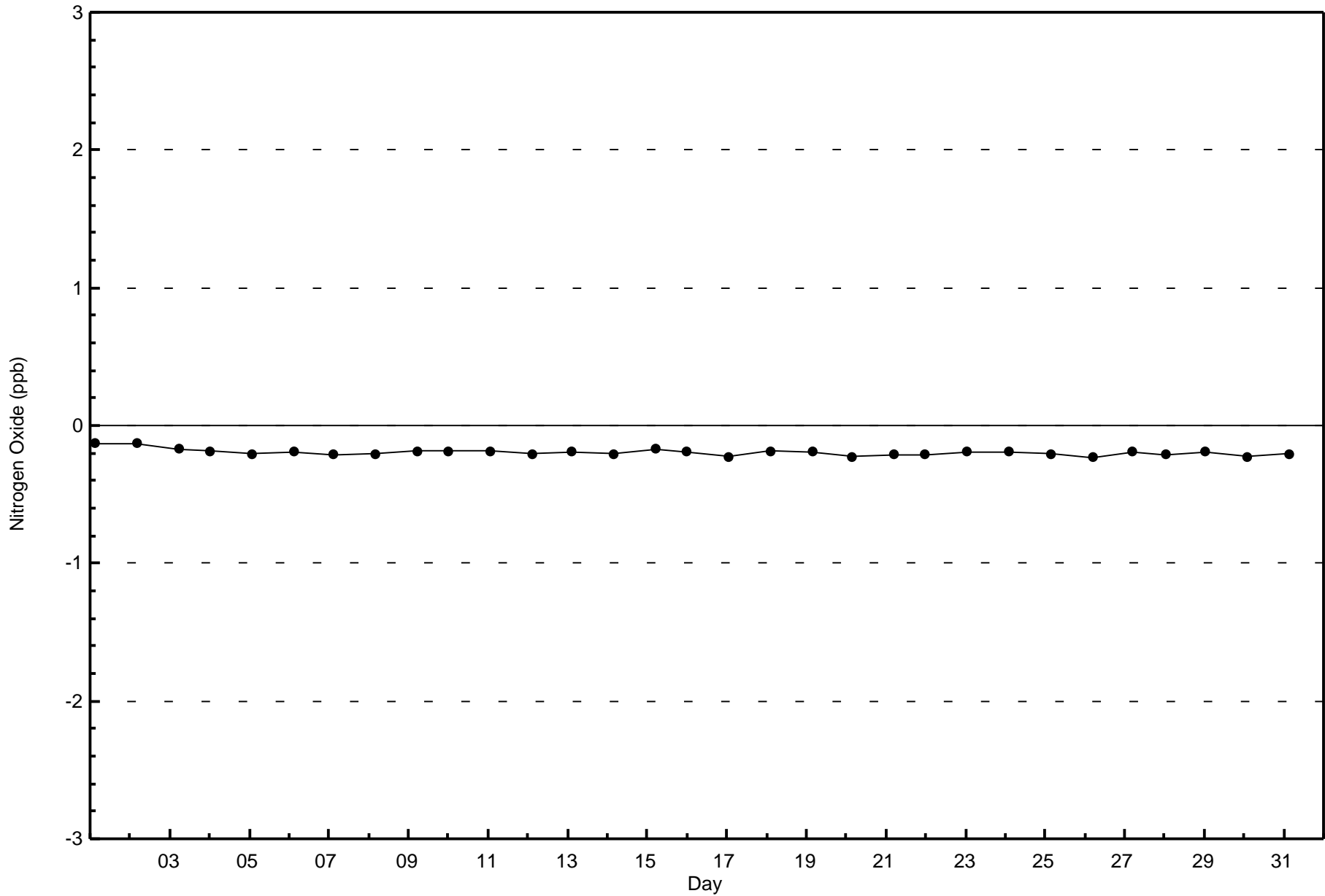


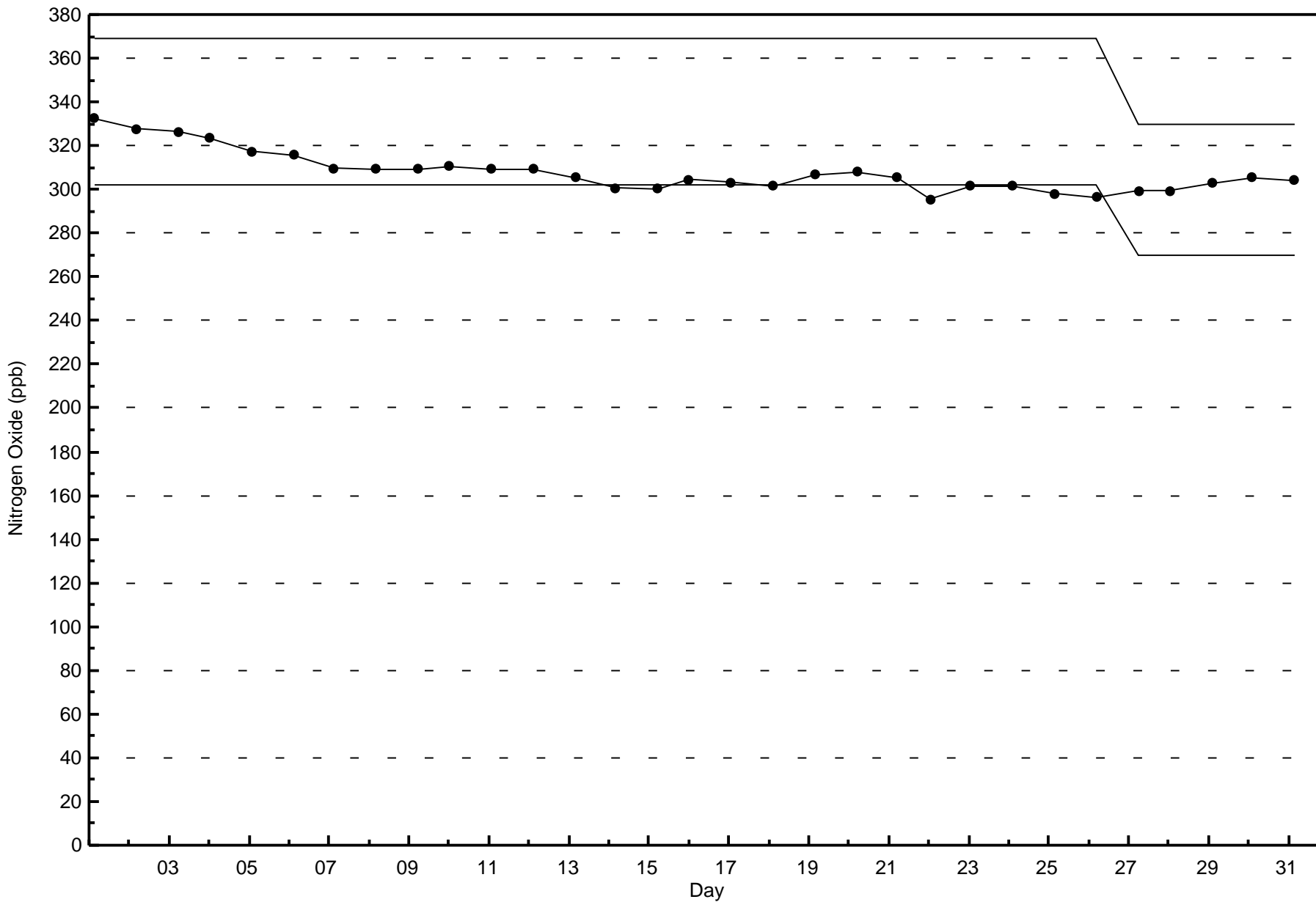
Wood Buffalo Environmental Association
Wind Rose Jul 2016

Nitrogen Oxide (NO) - ppb
Firebag (AMS 19)



Total Number of Valid Hours: 703







Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

Firebag - July 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 13 ppb on Jul 28 10:00	Maximum Daily Average: 3.2 ppb on Jul 28		Hours of Data:	705
Minimum Value: 0 ppb on Jul 7 11:00	Minimum Daily Average: 0.2 ppb on Jul 12		Hours of Missing Data:	39
Maximum Diurnal Average: 2.2 ppb at hour 7	Minimum Diurnal Average: 0.8 ppb at hour 16		Hours of Calibration:	37
Monthly Average: 1.3 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 O ₃ = 2 P ₉₀ = 3 P ₉₉ = 7		Percent Operational Time:	99.7

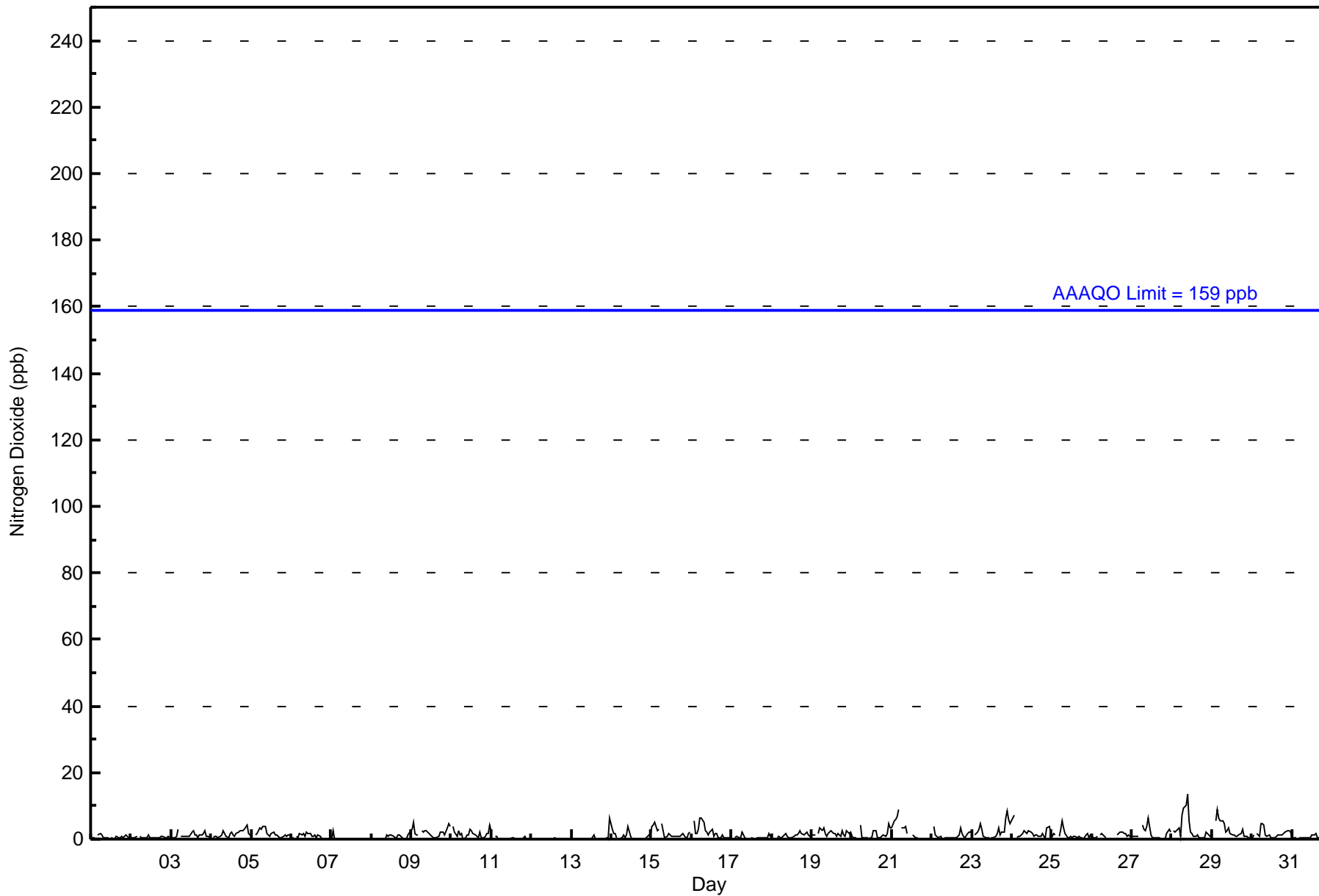
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Jul	0	0	0	Z	1	2	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0.6	2	
2-Jul	0	0	1	1	Z	1	1	1	0	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0.6	1
3-Jul	1	0	1	1	3	Z	1	1	1	1	1	2	3	1	1	1	1	1	1	2	3	1	1	1	1.2	3	
4-Jul	Z	0	1	1	1	1	1	2	2	1	0	2	2	1	1	2	2	3	3	3	3	4	2	1	1.6	4	
5-Jul	1	Z	1	2	3	4	3	4	4	2	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1.7	4	
6-Jul	1	0	Z	1	1	2	1	2	1	2	2	2	1	1	1	0	1	1	0	0	0	0	0	0	0.9	2	
7-Jul	0	2	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	2	
8-Jul	0	0	0	0	Z	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	1	3	0.6	3	
9-Jul	3	5	2	1	1	Z	3	2	3	2	2	1	1	0	1	0	1	2	2	2	1	3	5	4	2.1	5	
10-Jul	Z	4	2	1	3	1	2	0	1	1	1	3	3	2	1	1	1	2	0	0	1	2	2	4	1.6	4	
11-Jul	3	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.4	3	
12-Jul	0	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	
13-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	7	0.5	7	
14-Jul	3	2	2	1	Z	1	0	1	0	1	4	1	0	0	0	0	0	0	0	0	0	0	1	1	0.9	4	
15-Jul	4	4	5	2	3	Z	5	2	1	1	2	1	1	1	1	1	1	1	1	2	1	1	2	2	1.9	5	
16-Jul	Z	5	2	2	3	7	6	5	3	2	1	2	3	1	2	2	1	1	1	0	0	0	0	0	2.1	7	
17-Jul	1	Z	1	1	1	1	2	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	1	0.6	2	
18-Jul	1	0	Z	1	1	0	0	1	2	1	1	1	1	1	1	2	3	2	1	2	2	1	1	1	1.0	3	
19-Jul	1	1	1	Z	2	3	3	3	2	1	2	3	2	2	2	1	2	1	3	1	1	3	2	2	1.8	3	
20-Jul	1	0	0	1	Z	4	0	0	0	0	0	0	3	3	0	0	1	1	1	1	2	5	3	1.2	5		
21-Jul	3	5	6	7	9	Z	3	3	4	2	M	M	1	1	1	0	0	0	0	0	0	0	0	1	2.2	9	
22-Jul	Z	4	1	1	1	1	0	0	0	0	0	0	1	0	1	1	1	3	2	1	1	2	2	2	1.1	4	
23-Jul	2	Z	1	2	3	5	3	1	1	0	0	0	1	1	2	3	1	2	2	6	8	6	5	2.4	8		
24-Jul	6	7	Z	0	1	1	2	2	2	3	2	2	1	1	1	1	1	1	2	1	1	4	4	2	2.0	7	
25-Jul	1	2	1	Z	1	3	5	3	2	1	0	1	0	1	1	1	1	1	0	0	1	2	1	1	1.2	5	
26-Jul	1	1	0	1	Z	1	2	1	1	C	C	C	C	C	C	1	2	2	2	2	2	1	1	1	--	2	
27-Jul	1	1	1	1	1	Z	4	3	3	4	6	1	1	0	1	0	0	0	0	0	0	2	3	2	1.5	6	
28-Jul	Z	2	2	3	3	1	7	9	10	13	6	2	2	1	1	1	1	0	0	0	2	2	1	1	3.2	13	
29-Jul	1	Z	5	9	6	6	6	5	2	3	3	2	1	1	1	1	1	2	3	1	1	1	1	1	2.7	9	
30-Jul	1	1	Z	2	1	5	5	4	1	1	1	0	1	0	1	1	1	1	1	2	2	3	3	2	1.7	5	
31-Jul	1	0	0	Z	0	0	0	0	0	0	0	0	1	1	2	0	0	0	1	1	2	4	4	4	1.0	4	
	1.3	1.9	1.5	1.6	1.8	1.9	2.2	1.9	1.4	1.5	1.4	1.0	1.0	0.9	0.9	0.8	0.8	1.0	1.0	0.8	1.1	1.6	1.6	1.7	Diurnal Average		
	6	7	6	9	9	7	7	9	10	13	6	3	3	3	3	2	3	3	3	3	6	8	6	7	Diurnal Maximum		

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



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Firebag - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Firebag - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	705	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: 705

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Firebag - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	108	80	31	23	14	23	23	56	47	39	57	47	23	37	36	59	703
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	108	80	31	23	14	23	23	56	47	39	57	47	23	37	36	59	703

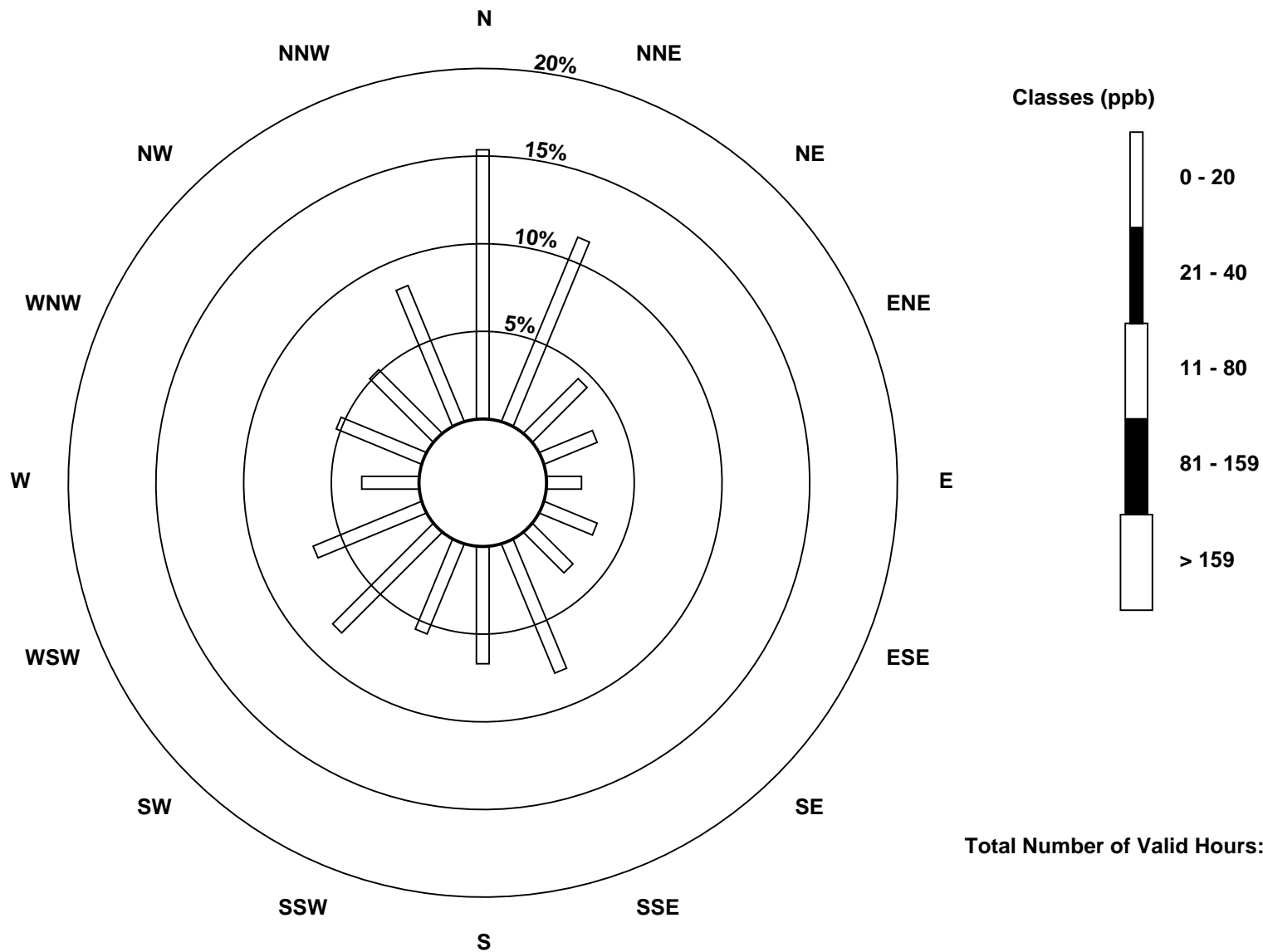
Total Number of Valid Hours: 703

Total Number of Hours: 744

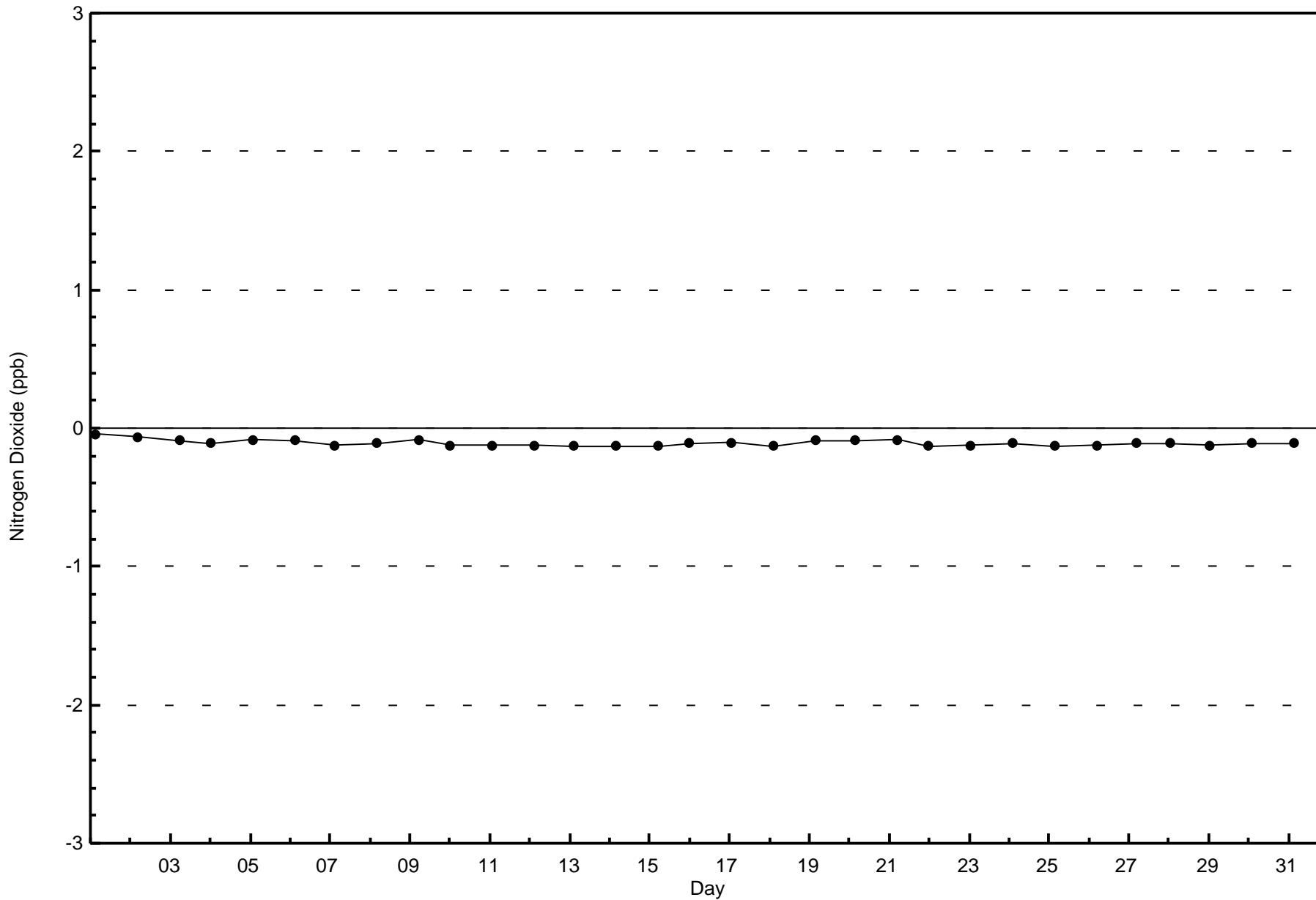


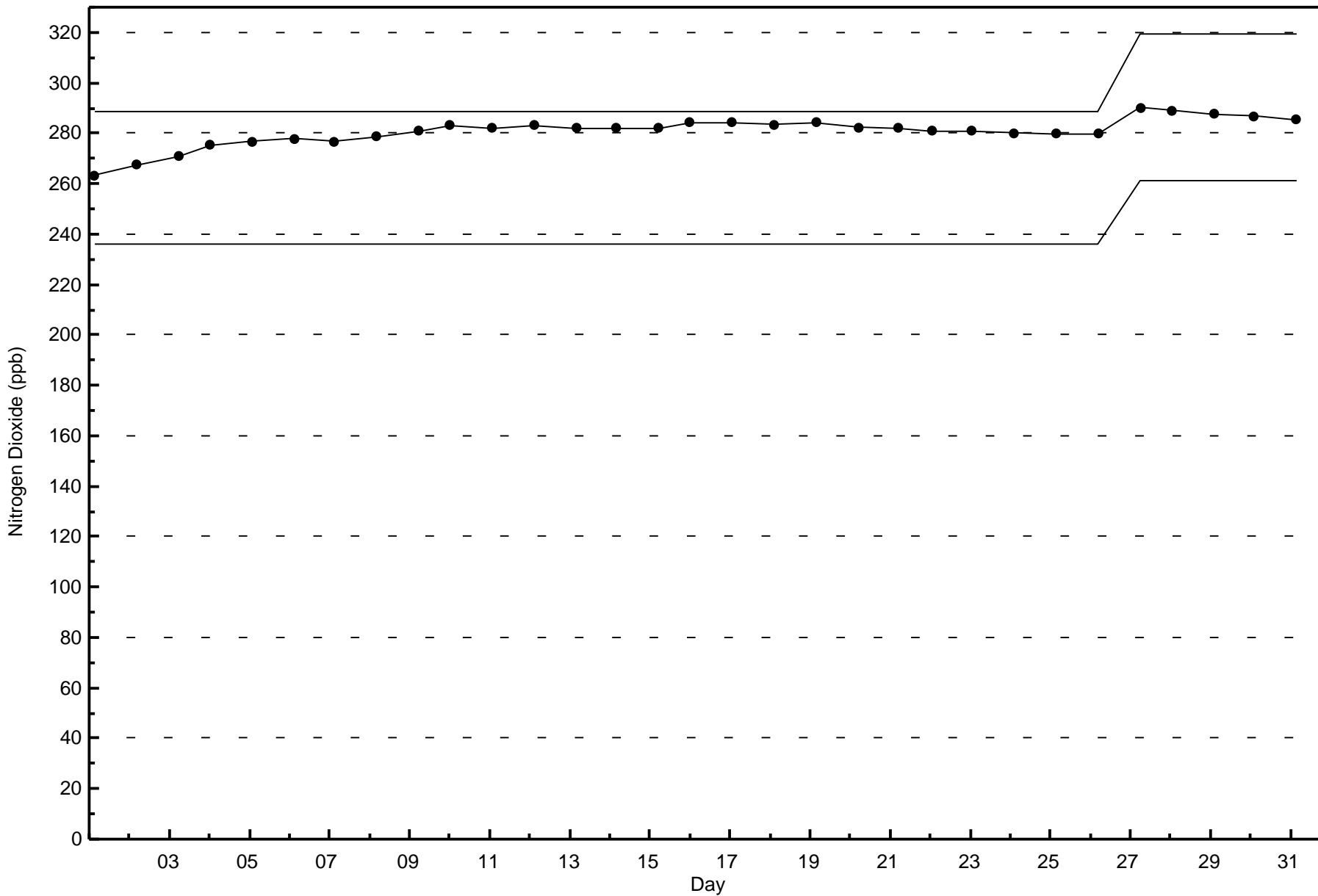
Wood Buffalo Environmental Association
Wind Rose Jul 2016

Nitrogen Dioxide (NO₂) - ppb
Firebag (AMS 19)



Total Number of Valid Hours: 703







Wood Buffalo Environmental Association
Summary of Hour Averages

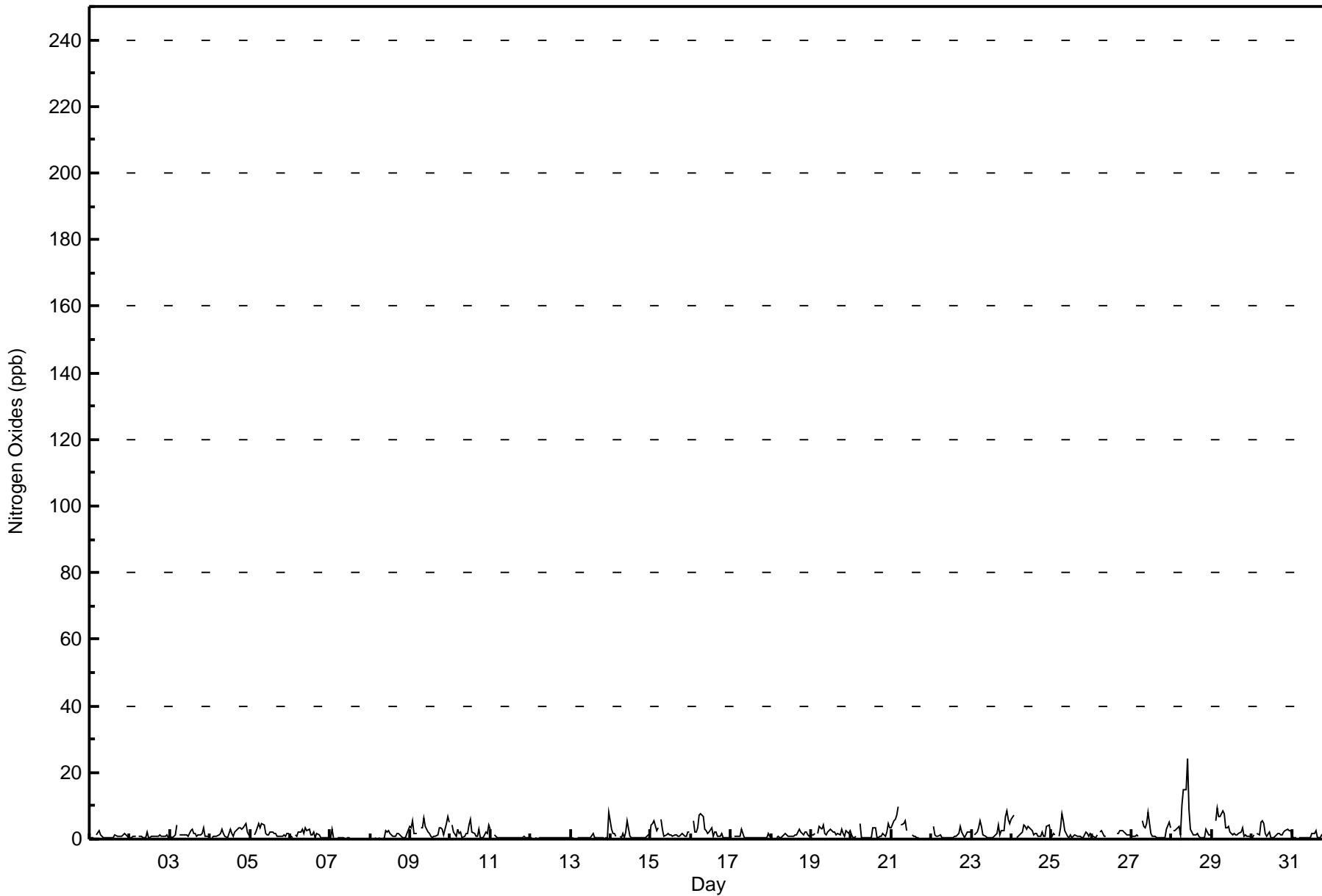
Nitrogen Oxides (NO_x) - ppb
Firebag - July 2016

Maximum Value: 24 ppb on Jul 28 10:00																	Maximum Daily Average: 4.6 ppb on Jul 28																	Hours in Service: 744																
Minimum Value: 0 ppb on Jul 21 23:00																	Minimum Daily Average: 0.3 ppb on Jul 12																	Hours of Data: 705																
Maximum Diurnal Average: 2.9 ppb at hour 7																	Minimum Diurnal Average: 1.0 ppb at hour 16																	Hours of Missing Data: 39																
Monthly Average: 1.7 ppb																	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 O ₃ = 2 P ₉₀ = 4 P ₉₉ = 8																	Hours of Calibration: 37																
																	Percent Operational Time: 99.7																																	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																										
1-Jul	0	0	1	Z	1	2	1	1	1	1	0	0	0	0	0	1	1	1	1	1	1	2	1	0	0.8	2																								
2-Jul	1	1	1	1	Z	1	1	1	1	0	2	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	2																								
3-Jul	1	1	1	1	4	Z	1	1	1	1	1	2	3	2	2	1	1	1	1	2	3	1	1	1	1.5	4																								
4-Jul	Z	1	1	1	1	1	2	3	2	1	1	2	3	2	1	2	3	4	3	3	3	5	2	1	2.0	5																								
5-Jul	1	Z	1	2	3	5	4	5	4	2	1	2	2	1	2	1	1	1	1	1	1	1	2	2	2.0	5																								
6-Jul	1	1	Z	1	1	2	2	3	2	3	2	3	1	1	2	1	2	1	0	0	0	0	0	0	1.4	3																								
7-Jul	0	3	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	3																								
8-Jul	0	0	0	0	Z	0	0	0	0	2	2	3	2	1	1	1	1	2	1	0	0	0	2	4	1.0	4																								
9-Jul	3	5	2	2	2	Z	3	4	6	4	2	2	1	1	1	1	1	3	3	3	1	5	7	5	2.9	7																								
10-Jul	Z	4	2	1	3	2	2	0	1	2	2	4	6	2	2	1	1	3	0	1	1	2	2	4	2.1	6																								
11-Jul	3	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0.5	3																								
12-Jul	0	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																								
13-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	8	0.7	8																								
14-Jul	3	2	2	1	Z	1	1	2	1	2	6	1	0	0	0	0	0	0	0	0	0	1	1	1	1.1	6																								
15-Jul	4	5	5	3	4	Z	6	3	1	1	2	1	1	1	1	1	1	1	1	2	1	1	2	2	2.2	6																								
16-Jul	Z	6	2	2	3	7	7	7	3	3	2	2	3	1	2	2	1	1	2	1	1	0	0	0	2.5	7																								
17-Jul	1	Z	1	1	1	1	3	2	0	0	0	0	0	0	0	0	1	1	0	0	0	0	2	1	0.7	3																								
18-Jul	1	0	Z	1	1	1	0	1	2	1	1	1	1	1	1	1	2	3	2	1	2	2	1	1	1.2	3																								
19-Jul	1	1	2	Z	2	4	3	4	2	1	2	3	2	2	2	1	2	1	3	2	1	3	2	3	2.1	4																								
20-Jul	1	1	1	1	Z	5	1	0	0	0	0	0	3	3	1	0	1	1	2	1	2	5	4	1.4	5																									
21-Jul	3	6	6	7	10	Z	4	5	6	2	M	M	1	1	1	0	0	0	0	0	0	0	0	1	2.6	10																								
22-Jul	Z	4	1	1	1	1	0	0	0	0	0	1	1	1	1	1	2	4	2	1	1	2	2	2	1.3	4																								
23-Jul	3	Z	1	2	3	6	4	1	1	0	0	0	0	1	1	2	4	1	3	2	7	9	6	5	2.7	9																								
24-Jul	6	7	Z	1	1	1	2	4	4	3	4	3	2	1	2	2	1	1	2	1	1	4	4	2	2.5	7																								
25-Jul	1	2	1	Z	1	3	7	6	2	1	1	1	0	1	1	1	1	1	1	0	0	2	1	1	1.6	7																								
26-Jul	1	1	1	1	Z	2	3	1	1	C	C	C	C	C	C	2	2	2	2	2	2	1	1	1	--	3																								
27-Jul	1	1	1	1	1	Z	6	4	3	5	8	2	1	1	1	1	0	0	0	0	0	3	5	3	2.1	8																								
28-Jul	Z	3	2	3	4	1	10	15	15	24	9	3	2	1	1	2	1	1	0	0	3	2	1	1	4.6	24																								
29-Jul	1	Z	5	9	7	7	9	8	3	3	4	2	1	2	1	1	2	2	3	1	1	1	1	1	3.2	9																								
30-Jul	1	1	Z	2	1	5	5	5	2	1	2	1	1	1	1	2	2	1	1	2	3	3	3	2	2.0	5																								
31-Jul	1	0	0	Z	0	0	0	0	0	0	0	0	2	2	2	0	0	0	1	1	2	4	4	4	1.2	4																								
1.5																	2.1																	Diurnal Average																
6																	7																	Diurnal Maximum																
1.6																	1.8																																	
9																	10																																	
2.1																	2.3																																	
7																	10																																	
2.9																	2.8																																	
15																	15																																	
2.1																	2.2																																	
24																	9																																	
2.0																	1.4																																	
4																	6																																	
1.1																	1.3																																	
3																	3																																	
1.0																	1.1																																	
2																	4																																	
1.3																	1.3																																	
3																	3																																	
1.0																	1.4																																	
7																	9																																	
1.9																	1.9																																	
7																	7																																	
2.0																																																		
Z - zerospan																	C - Calibration																	M - Maintenance																



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Firebag - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitrogen Oxides (NO_x) - ppb
Firebag - July 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	704	99.86	99.86
21 - 40	1	0.14	100.00
11 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 705

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Firebag - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	108	80	31	23	14	23	23	56	47	39	57	47	22	37	36	59	702
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	108	80	31	23	14	23	23	56	47	39	57	47	23	37	36	59	703

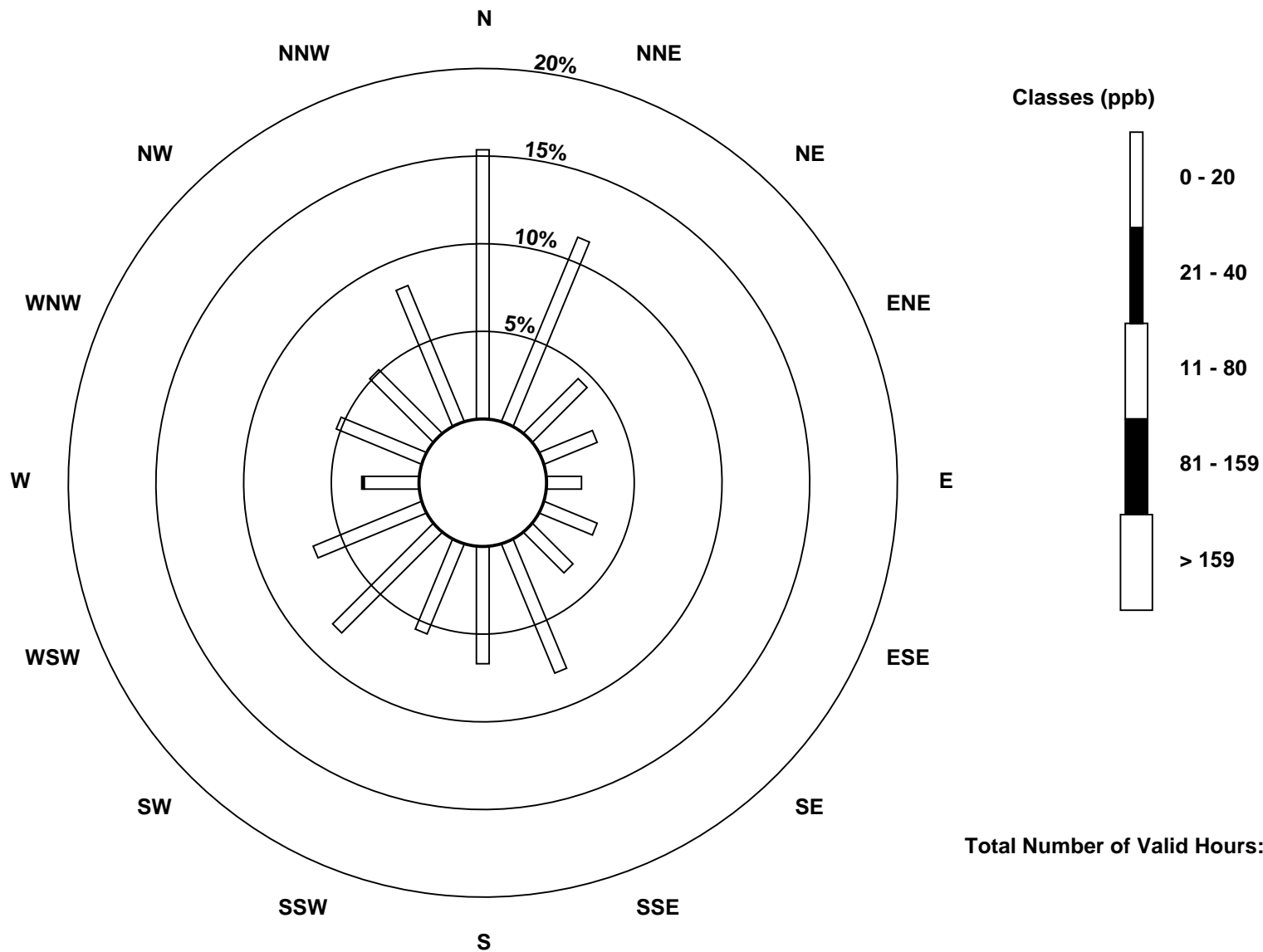
Total Number of Valid Hours: 703

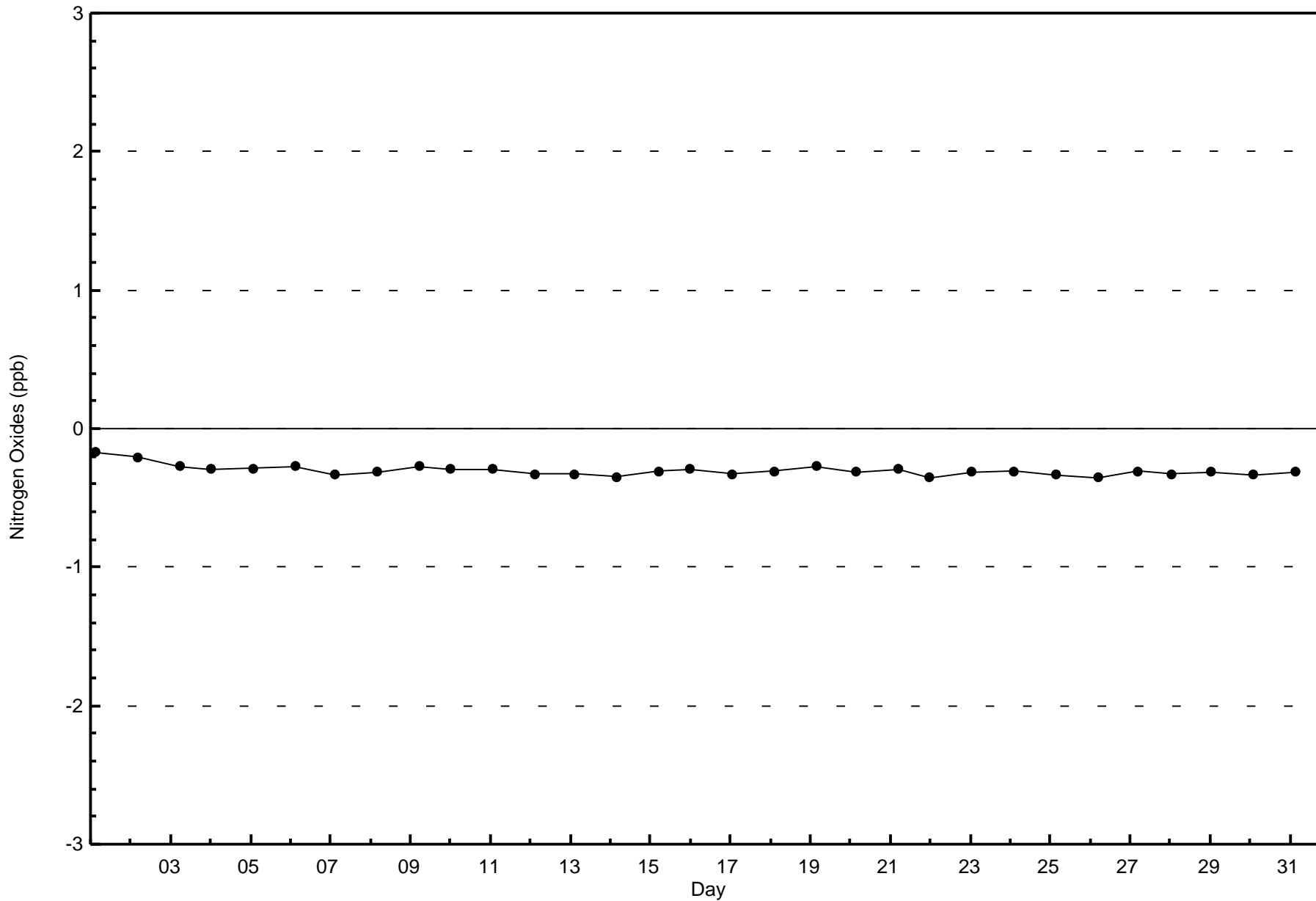
Total Number of Hours: 744

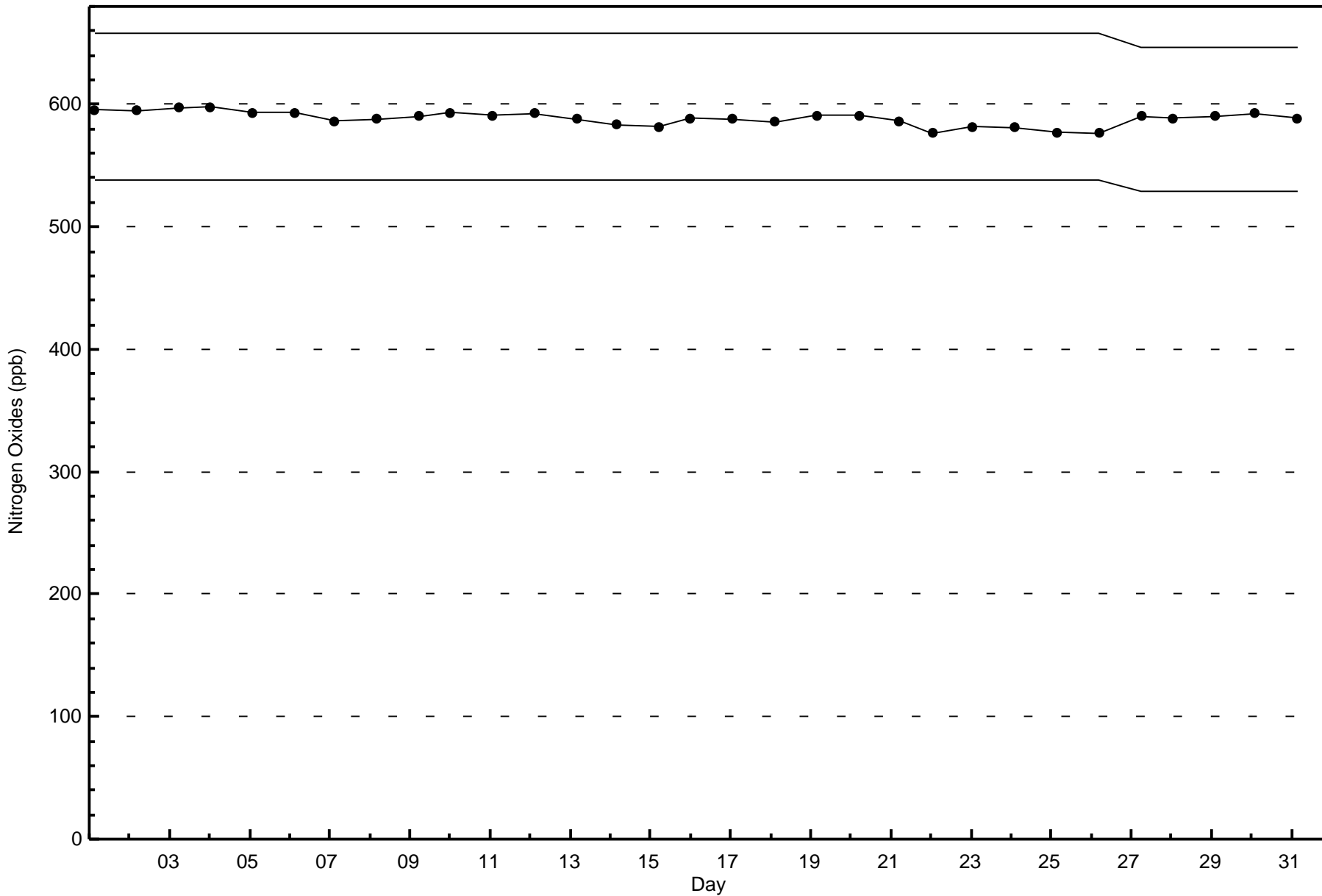


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Nitrogen Oxides (NO_x) - ppb
Firebag (AMS 19)

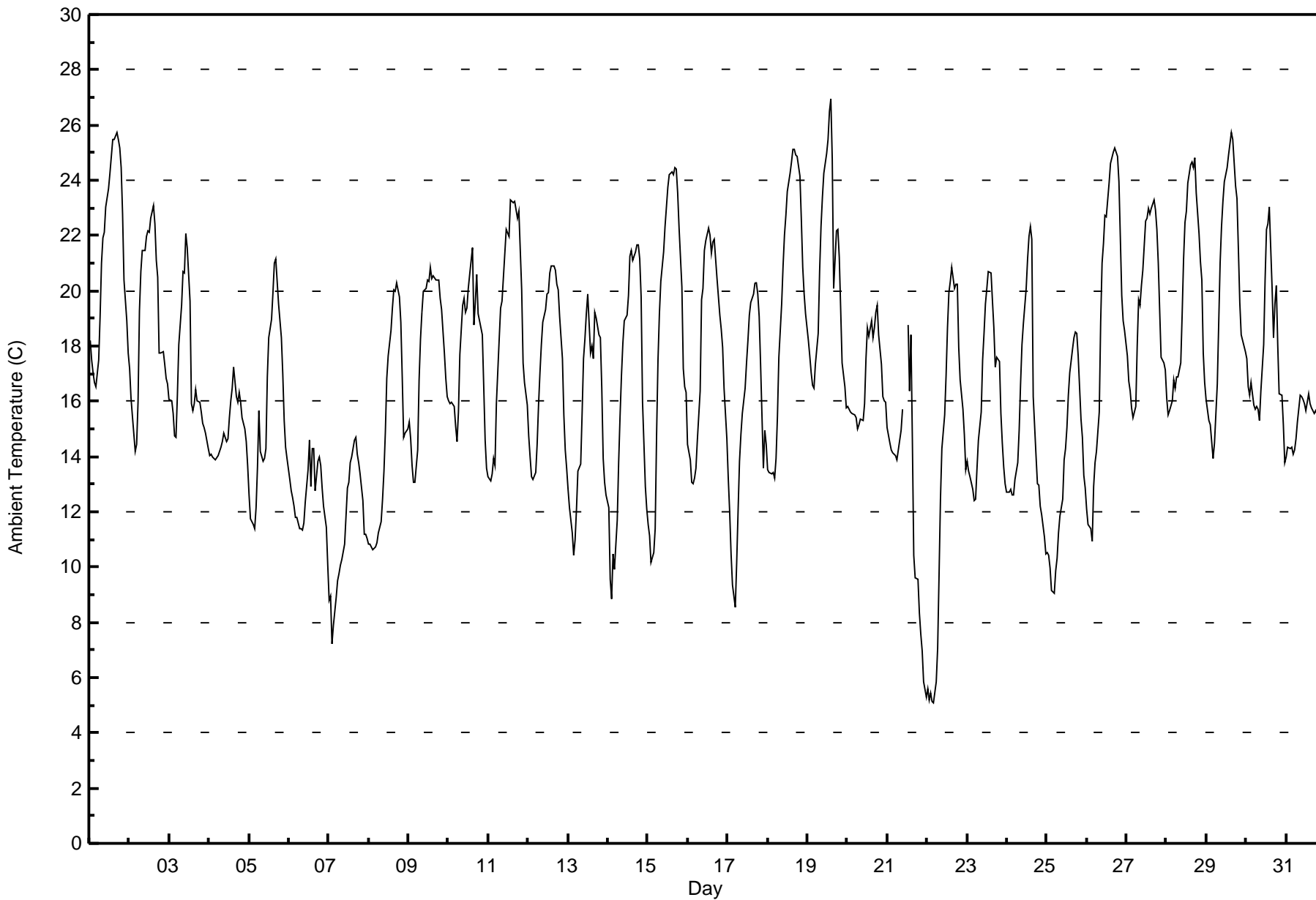








Maximum Value: 27.0 C on Jul 19 15:00		Maximum Daily Average: 21.5 C on Jul 1		Hours in Service: 744																																												
Minimum Value: 5.1 C on Jul 22 05:00		Minimum Daily Average: 11.4 C on Jul 7		Hours of Data: 742																																												
Maximum Diurnal Average: 20.8 C at hour 15		Minimum Diurnal Average: 12.9 C at hour 4		Hours of Missing Data: 2																																												
Monthly Average: 16.92 C		Percentiles: P ₁ = 5.8 P ₁₀ = 11.7 Q ₁ = 14.0 Median = 16.5 Q ₃ = 20.1 P ₉₀ = 22.6 P ₉₉ = 25.5		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-Jul	18.2	17.5	17.1	16.7	16.5	17.5	19.0	21.0	21.9	22.1	23.1	23.7	24.2	24.9	25.5	25.5	25.7	25.5	25.2	24.5	22.8	20.4	18.9	17.8	21.5	25.7																						
2-Jul	17.2	16.1	15.4	14.2	14.4	16.0	19.3	20.7	21.5	21.4	22.0	22.2	22.1	22.6	23.1	22.4	21.1	20.5	17.8	17.7	17.8	17.4	16.8	16.6	19.0	23.1																						
3-Jul	16.1	16.0	15.5	14.7	14.7	16.2	18.1	19.5	20.7	20.6	22.1	21.6	19.6	15.9	15.6	15.9	16.4	16.0	15.9	15.6	15.2	15.0	14.8	14.3	16.9	22.1																						
4-Jul	14.1	14.1	14.0	13.9	13.9	14.1	14.2	14.4	14.6	14.8	14.6	14.6	15.4	16.0	16.5	17.2	16.2	16.0	16.3	16.0	15.4	15.0	14.5	13.7	15.0	17.2																						
5-Jul	12.6	11.7	11.5	11.4	12.2	13.6	15.7	14.2	13.8	13.9	14.3	16.9	18.3	19.0	19.9	21.0	21.2	20.3	19.5	18.3	17.0	15.3	14.3	13.9	15.8	21.2																						
6-Jul	13.2	12.7	12.5	12.2	11.8	11.8	11.4	11.4	11.3	11.6	12.4	13.5	14.6	12.9	14.3	14.3	12.8	13.8	14.0	13.7	12.9	12.2	11.4	10.1	12.6	14.6																						
7-Jul	8.8	8.9	7.2	7.9	8.9	9.5	9.7	10.1	10.2	10.8	11.9	12.9	13.1	13.8	14.0	14.6	14.7	14.1	13.8	13.4	12.4	11.2	11.2	11.0	11.4	14.7																						
8-Jul	10.8	10.8	10.6	10.7	10.7	10.9	11.2	11.7	12.4	13.5	14.9	16.8	17.6	18.6	19.4	20.0	20.0	20.3	19.8	18.9	16.9	14.7	14.9	15.0	15.0	20.3																						
9-Jul	15.3	14.6	13.7	13.1	13.1	14.2	16.8	18.2	19.2	20.0	20.1	20.4	20.3	20.8	20.5	20.6	20.4	20.4	20.4	19.7	19.3	17.7	16.9	16.2	18.0	20.8																						
10-Jul	16.0	15.9	16.0	15.8	15.1	14.6	15.6	17.7	19.5	19.7	19.2	19.4	20.1	20.6	21.6	18.8	19.6	20.6	19.2	18.7	18.4	16.5	14.6	13.6	17.8	21.6																						
11-Jul	13.3	13.1	13.4	13.9	13.7	15.9	18.2	19.4	19.6	20.5	21.3	22.2	22.0	23.3	23.2	23.2	23.2	22.6	22.9	21.5	20.0	17.4	16.7	15.9	19.0	23.3																						
12-Jul	14.8	14.0	13.3	13.2	13.4	14.4	15.9	17.0	18.1	18.9	19.3	19.9	20.0	20.6	20.9	20.9	20.8	20.2	20.1	19.1	17.6	15.5	14.2	13.6	17.3	20.9																						
13-Jul	12.8	12.1	11.3	10.4	11.0	12.1	13.5	13.7	15.5	17.5	18.2	19.2	19.9	17.7	18.0	17.5	19.2	19.0	18.4	18.3	16.5	13.9	13.1	12.6	15.5	19.9																						
14-Jul	12.1	9.6	8.9	10.5	9.9	11.7	13.8	15.4	16.9	18.1	18.9	19.1	19.8	21.3	21.5	21.1	21.4	21.7	21.6	21.2	19.8	16.0	12.9	12.1	16.5	21.7																						
15-Jul	11.6	11.1	10.2	10.5	11.4	14.8	17.5	19.2	20.3	21.4	22.3	23.0	23.7	24.2	24.3	24.2	24.4	24.4	23.5	22.3	20.1	17.2	16.5	16.3	18.9	24.4																						
16-Jul	14.5	13.9	13.1	13.0	13.2	13.6	14.6	16.4	19.7	20.1	21.5	21.8	22.3	22.0	21.3	21.8	21.9	20.4	19.8	19.1	18.6	17.9	16.5	14.7	18.0	22.3																						
17-Jul	13.2	12.0	10.5	9.3	8.5	10.2	12.1	13.9	14.8	15.6	16.5	17.4	18.2	19.1	19.6	19.9	20.3	20.3	19.9	19.1	17.3	13.6	15.0	14.4	15.4	20.3																						
18-Jul	13.5	13.4	13.4	13.4	13.2	13.9	15.5	17.6	19.5	20.9	22.0	22.7	23.6	24.2	24.6	25.1	25.1	24.9	24.9	24.2	22.6	20.8	19.9	19.2	19.9	25.1																						
19-Jul	18.2	17.6	17.0	16.6	16.5	17.3	18.5	20.7	22.3	23.4	24.2	24.9	25.5	26.5	27.0	24.8	20.1	22.2	22.2	21.2	19.3	17.4	16.5	15.8	20.7	27.0																						
20-Jul	15.8	15.7	15.6	15.6	15.5	15.4	15.0	15.1	15.3	15.3	15.9	17.5	18.6	18.3	18.9	18.3	18.6	19.2	19.5	18.4	17.3	16.2	16.0	16.0	16.8	19.5																						
21-Jul	15.1	14.5	14.2	14.1	14.1	14.0	13.9	14.6	14.9	15.7	M	M	18.8	16.4	18.4	14.7	10.4	9.6	9.6	8.4	7.6	7.0	5.8	5.3	12.6	18.8																						
22-Jul	5.6	5.2	5.4	5.2	5.1	5.9	7.1	9.7	12.4	14.3	15.5	17.0	18.7	19.9	20.4	20.8	20.1	20.2	20.2	17.9	16.8	15.7	14.8	13.5	13.6	20.8																						
23-Jul	13.8	13.5	13.3	12.8	12.4	12.5	13.6	14.6	15.6	17.5	18.5	19.5	20.1	20.7	20.6	19.6	18.7	17.2	17.6	17.5	15.5	14.5	13.6	13.0	16.1	20.7																						
24-Jul	12.7	12.7	12.8	12.6	12.6	13.2	13.8	14.9	16.6	18.0	18.8	20.1	21.2	22.0	22.3	21.8	16.2	14.0	13.0	13.0	12.2	11.9	11.1	10.5	15.3	22.3																						
25-Jul	10.5	10.4	10.0	9.2	9.1	9.9	10.3	11.2	11.8	12.5	13.9	14.3	15.0	16.2	17.0	17.9	18.3	18.5	18.4	17.7	15.4	14.7	13.3	12.9	13.7	18.5																						
26-Jul	12.1	11.5	11.4	10.9	12.9	13.8	14.2	15.6	18.9	21.0	21.7	22.7	23.9	24.6	24.8	25.0	25.2	24.9	23.9	21.9	19.8	18.9	18.6	19.2	25.2	25.2																						
27-Jul	17.6	16.7	16.4	15.8	15.4	15.8	18.0	19.7	19.5	20.2	20.7	22.5	22.6	23.0	22.8	23.0	23.3	22.9	22.2	21.0	19.3	17.6	17.4	17.1	19.6	23.3																						
28-Jul	16.1	15.5	15.7	16.0	16.8	16.5	16.9	16.9	17.4	19.2	21.1	22.5	22.9	23.9	24.6	24.6	24.4	24.8	23.5	22.1	21.1	20.4	17.8	16.7	19.9	24.8																						
29-Jul	16.1	15.3	15.2	14.5	13.9	14.5	16.6	18.8	21.0	22.3	23.2	23.9	24.5	24.9	25.3	25.7	25.5	23.8	23.4	21.5	19.6	18.4	18.2	17.8	20.2	25.7																						
30-Jul	17.5	16.5	16.2	16.7	15.9	15.7	15.8	15.7	15.3	16.4	18.1	20.4	22.2	22.4	23.1	20.1	18.3	19.5	20.2	18.1	16.2	16.2	15.1	13.8	17.7	23.1																						
31-Jul	14.0	14.4	14.3	14.3	14.1	14.3	14.6	15.2	16.2	16.1	16.1	15.9	15.7	16.3	15.9	15.8	15.7	15.5	15.6	15.4	15.1	14.7	14.1	13.8	15.1	16.3																						
																								14.0	13.5	13.1	12.9	12.9	13.7	14.8	15.9	17.0	17.9	18.7	19.6	20.1	20.4	20.8	20.5	20.0	19.8	19.5	18.6	17.4	15.9	15.0	14.4	Diurnal Average
																								18.2	17.6	17.1	16.7	16.8	17.5	19.3	21.0	22.3	23.4	24.2	24.9	25.5	26.5	27.0	25.7	25.7	25.5	25.2	24.5	22.8	20.8	19.9	19.2	Diurnal Maximum
M - Maintenance																																																





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Firebag - July 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	31	4.18	4.18
10 - 20	522	70.35	74.53
> 20	189	25.47	100.00

Total Number of Valid Hours: 742

Total Number of Hours: 744



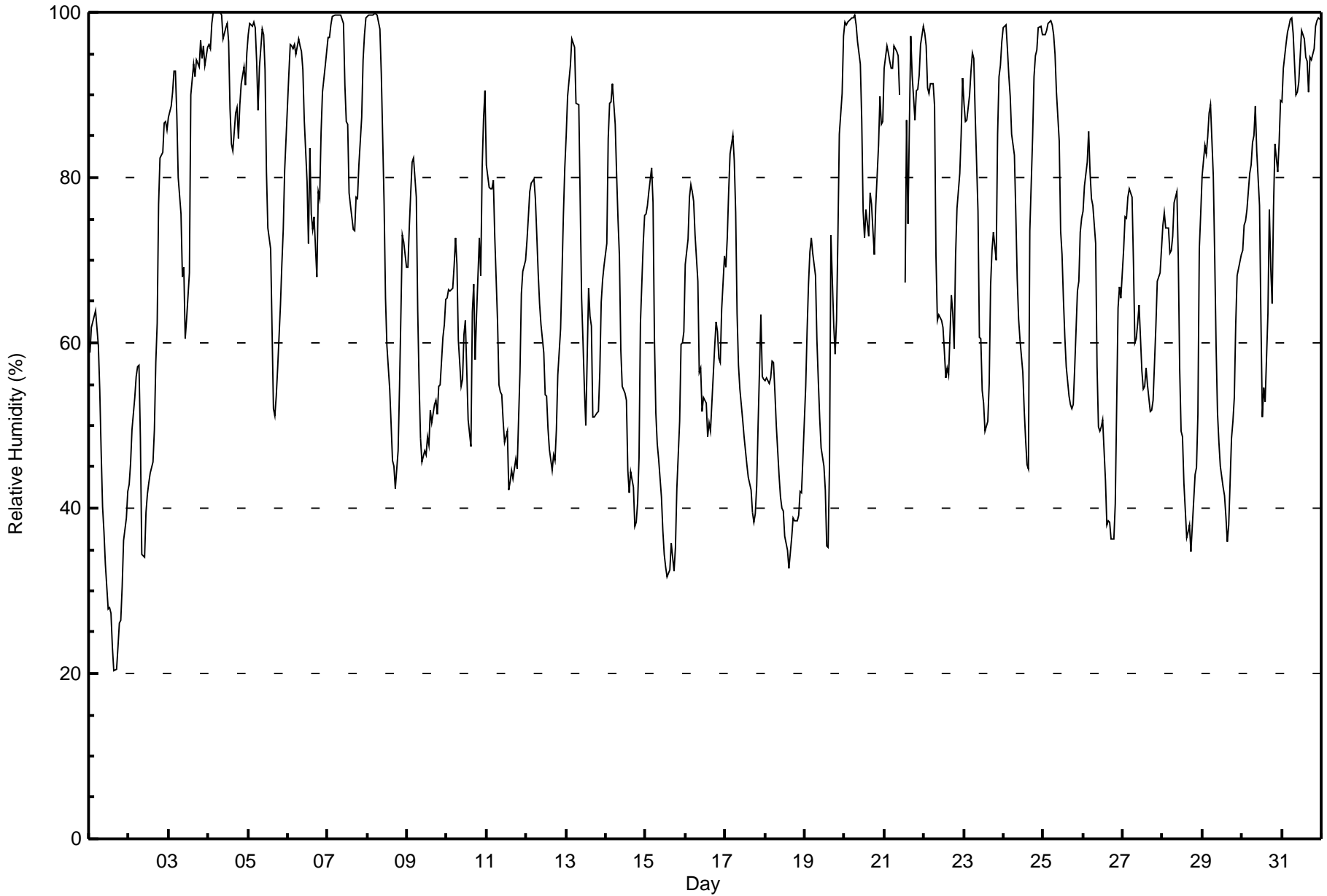
Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

Firebag - July 2016

Maximum Value: 100 % on Jul 4 04:00														Maximum Daily Average: 95.5 % on Jul 31														Hours in Service: 744	
Minimum Value: 20 % on Jul 1 16:00														Minimum Daily Average: 39.7 % on Jul 1														Hours of Data: 742	
Maximum Diurnal Average: 85.1 % at hour 5														Minimum Diurnal Average: 54.0 % at hour 15														Hours of Missing Data: 2	
Monthly Average: 69.7 %														Percentiles: P ₁ = 28 P ₁₀ = 43 Q ₁ = 53 Median = 71 Q ₃ = 88 P ₉₀ = 97 P ₉₉ = 100														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-Jul	59	62	63	63	64	60	54	47	40	37	33	28	28	27	23	20	21	23	26	26	30	36	39	42	39.7	64			
2-Jul	43	45	49	53	56	57	57	49	34	34	40	42	43	44	46	50	58	62	77	82	83	87	87	86	56.8	87			
3-Jul	87	89	90	93	93	88	80	76	68	69	60	63	68	90	92	94	92	94	93	97	94	96	94	96	85.6	97			
4-Jul	96	96	99	100	100	100	100	100	100	97	98	99	96	88	84	83	88	88	85	89	91	93	91	95	94.0	100			
5-Jul	97	99	98	99	98	94	88	93	98	97	93	81	74	71	62	52	51	54	57	65	69	74	81	85	80.4	99			
6-Jul	93	96	96	96	96	95	97	96	95	93	87	80	72	84	76	74	75	68	78	77	85	90	94	95	87.0	97			
7-Jul	97	97	98	99	100	100	100	100	100	99	91	87	86	78	77	74	74	78	78	82	87	94	97	99	90.4	100			
8-Jul	100	100	100	100	100	100	100	98	93	85	77	65	60	54	50	46	45	42	47	55	64	73	72	69	74.7	100			
9-Jul	69	74	78	82	82	78	64	55	48	46	47	46	49	48	52	50	53	53	51	55	55	61	62	65	59.3	82			
10-Jul	65	66	66	67	69	73	70	60	55	56	61	63	57	51	47	64	67	58	63	73	68	81	87	90	65.7	90			
11-Jul	82	79	79	79	80	73	63	55	54	54	51	48	49	42	43	45	44	46	45	51	56	66	69	70	59.1	82			
12-Jul	72	75	78	79	80	77	73	68	65	62	59	54	54	50	47	45	46	46	50	56	62	68	75	81	63.5	81			
13-Jul	85	90	94	97	96	96	89	89	77	65	60	54	50	67	63	62	51	51	52	52	56	65	68	69	70.7	97			
14-Jul	72	85	89	89	91	86	80	75	71	59	55	54	53	45	42	44	43	38	38	41	46	62	72	75	62.7	91			
15-Jul	76	77	78	81	77	61	51	48	46	41	37	34	33	32	33	36	34	32	35	42	50	60	60	61	50.7	81			
16-Jul	69	73	78	79	78	77	73	67	57	57	52	53	53	49	50	49	53	60	63	61	58	58	64	70	62.5	79			
17-Jul	69	73	78	83	85	82	76	63	57	54	51	49	47	45	44	42	40	38	39	43	50	63	56	56	57.6	85			
18-Jul	55	56	55	56	58	58	54	50	44	41	40	40	37	35	33	35	36	39	38	39	39	42	42	46	44.5	58			
19-Jul	55	62	67	71	73	71	68	60	55	51	47	45	42	35	35	45	73	62	59	63	73	85	90	97	61.9	97			
20-Jul	99	98	99	99	99	99	100	99	96	94	87	76	73	76	73	78	77	74	71	77	84	90	86	87	87.1	100			
21-Jul	93	96	95	94	93	93	96	95	95	90	M	M	67	87	74	86	97	92	87	91	91	92	96	98	90.9	98			
22-Jul	97	96	91	90	91	91	89	71	63	63	63	62	59	56	57	56	66	64	59	71	76	81	85	92	74.5	97			
23-Jul	89	87	87	90	93	95	94	88	76	61	60	54	53	49	51	55	67	71	73	70	85	92	94	96	76.3	96			
24-Jul	98	99	96	92	90	85	83	76	68	63	60	57	52	48	45	45	74	85	92	95	95	98	98	97	78.8	99			
25-Jul	97	97	98	99	99	99	97	95	90	84	74	71	65	61	57	54	53	52	53	57	66	67	73	75	76.4	99			
26-Jul	76	79	82	86	81	77	77	72	57	50	49	50	51	43	38	38	38	36	36	40	52	64	67	65	58.6	86			
27-Jul	71	75	75	78	79	78	70	60	60	62	65	57	54	55	57	55	52	52	53	57	62	68	68	71	63.9	79			
28-Jul	74	76	74	74	71	71	73	77	78	70	57	49	49	43	36	37	38	35	38	44	45	51	71	76	58.6	78			
29-Jul	80	84	83	85	88	89	80	70	60	52	48	45	43	42	39	36	38	48	51	53	62	68	69	71	61.8	89			
30-Jul	71	74	75	76	81	82	84	85	89	83	77	63	51	55	53	64	76	69	65	76	84	81	84	89	74.4	89			
31-Jul	89	93	96	98	98	99	99	98	90	90	92	95	98	97	95	94	90	95	94	96	98	99	99	99	95.5	99			
																												Diurnal Average	
																												Diurnal Maximum	
M - Maintenance																													





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity (RH) - %
Firebag - July 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	56	7.55	7.55
40 - 60	204	27.49	35.04
60 - 80	224	30.19	65.23
80 - 100	253	34.10	99.33

Total Number of Valid Hours: 742

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed (WS) - km/h

Firebag - July 2016

Maximum Speed: 30 km/h on Jul 21 17:00	Maximum Daily Speed Average: 18.3 km/h on Jul 2	Hours in Service: 744
Minimum Speed Value: 0 km/h on Jul 14 02:00	Minimum Daily Speed Average: 0.7 km/h on Jul 28	Hours of Data: 740
Maximum Diurnal Speed Average: 7.0 km/h at hour 17	Minimum Diurnal Speed Average: 0.3 km/h at hour 22	Hours of Missing Data: 4
Monthly Average Velocity: 1.2 km/h 300.4 deg	Percentiles: P ₁ = 2 P ₁₀ = 5 Q ₁ = 8 Median = 11 O ₃ = 14 P ₉₀ = 19 P ₉₉ = 26	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-Jul	S14	S13	S13	S14	SSE12	SSE12	SSE16	SSE19	S24	S26	S23	SSE24	S21	SSE20	SSE19	SE20	SE19	SE20	SE19	SE17	SE10	SE10	SSE12	SSE13	SSE16.5	S26	
2-Jul	SSE14	SSE11	SSE12	SSE12	SSE13	SSE13	SSE10	SSE15	SSE25	SSE27	S26	S25	SSE24	SSE24	SSE25	S28	S25	S20	SSE18	SSE16	SSE15	SSE14	SSE16	SSE15	SSE18.3	S28	
3-Jul	SSE13	SSE16	SSE13	SSE12	SSE12	SSE12	S12	SSE13	SSE15	SSE16	SSE22	SSE16	WNW7	SW8	E1	NE16	NE11	SSE8	S4	SE4	SSE2	S5	SSE8	SSE8	SSE8.3	SSE22	
4-Jul	S8	SSW8	SSW8	SSW6	SW8	SSW5	SW7	WSW6	WSW6	WNW9	WNW10	NNW6	WNW9	SE9	SE18	S18	SSW12	SSW8	S9	SSW10	SSW10	S9	SSW4	WNW2	SSW5.5	SE18	
5-Jul	NE6	NNE6	NE7	NE9	NE7	ENE6	N3	N14	NNW7	NE9	NE9	NE7	NNE12	NNE9	NNE13	NNE14	NNW17	NNE15	NNE12	NNE12	NNE6	ESE9	SE11	SE13	ESE13	NE7.5	NNE17
6-Jul	ESE14	ESE14	ESE16	ESE13	ESE12	ESE12	ENE11	ENE10	ENE12	ENE13	E15	ESE15	ESE16	NE15	ENE11	NE15	ENE13	NE10	NE11	NE8	NNE7	NNE7	NNE7	NNE9	ENE10.0	ESE16	
7-Jul	NNE7	E2	NNW7	N9	NNE9	NNE9	NNE9	N9	N10	N10	NE10	NNE11	NNE14	NNE17	NNE16	NNE13	N14	NNE18	NNE14	NNE13	N10	NNE9	N7	NNE6	NNE10.3	NNE18	
8-Jul	NNW4	NW2	N5	NNW3	N5	N4	NNE7	NNE7	NNE8	NNE7	NNE8	NE4	NNE5	N6	NNE5	NNW7	NNE8	N11	NNE11	NNE14	NE10	NE10	E8	E9	NNE6.2	NNE14	
9-Jul	E13	ESE10	ESE11	ESE8	ESE7	ESE5	ESE7	E9	E10	SE9	NE6	N4	W4	NW6	N6	NE9	ENE12	ENE10	ENE10	ENE6	ESE6	E6	ENE7	ENE5	E5.9	E13	
10-Jul	E10	E9	ESE8	SE9	SE9	ESE9	SE8	S8	WNW2	N5	NE4	S6	ENE12	ESE11	ESE10	SSE5	SW4	ENE7	NNW5	NW2	W3	WSW7	NW7	NW5	ESE3.1	ENE12	
11-Jul	NNE8	NE9	NE9	NE7	NNE8	NNE7	NNE8	N14	N15	NNE13	NNE12	N15	N14	NNE16	NNW15	NNW17	N20	N16	N18	NNE16	NE8	N9	N12	N12	N11.8	N20	
12-Jul	NNE12	N14	NNE13	NNE10	NNE12	NNE10	NNE12	N15	N16	N17	N20	N21	N18	NNW22	NNW21	N23	N24	N20	NNW20	N19	N14	N11	N11	N11	N15.7	N24	
13-Jul	N9	N10	N10	NNW11	N11	N13	N14	N16	N16	N19	N20	N19	N20	NNW20	NNE19	NE18	NE22	NE18	NNE16	NNE14	NNE10	NNE7	NNE9	ENE5	N13.6	NE22	
14-Jul	ESE4	ENE0	SSW2	SSW3	SSW4	SW5	W8	WNW9	NW10	NNW11	NNW11	N11	NNW10	NNW13	NNW16	NNW15	NNE14	N13	N14	N10	N5	AF	AF	NNW3	NNW6.8	NNW16	
15-Jul	SSW2	S3	WSW1	SW2	SW3	WSW5	W8	W11	W12	W11	WNW10	WNW9	WNW8	WNW9	NW13	NW19	WNW16	WNW15	WNW12	NW10	WNW7	WNW8	WNW8	W6	WNW8.0	WNW19	
16-Jul	W7	WSW9	WSW9	SW9	SW9	WSW9	WSW9	WSW9	WNW9	WNW9	NNW14	NW14	NNW16	N18	NW12	NW13	N19	N22	NNW19	N20	N17	N15	N12	N11	NW9.1	N22	
17-Jul	N9	N6	N8	NNW7	N6	NNW7	NNW10	N14	N20	N21	N16	N17	N14	NNW13	NNW12	N12	NW13	N12	N11	N8	NNE4	NE3	SE8	SSE10	N9.1	N21	
18-Jul	SSE11	S8	S9	S10	S9	SSW11	SSW12	SSW10	SW10	SW11	SW10	WSW10	SW13	SW14	SW13	SW13	WSW16	W14	WSW12	SW11	SW12	SSW12	SSW13	SSW14	SW10.6	WSW16	
19-Jul	SW14	SW15	SSW15	SSW14	SSW11	SW11	SSW16	SSW13	SW16	WSW19	WSW19	WSW20	WSW20	WSW18	WSW18	NNW16	NW4	NNW6	NW11	NW5	NNW9	WNW7	NW2	N9	WSW9.4	WSW20	
20-Jul	N8	N7	NNW6	NNW7	NNW9	NW10	N12	N9	N9	N9	NNE7	NNW5	NW9	NW10	NW10	NW11	WNW9	WNW9	NW7	WNW8	WNW6	SW4	WSW3	SW10	NNW6.6	N12	
21-Jul	SSW10	SW12	SW12	SW11	SW14	SW14	SW13	WSW13	WSW16	WNW13	M	M	WNW19	N10	NNW14	NNW25	N30	N21	N20	NNW20	N15	N8	NNW4	WSW3	WNW7.9	N30	
22-Jul	S4	S8	SSE10	SSE12	S16	S19	S20	S22	S20	S23	S25	S26	SSW28	SSW22	SW17	SW19	WSW12	W9	W14	NNW12	NW3	NNW8	NNE5	WNW1	SSW11.4	SSW28	
23-Jul	SW6	WSW7	WSW8	W4	NW5	NNW4	N5	NNE6	NNE6	N4	N7	NNW7	NW6	NNW6	N6	NNW10	NNW16	NW8	SW7	SW10	SW9	SW9	SW11	SW11	WNW4.1	WNW16	
24-Jul	SSW11	SW11	SSW12	SSW14	SSW14	SSW15	SSW18	SW23	WSW23	WSW20	WSW24	WSW26	WSW25	WSW22	WSW22	W27	NNW16	WNW16	W16	WSW6	W14	WNW11	W11	WSW11	WSW15.0	W27	
25-Jul	WSW13	WSW12	WSW12	WSW11	WSW10	W9	W8	WNW12	NW12	NW12	NNW14	NNW12	NNW8	NW10	NNW8	NW10	NNW8	N7	N7	NE6	E9	ESE10	SE11	SE11	NW4.9	NNW14	
26-Jul	SE11	SSE12	SSE10	SSE10	SSE17	SSE13	SE10	SSE12	S17	S15	SSW17	SW18	SW20	SW18	WSW17	W12	W11	WSW10	WSW11	WSW8	S10	S14	S14	S15	SSW10.4	SW20	
27-Jul	S16	S14	SSW12	SSW11	SSW8	SW6	W5	N9	NNW11	NNW12	NNW13	N13	N15	N13	N14	N13	N11	NNE9	NNE10	NNE9	NNE8	NE6	ENE8	ENE6	N4.2	S16	
28-Jul	E6	E5	SE5	SSE4	S5	SW7	SW8	SW8	SW7	W5	SW3	SSW1	NW3	NNW3	NNW9	N9	NNE10	NNE9	NNE8	NE7	ENE6	S6	SSW13	SSW13	SW0.7	SSW13	
29-Jul	SW13	SW11	SW8	WSW8	WSW7	SW9	SW11	SW12	SW11	WSW11	SW9	SW11	SW13	SW15	SW14	WSW12	WSW9	W9	ESE5	ESE14	SE12	SSE13	SSE13	SSE11	SSW8.4	SW15	
30-Jul	S11	NW6	ESE5	S10	SSW12	WSW14	WSW15	WSW17	SW10	SSE3	E2	S7	S10	S9	SSW12	WNW13	N13	NNE11	NE8	NNE9	ENE8	E6	E4	ENE2	SW2.5	WSW17	
31-Jul	NNE9	NNE9	NNE10	NNE7	N7	NNE12	N13	NNE14	NNE16	NNE15	NNE7	NW2	WNW7	WNW9	NW13	N11	NNW11	NNW9	N10	NNW7	WNW7	WNW14	WNW10	WNW12	NNW8.1	NNE16	

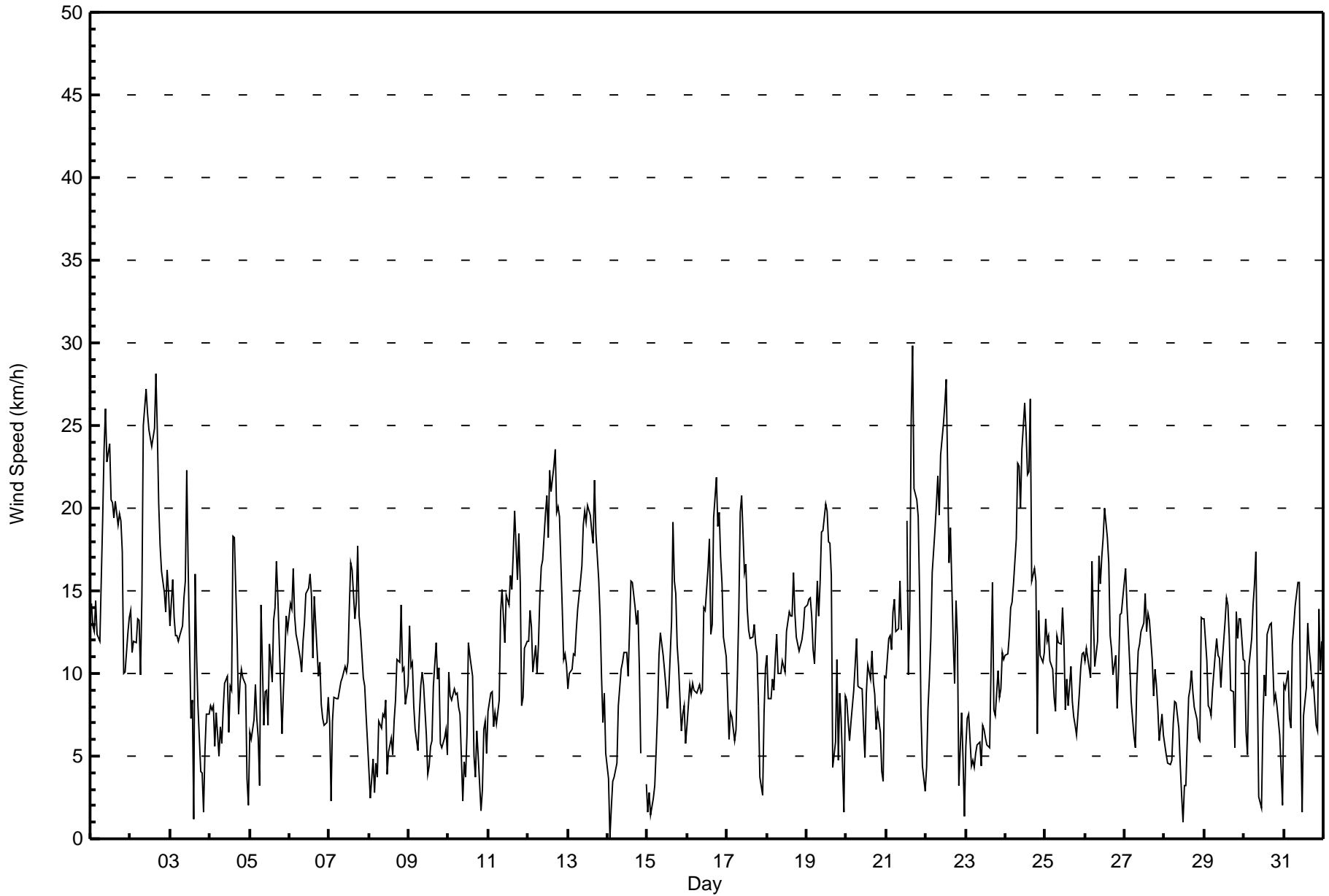
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S16	SSE16	ESE16	S14	SSE17	S19	S20	SW23	SSE25	SSE27	S26	WSW26	SSW28	SSE24	SSE25	S28	N30	N22	N20	N20	N17	N15	SSE16	SSE15		Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed (WS) - km/h
Firebag - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Firebag - July 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	83	11.22	11.22
6 - 11	339	45.81	57.03
12 - 19	257	34.73	91.76
20 - 28	60	8.11	99.86
29 - 38	1	0.14	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 740

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Firebag - July 2016**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	9	4	3	4	5	4	2	4	5	7	6	4	5	3	10	8	83
6 - 11	44	48	23	14	9	12	13	11	17	14	33	21	12	23	17	28	339
12 - 19	43	31	5	5	2	10	6	36	15	21	21	17	6	11	9	19	257
20 - 28	14	0	1	0	0	0	2	8	15	2	2	9	1	0	0	6	60
29 - 38	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	111	83	32	23	16	26	23	59	52	44	62	51	24	37	36	61	740

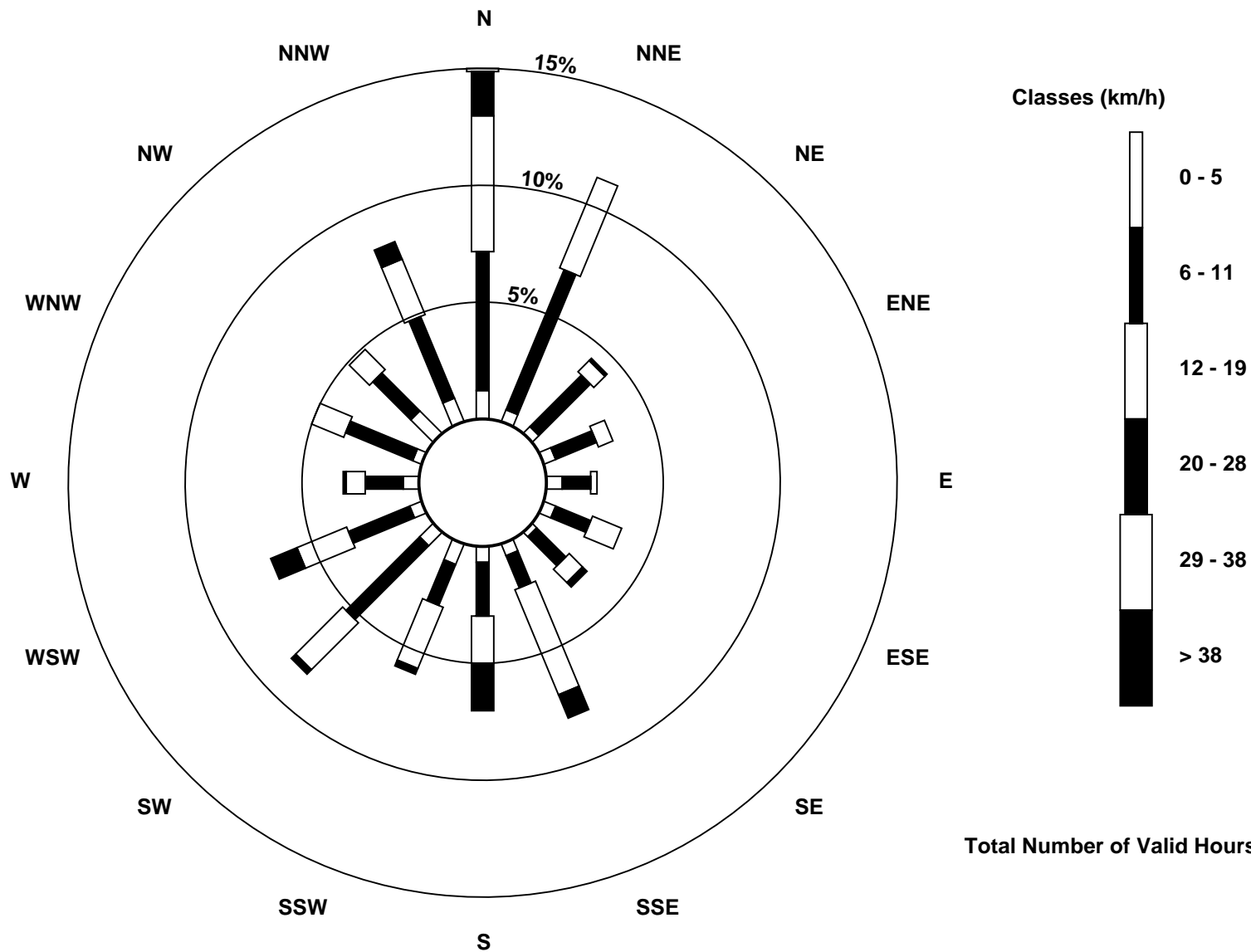
Total Number of Valid Hours: 740

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

Wind Speed (WS) - km/h
Firebag (AMS 19)





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Firebag - July 2016

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



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Firebag - July 2016

Direction of Maximum Speed: 351 deg on Jul 21 17:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 164.5 deg on Jul 2	Hours of Data: 740
Direction of Minimum Speed: 73 deg on Jul 14 02:00	Hours of Missing Data: 4
Direction of Minimum Daily Speed Average: 0.7 deg on Jul 28	Percent Operational Time: 99.5
Monthly Average Direction: 286.1 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-Jul	181	174	177	171	166	163	165	163	170	178	170	167	180	162	152	133	136	138	137	140	130	138	150	161	159.2
2-Jul	157	161	160	150	157	165	166	162	158	167	172	173	161	165	168	173	174	182	156	156	152	154	161	166	164.5
3-Jul	159	163	161	147	154	168	170	158	151	162	155	162	283	230	93	50	42	159	174	138	158	180	162	164	156.3
4-Jul	188	208	202	206	225	201	232	244	255	292	293	329	320	129	126	176	208	208	187	200	199	184	200	301	207.1
5-Jul	48	30	38	44	50	58	360	2	330	34	52	53	27	20	16	27	27	28	26	27	122	126	137	119	42.8
6-Jul	121	121	111	115	111	102	77	71	64	69	92	106	112	50	65	38	57	54	36	34	23	26	25	22	77.2
7-Jul	30	89	346	9	19	22	20	4	2	8	37	24	16	19	18	18	11	33	20	14	7	12	10	13	16.9
8-Jul	348	308	353	338	7	359	24	33	20	22	26	50	29	351	30	328	18	6	16	27	45	55	84	79	24.2
9-Jul	96	109	113	115	103	115	120	89	83	136	35	351	279	306	354	42	59	77	78	74	106	85	76	75	84.2
10-Jul	84	95	112	127	131	119	146	175	288	352	55	181	74	106	118	157	218	77	337	320	279	253	308	322	113.0
11-Jul	12	36	44	48	25	17	13	9	10	14	15	3	8	16	347	344	350	349	9	29	49	349	2	3	9.0
12-Jul	13	11	22	17	12	18	12	8	357	355	358	355	350	345	344	351	4	2	348	350	351	359	360	2	358.9
13-Jul	4	4	354	348	355	356	356	354	1	1	2	4	3	344	18	37	42	39	22	32	27	26	19	67	11.0
14-Jul	109	73	199	205	207	228	275	294	308	328	340	353	342	329	342	339	16	358	349	352	2	AF	AF	327	336.0
15-Jul	206	190	252	221	220	247	267	274	266	267	288	283	287	300	307	312	298	296	303	311	288	286	301	265	286.9
16-Jul	261	246	237	231	235	232	247	249	286	294	327	314	338	356	317	318	359	352	345	8	3	360	359	5	325.6
17-Jul	7	7	357	343	357	339	335	351	360	359	357	358	358	338	339	357	318	352	3	7	19	40	138	153	355.2
18-Jul	152	176	185	189	189	194	198	208	215	214	226	253	224	232	233	228	249	259	243	221	215	211	210	212	216.6
19-Jul	215	214	213	211	211	216	204	212	232	240	238	244	254	255	247	329	318	338	318	322	346	292	319	358	246.2
20-Jul	3	358	346	336	335	326	360	355	353	5	18	342	313	326	317	319	300	292	306	302	290	228	252	216	326.6
21-Jul	209	219	225	219	218	220	233	239	250	292	M	M	291	355	335	348	351	352	351	344	351	6	340	256	303.7
22-Jul	176	190	167	163	178	177	180	182	185	187	190	189	193	200	217	218	251	270	262	340	306	342	15	282	198.5
23-Jul	223	237	240	281	309	333	4	26	28	356	356	339	315	333	351	347	292	311	221	228	233	216	226	222	284.2
24-Jul	211	215	205	209	209	203	213	231	246	247	250	246	245	253	248	266	334	293	271	247	273	289	263	246	246.4
25-Jul	251	257	255	256	257	272	270	285	316	306	336	342	347	322	327	316	335	7	356	36	79	111	126	135	305.3
26-Jul	136	150	153	154	163	161	146	150	169	182	208	214	214	224	258	267	271	253	248	252	186	187	189	187	196.3
27-Jul	184	191	196	194	202	235	260	353	346	333	338	358	0	351	358	1	358	12	13	21	33	52	59	70	353.4
28-Jul	91	98	137	158	177	216	231	235	233	271	225	202	317	338	339	355	21	32	13	53	67	178	203	213	226.4
29-Jul	221	221	228	242	238	228	226	226	235	238	225	222	223	221	235	249	249	276	111	121	141	154	161	160	213.3
30-Jul	172	320	106	182	204	238	255	251	230	168	86	182	190	187	209	284	353	32	47	21	61	88	84	60	221.4
31-Jul	17	33	18	19	10	13	10	19	15	28	23	307	292	300	321	350	340	335	4	334	295	296	284	283	348.6

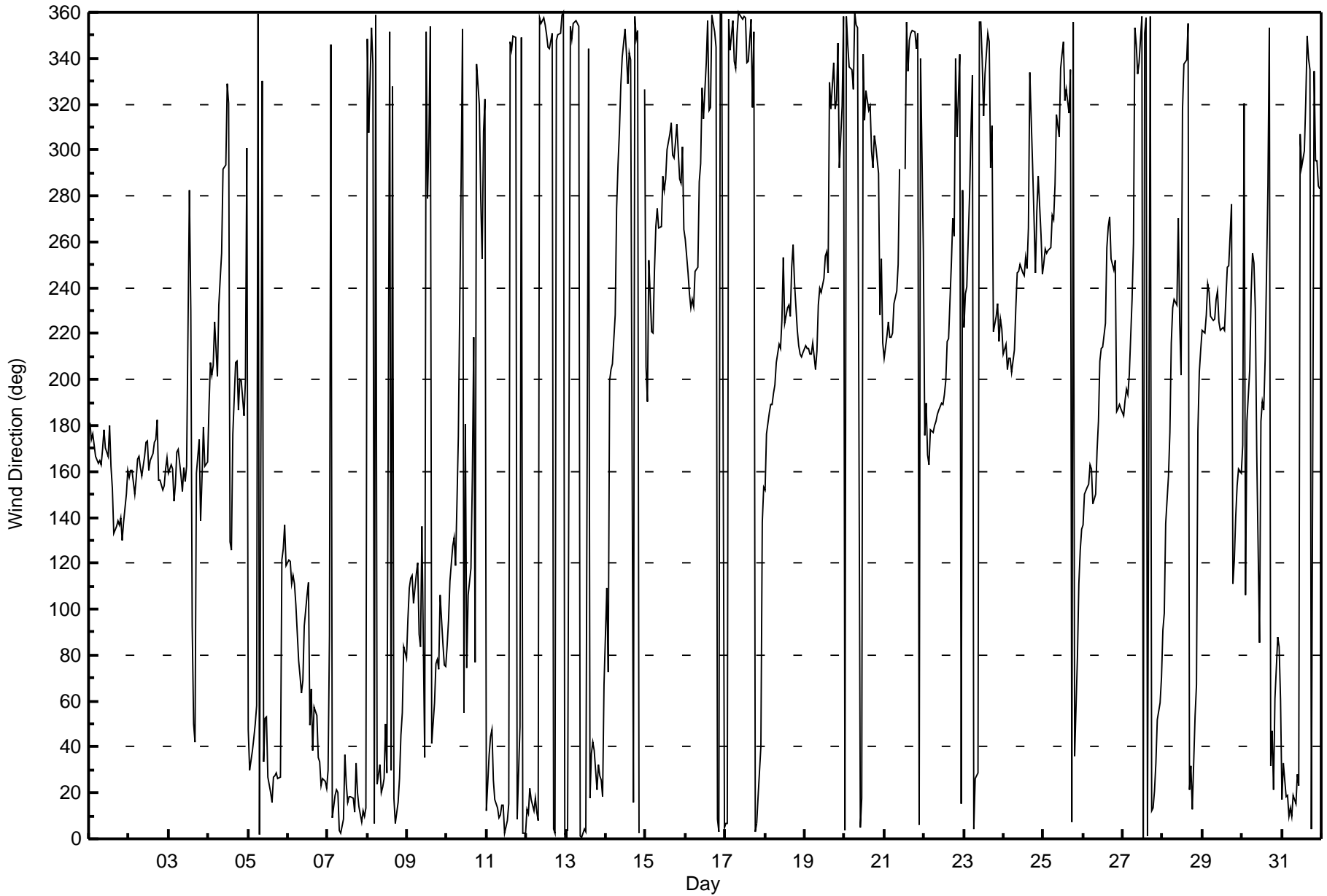
160.1 179.2 175.0 179.4 187.8 202.0 225.6 257.2 276.1 287.3 301.4 272.0 291.3 304.5 312.9 332.3 347.9 352.9 352.3 9.1 23.5 94.7 158.3 177.6
 Diurnal Average

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



Wood Buffalo Environmental Association
Hourly Averages

Wind Direction (WD) - deg
Firebag - July 2016





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
Firebag - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 93 deg on Jul 10 21:00 Minimum Value: 5 deg on Jul 27 04:00 Percentiles: P ₁ = 6 P ₁₀ = 9 Q ₁ = 12 Median = 16 Q ₃ = 23 P ₉₀ = 37 P ₉₉ = 83																	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-Jul	9	9	9	8	8	9	10	12	16	12	17	17	20	22	28	24	20	20	16	14	13	11	11	8	28
2-Jul	9	10	9	8	9	9	10	15	16	18	14	14	13	19	17	13	13	12	11	14	11	10	9	8	19
3-Jul	10	8	10	10	11	8	10	14	16	15	17	25	69	38	84	11	19	57	43	57	80	38	29	15	84
4-Jul	10	12	10	17	11	21	18	39	18	18	17	33	18	92	16	26	14	25	16	10	11	23	58	68	92
5-Jul	11	12	8	5	9	10	66	17	35	13	17	27	22	35	19	26	21	14	11	35	15	13	13	18	66
6-Jul	13	13	10	13	14	13	20	14	13	13	20	19	19	24	20	16	13	21	12	14	12	9	17	16	24
7-Jul	12	67	12	13	14	14	12	13	14	18	21	22	24	15	14	18	17	14	13	12	12	12	13	16	67
8-Jul	34	39	27	55	37	41	15	20	22	22	35	75	59	43	63	48	30	31	25	12	9	7	16	14	75
9-Jul	11	12	9	12	11	21	15	23	30	42	47	70	40	49	60	17	17	18	15	25	16	15	11	17	70
10-Jul	11	12	11	13	13	13	14	13	80	41	64	38	30	20	33	71	34	30	43	62	93	24	15	17	93
11-Jul	18	9	10	12	7	13	13	15	15	21	26	24	29	29	20	18	18	21	19	20	14	11	12	12	29
12-Jul	9	10	9	11	11	11	13	16	16	19	18	19	19	18	17	17	19	17	16	14	12	13	12	13	19
13-Jul	11	11	12	8	11	13	14	15	16	18	16	19	21	18	33	19	16	15	15	13	9	12	11	16	33
14-Jul	26	85	64	22	20	31	14	18	25	25	31	27	29	32	26	18	22	20	14	13	10	AF	AF	13	85
15-Jul	64	22	37	20	17	12	16	13	15	23	28	37	52	53	29	17	18	18	13	14	19	10	9	15	64
16-Jul	19	6	9	8	8	10	10	11	24	15	20	17	23	15	19	25	17	18	16	14	16	14	12	12	25
17-Jul	9	8	10	10	11	10	10	20	18	19	24	22	31	28	28	26	23	21	20	15	14	48	14	7	48
18-Jul	7	11	8	7	8	6	9	13	14	19	31	32	27	24	26	23	21	14	18	9	9	9	9	9	32
19-Jul	8	9	9	10	10	13	9	12	14	14	21	21	20	24	21	37	69	36	19	24	20	45	74	13	74
20-Jul	13	13	14	13	12	15	13	15	18	14	22	48	32	19	23	18	20	24	25	16	12	38	64	16	64
21-Jul	11	8	8	9	9	10	13	10	17	22	M	M	28	17	21	15	14	15	14	12	15	12	17	53	53
22-Jul	18	11	12	14	9	8	9	9	11	11	11	12	12	11	23	13	17	21	16	17	26	18	11	58	58
23-Jul	15	14	10	32	26	19	27	25	27	53	43	54	75	72	63	21	22	27	24	19	12	12	9	13	75
24-Jul	10	9	8	10	10	9	15	13	14	17	16	14	15	18	15	25	22	21	18	25	12	12	11	10	25
25-Jul	10	13	10	13	10	12	16	17	16	16	18	27	39	33	53	33	33	40	26	19	16	14	12	12	53
26-Jul	12	12	10	10	8	13	12	14	13	21	17	17	13	23	24	21	21	25	17	18	18	6	6	6	25
27-Jul	7	8	6	5	11	18	21	23	13	14	15	24	22	28	22	19	29	24	13	9	8	10	6	22	29
28-Jul	14	12	29	13	24	15	9	13	14	29	59	91	75	83	49	45	18	36	15	13	22	42	10	10	91
29-Jul	9	8	8	9	7	9	10	11	16	22	34	29	27	24	25	25	34	16	63	13	10	10	9	10	63
30-Jul	47	52	37	31	11	21	14	12	15	78	84	35	37	32	20	52	14	14	14	29	20	28	41	51	84
31-Jul	11	10	10	16	25	13	13	13	15	17	20	72	52	21	30	15	15	15	14	19	14	13	13	12	72
64 85 64 55 37 41 66 39 80 78 84 91 75 92 84 71 69 57 63 62 93 48 74 68																								Diurnal Maximum	
M - Maintenance AF - Analyzer Failure																									



Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	July 26, 2016	Last Calibration	June 28, 2016
Station Name	Firebag	Station Number	AMS 19
Reason:	Routine		
Start Time (MST)	8:50	End Time (MST)	12:30
Gas Cert Reference	SA130123A	Station temp.	22 Deg C
Cal Gas Concentration	49.3 ppm	Cal Gas Exp Date	12/12/2016
Calibrator Make/Model	API T700	Serial Number	996
ZAG Make/Model	API 701	Serial Number	4891
DACS make/model	Campbell Scientific CR3000	DACS serial No.	6466

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-605	-605
Analyzer IP address	192.168.1.43		Lamp voltage	788	788
Calculated slope	0.999974	1.001755	Chamber temp	44.9	45.3
Calculated intercept	-0.094047	-1.109179	Pressure	687.1	695.6
Analyzer Background	7.7	7.6	Flow	0.453	0.452
Analyzer Coefficient	0.993	0.994	Intensity	90	90

Analyzer make Thermo 43i Analyzer serial # 1410661308

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.4	----
as found span	5000	58.3	574.8	572.1	1.005
calibrator zero	5000	0.0	0.0	0.4	----
high point	5000	58.3	574.8	574.7	1.000
second point	5000	29.3	288.9	289.5	0.998
third point	5000	14.7	144.9	146.7	0.988
as left zero	5000	0.0	0.0	0.8	----
as left span	5000	58.3	574.8	571.9	1.005
Average Correction Factor					0.995

Corrected As found 571.7 Previous response 574.9 % change 0.6%

Notes:

Inlet filter changed after as founds. Span adjusted.

Calibration Performed By: Devin Russell



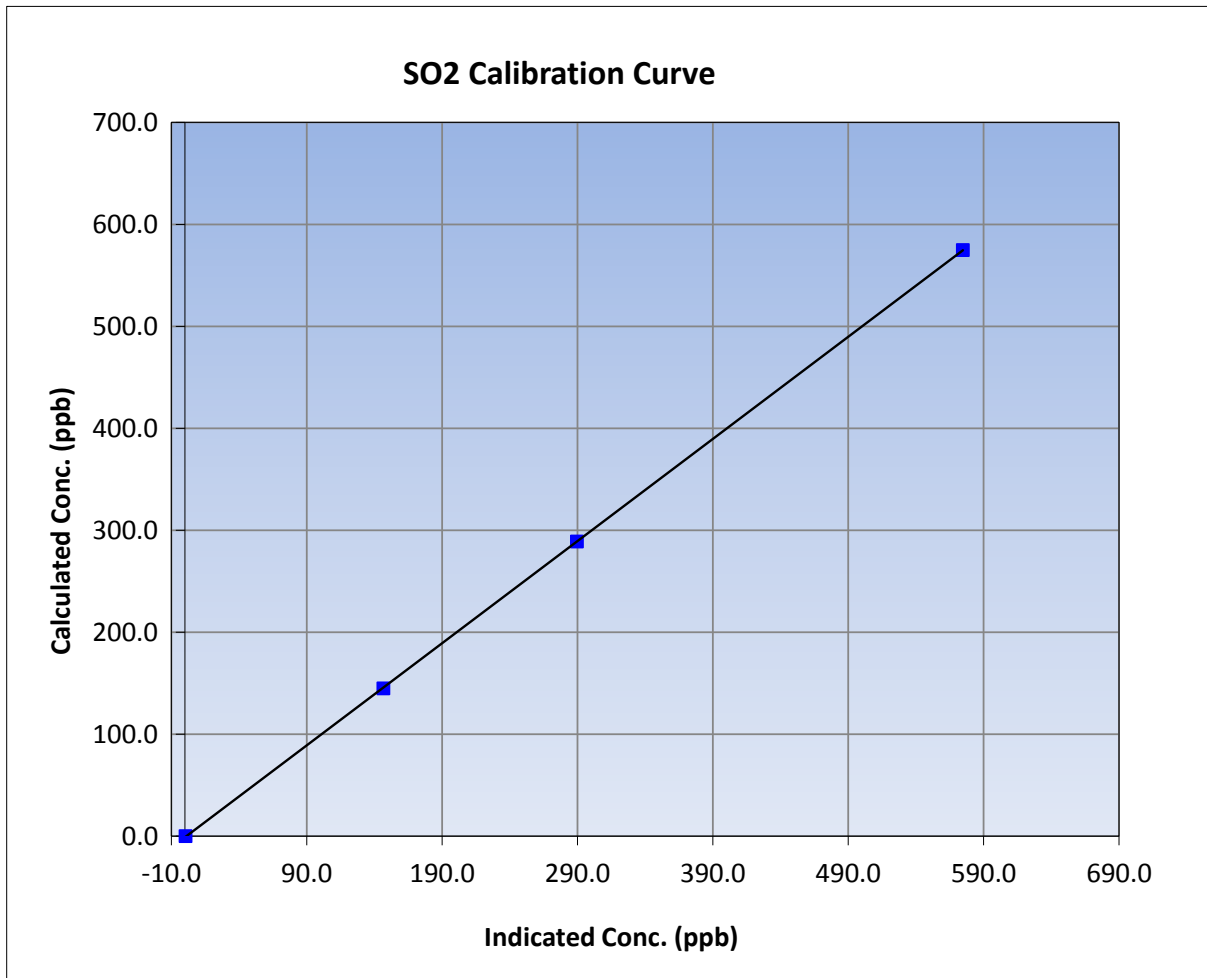
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	July 26, 2016	Previous Calibration	June 28, 2016
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	8:50	End Time (MST)	12:30
Analyzer make	Thermo 43i	Analyzer serial #	1410661308

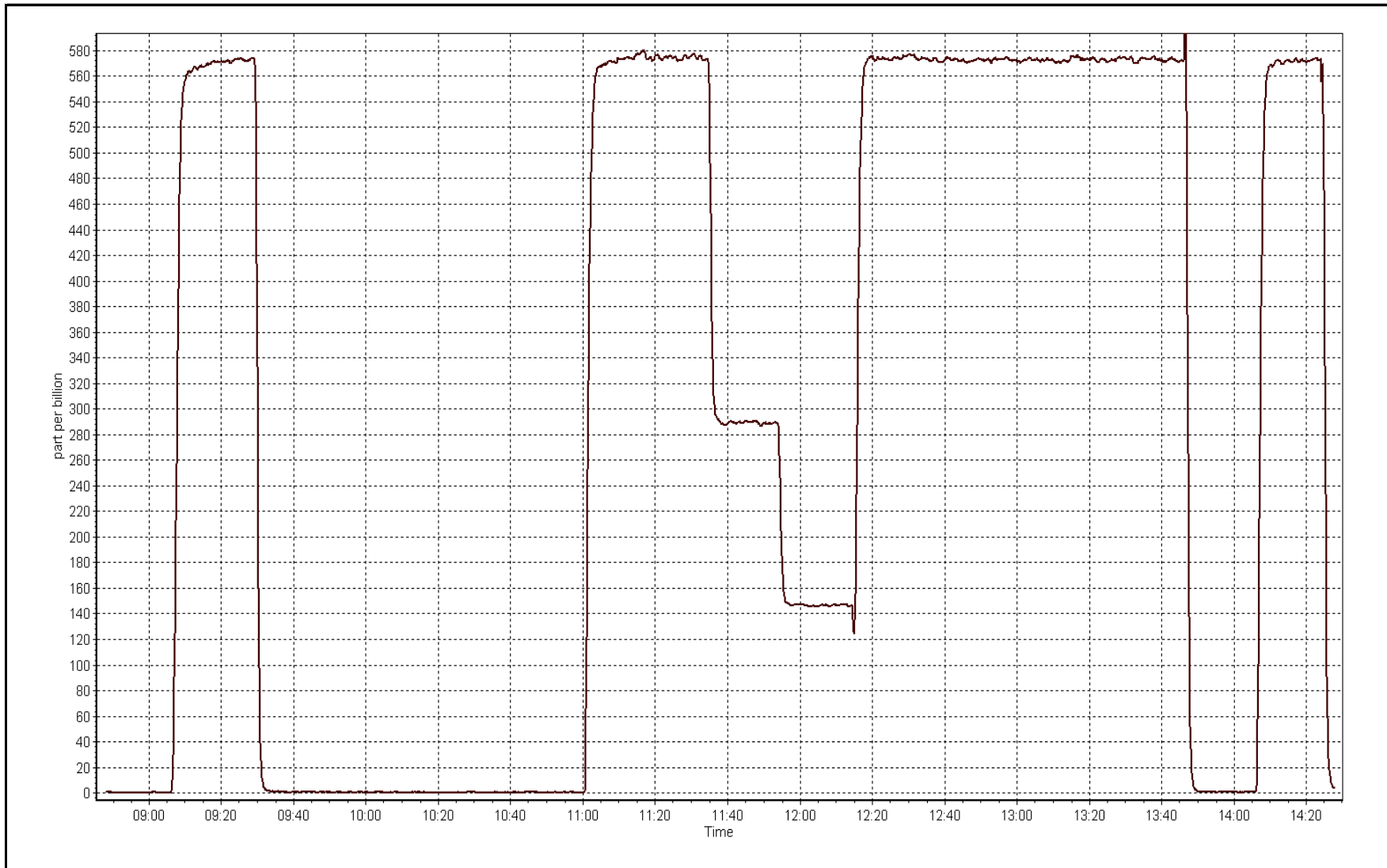
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.4	----	Correlation Coefficient	0.999993
574.8	574.7	1.0002		
288.9	289.5	0.9979	Slope	1.001755
144.9	146.7	0.9881		
			Intercept	-1.109179



SO2 Calibration Plot

Date: July 26, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	July 26, 2016	Last Calibration	June 27, 2016	
Station Name	Firebag	Station Number	AMS 19	
Reason:	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Routine</td> </tr> </table>			Routine
Routine				
Start Time (MST)	13:46	End Time (MST)	16:40	
Gas Cert Reference	ALM066720	Station temp.	22 Deg C	
Cal Gas Concentration	4.85 ppm	Cal Gas Exp Date	10/06/2014	
Calibrator Make/Model	API T700	Serial Number	996	
ZAG air Make/Model	API 701	Serial Number	4891	
DACS make/model	Campbell Scientific CR3000	Serial Number	6466	
SO2 gas concentration	49.3 ppm	SO2 gas cert/exp	SA130123A December-12-16	

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-574	-574
Analyzer IP address	192.168.1.45		Lamp voltage	932	935
Calculated slope	0.998713	1.002888	Chamber temp	45	45
Calculated intercept	-0.409581	-0.609526	Pressure	542.5	544.3
Analyzer Background	13	12.9	Flow	0.958	0.961
Analyzer Coefficient	1.164	1.164	Intensity	84	84
			Converter temp.	335	335

Analyzer make/model	Thermo 450i	Analyzer serial #	815129098
Converter make/model	NA	Converter serial #	NA

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.4	----
as found span	5000	83.3	80.8	81.1	0.997
SO2 scrubber check	5000	15.2	149.9	1.5	----
calibrator zero	5000	0.0	0.0	0.4	----
high point	5000	83.3	80.8	81.1	0.997
second point	5000	41.8	40.5	41.2	0.985
third point	5000	21.0	20.4	21.1	0.966
as left zero	5000	0.0	0.0	0.5	----
as left span	5000	83.4	80.9	81.6	0.992
Average Correction Factor					0.982

Corrected As found	80.7	Previous response	81.3	% change	0.8%
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Notes:

No maintenance completed. No adjustments made. Scrubber check completed after third point.

Calibration Performed By: Devin Russell



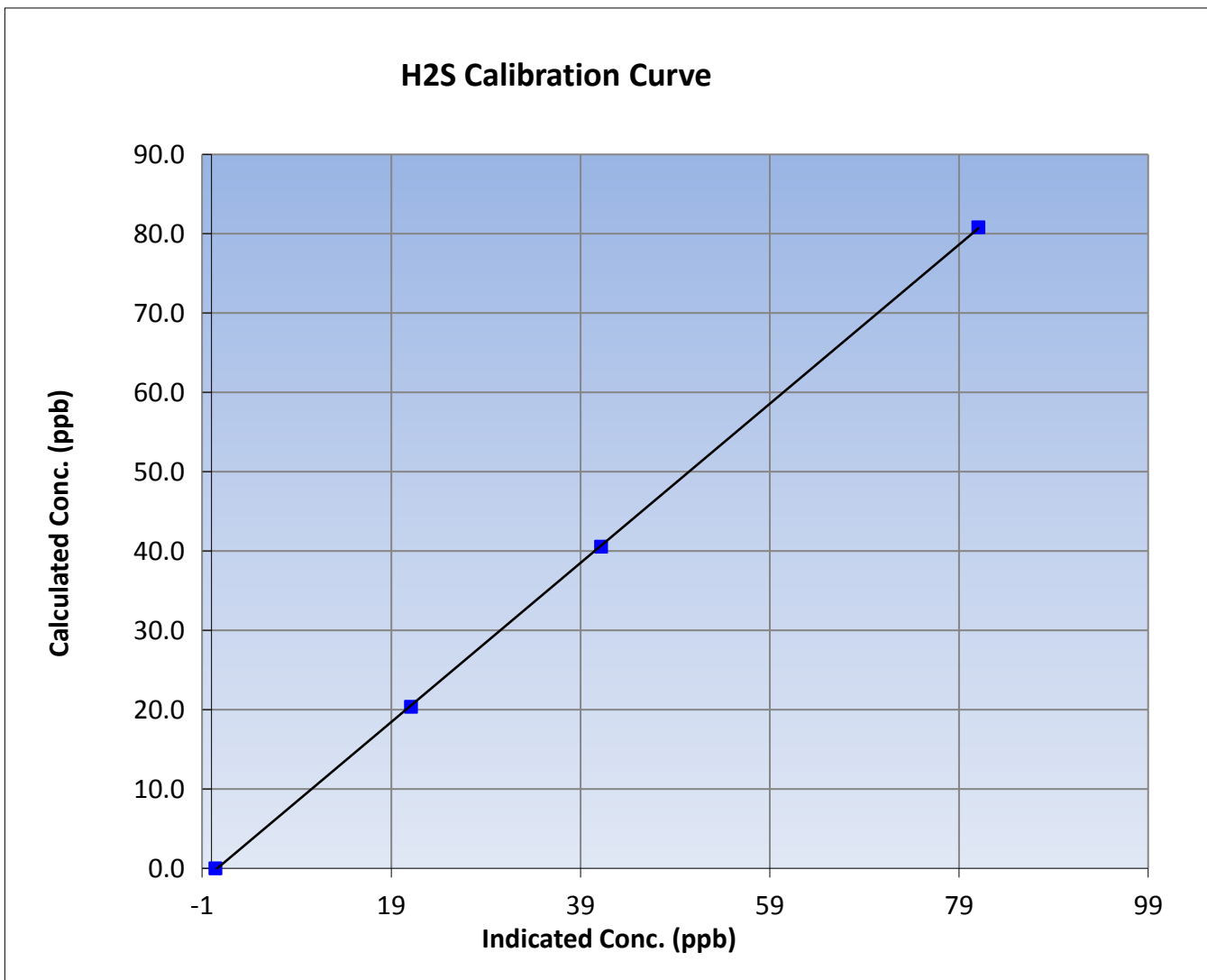
Wood Buffalo Environmental Association H2S Calibration Report

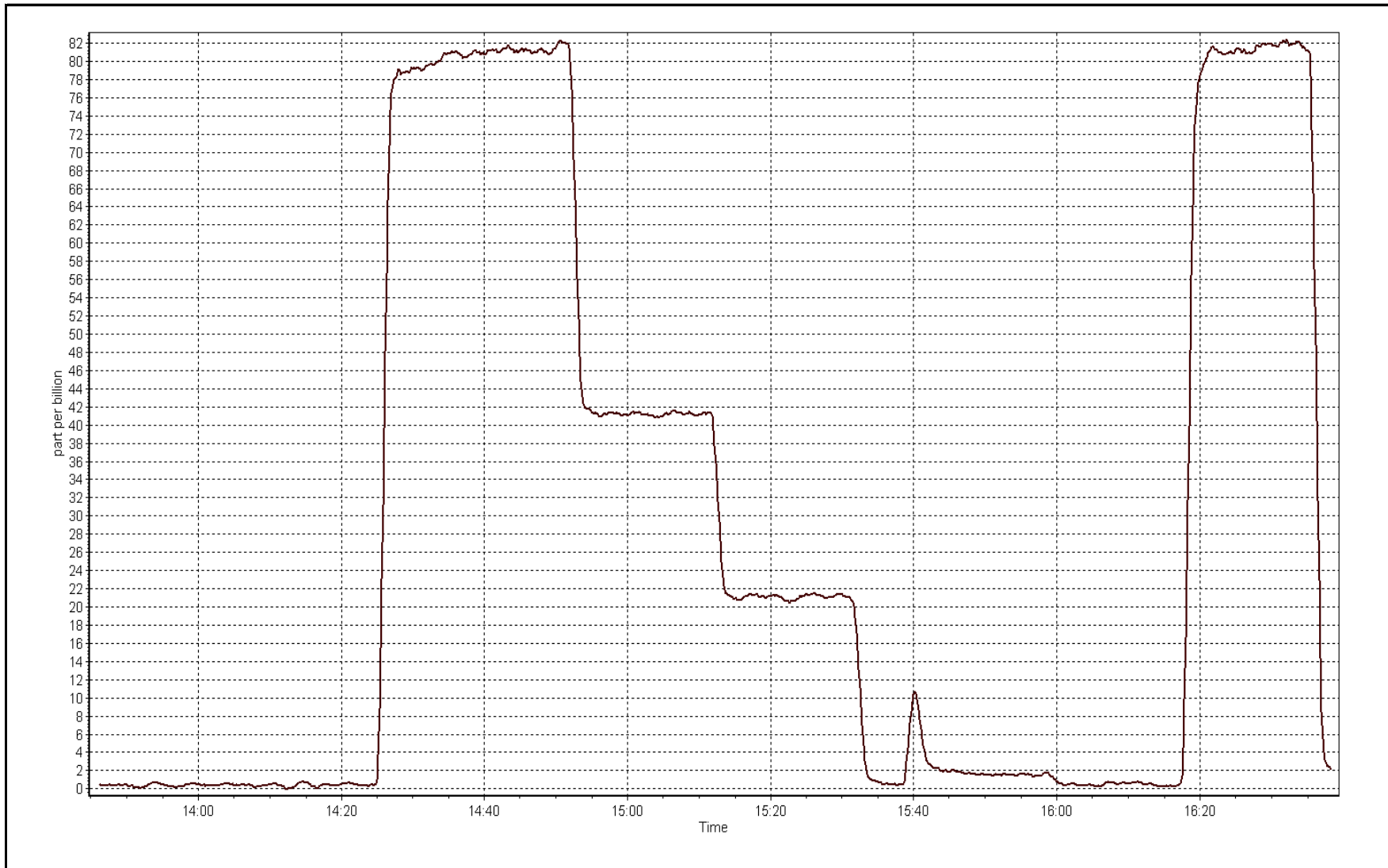
Station Information

Calibration Date	July 26, 2016	Previous Calibration	June 27, 2016
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	13:46	End Time (MST)	16:40
Analyzer make	Thermo 450i	Analyzer serial #	815129098

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.4	----	Correlation Coefficient	0.999971
80.8	81.1	0.9968		
40.5	41.2	0.9846	Slope	1.002888
20.4	21.1	0.9659		
			Intercept	-0.609526







Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	July 26, 2016	Last Calibration	June 28, 2016
Station Name	Firebag	Station Number	AMS 19
Reason:	Routine		
Start Time (MST)	8:50	End Time (MST)	14:30
Gas Cert Reference	SA130123A	Cal Gas Expiry Date	12/12/2016
CH4 Cal Gas Conc.	512 ppm	CH4 Equiv Conc.	1092.3 ppm
C3H8 Cal Gas Conc.	211 ppm	Station temp.	22 Deg C
Calibrator Make/Model	API T700	Serial Number	996
ZAG make/model	Teledyne API 701	Serial Number	4891
DACS make/model	Campbell Scientific CR3000	Serial Number	6466

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 50 ppm		Sample Pressure	8.6	8.6
Analyzer IP address	192.168.1.51		Air or Bypass Press	34.9	34.9
Calculated slope	1.005393	0.999532	Fuel Pressure	23.0	23.0
Calculated intercept	-0.088585	-0.010523	Analyzer Coeff	3.586	3.7
			Analyzer BKG	4.940	5.190

Analyzer make Thermo 51i-LT Analyzer serial # 1336160089

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	-0.03	----
as found span	5000	58.3	12.74	12.79	0.996
calibrator zero	5000	0.0	0.00	0.02	----
high point	5000	58.3	12.74	12.76	0.998
second point	5000	29.3	6.40	6.40	1.000
third point	5000	14.7	3.21	3.22	0.997
as left zero	5000	0.0	0.00	-0.03	----
as left span	5000	58.3	12.74	12.57	1.013
Average Correction Factor					0.998

Corrected As found 12.82 Previous response 12.76 % change -0.5%

Notes:

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

Calibration Performed By:

Devin Russell



Wood Buffalo Environmental Association THC Calibration Report

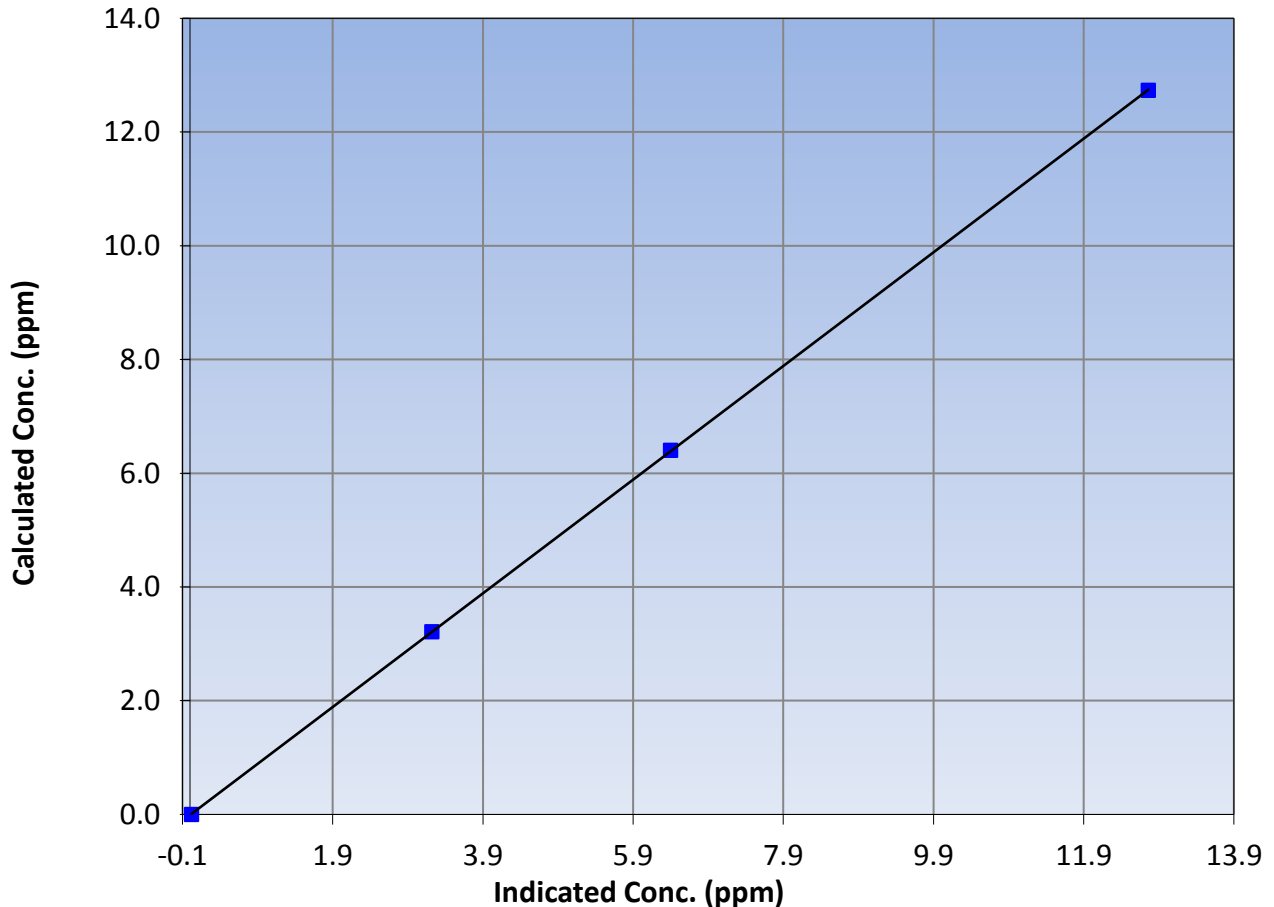
Station Information

Calibration Date	July 26, 2016	Previous Calibration	June 28, 2016
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	8:50	End Time (MST)	14:30
Analyzer make	Thermo 51i-LT	Analyzer serial #	1336160089

Calibration Data

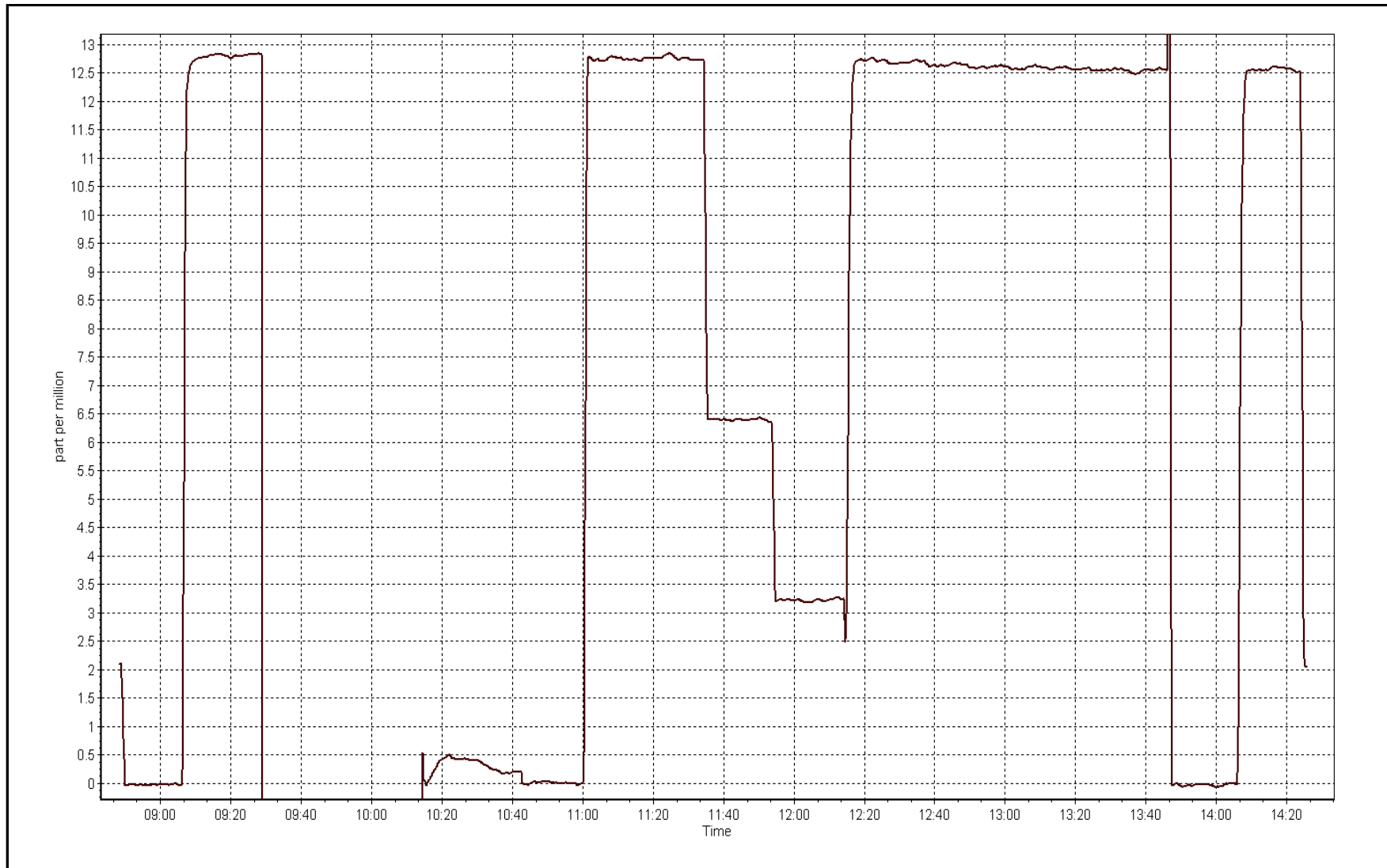
Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.02	----	Correlation Coefficient	0.999996
12.74	12.76	0.9981		
6.40	6.40	1.0001	Slope	0.999532
3.21	3.22	0.9973		
			Intercept	-0.010523

THC Calibration Curve



THC Calibration Plot

Date: July 26, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	July 26, 2016	Previous Calibration	June 28, 2016
Station Name	Firebag	Station Number	AMS 19
Reason:	Routine		
Start Time (MST)	8:50	End Time (MST)	14:30
NO Cal Gas Conc	51.5 ppm	Gas Cert Reference	SA130123A
NOX Cal Gas Conc	51.5 ppm	Cal Gas Expiry Date	12/12/2016
Calibrator	API T700	Serial Number	996
Zero air Generator	Teledyne API T701	Serial Number	4891

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	6466
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	1.002722	1.001726	1.002150
	Data Offset	-2.333903	-1.989767	-0.507402
Current Calibration	Data Slope	1.002767	1.001691	0.996429
	Data Offset	-1.097300	-0.961449	-0.744556

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1410661309
---------------------	------------	-------------------	------------

Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.43		192.168.1.43	
NO coefficient	1.066		1.080	
NOX coefficient	0.999		0.999	
NO2 coefficient	1.000		1.000	
NO bkgrnd	4.8		4.9	
NOX bkgrnd	5.0		5.0	
Chamber Temp	50.7	Deg C	50.5	Deg C
Moly Temp	326	Deg C	327.1	Deg C
PMT voltage	-780.3	V	-780.3	V
PMT Temp	-2.8	Deg C	-2.8	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	180.6	mmHg	185.8	mmHg
R Cell Press Nox	180.6	mmHg	185.8	mmHg
NO sample flow	0.561	lpm	0.56	lpm
Nox sample Flow	0.561	lpm	0.560	lpm

Notes:

Inlet filter changed after as founds. Span adjusted.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

July 26, 2016

Station Number:

AMS 19

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	-0.3	-0.2	-0.1	----	----
as found span	5000	58.3	600.5	600.5	0.0	586.3	585.3	1.0	1.0242	1.0260
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.3	-0.2	-0.1	----	----
high point	5000	58.3	600.5	600.5	0.0	599.3	599.9	-0.6	1.0020	1.0010
second point	5000	29.3	301.8	301.8	0.0	302.6	302.7	-0.1	0.9973	0.9970
third point	5000	14.7	151.4	151.4	0.0	153.6	153.4	0.2	0.9861	0.9873
as left zero	5000	0.0	0.0	0.0	0.0	-0.2	-0.1	-0.1	----	----
as left span	5000	58.3	600.5	310.9	289.6	610.1	310.8	299.3	0.9842	1.0004
Average Correction Factor									0.9951	0.9951

Corrected As found

NO_x= 586.6

NO= 585.5

Percent Change

NO_x= 2.5%

NO= 2.7%

Previous Response

NO_x= 601.2

NO= 601.4

GPT Calibration Data

Dilution Flow (total) 5000 ccm

Source Gas Flow 58.30 ccm

NOx ref calc conc = 600.5 ppb

NO ref calc conc = 600.5 ppb

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
1st NO ref point		0.0	600.0	598.9	-0.1	1.0009	1.0027	----	----
1st NO2 (300)	310.9	287.9	600.0	310.9	289.1	1.0009	----	0.9961	100.4%
2nd NO2 (200)	404.7	194.2	600.7	404.7	196.0	0.9997	----	0.9907	100.9%
3rd NO2 (100)	500.2	98.6	601.0	500.2	100.8	0.9991	----	0.9784	102.2%
2nd NO ref point	----	0.0	601.3	600.4	0.8	0.9987	1.0001	----	----
Average Correction Factor						0.9996		0.9884	101.2%

Calibration Performed By:

Devin Russell



Wood Buffalo Environmental Association

NO_x Calibration Summary

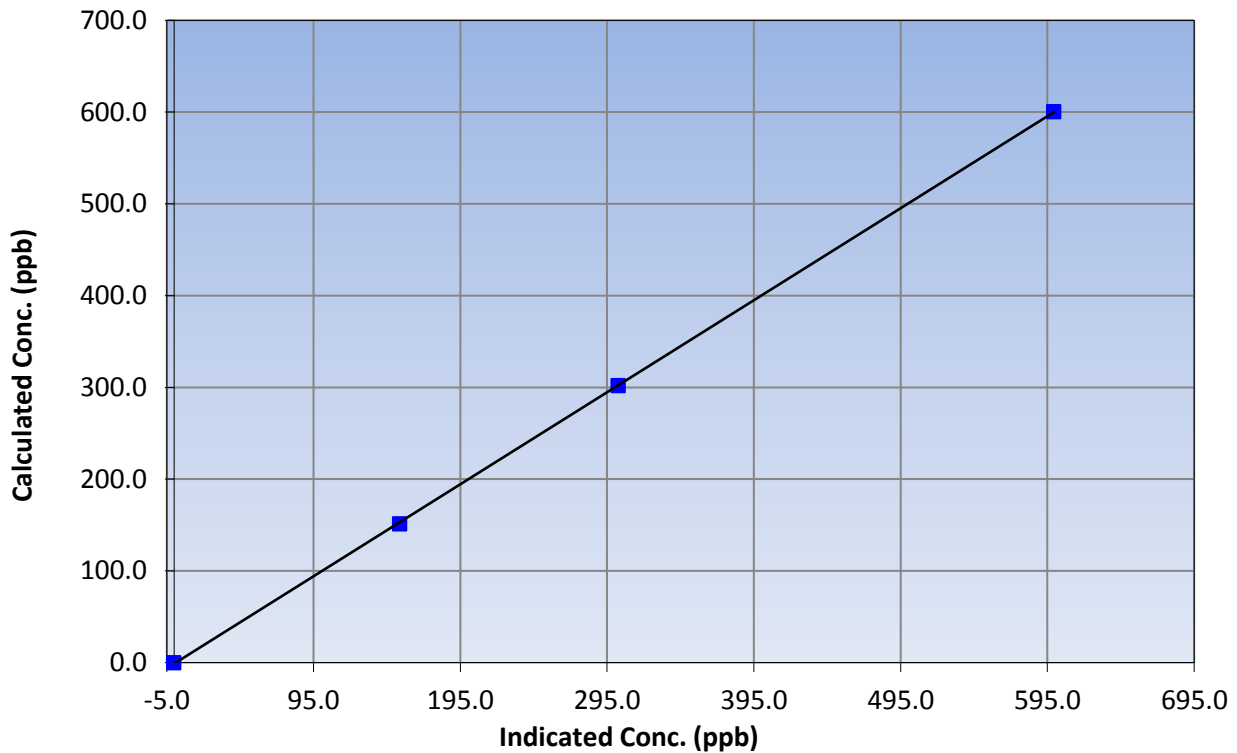
Station Information

Calibration Date	July 26, 2016	Previous Calibration	June 28, 2016
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	8:50	End Time (MST)	14:30
Analyzer make	Thermo 42i	Analyzer serial #	1410661309

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.3	----	Correlation Coefficient	0.999976
600.5	599.3	1.0020		
301.8	302.6	0.9973	Slope	1.002767
151.4	153.6	0.9861		
			Intercept	-1.097300

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

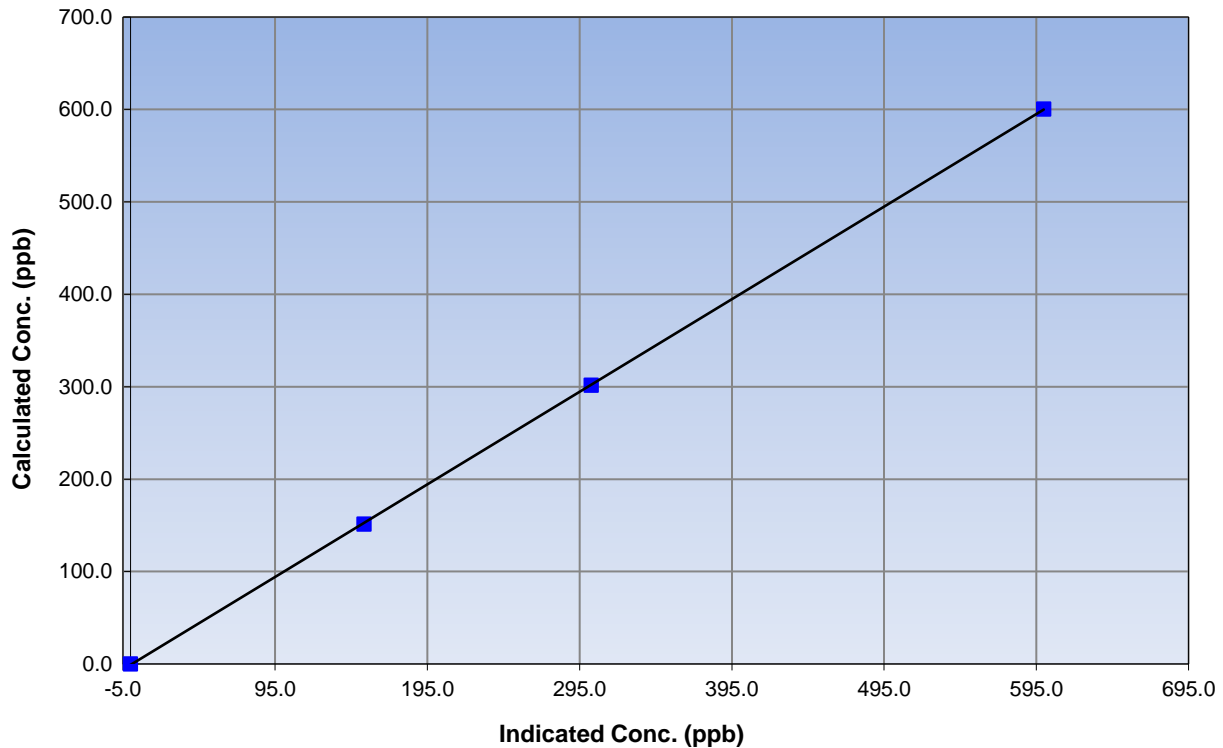
Station Information

Calibration Date	July 26, 2016	Previous Calibration	June 28, 2016
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	8:50	End Time (MST)	14:30
Analyzer make	Thermo 42i	Analyzer serial #	1410661309

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	N/A	Correlation Coefficient	0.999983
600.5	599.9	1.0010		
301.8	302.7	0.9970	Slope	1.001691
151.4	153.4	0.9873		
			Intercept	-0.961449

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

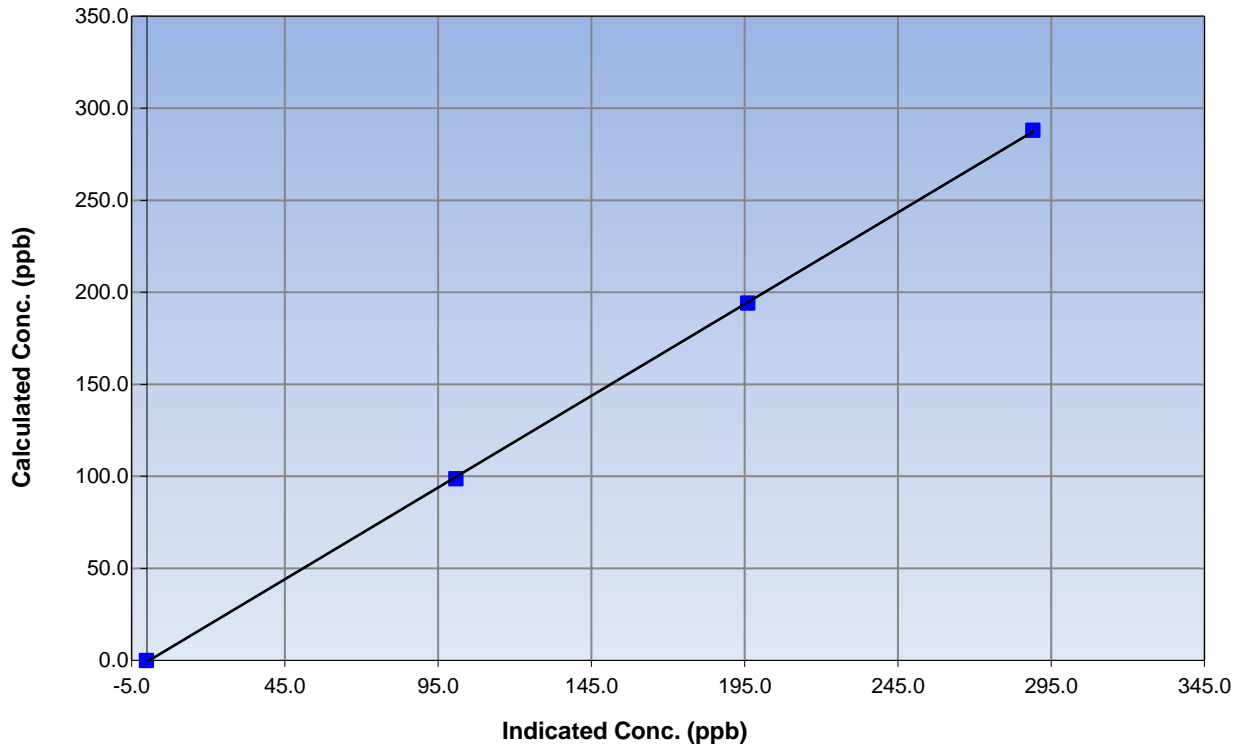
Station Information

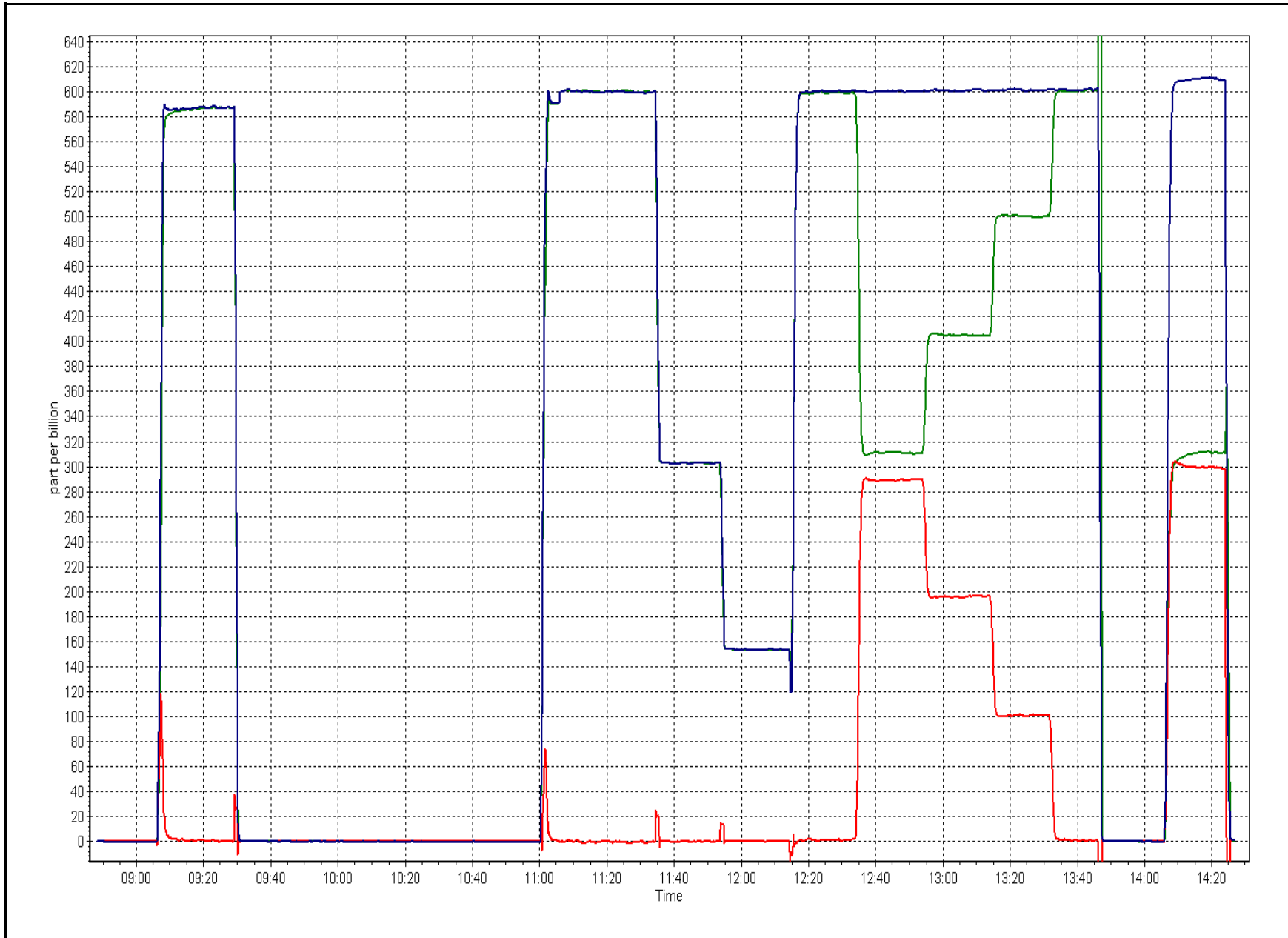
Calibration Date	July 26, 2016	Previous Calibration	June 28, 2016
Station Number	Firebag	Station Number	AMS 19
Start Time (MST)	8:50	End Time (MST)	14:30
Analyzer make	Thermo 42i	Analyzer serial #	1410661309

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999948
287.9	289.1	0.9961		
194.2	196.0	0.9907	Slope	0.996429
98.6	100.8	0.9784		
			Intercept	-0.744556

NO₂ Calibration Curve







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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 20
BRION MACKAY RIVER
JULY 2016**

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

August 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BRION MACKAY RIVER (AMS 20)
 JULY 2016

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	705	35	39	99.46	11	0	4	0
H2S (ppb) Average	705	34	39	99.33	2	0	0	0
THC (ppm) Average	704	35	40	99.33	2.6	-	2.2	-
NO2 (ppb) Average	705	35	39	99.46	16	0	4	-
NO (ppb) Average	705	35	39	99.46	13	-	2	-
NOX (ppb) Average	705	35	39	99.46	29	-	5	-
Temperature 2 m (C) Average	744	0	0	100.00	29.2	-	20.3	-
Relative Humidity (%) Average	744	0	0	100.00	99	-	95	-
Wind Speed 10 m (km/h) Average	741	0	3	99.60	17	-	9	-
Wind Direction 10 m (deg) Average	741	0	3	99.60	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BRION MACKAY RIVER (AMS 20)
 JULY 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	705	0.3	1	-	0	0	0	0	0	1	11
H2S (ppb) Average	705	0.2	0	-	0	0	0	0	0	0	2
THC (ppm) Average	704	2.1	0.1	-	1.9	1.9	2	2.1	2.2	2.3	2.6
NO2 (ppb) Average	705	1	1	-	0	0	0	1	1	3	16
NO (ppb) Average	705	0.2	1	-	0	0	0	0	0	0	13
NOX (ppb) Average	705	1.2	2	-	0	0	0	1	1	3	29
Temperature 2 m (C) Average	744	17.18	4.8	-	4.9	11.3	13.7	16.8	21	23.9	29.2
Relative Humidity (%) Average	744	71.1	20	-	20	42	54	74	90	96	99
Wind Speed 10 m (km/h) Average	741	6	3	-	0	2	4	6	8	10	17
Wind Direction 10 m (deg) Average	741	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BRION MACKAY RIVER (AMS 20)
JULY 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
SO2, H2S, NO2	31 Jul 2016 13:00	31 Jul 2016 16:00	4	Station power failure
THC	31 Jul 2016 13:00	31 Jul 2016 17:00	5	Station power failure
H2S	04 Jul 2016 22:00	04 Jul 2016 22:00	1	Intermittent unstable operation - excessive baseline drift
Wind Speed, Wind Direction	09 Jul 2016 23:00	09 Jul 2016 23:00	1	Flat line in sensor output signal
Wind Speed, Wind Direction	10 Jul 2016 23:00	10 Jul 2016 23:00	1	Flat line in sensor output signal
Wind Speed, Wind Direction	28 Jul 2016 02:00	28 Jul 2016 02:00	1	Flat line in sensor output signal



Wood Buffalo Environmental Association

Summary of Hour Averages

**Sulphur Dioxide (SO₂) - ppb
Brion MacKay River - July 2016**

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 11 ppb on Jul 10 15:00	Maximum Daily Average: 3.6 ppb on Jul 8		Hours of Data:	705
Minimum Value: 0 ppb on Jul 1 01:00	Minimum Daily Average: 0.0 ppb on Jul 15		Hours of Missing Data:	39
Maximum Diurnal Average: 0.7 ppb at hour 15	Minimum Diurnal Average: 0.1 ppb at hour 24		Hours of Calibration:	35
Monthly Average: 0.3 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 0 P ₉₀ = 1 P ₉₉ = 6		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-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
2-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
3-Jul	0	0	0	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-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
5-Jul	Z	0	0	0	0	0	0	0	2	5	3	1	1	1	1	0	0	0	1	0	0	0	0	0	0.7	5
6-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	1	0	0	0	0	0	0	0.3	3
7-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
8-Jul	0	0	1	Z	2	1	0	1	2	9	7	4	4	7	7	8	8	8	7	5	3	0	0	0	3.6	9
9-Jul	0	1	2	2	Z	1	1	1	0	1	2	2	3	1	0	0	0	0	1	0	1	1	1	0	0.9	3
10-Jul	0	0	0	0	0	Z	1	2	1	1	1	1	5	2	11	8	1	1	0	0	0	0	0	0	1.6	11
11-Jul	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
12-Jul	0	Z	0	0	0	0	0	0	0	0	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0.0	0
13-Jul	0	0	Z	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-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	1	4	1	0	0	0	0	0	0	0	0	0	0.3	4
15-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
16-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
17-Jul	Z	0	0	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-Jul	0	Z	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
19-Jul	0	0	Z	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-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
21-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
22-Jul	0	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
23-Jul	Z	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
24-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
25-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0.2	1
26-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
27-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	1	1	0	0.4	2
28-Jul	0	1	0	0	0	Z	0	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0.3	1
29-Jul	Z	0	0	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-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.1	1
31-Jul	0	0	Z	2	1	1	0	0	0	0	0	0	PF	PF	PF	PF	0	0	0	0	0	0	0	0	0.2	2

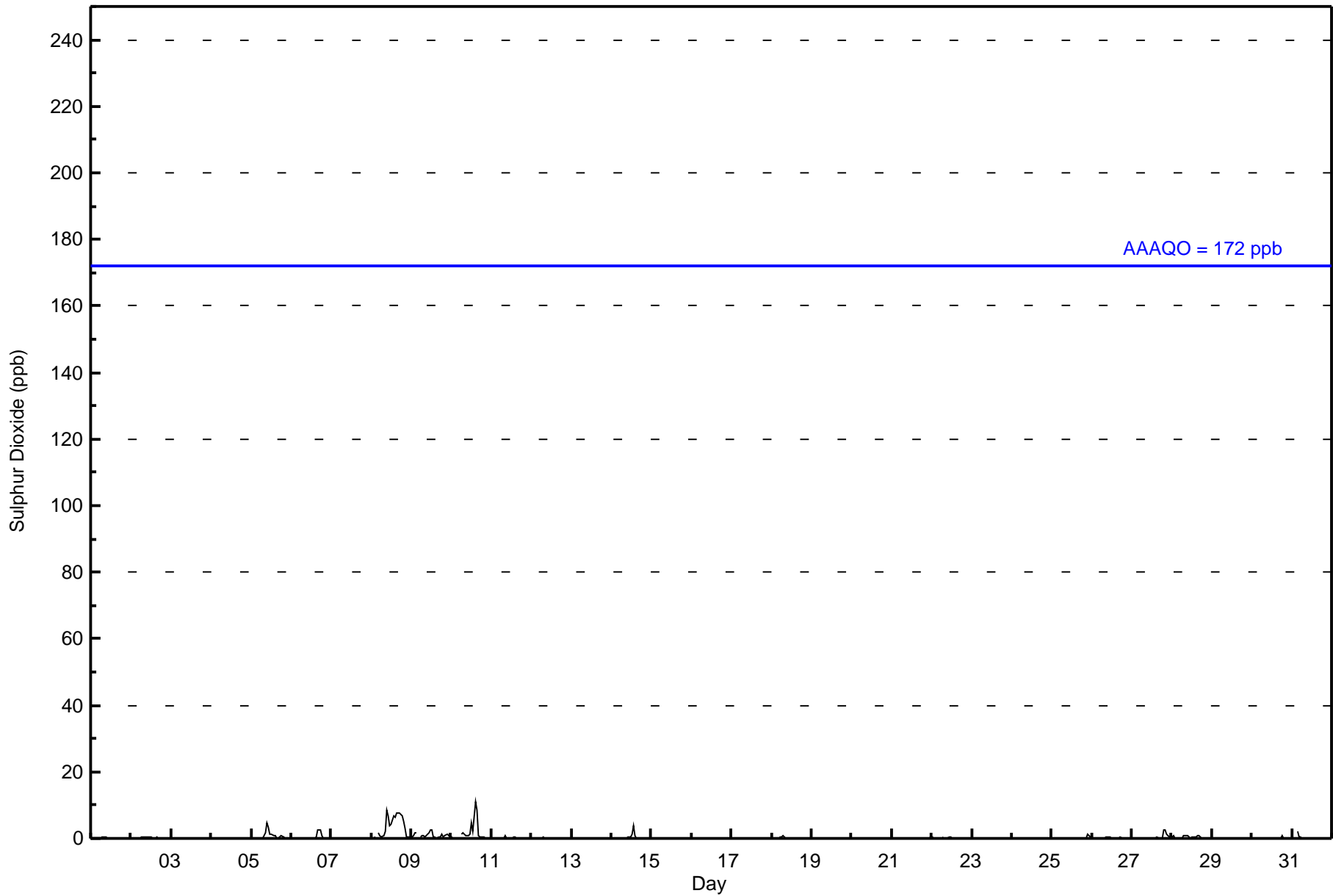
0.1	0.1	0.1	0.2	0.1	0.1	0.2	0.2	0.3	0.6	0.5	0.4	0.6	0.6	0.7	0.6	0.4	0.4	0.4	0.4	0.3	0.2	0.2	0.1	0.1	Diurnal Average
0	1	2	2	2	1	1	2	2	9	7	4	5	7	11	8	8	8	8	7	5	3	1	1	0	Diurnal Maximum

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 (SO₂) - ppb
Brion MacKay River - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Brion MacKay River - July 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	704	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: 705

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Brion MacKay River - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	84	64	41	8	19	9	46	52	43	44	40	60	55	36	35	65	701
11 - 20	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	84	64	41	9	19	9	46	52	43	44	40	60	55	36	35	65	702

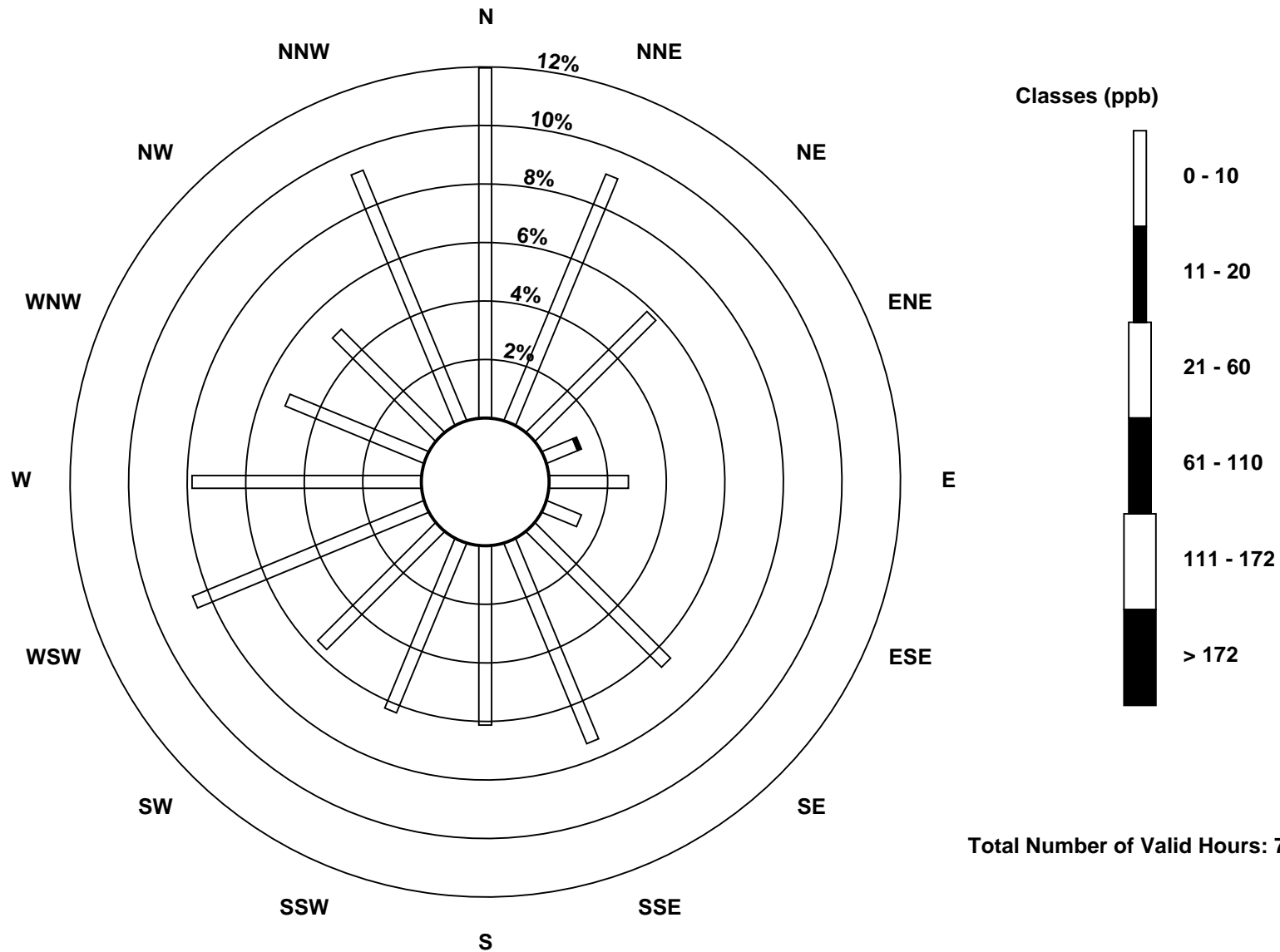
Total Number of Valid Hours: 702

Total Number of Hours: 744

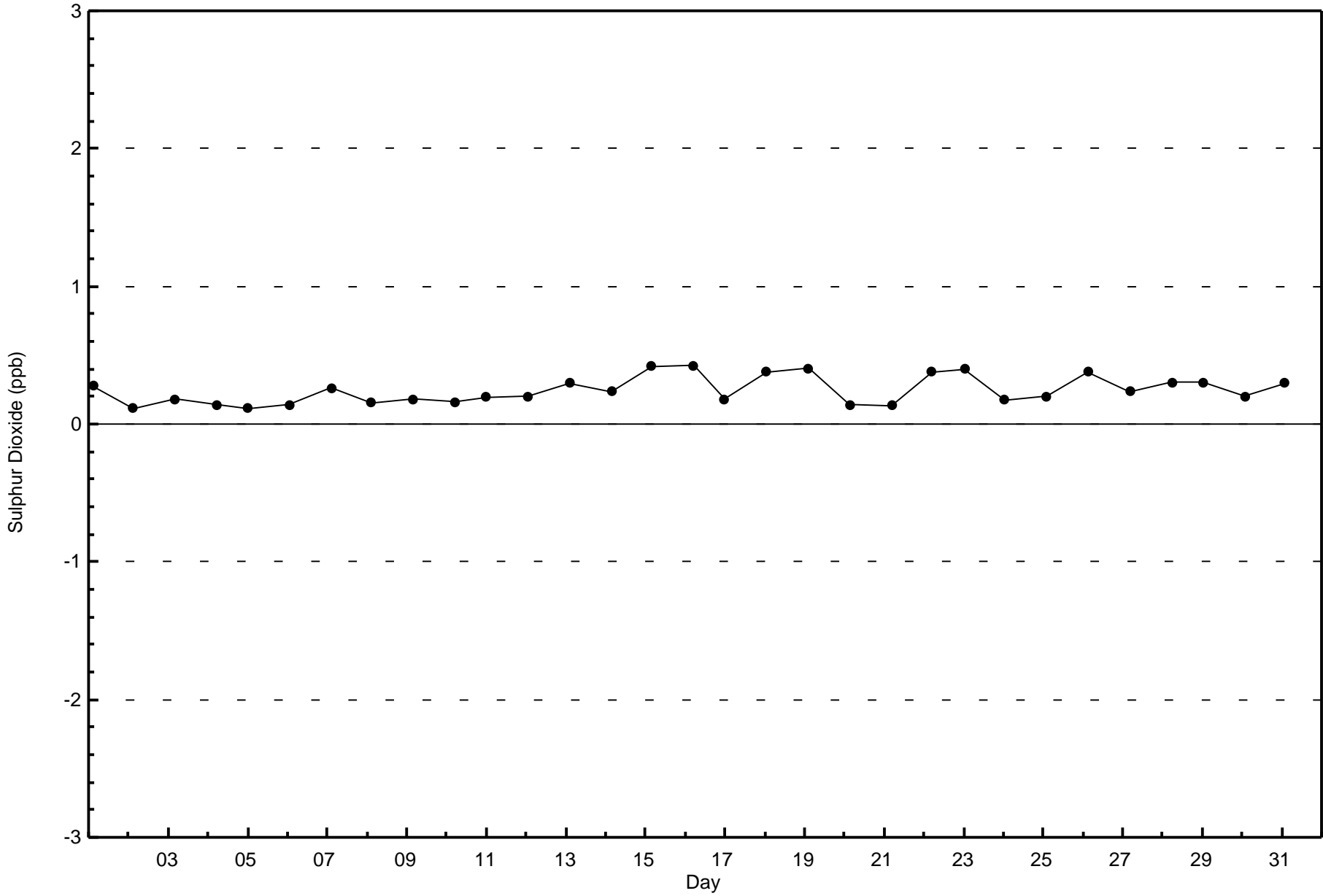


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Sulphur Dioxide (SO₂) - ppb
Brion MacKay River (AMS 20)



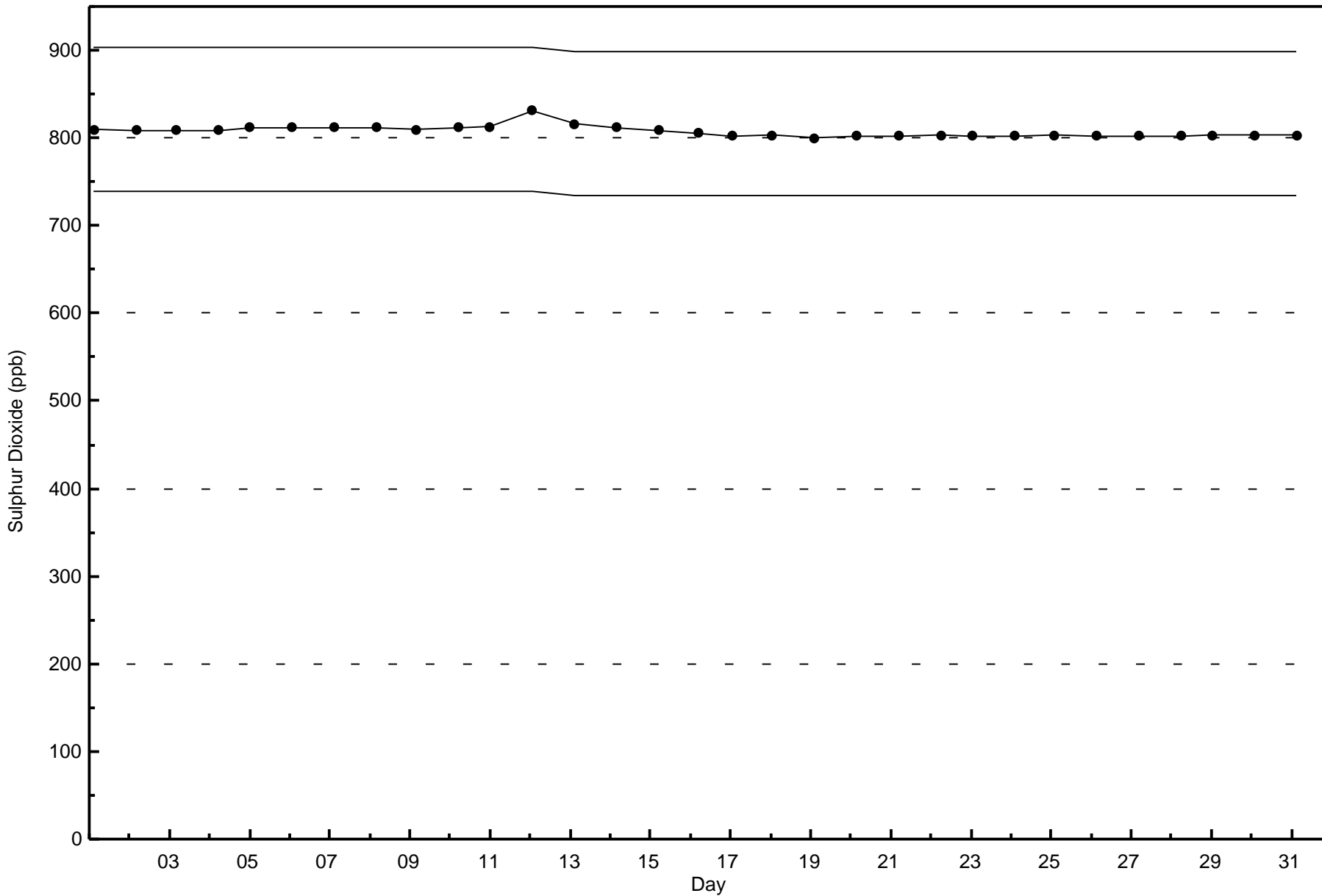
Total Number of Valid Hours: 702





Wood Buffalo Environmental Association
Span Responses

Sulphur Dioxide (SO₂) - ppb
Brion MacKay River - July 2016





Wood Buffalo Environmental Association
Summary of Hour Averages

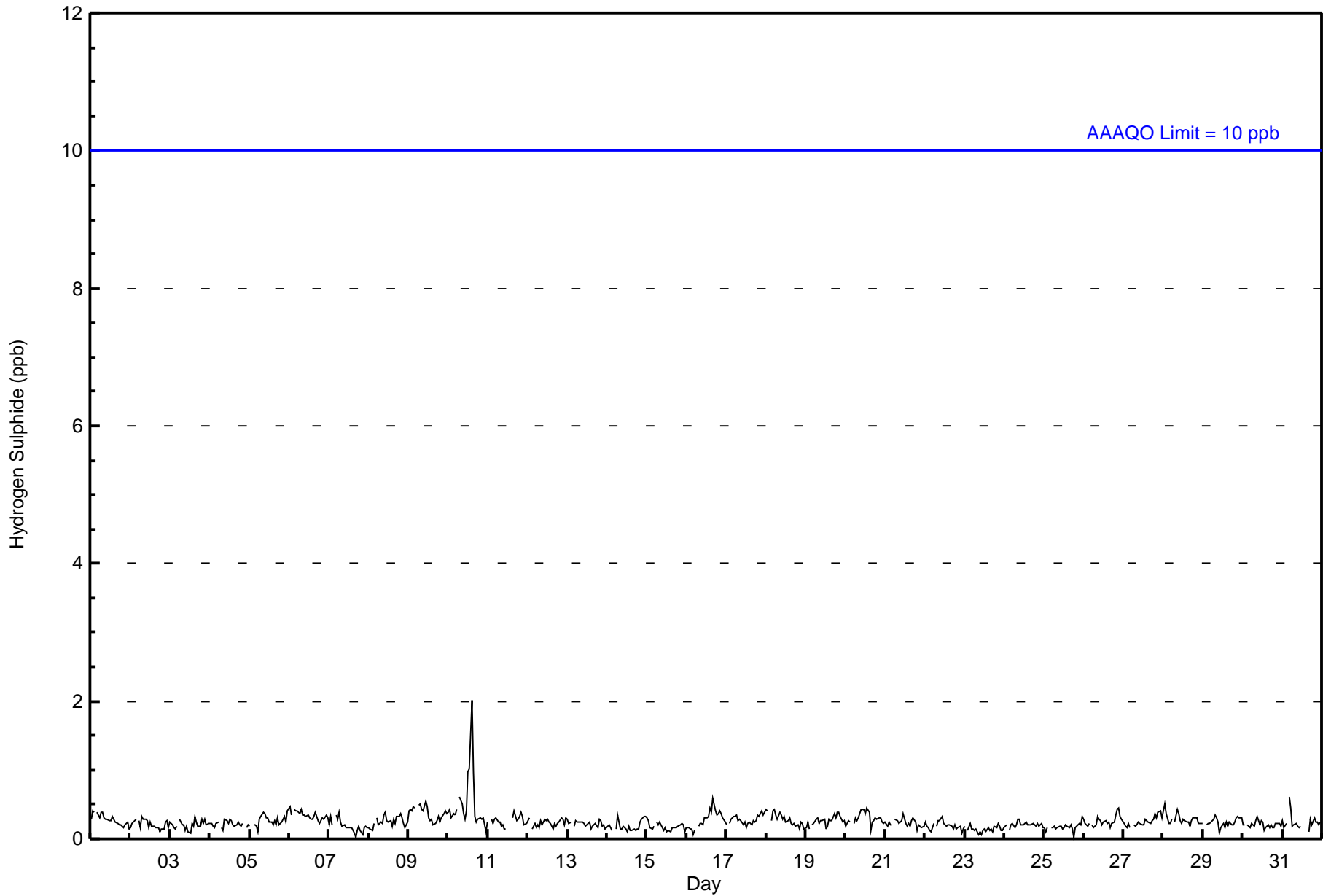
Hydrogen Sulphide (H₂S) - ppb
Brion MacKay River - July 2016

Number of Exceedences (AAQO):		1-hr: 0 24-hr: 0		Hours in Service: 744																																														
Maximum Value: 2 ppb on Jul 10 15:00		Maximum Daily Average: 0.5 ppb on Jul 10		Hours of Data: 705																																														
Minimum Value: 0 ppb on Jul 7 17:00		Minimum Daily Average: 0.1 ppb on Jul 23		Hours of Missing Data: 39																																														
Maximum Diurnal Average: 0.3 ppb at hour 15		Minimum Diurnal Average: 0.2 ppb at hour 3		Hours of Calibration: 34																																														
Monthly Average: 0.2 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 1		Percent Operational Time: 99.3																																														
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-Jul	0	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																								
2-Jul	0	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-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																								
4-Jul	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																								
5-Jul	0	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																								
6-Jul	0	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																								
7-Jul	0	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																								
8-Jul	0	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																								
9-Jul	0	0	0	0	0	Z	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1																								
10-Jul	0	0	0	0	0	0	Z	1	1	0	0	0	1	1	2	1	0	0	0	0	0	0	0	0	0.5	2																								
11-Jul	0	Z	0	0	0	0	0	0	0	0	0	C	C	C	0	0	0	0	0	0	0	0	0	0	0.3	0																								
12-Jul	0	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																								
13-Jul	0	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-Jul	0	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																								
15-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																								
16-Jul	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.3	1																								
17-Jul	0	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																								
18-Jul	0	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																								
19-Jul	0	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																								
20-Jul	0	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																								
21-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																								
22-Jul	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																								
23-Jul	0	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																								
24-Jul	0	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																								
25-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																								
26-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																								
27-Jul	0	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																								
28-Jul	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																								
29-Jul	0	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																								
30-Jul	0	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																								
31-Jul	0	0	0	Z	1	0	0	0	0	0	0	0	PF	PF	PF	PF	0	0	0	0	0	0	0	0	0.2	1																								
																								0.2	0.3	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.2	Diurnal Average		
																								0	0	0	0	1	0	0	1	1	0	1	0	1	1	2	1	1	0	0	0	0	0	0	0	0	Diurnal Maximum	
Z - zerospan C - Calibration UO - Unstable Operation PF - Power Failure																																																		
Alberta Ambient Air Quality Objectives (AAQO): 1-hr 10 ppb 24-hr 3 ppb																																																		



Wood Buffalo Environmental Association
Hourly Averages

Hydrogen Sulphide (H₂S) - ppb
Brion MacKay River - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Brion MacKay River - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
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**

**Hydrogen Sulphide (H₂S) - ppb
Brion MacKay River - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	85	62	42	10	18	9	46	52	43	45	39	61	53	37	34	66	702
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	85	62	42	10	18	9	46	52	43	45	39	61	53	37	34	66	702

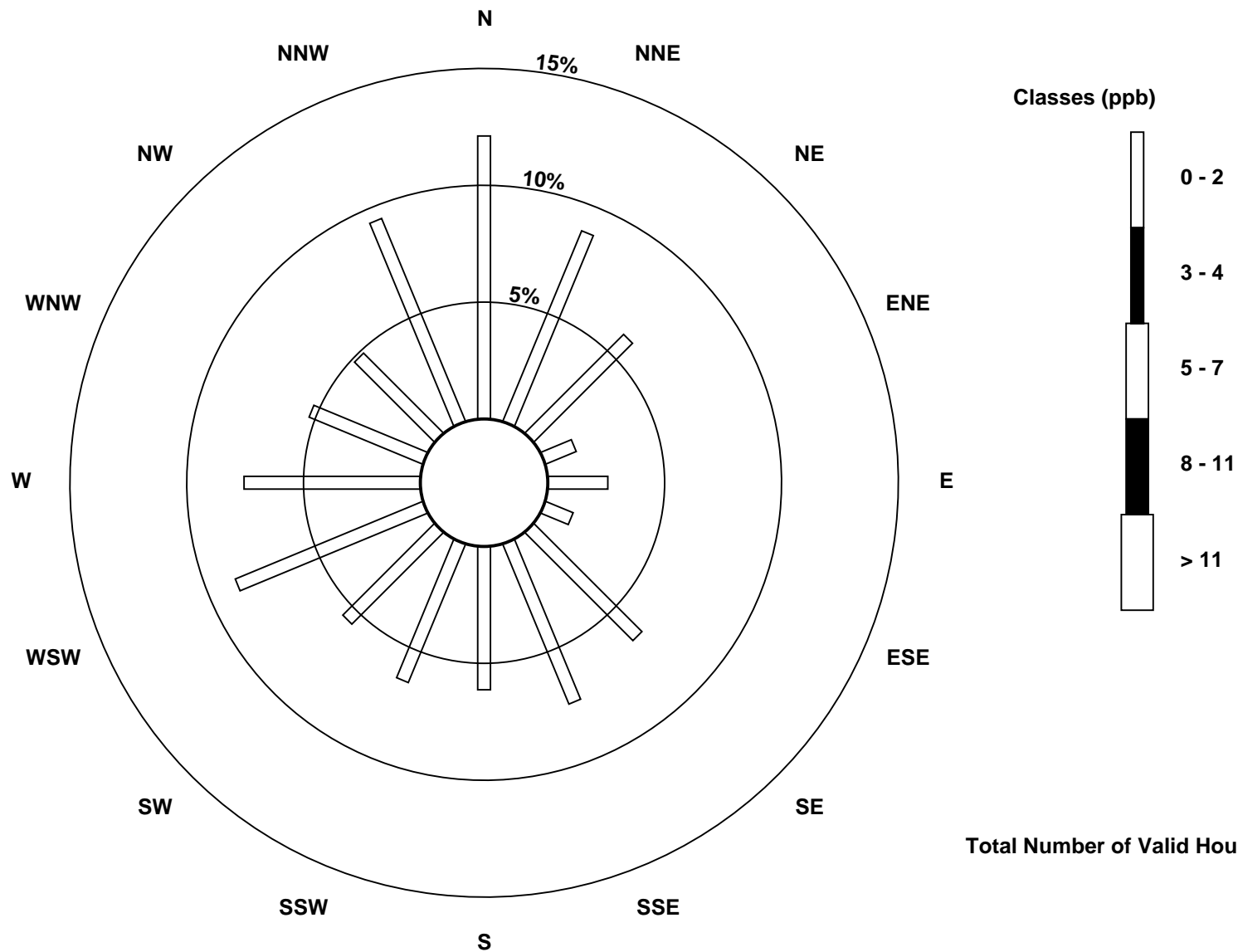
Total Number of Valid Hours: 702

Total Number of Hours: 744

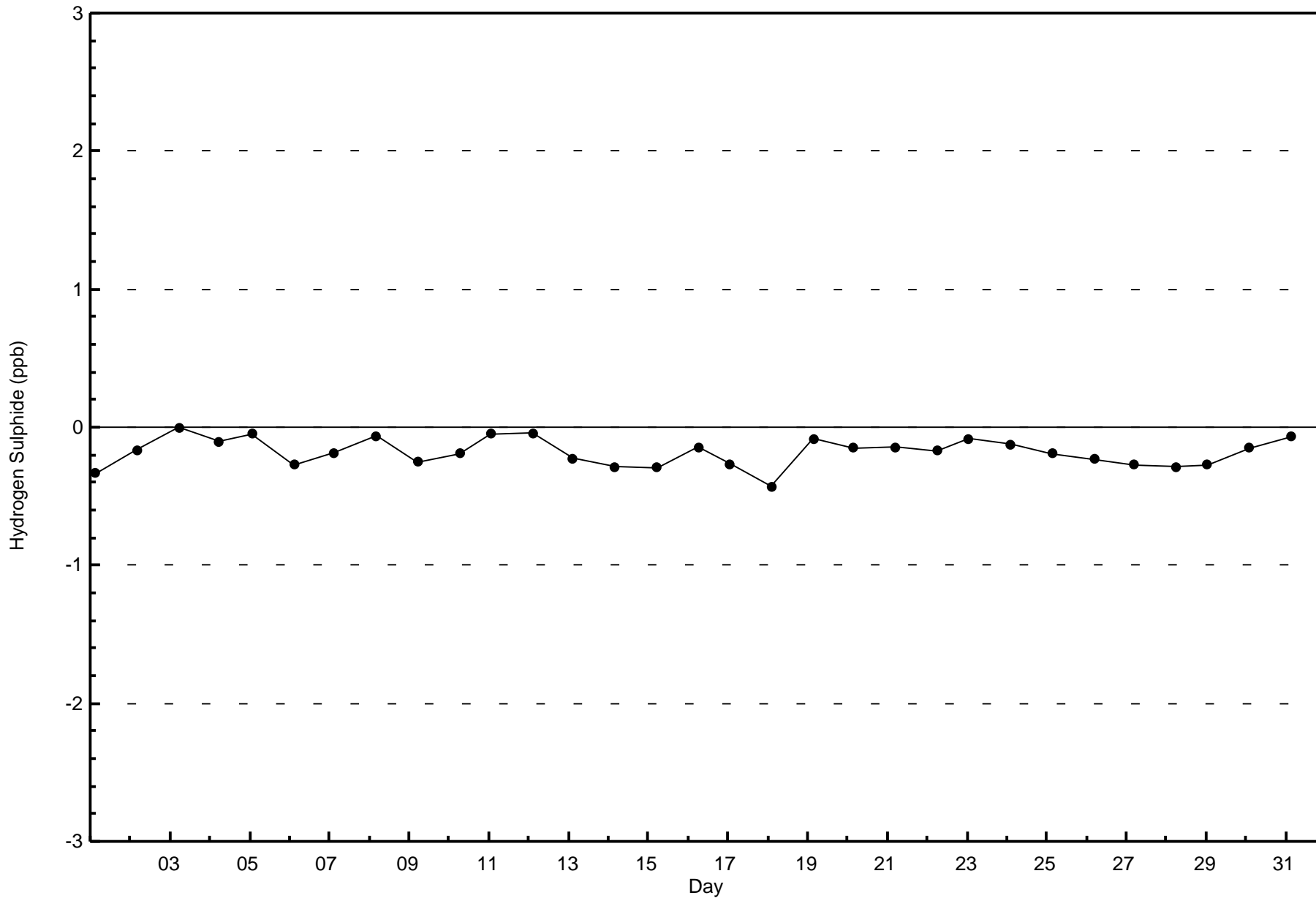


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Hydrogen Sulphide (H₂S) - ppb
Brion MacKay River (AMS 20)



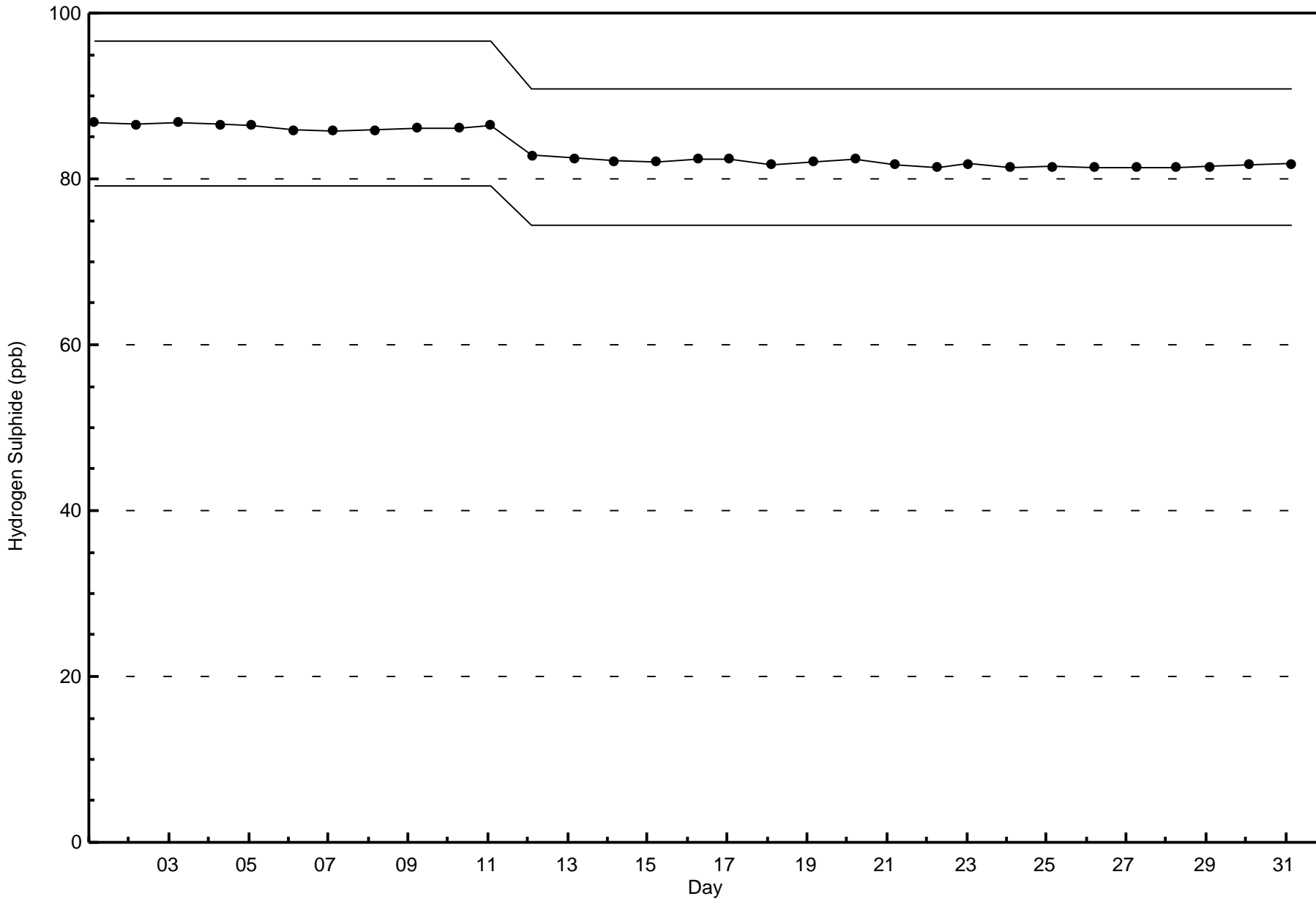
Total Number of Valid Hours: 702





Wood Buffalo Environmental Association
Span Responses

Hydrogen Sulphide (H₂S) - ppb
Brion MacKay River - July 2016





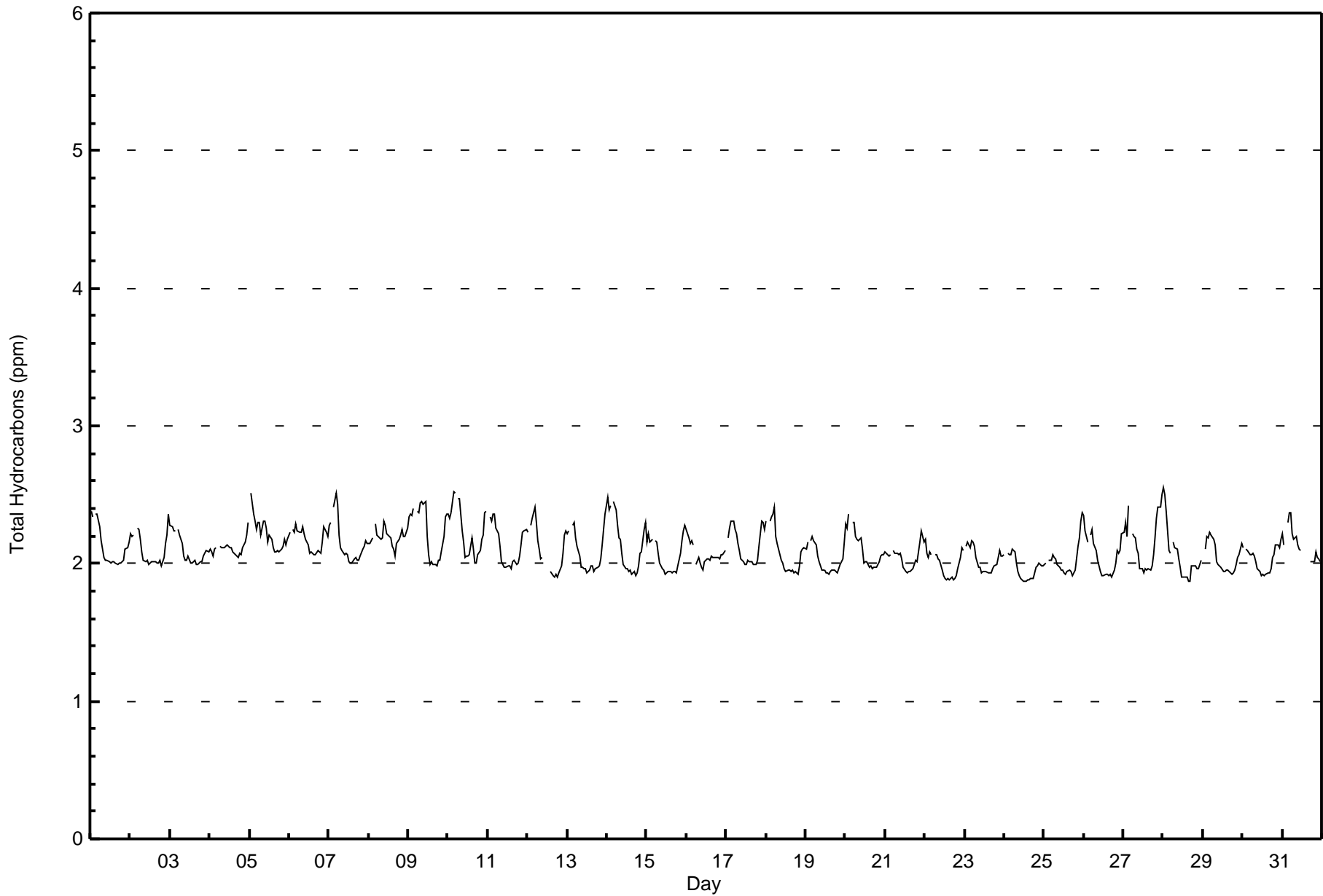
Wood Buffalo Environmental Association

Summary of Hour Averages

Total Hydrocarbons (THC) - ppm

Brion MacKay River - July 2016

Maximum Value: 2.6 ppm on Jul 28 01:00		Maximum Daily Average: 2.2 ppm on Jul 10		Hours in Service: 744																							
Minimum Value: 1.9 ppm on Jul 24 12:00		Minimum Daily Average: 2.0 ppm on Jul 24		Hours of Data: 704																							
Maximum Diurnal Average: 2.3 ppm at hour 5		Minimum Diurnal Average: 2.0 ppm at hour 17		Hours of Missing Data: 40																							
Monthly Average: 2.10 ppm		Percentiles: P ₁ = 1.9 P ₁₀ = 1.9 Q ₁ = 2.0 Median = 2.1 Q ₃ = 2.2 P ₉₀ = 2.3 P ₉₉ = 2.5		Hours of Calibration: 35																							
				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-Jul	2.4	2.3	Z	2.4	2.4	2.3	2.2	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.2	2.1	2.4	
2-Jul	2.2	2.2	2.2	Z	2.3	2.2	2.2	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.2	2.4	2.1	2.4	
3-Jul	2.3	2.3	2.2	2.2	Z	2.3	2.2	2.2	2.1	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.3	
4-Jul	2.1	2.1	2.1	2.1	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.2	2.2	2.3	2.1	2.3	
5-Jul	Z	2.5	2.4	2.3	2.2	2.3	2.3	2.2	2.3	2.3	2.3	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.2	2.2	2.5
6-Jul	2.2	Z	2.2	2.2	2.3	2.2	2.2	2.2	2.3	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.3	2.2	2.2	2.2	2.3
7-Jul	2.3	2.3	Z	2.4	2.5	2.4	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	2.1	2.1	2.1	2.2	2.1	2.1	2.5	
8-Jul	2.1	2.1	2.2	Z	2.3	2.2	2.2	2.2	2.2	2.3	2.3	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.3	
9-Jul	2.3	2.4	2.4	2.4	Z	2.4	2.4	2.4	2.4	2.4	2.5	2.2	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.2	2.3	2.4	2.2	2.5	
10-Jul	2.4	2.3	2.4	2.5	2.5	Z	2.5	2.5	2.2	2.2	2.0	2.1	2.1	2.1	2.2	2.1	2.0	2.0	2.1	2.1	2.2	2.2	2.4	2.4	2.2	2.5	
11-Jul	Z	2.3	2.3	2.4	2.4	2.3	2.2	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.2	2.2	2.2	2.1	2.4	
12-Jul	2.2	Z	2.3	2.3	2.4	2.3	2.2	2.1	2.0	2.0	C	C	C	C	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.1	2.2	2.2	2.1	2.4
13-Jul	2.2	2.2	Z	2.3	2.3	2.2	2.1	2.1	2.0	2.0	2.0	2.0	1.9	1.9	2.0	2.0	1.9	2.0	2.0	2.0	2.0	2.1	2.3	2.4	2.1	2.4	
14-Jul	2.5	2.4	2.4	Z	2.4	2.4	2.3	2.2	2.2	2.1	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.1	2.1	2.2	2.3	2.1	2.5
15-Jul	2.2	2.2	2.2	2.2	Z	2.2	2.2	2.1	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.1	2.2	2.2	2.3	2.1	2.3	
16-Jul	2.2	2.2	2.1	2.2	2.1	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.2
17-Jul	Z	2.2	2.3	2.3	2.3	2.2	2.2	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.3	2.3	2.3	2.1	2.3	
18-Jul	2.3	Z	2.3	2.3	2.4	2.4	2.2	2.1	2.1	2.0	2.0	2.0	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.1	2.1	2.1	2.1	2.1	2.4
19-Jul	2.1	2.2	Z	2.2	2.2	2.2	2.1	2.1	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	1.9	2.0	2.0	2.2	2.0	2.2	
20-Jul	2.3	2.3	2.4	Z	2.3	2.3	2.2	2.2	2.2	2.2	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.4
21-Jul	2.1	2.1	2.1	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.0	2.0	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.1	2.2	2.2	2.2	2.0	2.2
22-Jul	2.2	2.1	2.0	2.1	2.1	Z	2.1	2.1	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.1	2.1	2.0	2.2
23-Jul	Z	2.1	2.2	2.1	2.2	2.2	2.1	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.1	2.1	2.1	2.0	2.2	
24-Jul	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1
25-Jul	2.0	2.0	Z	2.0	2.0	2.1	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.1	2.2	2.3	2.4	2.0	2.4	
26-Jul	2.4	2.2	2.2	Z	2.2	2.3	2.1	2.1	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.1	2.1	2.1	2.2	2.1	2.4
27-Jul	2.2	2.3	2.2	2.4	Z	2.2	2.2	2.2	2.1	2.1	2.0	2.0	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.2	2.3	2.4	2.4	2.5	2.2	2.5
28-Jul	2.6	2.5	2.4	2.1	2.1	Z	2.2	2.1	2.1	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	2.0	2.0	2.1	2.1	2.6
29-Jul	Z	2.1	2.2	2.2	2.2	2.2	2.2	2.1	2.0	2.0	2.0	2.0	1.9	1.9	2.0	2.0	1.9	1.9	1.9	2.0	2.0	2.0	2.1	2.1	2.0	2.2	
30-Jul	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.1	2.1	2.1	2.1	2.2	2.0	2.2
31-Jul	2.2	2.1	Z	2.3	2.4	2.4	2.2	2.2	2.2	2.1	2.1	2.1	PF	PF	PF	PF	PF	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.1	2.1	2.4
	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.2	2.2	2.2	2.2	Diurnal Average
	2.6	2.5	2.4	2.5	2.5	2.4	2.5	2.5	2.4	2.4	2.5	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.2	2.2	2.3	2.4	2.4	2.5	2.5	2.5	Diurnal Maximum
Z - zerospan		C - Calibration				PF - Power Failure																					





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Brion MacKay River - July 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	313	44.46	44.46
2.1 - 3.0	391	55.54	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
Brion MacKay River - July 2016

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	44	19	14	3	6	2	11	21	24	22	20	26	33	17	18	33	313
2.1 - 3.0	40	45	27	6	13	7	35	31	19	22	20	34	22	18	17	32	388
3.1 - 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	84	64	41	9	19	9	46	52	43	44	40	60	55	35	35	65	701

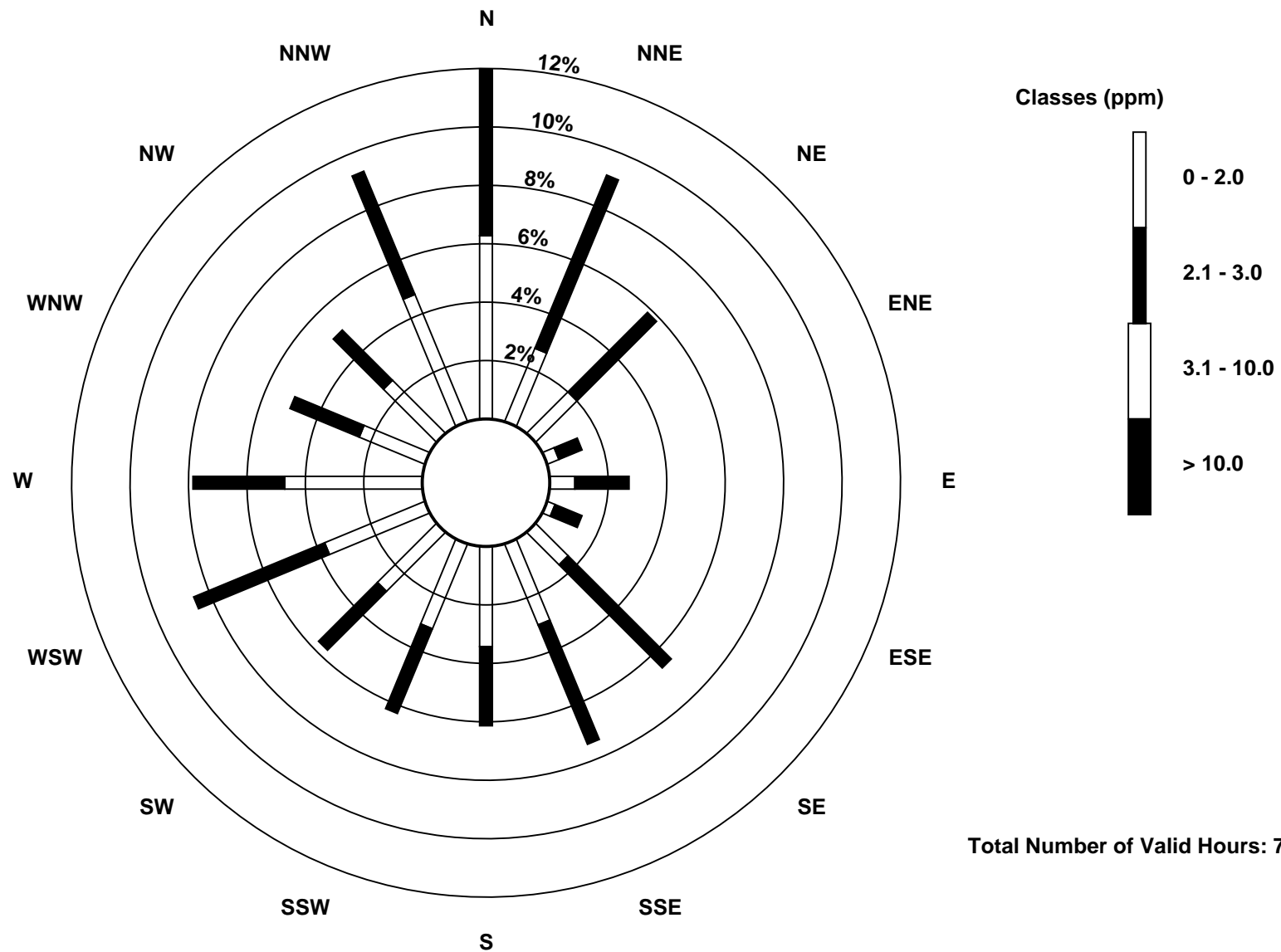
Total Number of Valid Hours: 701

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

Total Hydrocarbons (THC) - ppm
Brion MacKay River (AMS 20)

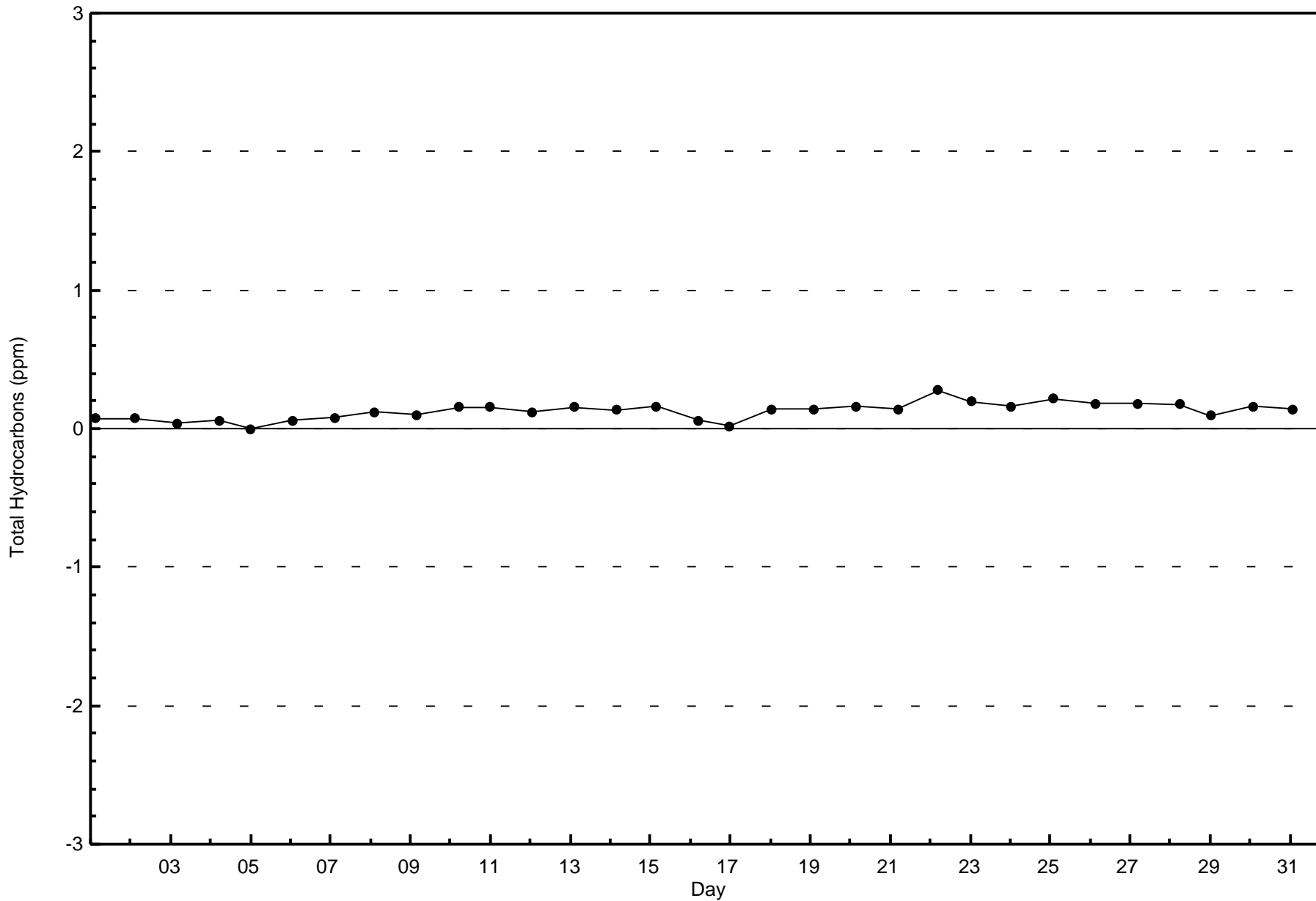


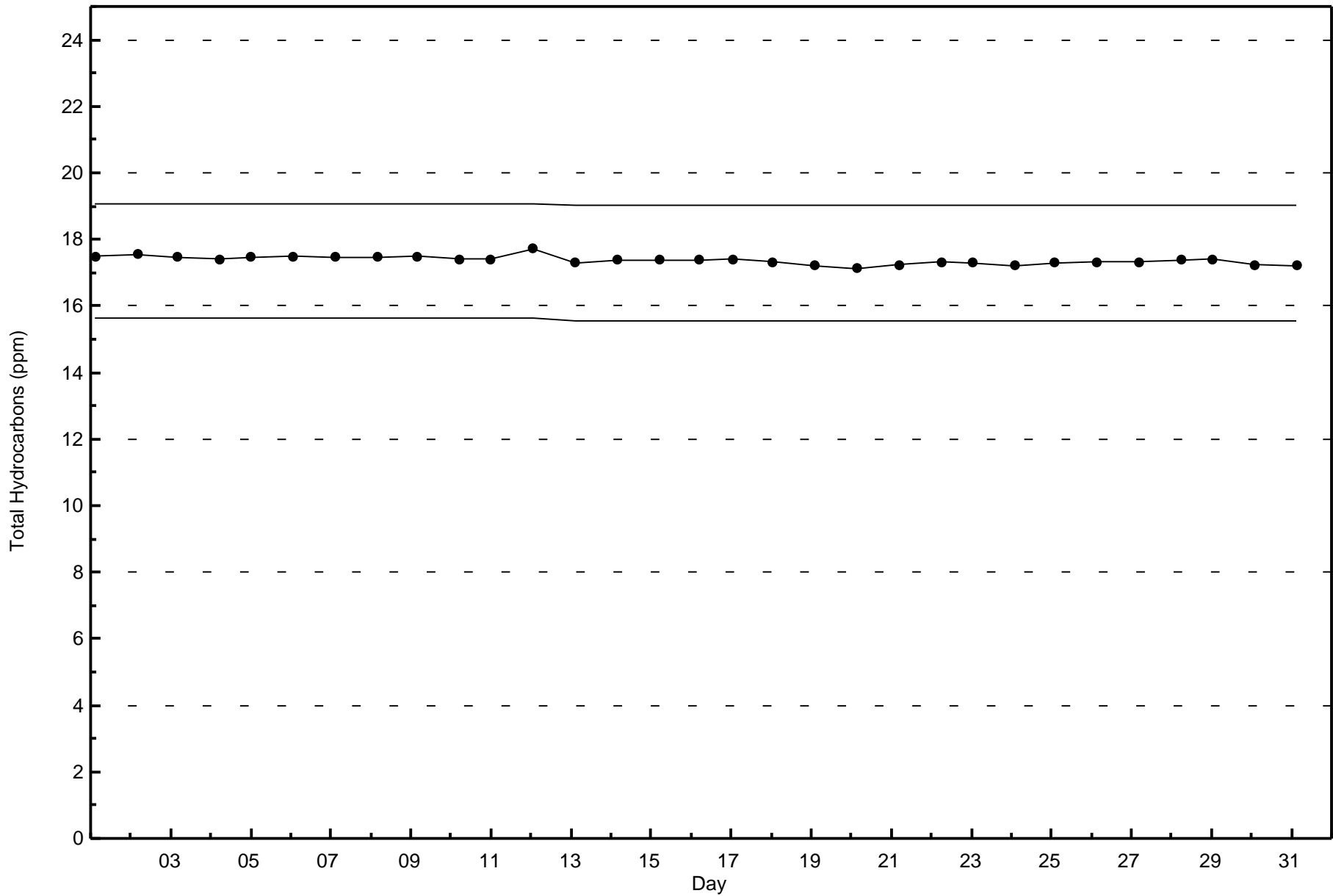
Total Number of Valid Hours: 701



Wood Buffalo Environmental Association
Zero Responses

Total Hydrocarbons (THC) - ppm
Brion MacKay River - July 2016





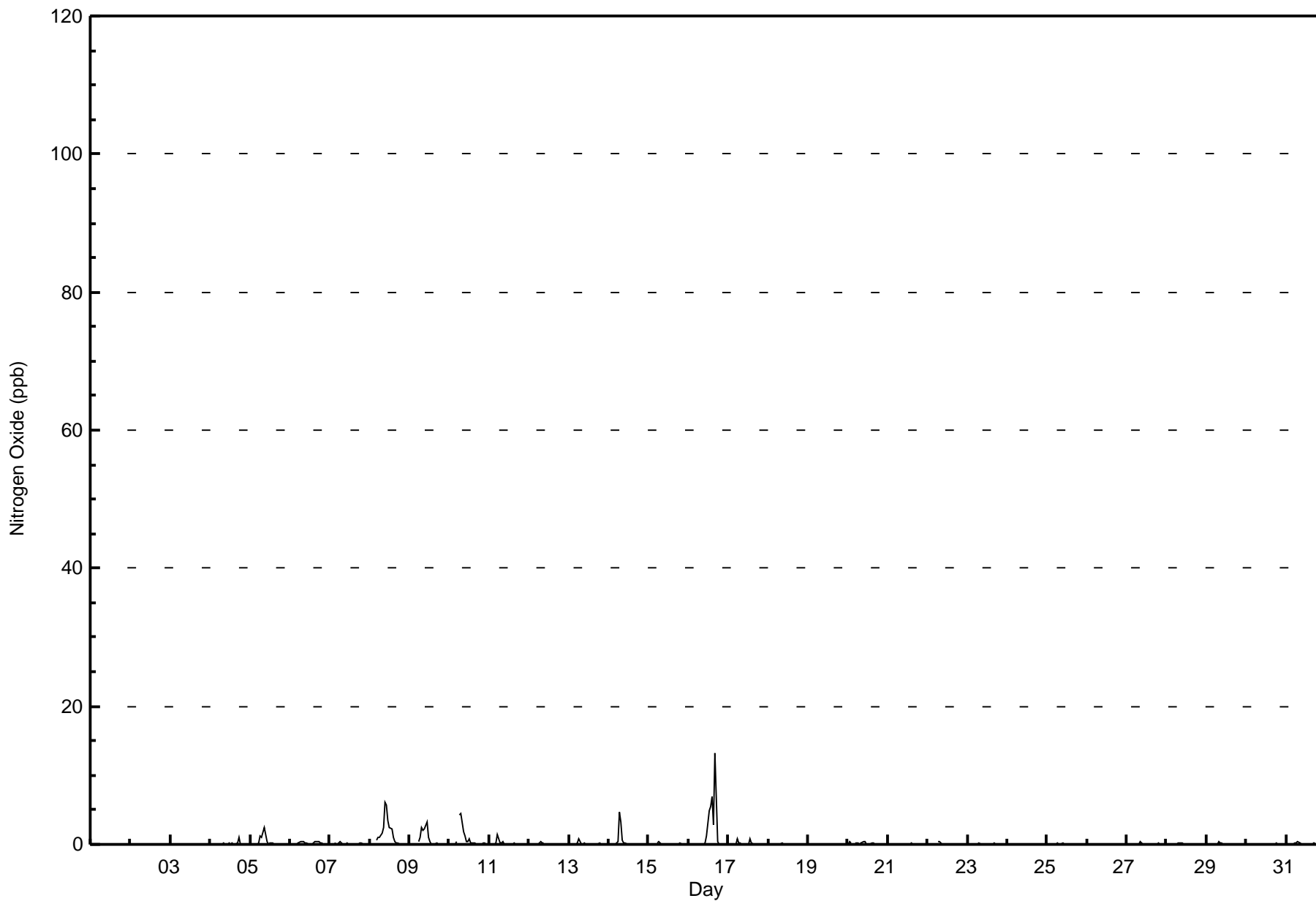


Maximum Value: 13 ppb on Jul 16 17:00																	Maximum Daily Average: 1.5 ppb on Jul 16										Hours in Service: 744																	
Minimum Value: 0 ppb on Jul 1 01:00																	Minimum Daily Average: 0.0 ppb on Jul 24										Hours of Data: 705																	
Maximum Diurnal Average: 0.5 ppb at hour 8																	Minimum Diurnal Average: 0.0 ppb at hour 1										Hours of Missing Data: 39																	
Monthly Average: 0.2 ppb																	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 O ₃ = 0 P ₉₀ = 0 P ₉₉ = 5										Hours of Calibration: 35																	
																	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-Jul	0	0	Z	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-Jul	0	0	0	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-Jul	0	0	0	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-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.1	1																		
5-Jul	Z	0	0	0	0	0	1	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	2																		
6-Jul	0	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																		
7-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																		
8-Jul	0	0	0	Z	1	1	1	2	2	6	6	3	2	2	1	0	0	0	0	0	0	0	0	0	1.2	6																		
9-Jul	0	0	0	0	Z	0	1	2	2	2	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0.6	3																		
10-Jul	0	0	0	0	0	Z	4	5	2	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.7	5																		
11-Jul	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1																		
12-Jul	0	Z	0	0	0	0	0	0	0	0	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0.1	0																		
13-Jul	0	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1																		
14-Jul	0	0	0	Z	0	0	5	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	5																		
15-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																		
16-Jul	0	0	0	0	0	Z	0	0	0	0	0	1	5	5	7	3	13	0	0	0	0	0	0	0	1.5	13																		
17-Jul	Z	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.1	1																		
18-Jul	0	Z	0	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-Jul	0	0	Z	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-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																		
21-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0																		
22-Jul	0	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																		
23-Jul	Z	0	0	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-Jul	0	Z	0	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-Jul	0	0	Z	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-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0																		
27-Jul	0	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																		
28-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0																		
29-Jul	Z	0	0	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-Jul	0	Z	0	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-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	PF	PF	PF	PF	0	0	0	0	0	0	0	0	0.1	0																		
																	0.0	0.0	0.0	0.0	0.1	0.2	0.5	0.5	0.4	0.4	0.4	0.2	0.3	0.3	0.3	0.2	0.5	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Diurnal Average	
																	0	0	0	0	1	1	5	5	2	6	6	3	5	5	7	3	13	1	0	0	0	0	0	0	0	0	0	Diurnal Maximum
Z - zerspan																	C - Calibration					PF - Power Failure																						



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxide (NO) - ppb
Brion MacKay River - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxide (NO) - ppb
Brion MacKay River - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	705	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: 705

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxide (NO) - ppb
Brion MacKay River - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	84	64	41	9	19	9	46	52	43	44	40	60	55	36	35	65	702
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	84	64	41	9	19	9	46	52	43	44	40	60	55	36	35	65	702

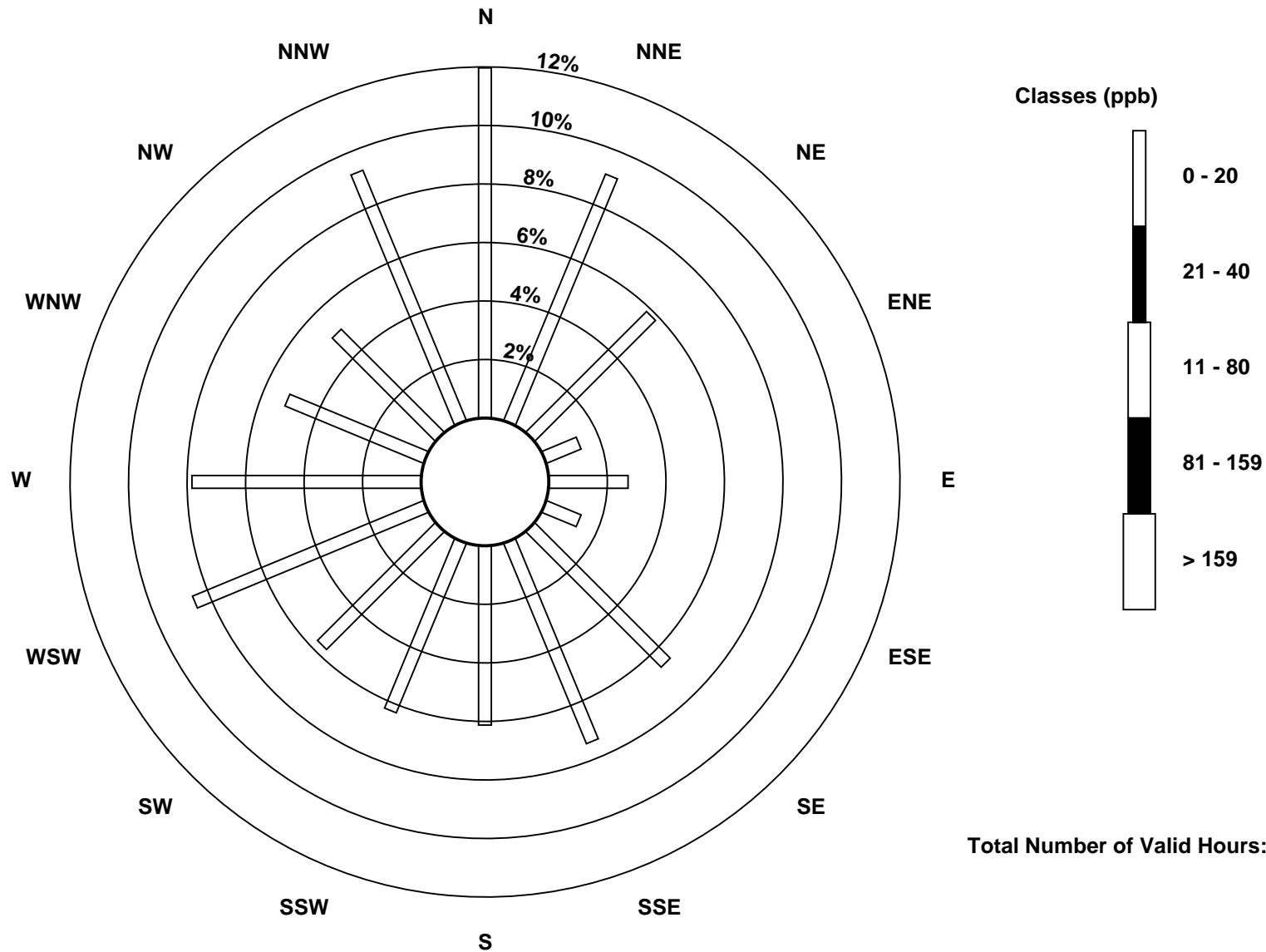
Total Number of Valid Hours: 702

Total Number of Hours: 744

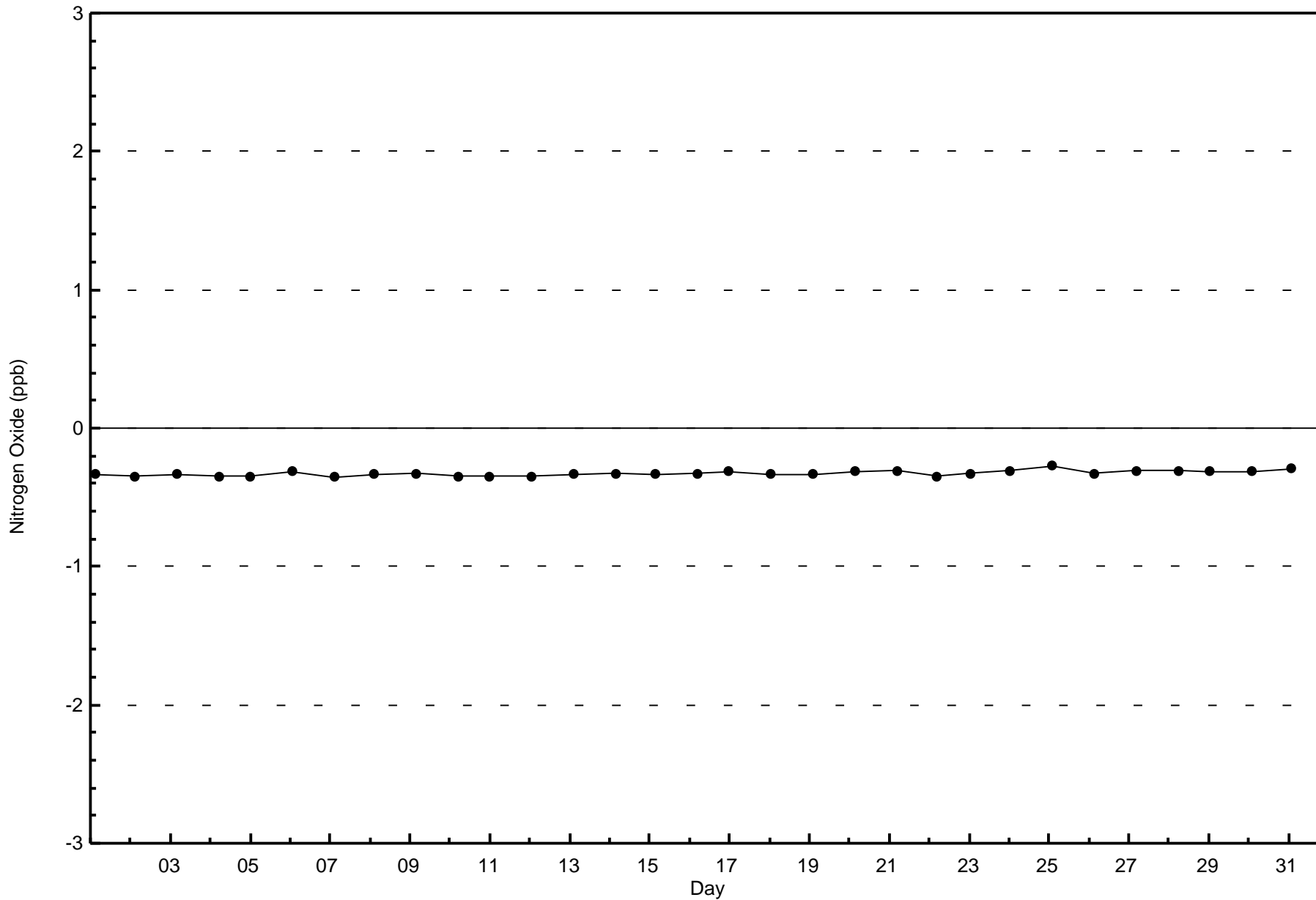


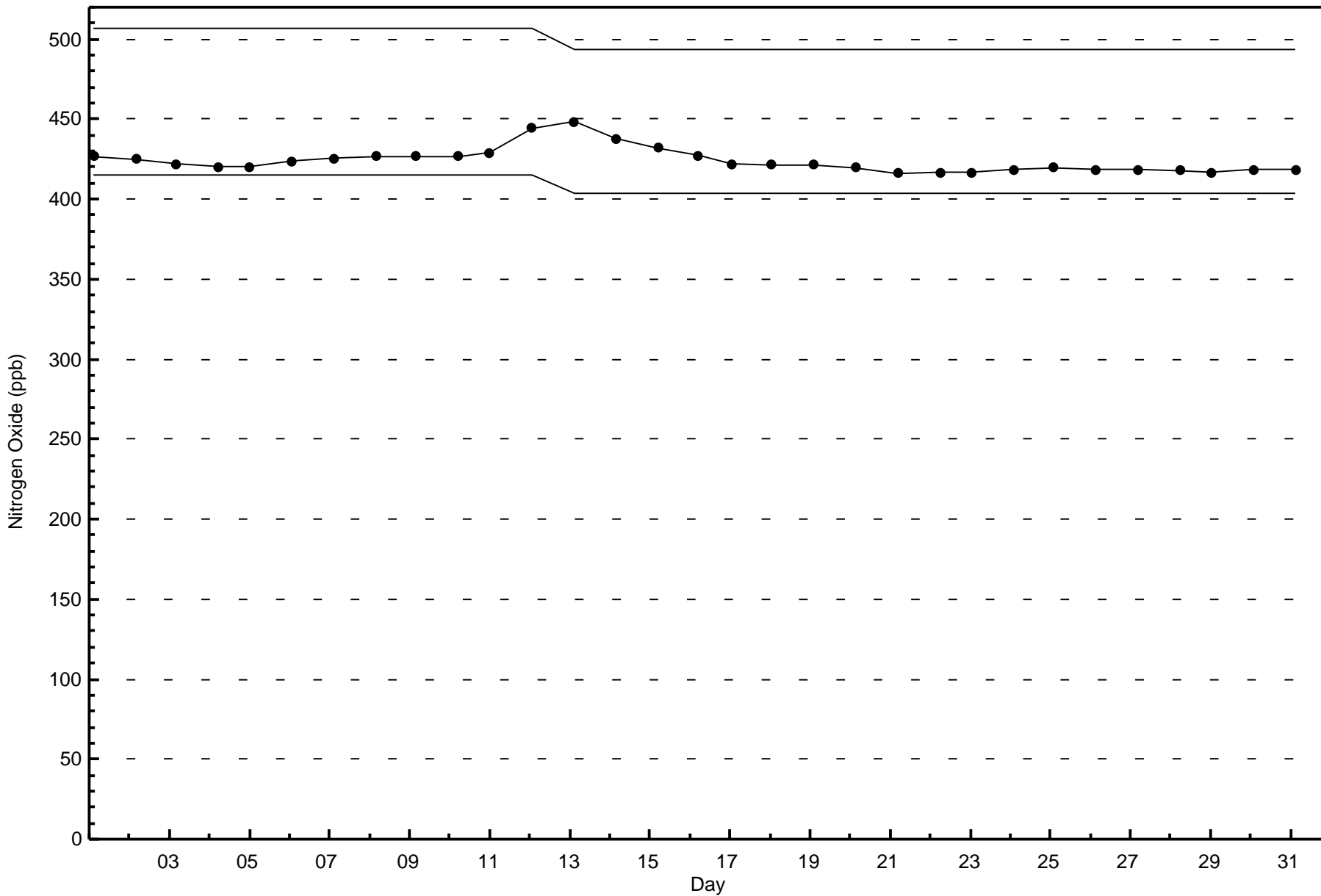
Wood Buffalo Environmental Association
Wind Rose Jul 2016

Nitrogen Oxide (NO) - ppb
Brion MacKay River (AMS 20)



Total Number of Valid Hours: 702







Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

Brion MacKay River - July 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 16 ppb on Jul 16 17:00	Maximum Daily Average: 3.5 ppb on Jul 8		Hours of Data:	705
Minimum Value: 0 ppb on Jul 5 05:00	Minimum Daily Average: 0.3 ppb on Jul 24		Hours of Missing Data:	39
Maximum Diurnal Average: 1.5 ppb at hour 7	Minimum Diurnal Average: 0.8 ppb at hour 12		Hours of Calibration:	35
Monthly Average: 1.0 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 O ₃ = 1 P ₉₀ = 3 P ₉₉ = 7		Percent Operational Time:	99.5

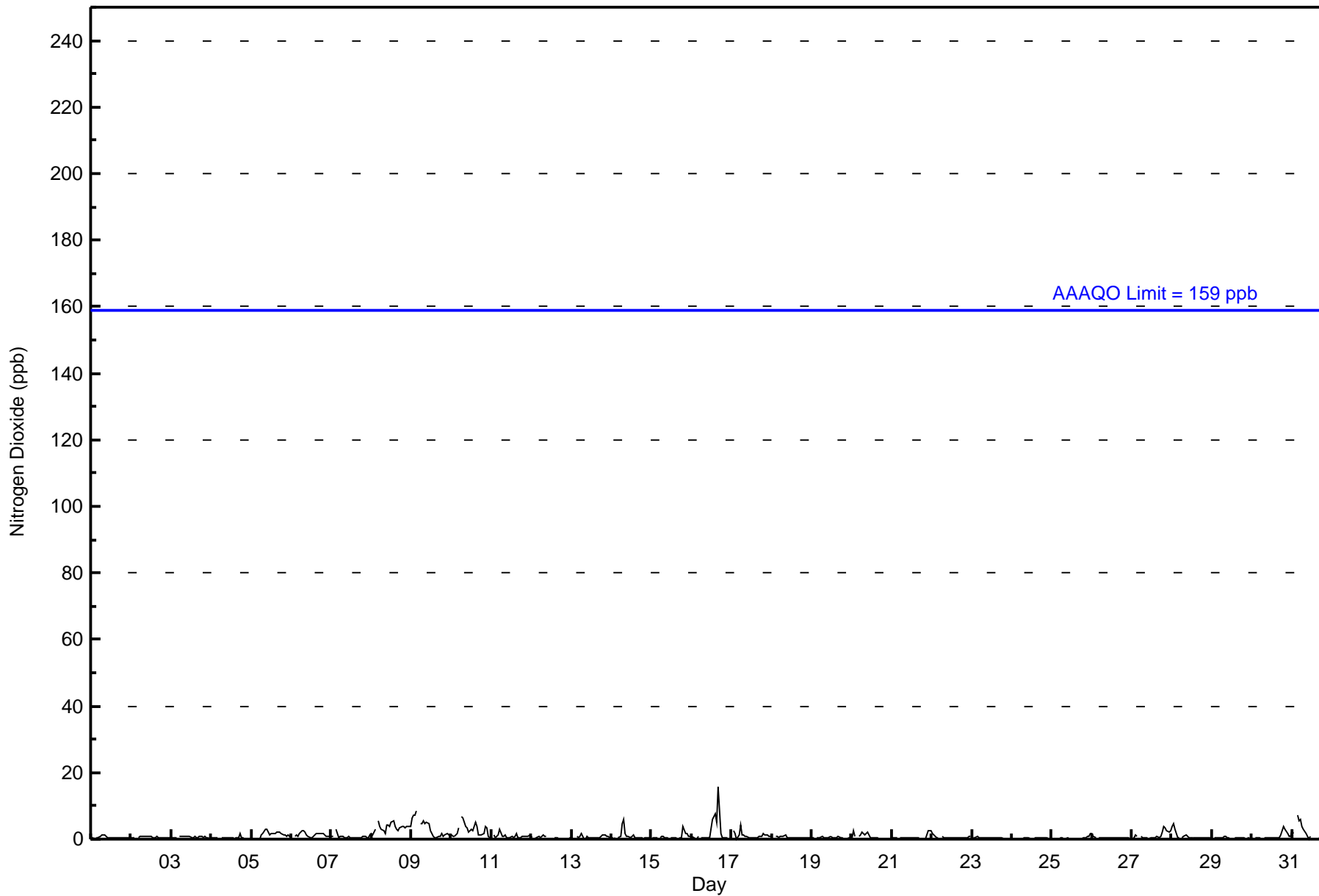
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	0	0	Z	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0.5	1
2-Jul	0	0	0	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0.6	1
3-Jul	0	0	0	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0.6	1
4-Jul	1	0	0	1	1	Z	0	0	1	0	0	0	1	0	0	1	0	0	1	2	1	0	0	0	0.4	2
5-Jul	Z	0	0	0	0	0	1	2	3	3	2	1	2	2	2	2	2	2	2	2	1	1	1	1	1.4	3
6-Jul	1	Z	1	1	1	2	3	3	2	1	1	1	1	1	2	2	2	2	2	2	1	1	1	1	1.3	3
7-Jul	1	1	Z	3	1	1	1	1	0	0	1	1	0	0	0	1	0	1	1	1	1	1	1	1	0.7	3
8-Jul	2	1	3	Z	6	4	3	3	2	4	4	4	5	6	4	3	3	3	4	4	4	3	4	4	3.5	6
9-Jul	7	7	7	9	Z	5	5	5	5	5	5	3	2	1	1	1	1	1	2	1	1	2	1	1	3.2	9
10-Jul	1	1	1	2	3	Z	7	7	4	3	2	3	3	3	5	4	1	1	1	2	4	3	1	0	2.7	7
11-Jul	Z	1	1	1	1	3	1	1	1	1	0	1	1	1	2	1	1	1	1	1	1	1	1	1	0.9	3
12-Jul	1	Z	0	0	1	1	1	1	1	1	C	C	C	C	1	0	0	0	0	0	0	0	0	0	0.5	1
13-Jul	0	0	Z	1	0	1	2	0	0	1	1	0	0	0	1	0	0	0	1	1	1	1	1	1	0.6	2
14-Jul	0	0	0	Z	1	1	5	6	2	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.9	6
15-Jul	0	0	1	1	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	1	4	2	2	1	1	0.7	4
16-Jul	1	0	0	0	1	Z	1	0	0	0	0	1	6	7	8	5	16	2	0	0	0	0	0	0	2.2	16
17-Jul	Z	3	2	0	1	4	1	1	1	1	1	1	1	0	1	1	1	1	1	2	1	1	1	1	1.2	4
18-Jul	1	Z	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0.5	1
19-Jul	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0	1	0.5	1
20-Jul	0	3	1	Z	1	1	2	2	1	2	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0.8	3
21-Jul	0	1	0	0	Z	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	2	3	0.6	3
22-Jul	2	1	1	1	1	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.6	2
23-Jul	Z	0	0	1	1	0	0	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0.4	1
24-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	1	0	0	0.3	1
25-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0.3	2
26-Jul	2	1	1	Z	0	0	0	1	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0	0	0.5	2
27-Jul	0	1	1	1	Z	1	1	1	1	1	0	0	0	0	0	1	1	1	2	4	3	3	2	2	1.1	4
28-Jul	4	5	3	1	1	Z	1	1	1	1	1	0	1	1	1	1	1	1	0	0	0	1	0	0	1.0	5
29-Jul	Z	1	1	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
30-Jul	1	Z	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0	1	3	4	3	2	1	1	0.9	4
31-Jul	3	2	Z	7	5	6	4	3	2	1	0	1	PF	PF	PF	PF	0	0	0	1	1	1	1	0	1.9	7
	1.0	1.2	1.0	1.2	1.0	1.4	1.5	1.4	1.1	1.1	0.9	0.8	1.0	1.0	1.0	0.9	1.1	0.8	0.8	1.0	0.9	0.9	0.8	0.8		Diurnal Average
	7	7	7	9	6	6	7	7	5	5	5	4	6	7	8	5	16	3	4	4	4	4	4	4		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 (NO₂) - ppb
Brion MacKay River - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Brion MacKay River - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	705	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: 705

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Brion MacKay River - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	84	64	41	9	19	9	46	52	43	44	40	60	55	36	35	65	702
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	84	64	41	9	19	9	46	52	43	44	40	60	55	36	35	65	702

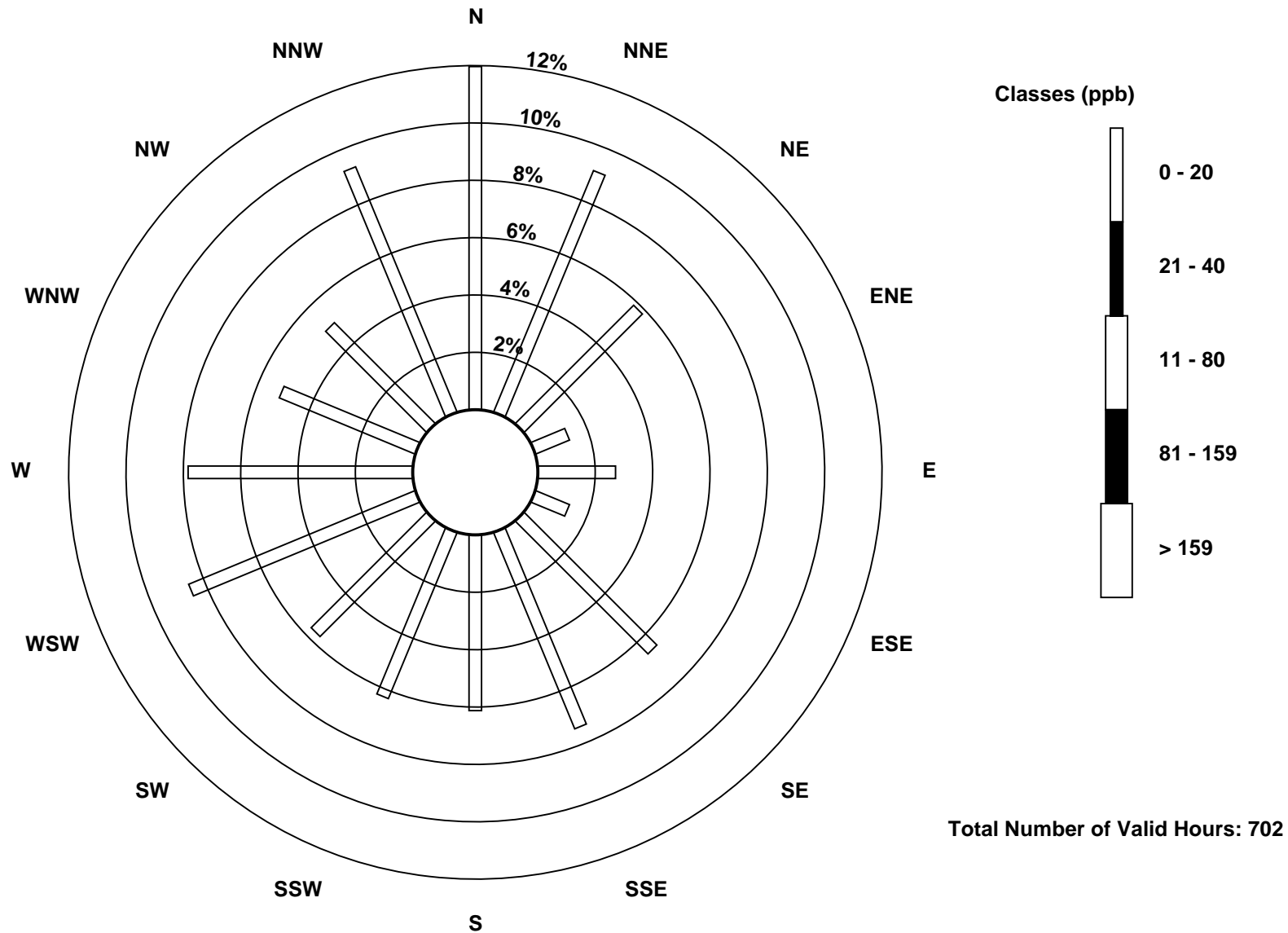
Total Number of Valid Hours: 702

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

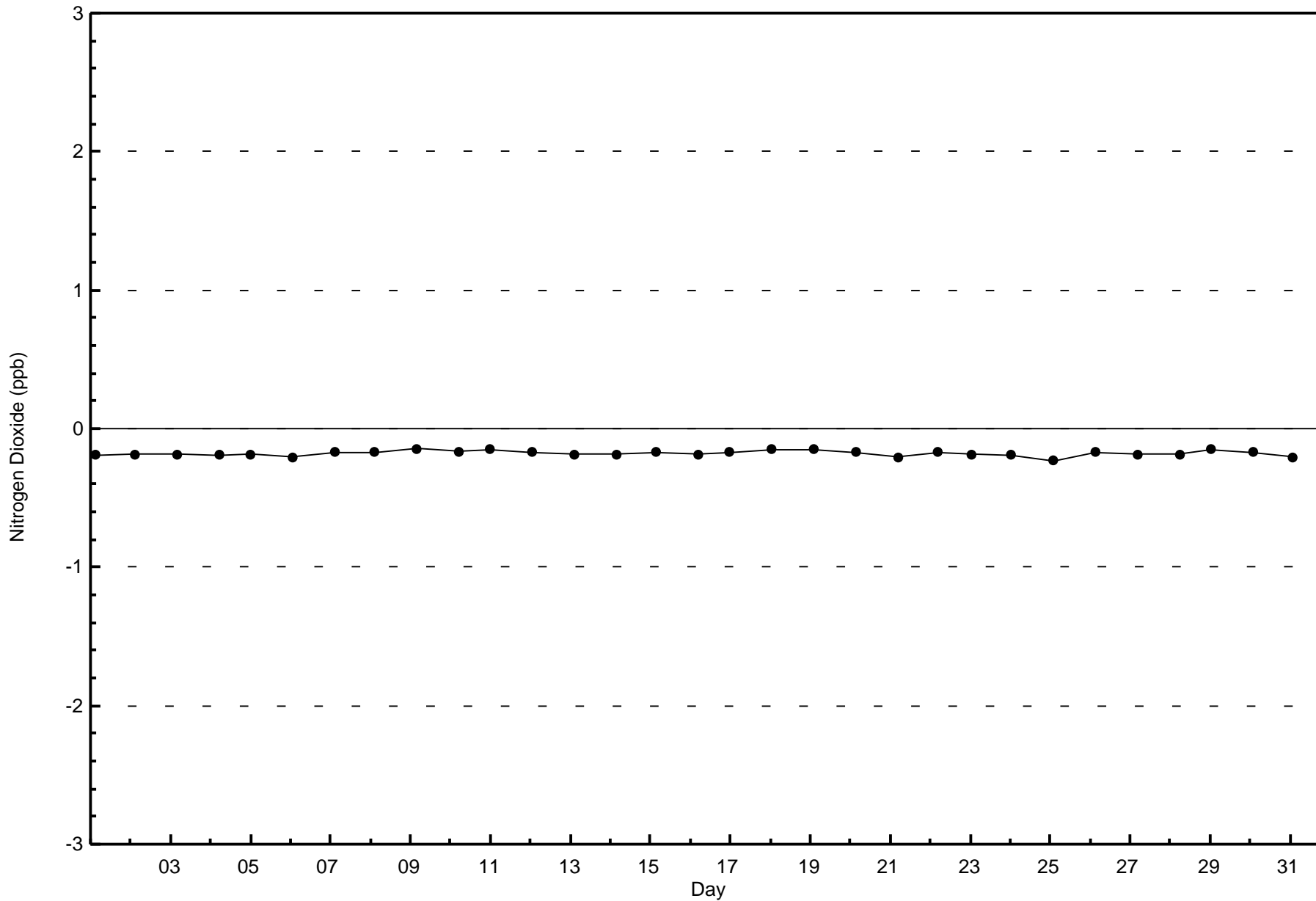
Nitrogen Dioxide (NO₂) - ppb
Brion MacKay River (AMS 20)

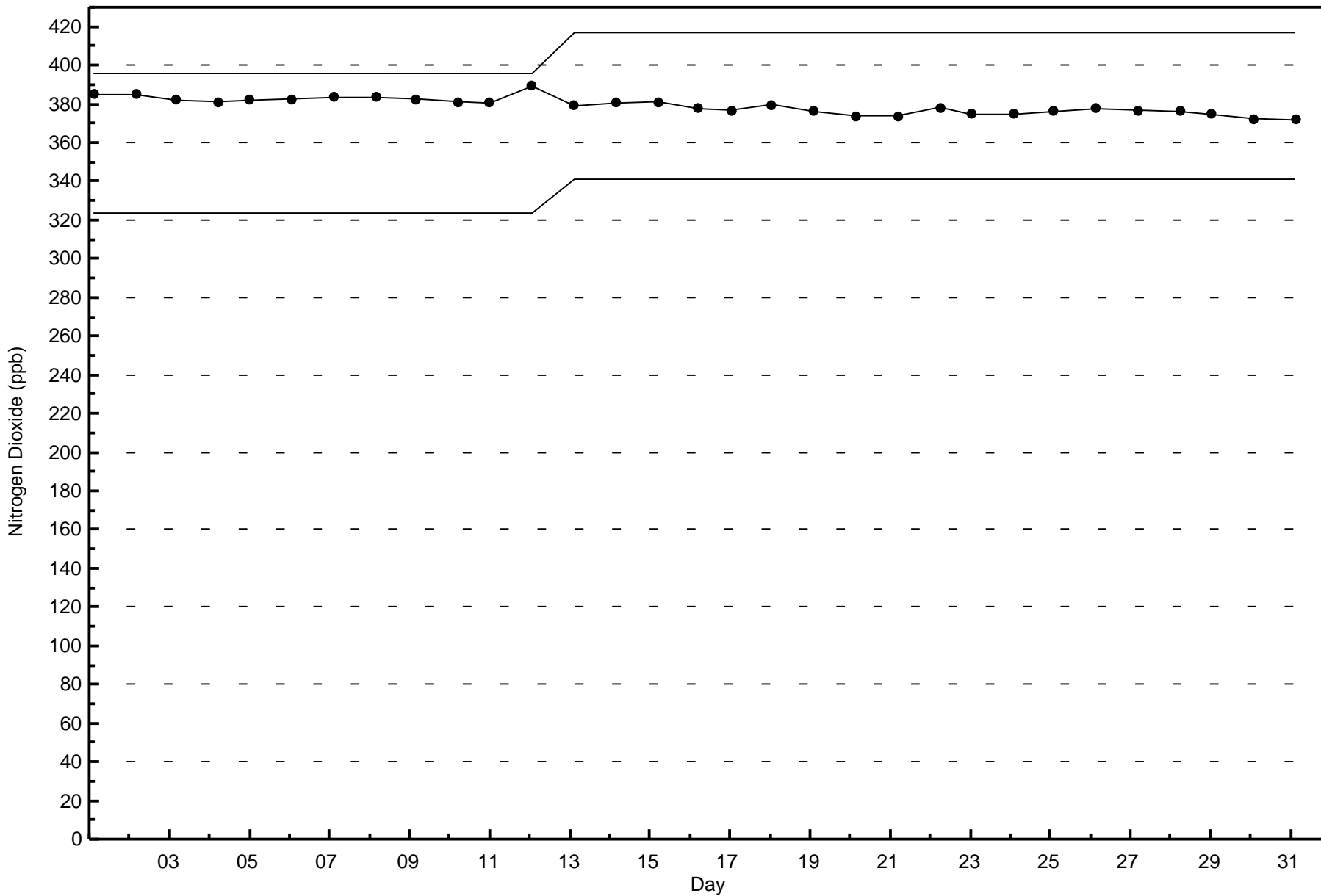




Wood Buffalo Environmental Association
Zero Responses

Nitrogen Dioxide (NO₂) - ppb
Brion MacKay River - July 2016







Wood Buffalo Environmental Association
Summary of Hour Averages

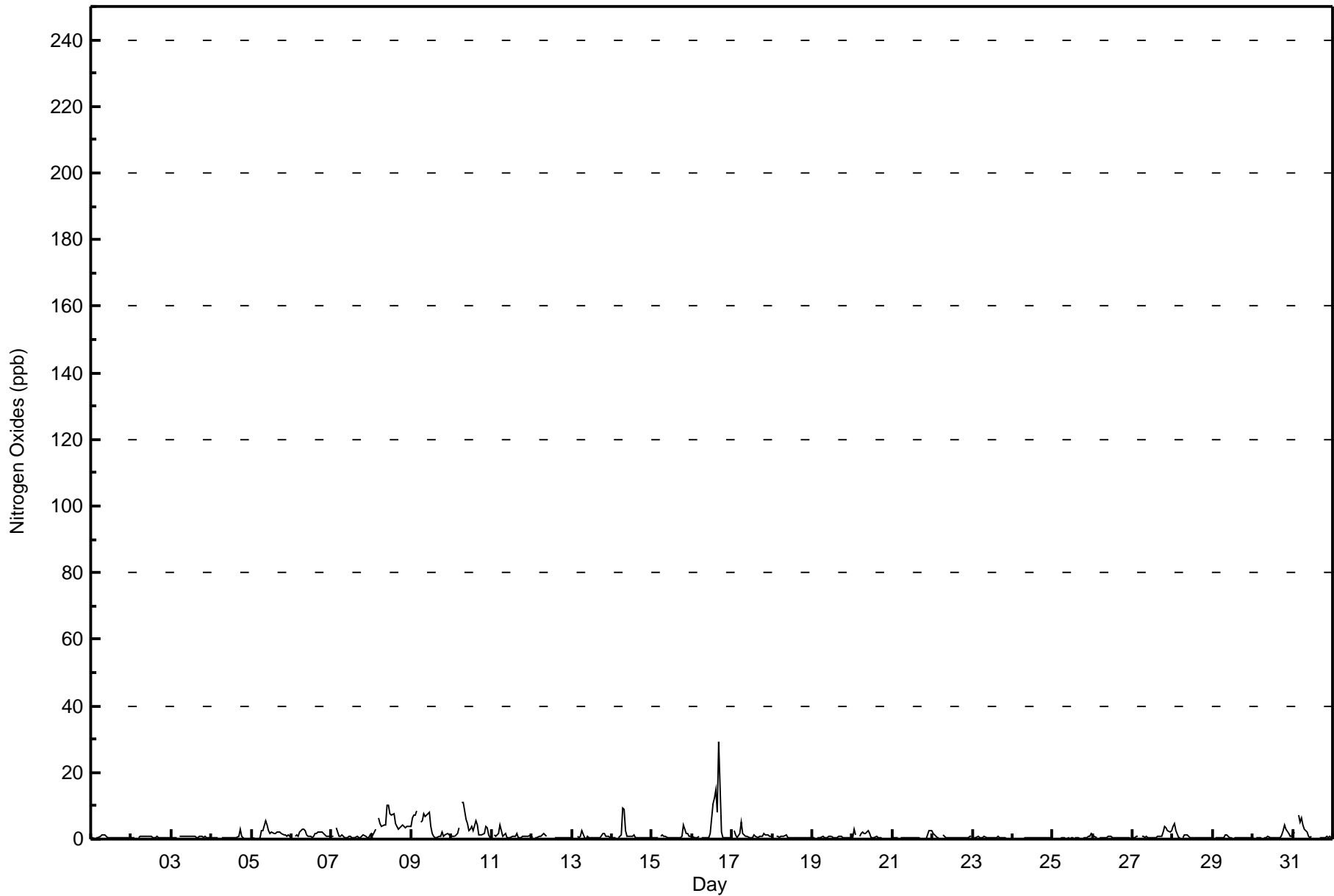
Nitrogen Oxides (NO_x) - ppb
Brion MacKay River - July 2016

Maximum Value: 29 ppb on Jul 16 17:00																	Maximum Daily Average: 4.8 ppb on Jul 8							Hours in Service: 744		
Minimum Value: 0 ppb on Jul 25 19:00																	Minimum Daily Average: 0.3 ppb on Jul 24							Hours of Data: 705		
Maximum Diurnal Average: 2.0 ppb at hour 7																	Minimum Diurnal Average: 0.8 ppb at hour 23							Hours of Missing Data: 39		
Monthly Average: 1.2 ppb																	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 O ₃ = 1 P ₉₀ = 3 P ₉₉ = 10							Hours of Calibration: 35		
																	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-Jul	0	0	Z	0	0	1	1	1	1	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0.6	1
2-Jul	0	0	0	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0.6	1
3-Jul	0	0	0	0	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0.6	1
4-Jul	0	0	0	0	0	Z	0	0	1	0	0	0	0	1	0	0	1	3	1	0	0	0	0	0	0.5	3
5-Jul	Z	0	0	0	0	0	2	3	5	4	3	2	2	2	2	2	2	2	2	1	1	1	1	1	1.7	5
6-Jul	1	Z	1	1	1	2	3	3	2	1	1	1	1	1	2	2	2	2	2	2	1	1	1	1	1.5	3
7-Jul	1	1	Z	3	1	1	1	1	0	0	1	1	0	0	0	1	1	1	1	1	1	1	1	1	0.8	3
8-Jul	2	1	3	Z	6	5	4	4	4	10	10	7	7	8	5	4	3	4	4	4	3	4	4	4	4.8	10
9-Jul	6	7	7	9	Z	5	6	8	7	7	8	4	2	1	1	1	1	1	2	1	1	2	1	1	3.8	9
10-Jul	1	1	1	2	4	Z	11	11	6	5	3	3	4	3	5	4	1	1	1	2	4	3	1	0	3.3	11
11-Jul	Z	1	1	1	1	4	1	1	2	0	0	0	1	1	1	2	1	1	1	1	1	1	1	1	1.1	4
12-Jul	0	Z	0	0	1	1	1	2	1	1	C	C	C	C	1	0	0	0	0	0	0	0	0	0	0.5	2
13-Jul	0	0	Z	1	1	1	3	0	0	1	1	0	0	1	1	0	0	1	2	2	1	1	1	0	0.7	3
14-Jul	0	0	0	Z	1	1	9	9	2	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1.3	9
15-Jul	0	0	1	1	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	1	4	2	2	1	1	0.8	4
16-Jul	1	0	0	0	1	Z	1	0	1	1	0	2	11	12	15	8	29	2	0	0	0	0	0	0	3.7	29
17-Jul	Z	3	1	0	1	5	2	1	1	1	1	1	1	1	0	1	1	1	1	2	1	1	1	1	1.3	5
18-Jul	1	Z	1	1	1	1	1	1	1	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0.6	1
19-Jul	0	1	Z	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	0	0	0	0	0	0.5	1
20-Jul	0	3	1	Z	1	2	2	2	2	2	2	0	1	0	1	1	0	0	0	0	0	0	0	0	0.9	3
21-Jul	0	0	0	0	Z	1	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	2	3	0.6	3
22-Jul	2	1	1	0	1	Z	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0.6	2
23-Jul	Z	0	0	1	1	0	1	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0.4	1
24-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	1	0	0	0.3	1
25-Jul	0	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0.3	2
26-Jul	1	1	1	Z	0	0	0	0	1	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0.5	1
27-Jul	0	1	1	1	Z	1	1	1	1	1	0	0	0	0	0	1	1	1	2	4	3	3	2	2	1.1	4
28-Jul	4	5	3	1	1	Z	0	1	1	1	1	0	1	1	1	1	1	1	0	0	0	0	0	0	1.0	5
29-Jul	Z	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
30-Jul	1	Z	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	3	4	3	2	1	1	0.9	4
31-Jul	2	2	Z	7	5	6	4	3	2	1	0	1	PF	PF	PF	PF	1	0	0	1	1	0	1	0	2.0	7
1.0 1.2 1.0 1.2 1.1 1.6 2.0 2.0 1.5 1.5 1.3 1.0 1.3 1.3 1.4 1.1 1.6 0.9 0.9 1.1 1.0 0.9 0.8 0.8																								Diurnal Average		
6 7 7 9 6 6 11 11 7 10 10 7 11 12 15 8 29 4 4 4 4 4 4 4 4																								Diurnal Maximum		
Z - zerospan			C - Calibration			PF - Power Failure																				



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Brion MacKay River - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Brion MacKay River - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	704	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: 705

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Brion MacKay River - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	83	64	41	9	19	9	46	52	43	44	40	60	55	36	35	65	701
21 - 40	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	84	64	41	9	19	9	46	52	43	44	40	60	55	36	35	65	702

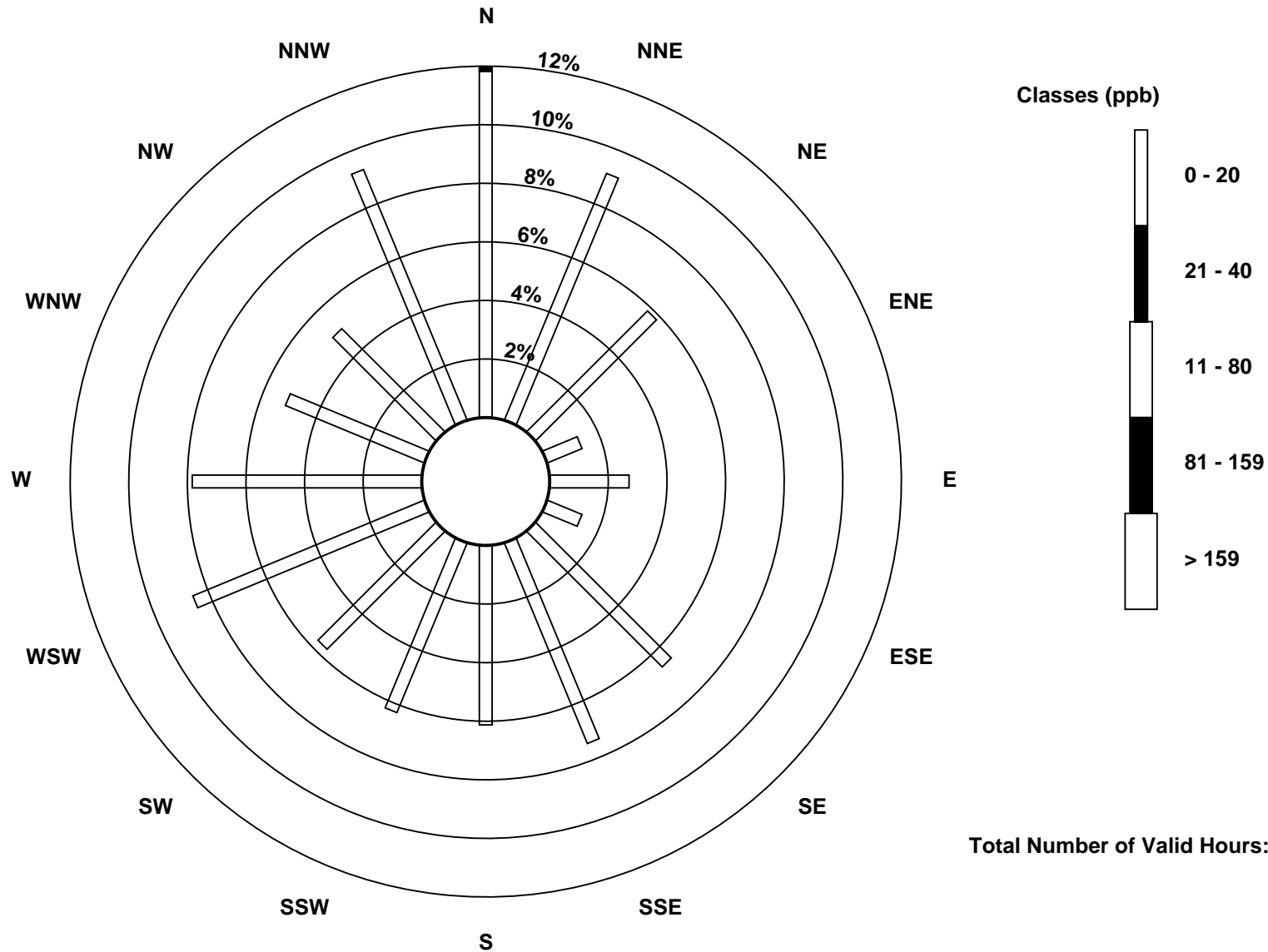
Total Number of Valid Hours: 702

Total Number of Hours: 744

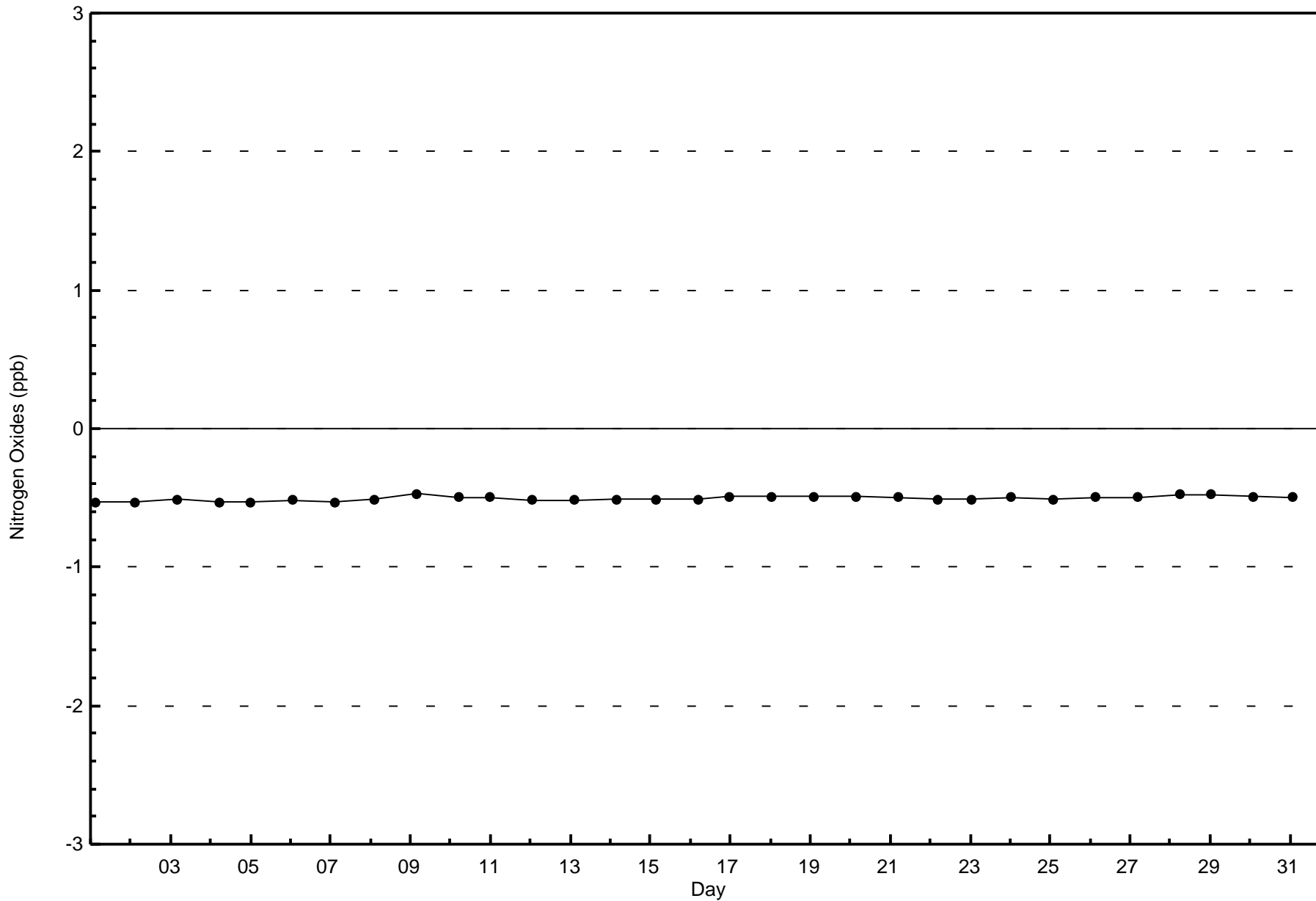


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Nitrogen Oxides (NO_x) - ppb
Brion MacKay River (AMS 20)



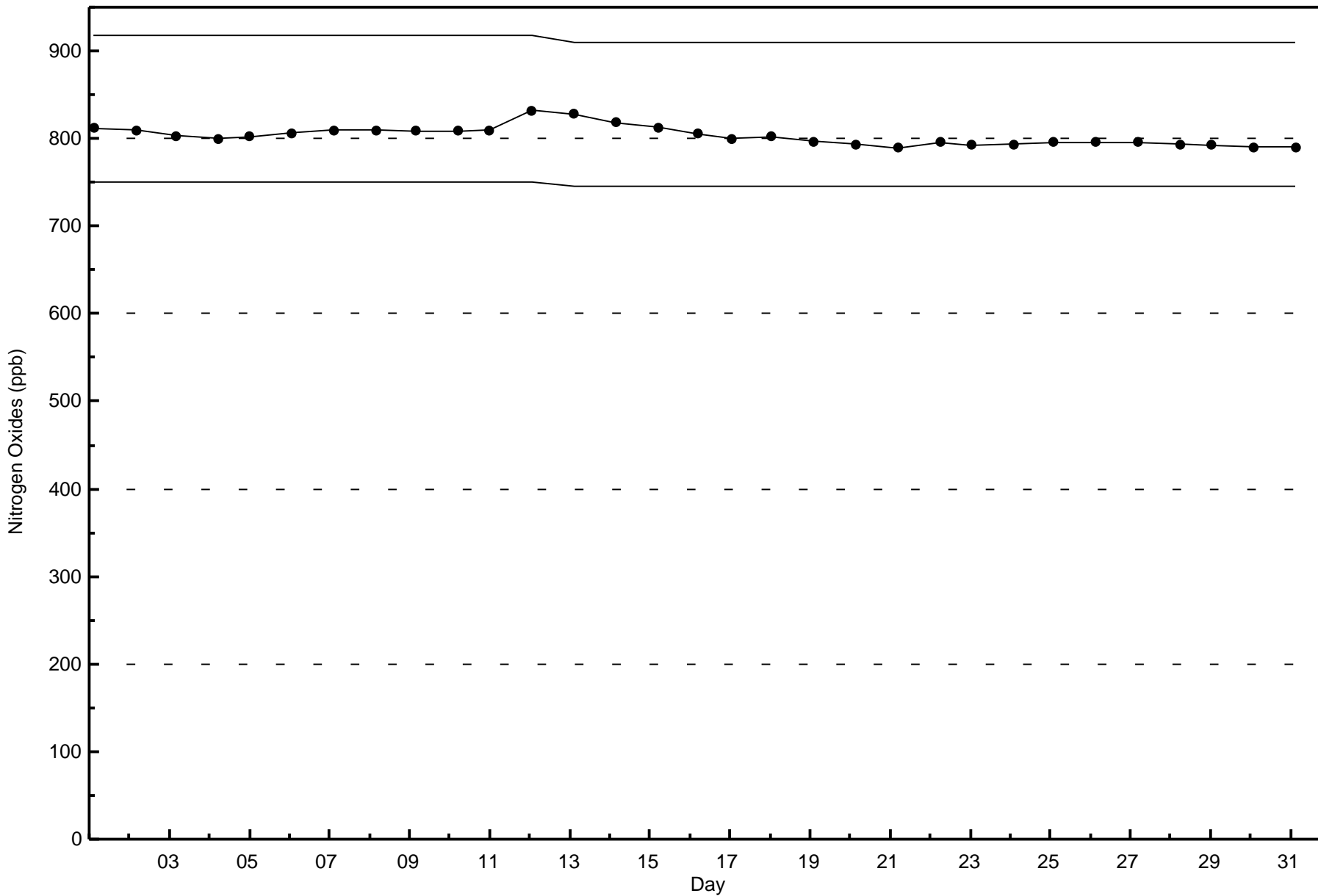
Total Number of Valid Hours: 702





Wood Buffalo Environmental Association
Span Responses

Nitrogen Oxides (NO_x) - ppb
Brion MacKay River - July 2016

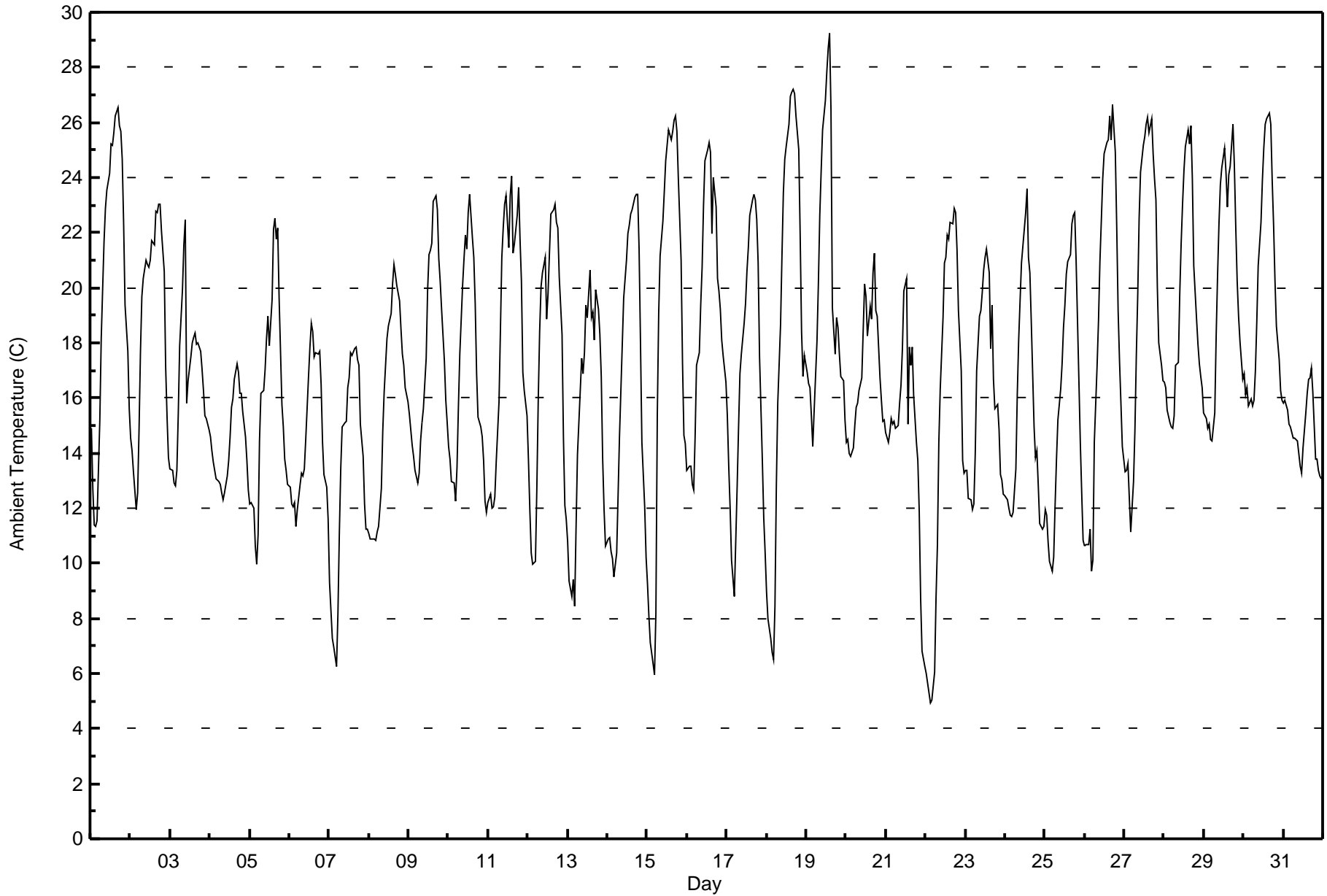




Wood Buffalo Environmental Association
Summary of Hour Averages

Ambient Temperature (AT) - C
Brion MacKay River - July 2016

Maximum Value: 29.2 C on Jul 19 15:00 Maximum Daily Average: 20.3 C on Jul 1																						Hours in Service: 744 Hours of Data: 744																										
Minimum Value: 4.9 C on Jul 22 04:00 Minimum Daily Average: 13.3 C on Jul 7 Maximum Diurnal Average: 22.1 C at hour 15 Minimum Diurnal Average: 11.4 C at hour 5 Monthly Average: 17.18 C Percentiles: P ₁ = 6.2 P ₁₀ = 11.3 Q ₁ = 13.7 Median = 16.8 Q ₃ = 21.0 P ₉₀ = 23.9 P ₉₉ = 26.9																						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-Jul	14.9	12.7	11.4	11.3	11.5	15.2	18.1	19.9	21.6	22.9	23.5	24.2	25.2	25.2	25.7	26.2	26.6	25.9	25.7	24.7	22.3	19.4	17.7	15.6	20.3	26.6																						
2-Jul	14.5	14.1	13.3	12.0	12.6	14.8	17.7	19.7	20.4	21.0	20.9	20.7	21.0	21.7	21.5	22.8	22.7	23.0	23.0	22.1	20.6	17.1	15.3	13.8	18.6	23.0																						
3-Jul	13.4	13.4	12.9	12.8	13.4	15.4	17.9	19.9	21.6	22.5	15.8	16.6	17.5	18.0	18.2	18.3	18.0	18.0	17.7	17.0	16.3	15.4	15.3	14.8	16.7	22.5																						
4-Jul	14.6	14.1	13.7	13.4	13.1	13.0	12.9	12.6	12.3	12.6	13.2	13.8	14.6	15.6	15.9	16.7	17.2	16.9	16.2	16.2	15.5	14.6	13.7	12.7	14.4	17.2																						
5-Jul	12.1	12.2	12.0	10.6	9.9	11.0	14.4	16.2	16.3	17.0	18.2	19.0	17.9	19.6	22.1	22.5	21.7	22.2	19.6	15.8	15.0	13.8	13.4	12.8	16.1	22.5																						
6-Jul	12.7	12.2	12.0	12.2	11.4	12.0	12.9	13.3	13.2	13.4	14.5	16.8	17.8	18.7	18.4	17.5	17.6	17.6	17.7	16.5	14.4	13.2	12.8	11.6	14.6	18.7																						
7-Jul	9.3	8.3	7.3	7.0	6.3	8.2	11.1	13.4	14.9	15.1	15.2	16.4	16.7	17.6	17.5	17.8	17.9	17.4	17.2	15.1	13.9	12.2	11.2	11.2	13.3	17.9																						
8-Jul	11.1	10.9	10.9	10.9	10.8	11.1	11.4	12.7	14.8	16.2	17.2	18.2	18.6	19.1	20.1	20.8	20.5	20.1	19.5	18.5	17.6	17.2	16.4	15.8	15.9	20.8																						
9-Jul	15.4	14.8	14.3	13.9	13.4	12.9	13.3	14.4	15.1	15.6	17.5	19.9	21.2	21.3	21.6	23.1	23.3	22.8	21.1	20.2	19.2	17.4	15.9	15.1	17.6	23.3																						
10-Jul	14.2	13.8	13.0	12.9	12.3	13.5	15.7	17.6	20.1	21.0	21.9	21.4	22.7	23.4	21.8	21.1	19.4	16.9	15.3	15.0	14.6	13.7	12.3	11.8	16.9	23.4																						
11-Jul	12.2	12.5	12.0	12.1	12.4	13.7	15.9	18.4	21.1	22.1	23.0	23.3	21.5	23.3	24.0	21.3	21.6	22.6	23.6	21.8	20.2	17.0	16.3	15.4	18.6	24.0																						
12-Jul	13.8	11.9	10.4	10.0	10.1	12.7	15.9	18.4	20.0	20.6	21.1	18.9	19.8	21.3	22.7	22.9	23.0	22.4	22.2	20.4	18.3	14.6	12.1	11.6	17.3	23.0																						
13-Jul	10.8	9.4	8.8	9.4	8.5	11.3	13.9	16.3	17.4	16.9	17.7	19.4	18.9	20.7	18.9	19.1	18.1	19.9	19.2	18.3	16.8	13.8	12.0	10.6	15.2	20.7																						
14-Jul	10.9	10.9	10.4	10.2	9.5	10.4	12.5	14.6	16.3	17.9	19.6	21.0	22.0	22.3	22.7	22.9	23.3	23.4	23.4	21.4	18.0	14.4	12.1	10.2	16.7	23.4																						
15-Jul	9.3	8.1	7.1	6.3	5.9	8.2	15.3	19.1	21.1	22.4	23.5	24.6	25.2	25.7	25.4	25.7	26.1	26.2	25.7	24.0	21.0	17.3	14.6	14.3	18.4	26.2																						
16-Jul	13.4	13.5	13.5	12.9	12.7	14.6	17.2	17.6	19.4	20.8	23.0	24.6	25.0	25.3	24.9	22.0	24.0	22.9	20.3	19.9	19.2	18.1	17.5	16.6	19.1	25.3																						
17-Jul	15.4	13.5	12.0	10.1	8.8	10.8	12.7	14.9	16.9	17.6	18.7	19.4	20.6	21.4	22.6	23.2	23.4	23.2	22.5	20.9	17.5	13.7	11.7	10.4	16.7	23.4																						
18-Jul	9.0	8.0	7.3	6.7	6.5	8.4	12.8	15.8	18.7	21.1	23.4	24.6	25.1	25.9	26.9	27.1	27.2	27.0	26.2	25.0	21.9	18.4	16.8	17.5	18.6	27.2																						
19-Jul	16.9	16.5	16.4	15.4	14.3	15.6	18.0	20.2	22.6	24.2	25.7	26.8	27.8	28.7	29.2	26.4	19.3	17.6	18.9	18.5	17.6	16.8	16.6	15.2	20.2	29.2																						
20-Jul	14.4	14.5	14.0	13.9	14.2	15.0	15.7	15.8	16.3	16.7	18.4	20.1	19.7	18.3	19.3	18.8	20.5	21.3	19.2	18.9	16.7	15.9	15.2	15.2	17.0	21.3																						
21-Jul	14.8	14.4	14.7	15.2	15.0	15.2	14.9	15.0	15.8	16.5	17.8	19.9	20.3	15.1	17.8	17.2	17.8	16.1	14.4	13.7	11.9	8.7	6.8	6.2	14.8	20.3																						
22-Jul	6.0	5.6	5.3	4.9	5.1	6.1	8.7	10.7	14.4	16.3	18.9	20.9	21.1	21.9	21.8	22.4	22.3	22.9	22.7	21.3	19.2	17.0	13.7	13.3	15.1	22.9																						
23-Jul	13.4	13.4	12.4	12.3	12.0	12.1	14.0	17.0	19.0	19.2	19.8	20.6	21.1	21.4	20.5	17.8	19.4	16.7	15.6	15.8	14.9	13.2	13.0	12.5	16.1	21.4																						
24-Jul	12.4	12.3	12.0	11.7	11.7	11.8	13.4	16.1	18.1	19.5	20.9	22.1	22.7	23.6	21.1	20.5	18.7	15.0	13.8	14.1	12.8	11.5	11.2	11.3	15.8	23.6																						
25-Jul	11.9	11.7	10.8	10.1	9.7	10.2	12.1	13.8	15.2	16.3	17.2	18.6	19.4	20.5	21.0	21.2	22.3	22.6	22.7	21.0	16.6	14.4	12.6	10.8	15.9	22.7																						
26-Jul	10.6	10.7	10.7	11.3	9.7	10.1	14.4	17.2	18.8	21.0	22.4	24.0	24.9	25.3	25.4	26.2	25.4	26.6	24.9	22.2	19.2	17.4	15.8	14.2	18.7	26.6																						
27-Jul	13.3	13.4	13.7	12.4	11.1	13.0	14.8	17.5	19.8	22.6	24.2	25.2	25.5	26.0	26.2	25.6	26.2	24.9	24.0	23.2	20.0	18.0	17.2	16.6	19.8	26.2																						
28-Jul	16.6	16.4	15.6	15.1	15.0	14.9	15.3	17.2	17.3	19.8	21.6	23.0	24.2	25.1	25.7	25.2	25.9	23.9	20.8	18.9	18.0	17.3	16.8	16.4	19.4	25.9																						
29-Jul	15.4	15.2	14.9	15.1	14.5	14.5	15.5	18.2	20.5	22.3	23.7	24.4	25.1	24.2	22.9	24.1	24.4	25.9	24.4	22.2	20.2	19.0	18.1	16.7	20.1	25.9																						
30-Jul	16.9	16.1	16.4	15.7	16.0	15.7	15.9	17.0	18.8	20.8	22.4	23.9	25.1	25.9	26.1	26.3	25.9	23.9	22.3	20.2	18.6	17.4	16.3	15.9	20.0	26.3																						
31-Jul	15.8	15.9	15.6	15.0	14.9	14.8	14.5	14.6	14.4	14.0	13.5	13.3	14.2	15.5	16.2	16.7	16.7	17.1	16.2	13.8	13.8	13.4	13.2	13.1	14.8	17.1																						
																								13.1	12.6	12.1	11.7	11.4	12.5	14.5	16.3	17.8	18.9	19.8	20.8	21.4	21.9	22.1	21.9	21.8	21.4	20.5	19.2	17.5	15.5	14.3	13.5	Diurnal Average
																								16.9	16.5	16.4	15.7	16.0	15.7	18.1	20.2	22.6	24.2	25.7	26.8	27.8	28.7	29.2	27.1	27.2	27.0	26.2	25.0	22.3	19.4	18.1	17.5	Diurnal Maximum





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Brion MacKay River - July 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	38	5.11	5.11
10 - 20	483	64.92	70.03
> 20	223	29.97	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744

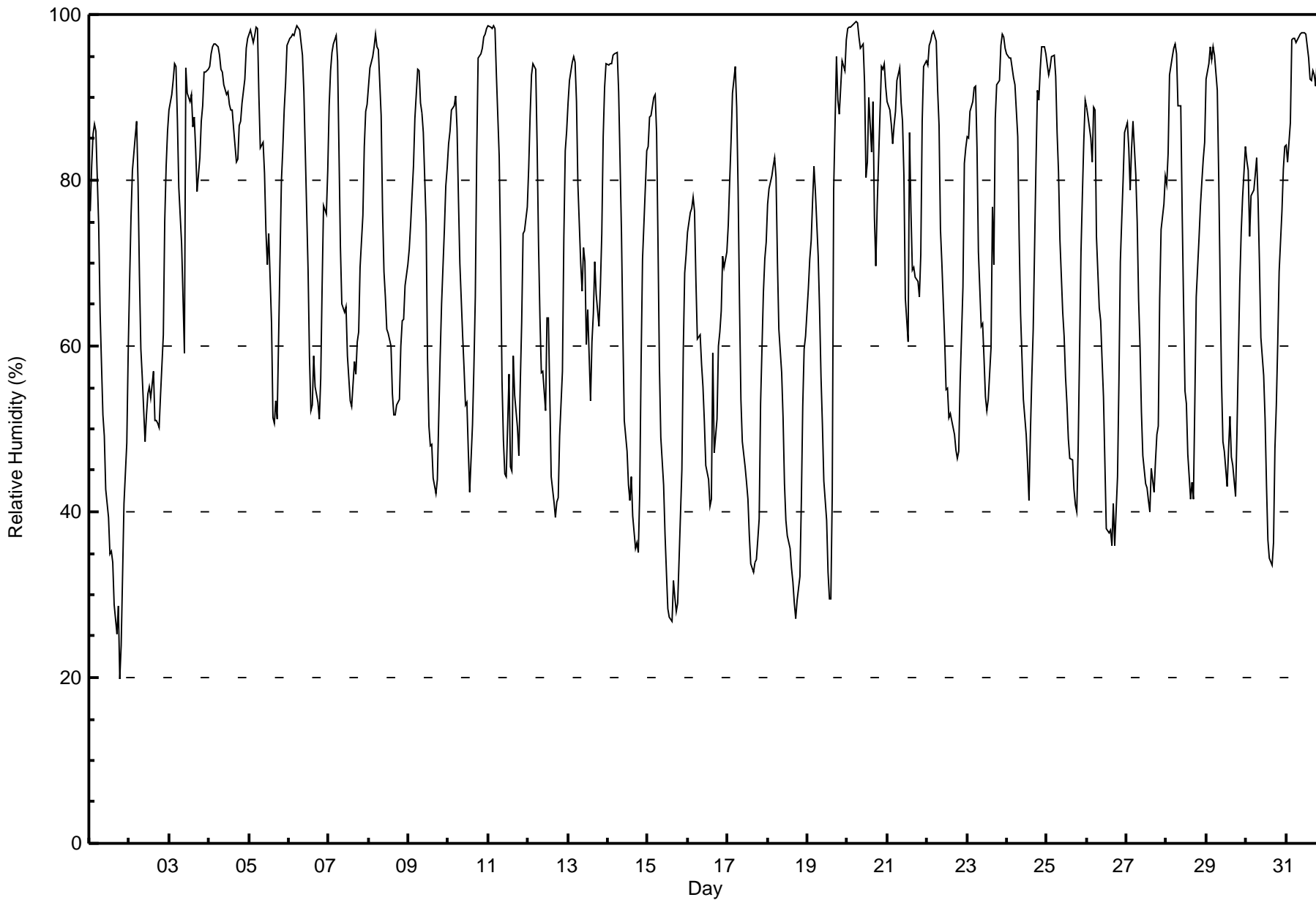


Wood Buffalo Environmental Association

Summary of Hour Averages

**Relative Humidity (RH) - %
Brion MacKay River - July 2016**

Maximum Value: 99 % on Jul 20 06:00																			Maximum Daily Average: 94.7 % on Jul 31						Hours in Service: 744																									
Minimum Value: 20 % on Jul 1 19:00																			Minimum Daily Average: 50.3 % on Jul 1						Hours of Data: 744																									
Maximum Diurnal Average: 91.8 % at hour 5																			Minimum Diurnal Average: 51.6 % at hour 15						Hours of Missing Data: 0																									
Monthly Average: 71.1 %																			Percentiles: P ₁ = 28 P ₁₀ = 42 Q ₁ = 54 Median = 74 Q ₃ = 90 P ₉₀ = 96 P ₉₉ = 99						Hours of Calibration: 0																									
																			Percent Operational Time: 100.0																															
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																										
1-Jul	76	82	86	87	86	75	64	58	52	49	43	39	35	35	34	29	25	29	20	24	32	41	48	59	50.3	87																								
2-Jul	68	76	81	85	87	80	69	60	56	48	52	54	55	54	57	51	51	51	50	54	61	75	82	86	64.3	87																								
3-Jul	88	90	92	94	94	87	79	72	66	59	94	91	90	90	87	88	84	79	83	87	89	93	93	93	85.9	94																								
4-Jul	94	95	96	96	96	96	95	93	93	91	90	91	89	88	89	86	82	83	87	87	89	92	96	97	91.4	97																								
5-Jul	98	98	97	97	98	98	90	84	85	81	74	70	74	63	51	51	53	51	61	80	84	89	92	96	79.7	98																								
6-Jul	97	97	98	97	98	99	98	97	95	91	84	69	59	52	53	59	55	53	51	56	67	77	76	81	77.4	99																								
7-Jul	89	93	95	96	97	94	83	72	65	64	65	59	56	53	53	58	57	60	62	69	76	84	88	89	74.2	97																								
8-Jul	91	94	95	96	98	96	96	88	76	69	66	62	61	60	54	52	52	53	54	60	63	63	67	70	72.3	98																								
9-Jul	72	75	78	82	87	93	93	89	88	86	75	58	50	48	48	44	42	44	51	59	65	74	79	82	69.3	93																								
10-Jul	84	86	89	89	90	86	78	70	61	57	53	53	47	42	50	57	66	83	95	95	96	97	98	98	75.9	98																								
11-Jul	99	99	98	99	98	93	83	72	56	49	45	44	57	45	45	59	54	50	47	55	63	74	74	77	68.0	99																								
12-Jul	81	88	93	94	93	84	72	63	57	57	52	63	63	54	44	41	39	41	42	49	57	73	84	86	65.5	94																								
13-Jul	89	92	94	95	94	89	79	70	67	72	70	60	64	53	61	64	70	66	62	67	74	85	91	94	76.0	95																								
14-Jul	94	94	94	95	95	95	91	82	74	62	51	47	43	41	44	40	36	36	35	42	58	70	79	84	66.0	95																								
15-Jul	84	88	88	90	90	86	73	58	49	43	37	33	28	27	27	32	30	28	29	34	45	59	69	71	54.1	90																								
16-Jul	74	76	77	78	76	68	61	61	58	55	51	46	44	41	42	59	47	51	60	62	64	71	70	71	60.9	78																								
17-Jul	75	80	85	91	94	89	79	65	54	49	45	44	42	37	34	33	34	34	37	39	53	66	71	72	58.3	94																								
18-Jul	77	79	81	82	83	80	70	62	57	51	43	39	37	36	33	32	29	27	29	32	41	53	60	61	53.1	83																								
19-Jul	67	71	73	77	82	79	71	64	56	51	44	39	33	30	30	42	79	95	90	88	91	94	93	97	68.1	97																								
20-Jul	98	98	99	99	99	99	99	97	96	96	92	80	82	90	83	90	76	70	77	83	94	93	94	91	90.6	99																								
21-Jul	90	88	87	84	87	88	92	94	89	87	80	66	61	86	76	69	70	68	68	66	71	87	94	94	80.9	94																								
22-Jul	94	96	97	98	98	97	91	87	74	70	61	55	55	51	52	51	49	47	46	47	56	67	82	84	71.0	98																								
23-Jul	85	85	88	89	91	91	84	71	62	63	59	54	52	54	60	77	70	87	92	92	96	98	97	96	78.9	98																								
24-Jul	95	95	95	94	92	92	85	73	64	59	54	49	46	41	50	56	62	82	91	90	93	96	96	95	76.9	96																								
25-Jul	94	93	94	95	95	93	86	81	73	64	61	56	53	49	46	46	43	41	40	48	71	78	85	90	69.7	95																								
26-Jul	89	88	85	82	89	88	73	65	63	58	54	46	38	37	38	36	41	36	44	56	70	75	80	86	63.2	89																								
27-Jul	87	84	79	84	87	81	75	66	60	52	47	43	43	41	40	45	42	46	49	50	66	74	77	80	62.5	87																								
28-Jul	79	83	93	95	96	96	95	89	89	76	65	55	53	47	42	44	41	53	66	73	77	80	83	85	73.1	96																								
29-Jul	92	94	96	95	96	95	91	80	68	56	49	47	43	47	52	47	46	42	50	59	68	74	78	84	68.6	96																								
30-Jul	82	81	73	78	79	81	83	78	70	61	56	51	43	37	34	34	36	48	53	60	69	76	81	84	63.7	84																								
31-Jul	84	82	87	97	97	97	97	97	98	98	98	98	98	95	92	92	93	93	91	98	98	98	98	98	94.7	98																								
																								86.0	87.7	89.0	90.6	91.8	89.2	83.1	76.1	70.0	65.3	61.5	56.8	54.6	52.5	51.6	53.6	53.3	55.7	58.4	63.3	70.9	78.3	82.4	84.9	Diurnal Average		
																								99	99	99	99	99	99	99	97	98	98	98	98	98	98	95	92	92	93	95	95	98	98	98	98	98	Diurnal Maximum	





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity (RH) - %
Brion MacKay River - July 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	1	0.13	0.13
20 - 40	54	7.26	7.39
40 - 60	194	26.08	33.47
60 - 80	176	23.66	57.12
80 - 100	319	42.88	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association
Summary of Hour Averages

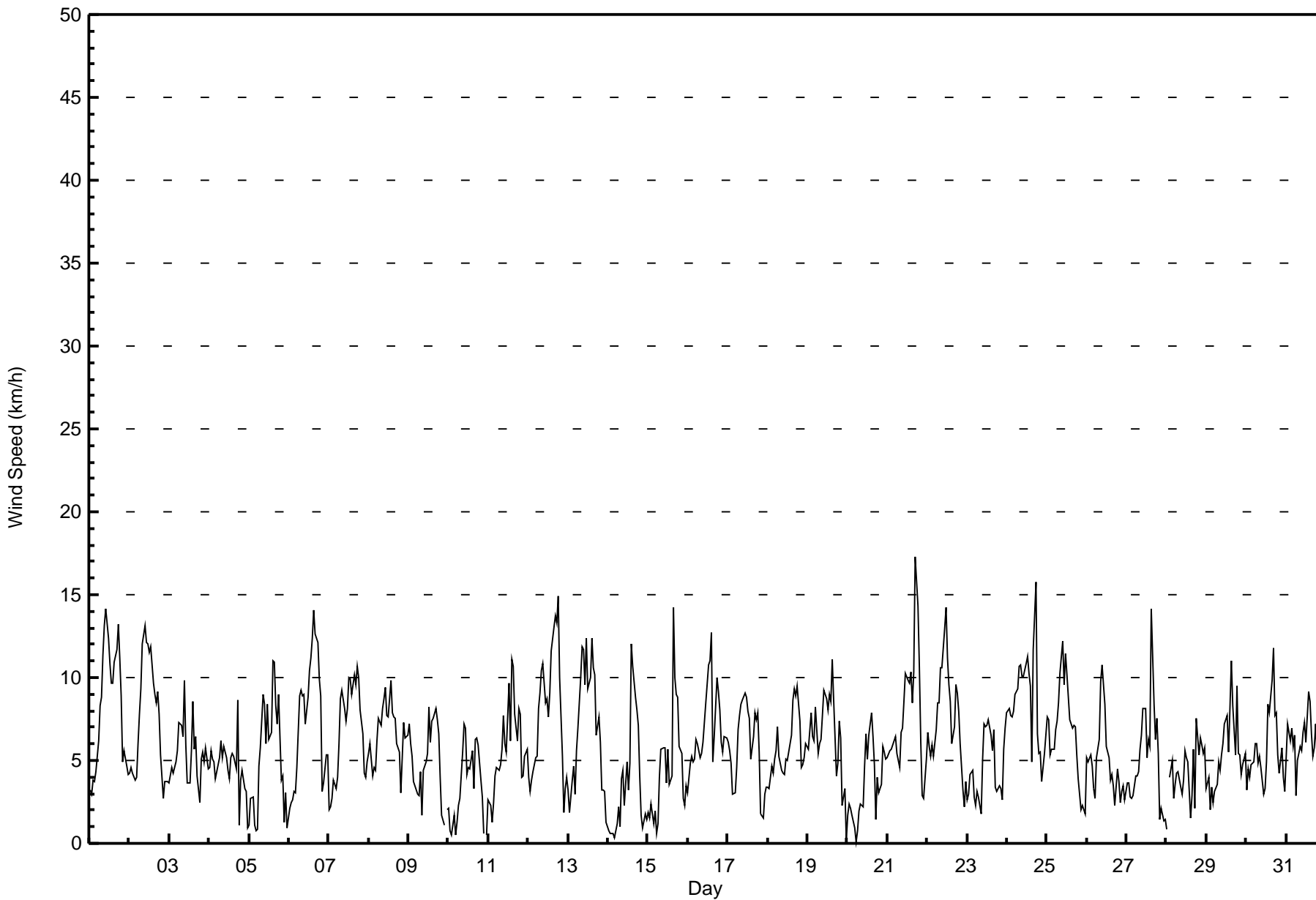
Wind Speed (WS) - km/h
Brion MacKay River - July 2016

Maximum Speed: 17 km/h on Jul 21 18:00	Maximum Daily Speed Average: 7.9 km/h on Jul 1	Hours in Service: 744
Minimum Speed Value: 0 km/h on Jul 20 06:00	Minimum Daily Speed Average: 1.0 km/h on Jul 28	Hours of Data: 741
Maximum Diurnal Speed Average: 3.9 km/h at hour 17	Minimum Diurnal Speed Average: 0.1 km/h at hour 22	Hours of Missing Data: 3
Monthly Average Velocity: 1.2 km/h 311.7 deg	Percentiles: P ₁ = 1 P ₁₀ = 2 Q ₁ = 4 Median = 6 Q ₃ = 8 P ₉₀ = 10 P ₉₉ = 14	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-Jul	SE3	SE3	SE4	SE4	SE4	SE6	SE8	SE9	SE11	SSE13	SSE14	SSE12	S11	SE10	SE10	S11	SSE12	S13	SSE11	SSE9	SE5	SE6	SSE5	SE4	SSE7.9	SSE14
2-Jul	SSE4	SE5	SSE4	SSE4	SE4	SE6	SE8	SE9	SE12	SE13	SSE12	S12	SSW12	S12	SSW10	SSE9	SSE8	S9	S8	SSW5	S3	SE4	SE4	SE4	SSE6.9	SE13
3-Jul	SE4	SE5	SE4	SE5	SSE5	SSE6	SSE7	SSE7	SSE6	SSE10	SSE6	E4	SE4	SE6	ESE9	SSE6	SSW6	WSW4	SSE2	SSW5	W6	W5	W6	W4	SSE3.7	SSE10
4-Jul	WSW5	WSW6	WSW5	WSW5	WSW4	WSW5	WSW5	WSW6	WSW5	WSW6	WNW5	WSW4	W4	W5	SW5	WSW5	WNW4	WNW9	SW1	SSW4	SSE4	S3	SSE3	SE1	WSW3.8	WNW9
5-Jul	NNW1	NNE3	NE3	NE1	SW1	W1	NNW5	NNW6	NNW9	N8	NNW6	N8	NNE6	NNE7	NE11	NNE11	N8	N7	N9	NE4	ESE4	S1	SW3	SE1	N4.1	NE11
6-Jul	E2	S2	NW3	SW3	NNW3	NNW5	N9	N9	N9	N9	NNE7	NNE9	NNE10	NNE11	NNE12	NNE14	NNE13	NNE12	NNE10	NNE9	N3	N4	NNE5	NNE5	NNE6.7	NNE14
7-Jul	NNW2	N2	NW3	NW4	NNW3	NNW4	N6	N9	N9	N8	N7	N8	NNW10	N10	NNW9	NNE10	NNE10	NNE11	NE10	NE8	NNE7	NNE4	NNE4	NNE5	N6.3	NNE11
8-Jul	NNE5	NNE6	NE4	NNE5	NNE4	NNE6	NNE8	NNE7	NE8	NE9	NNE9	NE8	NE8	NNE10	NE8	NE8	NE8	NE6	NE5	NE3	NNE5	NE7	NNE6	NNE7	NE6.6	NNE10
9-Jul	NNE7	NE6	NE5	NNE4	N3	NNW3	ENE3	NE4	NNW2	NNE4	E5	E5	E8	E6	E7	E8	ENE8	E7	E7	SE4	E2	E1	AF	N2	ENE4.0	E8
10-Jul	NE2	SW1	N1	E2	SE1	ENE1	E2	NE3	N5	NNE7	NNE7	E4	NE5	ESE4	ENE6	S3	W6	W6	WNW6	WNW4	NNW3	SE1	AF	NNW1	NNE1.3	NNE7
11-Jul	W3	W2	SW1	W2	WNW4	NW5	NNW4	N5	NE6	NNE8	NNE6	N6	NE10	NNE6	N11	NNW11	N8	NNW6	N8	N8	N4	N4	N5	N6	N4.9	N11
12-Jul	N4	NNW3	NNW4	NNW4	NW5	NNW5	N8	NNE9	N10	NNE11	N8	NNE9	NE8	N9	N12	N13	N14	NNW13	N15	NNE10	N5	NNW2	NNW3	NNW4	N7.5	N15
13-Jul	NNW3	NW2	NW4	NW5	NNW3	WNW6	NW7	NNW10	N12	N12	NNW10	N12	N9	NNW10	NNW12	NNW11	N10	N7	NE8	NNE6	N3	NNW3	NW3	NW1	NNW6.5	NNW12
14-Jul	NNW1	N1	E1	WNW1	W0	WSW1	NW2	WNW1	WNW4	W4	NW2	NNW5	NE3	NNW5	N12	N11	N9	N8	N7	NNE4	N2	SSE1	SE2	SE1	NNW2.8	N12
15-Jul	SSE2	SSE1	SSE2	SSE1	SSE2	SSE1	WSW1	W4	WNW6	W6	W6	W4	NNW6	N4	NNW4	N14	N10	NNW9	WNW9	NW6	NNW5	WNW3	WSW2	WSW3	NW3.1	N14
16-Jul	SW3	WSW5	WSW5	WSW5	WSW5	WSW6	W6	WSW5	W5	W6	W7	WNW9	NW11	NW11	N13	NE5	N6	N10	N9	N8	N6	N5	N6	NNW6	NW4.8	N13
17-Jul	NW6	NW6	NNW5	NW3	W3	NW5	NNW7	NNE8	NNE8	NNE9	N9	NNW9	N8	NNW8	NNW5	N6	NE8	NE7	NE8	ENE6	ESE2	SE1	SE3	SSE3	N4.4	N9
18-Jul	SE3	SE3	SSE5	SSE4	SSE5	SSE6	S7	SSW5	SW4	SW4	SW4	SW5	W5	W6	SW7	SSW9	SSW9	SW9	SW10	SSW7	SSW5	S5	S5	S6	SSW4.9	SW10
19-Jul	S6	S7	S8	S6	S6	SSW8	SSW5	SSW6	SW6	SW8	SW9	SW9	WSW8	W9	W9	NNW11	NNW9	SSE4	SSE5	SSW7	S6	SSW2	WSW3	ENE0	SW4.6	NNW11
20-Jul	WNW2	NW2	WNW2	WSW2	SSW1	NNE0	NNE1	E2	SSW2	SW2	W5	WSW7	NE5	N6	NNW8	NNW6	NW5	WNW1	E4	SSE3	S4	S6	SSW6	SW5	W1.1	NNW8
21-Jul	WSW5	SW6	SW6	SW6	SW6	WSW5	WSW5	WSW7	WSW7	WSW9	W10	W10	W10	WNW10	WNW8	NW10	N17	NNW14	NNW11	NNW6	NNE3	ESE3	SE5	W5.0	N17	
22-Jul	SE7	SSE6	SSE5	SE6	SSE5	SSE7	SSE9	S8	S11	S11	S13	S14	SSW11	SW10	SW9	WSW6	WNW7	WNW10	W9	WNW8	NW6	NNW3	WSW2	SSW4	SSW5.1	S14
23-Jul	W3	WSW3	W4	W4	W3	WSW2	WNW3	NNW3	W2	W5	W7	W7	WNW7	WSW7	W7	NNW6	N7	W3	S3	S3	S3	S3	SSW6	S7	WSW3.1	WSW7
24-Jul	SSW8	SSW8	SSW8	SSW8	SSW8	SSW9	SSW9	SW11	WSW11	WSW10	WSW10	WSW11	WSW11	WSW10	WNW9	W5	NW12	NW16	WNW7	WSW5	WSW5	WSW4	WSW5	WSW7	WSW6.9	NW16
25-Jul	WSW8	W7	WSW5	WSW6	WSW6	W7	W7	WNW8	WNW10	NW12	NW10	NW11	NW10	WNW9	NW7	NNW7	NNW7	N7	N5	NE4	ENE2	ESE2	ESE2	E2	WNW5.1	NW12
26-Jul	SE5	ESE5	SE5	SSE5	SSE3	SSE3	S5	SSW6	SSW10	SSW11	SSW10	S8	SSW6	WNW5	W4	S4	SE4	SSE2	S4	S4	SSE2	SSE3	SSE3	SSE3	S4.1	SSW11
27-Jul	SW4	WSW4	WSW3	WSW3	WSW3	W4	W4	WNW4	NW6	NNW7	N8	NNE8	NNE5	N6	N6	NNE14	NNE8	NE6	NE8	ENE5	ENE1	NE2	NE1	NE1	N3.0	NNE14
28-Jul	WNW1	AF	SSW4	S5	WNW3	NNW4	N4	N4	NE3	ENE3	N4	NNW6	N5	NW5	NNW2	NNE3	NE6	N2	SSW8	SSW5	SW6	SW6	SW5	SSW6	WNW1.0	SSW8
29-Jul	SSW3	WSW4	SW2	W3	SW2	SW3	SSW4	SW5	WSW4	WSW5	SW6	S7	SSW8	SSW5	SSW8	S11	SSE8	SSE5	S9	SSE5	SE5	SE4	SSE5	SSE5	SSW4.5	S11
30-Jul	SW3	SSW5	SW4	SSW5	SSW5	S6	S6	SSW5	SW5	W5	SW3	WSW3	W5	W8	W8	WNW10	NNW12	NE8	NNE8	N5	N4	NNW6	N4	N3	W2.4	NNW12
31-Jul	NNW5	N7	NE6	NNE7	NNE6	N7	NW3	NW5	WNW6	W6	WSW7	WNW7	NW6	NW9	NW9	NW7	WNW5	WNW6	NNW7	NW3	W5	W6	W6	SW4	NW4.5	NW9

SW0.8	SW1.0	SSW1.1	SW1.3	SW1.3	WSW1.4	W0.9	NNW1.0	NNW1.6	NNW1.5	W1.8	NNW1.9	NW2.3	NW3.0	NNW3.4	NNW3.3	N3.9	NNW3.5	N2.3	N0.9	NNW0.5	W0.1	SW0.7	SSW0.5	Diurnal Average
SSW8	SSW8	S8	SSW8	SSW8	SSW9	SSW9	SW11	SE12	SE13	SSE14	S14	SSW12	S12	N13	N14	N14	N17	N15	NNW11	NNE7	NE7	N6	S7	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
Brion MacKay River - July 2016

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	365	49.26	49.26
6 - 11	340	45.88	95.14
12 - 19	36	4.86	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: 741

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Brion MacKay River - July 2016**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	28	18	19	7	13	7	34	36	17	19	23	42	31	18	20	33	365
6 - 11	48	43	24	3	6	2	12	16	23	27	18	23	26	19	19	31	340
12 - 19	11	5	0	0	0	0	2	5	5	1	0	0	0	0	3	4	36
20 - 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	87	66	43	10	19	9	48	57	45	47	41	65	57	37	42	68	741

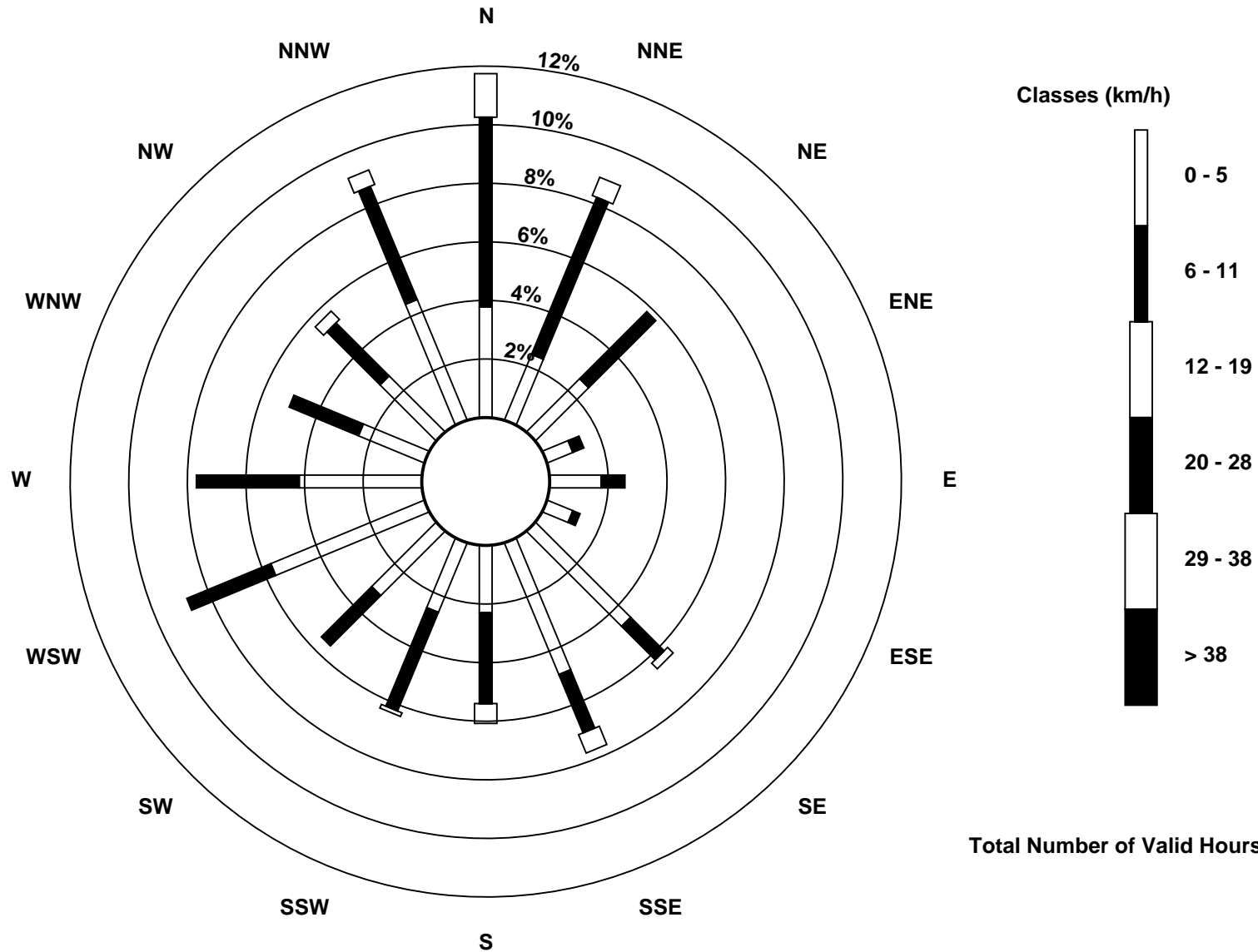
Total Number of Valid Hours: 741

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

Wind Speed (WS) - km/h
Brion MacKay River (AMS 20)





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Brion MacKay River - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 8 km/h on Jul 16 18:00 Minimum Value: 0 km/h on Jul 15 01:00 Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 3 P ₉₀ = 4 P ₉₉ = 6																	Hours in Service: 744 Hours of Data: 741 Hours of Missing Data: 3 Hours of Calibration: 0 Percent Operational Time: 99.6										
Day	Hourly Period Ending At (MST)																								Daily Maximum		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Jul	1	1	1	1	1	2	2	3	4	4	5	4	5	3	4	5	4	5	4	3	1	1	1	1	5		
2-Jul	1	1	1	1	1	2	2	3	4	5	4	4	4	4	4	4	3	3	3	2	1	1	1	1	5		
3-Jul	1	1	1	1	1	1	3	2	2	5	5	1	1	2	3	2	3	2	1	2	2	2	2	5			
4-Jul	2	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	3	2	1	1	1	1	3			
5-Jul	1	2	1	1	1	1	1	2	3	3	2	2	2	3	4	4	3	2	4	2	2	1	2	4			
6-Jul	1	1	3	2	1	2	3	3	3	3	2	3	4	4	5	4	5	4	3	3	1	1	1	5			
7-Jul	1	1	1	1	1	1	2	3	3	3	3	3	3	4	3	3	3	4	3	2	2	2	1	4			
8-Jul	2	2	1	1	2	2	2	2	3	3	3	3	2	3	3	3	3	2	2	1	2	2	2	3			
9-Jul	2	2	2	1	1	1	1	1	2	2	2	3	3	3	3	3	3	3	3	1	1	1	AF	3			
10-Jul	1	1	1	1	1	1	1	1	2	3	3	3	3	3	2	3	3	3	2	1	1	1	AF	3			
11-Jul	1	1	1	1	1	1	1	2	2	3	3	3	6	3	4	4	2	2	3	3	1	1	1	6			
12-Jul	1	1	1	1	1	1	3	3	3	3	3	5	3	3	4	5	5	4	5	3	2	1	1	5			
13-Jul	1	1	2	1	1	2	2	3	3	4	3	5	4	5	4	6	6	2	4	2	1	1	1	6			
14-Jul	1	1	1	1	1	1	1	1	2	2	2	2	3	3	4	3	3	3	2	1	1	1	0	4			
15-Jul	0	1	1	1	1	1	1	2	2	3	3	2	3	3	3	5	3	3	3	2	3	1	1	5			
16-Jul	1	2	2	2	2	2	2	2	2	3	3	3	3	4	5	5	2	8	3	3	2	1	2	8			
17-Jul	1	1	1	1	1	1	2	3	3	3	4	3	4	4	4	4	3	3	2	3	0	1	1	4			
18-Jul	0	0	1	1	1	1	2	2	2	2	2	3	3	3	4	4	4	4	3	3	1	1	1	4			
19-Jul	1	1	2	1	3	2	2	2	3	3	4	4	4	4	4	5	4	3	2	2	2	2	1	5			
20-Jul	1	2	1	1	1	1	1	1	1	1	2	3	3	2	4	2	2	3	2	1	1	1	2	4			
21-Jul	2	2	2	2	2	2	3	2	3	3	4	4	5	5	6	4	4	5	4	3	2	1	1	6			
22-Jul	2	1	1	1	1	2	3	3	4	4	4	6	5	4	3	3	4	4	4	4	2	2	1	6			
23-Jul	1	1	2	2	1	1	1	1	2	2	3	3	3	3	4	3	2	1	1	1	1	1	1	4			
24-Jul	2	2	2	2	2	2	3	4	4	4	4	4	5	5	6	2	6	6	3	2	2	1	2	6			
25-Jul	3	3	2	2	2	3	3	3	4	4	4	4	4	4	4	3	3	3	2	2	1	1	1	4			
26-Jul	1	1	1	2	1	1	2	2	4	4	4	3	3	2	2	4	2	2	2	1	1	1	1	4			
27-Jul	1	1	1	1	1	1	2	1	2	2	3	3	3	3	3	5	3	2	3	3	0	1	1	5			
28-Jul	2	AF	4	2	2	2	2	3	2	2	2	3	2	3	3	2	3	2	4	2	2	2	2	4			
29-Jul	2	2	1	2	1	1	1	2	2	2	3	4	3	3	3	4	3	2	3	2	1	1	1	4			
30-Jul	3	3	1	1	2	2	2	1	2	2	2	2	3	4	3	4	4	3	3	2	1	2	1	4			
31-Jul	2	2	2	2	2	2	1	2	2	3	3	4	3	3	2	2	2	2	4	2	2	2	3	4			
																	Diurnal Maximum										
AF - Analyzer Failure																											



Wood Buffalo Environmental Association
Summary of Hour Averages

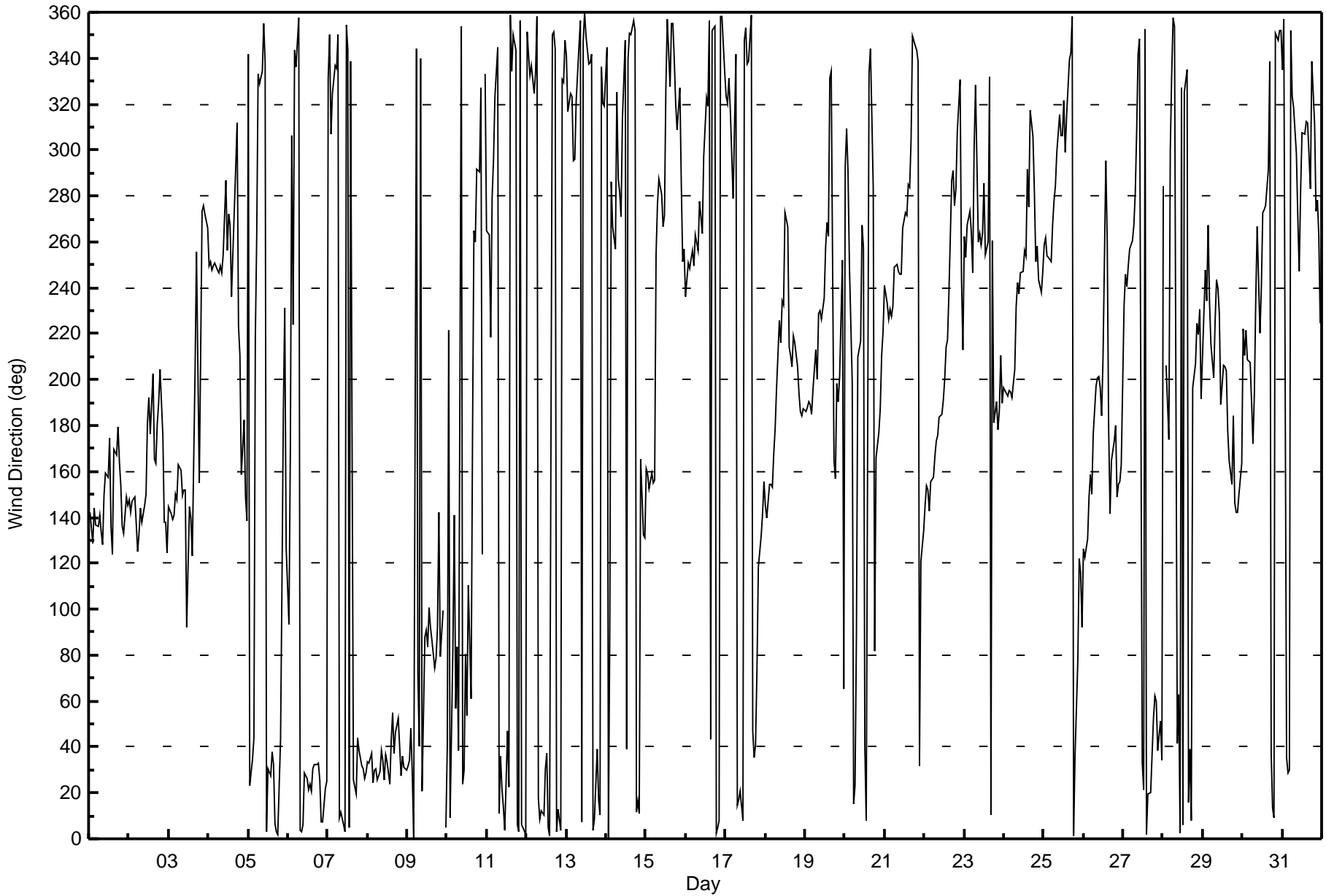
Wind Direction (WD) - deg
Brion MacKay River - July 2016

Direction of Maximum Speed: 350 deg on Jul 21 18:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 150.6 deg on Jul 1	Hours of Data: 741
Direction of Minimum Speed: 15 deg on Jul 20 06:00	Hours of Missing Data: 3
Direction of Minimum Daily Speed Average: 1.0 deg on Jul 28	Percent Operational Time: 99.6
Monthly Average Direction: 278.9 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Jul	142	135	129	144	137	136	141	134	128	150	159	158	174	136	124	170	167	179	164	154	136	133	149	145	150.6
2-Jul	148	142	147	149	137	125	133	144	138	145	150	181	192	176	203	165	164	181	190	205	176	138	138	124	161.2
3-Jul	145	142	139	141	150	148	163	161	149	152	152	92	144	140	123	164	204	256	155	213	273	276	272	266	166.7
4-Jul	249	252	248	250	250	248	247	250	247	254	287	256	272	267	236	255	292	312	223	210	159	183	149	138	251.0
5-Jul	342	23	34	44	218	263	333	329	334	355	338	3	31	27	38	33	7	3	2	43	110	186	231	127	9.2
6-Jul	93	170	306	224	343	336	358	3	3	6	29	26	22	24	21	30	32	32	33	26	7	7	22	25	19.0
7-Jul	331	350	307	324	337	336	350	9	11	6	3	355	343	5	338	26	23	19	44	39	32	30	26	29	8.4
8-Jul	33	33	37	25	30	30	26	29	39	34	26	37	34	24	43	55	37	46	53	40	27	36	31	30	34.5
9-Jul	32	34	48	29	1	344	72	40	340	20	88	91	83	101	92	87	74	79	92	142	79	100	AF	5	66.6
10-Jul	40	221	9	83	141	57	84	38	354	24	30	81	54	111	61	175	265	260	292	291	327	124	AF	333	16.0
11-Jul	265	263	219	279	296	323	345	11	36	22	14	4	47	22	359	334	351	343	6	3	356	6	5	2	358.5
12-Jul	351	341	333	337	325	334	358	18	9	12	10	30	37	5	1	350	351	344	3	13	4	331	330	348	360.0
13-Jul	341	317	324	324	296	296	321	345	356	7	347	360	350	337	338	342	4	8	39	17	10	336	321	319	348.2
14-Jul	345	0	95	286	266	257	325	287	282	271	314	348	39	340	351	350	357	352	11	16	11	165	133	131	347.9
15-Jul	161	159	152	159	155	156	255	276	287	281	266	271	327	357	328	355	355	339	321	308	327	286	251	257	314.3
16-Jul	236	251	248	253	256	250	263	256	278	271	264	297	323	319	356	43	352	354	2	5	8	358	358	334	316.1
17-Jul	323	321	331	317	279	310	342	14	17	21	8	348	354	338	339	359	47	35	41	73	118	132	141	156	4.0
18-Jul	145	140	154	154	153	168	179	196	226	216	234	232	273	267	214	211	206	219	216	206	194	186	184	188	201.3
19-Jul	186	188	190	189	185	196	213	200	229	230	227	236	258	268	263	331	334	165	157	198	190	201	252	66	222.6
20-Jul	293	310	290	249	199	15	23	89	210	217	268	257	40	8	334	344	315	283	82	166	177	187	211	221	278.0
21-Jul	241	233	226	231	228	232	249	250	247	246	246	266	272	271	285	284	305	350	345	344	338	32	121	134	279.9
22-Jul	145	154	152	143	156	158	167	173	176	184	185	191	200	214	217	237	286	291	276	283	308	331	244	213	201.9
23-Jul	262	253	267	273	264	247	301	329	260	264	259	264	286	255	260	332	10	260	181	191	178	187	211	190	258.1
24-Jul	196	194	193	195	195	192	205	232	242	238	246	247	256	254	292	275	318	306	282	251	258	243	238	247	243.7
25-Jul	258	262	254	253	251	267	277	284	299	315	306	306	322	299	315	339	343	358	2	36	77	122	116	92	302.9
26-Jul	127	123	131	149	159	150	177	197	201	201	196	184	210	296	260	180	142	165	173	180	149	155	156	163	178.8
27-Jul	232	246	240	249	257	261	267	282	308	342	349	33	21	353	2	19	20	37	52	62	60	39	51	34	358.3
28-Jul	285	AF	206	174	300	333	358	354	41	63	2	327	6	325	335	16	39	8	196	207	225	220	231	192	288.3
29-Jul	210	248	234	267	234	215	201	225	243	240	229	189	206	206	204	178	165	154	184	147	142	142	150	164	193.5
30-Jul	222	210	221	209	207	190	172	194	235	267	220	240	273	274	276	292	338	37	13	9	351	348	352	352	280.7
31-Jul	335	357	35	29	30	352	324	318	298	271	247	282	307	307	312	312	298	283	339	311	273	278	262	225	311.7

225.3 226.1 211.6 219.5 225.6 238.1 262.7 295.7 300.6 300.7 278.3 292.6 323.1 316.5 330.5 348.5 352.1 344.9 9.6 2.9 336.3 259.5 228.7 193.6
 Diurnal Average

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





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
Brion MacKay River - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 101 deg on Jul 28 15:00 Minimum Value: 7 deg on Jul 15 00:00 Percentiles: P ₁ = 12 P ₁₀ = 18 Q ₁ = 25 Median = 33 Q ₃ = 46 P ₉₀ = 61 P ₉₉ = 89																	Hours in Service: 744 Hours of Data: 741 Hours of Missing Data: 3 Hours of Calibration: 0 Percent Operational Time: 99.6								
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Jul	23	20	18	20	18	16	21	28	27	30	33	32	40	37	36	37	34	29	29	27	20	16	22	14	40
2-Jul	15	15	15	13	21	17	22	26	27	30	31	30	27	28	34	45	32	34	29	27	27	13	14	12	45
3-Jul	21	15	14	17	16	21	26	31	39	44	52	35	39	36	24	31	37	43	61	28	45	38	43	44	61
4-Jul	42	41	43	40	39	44	45	41	41	41	43	44	42	47	37	49	46	22	64	27	22	24	23	91	91
5-Jul	57	41	30	56	46	50	31	25	27	29	33	28	25	38	36	30	28	33	29	63	49	73	69	90	90
6-Jul	38	46	68	76	33	24	25	26	25	26	29	35	36	35	32	27	32	26	29	24	23	18	19	22	76
7-Jul	42	49	30	19	13	20	31	28	33	36	35	37	30	35	40	35	34	29	29	27	22	22	22	20	49
8-Jul	26	24	26	24	28	25	27	28	35	33	34	42	35	28	36	46	27	27	26	23	21	24	23	22	46
9-Jul	22	25	26	25	29	31	29	26	87	46	38	54	42	51	33	46	43	35	38	37	28	42	AF	34	87
10-Jul	22	87	87	25	83	50	45	54	44	36	43	66	86	60	39	48	50	45	40	41	20	65	AF	69	87
11-Jul	18	22	44	33	18	17	27	33	36	35	52	61	46	51	30	24	26	31	28	25	20	19	18	21	61
12-Jul	26	29	14	14	14	16	23	28	28	33	37	36	38	31	34	33	27	26	26	26	22	40	25	18	40
13-Jul	22	23	16	15	25	23	25	27	28	28	31	29	29	49	25	27	29	33	33	24	22	15	12	27	49
14-Jul	43	77	82	47	66	46	42	72	49	53	87	62	87	79	29	30	36	32	33	23	29	78	10	7	87
15-Jul	13	28	10	66	17	72	76	49	48	56	55	75	67	89	75	33	26	33	25	23	18	34	36	34	89
16-Jul	44	44	48	49	44	49	48	50	49	47	49	37	25	27	41	72	30	30	27	26	23	22	22	20	72
17-Jul	19	14	17	21	19	18	24	28	36	37	48	41	49	59	77	69	44	38	28	40	31	27	26	12	77
18-Jul	14	13	15	11	8	13	20	31	51	72	78	61	82	56	61	47	38	35	28	25	18	14	12	15	82
19-Jul	14	18	18	14	17	23	35	35	44	47	45	50	50	48	52	46	47	46	26	21	19	76	42	98	98
20-Jul	71	50	35	44	70	87	90	48	46	69	54	46	54	35	35	33	53	79	44	23	15	16	21	21	90
21-Jul	32	26	26	35	27	30	45	42	45	46	43	48	44	42	41	40	35	24	24	23	19	24	26	13	48
22-Jul	18	21	20	20	25	21	25	26	28	26	29	29	26	31	26	42	45	38	43	35	23	57	33	26	57
23-Jul	35	39	47	44	57	49	46	81	84	58	45	49	48	52	59	52	33	53	38	32	20	27	18	14	84
24-Jul	16	16	17	18	18	19	24	38	43	43	47	42	46	49	44	50	40	29	44	50	42	38	31	39	50
25-Jul	47	49	46	46	54	48	43	41	31	28	34	30	29	45	51	36	50	39	35	42	34	38	42	44	54
26-Jul	12	12	14	25	43	14	25	30	26	33	36	42	61	60	77	82	55	71	22	25	19	14	7	26	82
27-Jul	22	27	34	29	26	29	37	40	31	36	35	33	76	64	64	29	37	30	28	30	38	27	54	21	76
28-Jul	82	AF	66	52	62	71	37	42	49	60	77	53	61	63	101	75	52	57	30	27	26	25	27	31	101
29-Jul	66	55	50	54	33	25	28	38	55	50	52	53	42	51	32	27	29	35	25	25	18	24	16	15	66
30-Jul	62	53	37	24	28	20	25	30	41	69	90	81	66	50	48	41	35	32	26	24	26	20	19	27	90
31-Jul	26	33	31	25	32	23	35	27	40	48	47	51	29	24	23	32	35	37	43	39	41	38	46	72	72
82 87 87 76 83 87 90 81 87 72 90 81 87 89 101 82 55 79 64 63 49 78 69 98																								Diurnal Maximum	
AF - Analyzer Failure																									



Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	July 12, 2016	Last Calibration	June 23, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Reason:	Routine		
Start Time (MST)	10:00	End Time (MST)	14:00
Gas Cert Reference	EY0000372	Station temp.	22 Deg C
Cal Gas Concentration	50.7 ppm	Cal Gas Exp Date	10-Jun-16
Calibrator Make/Model	API T700	Serial Number	1220
ZAG Make/Model	API 701	Serial Number	4766
DACS make/model	Campbell Scientific CR3000	DACS serial No.	9627

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-633	-633
Analyzer IP address	192.168.1.43		Lamp voltage	828	826
Calculated slope	0.990985	0.993182	Chamber temp	45	45.4
Calculated intercept	0.596384	0.947563	Pressure	661.2	665.6
Analyzer Background	12.3	11.9	Flow	0.476	0.479
Analyzer Coefficient	0.972	0.945	Intensity	88	88

Analyzer make Thermo 43i Analyzer serial # 1501301450

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.3	----
as found span	5000	79.9	810.2	833.4	0.972
calibrator zero	5000	0.0	0.0	0.3	----
high point	5000	79.9	810.2	815.5	0.993
second point	5000	40.1	406.6	407.5	0.998
third point	5000	20.1	203.8	203.3	1.003
as left zero	5000	0.0	0.0	0.4	----
as left span	5000	79.9	810.2	817.2	0.991
Average Correction Factor					0.998

Corrected As found 833.1 Previous response 817.0 % change -1.9%

Notes:

Sample inlet filter replaced after as founds. Adjusted span. As lefts began at 13:21 MST.

Calibration Performed By: Asad Hidayat



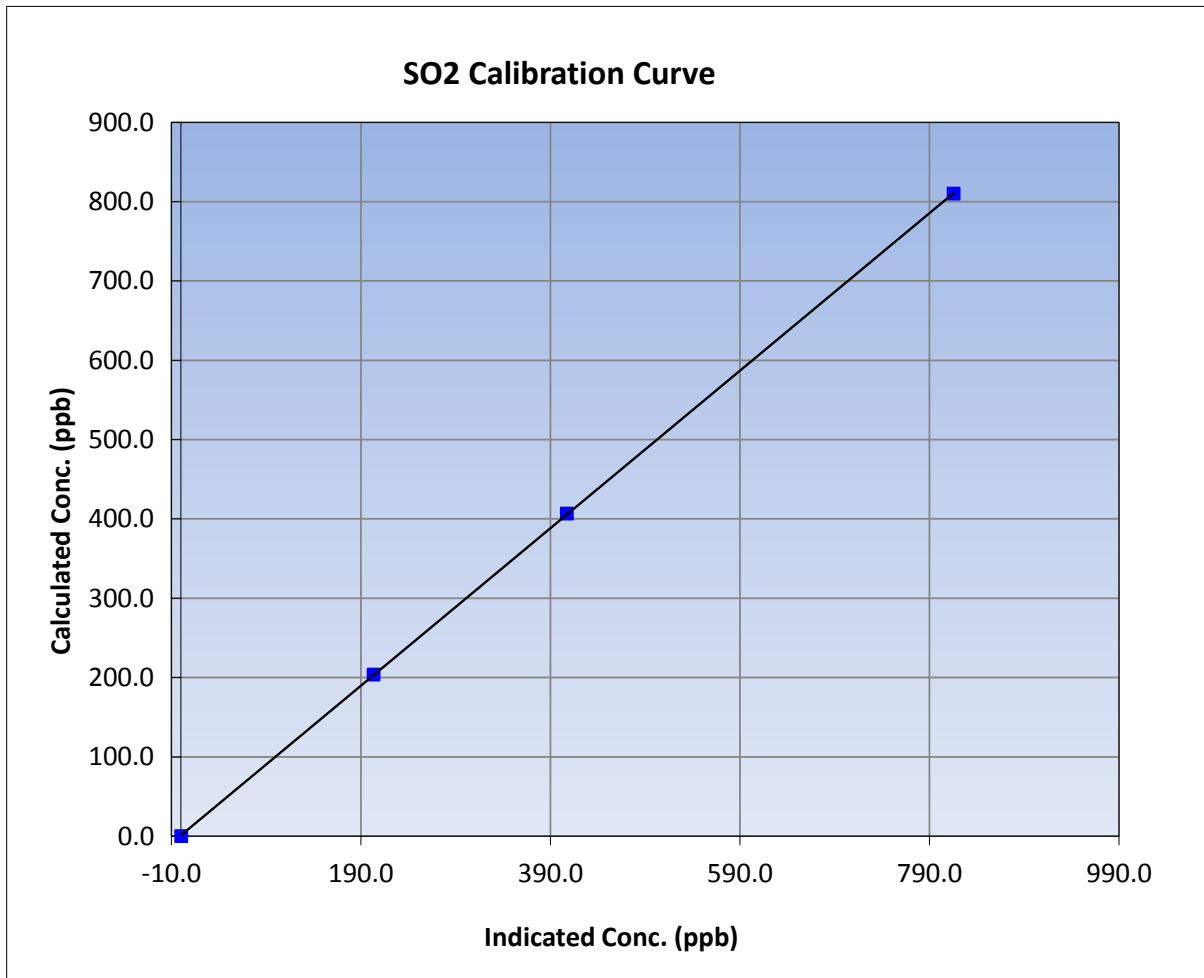
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	July 12, 2016	Previous Calibration	June 23, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Start Time (MST)	10:00	End Time (MST)	14:00
Analyzer make	Thermo 43i	Analyzer serial #	1501301450

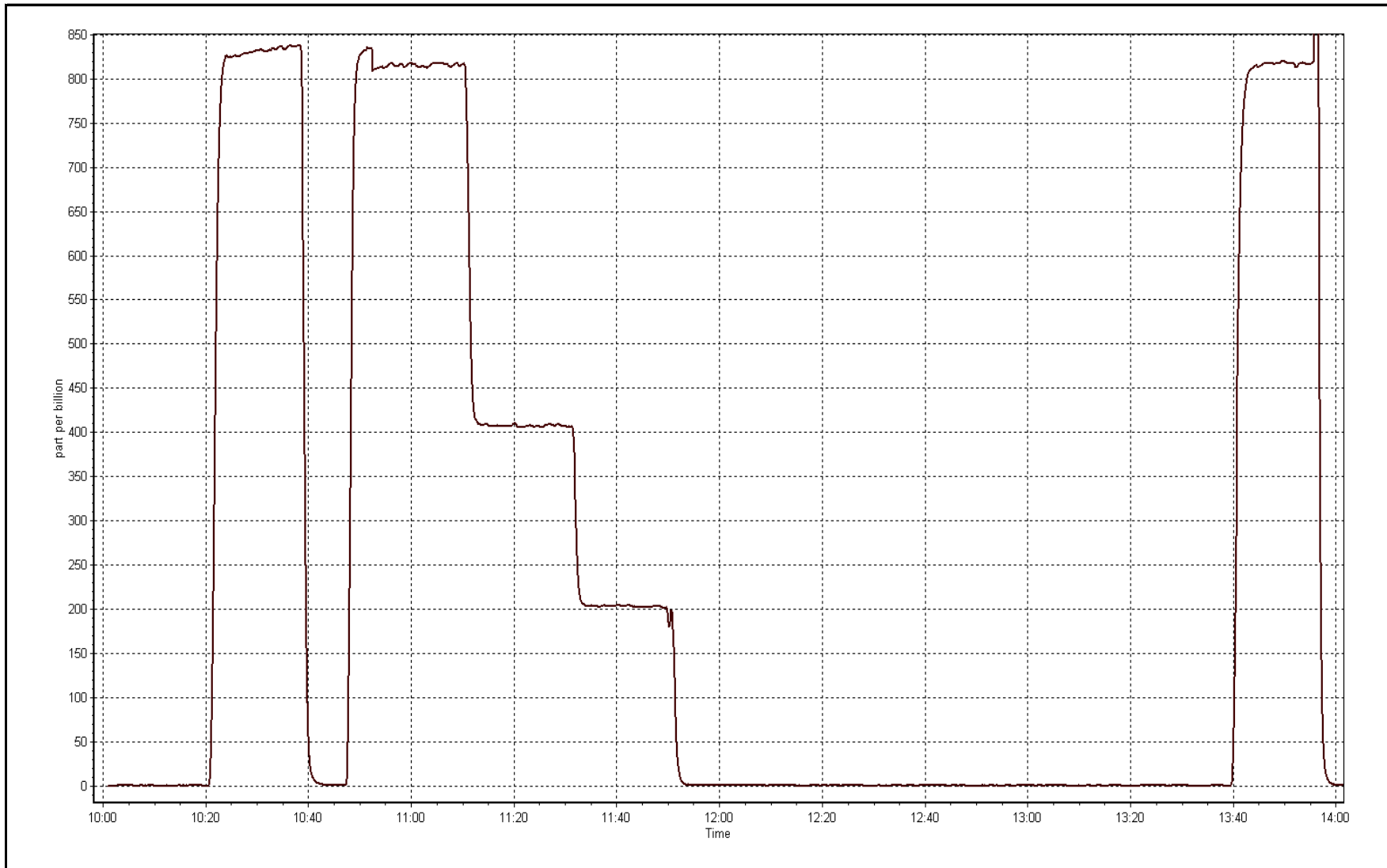
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	----	Correlation Coefficient	0.999989
810.2	815.5	0.9934		
406.6	407.5	0.9979	Slope	0.993182
203.8	203.3	1.0028		
			Intercept	0.947563



SO2 Calibration Plot

Date: July 12, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	July 11, 2016	Last Calibration	June 22, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Reason:	Routine		
Start Time (MST)	11:50	End Time (MST)	15:02
Gas Cert Reference	LL119508	Station temp.	22 Deg C
Cal Gas Concentration	5.35 ppm	Cal Gas Exp Date	13/02/2018
Calibrator Make/Model	API 700	Serial Number	1220
ZAG air Make/Model	API 701	Serial Number	4766
DACS make/model	Campbell Scientific CR3000	Serial Number	9627
SO2 gas concentration	50.7 ppm	SO2 gas cert/exp	EY0000372 10-Jun-16

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	505	505
Analyzer IP address	192.168.1.75		Lamp voltage	2907	2854
Calculated slope	0.995554	0.989104	Chamber temp	50	50
Calculated intercept	0.365409	0.038762	Pressure	23.0	23.4
Analyzer Background	25.2	25.2	Flow	0.609	0.628
Analyzer Coefficient	1.125	1.024	Intensity	72	71
			Converter temp.	317	316

Analyzer make/model	API T101	Analyzer serial #	196
Converter make/model	NA	Converter serial #	NA

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.1	----
as found span	5000	75.6	80.9	86.5	0.935
SO2 scrubber check	5000	19.8	200.8	3.9	----
calibrator zero	5000	0.0	0.0	-0.1	----
high point	5000	75.6	80.9	81.7	0.990
second point	5000	37.9	40.6	41.1	0.987
third point	5000	19.0	20.3	20.5	0.991
as left zero	5000	0.0	0.0	0.2	----
as left span	5000	75.6	80.9	81.7	0.990
Average Correction Factor					0.990

Corrected As found	86.6	Previous response	80.9	% change	-6.6%
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Notes:

Sample inlet filter replaced after as founds. By pass API's SOX scrubber canister and installed tube SOX scrubber with new beads, to reduce stabilization time observed during calibration points. Adjusted span.

Calibration Performed By: Asad Hidayat



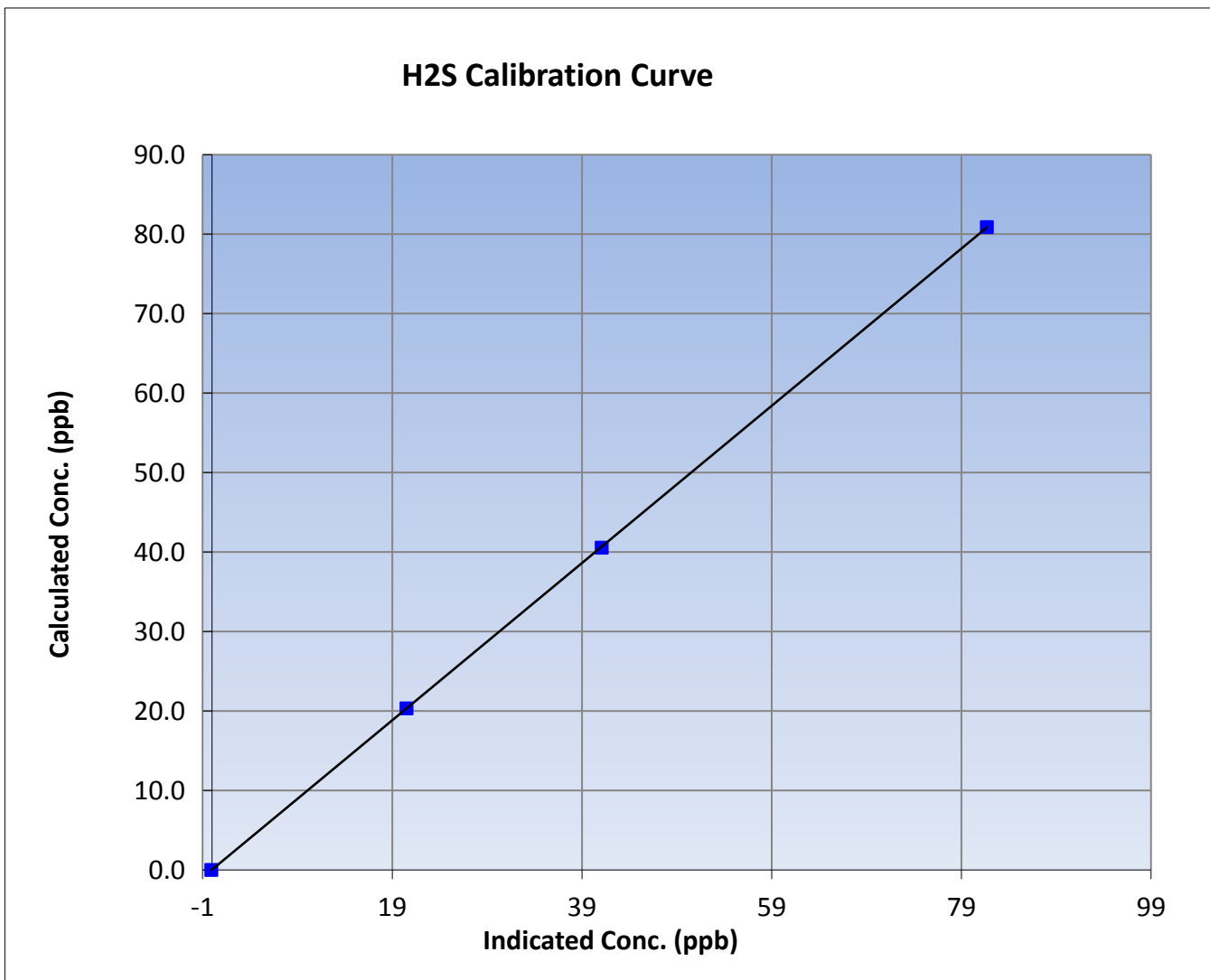
Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	July 11, 2016	Previous Calibration	June 22, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Start Time (MST)	11:50	End Time (MST)	15:02
Analyzer make	API T101	Analyzer serial #	196

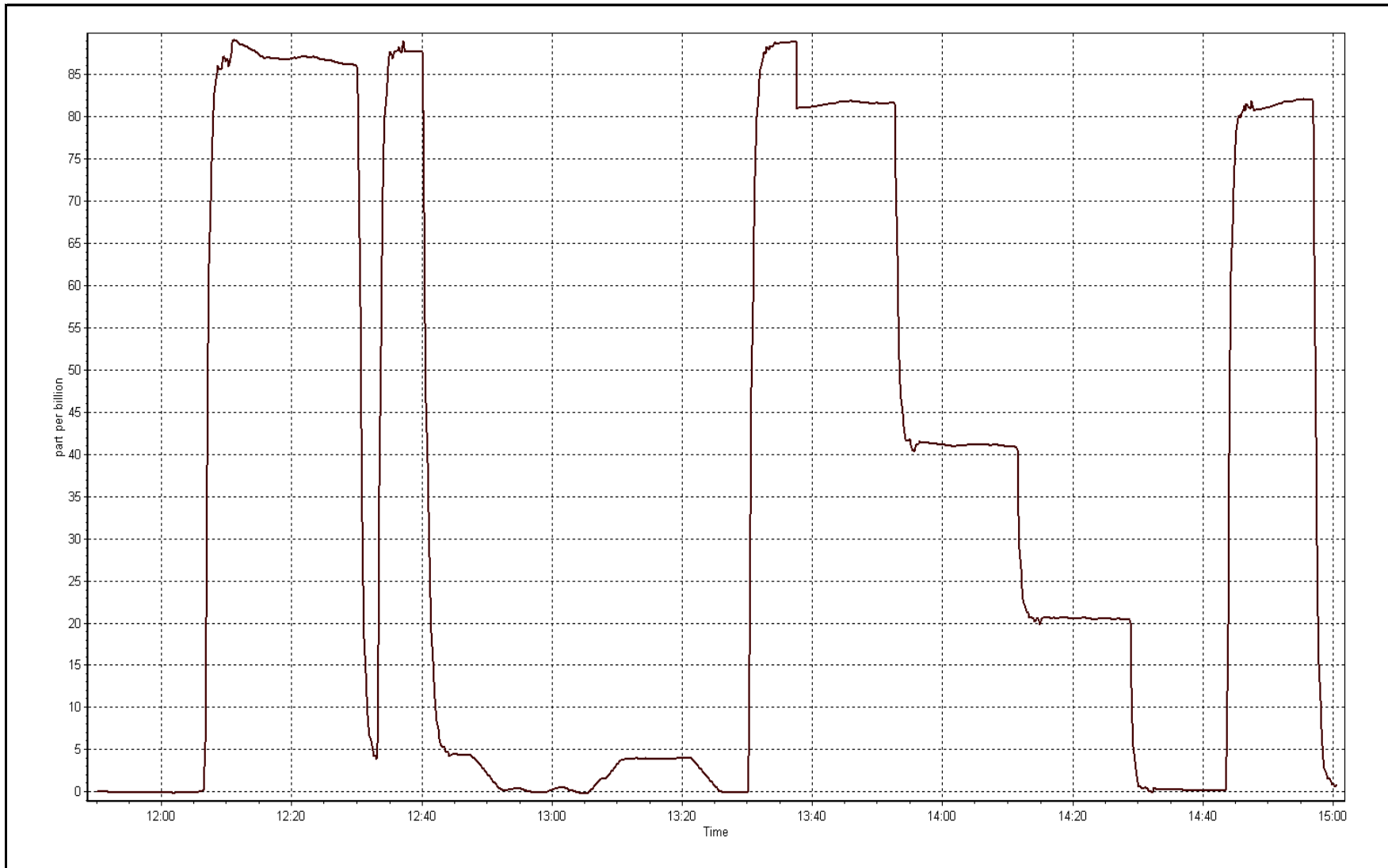
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999995
80.9	81.7	0.9902		
40.6	41.1	0.9874	Slope	0.989104
20.3	20.5	0.9912		
			Intercept	0.038762



H2S Calibration Plot

Date: July 11, 2016





Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	July-12-16	Last Calibration	June-23-16
Station Name	Brion Mackay River	Station Number	AMS 20
Reason:	Routine		
Start Time (MST)	10:00	End Time (MST)	14:00
Gas Cert Reference	EY0000372	Cal Gas Expiry Date	10/06/2016
CH4 Cal Gas Conc.	517 ppm	CH4 Equiv Conc.	1072.5 ppm
C3H8 Cal Gas Conc.	202 ppm	Station temp.	22 Deg C
Calibrator Make/Model	API T700	Serial Number	1220
ZAG make/model	Teledyne API 701	Serial Number	4766
DACS make/model	Campbell Scientific CR3000	Serial Number	9627

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 50 ppm		Sample Pressure	8.6	8.6
Analyzer IP address	192.168.1.51		Air or Bypass Press	34.3	34.3
Calculated slope	0.997564	0.998628	Fuel Pressure	23.9	23.9
Calculated intercept	0.071038	0.063095	Analyzer Coeff	4.5	4.4
			Analyzer BKG	1.970	1.920

Analyzer make	51i-LT	Analyzer serial #	1501663727
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Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	-0.05	----
as found span	5000	79.9	17.14	17.58	0.975
calibrator zero	5000	0.0	0.00	-0.05	----
high point	5000	79.9	17.14	17.11	1.002
second point	5000	40.1	8.60	8.53	1.008
third point	5000	20.1	4.31	4.25	1.014
as left zero	5000	0.0	0.00	-0.05	----
as left span	5000	79.9	17.14	17.14	1.000
Average Correction Factor					1.008

Corrected As found	17.63	Previous response	17.11	% change	-3.0%
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Notes:

Sample inlet filter replaced after as founds. Adjusted span.

Calibration Performed By:

_____ Asad Hidayat



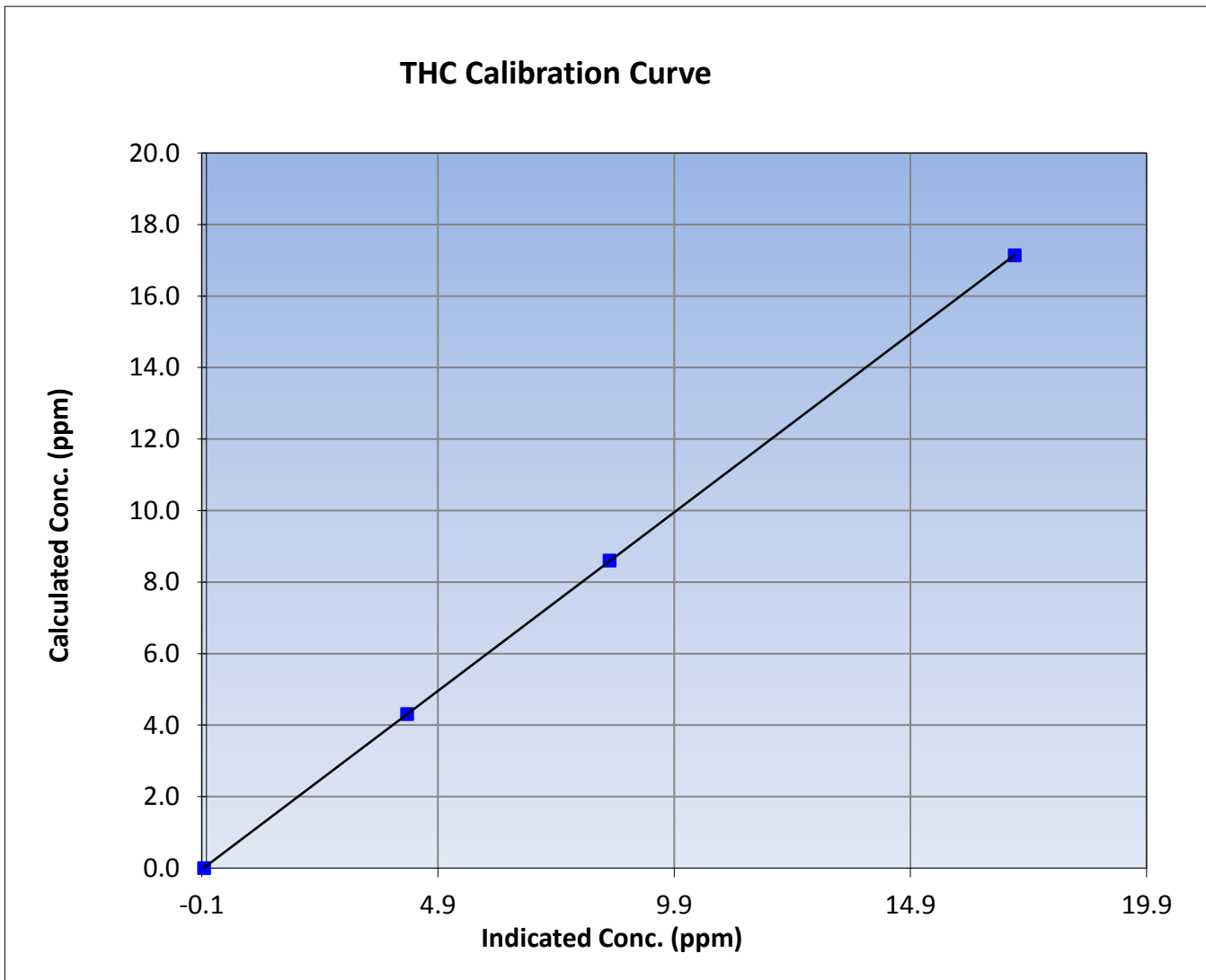
Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	July 12, 2016	Previous Calibration	June 23, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Start Time (MST)	10:00	End Time (MST)	14:00
Analyzer make	51i-LT	Analyzer serial #	1501663727

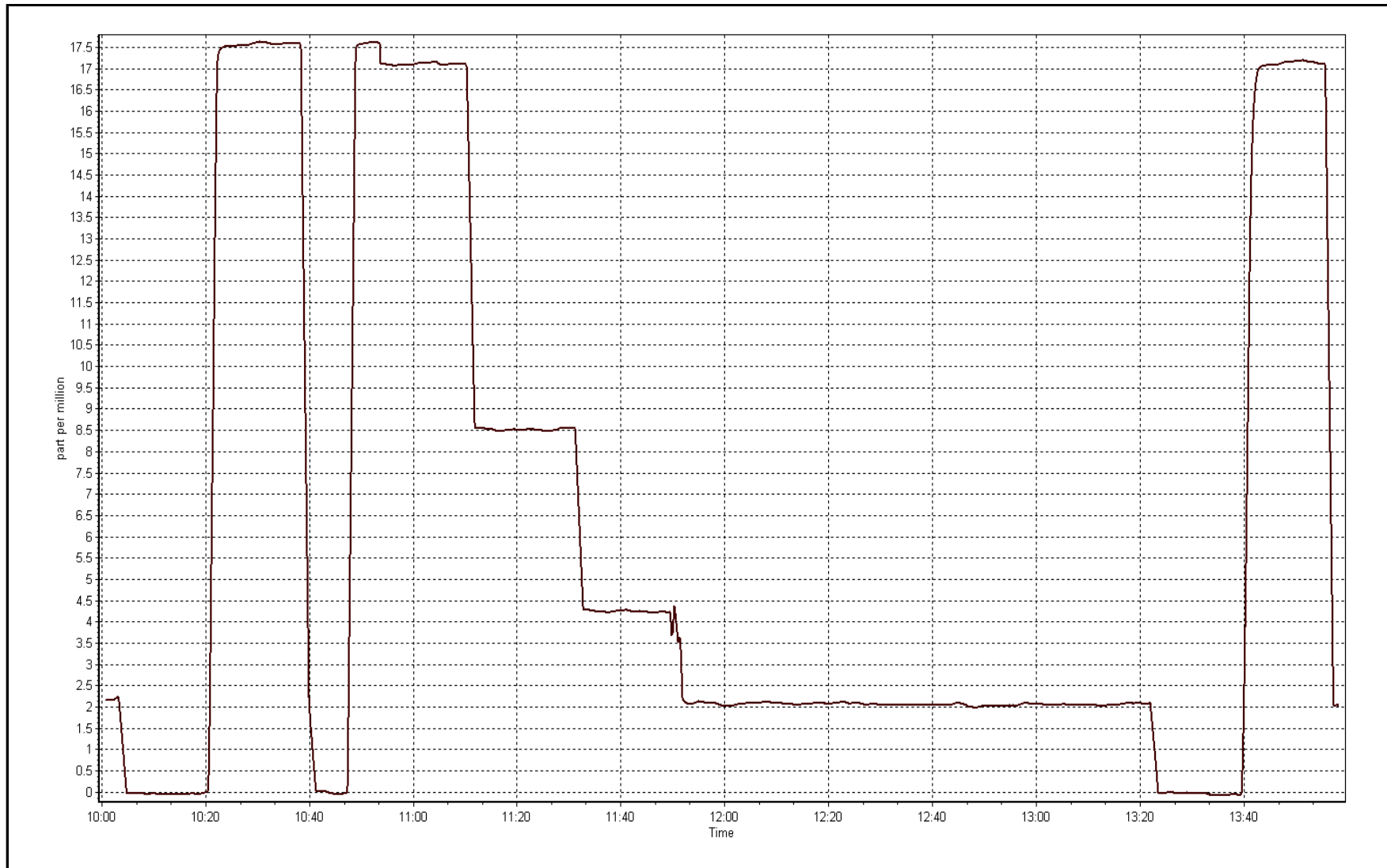
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	-0.05	----	Correlation Coefficient	0.999996
17.14	17.11	1.0017		
8.60	8.53	1.0084	Slope	0.998628
4.31	4.25	1.0145		
			Intercept	0.063095



THC Calibration Plot

Date: July 12, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	July 12, 2016	Previous Calibration	June 23, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Reason:	Routine		
Start Time (MST)	10:00	End Time (MST)	14:00
NO Cal Gas Conc	50.1 ppm	Gas Cert Reference	EY0000372
NOx Cal Gas Conc	50.4 ppm	Cal Gas Expiry Date	June 10, 2016
Calibrator	API T700	Serial Number	1220
Zero air Generator	Teledyne API T701	Serial Number	4766

DACS Information

DACS make & model	Cambell Scientific CR3000	DACS serial No.	9627
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.996186	0.994298	0.993256
	Data Offset	-0.616301	-0.402050	-0.451134
Current Calibration	Data Slope	0.995836	0.996724	0.997254
	Data Offset	0.722650	0.467468	-0.866728

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1505164379
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.42		192.168.1.42	
NO coefficient	1.143		1.104	
NOx coefficient	1.003		1.005	
NO2 coefficient	0.995		0.995	
NO bkgrnd	3.5		3.3	
NOx bkgrnd	3.7		3.6	
Chamber Temp	50.6	Deg C	50.6	Deg C
Moly Temp	325.6	Deg C	326.6	Deg C
PMT voltage	-767.4	V	-767.4	V
PMT Temp	-2.8	Deg C	-3	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	171.1	mmHg	171.4	mmHg
R Cell Press Nox	171.1	mmHg	171.4	mmHg
NO sample flow	0.807	lpm	0.806	lpm
Nox sample Flow	0.806	lpm	0.807	lpm

Notes:

Sample inlet filter replaced after as founds. Span adjusted. Nox drifted during GPT; second high NO point used for GPT reference.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

July 12, 2016

Station Number:

AMS 20

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	-0.5	-0.3	-0.1	----	----
as found span	5000	79.9	805.4	800.6	4.8	830.2	825.5	4.6	0.9702	0.9698
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.5	-0.3	-0.1	----	----
high point	5000	79.9	805.4	800.6	4.8	807.8	802.6	5.3	0.9970	0.9975
second point	5000	40.1	404.2	401.8	2.4	406.1	403.2	2.9	0.9955	0.9965
third point	5000	20.1	202.6	201.4	1.2	201.8	201.1	1.7	1.0041	1.0017
as left zero	5000	0.0	0.0	0.0	0.0	-0.3	-0.2	-0.1	----	----
as left span	5000	79.9	805.4	448.6	356.8	828.0	451.5	376.6	0.9727	0.9936
Average Correction Factor									0.9988	0.9986

Corrected As found
Previous Response

NO_x= 830.6
NO_x= 809.1

NO= 825.9
NO= 805.6

Percent Change

NO_x= -2.6%

NO= -2.5%

GPT Calibration Data

Dilution Flow (total) 5000 ccm Source Gas Flow 79.90 ccm NOx ref calc conc = 805.4 ppb NO ref calc conc = 800.6 ppb

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
1st NO ref point		4.8	823.6	816.9	-0.1	0.9779	0.9801	----	----
1st NO2 (300)	448.6	373.1	822.6	448.6	374.1	0.9791	----	0.9975	100.3%
2nd NO2 (200)	567.1	254.6	824.0	567.1	257.0	0.9774	----	0.9908	100.9%
3rd NO2 (100)	689.7	131.9	824.0	689.7	134.3	0.9774	----	0.9825	101.8%
2nd NO ref point		4.8	823.6	816.9	6.7	0.9779	0.9801	----	----
Average Correction Factor						0.9779		0.9902	101.0%

Calibration Performed By: Asad Hidayat



Wood Buffalo Environmental Association

NO_x Calibration Summary

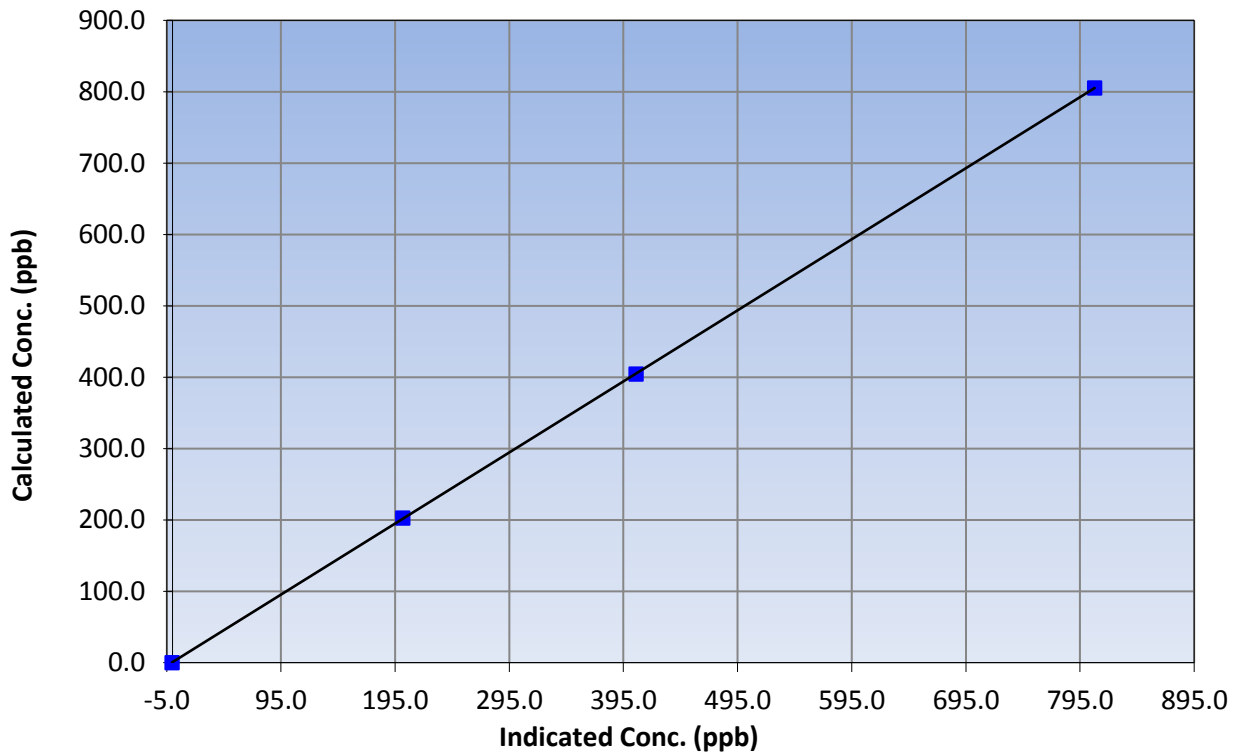
Station Information

Calibration Date	July 12, 2016	Previous Calibration	June 23, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Start Time (MST)	10:00	End Time (MST)	14:00
Analyzer make	Thermo 42i	Analyzer serial #	1505164379

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.5	----	Correlation Coefficient	0.999995
805.4	807.8	0.9970		
404.2	406.1	0.9955	Slope	0.995836
202.6	201.8	1.0041		
			Intercept	0.722650

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

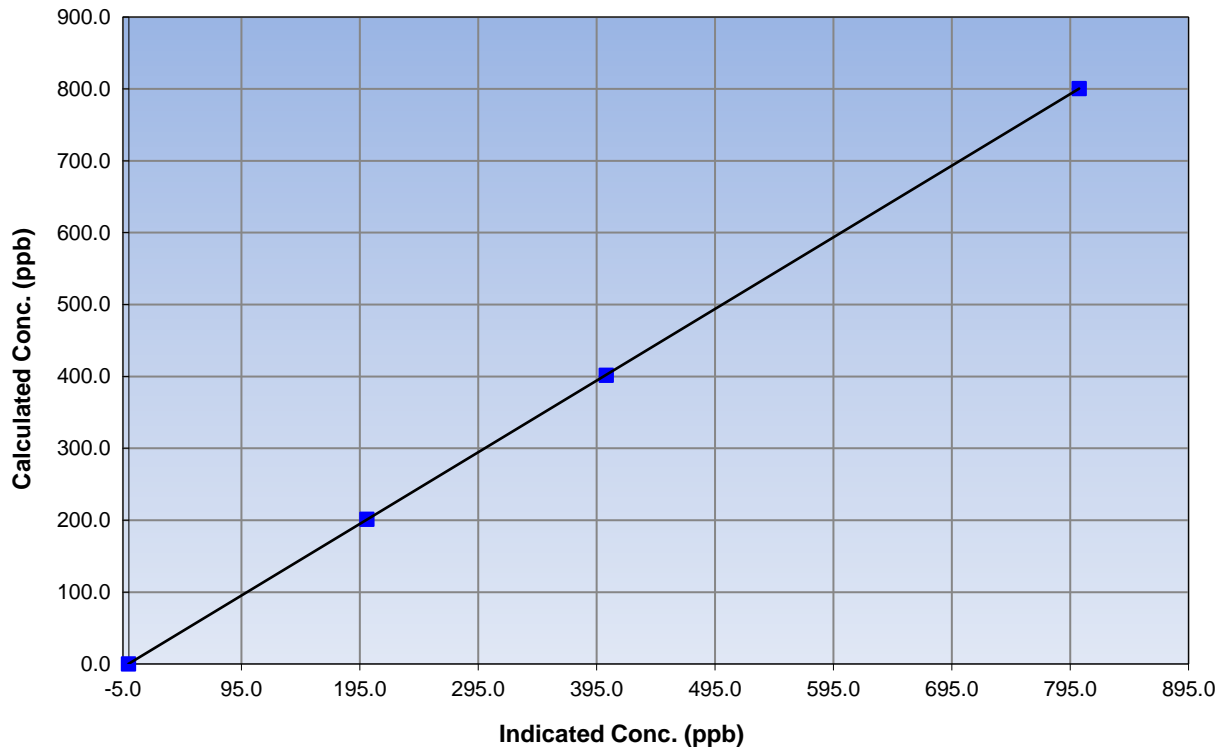
Station Information

Calibration Date	July 12, 2016	Previous Calibration	June 23, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Start Time (MST)	10:00	End Time (MST)	14:00
Analyzer make	Thermo 42i	Analyzer serial #	1505164379

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.3	N/A	Correlation Coefficient	0.999998
800.6	802.6	0.9975		
401.8	403.2	0.9965	Slope	0.996724
201.4	201.1	1.0017		
			Intercept	0.467468

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

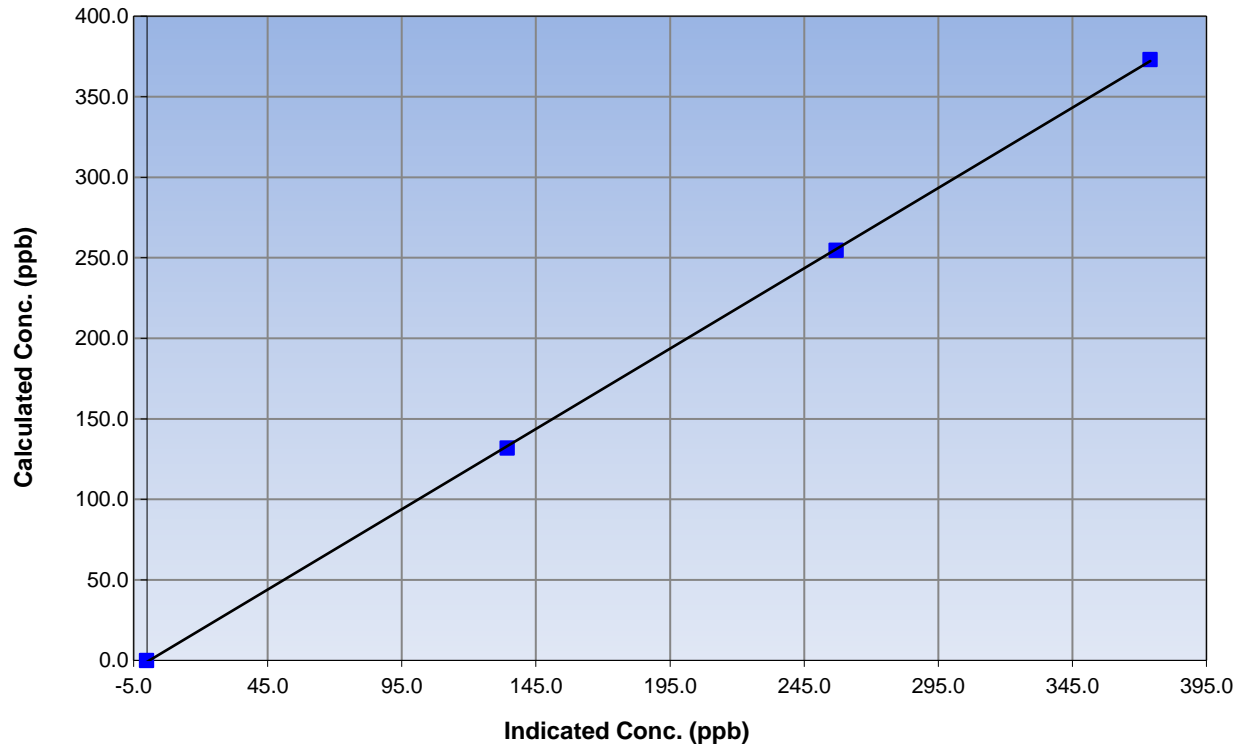
Station Information

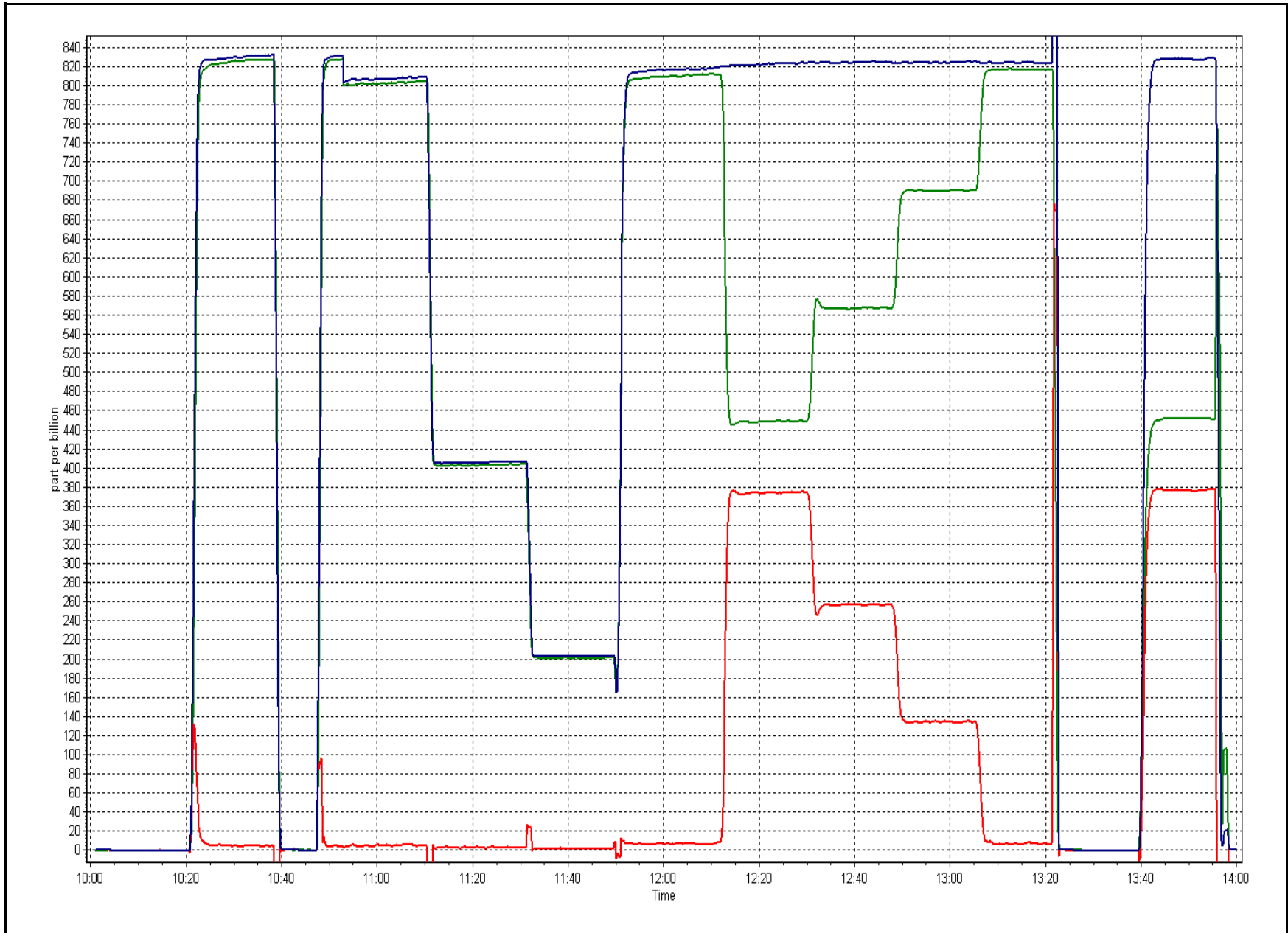
Calibration Date	July 12, 2016	Previous Calibration	June 23, 2016
Station Number	Brion Mackay River	Station Number	AMS 20
Start Time (MST)	10:00	End Time (MST)	14:00
Analyzer make	Thermo 42i	Analyzer serial #	1505164379

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999952
373.1	374.1	0.9975		
254.6	257.0	0.9908	Slope	0.997254
131.9	134.3	0.9825		
			Intercept	-0.866728

NO₂ Calibration Curve







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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 21
CONKLIN COMMUNITY
JULY 2016**

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

August 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONKLIN COMMUNITY (AMS 21)
 JULY 2016

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2(ppb) Average	705	37	39	99.73	2	0	1	0
TRS(ppb) Average	708	36	36	100.00	1	0	1	0
THC(ppm) Average	703	37	41	99.46	3	-	2.1	-
NMHC(ppm) Average	703	37	41	99.46	0.13	-	0.017	-
CH4(ppm) Average	703	37	41	99.46	2.9	-	2.1	-
O3 (ppb) Average	707	35	37	99.73	54	0	36	-
NO2 (ppb) Average	705	37	39	99.73	8	0	1	-
NO (ppb) Average	705	37	39	99.73	15	-	1	-
NOX (ppb) Average	705	37	39	99.73	22	-	2	-
PM2.5 (ug/m3) Average	743	1	1	100.00	44.3	-	9.1	0
Wind Speed 10 m (km/h) Average	740	0	4	99.46	18	-	12	-
Wind Direction 10 m (deg) Average	740	0	4	99.46	-	-	-	-
Temperature 2 m (C) Average	744	0	0	100.00	27.7	-	20.9	-
Relative Humidity (%) Average	744	0	0	100.00	99	-	88.0	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONKLIN COMMUNITY (AMS 21)
 JULY 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	705	0.3	0	-	0	0	0	0	0	1	2
TRS (ppb) Average	708	0.5	0	-	0	0	0	0	0	1	1
THC (ppm) Average	703	1.98	0.2	-	1.8	1.9	1.9	1.9	2	2.3	3
NMHC(ppm) Average	703	0.003	0.013	-	0	0	0	0	0	0	0.13
CH4(ppm) Average	703	1.98	0.2	-	1.8	1.9	1.9	1.9	2	2.3	2.9
O3 (ppb) Average	707	26.3	12	-	5	8	17	27	35	41	54
NO2 (ppb) Average	705	0.8	1	-	0	0	0	1	1	2	8
NO (ppb) Average	705	0.2	1	-	0	0	0	0	0	0	15
NOX (ppb) Average	705	1	1	-	0	0	0	1	1	2	22
PM2.5 (ug/m3) Average	743	4.17	4	-	0.1	0.8	2.1	3.2	4.9	7.9	44.3
Wind Speed 10 m (km/h) Average	740	5.8	4	-	0	1	3	5	8	11	18
Wind Direction 10 m (deg) Average	740	-	-	-	-	-	-	-	-	-	-
Temperature 2 m (C) Average	744	17.01	5	-	5.9	10.1	13.4	16.9	21.1	23.8	27.7
Relative Humidity (%) Average	744	72.4	21	-	28	42	54	76	92	96	99

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONKLIN COMMUNITY (AMS 21)
JULY 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
SO2, THC, O3, NO2	04 Jul 2016 12:00	04 Jul 2016 13:00	2	Maintenance - manifold cleaning
NMHC, CH4, THC	28 Jul 2016 10:00	28 Jul 2016 11:00	2	Maintenance - replaced carrier gas
Wind Speed, Wind Direction	01 Jul 2016 06:00	01 Jul 2016 06:00	1	Flat line in sensor output signal
Wind Speed, Wind Direction	02 Jul 2016 00:00	02 Jul 2016 00:00	1	Flat line in sensor output signal
Wind Speed, Wind Direction	03 Jul 2016 02:00	03 Jul 2016 02:00	1	Flat line in sensor output signal
Wind Speed, Wind Direction	09 Jul 2016 01:00	09 Jul 2016 01:00	1	Flat line in sensor output signal



Wood Buffalo Environmental Association

Summary of Hour Averages

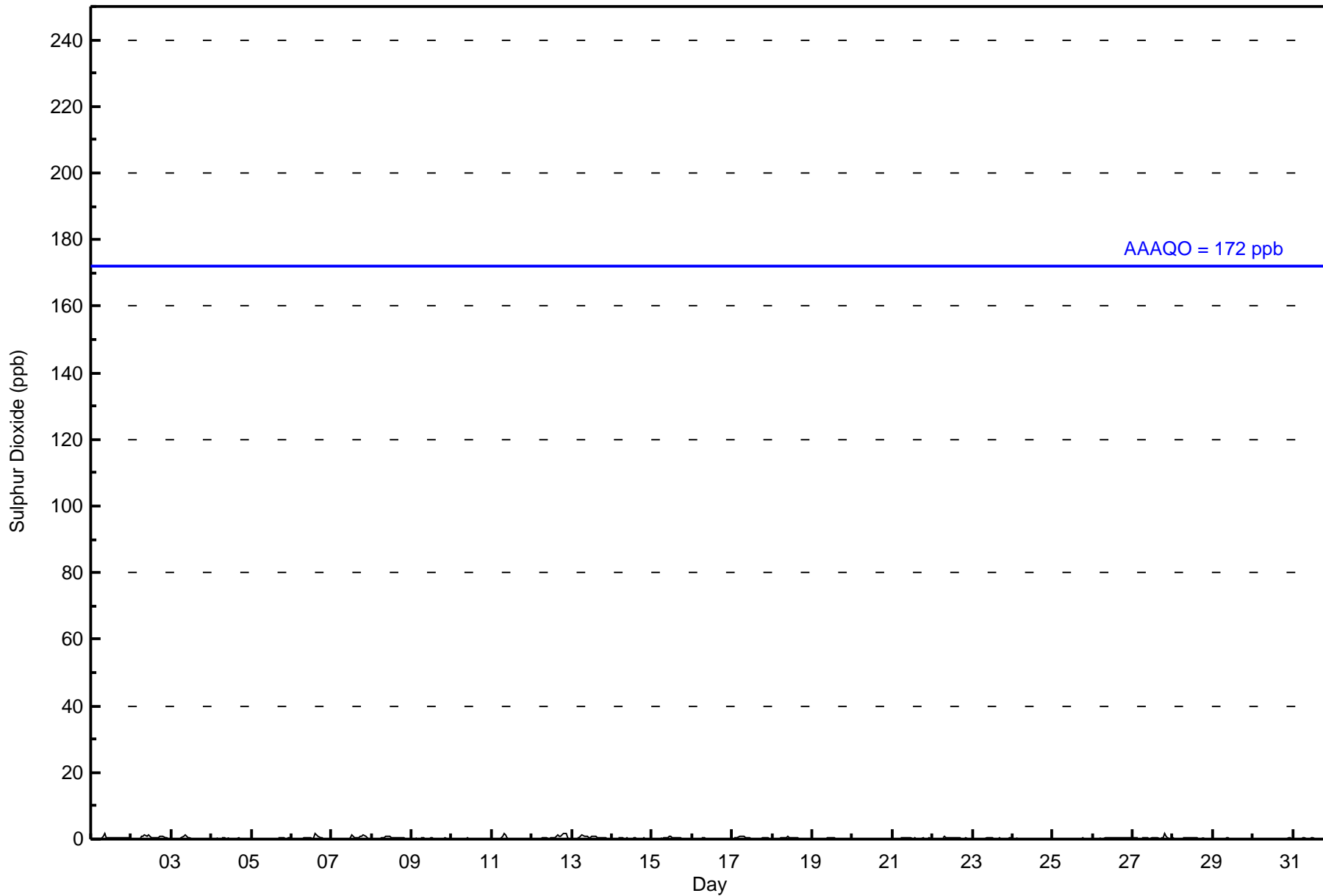
**Sulphur Dioxide (SO₂) - ppb
Conklin Community - July 2016**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 2 ppb on Jul 1 09:00 Maximum Daily Average: 0.6 ppb on Jul 2																	Hours in Service: 744 Hours of Data: 705									
Minimum Value: 0 ppb on Jul 16 17:00 Minimum Daily Average: 0.1 ppb on Jul 20 Maximum Diurnal Average: 0.4 ppb at hour 9 Minimum Diurnal Average: 0.1 ppb at hour 24 Monthly Average: 0.3 ppb Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 1																	Hours of Missing Data: 39 Hours of Calibration: 37 Percent Operational Time: 99.7									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	0	0	Z	0	0	0	1	1	2	1	1	0	1	0	0	0	0	1	0	1	0	0	0	0	0.5	2
2-Jul	0	0	0	Z	0	0	1	1	1	1	1	1	0	1	0	0	1	1	1	1	0	0	0	0	0.6	1
3-Jul	0	0	0	0	Z	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
4-Jul	0	0	0	0	0	Z	0	0	0	0	0	M	M	Z	0	0	0	0	0	0	0	0	0	0	0.2	0
5-Jul	Z	0	0	0	0	0	0	0	0	0	C	C	C	C	C	C	0	0	0	0	0	0	0	0	--	0
6-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	0	2	1	1	0	0	0	0	0	0	0	0	0.4	2
7-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	1	1	0	0	0	0.4	1
8-Jul	0	0	0	Z	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
9-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.2	1
10-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
11-Jul	Z	0	0	0	0	0	1	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	2
12-Jul	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	1	1	1	1	1	2	1	0	0	0	0.5	2
13-Jul	0	0	Z	0	0	1	1	1	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0.5	1
14-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
15-Jul	0	0	0	0	Z	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.3	1
16-Jul	0	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
17-Jul	Z	1	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
18-Jul	0	Z	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
19-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
20-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
21-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
22-Jul	0	0	0	0	0	Z	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0.3	1
23-Jul	Z	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
24-Jul	0	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
25-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
26-Jul	0	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
27-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0	0	0	0.4	2
28-Jul	0	0	0	0	0	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
29-Jul	Z	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
30-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
31-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
0.2 0.2 0.2 0.2 0.2 0.2 0.3 0.4 0.4 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.2 0.2 0.3 0.3 0.3 0.2 0.2 0.1																								Diurnal Average		
0 1 0 0 1 1 1 2 2 1 1 1 1 1 1 2 1 1 1 1 2 1 0 0 0																								Diurnal Maximum		
Z - zerospan C - Calibration M - Maintenance Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb																										



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Conklin Community - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Conklin Community - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	705	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: 705

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Conklin Community - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	59	33	13	12	15	34	18	24	42	63	65	39	33	53	87	111	701
11 - 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	59	33	13	12	15	34	18	24	42	63	65	39	33	53	87	111	701

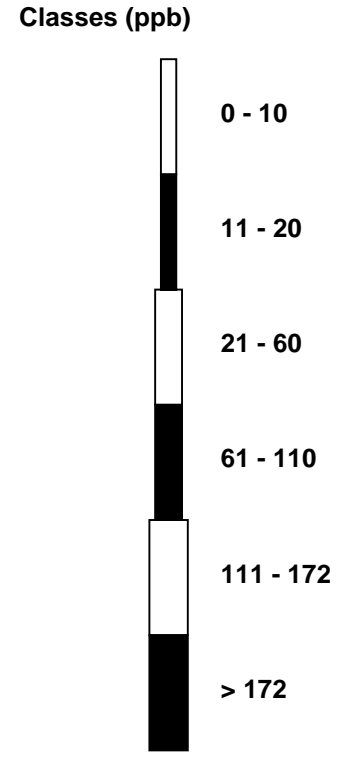
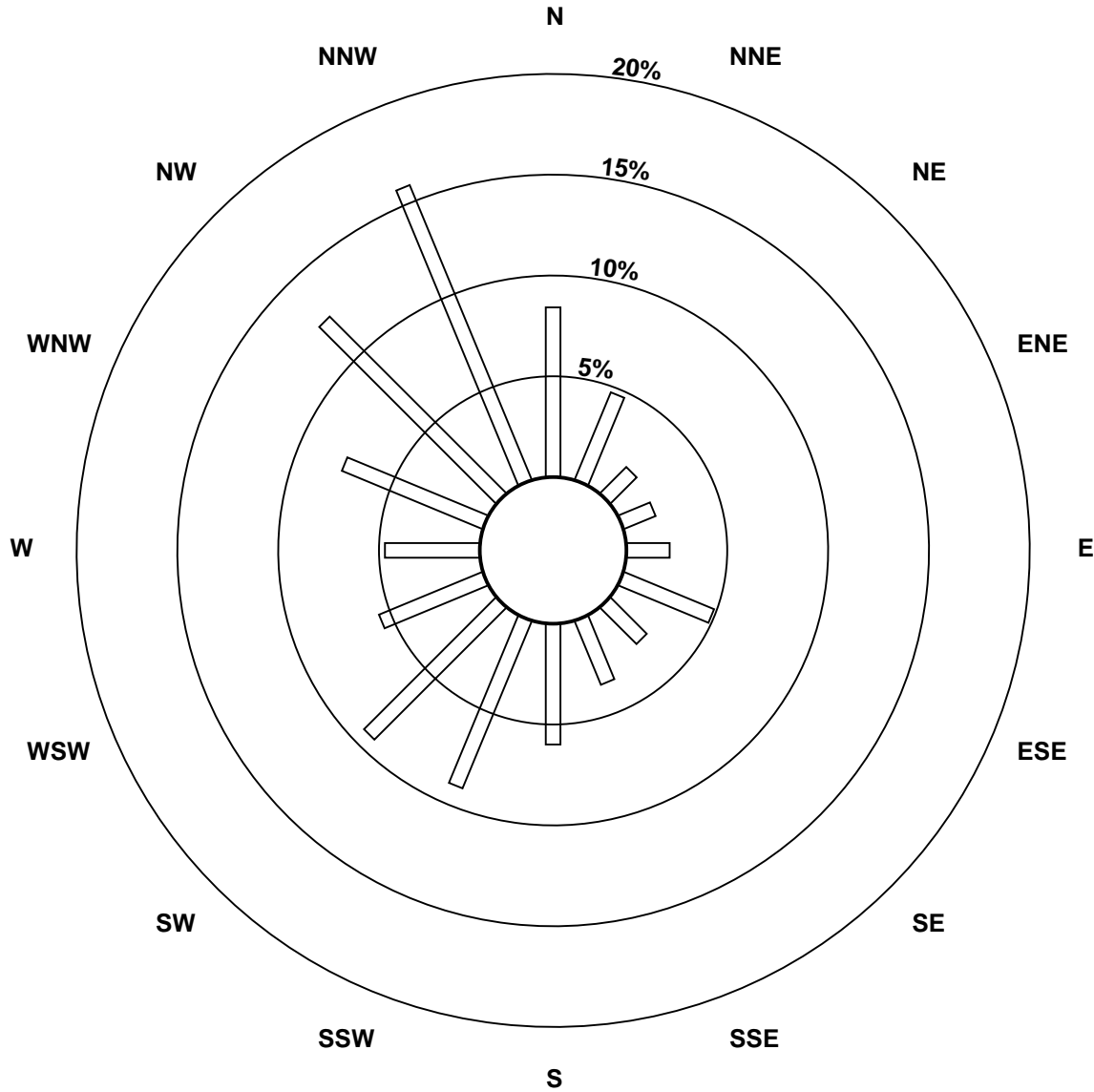
Total Number of Valid Hours: 701

Total Number of Hours: 744

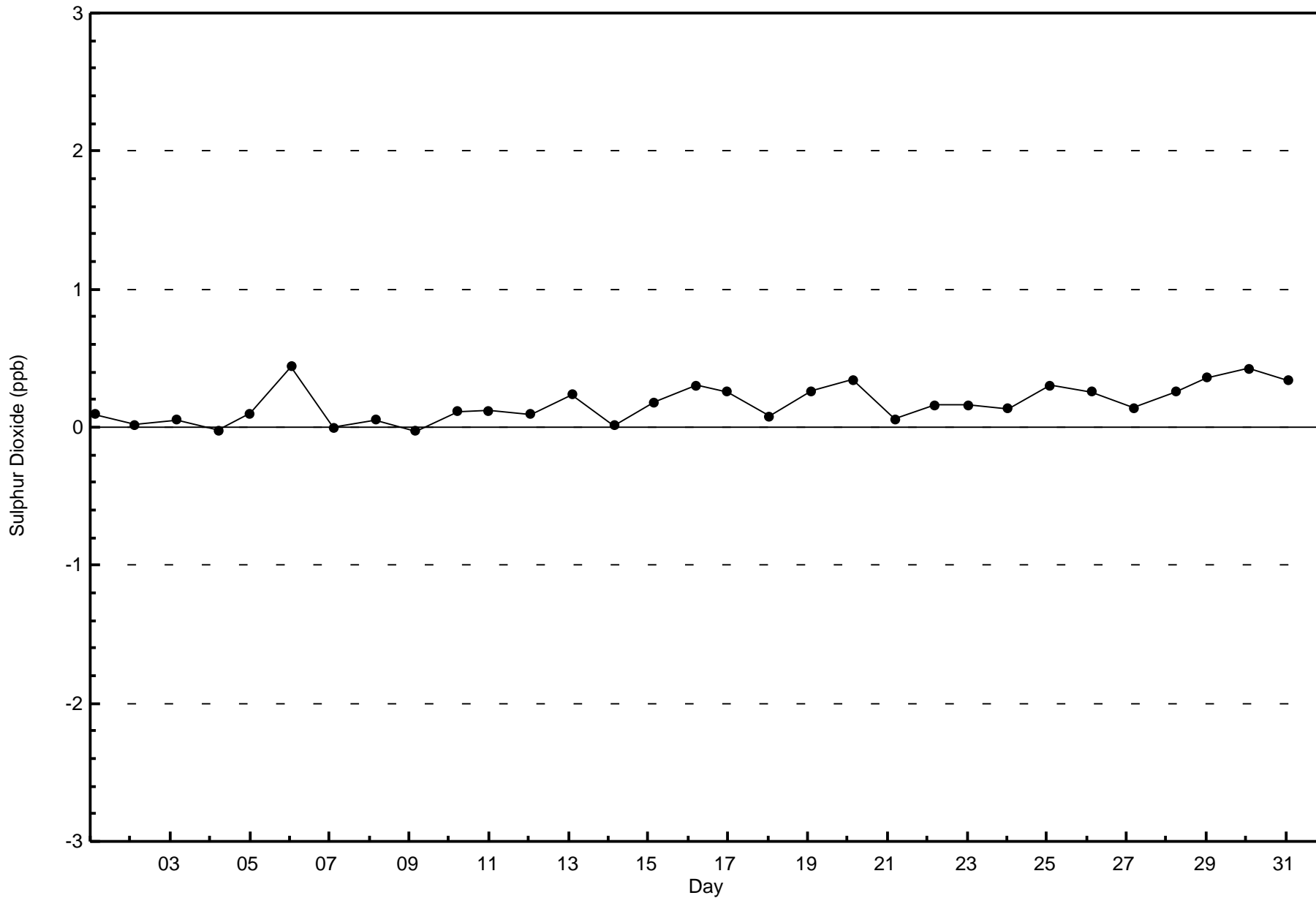


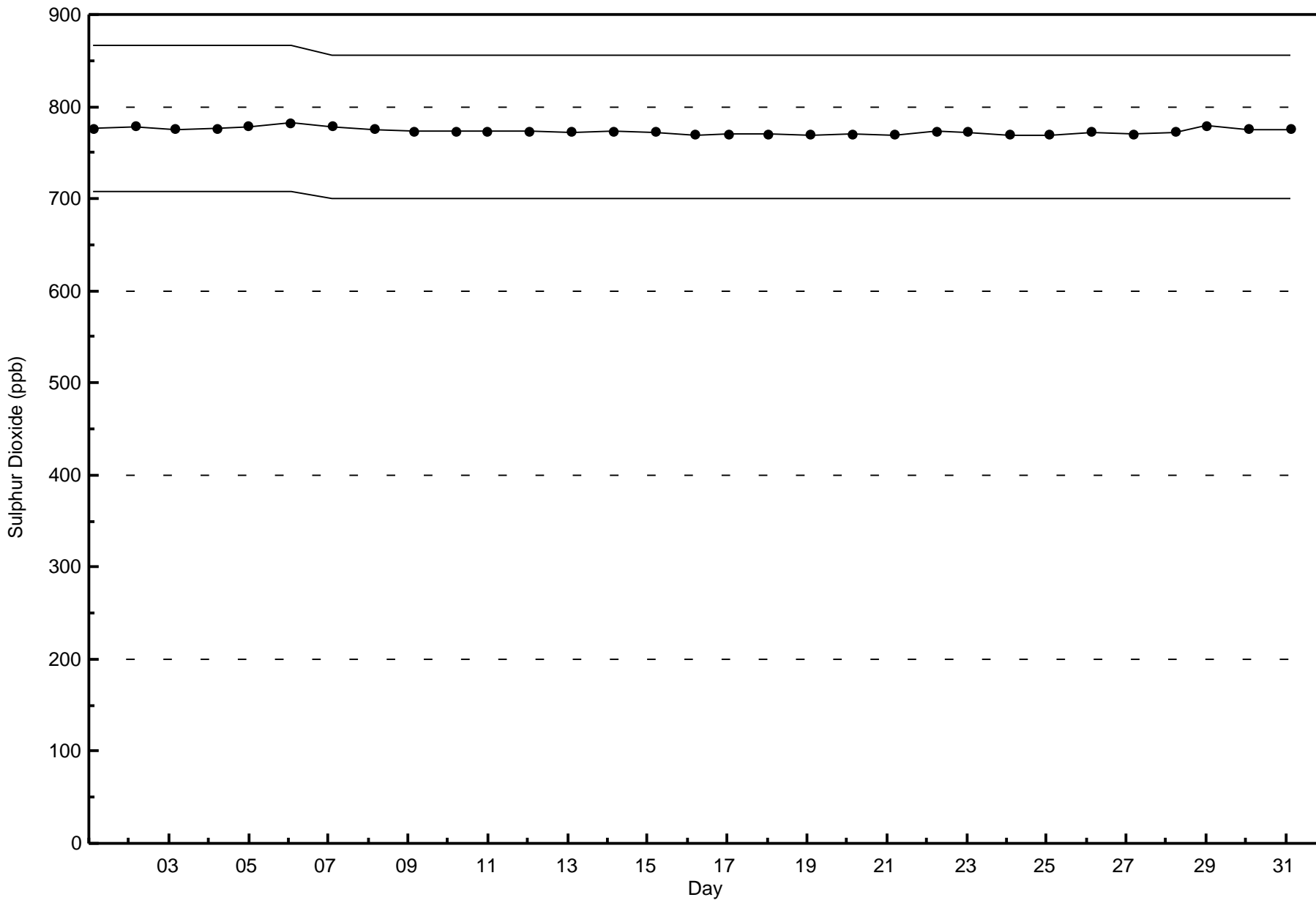
Wood Buffalo Environmental Association
Wind Rose Jul 2016

Sulphur Dioxide (SO₂) - ppb
Conklin Community (AMS 21)



Total Number of Valid Hours: 701







Wood Buffalo Environmental Association

Summary of Hour Averages

Total Reduced Sulphur (TRS) - ppb

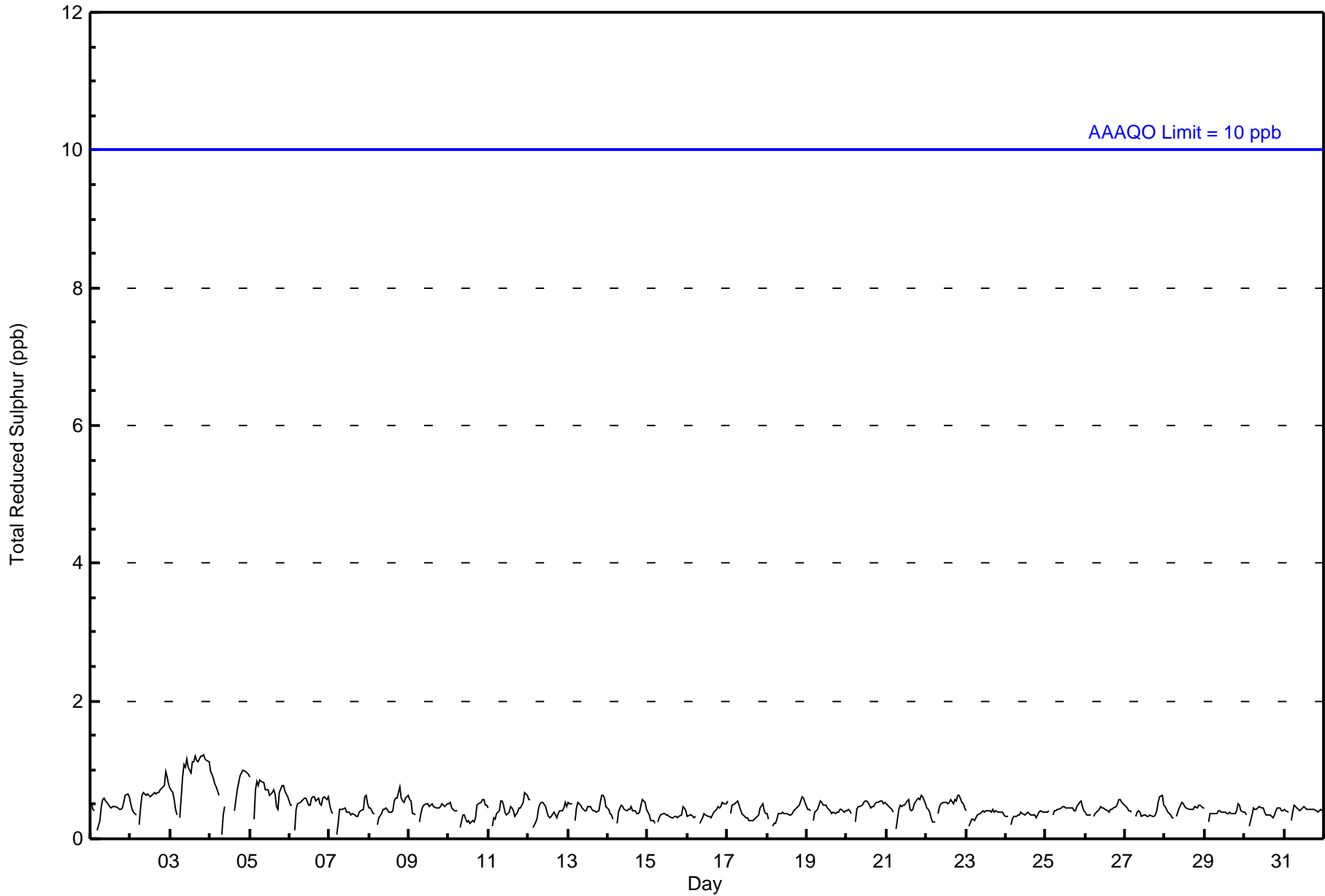
Conklin Community - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																
Maximum Value: 1 ppb on Jul 3 21:00										Maximum Daily Average: 1.0 ppb on Jul 3										Hours of Data: 708						
Minimum Value: 0 ppb on Jul 4 08:00										Minimum Daily Average: 0.3 ppb on Jul 15										Hours of Missing Data: 36						
Maximum Diurnal Average: 0.6 ppb at hour 22										Minimum Diurnal Average: 0.3 ppb at hour 5										Hours of Calibration: 36						
Monthly Average: 0.5 ppb										Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 1 P ₉₉ = 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-Jul	1	0	0	Z	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1	1		
2-Jul	1	0	0	0	Z	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
3-Jul	1	1	1	0	0	Z	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
4-Jul	1	1	1	1	1	1	Z	0	0	0	C	C	C	C	C	0	1	1	1	1	1	1	1	1		
5-Jul	1	Z	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1	1	1	1		
6-Jul	0	0	Z	0	0	1	1	1	1	1	1	0	0	1	1	1	1	1	1	0	1	1	1	1		
7-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1		
8-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1		
9-Jul	1	1	0	0	0	Z	0	0	0	0	1	1	0	0	1	0	0	0	0	0	1	0	0	1		
10-Jul	1	1	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0		
11-Jul	0	Z	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1		
12-Jul	1	1	Z	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0		
13-Jul	1	1	1	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1		
14-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0		
15-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
16-Jul	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1		
17-Jul	1	Z	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0		
18-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1		
19-Jul	0	0	0	Z	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
20-Jul	0	0	0	0	Z	0	0	0	0	0	1	1	1	1	0	0	0	1	1	1	1	1	1	1		
21-Jul	1	0	0	0	0	Z	0	0	0	0	0	0	1	1	0	0	0	1	1	1	1	1	1	1		
22-Jul	0	0	0	0	0	0	Z	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1		
23-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
24-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
25-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0		
26-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1		
27-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0		
28-Jul	0	0	0	0	0	0	Z	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0		
29-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0		
30-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
31-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
0.5 0.4 0.4 0.4 0.3 0.4 0.4 0.4 0.5 0.5 0.5 0.5 0.4 0.4 0.4 0.4 0.4 0.5 0.5 0.5 0.6 0.6 0.6 0.5																								Diurnal Average		
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
Conklin Community - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb
Conklin Community - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	708	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb
Conklin Community - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	56	39	13	12	13	33	17	25	44	62	67	40	33	53	83	114	704
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	56	39	13	12	13	33	17	25	44	62	67	40	33	53	83	114	704

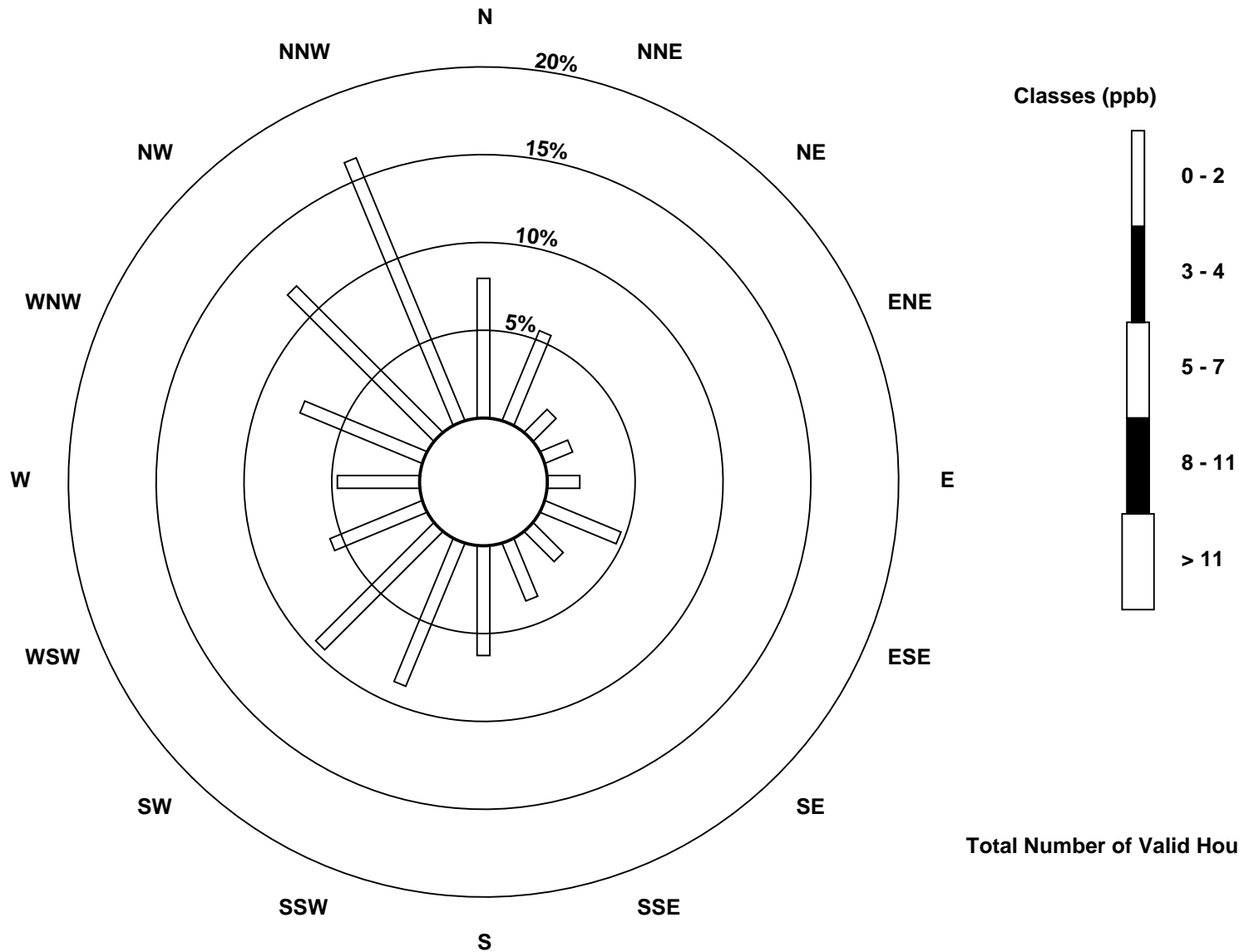
Total Number of Valid Hours: 704

Total Number of Hours: 744

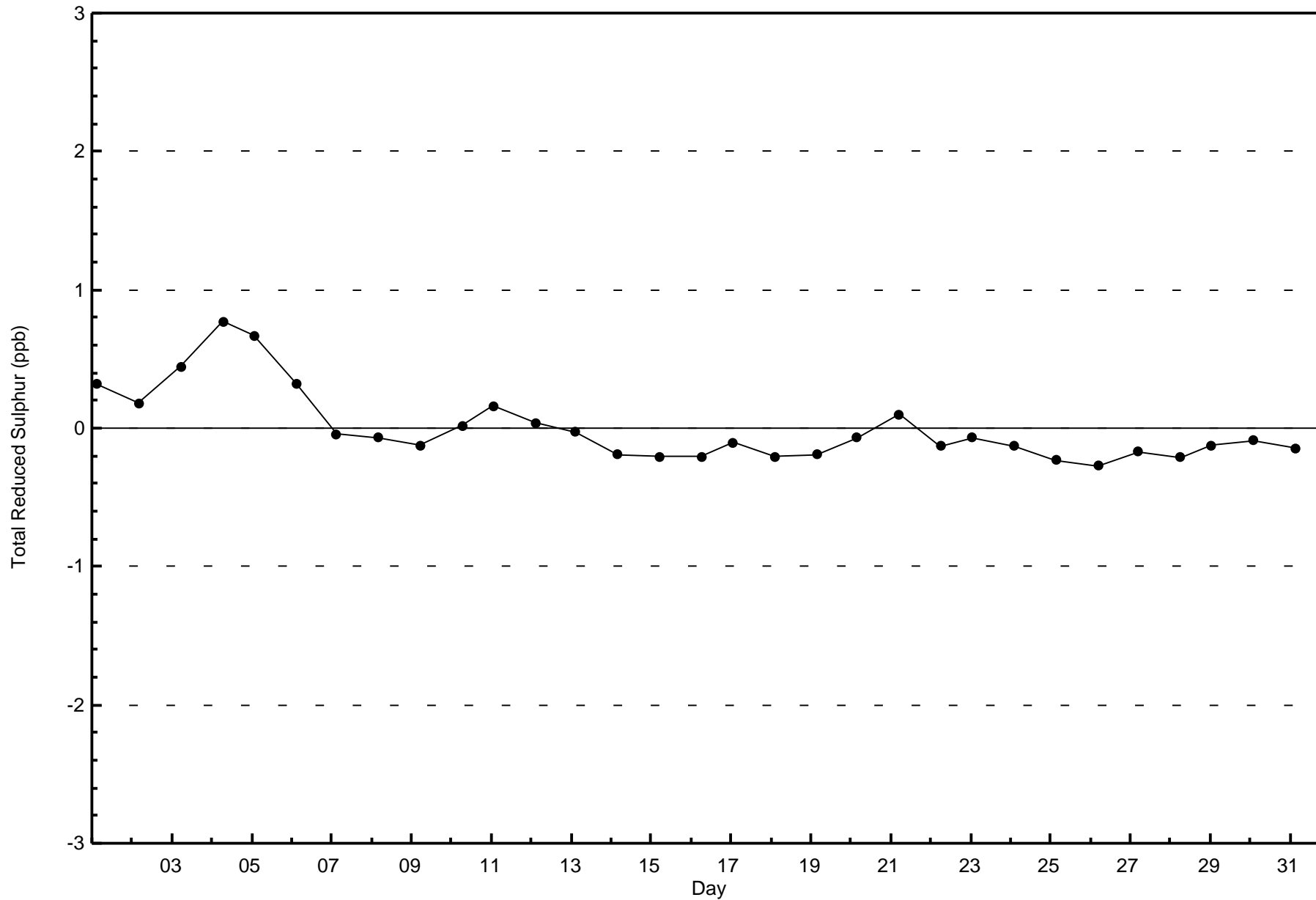


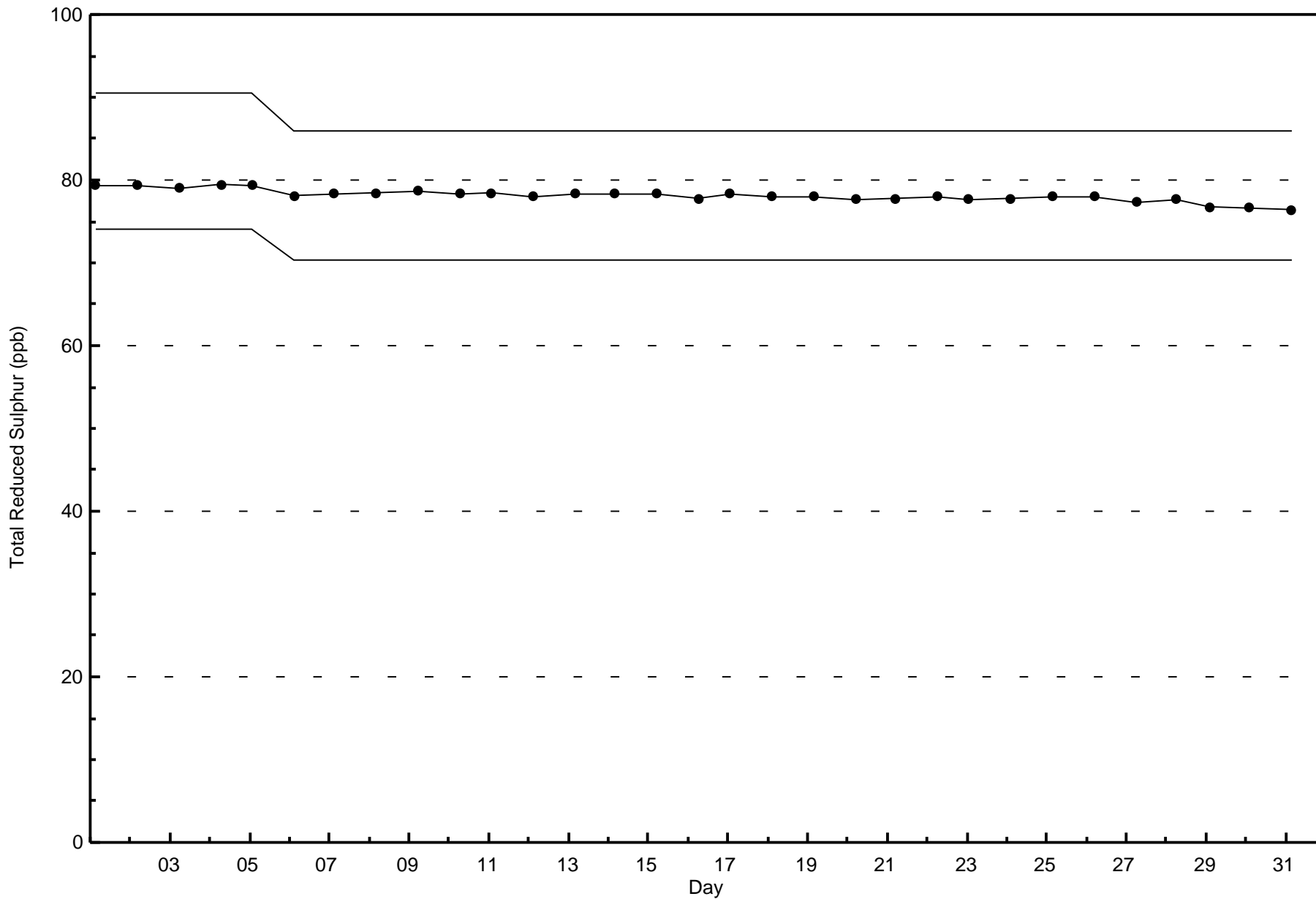
Wood Buffalo Environmental Association
Wind Rose Jul 2016

Total Reduced Sulphur (TRS) - ppb
Conklin Community (AMS 21)



Total Number of Valid Hours: 704







Wood Buffalo Environmental Association
Summary of Hour Averages

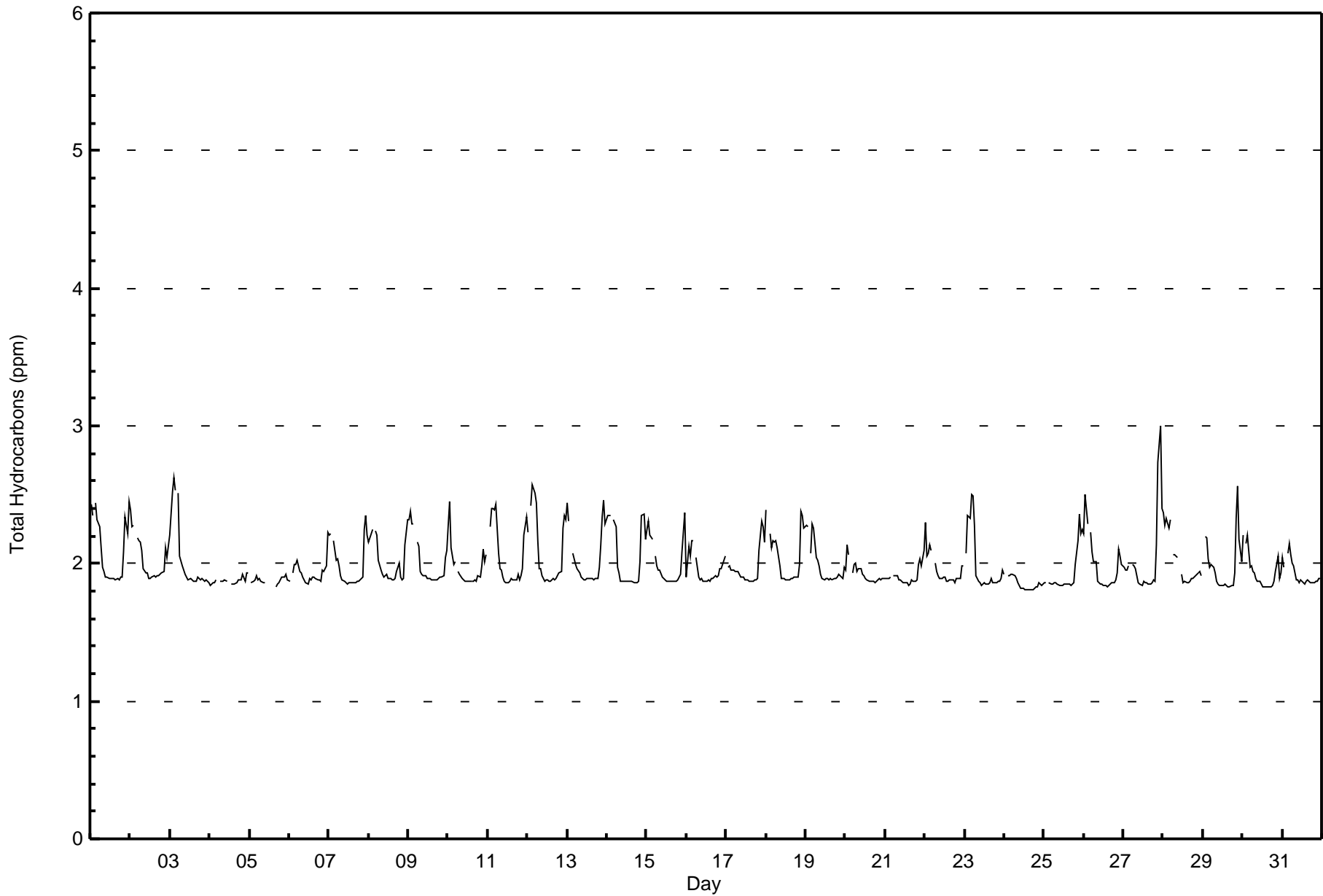
Total Hydrocarbons (THC) - ppm
Conklin Community - July 2016

Maximum Value: 3.0 ppm on Jul 27 23:00		Maximum Daily Average: 2.1 ppm on Jul 12		Hours in Service: 744																							
Minimum Value: 1.8 ppm on Jul 24 18:00		Minimum Daily Average: 1.9 ppm on Jul 24		Hours of Data: 703																							
Maximum Diurnal Average: 2.2 ppm at hour 2		Minimum Diurnal Average: 1.9 ppm at hour 15		Hours of Missing Data: 41																							
Monthly Average: 1.98 ppm		Percentiles: P ₁ = 1.8 P ₁₀ = 1.9 Q ₁ = 1.9 Median = 1.9 Q ₃ = 2.0 P ₉₀ = 2.3 P ₉₉ = 2.5		Hours of Calibration: 37																							
				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-Jul	2.4	2.3	Z	2.4	2.3	2.3	2.1	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.1	2.3	2.2	2.4	2.1	2.4	
2-Jul	2.4	2.3	2.3	Z	2.2	2.2	2.2	2.1	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.1	2.0	2.1	2.0	2.4	
3-Jul	2.2	2.5	2.6	2.5	Z	2.5	2.1	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.6	
4-Jul	1.8	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	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	1.9	
5-Jul	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	C	C	C	C	C	C	1.8	1.8	1.9	1.9	1.9	1.9	1.9	--	1.9	
6-Jul	1.9	Z	1.9	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	2.0	2.2	1.9	2.2	
7-Jul	2.2	2.2	Z	2.2	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	2.2	2.3	2.2	2.0	2.3	
8-Jul	2.2	2.2	2.2	Z	2.2	2.2	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	1.9	2.1	2.3	2.0	2.3	
9-Jul	2.3	2.4	2.3	2.3	Z	2.2	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	2.0	2.1	2.0	2.4	
10-Jul	2.3	2.5	2.1	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	2.0	2.1	2.0	2.1	2.0	2.5	
11-Jul	Z	2.3	2.4	2.4	2.4	2.4	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	2.0	2.2	2.3	2.0	2.4	
12-Jul	2.2	Z	2.4	2.6	2.5	2.4	2.2	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.3	2.4	2.3	2.1	2.6	
13-Jul	2.4	2.3	Z	2.1	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.1	2.3	2.5	2.3	2.0	2.5	
14-Jul	2.3	2.3	2.4	Z	2.3	2.3	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.3	2.4	2.2	2.0	2.4	
15-Jul	2.3	2.3	2.2	2.2	Z	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	2.1	2.2	2.4	2.0	2.4	
16-Jul	1.9	2.1	2.1	2.2	2.2	Z	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.1	2.0	2.2	
17-Jul	Z	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.1	2.3	2.3	2.2	2.0	2.3	
18-Jul	2.4	Z	2.2	2.1	2.2	2.2	2.2	2.1	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.4	2.3	2.3	2.0	2.4	
19-Jul	2.3	2.3	Z	2.1	2.3	2.3	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	2.3	
20-Jul	2.0	2.1	2.1	Z	1.9	2.0	2.0	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	2.1	
21-Jul	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	1.8	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.1	1.9	2.1	
22-Jul	2.3	2.1	2.1	2.1	2.1	Z	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.3
23-Jul	Z	2.1	2.4	2.3	2.5	2.5	2.3	1.9	1.9	1.9	1.8	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	2.5	
24-Jul	1.9	Z	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	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9	1.9	
25-Jul	1.9	1.9	Z	1.9	1.8	1.9	1.9	1.9	1.9	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.9	1.8	1.9	1.9	2.0	2.2	2.4	2.2	2.2	1.9	2.4
26-Jul	2.2	2.5	2.3	Z	2.2	2.1	2.0	2.0	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	2.1	2.1	2.0	2.0	2.5	
27-Jul	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	1.9	1.9	1.8	1.8	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.1	2.7	3.0	2.4	2.0	3.0
28-Jul	2.4	2.3	2.3	2.3	2.3	Z	2.1	2.1	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	1.9	2.0	2.4	
29-Jul	Z	2.2	2.2	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9	2.3	2.6	2.2	2.0	2.0	2.6
30-Jul	2.2	Z	2.1	2.2	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9	1.9	2.0	1.9	1.9	2.2	
31-Jul	2.0	2.0	Z	2.1	2.1	2.1	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.1
																								Diurnal Average			
																								Diurnal Maximum			
Z - zerospan C - Calibration M - Maintenance																											



Wood Buffalo Environmental Association
Hourly Averages

Total Hydrocarbons (THC) - ppm
Conklin Community - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Conklin Community - July 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	541	76.96	76.96
2.1 - 3.0	162	23.04	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 703

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Conklin Community - July 2016**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	45	29	13	11	10	28	12	5	18	42	55	37	31	52	75	78	541
2.1 - 3.0	14	4	0	1	5	6	6	19	24	21	10	2	1	1	12	32	158
3.1 - 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	59	33	13	12	15	34	18	24	42	63	65	39	32	53	87	110	699

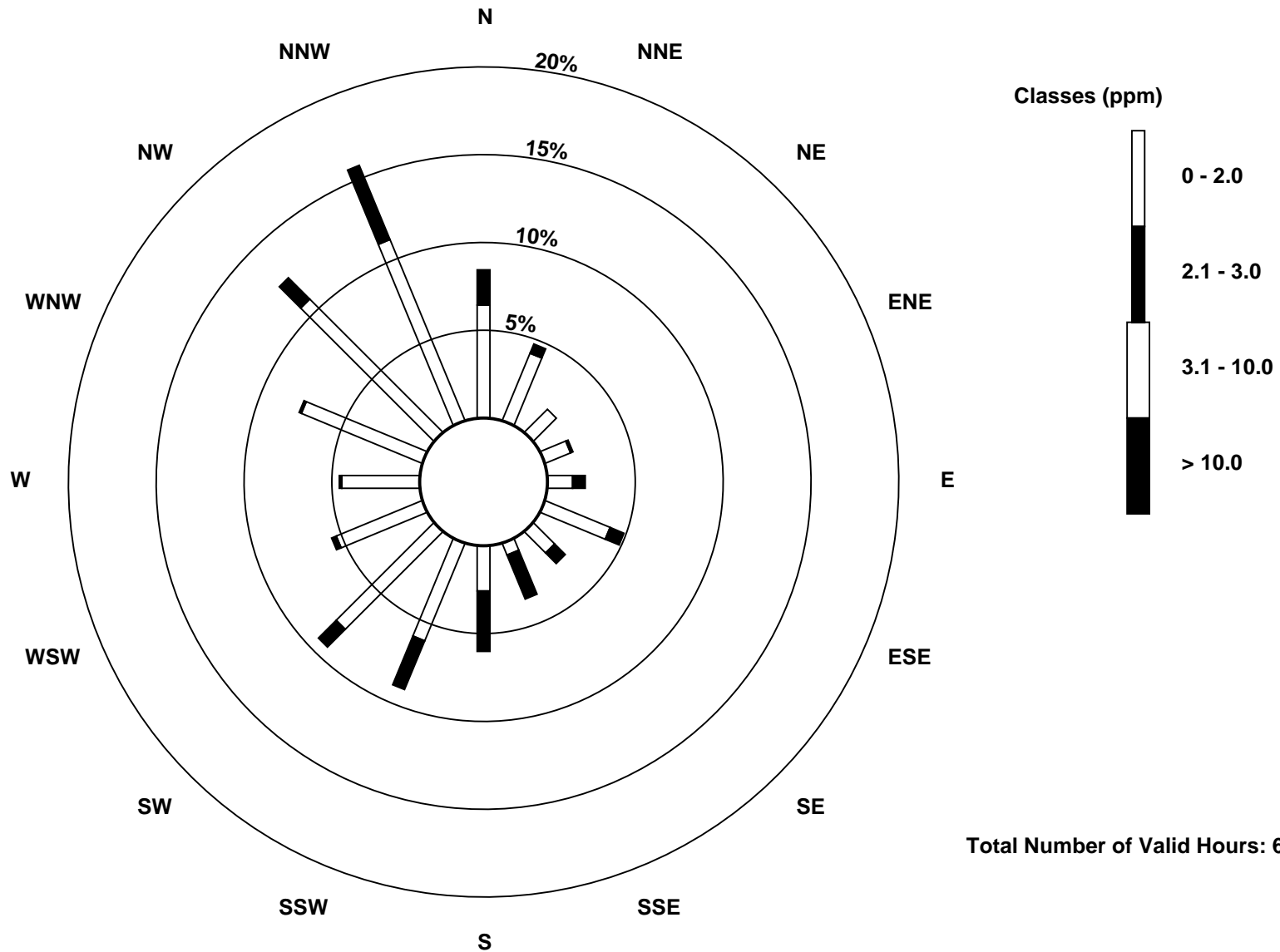
Total Number of Valid Hours: 699

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

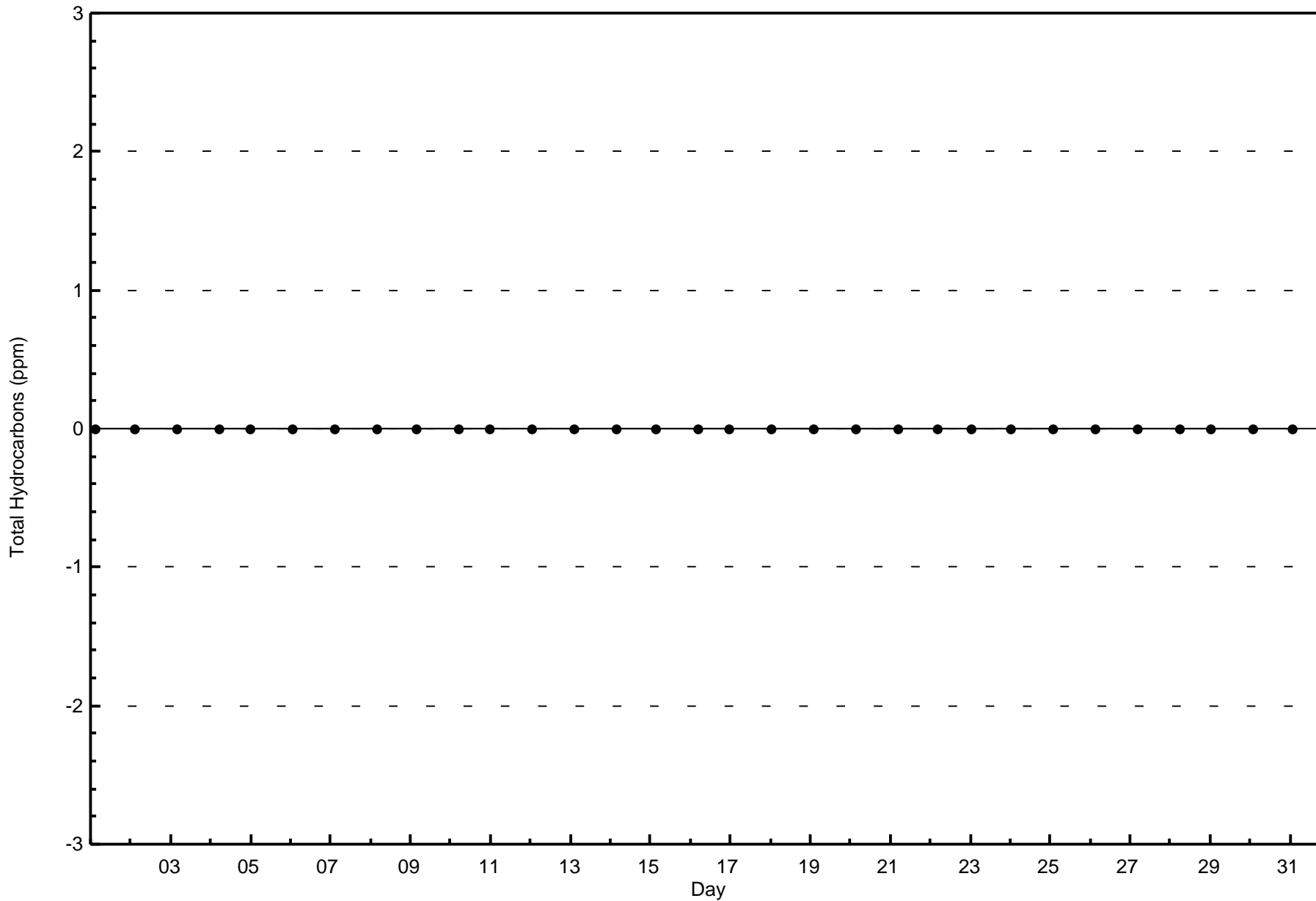
Total Hydrocarbons (THC) - ppm
Conklin Community (AMS 21)

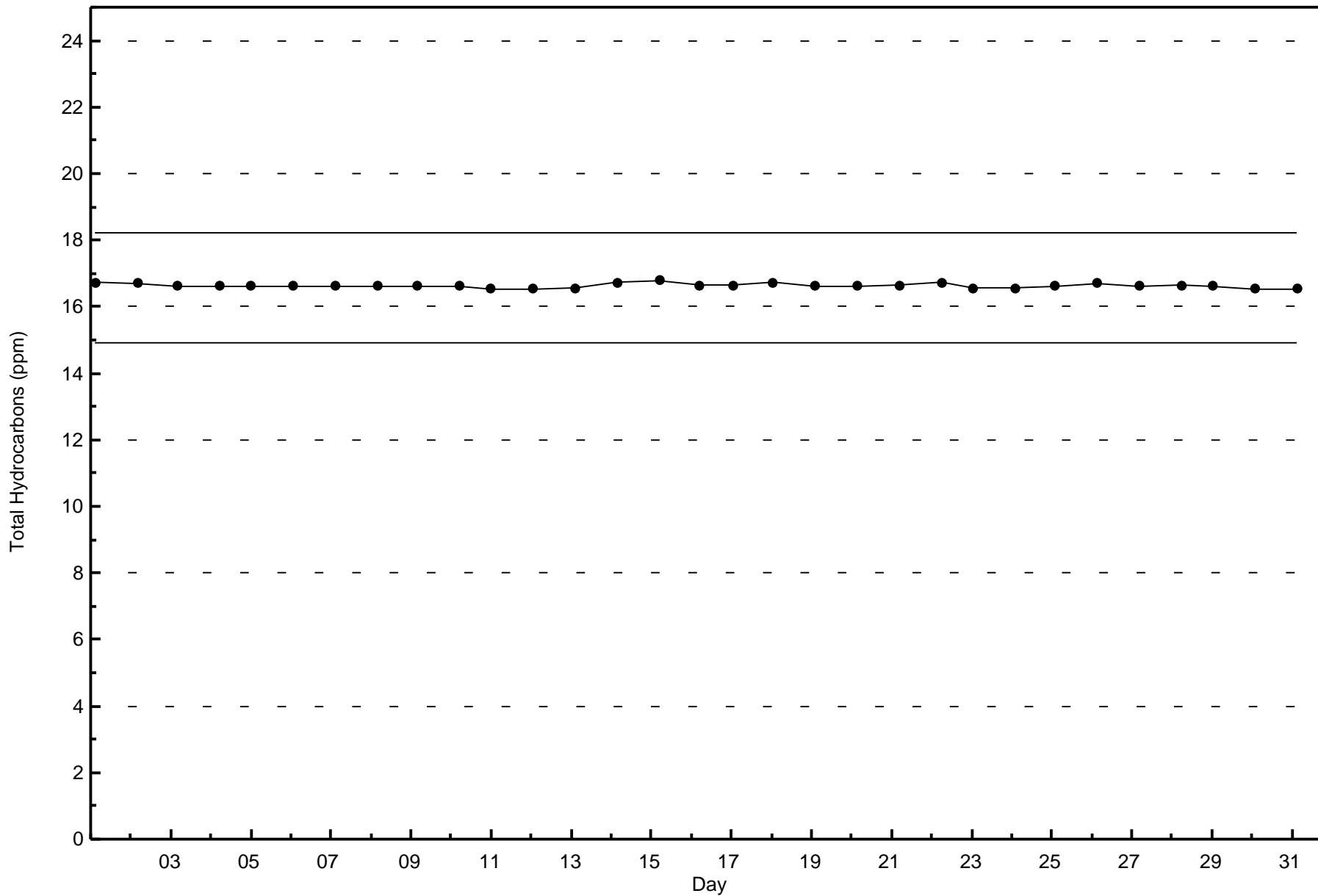




Wood Buffalo Environmental Association
Zero Responses

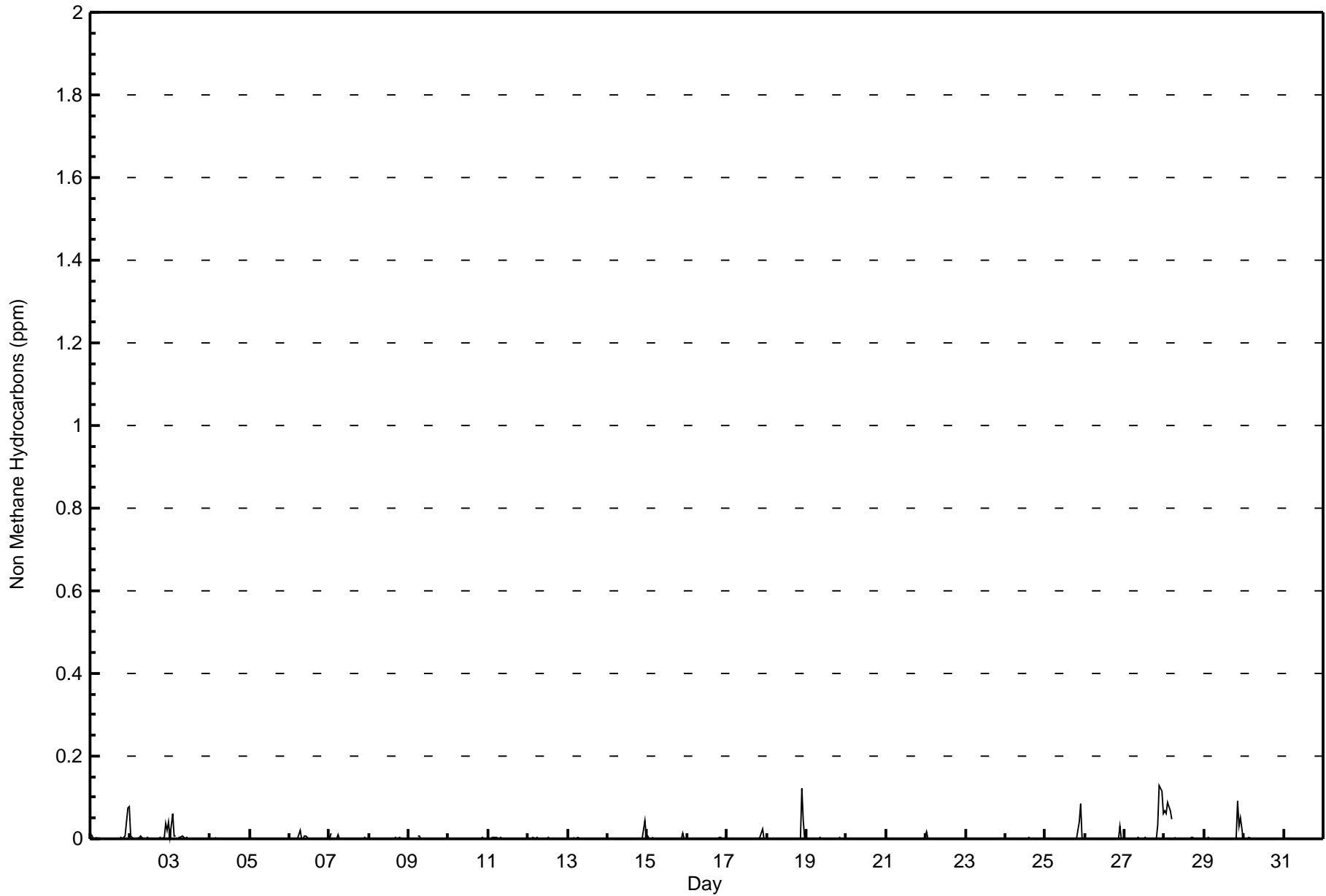
Total Hydrocarbons (THC) - ppm
Conklin Community - July 2016







Maximum Value: 0.130 ppm on Jul 27 22:00		Maximum Daily Average: 0.017 ppm on Jul 28		Hours in Service: 744																						
Minimum Value: 0.000 ppm on Jul 1 05:00		Minimum Daily Average: 0.000 ppm on Jul 23		Hours of Data: 703																						
Maximum Diurnal Average: 0.016 ppm at hour 22		Minimum Diurnal Average: 0.000 ppm at hour 12		Hours of Missing Data: 41																						
Monthly Average: 0.003 ppm		Percentiles: P ₁ = 0.0 P ₁₀ = 0.0 Q ₁ = 0.0 Median = 0.0 Q ₃ = 0.0 P ₉₀ = 0.0 P ₉₉ = 0.1		Hours of Calibration: 37																						
				Percent Operational Time: 99.5																						
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-Jul	0.009	0.003	Z	0.003	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	0.003	0.000	0.003	0.006	0.076	0.077	0.008	0.077
2-Jul	0.007	0.002	0.002	Z	0.002	0.001	0.005	0.002	0.001	0.001	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.002	0.005	0.037	0.021	0.040	0.006	0.040
3-Jul	0.005	0.062	0.007	0.007	Z	0.005	0.003	0.007	0.003	0.001	0.004	0.000	0.000	0.001	0.001	0.001	0.002	0.000	0.001	0.000	0.000	0.001	0.001	0.000	0.005	0.062
4-Jul	0.000	0.000	0.000	0.000	0.002	Z	0.000	0.000	0.001	0.000	0.000	0.000	M	M	0.001	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.002
5-Jul	Z	0.002	0.000	0.001	0.001	0.000	0.001	0.000	0.000	0.000	C	C	C	C	C	C	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	--	0.002
6-Jul	0.000	Z	0.000	0.000	0.000	0.000	0.021	0.000	0.001	0.006	0.007	0.000	0.001	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.002	0.021
7-Jul	0.000	0.013	Z	0.000	0.000	0.009	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	0.004	0.001	0.000	0.001	0.013
8-Jul	0.000	0.001	0.001	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	0.002	0.000	0.003	0.000	0.001	0.001	0.000	0.000	0.000	0.003
9-Jul	0.001	0.000	0.000	0.001	Z	0.006	0.008	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.008
10-Jul	0.000	0.000	0.000	0.001	0.001	Z	0.002	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.001	0.000	0.000	0.004	0.001	0.001	0.000	0.001	0.004
11-Jul	Z	0.001	0.002	0.002	0.004	0.002	0.001	0.003	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.002	0.000	0.001	0.004
12-Jul	0.000	Z	0.001	0.003	0.000	0.002	0.000	0.001	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	0.001	0.000	0.000	0.003
13-Jul	0.000	0.000	Z	0.004	0.000	0.001	0.002	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.004
14-Jul	0.001	0.000	0.000	Z	0.000	0.001	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	0.042	0.004	0.002	0.042
15-Jul	0.006	0.000	0.000	0.002	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	0.012	0.001	0.001	0.001	0.012
16-Jul	0.000	0.000	0.001	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	0.003	0.003	0.000	0.000	0.003	0.000	0.003
17-Jul	Z	0.001	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	0.002	0.022	0.000	0.000	0.001	0.022
18-Jul	0.001	Z	0.001	0.001	0.000	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.001	0.000	0.000	0.000	0.123	0.043	0.002	0.008	0.123
19-Jul	0.000	0.000	Z	0.001	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.003
20-Jul	0.000	0.000	0.000	Z	0.000	0.001	0.001	0.000	0.001	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.000	0.001
21-Jul	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.005	0.000	0.005
22-Jul	0.017	0.000	0.000	0.000	0.001	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	0.001	0.001	0.000	0.000	0.001	0.017
23-Jul	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001
24-Jul	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	0.000	0.000	0.002
25-Jul	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	0.041	0.084	0.000	0.000	0.005	0.084
26-Jul	0.000	0.000	0.001	Z	0.001	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	0.031	0.000	0.002	0.002	0.031
27-Jul	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.035	0.130	0.114	0.060	0.015	0.130
28-Jul	0.069	0.063	0.088	0.068	0.048	Z	0.004	0.001	0.000	M	M	0.000	0.002	0.000	0.000	0.000	0.002	0.002	0.000	0.001	0.001	0.000	0.000	0.000	0.017	0.088
29-Jul	Z	0.000	0.003	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	0.005	0.093	0.032	0.049	0.000	0.008	0.093
30-Jul	0.000	Z	0.001	0.003	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	0.003
31-Jul	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan C - Calibration M - Maintenance																										





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm
Conklin Community - July 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 0.005	661	94.03	94.03
0.006 - 0.05	29	4.13	98.15
0.06 - 0.1	13	1.85	100.00
> 0.1	0	0.00	100.00

Total Number of Valid Hours: 703

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm
Conklin Community - July 2016**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 0.005	58	32	13	12	14	33	16	18	36	56	60	39	32	51	82	107	659
0.006 - 0.05	1	1	0	0	1	1	2	4	3	3	5	0	0	2	4	2	29
0.06 - 0.1	0	0	0	0	0	0	0	2	3	4	0	0	0	0	1	1	11
> 0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	59	33	13	12	15	34	18	24	42	63	65	39	32	53	87	110	699

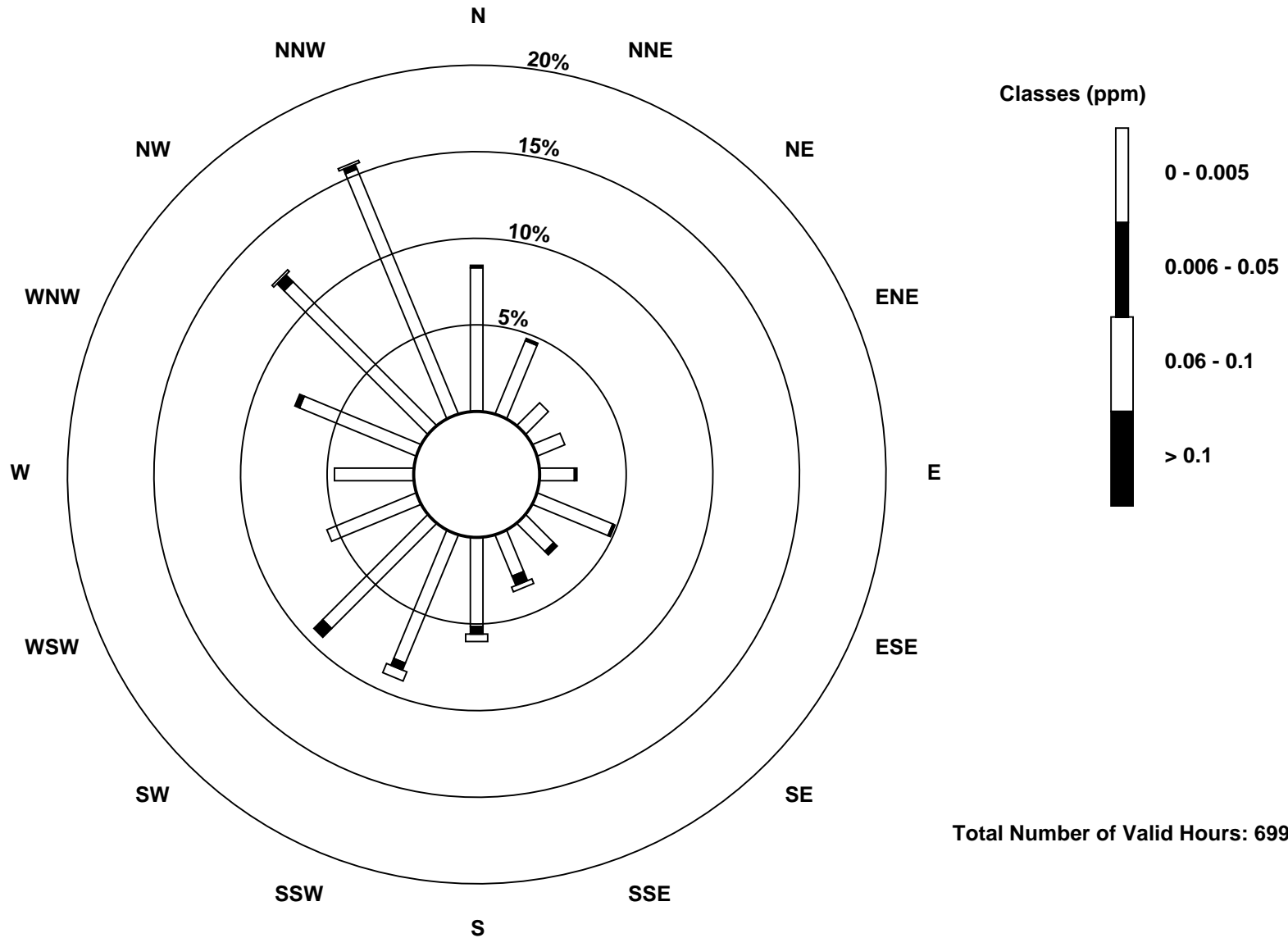
Total Number of Valid Hours: 699

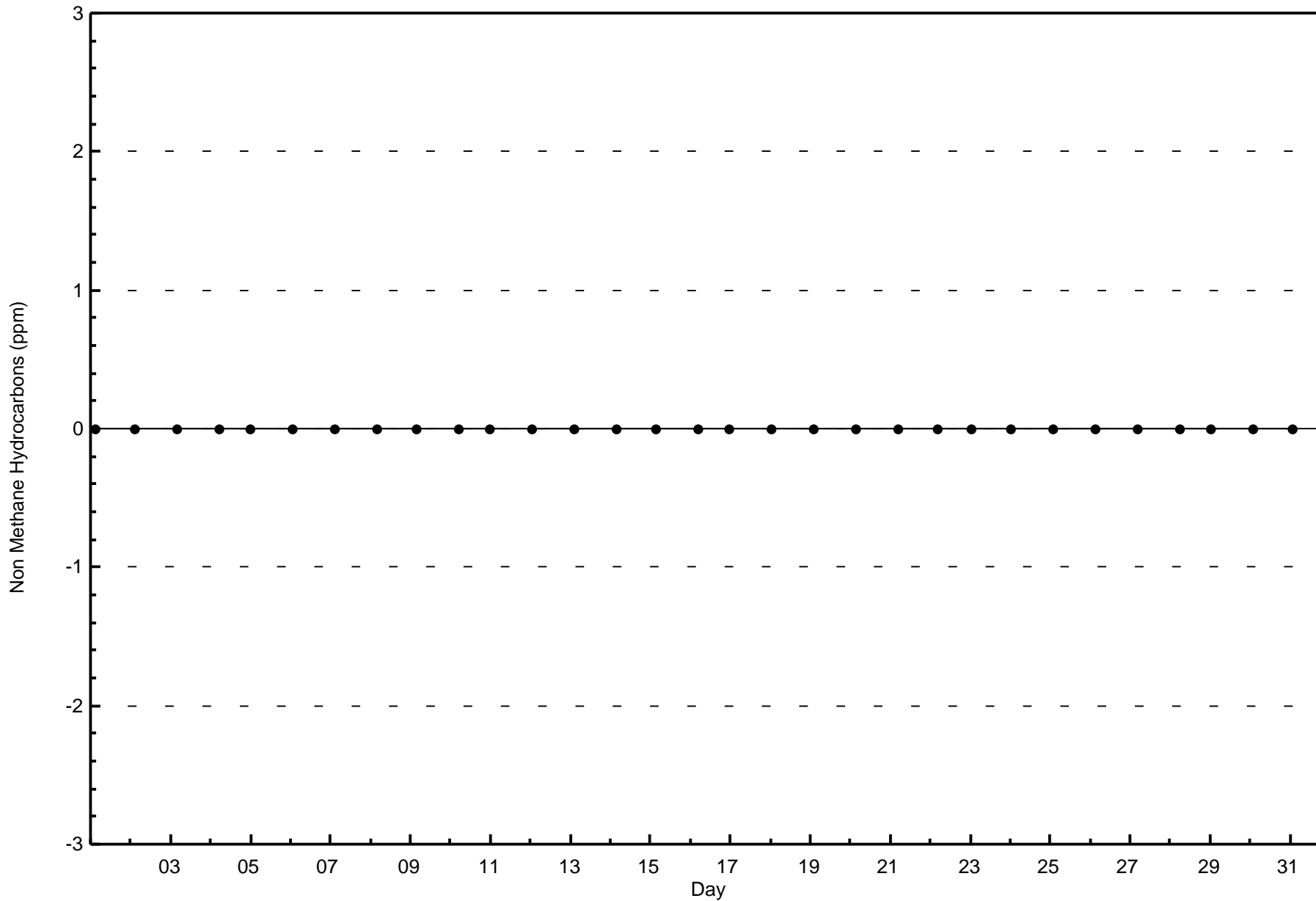
Total Number of Hours: 744

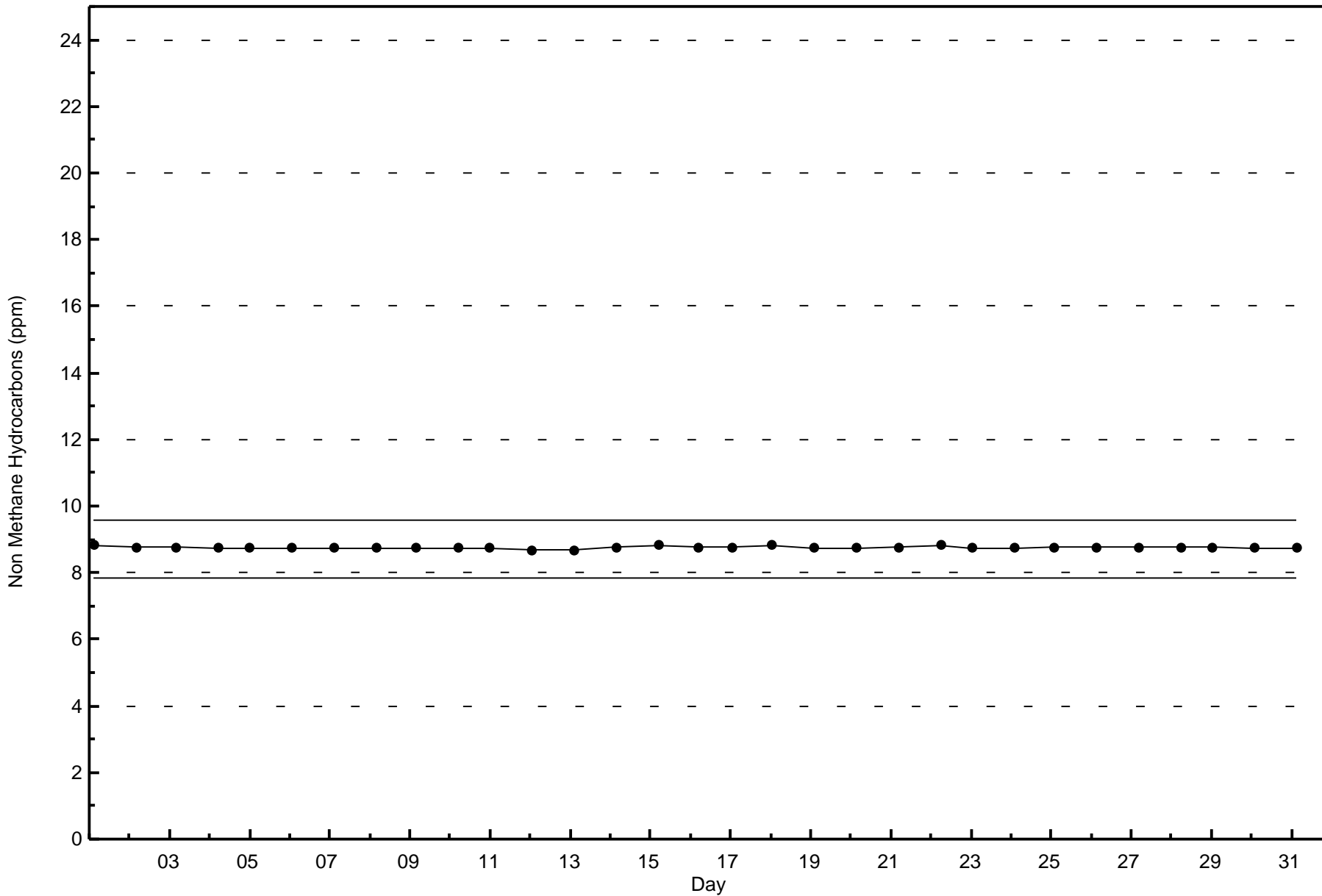


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Non Methane Hydrocarbons (NMHC) - ppm
Conklin Community (AMS 21)

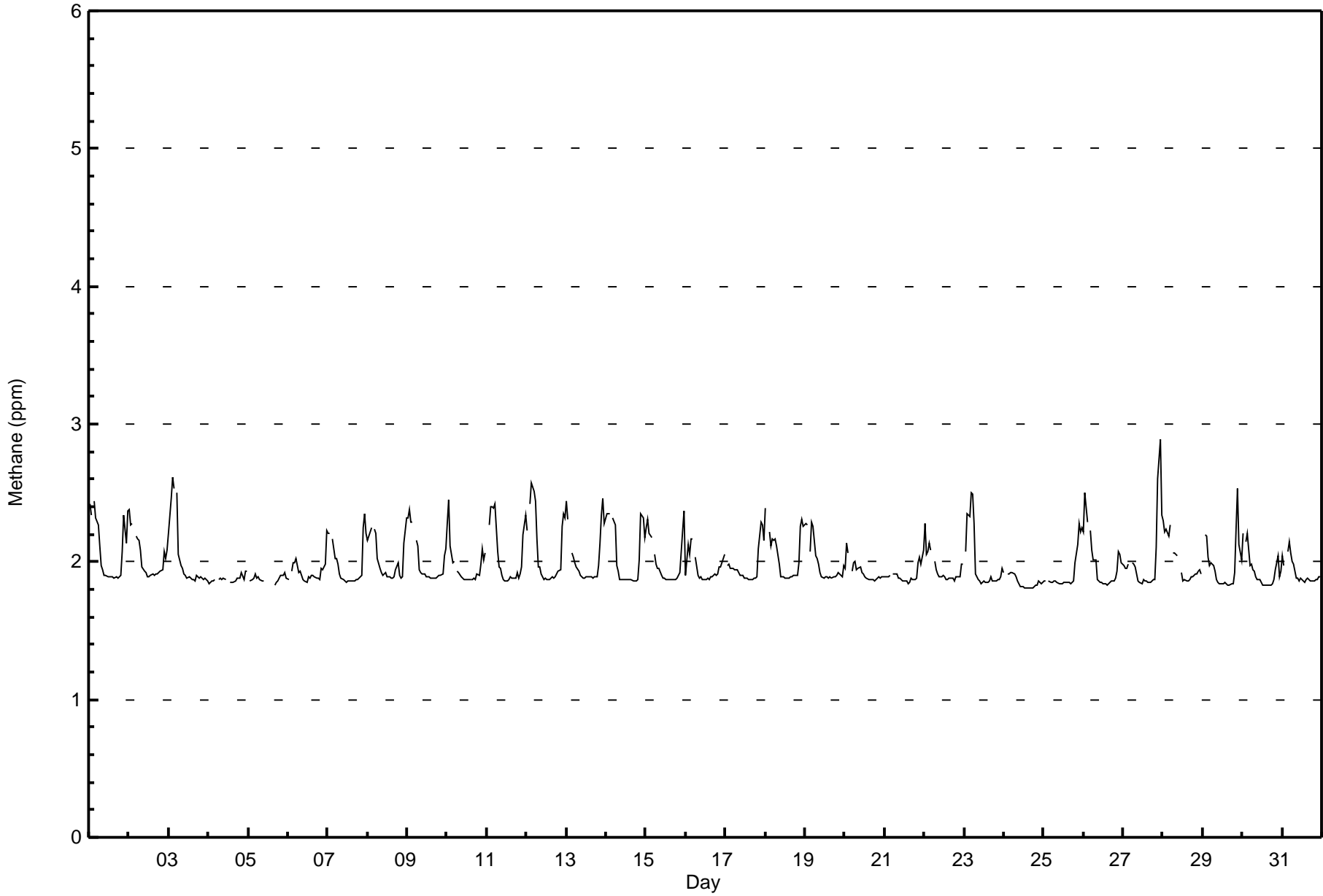








Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0														Hours in Service: 744																																				
Maximum Value: 2.9 ppm on Jul 27 23:00														Maximum Daily Average: 2.1 ppm on Jul 12																																				
Minimum Value: 1.8 ppm on Jul 24 18:00														Minimum Daily Average: 1.9 ppm on Jul 24																																				
Maximum Diurnal Average: 2.2 ppm at hour 2														Minimum Diurnal Average: 1.9 ppm at hour 15																																				
Monthly Average: 1.98 ppm														Percentiles: P ₁ = 1.8 P ₁₀ = 1.9 Q ₁ = 1.9 Median = 1.9 Q ₃ = 2.0 P ₉₀ = 2.3 P ₉₉ = 2.5																																				
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																										
1-Jul	2.4	2.3	Z	2.4	2.3	2.3	2.1	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.1	2.3	2.1	2.4	2.1	2.4																								
2-Jul	2.4	2.3	2.3	Z	2.2	2.2	2.2	2.1	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.1	2.0	2.1	2.0	2.4																								
3-Jul	2.2	2.5	2.6	2.5	Z	2.5	2.1	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.6																								
4-Jul	1.8	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	M	M	1.8	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-Jul	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	C	C	C	C	C	C	1.8	1.8	1.9	1.9	1.9	1.9	1.9	1.9																									
6-Jul	1.9	Z	1.9	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	2.0	2.2	1.9	2.2																								
7-Jul	2.2	2.2	Z	2.2	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	2.2	2.3	2.2	2.0	2.3																								
8-Jul	2.2	2.2	2.2	Z	2.2	2.2	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	1.9	2.1	2.3	2.0	2.3																								
9-Jul	2.3	2.4	2.3	2.3	Z	2.2	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	2.0	2.1	2.0	2.4																								
10-Jul	2.3	2.5	2.1	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	2.0	2.1	2.0	2.1	2.0	2.5																								
11-Jul	Z	2.3	2.4	2.4	2.4	2.4	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	2.0	2.2	2.3	2.0	2.4																								
12-Jul	2.2	Z	2.4	2.6	2.5	2.4	2.2	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.3	2.4	2.3	2.1	2.6																								
13-Jul	2.4	2.3	Z	2.1	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.1	2.3	2.5	2.3	2.0	2.5																								
14-Jul	2.3	2.3	2.4	Z	2.3	2.3	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.3	2.3	2.2	2.0	2.4																								
15-Jul	2.2	2.3	2.2	2.2	Z	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	2.1	2.2	2.4	2.0	2.4																								
16-Jul	1.9	2.1	2.1	2.2	2.2	Z	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.1	2.0	2.2																								
17-Jul	Z	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.1	2.3	2.3	2.2	2.0	2.3																								
18-Jul	2.4	Z	2.2	2.1	2.2	2.2	2.2	2.1	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.3	2.3	2.3	2.0	2.4																								
19-Jul	2.3	2.3	Z	2.1	2.3	2.3	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	2.3																								
20-Jul	2.0	2.1	2.1	Z	1.9	2.0	2.0	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	2.1																								
21-Jul	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	1.8	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.1	1.9	2.1																								
22-Jul	2.3	2.1	2.1	2.1	2.1	Z	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.3																							
23-Jul	Z	2.1	2.4	2.3	2.5	2.5	2.3	1.9	1.9	1.9	1.8	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	2.5																								
24-Jul	1.9	Z	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	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9	1.9	1.9																								
25-Jul	1.9	1.9	Z	1.9	1.8	1.9	1.9	1.9	1.9	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.9	1.8	1.9	2.0	2.1	2.3	2.2	2.2	1.9	2.3																								
26-Jul	2.2	2.5	2.3	Z	2.2	2.1	2.0	2.0	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	2.1	2.1	2.0	2.0	2.5																								
27-Jul	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	1.9	1.9	1.8	1.8	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.1	2.6	2.9	2.3	2.0	2.9																								
28-Jul	2.3	2.2	2.2	2.2	2.3	Z	2.1	2.1	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	1.9	2.0	2.3																								
29-Jul	Z	2.2	2.2	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9	2.2	2.5	2.1	2.0	2.5																								
30-Jul	2.2	Z	2.1	2.2	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9	1.9	2.0	1.9	1.9	1.9	2.2																								
31-Jul	2.0	2.0	Z	2.1	2.1	2.1	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.1																								
																								2.2	2.2	2.2	2.1	2.1	2.1	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.1	2.1	2.1	Diurnal Average		
																								2.4	2.5	2.6	2.6	2.5	2.5	2.3	2.1	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.2	2.6	2.9	2.4	Diurnal Maximum	
Z - zerospan			C - Calibration			M - Maintenance																																												





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Methane (CH₄) - ppm
Conklin Community - July 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	541	76.96	76.96
2.1 - 3.0	162	23.04	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 703

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Methane (CH₄) - ppm
Conklin Community - July 2016**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	45	29	13	11	10	28	12	5	18	42	55	37	31	52	75	78	541
2.1 - 3.0	14	4	0	1	5	6	6	19	24	21	10	2	1	1	12	32	158
3.1 - 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	59	33	13	12	15	34	18	24	42	63	65	39	32	53	87	110	699

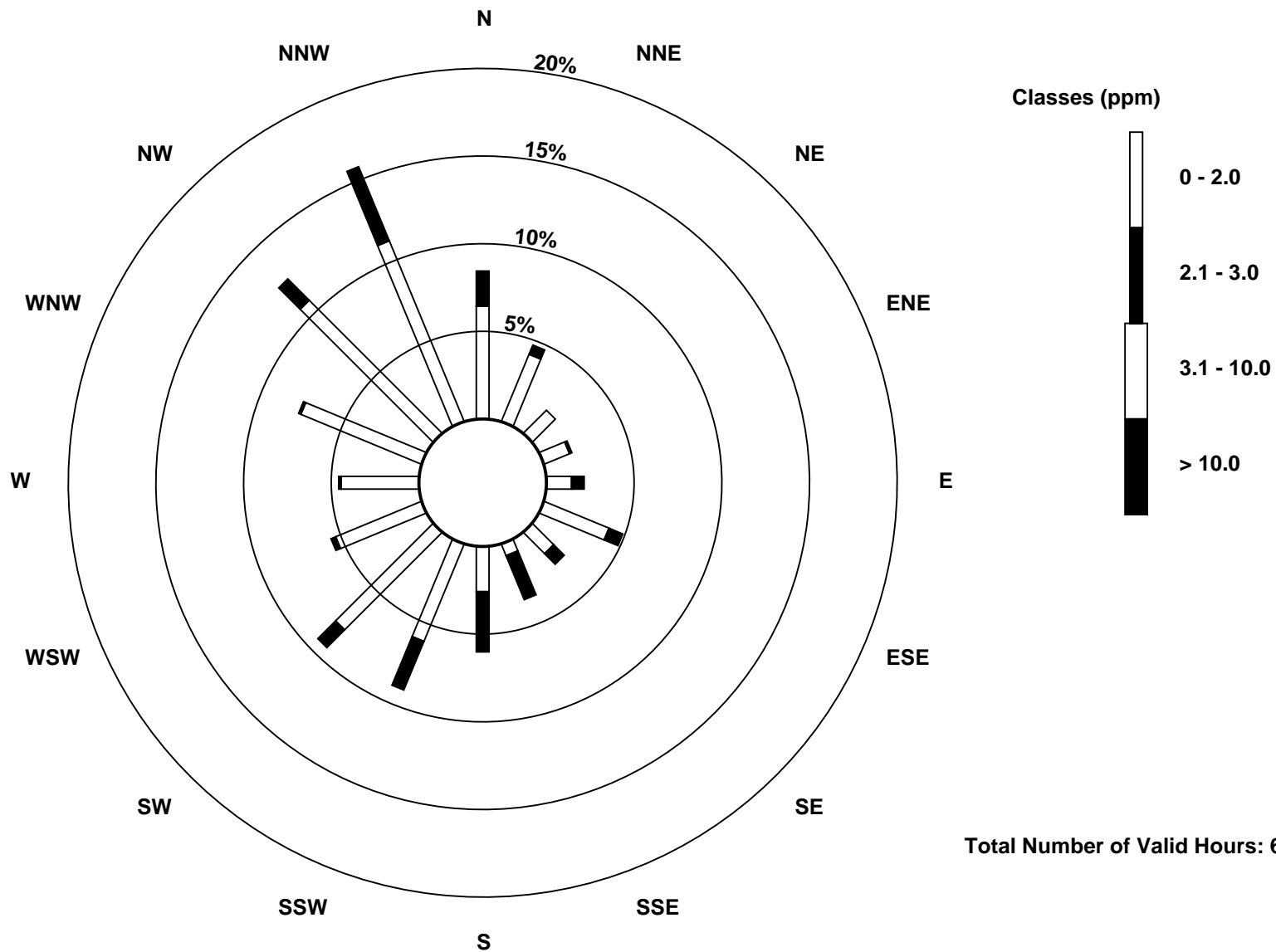
Total Number of Valid Hours: 699

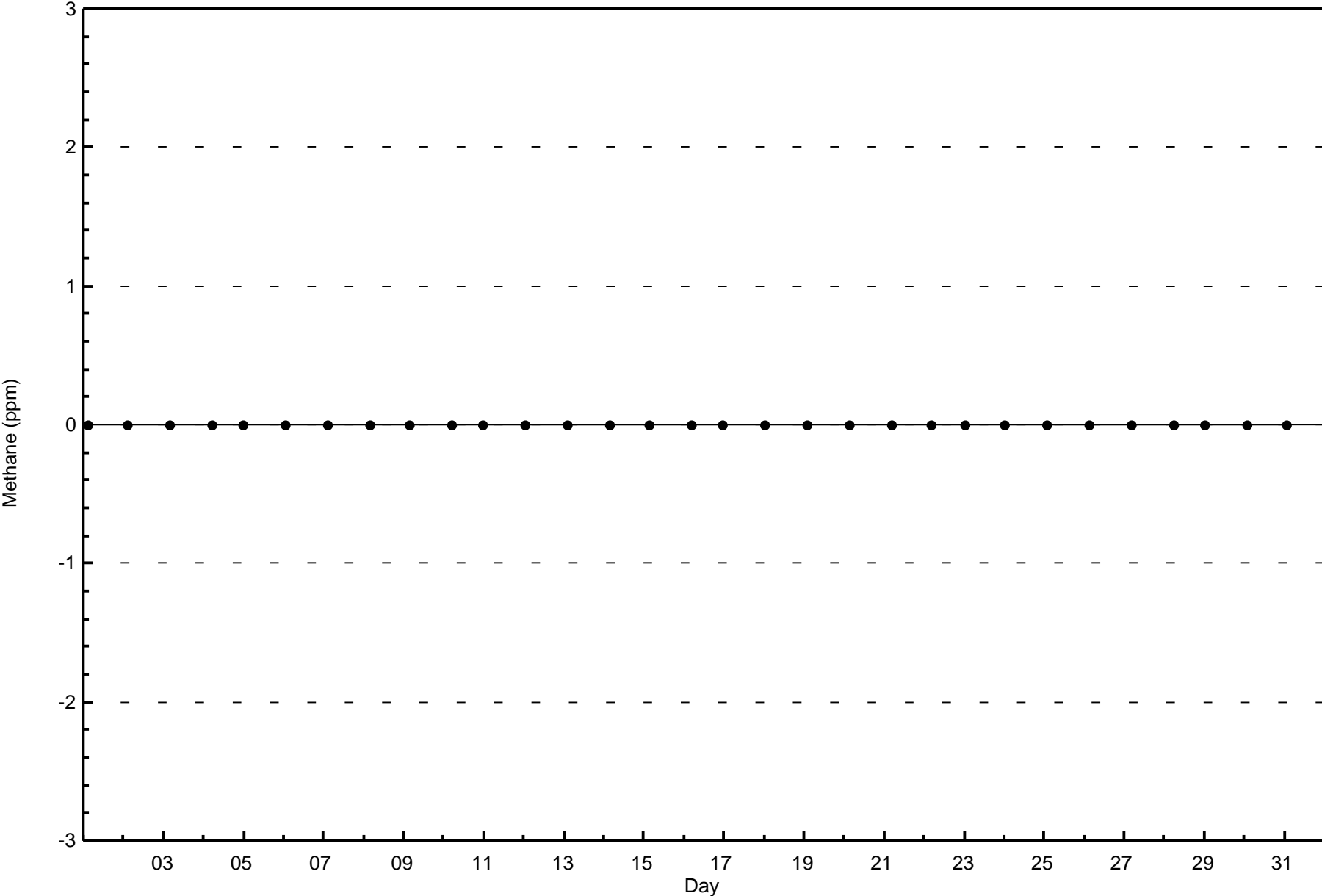
Total Number of Hours: 744

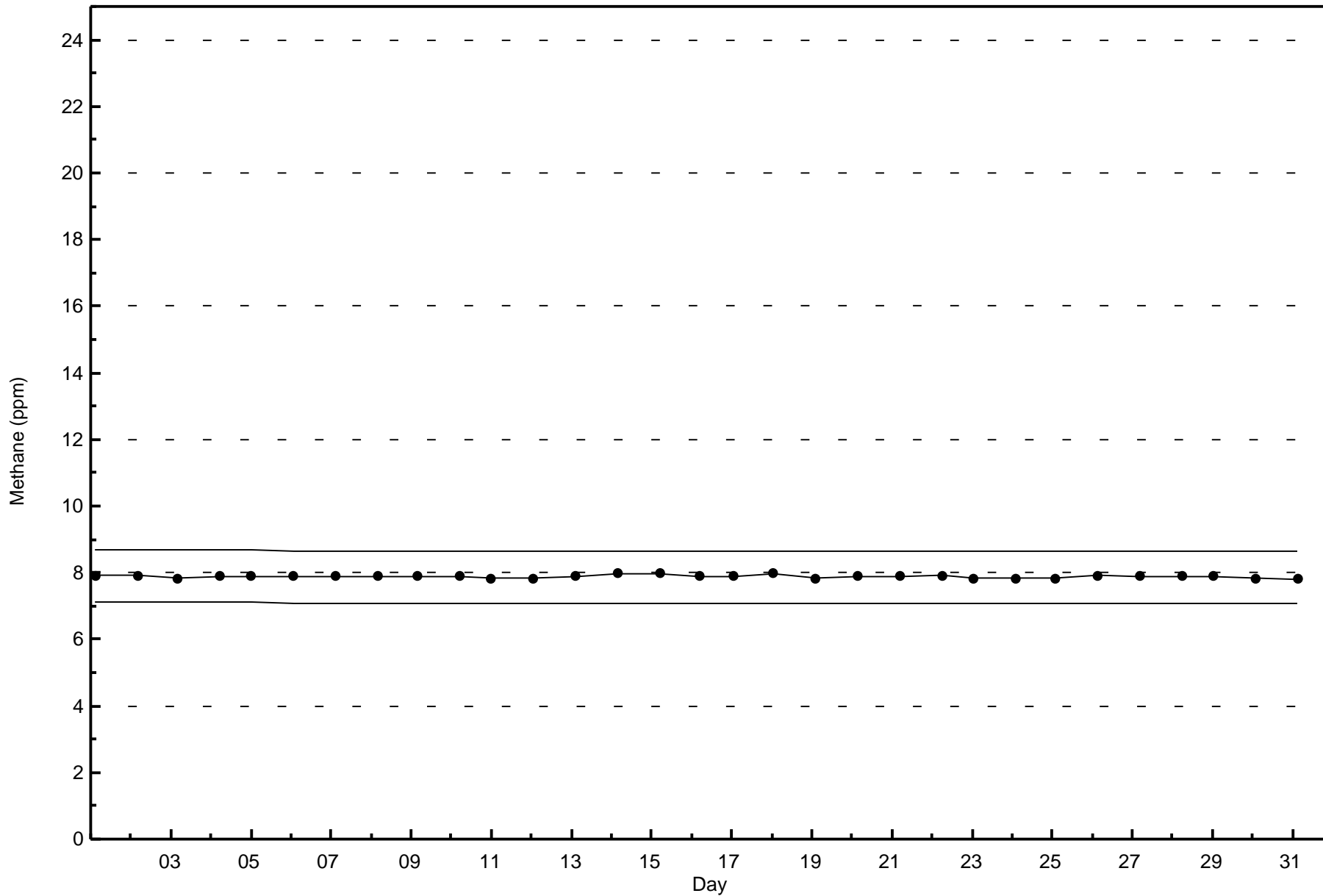


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Methane (CH₄) - ppm
Conklin Community (AMS 21)









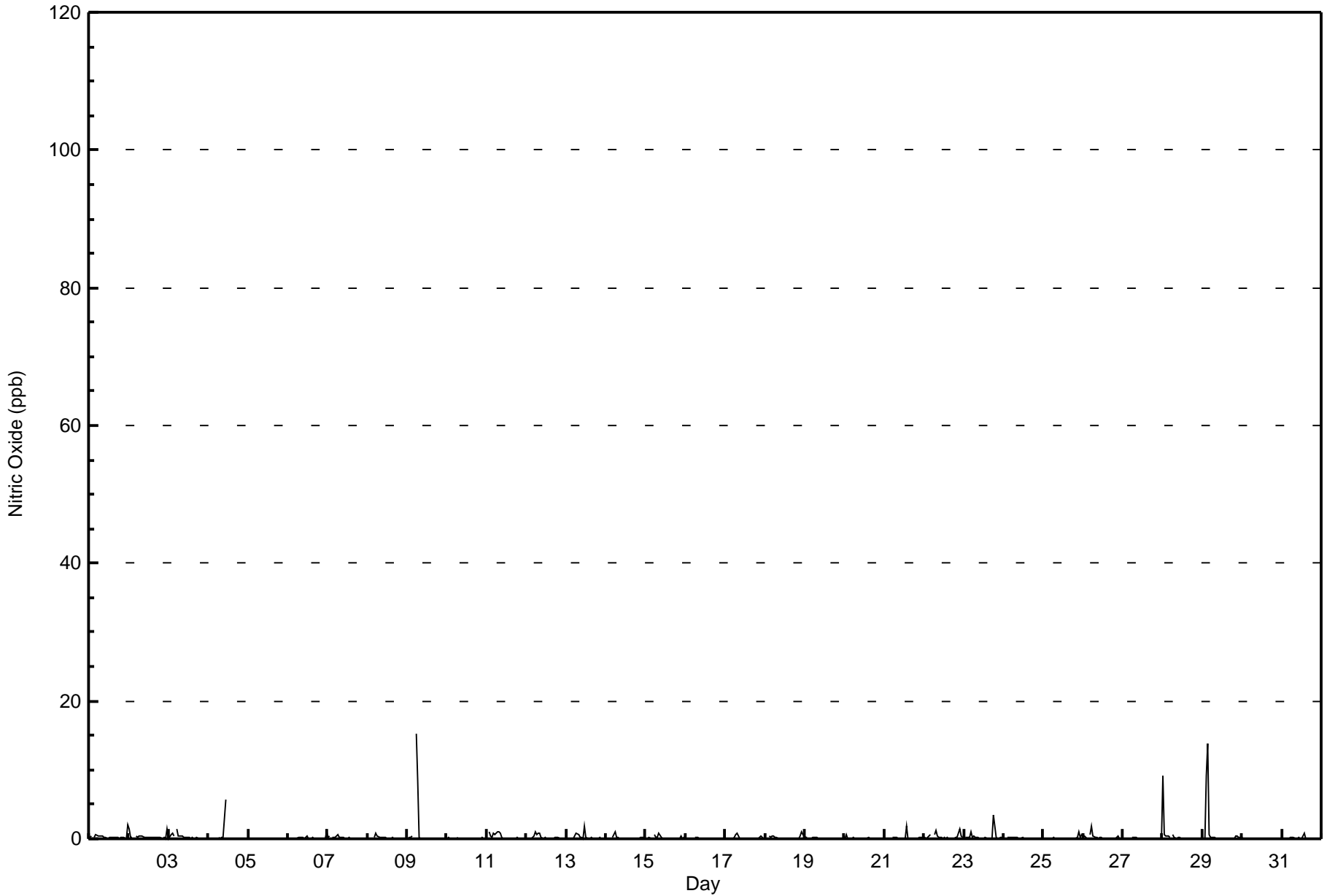
Maximum Value: 15 ppb on Jul 9 06:00																		Maximum Daily Average: 1.1 ppb on Jul 29						Hours in Service: 744		
Minimum Value: 0 ppb on Jul 6 22:00																		Minimum Daily Average: 0.0 ppb on Jul 30						Hours of Data: 705		
Maximum Diurnal Average: 1.0 ppb at hour 6																		Minimum Diurnal Average: 0.0 ppb at hour 17						Hours of Missing Data: 39		
Monthly Average: 0.2 ppb																		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 2						Hours of Calibration: 37		
																		Percent Operational Time: 99.7								
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	0	0	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.3	2
2-Jul	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.3	1
3-Jul	0	1	1	0	Z	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	2
4-Jul	0	0	0	0	0	Z	0	0	0	0	6	M	M	Z	0	0	0	0	0	0	0	0	0	0	0.3	6
5-Jul	Z	0	0	0	0	0	0	0	0	0	C	C	C	C	C	C	0	0	0	0	0	0	0	0	--	0
6-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1	1
7-Jul	0	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
8-Jul	0	0	0	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
9-Jul	0	0	0	0	Z	15	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.1	15
10-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
11-Jul	Z	1	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
12-Jul	0	Z	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
13-Jul	0	0	Z	0	0	0	1	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0.2	2
14-Jul	0	0	0	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
15-Jul	0	0	0	0	Z	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
16-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
17-Jul	Z	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
18-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.2	1
19-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
20-Jul	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
21-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0.1	2
22-Jul	0	0	0	0	1	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.3	1
23-Jul	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0.3	3
24-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
25-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0.1	1
26-Jul	0	0	0	Z	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	2
27-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
28-Jul	9	1	0	0	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	9
29-Jul	Z	0	9	14	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.1	14
30-Jul	0	Z	0	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-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.1	1
																		Diurnal Average		Diurnal Maximum						
																		0.5		9						
																		0.2		1						
																		0.5		9						
																		0.7		14						
																		0.3		1						
																		1.0		15						
																		0.6		8						
																		0.3		1						
																		0.2		1						
																		0.1		0						
																		0.3		6						
																		0.1		2						
																		0.0		0						
																		0.1		2						
																		0.0		0						
																		0.0		0						
																		0.0		0						
																		0.0		0						
																		0.2		3						
																		0.0		0						
																		0.1		0						
																		0.2		1						
																		0.1		1						
																		0.2		2						

Z - zerospan C - Calibration M - Maintenance



Wood Buffalo Environmental Association
Hourly Averages

Nitric Oxide (NO) - ppb
Conklin Community - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb
Conklin Community - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	705	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: 705

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitric Oxide (NO) - ppb
Conklin Community - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	59	33	13	12	15	34	18	24	42	63	65	39	33	53	87	111	701
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	59	33	13	12	15	34	18	24	42	63	65	39	33	53	87	111	701

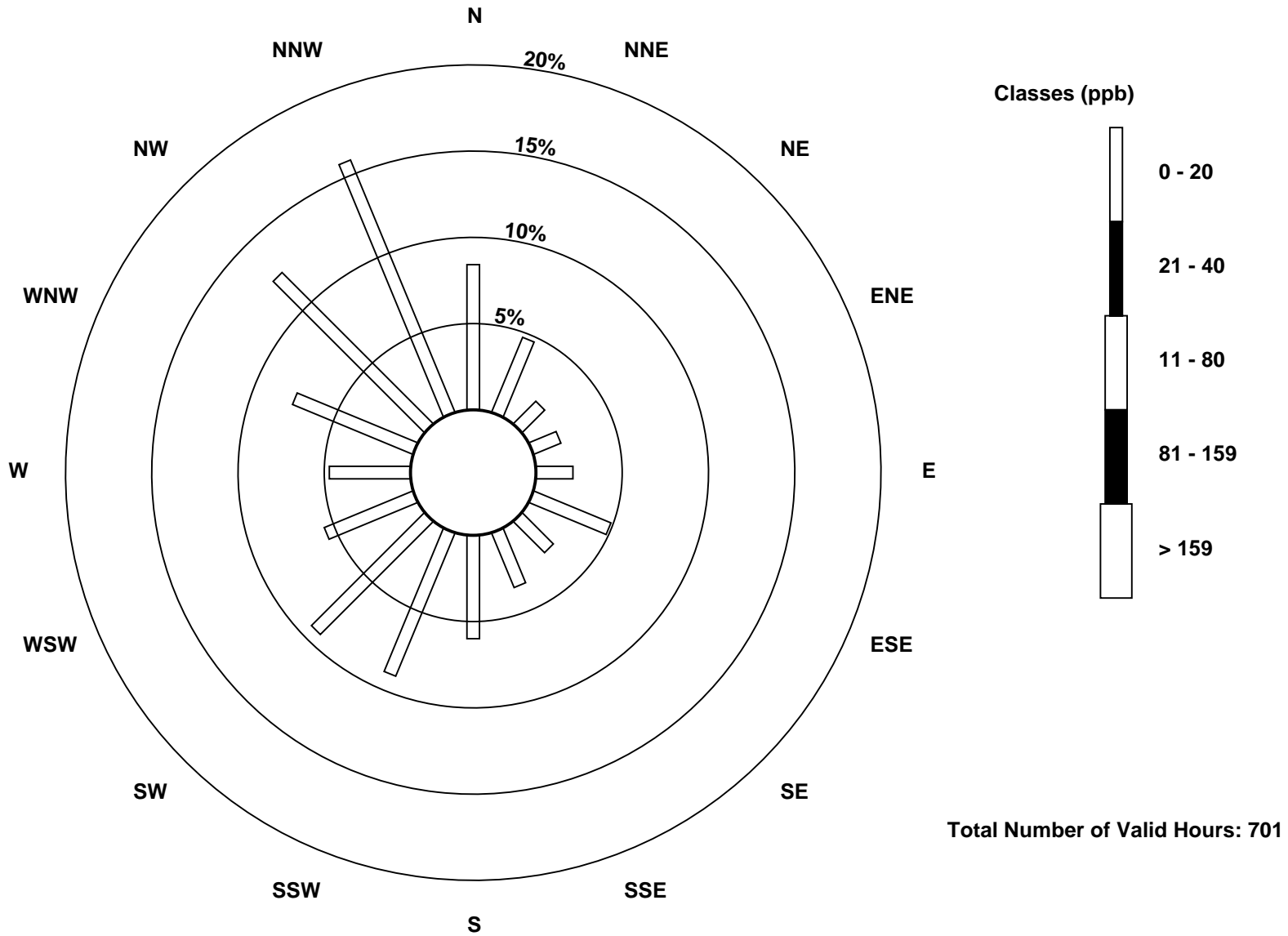
Total Number of Valid Hours: 701

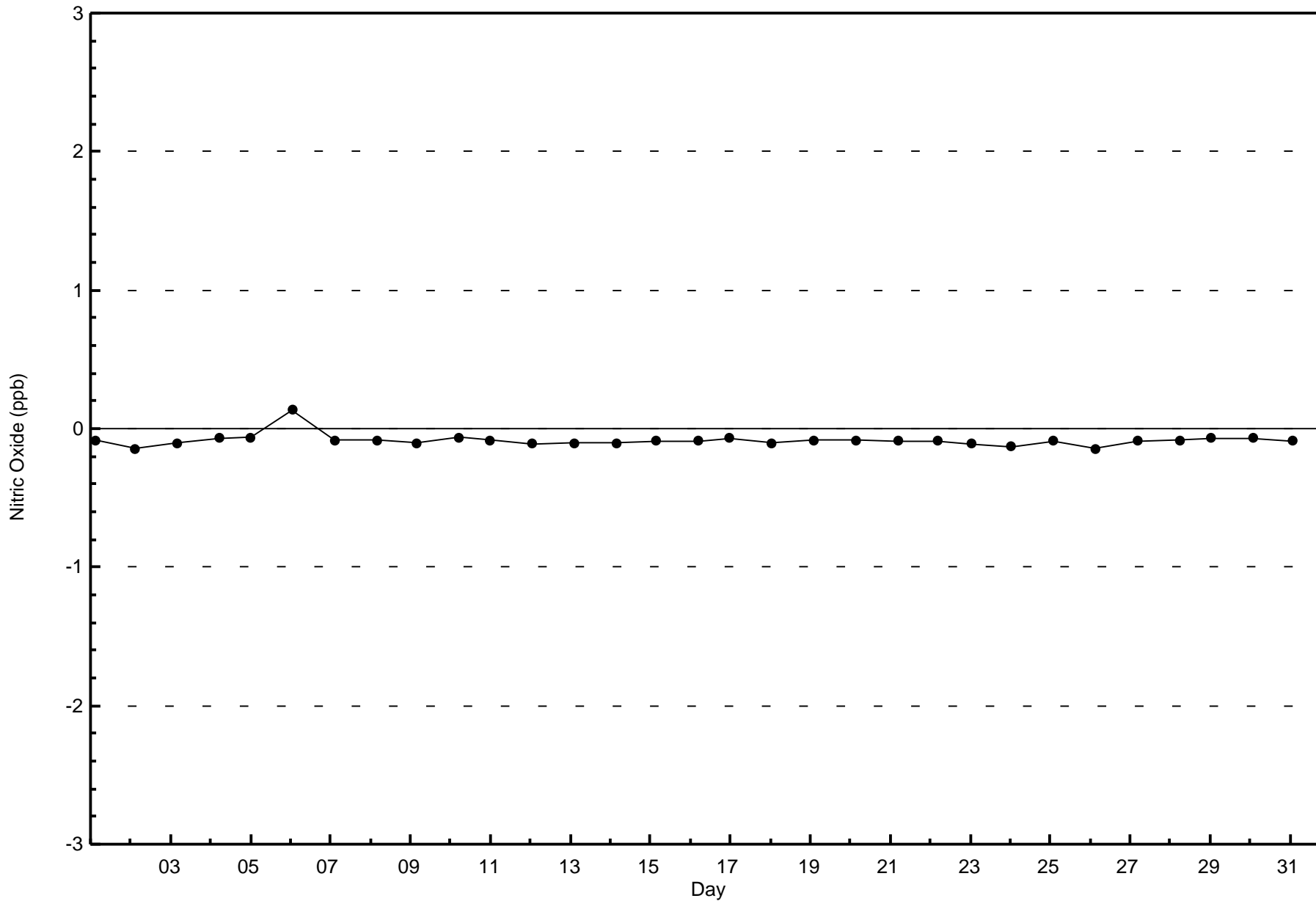
Total Number of Hours: 744

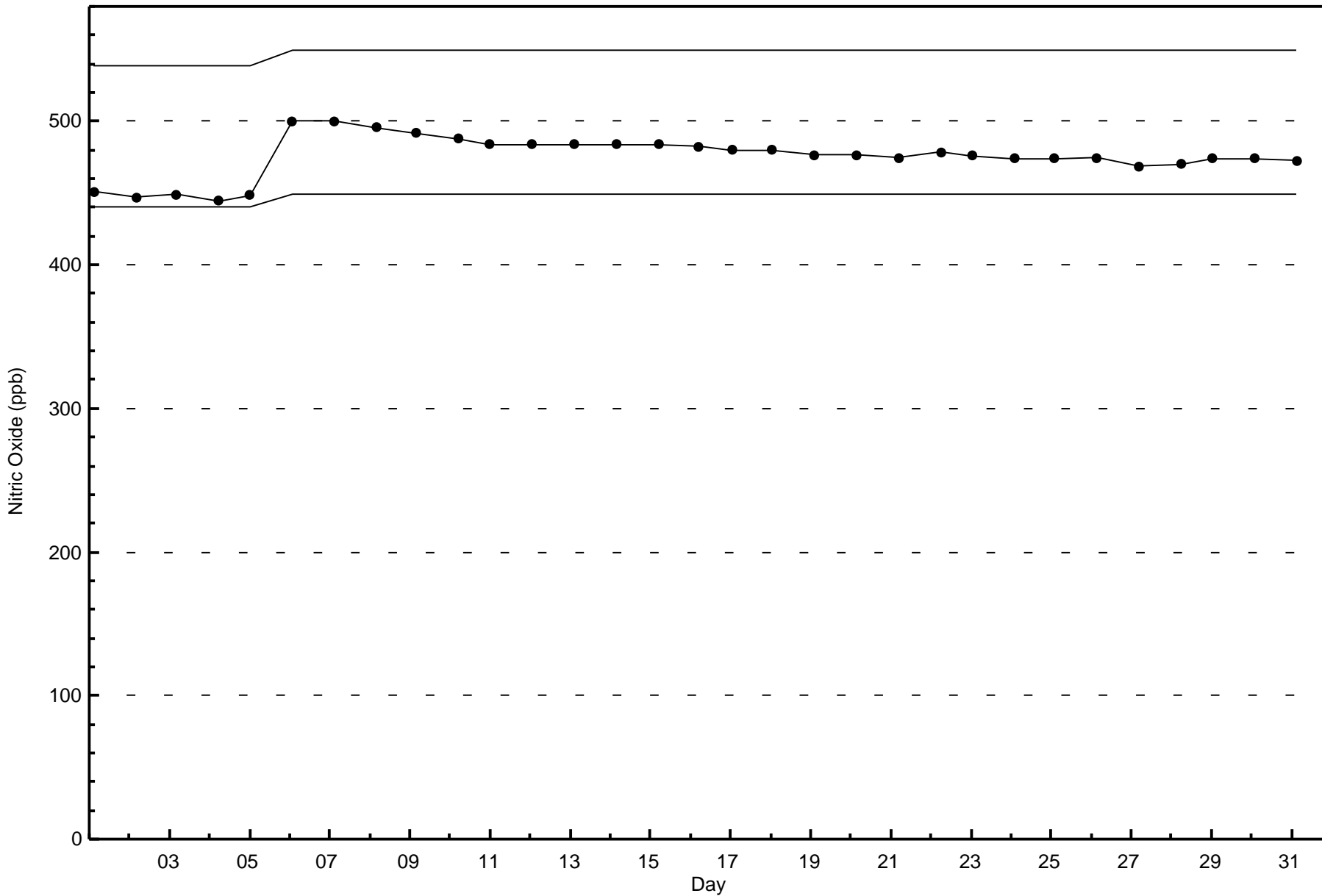


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Nitric Oxide (NO) - ppb
Conklin Community (AMS 21)









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

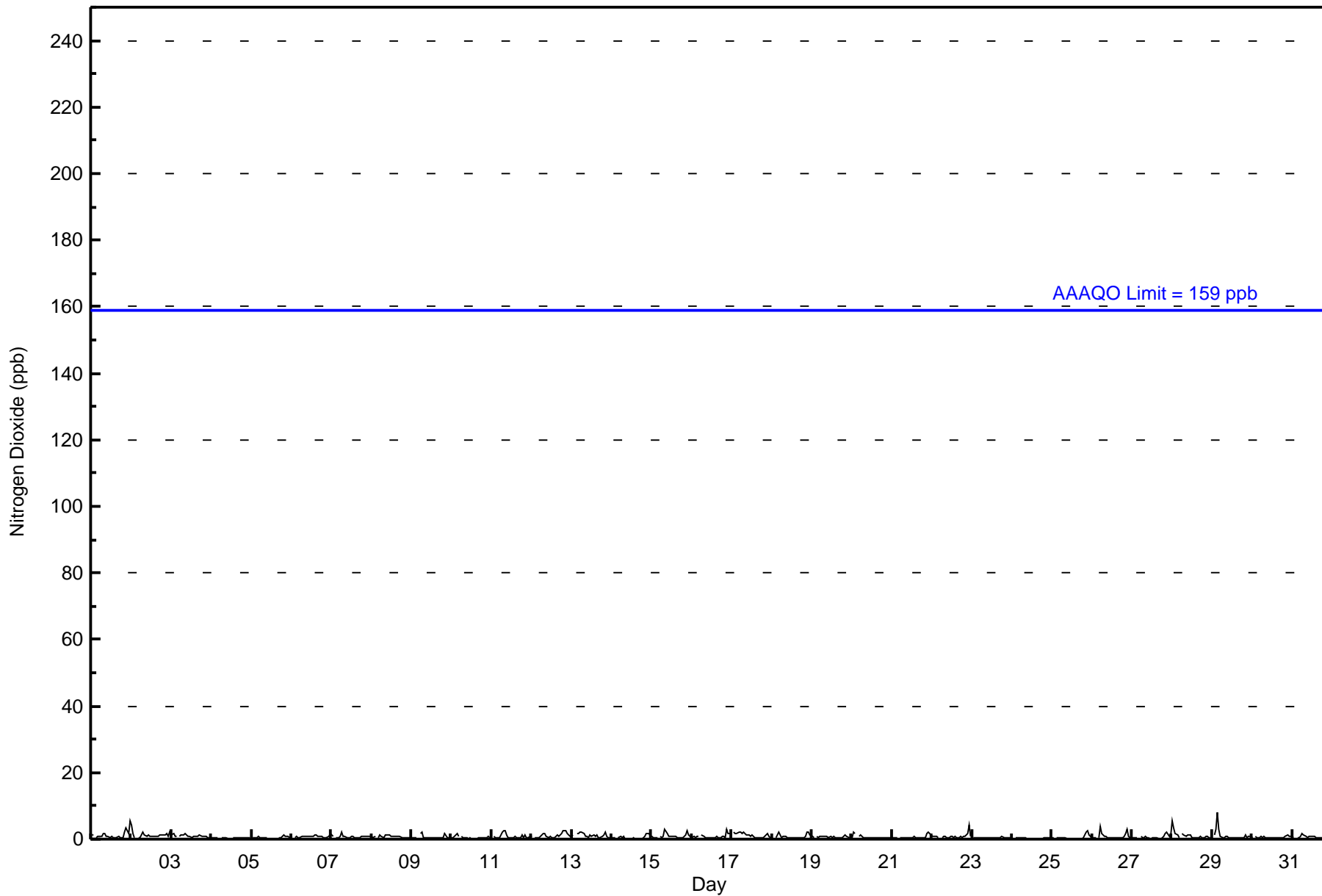
Conklin Community - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																																								
Maximum Value: 8 ppb on Jul 29 04:00										Maximum Daily Average: 1.2 ppb on Jul 17										Hours of Data: 705																														
Minimum Value: 0 ppb on Jul 4 11:00										Minimum Daily Average: 0.3 ppb on Jul 24										Hours of Missing Data: 39																														
Maximum Diurnal Average: 1.3 ppb at hour 22										Minimum Diurnal Average: 0.5 ppb at hour 17										Hours of Calibration: 37																														
Monthly Average: 0.8 ppb										Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 1 P ₉₀ = 2 P ₉₉ = 3										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-Jul	1	1	Z	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	0	1	2	3	2	5	1.2	5																								
2-Jul	4	2	1	Z	0	0	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1.2	4																								
3-Jul	1	2	1	1	Z	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0.9	2																								
4-Jul	0	0	1	1	1	Z	1	0	1	1	0	M	M	Z	0	0	0	1	1	0	0	0	1	0	0.4	1																								
5-Jul	Z	1	1	1	1	1	1	0	0	0	C	C	C	C	C	C	0	1	1	1	1	1	1	1	--	1																								
6-Jul	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	2	0.8	2																								
7-Jul	1	1	Z	1	1	1	2	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	0.8	2																								
8-Jul	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0.8	1																								
9-Jul	0	0	1	0	Z	2	2	1	0	0	0	0	1	0	0	0	0	0	0	0	0	2	1	1	0	0.6	2																							
10-Jul	1	1	1	2	1	Z	1	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0.5	2																								
11-Jul	Z	1	1	0	0	0	2	3	3	1	0	0	1	1	1	1	1	0	1	0	1	1	1	1	0.8	3																								
12-Jul	1	Z	1	0	1	1	1	2	2	1	0	1	1	1	1	1	1	1	2	3	3	2	1	1	1.1	3																								
13-Jul	1	1	Z	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	0	1.2	2																								
14-Jul	0	0	0	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	2	2	1	0.5	2																								
15-Jul	1	1	1	0	Z	1	1	1	3	2	1	1	1	1	1	1	1	1	1	1	1	3	1	1	0.9	3																								
16-Jul	1	1	1	1	1	Z	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	3	2	2	0.8	3																								
17-Jul	Z	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1.2	2																								
18-Jul	0	Z	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	0.8	2																								
19-Jul	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1																								
20-Jul	0	2	2	Z	1	1	1	1	1	1	0	0	0	0	1	0	0	1	1	0	1	0	0	0	0.6	2																								
21-Jul	0	0	0	1	Z	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	2	2	1	0.6	2																								
22-Jul	1	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	4	1	0.9	4																								
23-Jul	Z	1	1	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0.4	1																								
24-Jul	1	Z	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.3	1																								
25-Jul	0	1	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	1	1	0.5	3																								
26-Jul	1	0	0	Z	1	4	2	1	1	0	1	0	0	0	0	0	0	0	1	1	2	3	1	1	0.9	4																								
27-Jul	1	1	1	1	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	1	1	2	2	1	1	0.6	2																								
28-Jul	5	3	2	1	1	Z	2	1	1	1	1	1	1	1	0	0	1	1	0	1	1	1	0	0	1.1	5																								
29-Jul	Z	1	3	8	3	1	1	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1.1	8																								
30-Jul	1	Z	1	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	0.6	1																								
31-Jul	1	1	Z	1	0	1	2	1	1	1	1	1	1	1	1	0	0	0	0	0	1	0	0	0	0.6	2																								
																								1.0	0.9	0.8	1.0	0.8	1.0	1.0	0.9	0.9	0.7	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.7	1.0	1.3	1.0	0.9	Diurnal Average	
																								5	3	3	8	3	4	2	3	3	2	1	1	1	1	1	1	1	1	1	1	2	3	3	3	4	5	Diurnal Maximum
Z - zerospan C - Calibration M - Maintenance																																																		
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb																																																		



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Conklin Community - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Conklin Community - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	705	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: 705

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Conklin Community - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	59	33	13	12	15	34	18	24	42	63	65	39	33	53	87	111	701
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	59	33	13	12	15	34	18	24	42	63	65	39	33	53	87	111	701

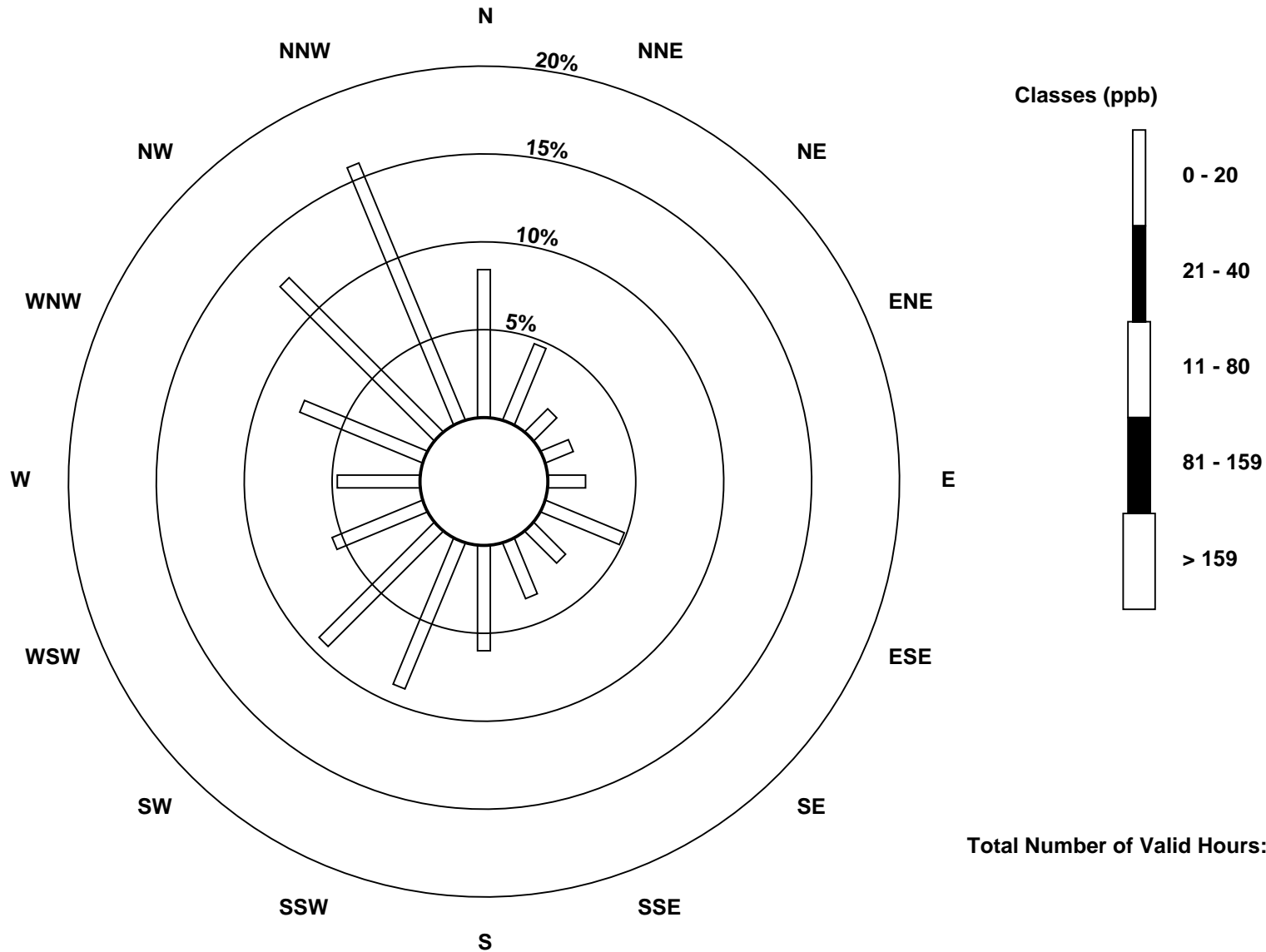
Total Number of Valid Hours: 701

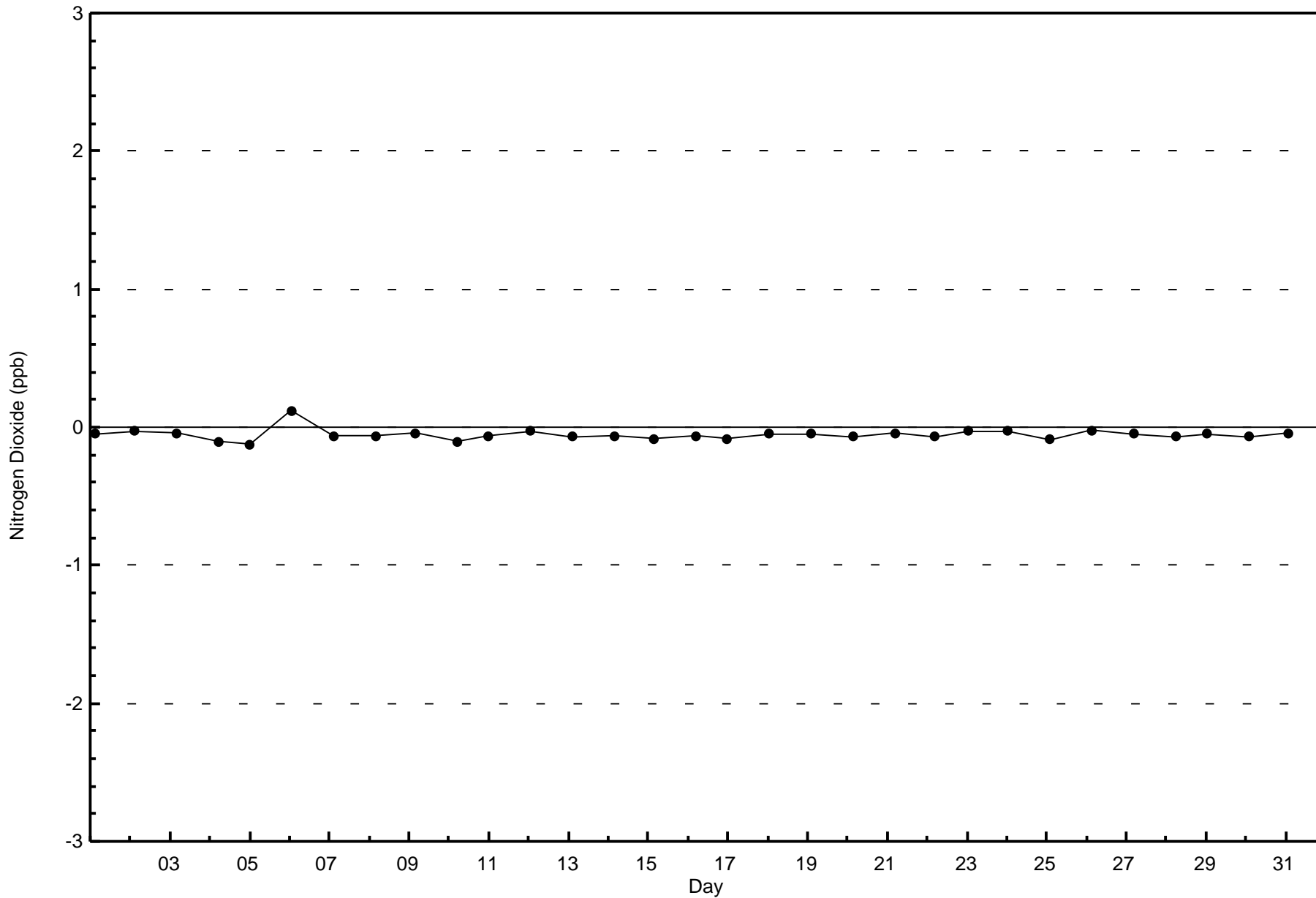
Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

Nitrogen Dioxide (NO₂) - ppb
Conklin Community (AMS 21)

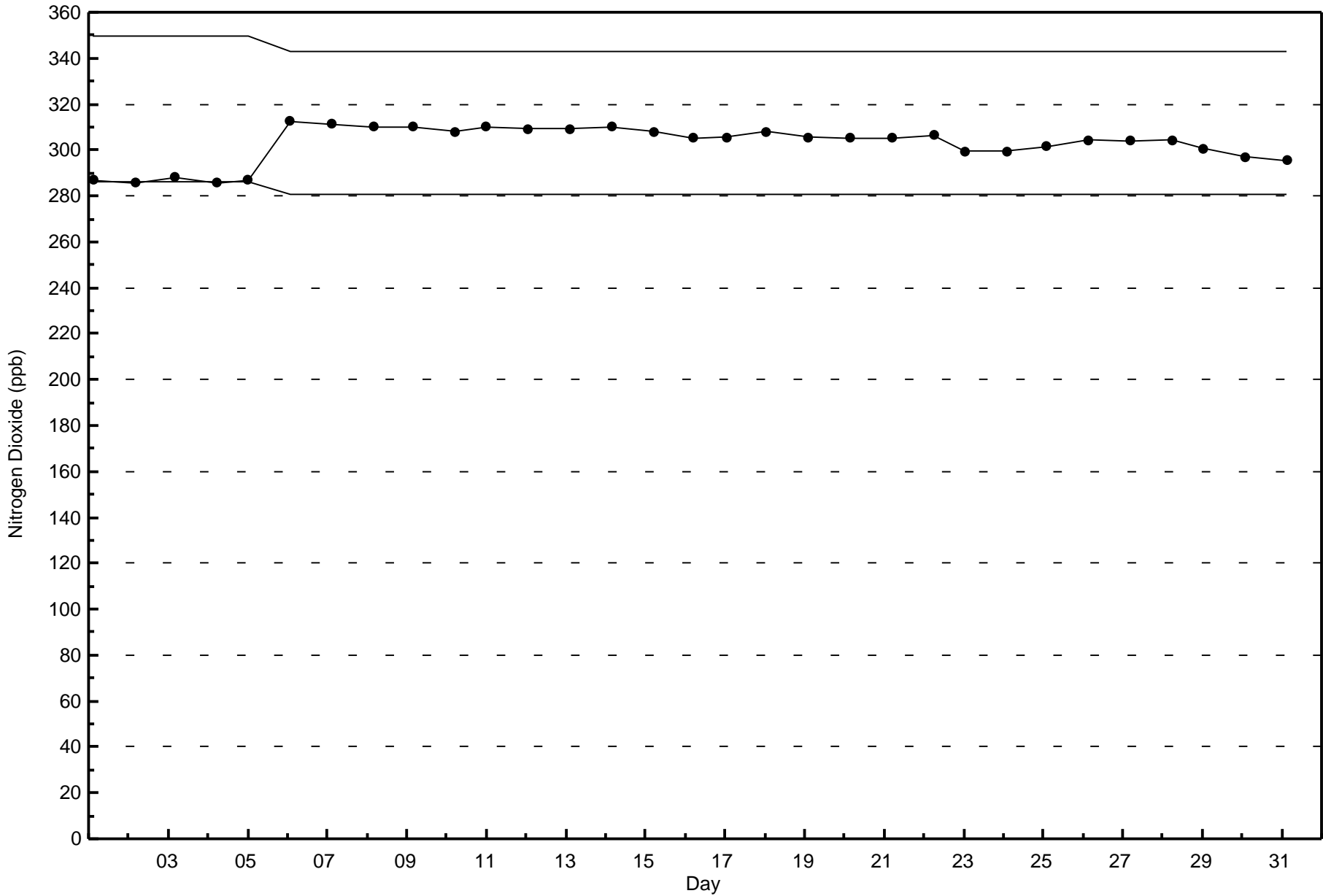






Wood Buffalo Environmental Association
Span Responses

Nitrogen Dioxide (NO₂) - ppb
Conklin Community - July 2016





Wood Buffalo Environmental Association
Summary of Hour Averages

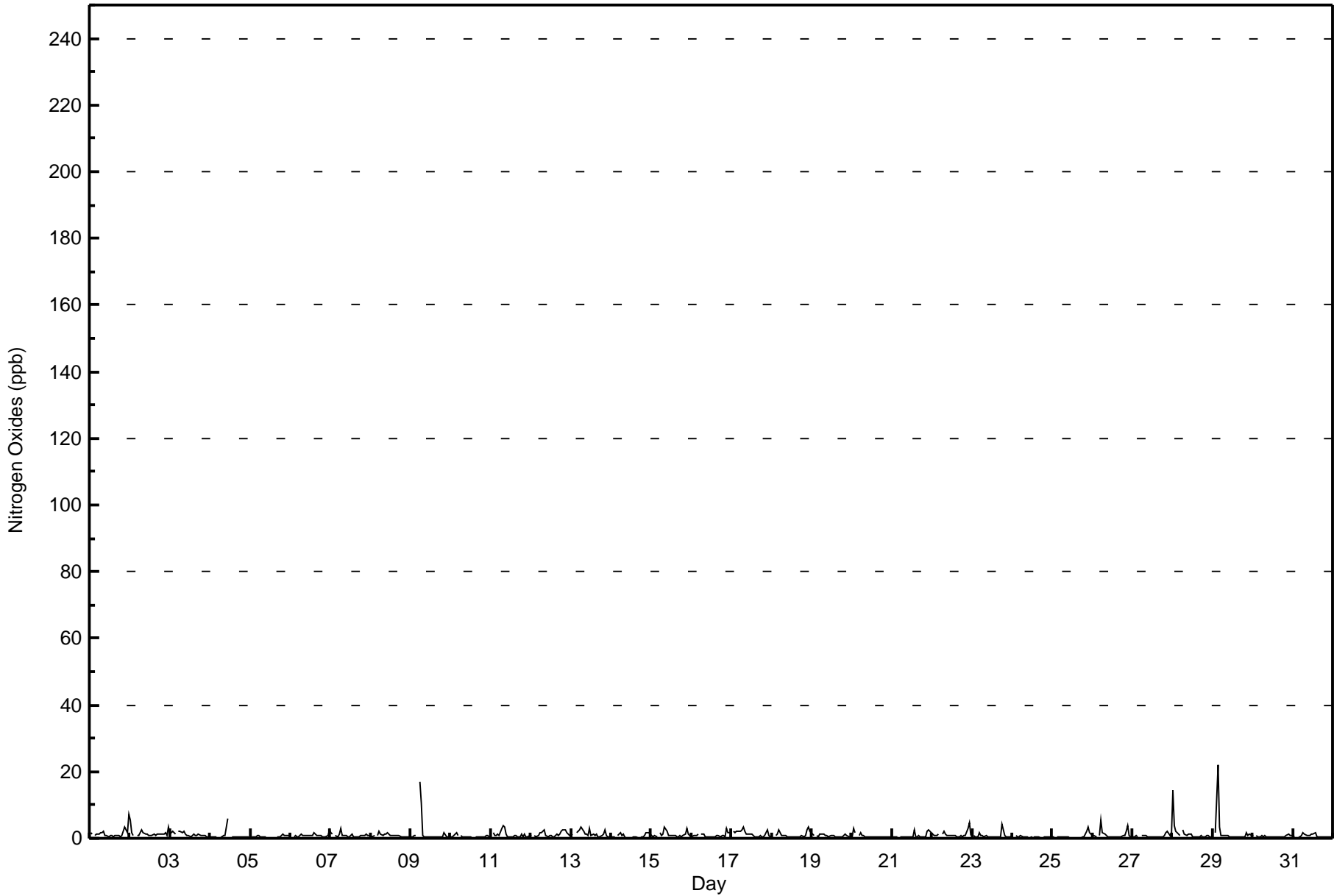
Nitrogen Oxides (NO_x) - ppb
Conklin Community - July 2016

Maximum Value: 22 ppb on Jul 29 04:00		Maximum Daily Average: 2.2 ppb on Jul 29		Hours in Service: 744																						
Minimum Value: 0 ppb on Jul 25 13:00		Minimum Daily Average: 0.4 ppb on Jul 24		Hours of Data: 705																						
Maximum Diurnal Average: 2.0 ppb at hour 6		Minimum Diurnal Average: 0.5 ppb at hour 17		Hours of Missing Data: 39																						
Monthly Average: 1.0 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 O ₃ = 1 P ₉₀ = 2 P ₉₉ = 5		Hours of Calibration: 37																						
				Percent Operational Time: 99.7																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	2	1	Z	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	2	3	2	7	1.5	7
2-Jul	6	2	1	Z	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	2	1	3	1.5	6
3-Jul	1	2	2	1	Z	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1.2	2
4-Jul	0	0	1	1	1	Z	1	0	1	1	6	M	M	0	0	0	1	0	0	0	0	1	0	0	0.7	6
5-Jul	Z	1	0	1	1	1	1	0	0	0	C	C	C	C	C	C	0	0	0	1	1	1	1	1	--	1
6-Jul	1	Z	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	3	0.9	3
7-Jul	2	1	Z	1	1	1	3	1	1	1	0	1	1	1	1	0	0	1	1	1	1	1	1	1	0.9	3
8-Jul	1	0	1	Z	1	2	1	1	1	1	2	1	1	1	1	1	1	1	0	1	0	0	0	0	0.9	2
9-Jul	0	0	1	1	Z	17	10	1	0	0	0	0	1	0	0	0	0	0	0	0	2	1	1	0	1.7	17
10-Jul	1	1	1	2	1	Z	1	0	0	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0.6	2
11-Jul	Z	2	1	1	1	1	3	4	3	1	0	0	1	1	1	1	1	0	1	0	1	1	1	1	1.1	4
12-Jul	1	Z	1	1	1	2	2	2	2	1	0	1	1	1	1	1	1	1	2	3	3	2	1	1	1.3	3
13-Jul	1	1	Z	2	2	3	3	2	1	1	1	3	1	1	1	1	1	1	1	1	2	1	1	0	1.4	3
14-Jul	0	0	0	Z	1	2	1	1	0	0	0	0	0	0	0	0	0	0	0	1	2	2	1	0	0.6	2
15-Jul	1	1	1	0	Z	2	1	1	4	2	1	1	1	1	1	1	1	1	1	1	3	1	1	1	1.1	4
16-Jul	0	1	1	1	1	Z	1	1	0	0	0	0	0	0	0	1	1	1	1	1	3	2	2	0	0.8	3
17-Jul	Z	2	2	2	2	2	3	3	2	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1.4	3
18-Jul	0	Z	1	1	2	2	1	1	1	1	1	0	1	1	1	1	1	1	1	1	2	3	2	0	1.0	3
19-Jul	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0.8	1
20-Jul	0	3	2	Z	1	2	1	1	1	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0.7	3
21-Jul	0	0	0	1	Z	0	1	1	0	0	0	0	0	3	0	0	1	0	1	0	0	2	2	2	0.7	3
22-Jul	1	1	1	1	1	Z	1	2	1	1	1	1	1	1	1	1	1	1	1	1	3	5	1	1	1.2	5
23-Jul	Z	1	1	1	2	1	1	1	1	0	0	0	0	0	0	0	0	0	4	1	1	1	1	1	0.7	4
24-Jul	1	Z	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.4	1
25-Jul	0	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	1	1	0.6	4
26-Jul	1	1	1	Z	1	6	2	1	1	1	1	1	0	0	0	0	0	1	1	1	2	4	1	1	1.1	6
27-Jul	0	1	1	1	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	1	1	2	2	1	1	0.7	2
28-Jul	15	4	2	1	1	Z	2	1	1	1	1	1	1	0	0	0	1	1	0	1	1	1	0	0	1.7	15
29-Jul	Z	2	12	22	4	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	2	1	1	1	2.2	22
30-Jul	1	Z	1	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0.6	1
31-Jul	1	1	Z	1	0	1	2	1	1	1	1	1	1	1	0	0	0	0	0	0	1	0	0	0	0.7	2
1.5 1.1 1.3 1.7 1.1 2.0 1.6 1.2 1.1 0.8 0.8 0.7 0.6 0.7 0.6 0.6 0.5 0.6 0.8 0.7 1.1 1.5 1.1 1.1																								Diurnal Average		
15 4 12 22 4 17 10 4 4 2 6 3 1 3 1 1 1 1 1 4 3 3 4 5 7																								Diurnal Maximum		
Z - zerospan C - Calibration M - Maintenance																										



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Conklin Community - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Conklin Community - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	704	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: 705

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Conklin Community - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	59	33	13	12	15	34	18	24	42	62	65	39	33	53	87	111	700
21 - 40	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	59	33	13	12	15	34	18	24	42	63	65	39	33	53	87	111	701

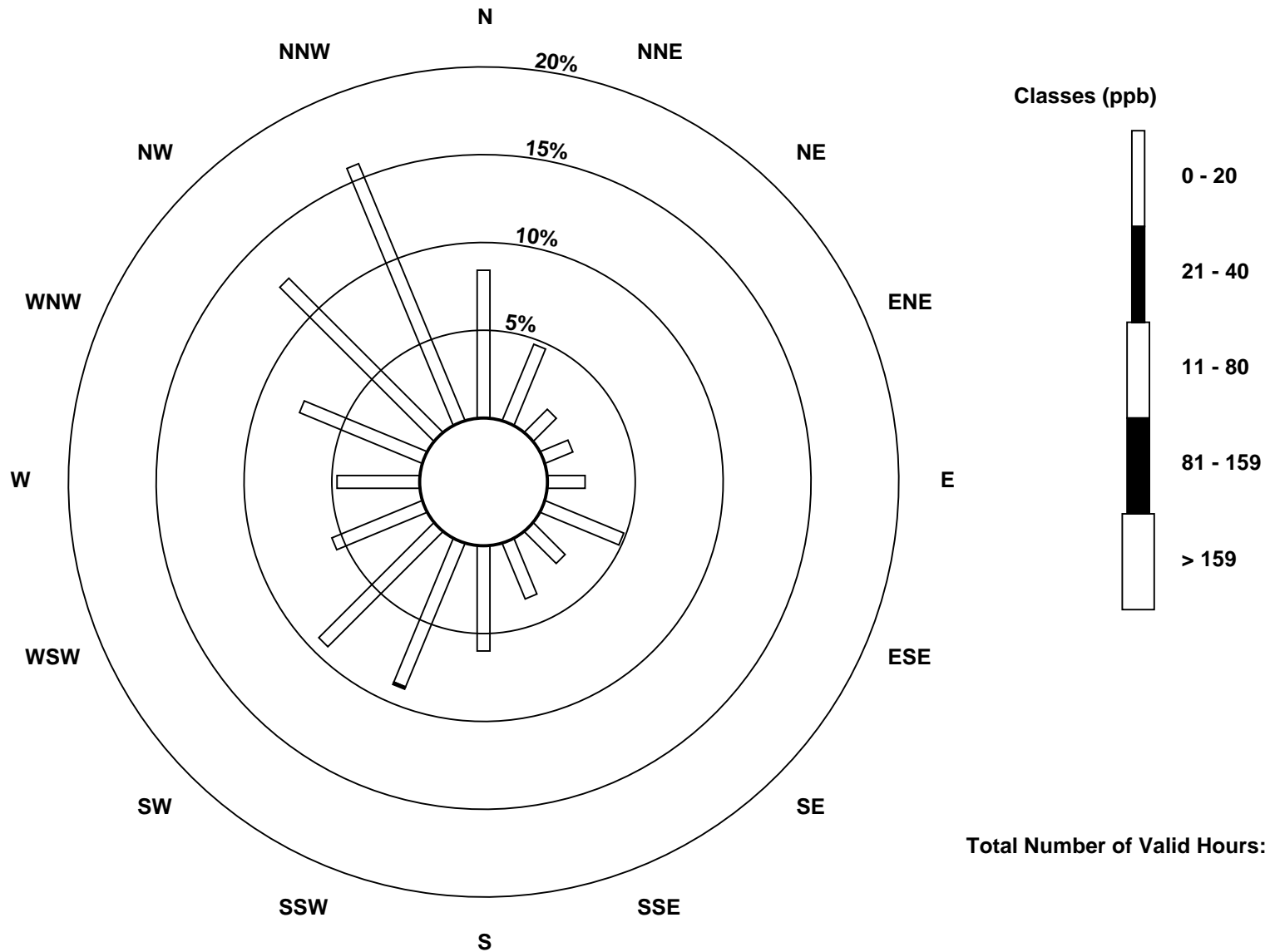
Total Number of Valid Hours: 701

Total Number of Hours: 744

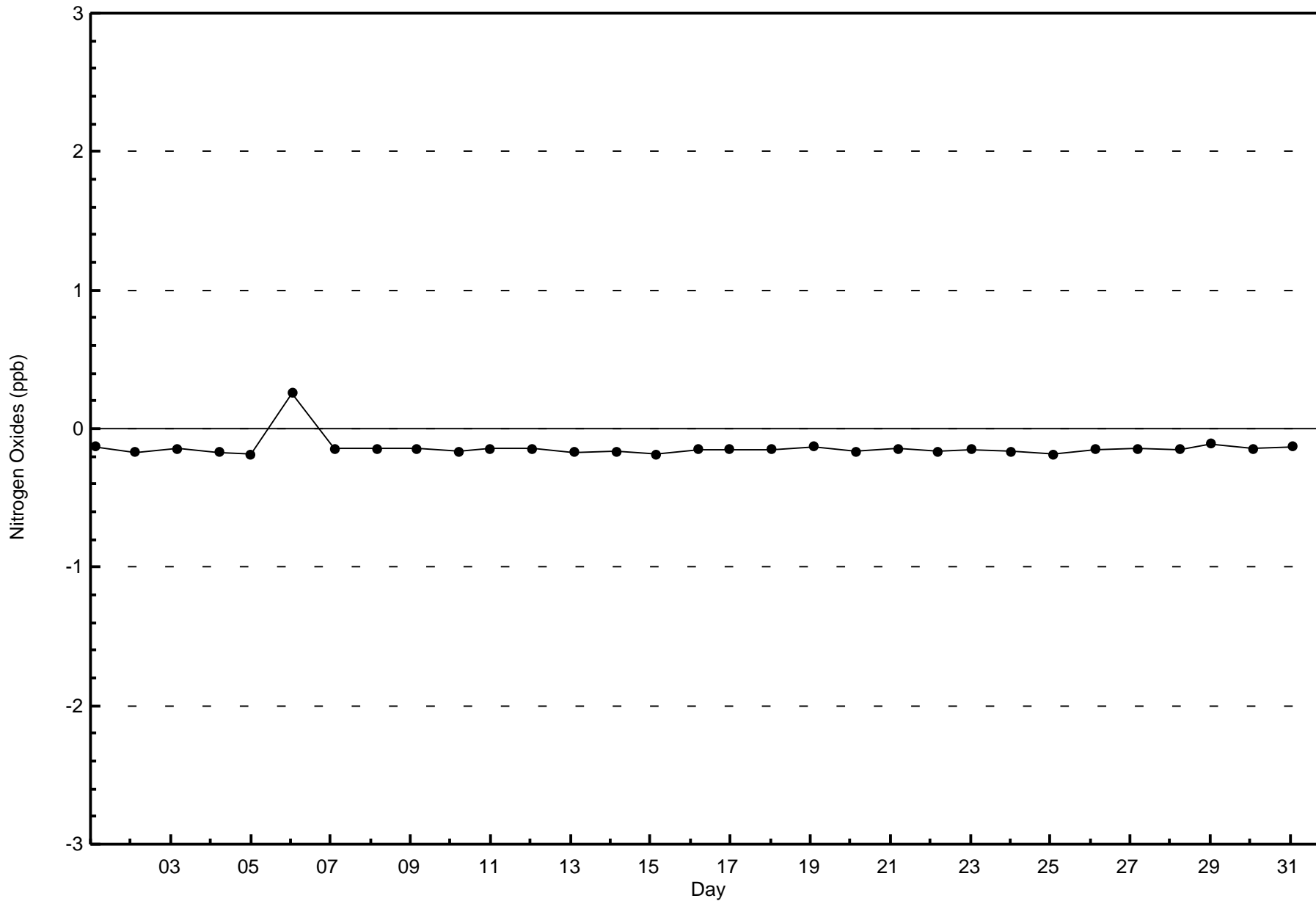


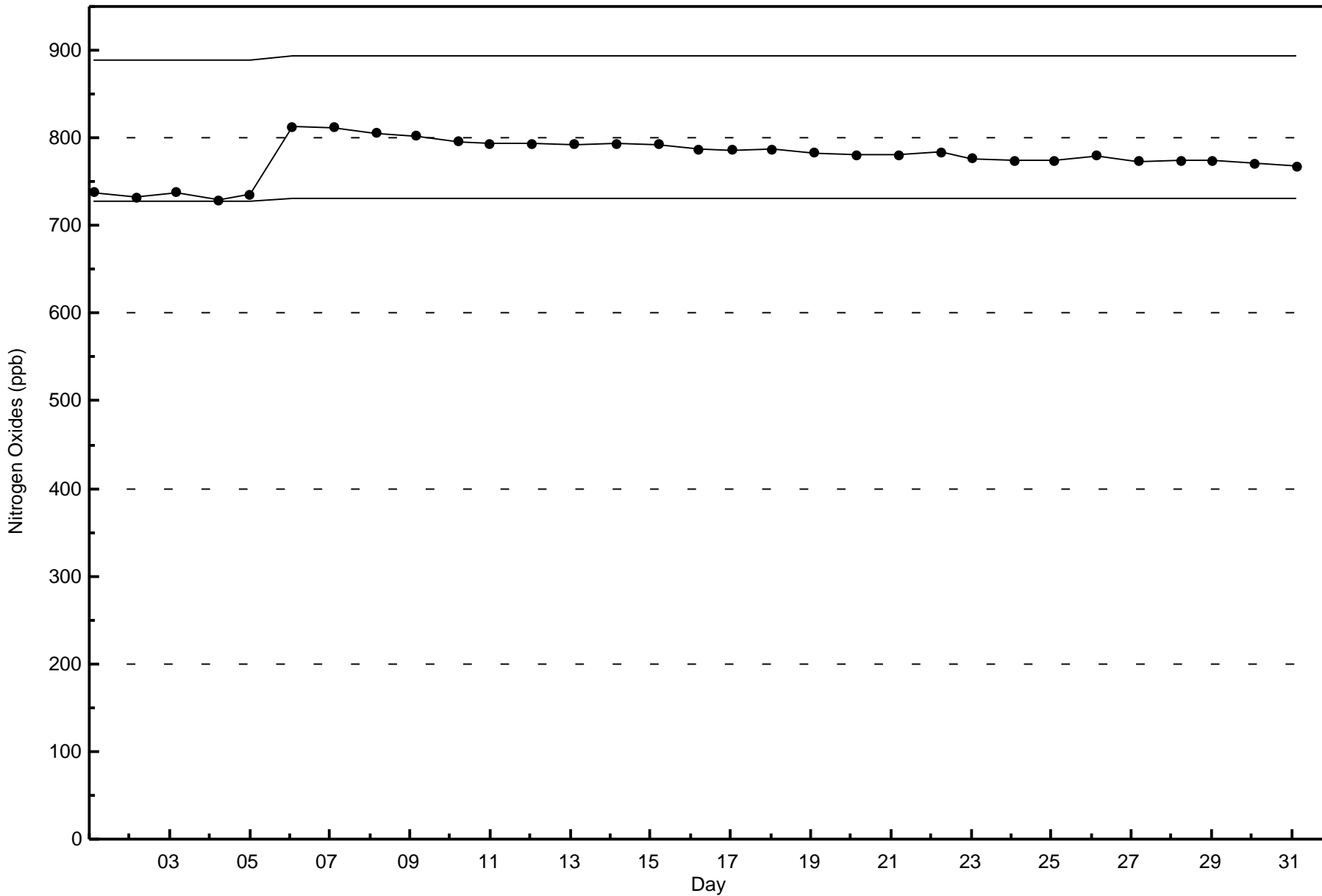
Wood Buffalo Environmental Association
Wind Rose Jul 2016

Nitrogen Oxides (NO_x) - ppb
Conklin Community (AMS 21)



Total Number of Valid Hours: 701







Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O₃) - ppb

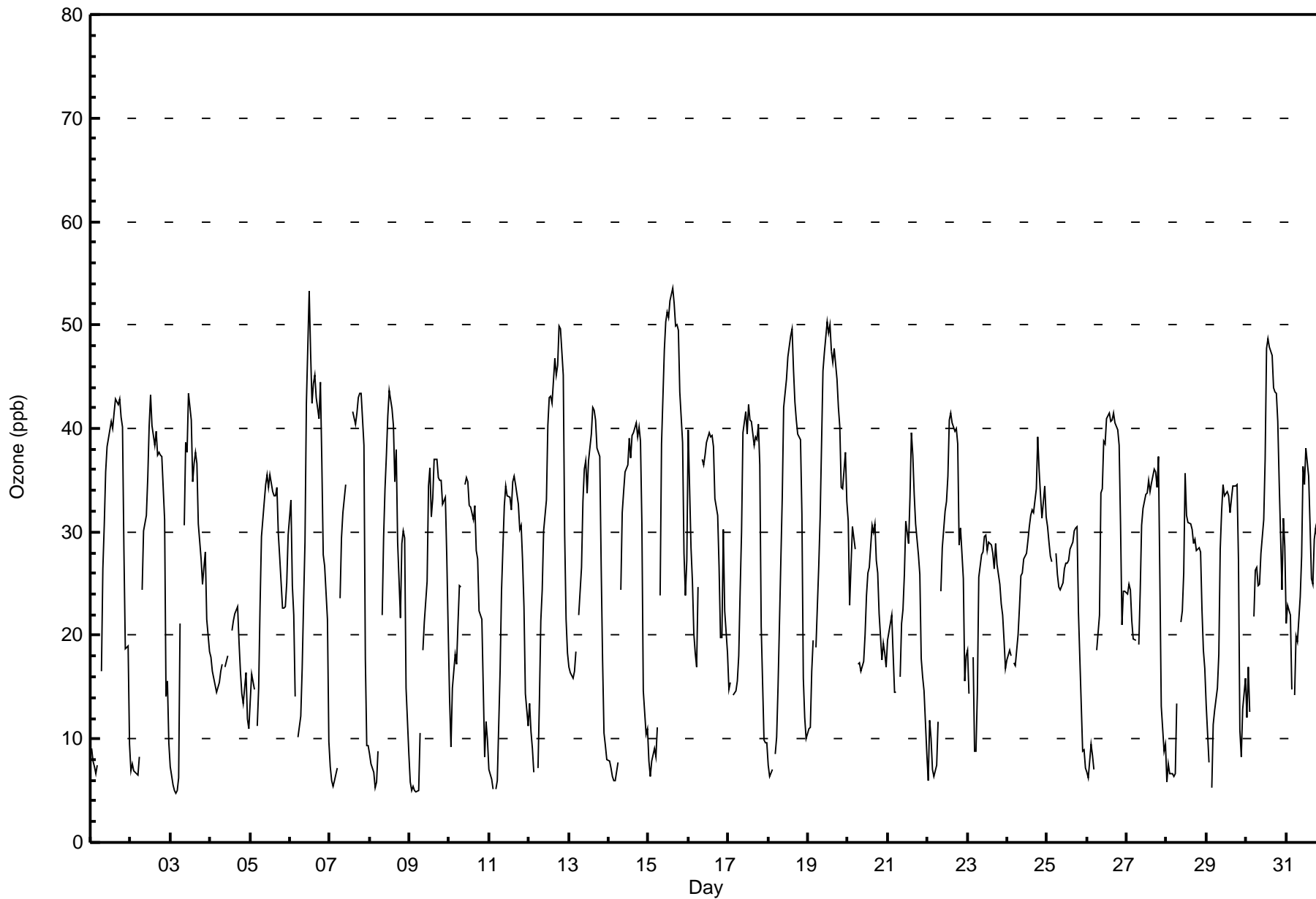
Conklin Community - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																																							
Maximum Value: 54 ppb on Jul 15 15:00										Maximum Daily Average: 35.8 ppb on Jul 19										Hours of Data: 707																													
Minimum Value: 5 ppb on Jul 3 04:00										Minimum Daily Average: 16.8 ppb on Jul 4										Hours of Missing Data: 37																													
Maximum Diurnal Average: 38.0 ppb at hour 13										Minimum Diurnal Average: 11.6 ppb at hour 5										Hours of Calibration: 35																													
Monthly Average: 26.3 ppb										Percentiles: P ₁ = 5 P ₁₀ = 8 Q ₁ = 17 Median = 27 Q ₃ = 35 P ₉₀ = 41 P ₉₉ = 50										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-Jul	9	8	7	7	7	Z	17	26	31	36	38	40	41	40	41	43	42	43	41	40	28	19	19	9	27.5	43																							
2-Jul	7	8	7	7	6	8	Z	24	30	32	35	40	43	40	38	40	37	38	37	37	31	14	16	10	25.5	43																							
3-Jul	7	6	5	5	5	6	21	Z	31	39	38	43	41	35	37	38	37	31	27	25	27	28	21	18	24.8	43																							
4-Jul	18	17	16	15	14	16	17	Z	17	Z	17	18	M	M	20	21	22	23	19	16	14	13	16	12	11	16.8	23																						
5-Jul	14	16	15	Z	11	15	23	30	33	35	35	34	35	34	34	33	34	30	27	23	23	23	25	30	26.6	35																							
6-Jul	33	25	22	14	Z	10	12	17	23	29	42	53	47	42	44	45	43	41	45	37	28	27	22	10	30.9	53																							
7-Jul	7	6	5	6	7	Z	24	29	32	35	C	C	C	C	42	40	41	43	43	43	38	18	9	9	25.2	43																							
8-Jul	9	8	7	5	6	9	Z	22	29	34	37	41	44	42	40	35	38	29	22	29	30	29	15	9	24.7	44																							
9-Jul	6	5	5	5	5	5	11	Z	19	21	25	34	36	31	33	37	37	35	35	35	33	33	28	21	23.3	37																							
10-Jul	14	9	15	18	17	21	25	25	Z	35	35	35	33	32	31	33	28	27	22	22	15	8	12	10	22.7	35																							
11-Jul	7	6	5	Z	5	6	17	24	29	32	35	34	33	32	35	35	35	33	30	31	27	23	14	11	23.4	35																							
12-Jul	13	11	9	7	Z	7	14	21	24	30	33	40	43	43	42	47	45	46	50	50	45	30	22	18	30.0	50																							
13-Jul	17	16	16	17	18	Z	22	27	33	36	37	34	37	39	42	42	41	38	37	27	18	11	9	8	27.0	42																							
14-Jul	8	7	6	6	6	8	Z	24	32	34	36	36	39	37	39	40	40	39	40	39	31	15	10	11	25.4	40																							
15-Jul	8	6	8	9	8	11	Z	24	39	48	50	51	51	52	54	52	50	50	50	44	39	28	24	27	34.0	54																							
16-Jul	40	28	25	20	18	17	25	Z	37	36	37	39	40	39	39	38	33	32	27	20	20	30	22	18	29.6	40																							
17-Jul	15	16	Z	14	15	16	18	24	30	40	42	39	42	41	41	38	39	39	40	37	21	10	10	10	27.6	42																							
18-Jul	7	6	7	Z	8	10	15	21	33	42	43	45	47	49	50	46	43	41	39	39	32	16	12	10	28.8	50																							
19-Jul	11	11	17	20	Z	19	27	31	38	46	47	50	49	50	48	46	48	45	42	40	34	34	38	33	35.8	50																							
20-Jul	31	23	27	31	28	Z	17	17	17	18	20	24	26	27	31	30	31	27	26	22	18	19	18	17	23.6	31																							
21-Jul	19	21	22	18	14	14	Z	16	21	22	26	31	29	33	40	37	34	31	28	26	18	16	15	9	23.5	40																							
22-Jul	6	12	10	7	6	7	12	Z	24	28	32	33	35	41	42	41	40	40	39	29	30	26	16	18	24.9	42																							
23-Jul	19	14	Z	18	9	9	15	26	28	28	30	30	28	29	29	28	26	29	27	25	23	22	19	17	22.9	30																							
24-Jul	18	19	18	Z	17	17	20	23	26	26	27	28	29	31	32	32	32	34	39	36	33	31	34	31	27.6	39																							
25-Jul	31	29	28	27	Z	28	26	25	24	25	26	27	27	27	28	29	30	30	31	22	13	9	9	7	24.3	31																							
26-Jul	7	6	9	8	7	Z	19	22	34	34	39	38	41	41	41	41	41	41	40	38	31	21	24	24	28.2	41																							
27-Jul	24	25	24	21	20	19	Z	19	24	31	32	34	34	35	34	35	36	36	34	37	26	13	9	9	26.6	37																							
28-Jul	6	8	7	7	6	7	13	Z	21	22	26	36	32	31	31	30	29	29	28	28	28	23	19	17	21.0	36																							
29-Jul	13	8	Z	5	11	13	15	18	28	32	35	34	34	34	32	33	34	34	35	27	11	8	13	16	22.7	35																							
30-Jul	12	17	13	Z	22	26	27	25	25	28	31	37	48	49	48	47	44	44	43	41	35	24	31	29	32.4	49																							
31-Jul	21	23	22	15	Z	14	20	19	24	28	36	35	38	35	31	26	25	29	30	28	25	24	22	20	25.6	38																							
																								14.7	13.5	13.5	12.7	11.6	13.0	18.7	23.0	28.2	31.5	34.2	37.1	38.0	37.1	37.7	37.4	36.7	35.6	34.6	31.9	26.5	20.9	18.3	16.0	Diurnal Average	
																								40	29	28	31	28	28	27	31	39	48	50	53	51	52	54	52	50	50	50	50	45	34	38	33	Diurnal Maximum	
Z - zerospan C - Calibration M - Maintenance																																																	
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb																																																	



Wood Buffalo Environmental Association
Hourly Averages

Ozone (O₃) - ppb
Conklin Community - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ozone (O₃) - ppb
Conklin Community - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	239	33.80	33.80
21 - 50	462	65.35	99.15
51 - 82	6	0.85	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



Wood Buffalo Environmental Association
Frequency Distribution

Ozone (O₃) - ppb
Conklin Community - July 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	15	7	1	0	5	6	2	22	30	27	31	7	4	7	23	49	236
21 - 50	42	31	11	12	10	27	11	4	17	34	37	32	29	45	56	64	462
51 - 82	0	0	0	0	0	0	0	0	0	0	0	1	0	2	3	0	6
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	57	38	12	12	15	33	13	26	47	61	68	40	33	54	82	113	704

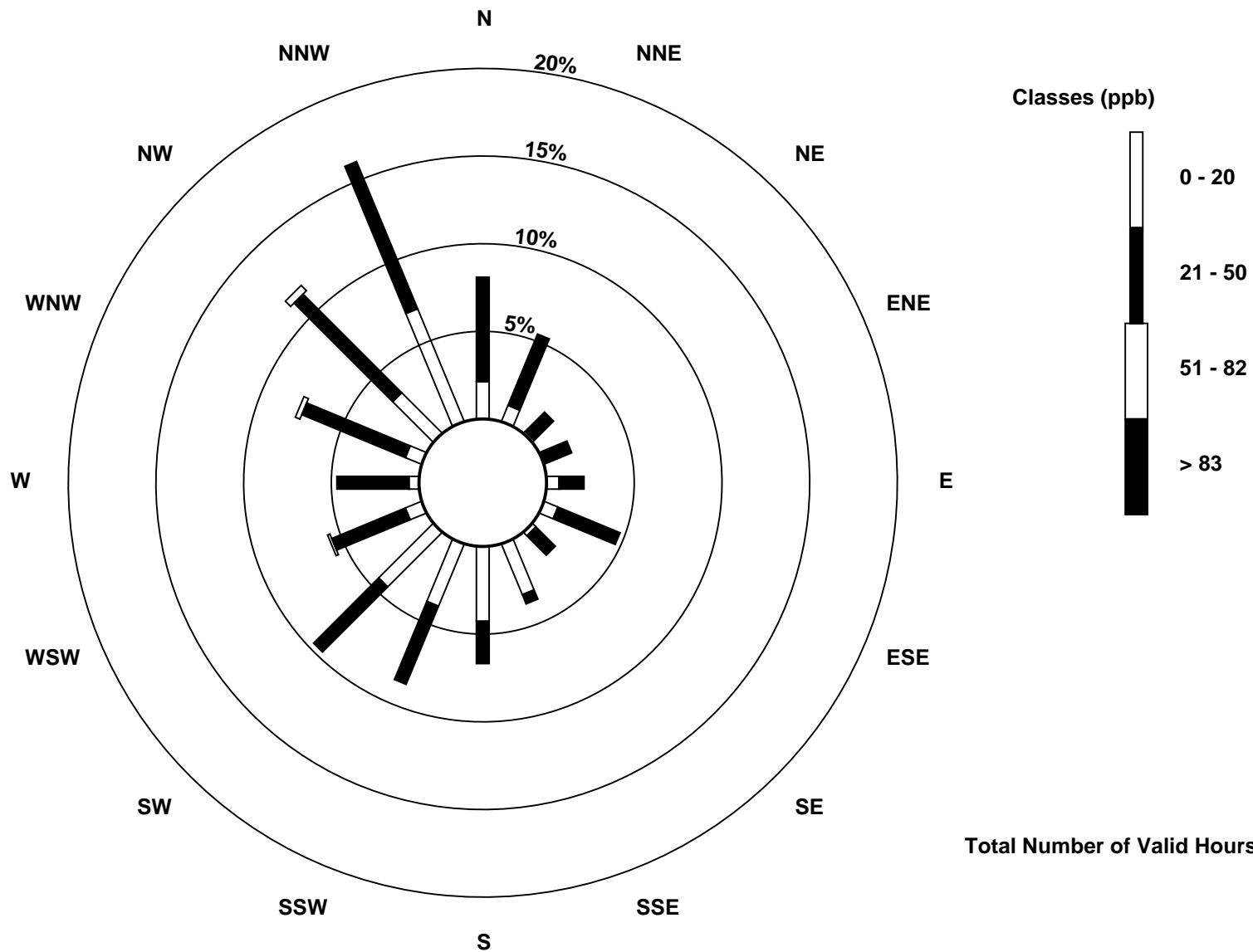
Total Number of Valid Hours: 704

Total Number of Hours: 744

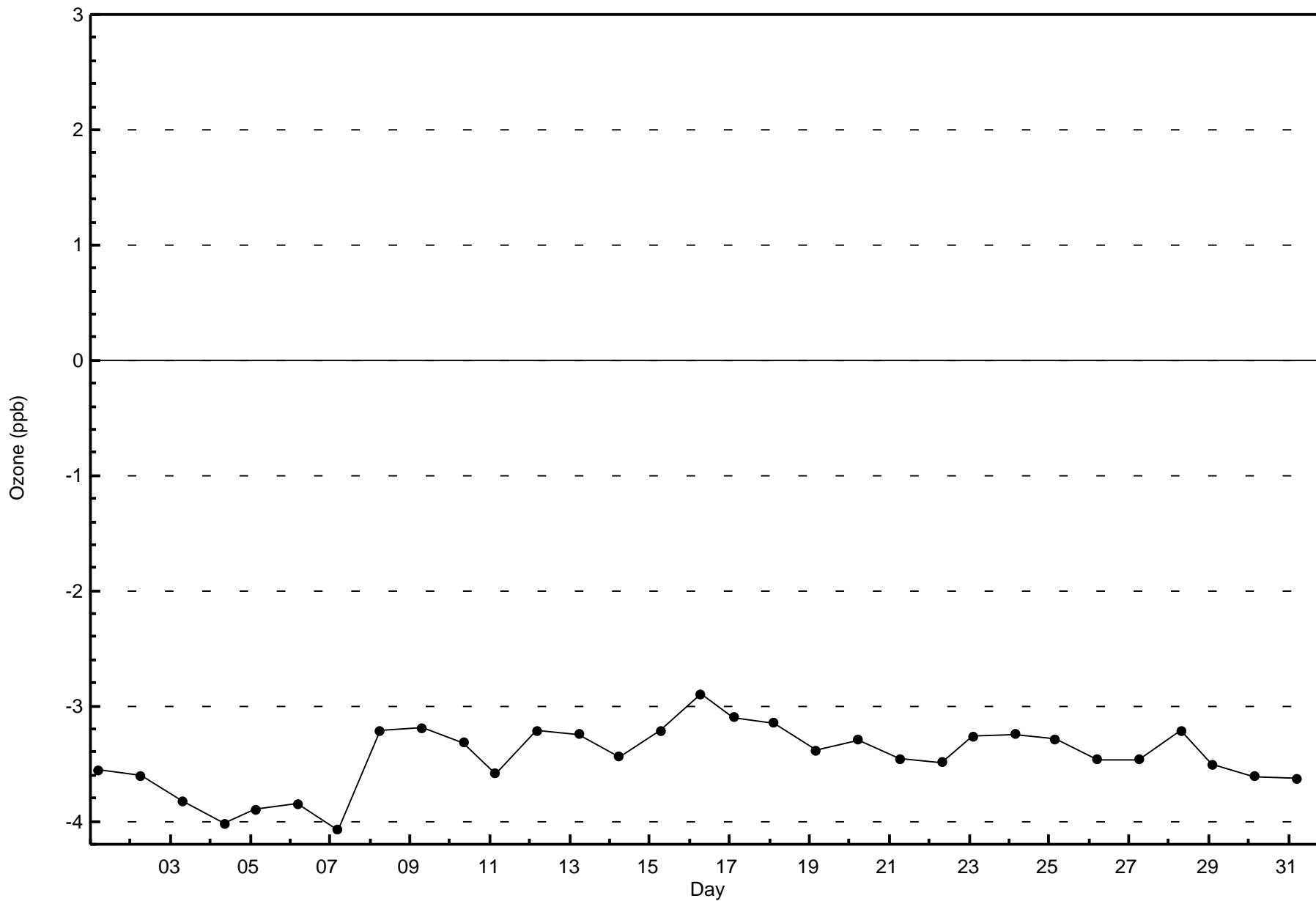


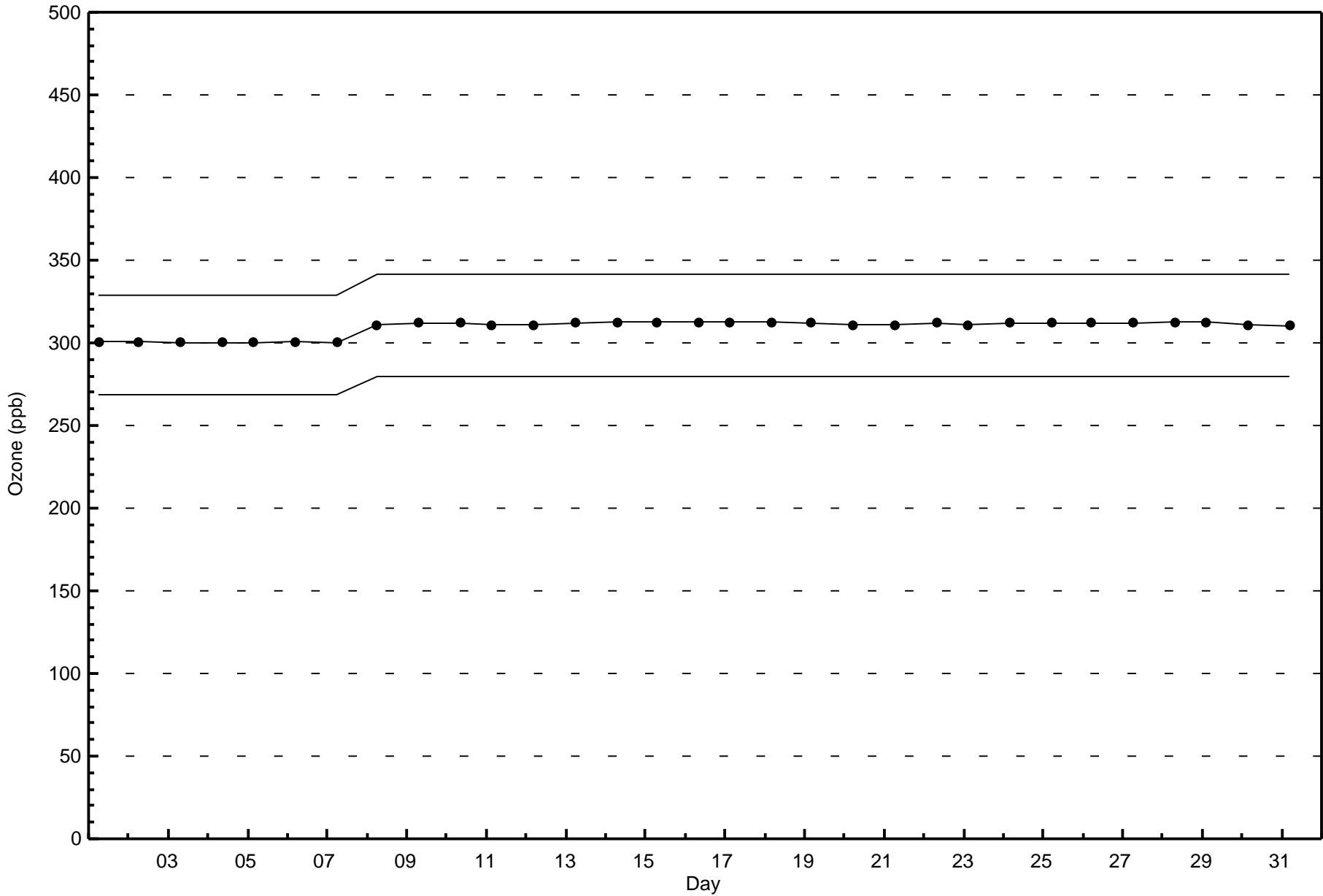
Wood Buffalo Environmental Association
Wind Rose Jul 2016

Ozone (O₃) - ppb
Conklin Community (AMS 21)



Total Number of Valid Hours: 704





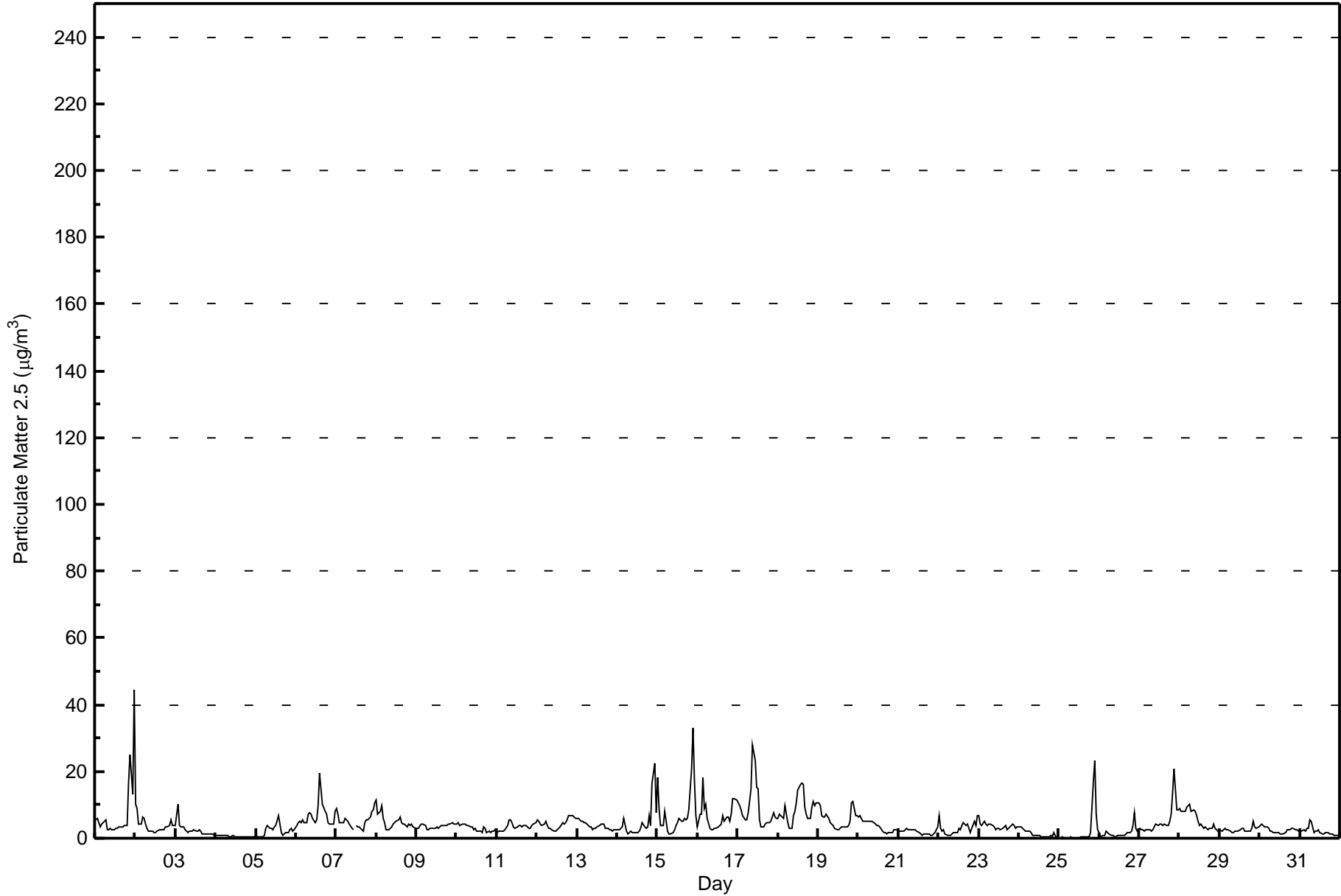


Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 44.3 µg/m ³ on Jul 2 00:00 Maximum Daily Average: 9.1 µg/m ³ on Jul 17		Hours in Service: 744 Hours of Data: 743 Hours of Missing Data: 1 Hours of Calibration: 1 Percent Operational Time: 100.0																																														
Minimum Value: 0.1 µg/m ³ on Jul 25 04:00 Maximum Diurnal Average: 7.7 µg/m ³ at hour 22 Monthly Average: 4.17 µg/m ³		Minimum Daily Average: 0.6 µg/m ³ on Jul 4 Minimum Diurnal Average: 3.2 µg/m ³ at hour 18 Percentiles: P ₁ = 0.2 P ₁₀ = 0.8 Q ₁ = 2.1 Median = 3.2 Q ₃ = 4.9 P ₉₀ = 7.9 P ₉₉ = 21.7																																														
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-Jul	5.6	6.1	4.7	3.5	4.1	5.1	5.3	2.7	2.5	2.8	2.7	2.6	3.0	3.1	3.3	3.4	3.6	4.0	4.0	3.6	16.3	25.0	13.0	44.3	7.3	44.3																						
2-Jul	10.3	8.8	4.3	4.1	6.3	6.0	4.4	3.1	2.2	2.0	2.0	1.8	1.7	2.0	2.5	2.5	2.5	2.6	3.4	3.4	3.7	5.7	3.9	3.8	3.9	10.3																						
3-Jul	3.7	10.2	3.9	3.3	3.3	3.2	2.4	1.7	2.0	2.2	2.3	2.5	2.3	2.1	2.6	2.2	1.3	1.3	1.3	1.3	1.4	1.4	1.3	1.0	2.5	10.2																						
4-Jul	0.8	0.8	0.9	0.8	0.8	0.8	0.8	0.6	0.6	0.6	0.7	0.4	0.4	0.4	0.5	0.5	0.5	0.4	0.6	0.6	0.5	0.5	0.5	0.6	0.6	0.9																						
5-Jul	0.7	0.6	0.5	0.5	0.5	1.0	2.9	3.7	2.8	2.9	2.8	3.6	3.7	6.9	4.3	1.9	0.7	1.3	1.6	1.5	2.4	3.1	2.1	2.5	2.3	6.9																						
6-Jul	3.7	4.6	5.1	4.8	5.4	4.8	4.6	7.0	7.4	7.1	6.0	4.5	5.3	9.7	19.3	14.8	10.2	7.9	7.3	4.5	4.1	4.4	4.4	7.9	6.9	19.3																						
7-Jul	9.0	7.2	4.7	4.5	4.7	5.8	5.4	5.3	4.3	3.0	2.5	C	3.7	3.4	3.3	2.4	2.2	4.6	5.4	5.7	6.2	8.1	8.4	10.5	5.2	10.5																						
8-Jul	11.6	7.3	8.2	9.6	6.1	4.7	2.3	2.4	2.9	3.3	4.2	4.8	5.1	5.6	6.2	4.9	4.1	4.1	3.6	4.3	3.9	4.2	3.4	2.8	5.0	11.6																						
9-Jul	3.0	3.1	3.8	4.4	4.4	3.8	2.7	2.5	2.8	3.0	3.0	3.2	3.5	3.0	3.5	3.8	3.8	3.8	4.0	4.1	4.3	4.8	4.3	4.1	3.6	4.8																						
10-Jul	4.3	4.8	3.9	4.1	4.0	4.1	3.9	3.8	3.3	3.2	2.7	2.8	2.2	2.0	2.0	1.8	3.4	2.9	1.9	1.9	1.9	2.3	2.2	2.3	3.0	4.8																						
11-Jul	1.8	2.0	2.2	2.1	2.0	2.7	3.9	5.6	5.6	4.8	3.5	2.9	3.3	3.7	3.7	3.5	3.6	3.9	3.2	2.8	2.8	3.7	4.1	4.6	3.4	5.6																						
12-Jul	5.7	5.0	4.3	3.7	4.4	4.9	3.8	2.8	2.8	2.6	2.3	2.1	2.5	2.9	3.3	4.8	4.1	4.5	5.6	7.0	6.8	6.9	6.2	5.8	4.4	7.0																						
13-Jul	5.8	5.8	5.0	5.1	4.7	4.9	4.2	3.6	3.5	2.8	2.8	3.2	3.2	4.0	4.3	4.3	2.8	3.1	2.7	2.5	2.2	2.4	2.6	3.7	5.8																							
14-Jul	2.6	2.5	3.0	3.5	6.0	2.1	1.4	1.7	2.0	1.6	1.9	1.9	1.9	2.0	3.0	4.6	3.4	3.0	3.3	6.9	3.9	16.5	22.4	7.7	4.5	22.4																						
15-Jul	18.1	8.9	3.9	3.6	8.0	5.1	1.9	1.2	1.1	1.8	2.5	3.6	4.7	5.8	5.2	5.2	5.9	5.7	5.8	8.4	20.6	33.2	17.3	6.7	7.7	33.2																						
16-Jul	3.5	7.1	7.3	18.3	9.1	10.0	5.8	3.0	2.5	2.5	2.8	2.9	3.4	3.9	4.2	6.7	5.2	6.3	6.2	5.3	7.3	12.0	11.9	11.3	6.6	18.3																						
17-Jul	10.7	9.9	8.6	6.7	5.6	5.6	7.6	11.1	15.0	27.9	23.2	15.5	15.0	5.6	3.4	3.4	4.1	4.7	4.8	4.9	5.3	7.8	6.4	6.0	9.1	27.9																						
18-Jul	5.9	7.3	6.5	5.8	9.9	7.3	4.7	2.8	2.8	6.7	8.2	10.5	14.3	15.9	16.6	15.9	9.4	7.2	5.9	6.1	9.1	11.2	9.9	10.4	8.8	16.6																						
19-Jul	10.5	9.8	6.8	6.5	6.3	7.1	6.1	4.8	4.1	3.7	3.1	2.5	2.5	2.9	3.2	3.3	3.4	3.5	3.9	5.0	10.6	11.2	6.6	6.9	5.6	11.2																						
20-Jul	6.3	6.7	6.0	5.3	5.1	5.1	5.2	5.1	5.0	4.7	4.1	3.7	3.8	3.3	2.1	1.7	1.6	1.4	1.6	1.8	1.8	2.4	2.5	2.5	3.7	6.7																						
21-Jul	2.3	2.1	2.1	2.3	2.7	2.8	2.5	2.6	2.4	2.5	2.7	2.1	1.6	1.2	0.8	1.1	1.2	1.4	1.2	1.0	1.0	1.2	1.8	3.5	1.9	3.5																						
22-Jul	6.7	3.1	2.3	2.4	1.2	0.8	0.7	0.9	1.4	1.9	1.8	1.6	2.8	2.7	3.7	4.5	3.8	4.4	2.9	1.7	2.9	4.9	3.9	6.7	2.9	6.7																						
23-Jul	6.8	4.3	3.9	5.0	4.4	3.9	4.3	4.1	3.7	3.2	2.7	3.0	3.0	2.7	2.9	3.2	3.7	2.5	2.9	3.7	4.1	3.7	3.1	3.4	3.7	6.8																						
24-Jul	3.6	3.4	3.1	2.6	2.1	2.2	2.1	1.7	1.0	0.8	0.7	0.8	0.7	0.6	0.6	0.5	0.4	0.5	0.6	0.8	0.3	1.9	0.1	0.2	1.3	3.6																						
25-Jul	0.2	0.1	0.3	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	0.3	0.3	0.3	1.6	16.9	23.1	7.3	2.5	2.3	23.1																						
26-Jul	1.6	0.6	0.6	0.6	2.0	1.7	1.2	1.0	0.7	0.6	0.6	0.9	0.8	0.8	0.8	0.9	1.1	1.5	1.9	1.9	4.0	7.4	2.9	2.3	1.6	7.4																						
27-Jul	2.8	2.6	2.4	2.3	2.4	2.6	2.5	2.3	2.6	3.6	4.1	3.9	4.1	4.2	4.0	4.1	3.9	4.0	4.9	7.4	13.7	20.9	8.6	8.3	5.1	20.9																						
28-Jul	9.0	8.0	8.1	8.2	9.3	9.9	10.4	8.0	8.3	7.9	6.8	5.2	4.0	4.1	3.1	3.4	2.9	2.7	3.0	3.0	4.1	2.9	2.4	2.2	5.7	10.4																						
29-Jul	2.4	2.1	2.5	2.9	2.7	2.7	2.2	1.7	1.9	1.9	2.3	2.3	2.6	2.9	2.8	2.2	2.1	2.1	2.2	2.8	5.0	3.3	3.1	3.5	2.6	5.0																						
30-Jul	3.8	4.1	3.6	3.5	3.6	3.0	2.1	2.3	1.8	1.9	1.8	1.6	1.2	1.2	1.4	1.7	2.5	2.7	2.4	3.1	2.9	2.7	2.4	2.3	2.5	4.1																						
31-Jul	2.0	2.2	2.4	2.3	2.8	3.1	5.5	5.1	1.8	2.1	2.2	2.4	1.7	1.1	1.2	1.5	1.5	1.6	1.5	1.1	1.0	0.7	0.7	0.7	2.0	5.5																						
																								5.3	4.9	4.0	4.3	4.3	4.1	3.7	3.4	3.3	3.7	3.5	3.3	3.5	3.6	3.8	3.7	3.3	3.2	3.2	3.5	5.5	7.7	5.5	5.8	Diurnal Average
																								18.1	10.2	8.6	18.3	9.9	10.0	10.4	11.1	15.0	27.9	23.2	15.5	15.0	15.9	19.3	15.9	10.2	7.9	7.3	8.4	20.6	33.2	22.4	44.3	Diurnal Maximum
C - Calibration																																																
Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m ³																																																



Wood Buffalo Environmental Association
Hourly Averages

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Conklin Community - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Conklin Community - July 2016**

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	505	67.97	67.97
6 - 15	137	18.44	86.41
16 - 25	16	2.15	88.56
26 - 80	3	0.40	88.96
> 81.0	0	0.00	88.96

Total Number of Valid Hours: 743

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Particulate Matter 2.5 (PM_{2.5}) - μg/m³
Conklin Community - July 2016**

Concentration Ranges (μg/m ³)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	50	31	9	11	13	31	15	13	29	40	48	27	21	38	52	75	503
6 - 15	6	5	3	0	1	3	3	8	17	16	14	7	4	1	17	31	136
16 - 25	1	0	0	1	1	0	0	2	2	3	3	1	0	0	1	1	16
26 - 80	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	58	36	12	12	15	34	18	23	48	59	66	35	25	39	70	107	657

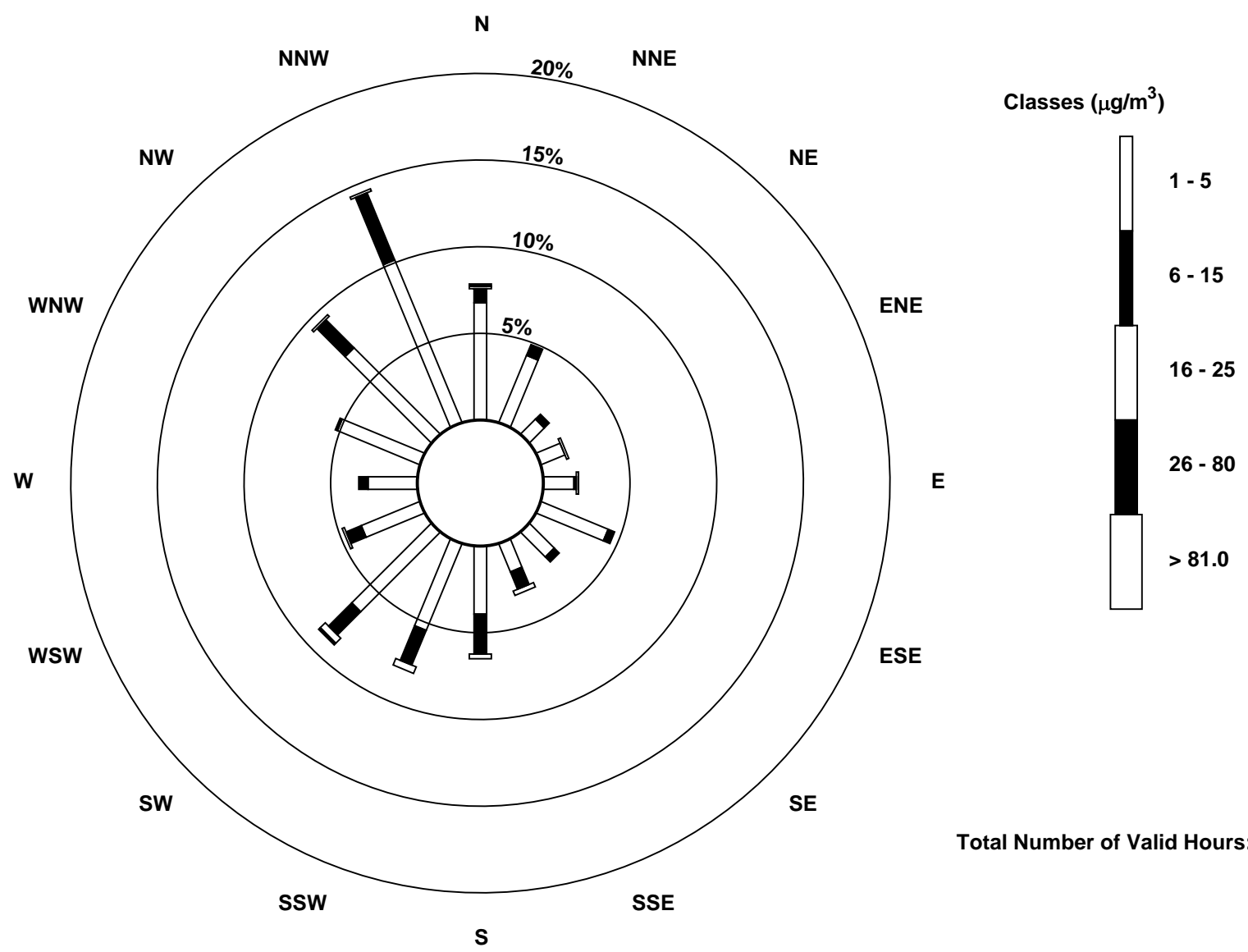
Total Number of Valid Hours: 739

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Conklin Community (AMS 21)





Wood Buffalo Environmental Association
Summary of Hour Averages

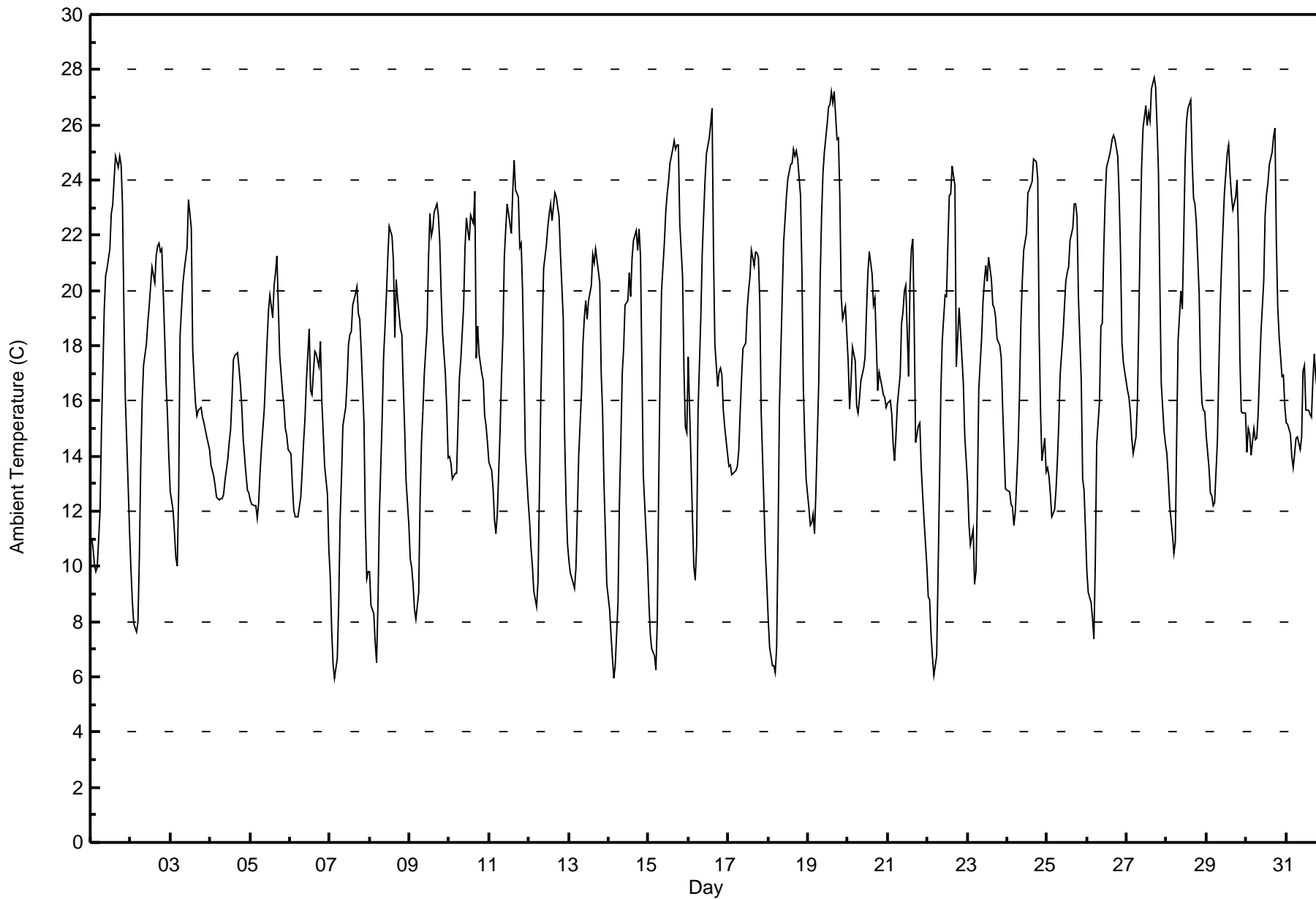
Ambient Temperature (AT) - C
Conklin Community - July 2016

Maximum Value: 27.7 C on Jul 27 17:00 Maximum Daily Average: 20.9 C on Jul 27																						Hours in Service: 744 Hours of Data: 744																									
Minimum Value: 5.9 C on Jul 7 04:00 Minimum Daily Average: 13.9 C on Jul 7 Maximum Diurnal Average: 22.2 C at hour 15 Minimum Diurnal Average: 10.5 C at hour 5 Monthly Average: 17.01 C Percentiles: P ₁ = 6.4 P ₁₀ = 10.1 Q ₁ = 13.4 Median = 16.9 Q ₃ = 21.1 P ₉₀ = 23.8 P ₉₉ = 26.7																						Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																							
1-Jul	11.0	10.7	10.1	9.8	10.0	12.0	14.9	17.1	19.3	20.5	20.8	21.5	22.8	23.1	24.0	24.9	24.5	24.9	24.5	23.1	19.3	16.1	13.0	11.3	17.9	24.9																					
2-Jul	9.9	8.8	7.9	7.6	8.0	10.3	13.7	16.0	17.3	18.0	18.8	19.4	20.1	20.8	20.3	21.3	21.6	21.7	21.4	21.5	18.4	16.7	15.6	14.0	16.2	21.7																					
3-Jul	12.7	12.0	11.2	10.3	10.0	12.6	18.3	20.2	20.8	21.2	21.6	23.3	22.3	17.9	16.8	15.9	15.5	15.7	15.8	15.4	15.2	15.0	14.7	14.2	16.2	23.3																					
4-Jul	13.7	13.5	13.2	12.9	12.5	12.4	12.4	12.5	12.6	13.1	13.9	14.5	15.0	16.1	17.5	17.6	17.7	17.2	16.6	15.8	14.6	13.3	12.8	12.7	14.3	17.7																					
5-Jul	12.4	12.3	12.2	12.2	11.8	12.3	13.4	14.3	15.7	16.9	18.2	19.3	19.8	19.0	20.2	20.6	21.3	19.4	17.7	16.3	15.8	15.0	14.8	14.2	16.0	21.3																					
6-Jul	14.1	13.0	12.1	11.8	11.8	11.8	12.5	13.5	14.5	15.4	16.8	18.6	16.4	16.2	17.0	17.8	17.7	17.2	18.2	16.0	14.8	13.6	12.6	10.6	14.7	18.6																					
7-Jul	9.6	7.7	6.5	5.9	6.6	8.6	11.6	13.2	15.1	15.8	16.7	18.0	18.4	18.5	19.5	19.9	20.1	19.1	19.0	17.9	15.2	11.6	9.5	9.8	13.9	20.1																					
8-Jul	9.8	8.6	8.3	7.3	6.5	8.7	11.9	15.4	17.6	18.7	19.8	21.2	22.3	22.0	21.0	18.3	20.4	19.7	18.6	18.4	16.6	15.0	13.1	11.5	15.4	22.3																					
9-Jul	10.3	9.9	9.3	8.4	8.1	9.0	12.4	14.5	15.7	17.0	18.7	21.1	22.8	22.0	22.2	22.8	23.1	22.7	21.8	19.9	18.5	17.0	15.7	13.9	16.5	23.1																					
10-Jul	14.0	13.8	13.2	13.4	13.4	15.2	16.8	17.5	19.4	21.6	22.6	22.2	21.8	22.7	22.4	23.6	17.5	18.7	17.7	17.0	16.7	15.5	15.1	14.5	17.8	23.6																					
11-Jul	13.8	13.5	12.8	11.7	11.2	11.9	15.0	16.9	18.3	21.2	22.2	23.1	22.4	22.1	23.6	24.7	23.6	23.4	21.6	21.7	20.0	17.2	14.1	12.4	18.3	24.7																					
12-Jul	11.6	10.7	10.0	9.1	8.5	9.4	12.7	16.1	18.5	20.8	21.6	22.3	22.8	23.1	22.5	23.6	23.4	23.0	22.7	21.3	19.0	14.6	12.3	10.8	17.1	23.6																					
13-Jul	10.2	9.7	9.4	9.2	9.9	11.9	14.0	16.3	18.0	19.0	19.6	19.0	19.6	20.2	21.3	21.0	21.5	21.1	20.3	17.0	15.6	12.9	11.3	9.4	15.7	21.5																					
14-Jul	8.4	7.5	6.7	5.9	6.4	8.7	12.4	14.5	17.0	17.9	19.5	19.6	20.6	19.8	21.1	21.8	22.2	21.5	22.2	21.3	17.3	13.3	11.2	10.2	15.3	22.2																					
15-Jul	8.7	7.5	7.0	6.8	6.3	8.1	13.0	17.2	20.0	21.7	22.8	23.5	23.9	24.6	25.1	25.4	25.1	25.3	25.3	22.4	20.5	17.0	15.0	14.9	17.8	25.4																					
16-Jul	17.6	13.8	11.8	10.0	9.5	10.7	15.6	19.1	21.3	22.7	24.0	25.0	25.5	26.0	26.6	21.5	18.1	16.5	17.0	17.2	16.9	15.7	15.1	14.1	18.0	26.6																					
17-Jul	13.6	13.7	13.3	13.4	13.5	13.6	14.2	15.5	16.8	17.9	18.1	19.3	20.0	20.5	21.5	20.9	21.4	21.3	21.2	19.6	15.6	12.2	10.5	9.3	16.5	21.5																					
18-Jul	8.1	7.1	6.4	6.4	6.2	7.1	11.0	15.8	19.8	21.7	22.6	23.5	24.0	24.6	24.6	25.1	24.9	25.1	24.8	23.4	20.7	16.5	14.6	13.2	17.4	25.1																					
19-Jul	12.1	11.5	11.6	11.9	11.2	12.7	16.7	20.4	22.7	24.3	25.0	26.0	26.6	26.8	27.2	26.8	27.2	25.5	25.5	23.4	19.8	19.0	19.4	18.4	20.5	27.2																					
20-Jul	17.4	15.7	16.7	17.9	17.4	15.8	15.6	16.1	16.7	17.2	17.6	19.2	20.7	21.4	20.6	19.5	19.7	18.1	16.4	17.0	16.5	16.2	16.1	15.7	17.6	21.4																					
21-Jul	15.9	16.0	15.5	14.4	13.8	14.8	15.9	16.9	18.8	19.2	20.0	20.2	16.9	20.3	21.5	21.9	18.8	14.5	15.1	15.2	13.6	12.6	11.7	10.0	16.4	21.9																					
22-Jul	8.9	8.8	7.5	6.7	6.1	6.8	9.7	13.0	16.4	18.2	19.8	19.8	21.7	23.5	23.5	24.5	23.8	17.3	18.3	19.4	18.5	16.6	14.7	13.9	15.7	24.5																					
23-Jul	13.0	11.5	10.8	11.3	9.4	9.8	12.6	16.4	18.3	19.6	20.3	20.9	20.3	21.2	20.4	19.5	19.4	19.0	18.2	18.0	17.6	15.8	14.3	12.8	16.3	21.2																					
24-Jul	12.7	12.7	12.3	12.1	11.5	12.0	14.3	16.2	18.8	20.3	21.5	22.1	23.5	23.6	23.8	24.0	24.8	24.7	24.1	18.5	15.6	13.9	14.6	13.4	18.0	24.8																					
25-Jul	13.6	13.2	12.6	11.8	12.1	12.8	13.8	15.2	17.0	18.4	19.4	20.3	20.7	20.8	21.8	22.3	23.1	23.1	22.7	19.7	16.7	13.2	12.8	11.4	17.0	23.1																					
26-Jul	9.8	9.1	8.7	8.1	7.4	10.1	14.5	16.0	18.7	18.8	21.4	23.2	24.4	24.9	25.1	25.5	25.6	25.5	24.9	23.5	21.3	18.1	17.4	17.1	18.3	25.6																					
27-Jul	16.4	16.1	15.6	14.7	14.1	14.7	16.0	18.9	22.1	24.5	25.9	26.7	26.0	26.5	26.1	27.3	27.7	27.3	25.9	24.3	20.2	16.6	14.9	14.5	20.9	27.7																					
28-Jul	14.1	13.2	12.2	11.1	10.5	10.9	14.8	18.2	20.0	19.3	22.0	24.7	26.1	26.6	26.9	24.7	23.3	23.2	22.4	19.9	17.1	15.9	15.7	15.6	18.7	26.9																					
29-Jul	14.8	13.6	12.7	12.5	12.2	12.3	14.5	17.1	19.4	21.0	22.3	23.5	25.0	25.3	24.2	23.4	23.0	23.4	24.0	21.9	17.6	15.6	15.6	15.6	18.8	25.3																					
30-Jul	14.2	15.0	14.8	14.0	15.0	14.6	14.6	15.5	17.0	18.4	20.3	22.7	23.5	23.9	24.5	25.0	25.6	25.9	21.7	19.4	18.3	16.9	16.9	15.8	18.9	25.9																					
31-Jul	15.2	15.2	14.8	14.0	13.6	14.1	14.6	14.7	14.2	14.7	17.1	17.3	15.7	15.7	15.5	15.4	16.7	17.7	16.9	16.0	15.0	14.8	14.2	13.8	15.3	17.7																					
																						12.5	11.8	11.2	10.7	10.5	11.5	14.0	16.1	18.0	19.2	20.3	21.3	21.7	21.9	22.2	22.1	21.9	21.3	20.7	19.4	17.4	15.3	14.2	13.2	Diurnal Average	
																						17.6	16.1	16.7	17.9	17.4	15.8	18.3	20.4	22.7	24.5	25.9	26.7	26.6	26.8	27.2	27.3	27.7	27.3	25.9	24.3	21.3	19.0	19.4	18.4	Diurnal Maximum	



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature (AT) - C
Conklin Community - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Conklin Community - July 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	69	9.27	9.27
10 - 20	450	60.48	69.76
> 20	225	30.24	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744

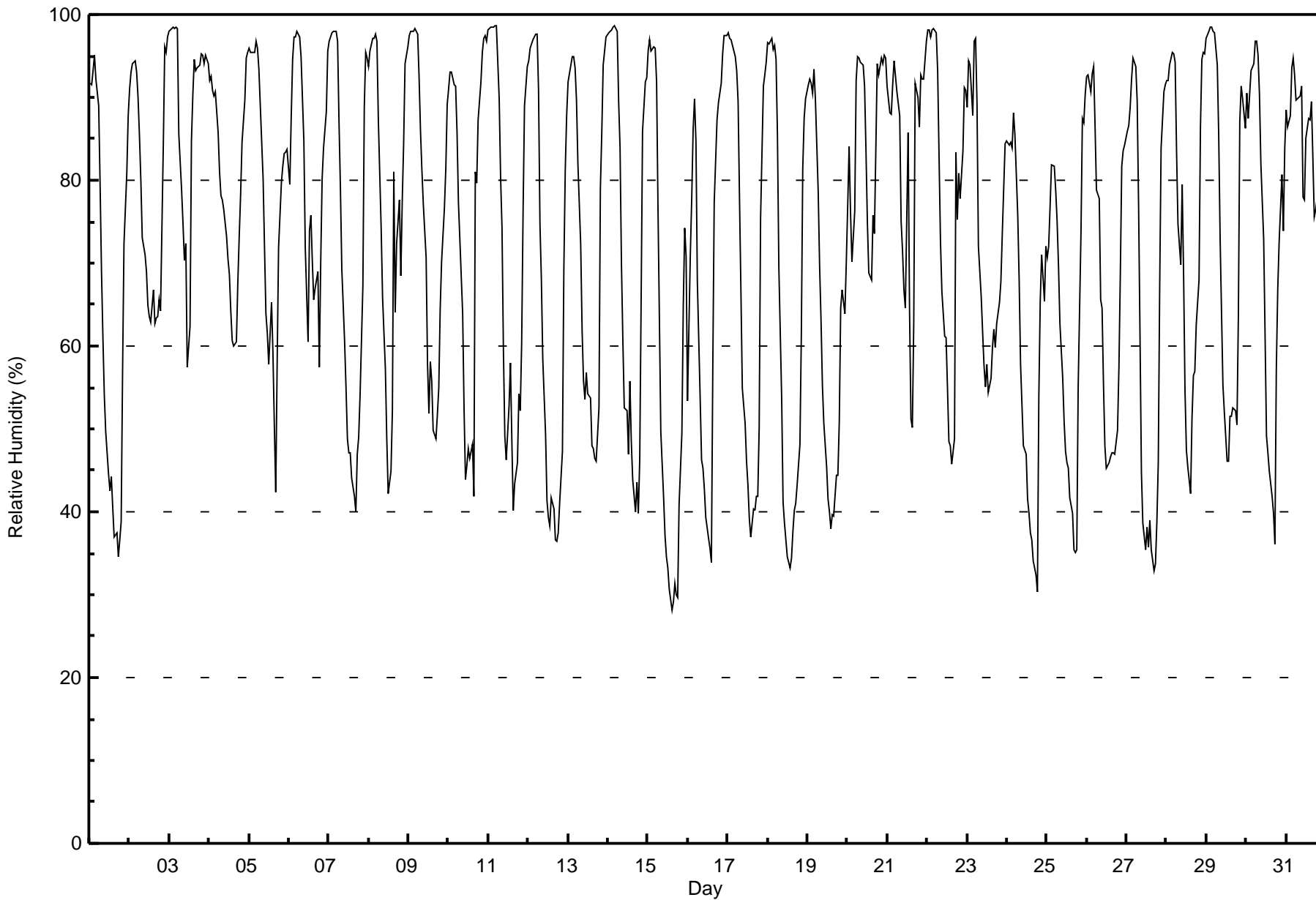


Wood Buffalo Environmental Association

Summary of Hour Averages

**Relative Humidity (RH) - %
Conklin Community - July 2016**

Maximum Value: 99 % on Jul 11 06:00																			Maximum Daily Average: 88.1 % on Jul 3						Hours in Service: 744	
Minimum Value: 28 % on Jul 15 15:00																			Minimum Daily Average: 57.8 % on Jul 15						Hours of Data: 744	
Maximum Diurnal Average: 94.1 % at hour 5																			Minimum Diurnal Average: 50.3 % at hour 15						Hours of Missing Data: 0	
Monthly Average: 72.4 %																			Percentiles: P ₁ = 32 P ₁₀ = 42 Q ₁ = 54 Median = 76 Q ₃ = 92 P ₉₀ = 96 P ₉₉ = 98						Hours of Calibration: 0	
																			Percent Operational Time: 100.0							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	92	92	93	95	92	89	79	69	61	54	50	45	43	44	41	37	37	35	37	39	57	72	81	88	63.3	95
2-Jul	91	93	94	94	93	90	85	80	73	71	69	65	64	63	67	63	63	63	66	64	84	96	95	97	78.5	97
3-Jul	98	98	98	98	98	98	86	79	75	70	72	58	62	85	90	95	93	94	94	95	95	94	95	94	88.1	98
4-Jul	92	93	91	90	91	86	81	78	78	76	73	71	69	64	61	60	61	68	73	78	85	90	95	95	79.0	95
5-Jul	96	95	95	95	97	96	93	89	80	72	64	62	58	65	59	50	42	58	72	80	82	83	83	84	77.1	97
6-Jul	79	88	95	97	97	98	97	95	90	85	72	60	74	76	70	66	67	69	58	70	80	84	88	96	81.3	98
7-Jul	97	97	98	98	98	97	87	79	69	61	55	49	47	47	44	42	40	47	49	54	67	89	95	95	70.9	98
8-Jul	94	96	97	97	98	97	87	74	66	61	57	49	42	45	52	81	64	72	78	69	78	84	94	96	76.2	98
9-Jul	98	98	98	98	98	98	92	86	81	77	71	58	52	58	56	50	49	52	55	64	70	77	81	89	75.2	98
10-Jul	91	93	93	92	91	86	77	73	64	52	44	46	48	46	48	42	81	80	87	92	95	97	97	97	75.5	97
11-Jul	98	98	98	99	99	99	90	80	74	59	49	46	53	58	49	40	43	46	54	52	61	76	89	94	71.0	99
12-Jul	94	96	96	97	98	98	91	75	68	58	49	41	39	38	42	40	37	36	38	41	47	69	81	88	64.9	98
13-Jul	92	93	95	95	94	90	82	72	62	56	54	57	54	54	48	48	46	46	53	79	86	94	96	97	72.5	97
14-Jul	98	98	98	98	99	98	90	84	70	61	53	52	47	56	48	44	40	44	40	46	65	86	92	92	70.7	99
15-Jul	96	97	96	96	96	92	77	63	50	42	37	35	33	31	28	29	31	30	30	41	49	65	74	71	57.8	97
16-Jul	53	71	78	86	90	85	68	54	46	45	43	39	37	36	34	57	77	87	89	91	92	95	97	97	68.7	97
17-Jul	98	97	97	96	95	93	89	78	67	55	51	46	43	39	37	40	40	42	42	50	75	91	93	94	68.7	98
18-Jul	97	96	97	96	96	95	85	70	54	41	39	37	35	33	34	38	40	41	43	48	61	81	87	90	63.9	97
19-Jul	92	92	92	91	93	90	79	70	63	55	51	45	42	40	38	40	39	44	44	51	65	67	64	70	63.2	93
20-Jul	77	84	76	70	76	92	95	95	94	94	91	84	75	69	68	76	74	84	94	93	95	94	95	95	84.9	95
21-Jul	91	88	88	92	94	92	91	88	75	71	67	65	86	64	51	50	63	92	90	86	93	92	92	97	81.6	97
22-Jul	98	98	97	98	98	98	93	83	73	67	61	61	55	48	48	46	49	83	75	81	78	84	91	91	77.3	98
23-Jul	89	94	94	88	97	97	89	72	66	62	58	55	58	54	56	60	62	60	63	65	68	74	79	84	72.6	97
24-Jul	85	84	85	84	88	85	76	68	58	53	48	47	42	40	38	37	34	32	30	54	65	71	65	72	60.0	88
25-Jul	71	72	77	82	82	79	75	70	63	56	51	47	46	45	42	40	35	35	35	55	74	87	87	90	62.3	90
26-Jul	93	93	91	93	94	87	79	78	66	65	55	48	45	46	47	47	47	47	50	57	69	82	84	84	68.5	94
27-Jul	86	87	89	92	95	94	90	77	61	45	39	35	38	36	39	35	33	34	39	46	67	84	91	91	63.4	95
28-Jul	92	92	94	95	95	94	83	75	70	80	69	55	47	45	42	51	56	57	62	68	86	95	95	95	74.8	95
29-Jul	97	98	98	98	98	98	94	85	73	64	55	52	46	46	51	52	52	52	51	64	87	91	90	86	74.2	98
30-Jul	90	87	90	93	94	97	97	95	90	82	73	61	49	47	45	42	40	36	57	67	73	81	74	84	72.7	97
31-Jul	88	87	88	94	95	93	90	90	90	91	78	78	85	87	87	90	83	76	76	79	84	83	89	92	86.3	95
																			90.4						Diurnal Average	
																			98						Diurnal Maximum	





Wood Buffalo Environmental Association
Summary of Hour Averages

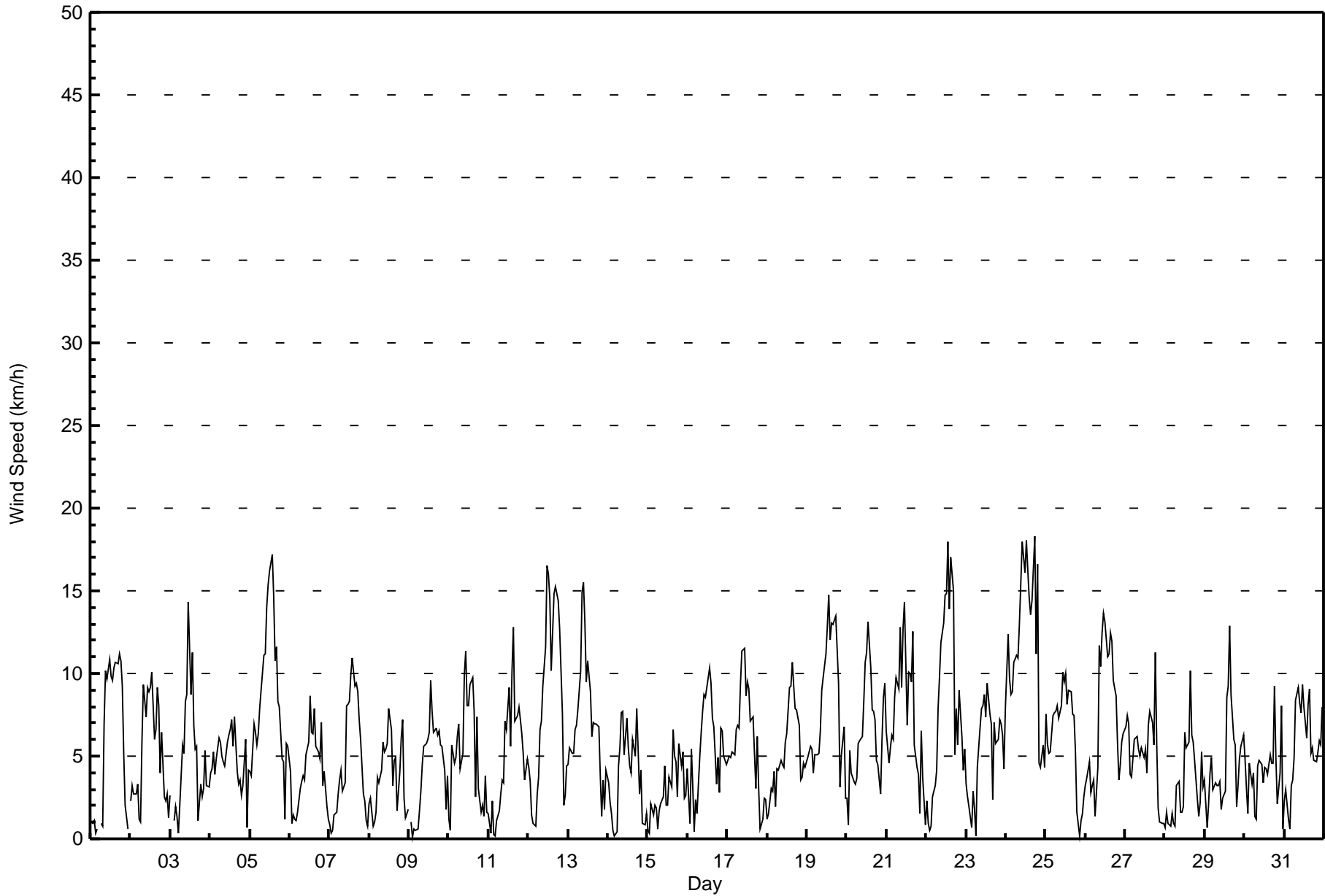
Wind Speed (WS) - km/h
Conklin Community - July 2016

Maximum Speed: 18 km/h on Jul 24 18:00	Maximum Daily Speed Average: 10.6 km/h on Jul 24	Hours in Service: 744
Minimum Speed Value: 0 km/h on Jul 9 03:00	Minimum Daily Speed Average: 0.5 km/h on Jul 3	Hours of Data: 740
Maximum Diurnal Speed Average: 4.1 km/h at hour 15	Minimum Diurnal Speed Average: 1.2 km/h at hour 5	Hours of Missing Data: 4
Monthly Average Velocity: 2.0 km/h 291.5 deg	Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 3 Median = 5 Q ₃ = 8 P ₉₀ = 11 P ₉₉ = 16	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-Jul	ESE1	ESE1	S1	W0	S1	AF	NNW1	N1	ESE7	SE10	SE10	SE11	ESE10	ESE10	ESE10	ESE11	ESE11	ESE11	ESE11	SE9	SSE5	S2	NW1	AF	ESE5.6	ESE11
2-Jul	SSE2	S3	SSE3	S3	S3	S1	SE1	ESE6	SE9	ESE7	SE9	SE9	ESE9	ESE10	ESE6	E7	ESE9	ESE8	ENE4	ESE6	ESE3	SSE2	SW3	WNW1	SE4.6	ESE10
3-Jul	N3	AF	SE1	SSE2	SSE1	E0	ENE2	SE6	SE5	ESE8	ESE9	SSE14	SE9	NW11	WNW7	W5	W6	E1	W3	NW3	WNW3	WNW5	NW3	NW3	S0.5	SSE14
4-Jul	WNW4	NW4	WNW5	NW4	WNW5	NW6	NW6	WNW5	NW5	NW4	WNW6	W6	WNW7	NW7	NW6	NNW7	N4	NNE3	NNE4	NE3	N3	NNW6	NNW1	SW4	NW3.9	NNW7
5-Jul	SW4	NNW4	NNW7	NNW6	NNW6	NNW6	NNW8	N9	N11	N11	NNE14	NNE15	NNE16	N17	N15	NNE11	NNE12	N8	NNW8	NNW5	NNW5	N1	SE6	S6	N7.2	N17
6-Jul	SSW4	NNW1	ESE1	WSW1	NW1	S2	WNW3	NW3	NW4	NW4	NW5	WNW6	NW9	NE6	ENE6	ESE8	NE6	NNE5	NNE5	N7	N3	N4	NW2	NW1	N2.2	NW9
7-Jul	WSW1	NW0	WSW0	SW1	S2	N3	NNW4	NNW4	NNW3	NW3	NNW8	NW8	NNW8	NNW10	NNW11	NNW9	NNW9	N9	NNE7	NE6	NNE3	NNW2	NNW1	NW1	NNW4.1	NNW11
8-Jul	NNW2	NNW2	NNW1	NNW1	NW2	NNW4	N3	ENE4	ENE6	E5	ESE5	E6	ESE8	E7	SSE3	NW5	N5	NNW2	NNW4	NE6	N7	NNE2	NW1	NNW2	NE2.3	ESE8
9-Jul	AF	NNW1	ESE0	NNW1	SW1	SW1	NNE2	N3	NNE5	NNE6	NE6	E6	ESE6	NNE10	NE8	ENE6	NE7	NE6	ENE6	E6	E6	E4	E2	N4	NE3.5	NNE10
10-Jul	NW1	SW0	NNW6	NNW5	NNW5	NNW6	N7	NE4	NE5	ESE10	ESE11	ENE8	NE8	NNE9	N10	NE8	S3	WSW7	NNW3	W2	ESE2	NNW1	NNW4	N2	NNE2.8	ESE11
11-Jul	NNW2	E0	NNW2	NW0	NNW0	N1	N2	N3	NNW4	NNE3	NNE7	N7	NW9	NW6	NNW10	N13	NNE7	NNE7	N8	N7	NNW6	NNW5	N4	NNW5	N4.6	N13
12-Jul	N4	NNW3	N1	N1	NNE1	N3	NNW4	NNW7	N7	N9	N12	NNW17	N16	N15	N10	NNW15	NNW15	NNW15	NNW14	NNW13	NNW8	NNW2	NNW3	NNW4	N8.1	NNW17
13-Jul	NNW4	NNW6	NNW5	N5	NNW7	NW7	NW8	NNW10	NNW15	NNW16	NNW13	N10	NNW11	NNW9	NW6	NNW7	NNW7	N7	N7	NW4	NW1	NNW4	N2	N4	NNW7.1	NNW16
14-Jul	NNW3	NNW2	NNW2	NNE1	NNW0	ESE0	NNW4	NNW5	NNE8	NNE8	NNE5	NNE7	NNE5	ENE4	SSW4	SE6	NNE5	N8	N5	NNE3	NNW4	NW1	SSW1	SSW2	NNE2.7	N8
15-Jul	SW1	SSE0	SSE2	SSE1	S2	ESE1	ENE2	N2	SW3	N4	NW2	NW2	WSW4	WNW3	NW7	NW5	NW5	W3	W6	SW4	SW5	SSW2	WSW3	W1.6	NW7	
16-Jul	NW4	SW1	SSW5	SSW3	SW0	S2	NNW2	NW5	NW6	WNW8	WNW9	WNW9	NW10	NW10	NW9	NW7	W7	WNW3	SW5	SW3	NNW7	NNW7	NNW5	NNW5	WNW4.3	NW10
17-Jul	NW5	NW5	NW5	NW5	NNW5	NNW7	NNW7	N9	N11	N12	N9	NNW9	NNW9	NNW7	N7	NNE5	ENE3	N6	NNE3	NNW1	SW1	SSW2	SSE2	NNW5.2	N12	
18-Jul	SW1	SSE2	S3	S3	SSE4	S2	SSE4	S4	SSW5	WSW4	WSW4	SW6	SSW6	S9	SW9	WSW11	WSW9	SW8	SW8	SW7	SSW4	SSW4	SSW5	SSW4	SSW4.7	WSW11
19-Jul	SSW5	SSW5	S6	S5	SE4	SSE5	S5	SW5	WSW7	SW9	SW10	SW11	SW13	WSW15	WSW12	WSW13	WSW13	WSW13	WSW11	WNW9	NW3	W5	WSW7	SW2	SW7.0	WSW15
20-Jul	SW2	SSW1	SSW5	W4	NW4	S3	SSW4	SW6	WSW6	SW6	WSW8	WSW11	WSW11	WSW13	NW10	NW8	NW8	NW7	WSW5	SW4	WSW3	WSW6	SW9	SW9	WSW5.0	WSW13
21-Jul	W7	WNW5	WSW6	SW6	SSW6	SW9	SW10	SW9	WSW13	W9	W13	NNW14	NW7	NNW10	NNW10	WNW9	NNW13	WNW6	WNW4	WNW4	NW2	N7	NNW4	NW1	W6.1	WNW14
22-Jul	NNW2	NNE1	N1	SSW1	S3	S3	SSE4	SSE8	S10	SSW12	SSW13	SSW15	SSW15	SW18	SW14	SSW17	SSW15	W5	SW8	SSW6	SW9	SW6	S4	SW5	SSW7.3	SW18
23-Jul	SW3	SSE3	SE2	NNE1	ESE3	E2	E0	NW4	NNW7	NW8	WNW8	WNW9	NNW7	W9	WNW8	NW7	NNW2	WNW7	W6	WSW6	SW7	SW7	SW6	SSW4	W3.7	W9
24-Jul	SW8	SW12	SW10	SW9	SSW9	SW11	SW11	SW13	WSW15	WSW18	WSW16	WSW18	WSW16	W15	W14	W14	W18	NNW11	NNW17	WNW5	WSW4	WNW6	WNW4	WSW10.6	W18	
25-Jul	W8	W6	WNW5	NW5	W7	WNW8	WNW8	NW8	NNW7	NW8	NW10	NW9	NW10	NW8	NW9	NNW9	NW8	NNW7	NNW5	NNW2	E0	SSE1	S2	SSE3	NNW5.7	NW10
26-Jul	S3	SSE4	S5	SSE3	S3	S4	SW1	S4	SW12	SSW10	SSW12	SSW14	SSW13	SSW11	SW11	SW12	SW12	SW10	SW9	SSW6	SSW4	S4	S6	S6	SSW7.0	SSW14
27-Jul	SSW7	SSW7	SSW7	S4	S4	SSW6	SSW6	SW6	SW5	WNW5	WNW6	NW5	NW5	NW4	NNW7	NW8	NW7	NW6	N11	NNE6	NNW2	NNW1	SSW1	S1	W2.3	N11
28-Jul	S1	SSW2	SSW1	S1	S2	SW1	SSW1	SE3	SE3	W2	NNW2	NNW2	WNW6	WSW6	NW6	NNW10	NNW6	N6	ENE5	NNE2	WNW1	WSW2	SSW5	S3	NW1.0	NNW10
29-Jul	NNW4	S1	SSW2	SSW4	SSW5	SSW3	SSW3	SSW3	NNW3	NW3	WNW2	NNW2	SSW3	SSW9	SW9	WSW13	SW9	SSW6	SW6	WSW2	SSE3	SSE5	SSW6	SSW6	SW3.6	WSW13
30-Jul	SSE5	SW3	SE1	SW5	SSW3	SSE4	N1	S1	SSW4	W5	WNW5	WNW3	NW4	WNW4	NW4	WNW5	WNW5	W5	SSW9	S5	S2	S4	SSW8	W1	SW2.4	SSW9
31-Jul	S2	SSW3	S1	N1	SSW3	NW4	NW5	W8	WNW9	NW8	NW8	NNW9	NW8	W6	W8	WSW9	W5	WNW5	WNW5	WNW5	W5	W6	WNW6	W8	WNW4.8	NNW9

WSW1.6	WSW1.3	WSW1.4	WSW1.3	SW1.2	WSW1.5	NNW1.6	NNW1.5	NNW2.2	NW2.1	NW2.5	NNW2.5	NW3.1	WNW3.7	NNW4.1	NW3.8	NW3.2	NW3.1	NW2.6	NW1.7	NNW1.4	W1.6	WSW1.7	WSW1.7	Diurnal Average
SW8	SW12	SW10	SW9	SSW9	SW11	SW11	SW11	NNW15	NNW16	WSW18	NNW17	WSW18	SW18	NNE15	SSW17	NNW15	W18	NNW14	NNW17	SW9	SW7	SW9	SW9	Diurnal Maximum

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Conklin Community - July 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	388	52.43	52.43
6 - 11	293	39.59	92.03
12 - 19	59	7.97	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: 740

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Conklin Community - July 2016**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	29	20	3	7	9	10	8	25	44	37	28	12	14	27	49	66	388
6 - 11	25	14	10	5	6	24	10	1	6	18	35	15	16	27	40	41	293
12 - 19	6	5	0	0	0	0	0	1	0	9	8	13	5	1	0	11	59
20 - 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	60	39	13	12	15	34	18	27	50	64	71	40	35	55	89	118	740

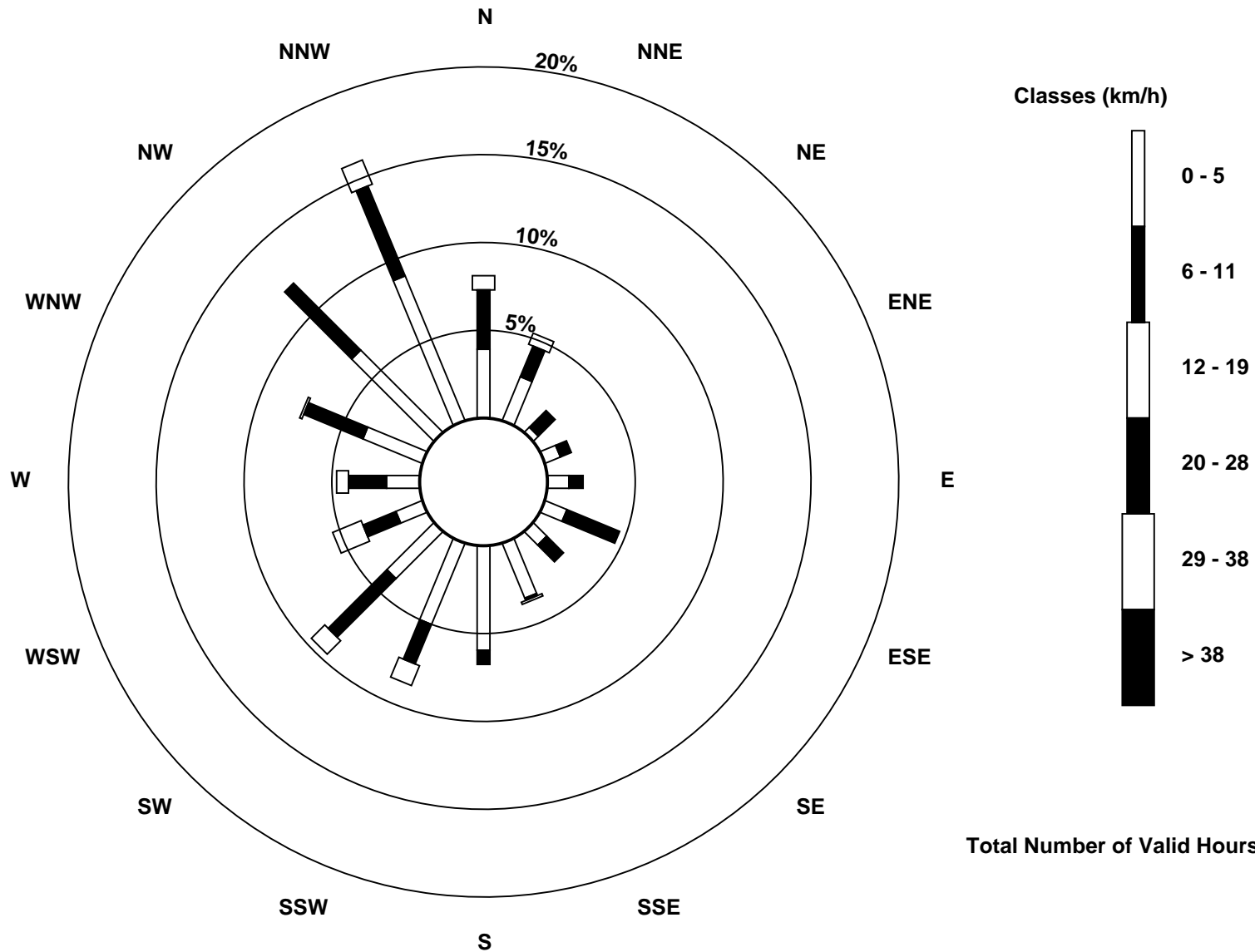
Total Number of Valid Hours: 740

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

Wind Speed (WS) - km/h
Conklin Community (AMS 21)



Total Number of Valid Hours: 740



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Conklin Community - July 2016

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



Wood Buffalo Environmental Association
Summary of Hour Averages

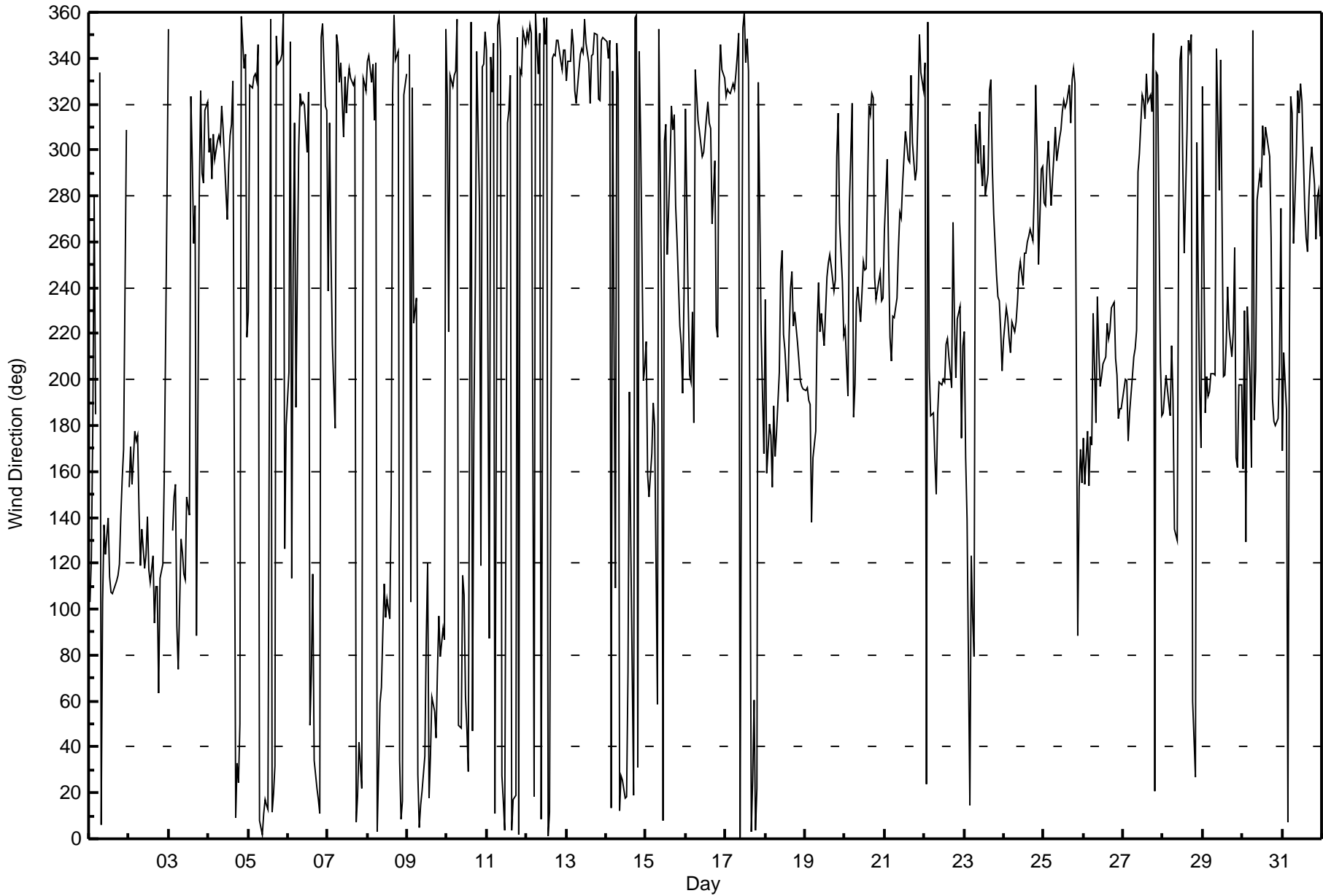
Wind Direction (WD) - deg
Conklin Community - July 2016

Direction of Maximum Speed: 261 deg on Jul 24 18:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 251.1 deg on Jul 24	Hours of Data: 740
Direction of Minimum Speed: 103 deg on Jul 9 03:00	Hours of Missing Data: 4
Direction of Minimum Daily Speed Average: 0.5 deg on Jul 3	Percent Operational Time: 99.5
Monthly Average Direction: 295.4 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-Jul	103	123	179	280	185	AF	334	6	103	137	124	140	114	108	107	109	112	115	120	140	157	169	309	AF	121.5
2-Jul	153	171	155	178	173	176	143	119	135	118	124	140	117	112	123	94	110	110	63	113	119	158	218	282	125.3
3-Jul	353	AF	134	149	154	93	74	131	125	115	113	149	141	323	295	259	276	88	280	326	290	285	318	321	170.6
4-Jul	299	305	288	307	296	304	307	303	319	309	282	270	294	306	311	330	9	33	24	50	358	335	342	218	311.2
5-Jul	230	328	327	332	333	330	346	8	2	11	17	15	13	357	11	19	32	350	338	339	342	360	126	180	1.4
6-Jul	203	347	114	249	312	188	301	324	320	321	320	299	325	49	72	115	34	22	17	11	349	355	319	318	357.5
7-Jul	239	312	256	215	179	350	345	330	338	306	332	316	329	336	331	328	331	7	19	42	22	331	329	326	338.9
8-Jul	339	341	330	337	313	338	3	59	66	89	111	96	104	96	149	325	359	339	343	34	9	17	324	333	40.0
9-Jul	AF	342	103	327	225	235	28	5	15	21	36	87	120	18	36	61	55	44	73	97	80	91	87	353	52.3
10-Jul	324	221	333	328	333	335	357	50	48	115	106	62	48	29	356	47	181	241	343	276	119	336	337	352	25.6
11-Jul	344	87	340	325	347	11	354	358	343	28	16	3	312	317	333	4	17	19	349	2	335	333	352	346	351.7
12-Jul	351	348	354	351	18	360	346	333	351	9	358	346	358	1	11	340	341	341	348	348	339	335	344	344	350.0
13-Jul	330	338	339	353	345	326	321	335	342	344	342	357	347	338	320	341	342	351	350	322	322	348	349	349	340.6
14-Jul	347	340	348	13	335	109	347	329	12	27	25	18	18	73	194	128	19	357	359	31	343	307	200	206	12.1
15-Jul	216	159	149	168	190	180	120	58	352	230	8	304	311	255	294	319	309	315	276	260	224	216	194	238	269.7
16-Jul	318	233	202	199	229	181	335	313	308	303	297	299	314	321	312	309	268	295	224	219	327	346	335	331	301.7
17-Jul	323	326	325	325	329	327	333	341	351	1	353	360	338	348	334	3	26	61	4	22	330	222	194	168	346.7
18-Jul	235	159	180	176	153	188	167	177	203	247	257	219	213	190	219	240	247	223	229	216	208	200	197	196	212.5
19-Jul	195	197	191	189	138	166	177	223	242	221	229	215	229	245	251	254	250	239	243	297	316	268	243	219	233.2
20-Jul	222	207	193	276	320	183	197	234	241	225	238	251	248	248	319	315	325	323	245	235	243	247	234	236	254.5
21-Jul	265	296	254	219	208	228	227	235	257	273	270	286	308	303	296	295	333	303	287	292	316	350	334	326	277.9
22-Jul	338	24	356	205	185	186	166	150	185	199	198	200	199	215	218	210	197	268	226	201	226	232	175	215	204.8
23-Jul	221	166	139	15	123	96	80	311	294	317	294	284	302	280	290	326	331	293	272	246	236	234	222	204	275.9
24-Jul	217	231	227	218	212	225	221	225	235	246	252	241	255	255	260	262	266	261	282	328	300	250	292	293	251.1
25-Jul	277	276	293	304	276	287	298	310	295	305	309	316	322	318	321	329	312	331	336	329	88	153	170	155	306.2
26-Jul	175	154	177	154	175	172	229	181	236	213	197	201	207	210	225	218	221	231	234	210	202	183	188	187	207.0
27-Jul	196	200	200	173	185	201	210	214	221	290	298	324	322	313	333	321	324	317	351	21	334	332	207	184	276.9
28-Jul	186	194	202	190	184	215	192	135	130	264	339	345	292	255	308	348	343	351	60	27	303	243	195	171	307.0
29-Jul	327	186	201	193	194	202	203	202	344	315	282	339	201	202	216	240	222	210	221	258	166	161	198	197	216.7
30-Jul	161	230	129	232	200	162	352	183	204	278	290	283	311	298	310	301	297	261	192	182	180	183	207	274	234.0
31-Jul	169	211	187	7	210	324	316	259	298	326	316	329	321	275	262	256	279	293	302	285	261	280	283	262	286.0

257.7 253.7 239.0 246.4 231.9 256.8 291.2 286.0 298.0 304.4 306.2 293.7 304.1 300.7 301.6 307.4 312.3 311.8 312.1 325.6 298.8 273.9 237.7 243.7
 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
Conklin Community - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 107 deg on Jul 1 05:00 Minimum Value: 6 deg on Jul 18 22:00 Percentiles: P ₁ = 11 P ₁₀ = 19 Q ₁ = 26 Median = 38 Q ₃ = 56 P ₉₀ = 77 P ₉₉ = 99																			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-Jul	76	75	83	64	107	AF	64	81	33	26	28	28	32	33	30	29	27	24	20	19	10	93	62	AF	107
2-Jul	48	23	23	22	15	80	95	26	21	37	23	25	30	27	25	36	26	29	31	31	74	55	54	42	95
3-Jul	19	AF	73	53	88	91	70	46	48	30	26	23	58	35	45	60	40	90	50	30	45	41	40	39	91
4-Jul	52	53	48	48	45	50	50	47	51	51	43	42	48	41	42	30	37	29	24	43	25	32	99	26	99
5-Jul	54	40	23	19	14	16	23	24	25	27	27	28	27	23	28	37	33	31	18	14	18	78	31	47	78
6-Jul	71	84	86	62	54	85	62	43	45	49	37	50	36	54	44	40	53	37	62	28	20	19	15	57	86
7-Jul	93	55	77	65	74	33	34	45	78	69	34	49	60	32	34	35	34	37	27	32	25	29	78	99	99
8-Jul	46	17	76	36	70	26	32	47	43	41	43	51	46	38	73	50	27	15	14	31	23	49	37	48	76
9-Jul	AF	46	94	72	75	90	50	35	27	32	44	62	56	29	37	48	40	47	44	36	39	45	73	25	94
10-Jul	51	82	14	29	16	18	27	42	50	34	33	40	39	45	29	51	81	25	60	71	95	37	31	37	95
11-Jul	16	98	9	82	93	66	67	62	68	72	45	56	42	41	36	32	65	31	19	20	16	19	15	14	98
12-Jul	27	25	70	64	83	21	26	25	33	34	32	25	25	29	26	25	23	22	18	17	17	22	22	15	83
13-Jul	14	12	12	14	16	22	25	23	23	24	28	32	25	47	49	29	28	30	32	26	16	14	11	13	49
14-Jul	14	15	23	59	87	96	25	24	38	38	72	52	61	60	66	48	61	26	31	69	20	66	99	67	99
15-Jul	83	96	65	73	62	75	92	70	76	81	76	86	93	81	78	46	55	48	48	20	30	21	66	78	96
16-Jul	65	101	27	53	104	67	92	48	46	43	46	42	38	35	41	68	56	93	33	76	72	65	12	12	104
17-Jul	14	15	14	14	16	14	19	26	24	28	26	40	35	39	49	34	69	77	43	28	34	62	43	74	77
18-Jul	58	83	42	51	19	49	28	29	45	55	70	68	57	42	34	38	46	43	31	24	29	6	8	11	83
19-Jul	9	10	13	13	23	22	23	41	31	36	30	36	29	27	31	24	30	19	18	45	69	35	42	76	76
20-Jul	81	96	42	64	47	30	31	21	18	24	20	23	29	27	41	38	33	33	32	41	72	35	18	17	96
21-Jul	41	56	37	28	25	23	21	23	29	48	39	40	49	45	44	47	38	45	42	44	32	18	19	66	66
22-Jul	37	78	78	90	28	36	31	26	32	29	27	26	26	28	28	26	25	71	22	25	24	27	38	35	90
23-Jul	68	59	91	96	58	56	98	44	44	38	46	43	45	46	44	32	52	45	34	18	13	16	18	37	98
24-Jul	23	18	20	19	19	20	22	23	23	23	23	23	28	30	33	38	38	30	43	32	36	38	53	43	53
25-Jul	48	48	51	52	39	46	48	43	47	46	42	39	33	35	35	31	36	29	26	68	89	80	78	35	89
26-Jul	30	28	20	55	34	63	89	39	22	24	23	29	29	40	32	31	27	29	22	26	21	16	16	19	89
27-Jul	21	21	22	61	45	27	23	20	35	45	57	54	55	49	27	34	38	44	24	22	46	77	72	83	83
28-Jul	96	67	74	85	77	85	89	58	51	91	84	85	47	59	45	26	24	21	55	70	89	71	34	65	96
29-Jul	39	102	88	33	32	43	48	49	63	61	83	87	79	64	25	18	24	25	28	51	32	17	13	16	102
30-Jul	24	68	77	70	73	41	76	99	40	44	54	80	64	59	63	50	46	48	32	54	90	72	24	99	99
31-Jul	69	39	93	70	62	47	41	37	44	21	34	31	37	38	32	23	43	47	51	42	35	41	47	24	93
96 102 94 96 107 96 98 99 78 91 84 87 93 81 78 68 81 93 62 76 95 93 99 99																									
Diurnal Maximum																									
AF - Analyzer Failure																									



Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	July 5, 2016	Last Calibration	June 9, 2016
Station Name	Conklin Community	Station Number	AMS 21
Reason:	Routine		
Start Time (MST)	9:55	End Time (MST)	15:15
Gas Cert Reference	EY0000359	Station temp.	22 Deg C
Cal Gas Concentration	51.4 ppm	Cal Gas Exp Date	Feb-09-2018
Calibrator Make/Model	API T700	Serial Number	1221
ZAG Make/Model	API 701	Serial Number	5611
DACS make/model	Campbell Scientific CR3000	DACS serial No.	9628

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-655	-655
Analyzer IP address	192.168.1.43		Lamp voltage	839	840
Calculated slope	0.993535	1.001396	Chamber temp	45.0	45.0
Calculated intercept	0.926258	0.218531	Pressure	651.1	652.3
Analyzer Background	20.6	20.3	Flow	0.480	0.481
Analyzer Coefficient	0.910	0.900	Intensity	92	92

Analyzer make Thermo 43i Analyzer serial # JC1428701363

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.1	----
as found span	5000	76.5	786.4	783.8	1.003
calibrator zero	5000	0.0	0.0	-0.1	----
high point	5000	76.5	786.4	784.8	1.002
second point	5000	38.2	392.7	393.0	0.999
third point	5000	19.2	197.4	195.9	1.007
as left zero	5000	0.0	0.0	0.2	----
as left span	5000	76.5	786.4	788.0	0.998
Average Correction Factor					1.003

Corrected As found 783.8 Previous response 790.6 % change 0.9%

Notes:

Sample inlet filter replaced after 1st high point, however, response slightly went up after changing filter so ended up adjusting span. As lefts began at 14:40 MST.

Calibration Performed By: Asad Hidayat



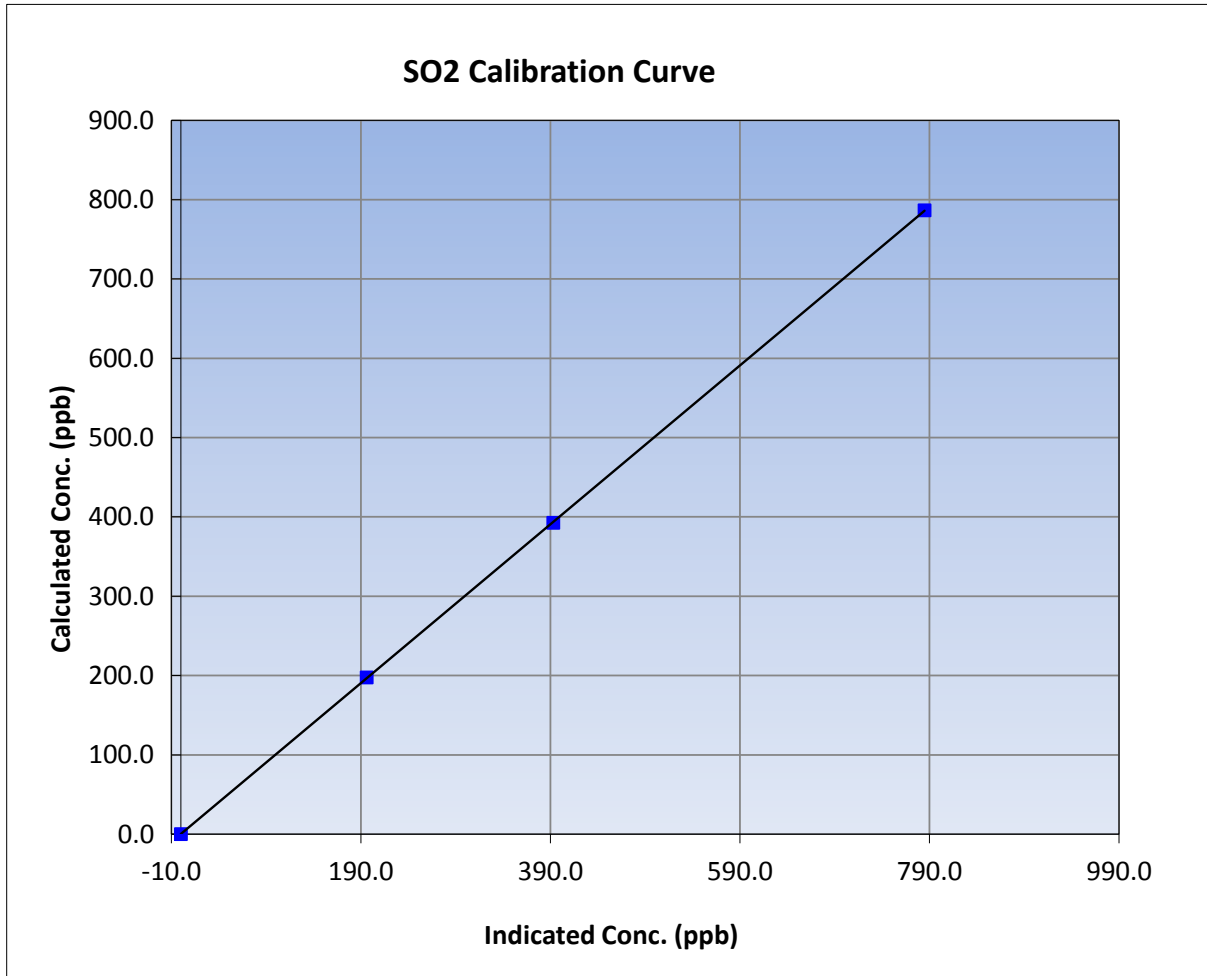
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	July 5, 2016	Previous Calibration	June 9, 2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	9:55	End Time (MST)	15:15
Analyzer make	Thermo 43i	Analyzer serial #	JC1428701363

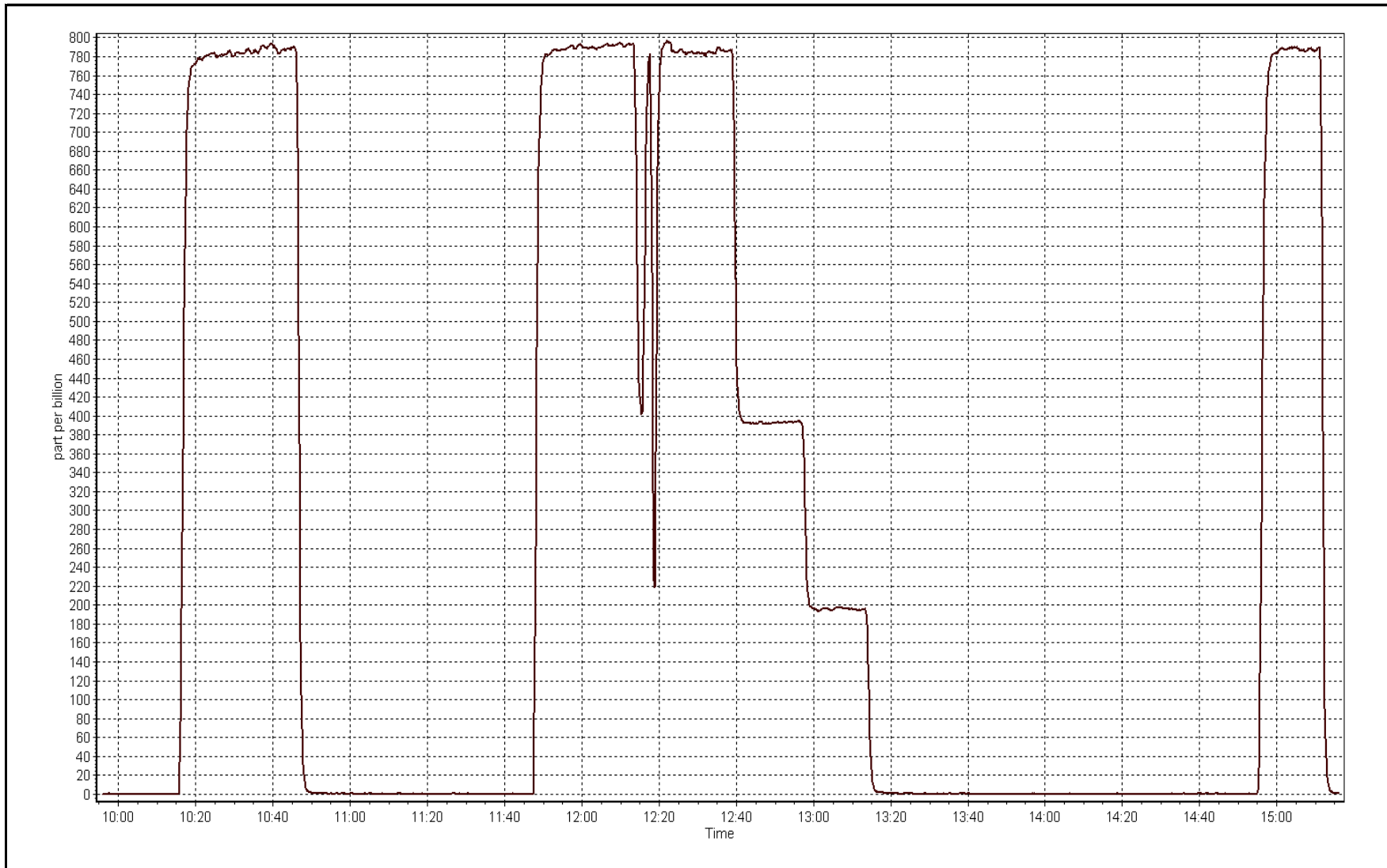
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999994
786.4	784.8	1.0021		
392.7	393.0	0.9992	Slope	1.001396
197.4	195.9	1.0073		
			Intercept	0.218531



SO2 Calibration Plot

Date: July 5, 2016





Wood Buffalo Environmental Association TRS Calibration Report

Station Information

Calibration Date	July 4, 2016	Last Calibration	June 17, 2016
Station Name	Conklin Community	Station Number	AMS 21
Reason:	Routine		
Start Time (MST)	10:21	End Time (MST)	13:40
Gas Cert Reference	LL119411	Station temp.	22 Deg C
Cal Gas Concentration	4.97 ppm	Cal Gas Exp Date	12/02/2019
Calibrator Make/Model	API T700	Serial Number	1221
Dil air Make/Model	API 701	Serial Number	5611
DACS make/model	Campbell Scientific CR3000	DACS serial No.	9628
SO2 gas concentration	51.4 ppm	SO2 gas cert/exp	EY0000359 9/Feb/18

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-732	-732
Analyzer IP address	192.168.1.44		Lamp voltage	995	998
Calculated slope	0.988277	0.994898	Chamber temp	45	45
Calculated intercept	0.154923	0.189682	Pressure	660.0	661.8
Analyzer Background	1.61	1.83	Flow	0.425	0.426
Analyzer Coefficient	1.010	1.010	Intensity	92	92
			Converter temp.	800	800
Analyzer make/model	Thermo 43i-TLE		Analyzer serial #	1236656116	
Converter make/model	CDN-101		Converter serial #	NA	

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.7	----
as found span	5000	80.6	80.1	79.4	1.009
SO2 scrubber check	5000	19.5	200.5	0.5	----
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	80.6	80.1	80.4	0.996
second point	5000	40.3	40.1	40.1	1.000
third point	5000	20.2	20.1	19.8	1.015
as left zero	5000	0.0	0.0	-0.2	----
as left span	5000	80.6	80.1	81.1	0.988
Average Correction Factor					1.004

Corrected As found	78.7	Previous response	80.9	% change	2.8%
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Notes:

Sample inlet filter replaced after as founds. Zero response came down a bit after doing as founds. Adjusted zero slightly. Scrubber check done after 3rd point. As left zero began at 12:58 MST.

Calibration Performed By:

Asad Hidayat



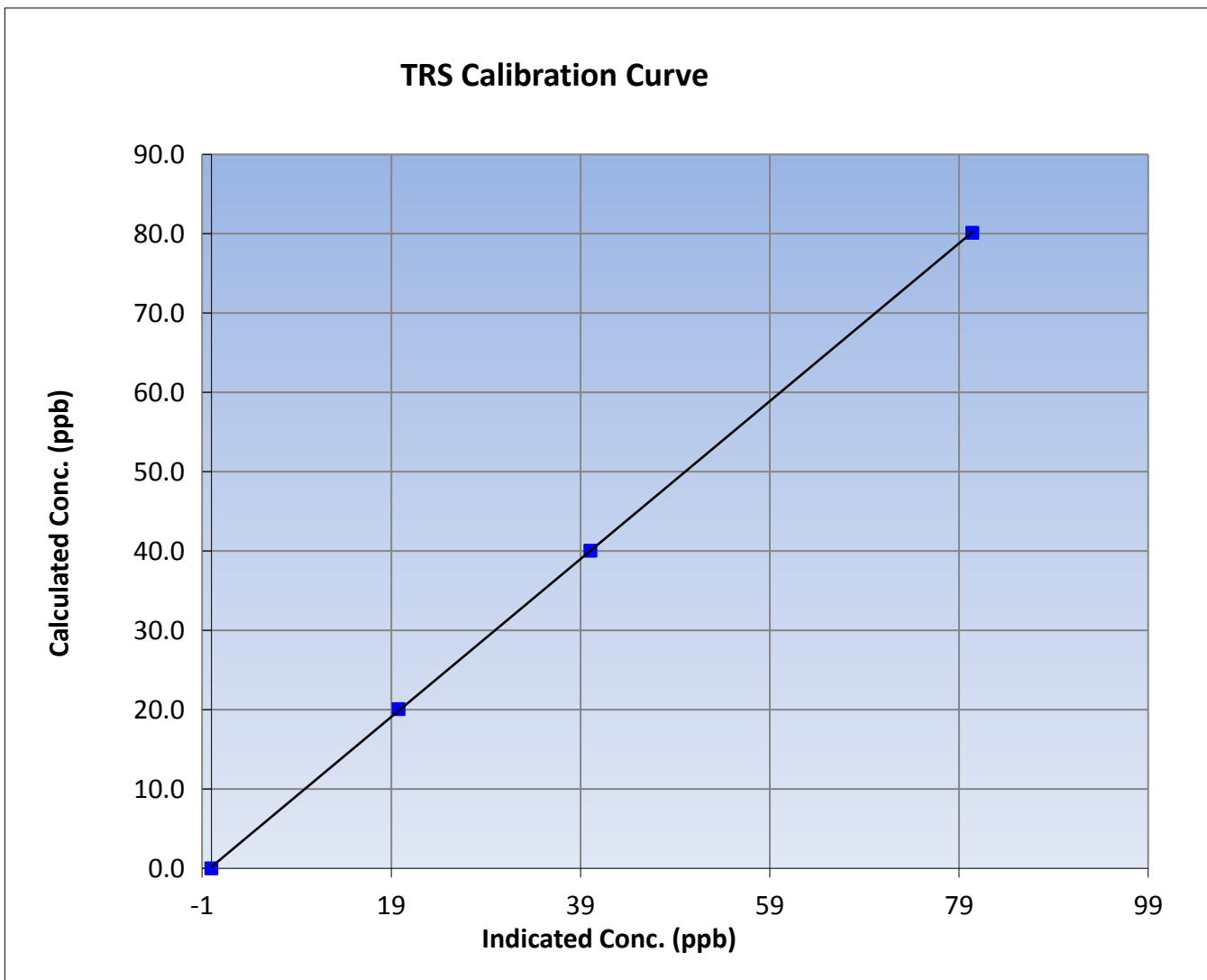
Wood Buffalo Environmental Association TRS Calibration Report

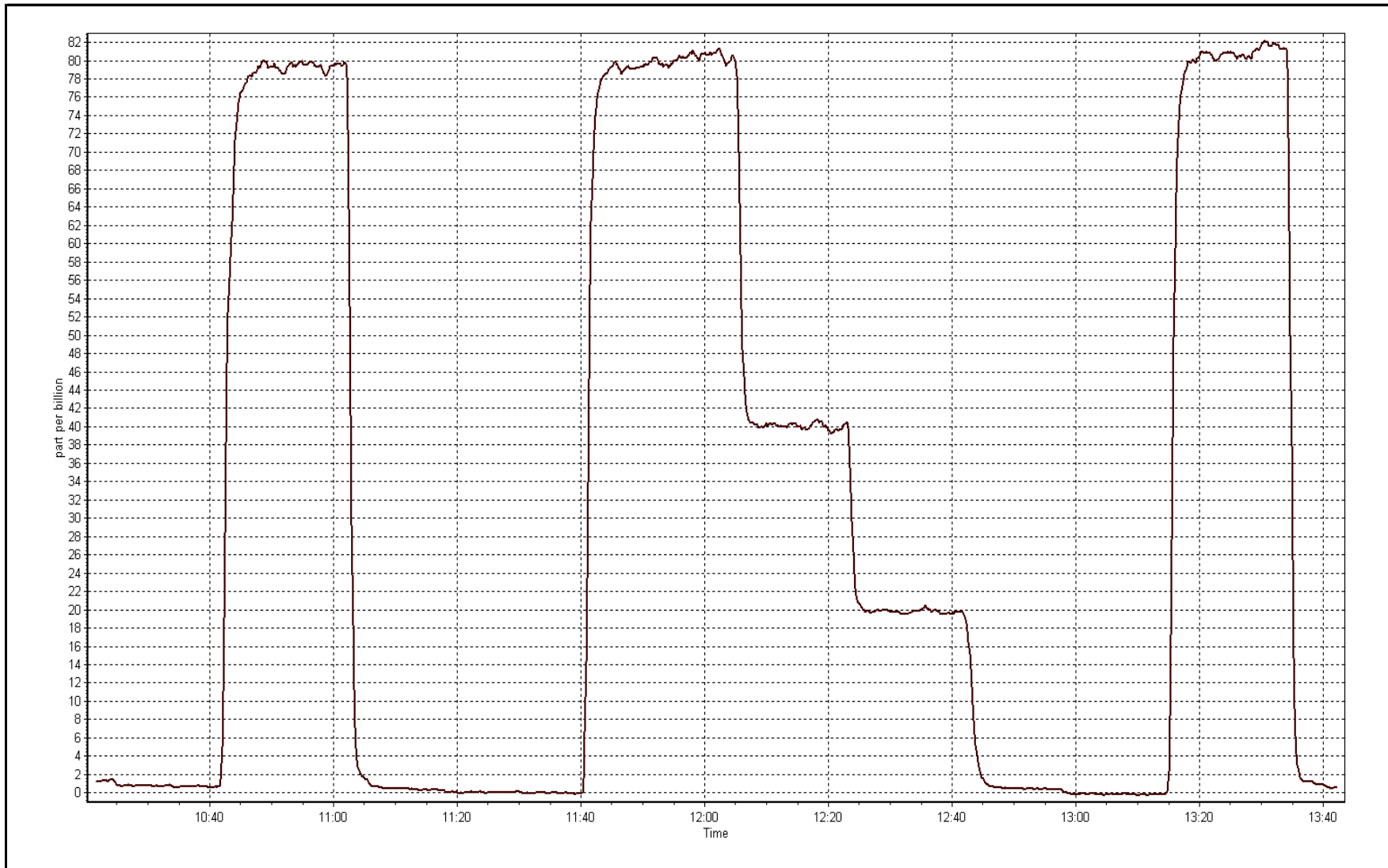
Station Information

Calibration Date	July 4, 2016	Previous Calibration	June 17, 2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	10:21	End Time (MST)	13:40
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1236656116

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999978
80.1	80.4	0.9965		
40.1	40.1	1.0002	Slope	0.994898
20.1	19.8	1.0151		
			Intercept	0.189682







Wood Buffalo Environmental Association THC / NMHC Calibration Report

Station Information

Calibration Date	July-05-16	Last Calibration	6/10/2016 & 6/09/2016
Station Name	Conklin Community	Station Number	AMS 21
Reason:	Routine		
Start Time (MST)	9:55	End Time (MST)	15:15
Gas Cert Reference	EY0000359	Cal Gas Expiry Date	Feb-09-2018
CH4 Cal Gas Conc.	512.0 ppm	CH4 Equiv Conc.	1084.0 ppm
C3H8 Cal Gas Conc.	208.0 ppm	Station temp.	21 Deg C
Calibrator Model	API T700	Serial Number	1221
ZAG make/model	Teledyne API 701	Serial Number	5611
DACS make/model	Campbell Scientific CR3000	Serial Number	9628

Analyzer Information

	Before	After		Before	After
THC Range (ppm)	0 - 50 ppm		Column Temp	75.0	75.1
NMHC Range (ppm)	0 - 25 ppm		Detector Temp	175.1	175.0
Analyzer IP address	192.168.1.55		Flame Temp	405.0	405.0
THC Calc slope	1.000030	1.000594	Carrier Pressure	37.0	37.0
THC Calc intercept	0.064245	0.060190	Fuel Pressure	49.6	49.6
NMHC Calc slope	1.000863	1.004392	Air Pressure	34.3	34.3
NMHC Calc intercept	0.025901	0.030079			

Analyzer make Thermo 55i Analyzer serial # 1152430011

THC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	0.00	----
as found span	5000	76.5	16.59	16.62	0.998
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	76.5	16.59	16.55	1.002
second point	5000	38.2	8.28	8.17	1.014
third point	5000	19.1	4.14	4.03	1.028
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	76.5	16.59	16.57	1.001
Average Correction Factor					1.014

Corrected As found 16.62 Previous response 16.52 % change -0.6%

Notes:

Sample inlet filter replaced afer high point; second high point done again to make sure reponse stayed the same as it was prior to changing filter. No adjustments made. Replaced H2 cylinder after as founds to see if that would reduce NMHC's baseline noise.

Calibration Performed By: Asad Hidayat



Wood Buffalo Environmental Association THC / NMHC Calibration Report

NMHC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	0.00	----
as found span	5000	76.5	8.75	8.74	1.001
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	76.5	8.75	8.70	1.006
second point	5000	38.2	4.37	4.30	1.016
third point	5000	19.1	2.19	2.12	1.031
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	76.5	8.75	8.71	1.005
Average Correction Factor					1.018

Corrected As found 8.74 Previous response 8.72 % change -0.3%

CH4 Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	0.00	----
as found span	5000	76.5	7.83	7.88	0.994
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	76.5	7.83	7.86	0.997
second point	5000	38.2	3.91	3.87	1.011
third point	5000	19.1	1.96	1.91	1.024
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	76.5	7.83	7.86	0.997
Average Correction Factor					1.010

Corrected As found 7.88 Previous response 7.80 % change -1.0%



Wood Buffalo Environmental Association

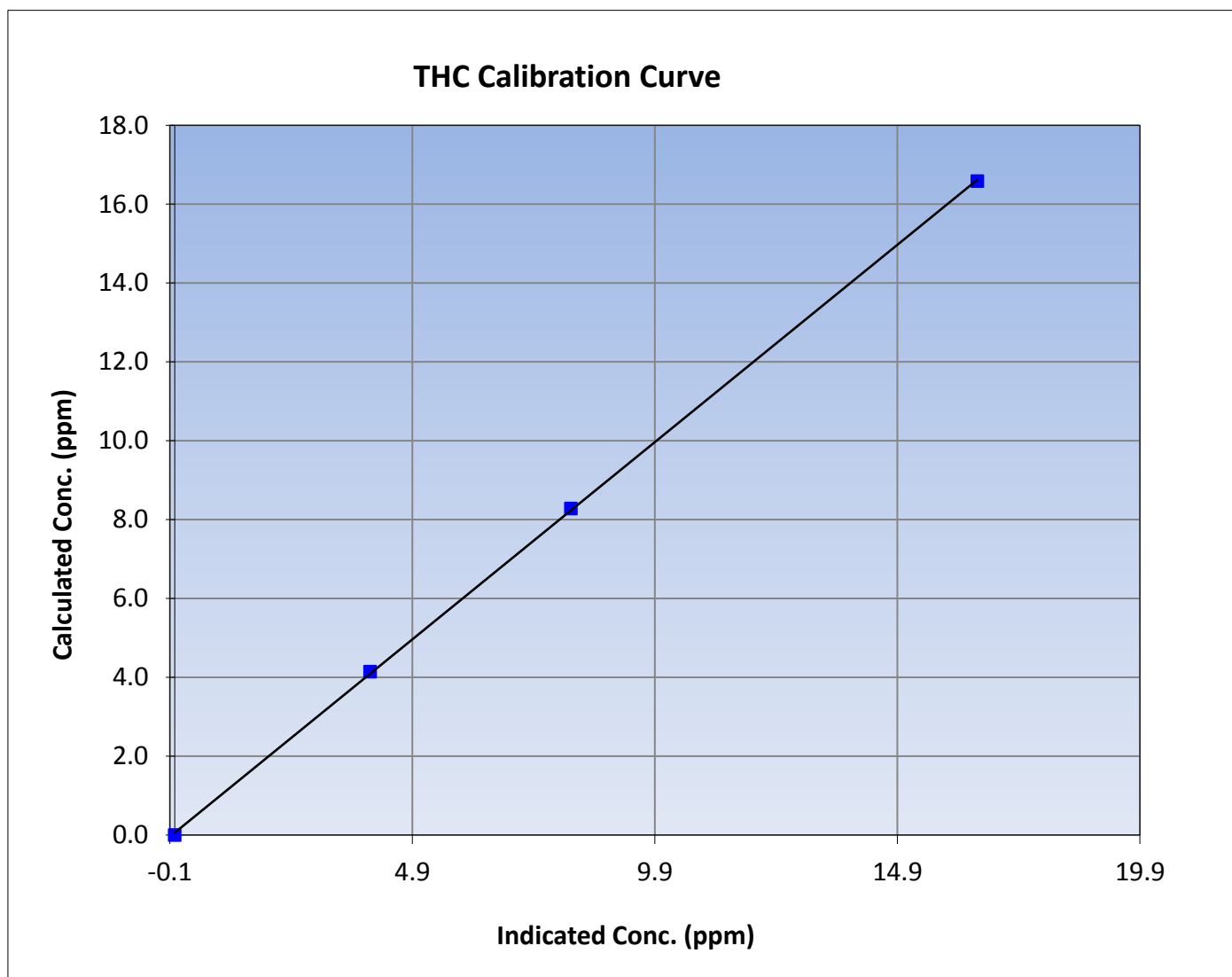
THC Calibration Summary

Station Information

Calibration Date	July 5, 2016	Previous Calibration	6/10/2016 & 6/09/2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	9:55	End Time (MST)	15:15
Analyzer make	Thermo 55i	Analyzer serial #	1152430011

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999938
16.59	16.55	1.0021		
8.28	8.17	1.0137	Slope	1.000594
4.14	4.03	1.0275		
			Intercept	0.060190





Wood Buffalo Environmental Association

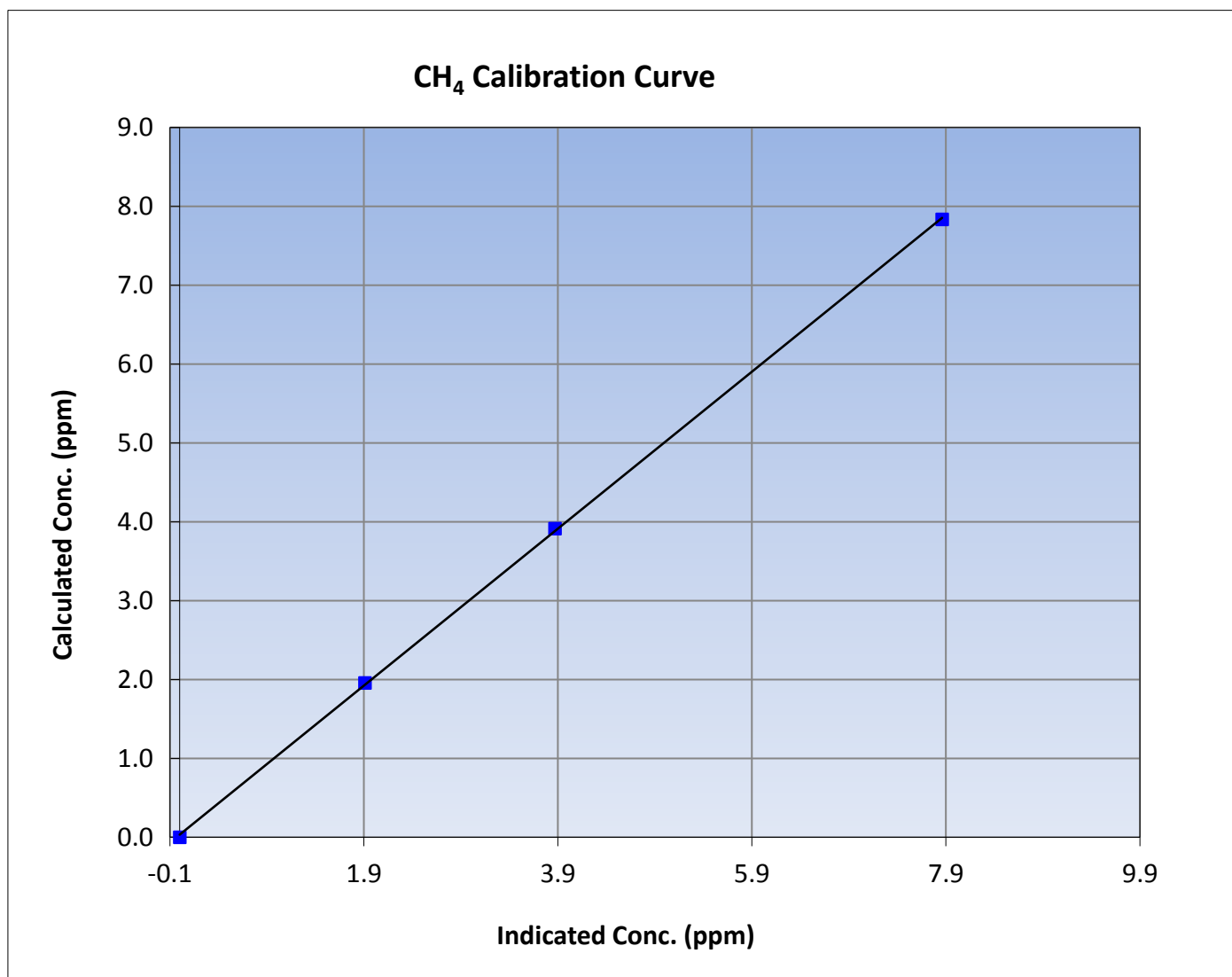
CH₄ Calibration Summary

Station Information

Calibration Date	July 5, 2016	Previous Calibration	6/10/2016 & 6/09/2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	9:55	End Time (MST)	15:15
Analyzer make	Thermo 55i	Analyzer serial #	1152430011

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999917
7.83	7.86	0.9966		
3.91	3.87	1.0108	Slope	0.995071
1.96	1.91	1.0240		
			Intercept	0.032089





Wood Buffalo Environmental Association

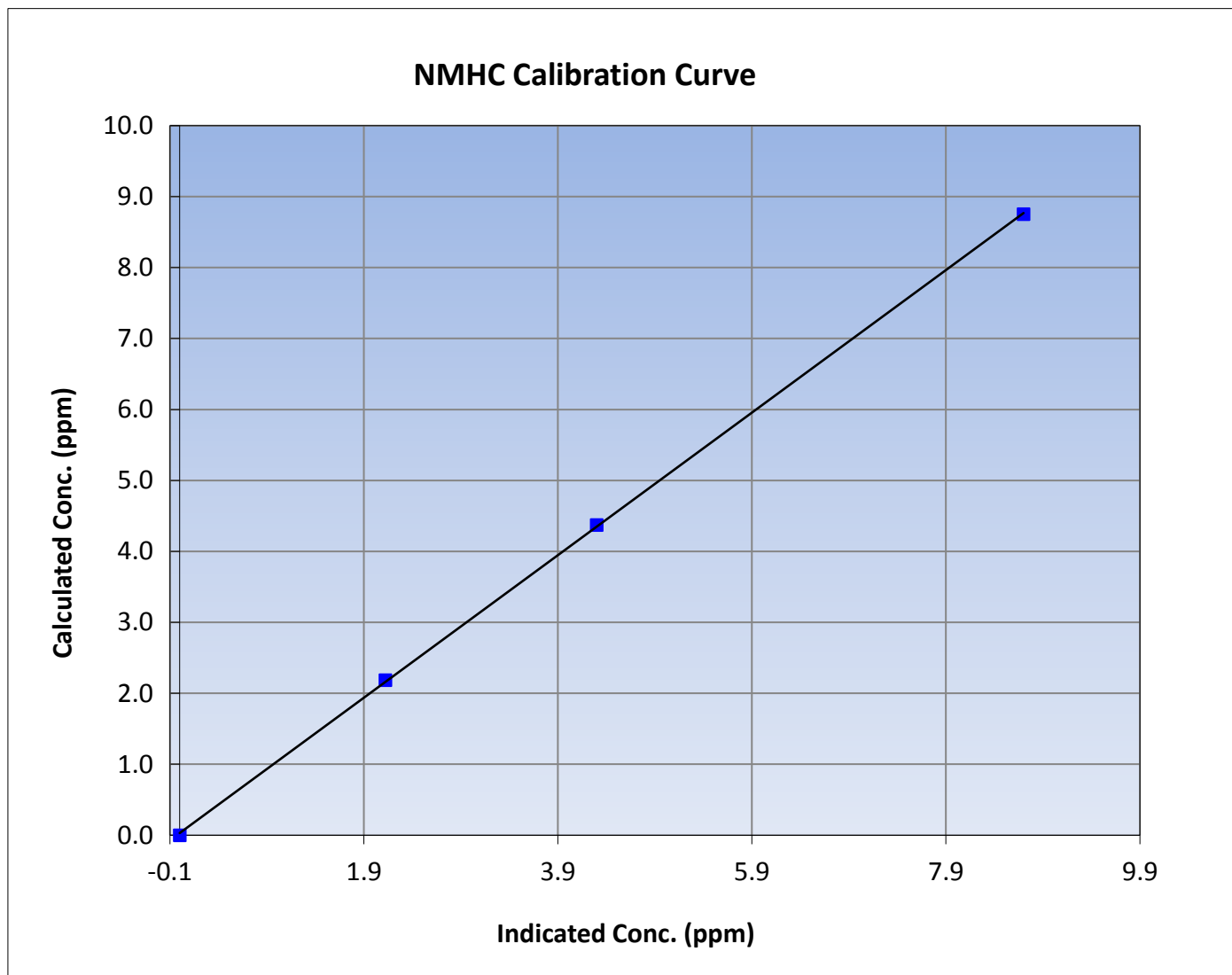
NMHC Calibration Summary

Station Information

Calibration Date	July 5, 2016	Previous Calibration	6/10/2016 & 6/09/2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	9:55	End Time (MST)	15:15
Analyzer make	Thermo 55i	Analyzer serial #	1152430011

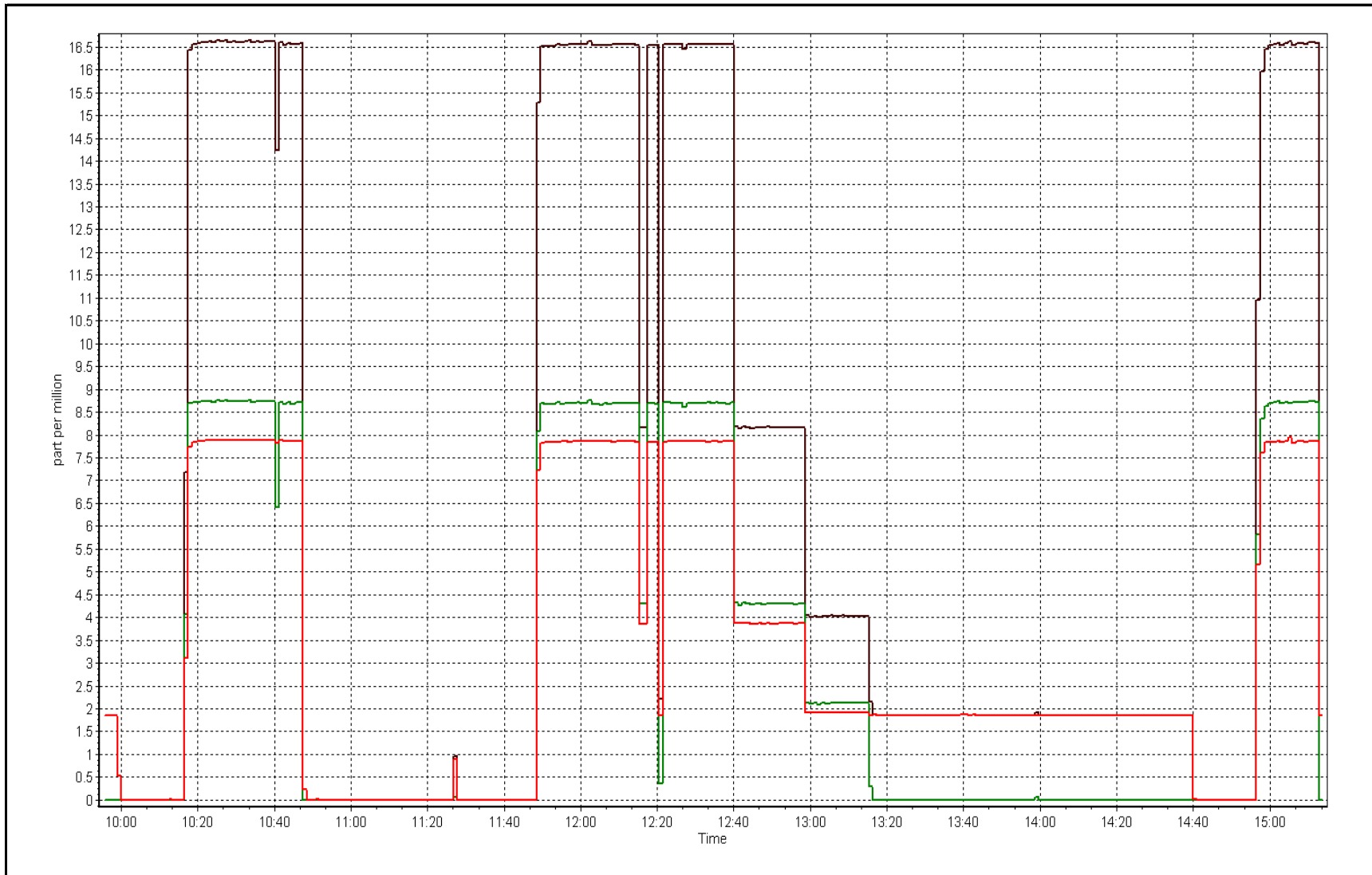
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999945
8.75	8.70	1.0059		
4.37	4.30	1.0163	Slope	1.004392
2.19	2.12	1.0307		
			Intercept	0.030079



THC Calibration Plot

Date: July 5, 2016





Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	July 7, 2016	Previous Calibration	June 14, 2016
Station Name	Conklin Community	Station Number	AMS 21
Reason:	Routine		
Start Time (MST)	10:01	End Time (MST)	13:38
NO2 GPT Ref date	July-05-16	Transfer Standard	NOX GPT
Calibrator Make/Model	Teledyne API 700	Station temp.	21 Deg C
ZAG make/model	Teledyne API 701	Serial Number	1221
DACS make/model	Campbell Scientific CR3000	Serial Number	5611
		Serial Number	9628

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Bench temp.	28.0	28.0
Analyzer IP address	192.168.1.48		Lamp temp.	53.4	53.4
Calculated slope	1.012329	0.999334	Pressure	642.5	647.7
Calculated intercept	-0.522372	-0.518554	Flow cell A	0.722	0.730
Analyzer Background	-0.6	-1.4	Flow cell B	0.726	0.729
Analyzer Coefficient	1.012	1.049	Cell A Intensity	72689	72565
			Cell B Intensity	74412	73429

Analyzer make	Thermo 49i	Analyzer serial #	1501663734
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Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator Lamp Intensity	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	185.2/800	0.0	-0.9	----
as found span	5000	561.3/1001.8	311.6	299.8	1.039
calibrator zero	5000	185.2/800	0.0	0.3	----
high point	5000	561.3/1001.8	311.6	312.2	0.998
second point	5000	380.6/914.1	206.7	207.4	0.997
third point	5000	190.9/803.9	103.8	104.6	0.992
as left zero	6000	185.2/800	0.0	-0.1	----
as left span	5000	561.3/1001.8	311.6	313.5	0.994
Average Correction Factor					0.996

Corrected As found	300.7	Previous response	308.3	% change	2.5%
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Notes:

Sample inlet filter replaced after as founds. Adjusted both zero and span.

Calibration Performed By: Asad Hidayat



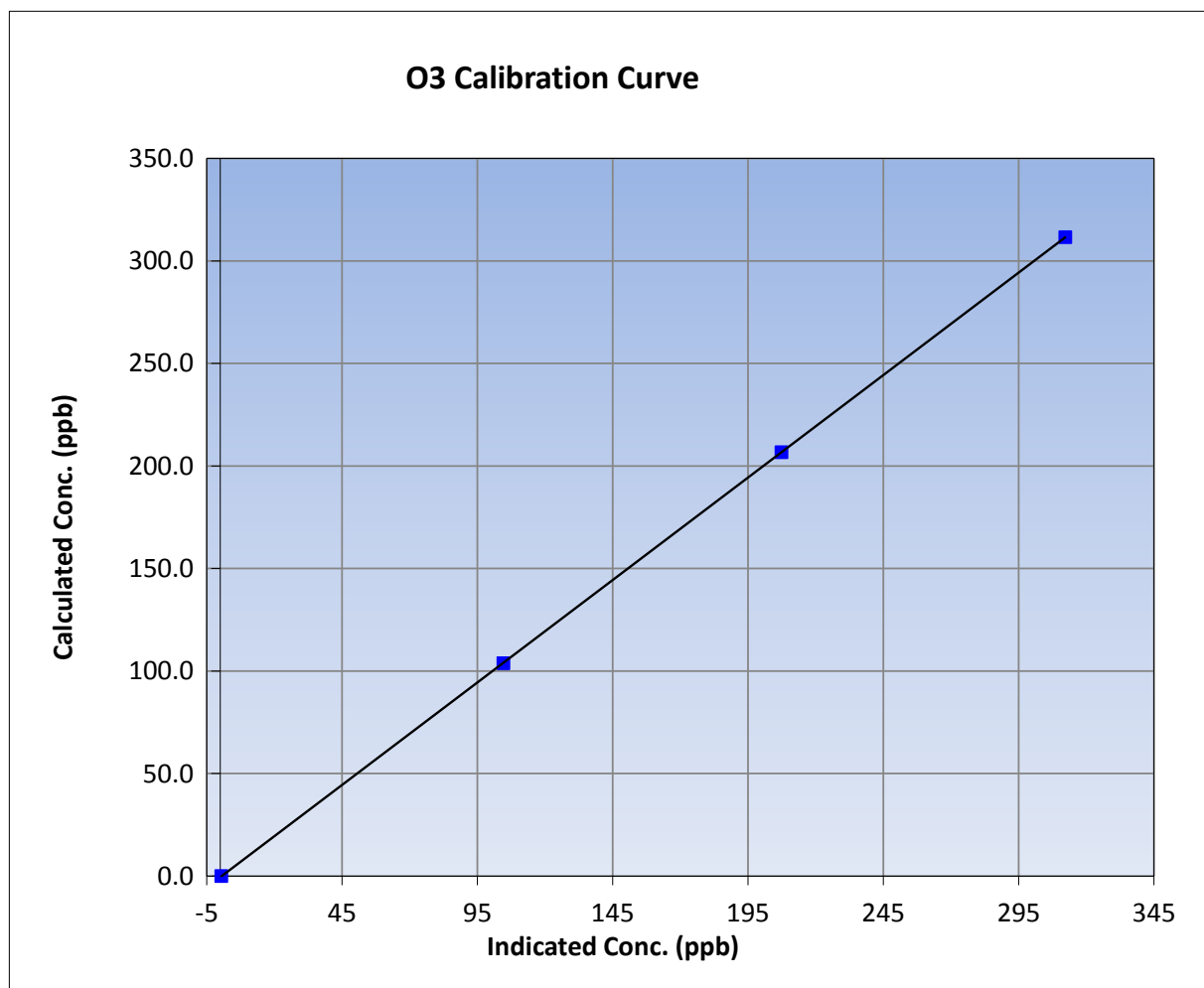
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	July-07-16	Previous Calibration	June 14, 2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	10:01	End Time (MST)	13:38
Analyzer make	Thermo 49i	Analyzer serial #	1501663734

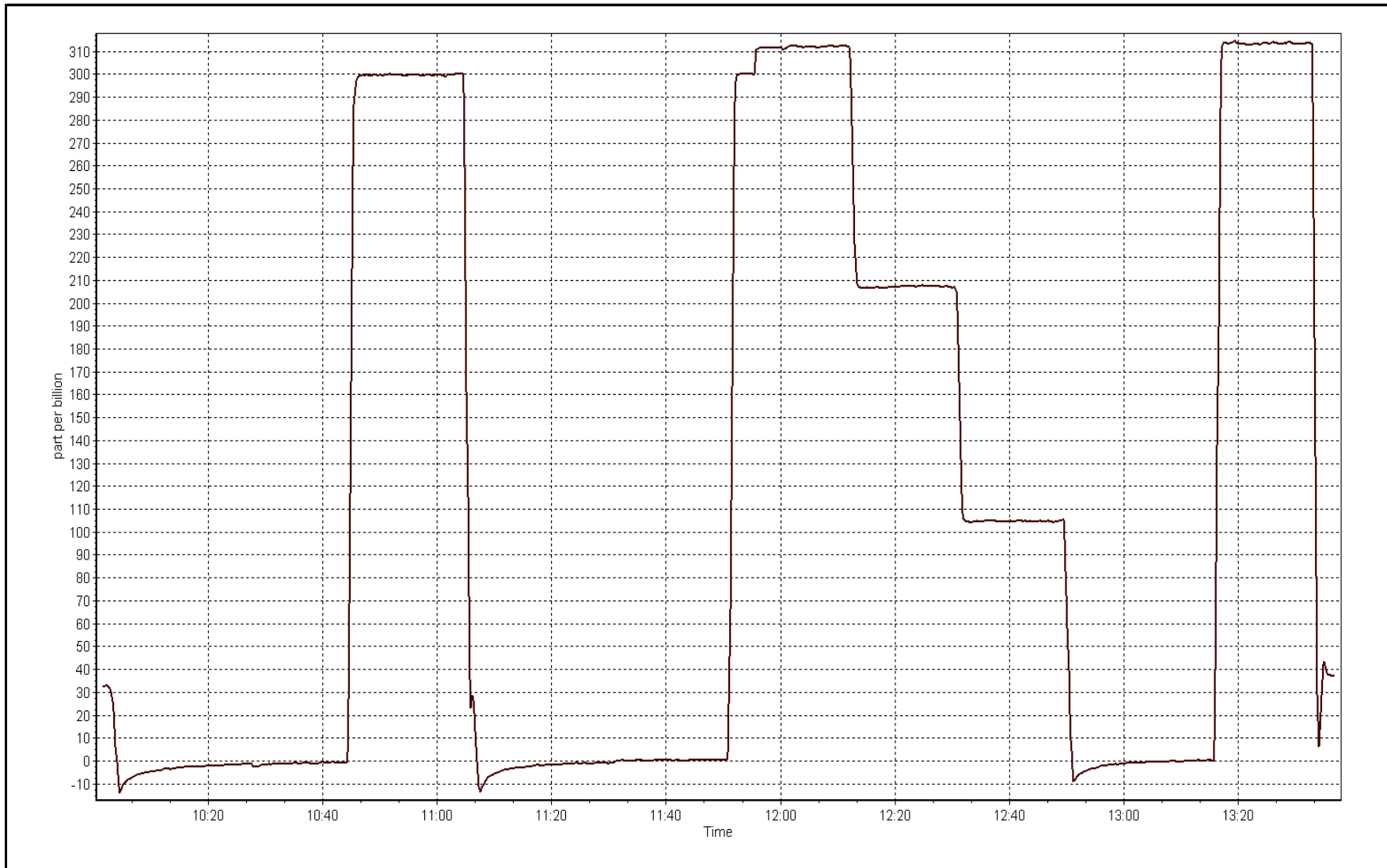
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	----	Correlation Coefficient	0.999998
311.6	312.2	0.9980		
206.7	207.4	0.9967	Slope	0.999334
103.8	104.6	0.9918		
			Intercept	-0.518554



O3 Calibration Plot

Date: July 7, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	July 5, 2016	Previous Calibration	June 9, 2016
Station Name	Conklin Community	Station Number	AMS 21
Reason:	Routine		
Start Time (MST)	9:55	End Time (MST)	15:15
NO Cal Gas Conc	52.4 ppm	Gas Cert Reference	EY0000359
NOx Cal Gas Conc	52.4 ppm	Cal Gas Expiry Date	Feb-09-2018
Calibrator	API T700	Serial Number	1221
Zero air Generator	API 701	Serial Number	5611

DACs Information

DACs make & model	Campbell Scientific CR3000	DACs serial No.	9628
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Calibration Statistics

Parameter	NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.993499	0.993065
	Data Offset	1.185989	1.693580
Current Calibration	Data Slope	0.997694	0.997931
	Data Offset	-0.178380	0.292314

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1501663731
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000 ppb		0-1000 ppb	
Analyzer IP	192.168.1.43		192.168.1.43	
NO coefficient	1.087		0.914	
NOx coefficient	0.998		0.999	
NO2 coefficient	1.000		1.000	
NO bkgrnd	7.1		6.0	
NOx bkgrnd	7.1		6.1	
Chamber Temp	49.7	Deg C	49.6	Deg C
Moly Temp	326.3	Deg C	323.4	Deg C
PMT voltage	-840.6	v	-840.6	v
PMT Temp	-2.8	Deg C	-2.9	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	170.6	mmHg	137.8	mmHg
R Cell Press Nox	170.6	mmHg	137.8	mmHg
NO sample flow	0.647	lpm	0.844	lpm
Nox sample Flow	0.648	lpm	0.843	lpm

Notes:

Pump and charcoal canister attached to pump replaced after as founds. Seen major improvement in reaction chamber (from 182 mmHg to 138 mmHg). Adjusted span. Sample inlet filter replaced after 1st high point. Nox drifted during GPT, used 2nd high GPT as a reference.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

July 5, 2016

Station Number:

AMS 21

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	-0.2	-0.1	-0.1	----	----
as found span	5000	76.5	801.7	801.7	0.0	731.4	730.6	0.8	1.0962	1.0974
calibrator zero	5000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	----	----
high point	5000	76.5	801.7	801.7	0.0	803.3	802.9	0.5	0.9981	0.9986
second point	5000	38.2	400.3	400.3	0.0	402.7	401.9	0.9	0.9941	0.9962
third point	5000	19.2	201.2	201.2	0.0	201.2	200.3	0.9	1.0000	1.0047
as left zero	5000	0.0	0.0	0.0	0.0	0.1	0.1	0.0	----	----
as left span	5000	76.5	801.7	501.3	300.5	818.0	504.8	313.2	0.9801	0.9929
Average Correction Factor									0.9974	0.9998

Corrected As found
Previous Response

NO_x= 731.5
NO_x= 805.8

NO= 730.6
NO= 805.6

Percent Change

NO_x= 10.2%

NO= 10.3%

GPT Calibration Data

Dilution Flow (total) 5000 ccm Source Gas Flow 76.50 ccm NOx ref calc conc = 801.7 ppb NO ref calc conc = 801.7 ppb

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
1st NO ref point		0.0	814.9	812.8	0.0	0.9838	0.9863	----	----
1st NO2 (300)	501.3	311.6	810.3	501.3	309.0	0.9895	----	1.0083	99.2%
2nd NO2 (200)	606.1	206.7	812.0	606.1	205.9	0.9874	----	1.0041	99.6%
3rd NO2 (100)	709.1	103.8	814.1	709.1	105.0	0.9849	----	0.9884	101.2%
2nd NO ref point		0.0	814.9	812.8	2.2	0.9838	0.9863	----	----
Average Correction Factor						0.9864		1.0003	100.0%

Calibration Performed By: Asad Hidayat



Wood Buffalo Environmental Association

NO_x Calibration Summary

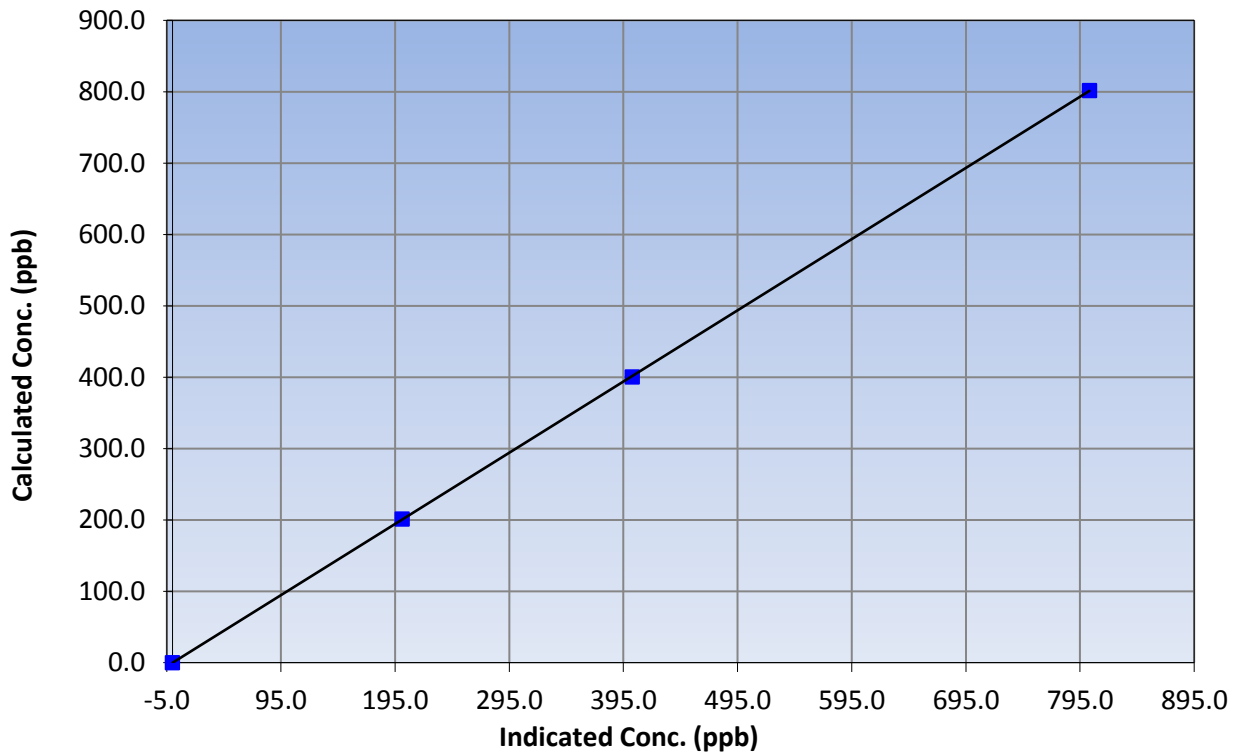
Station Information

Calibration Date	July 5, 2016	Previous Calibration	June 9, 2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	9:55	End Time (MST)	15:15
Analyzer make	Thermo 42i	Analyzer serial #	1501663731

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999993
801.7	803.3	0.9981		
400.3	402.7	0.9941	Slope	0.997694
201.2	201.2	1.0000		
			Intercept	-0.178380

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

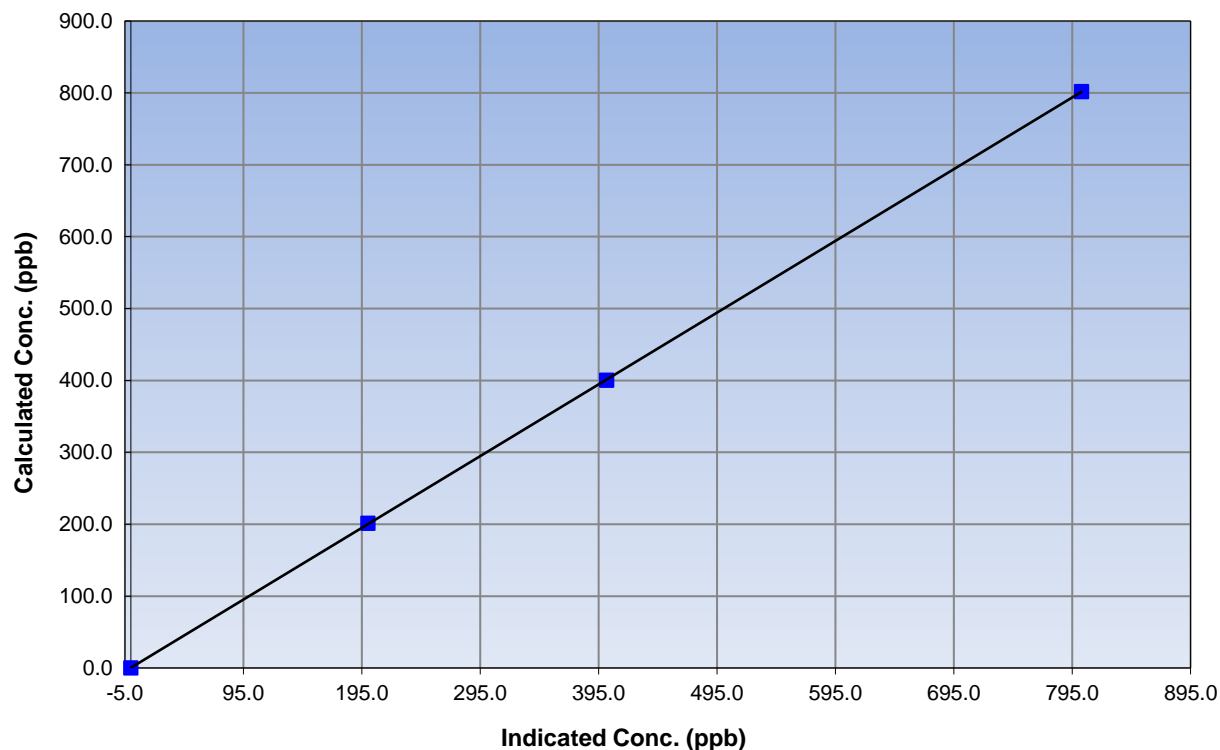
Station Information

Calibration Date	July 5, 2016	Previous Calibration	June 9, 2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	9:55	End Time (MST)	15:15
Analyzer make	Thermo 42i	Analyzer serial #	1501663731

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	N/A	Correlation Coefficient	0.999994
801.7	802.9	0.9986		
400.3	401.9	0.9962	Slope	0.997931
201.2	200.3	1.0047		
			Intercept	0.292314

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

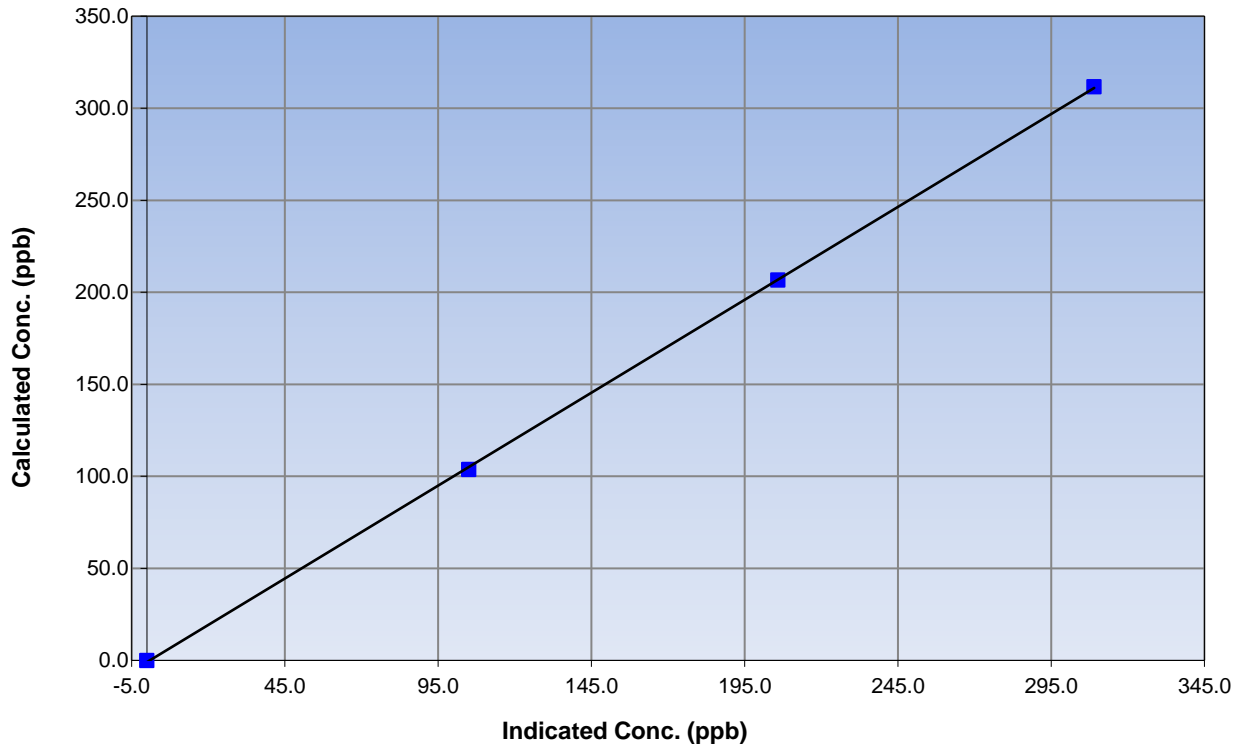
Station Information

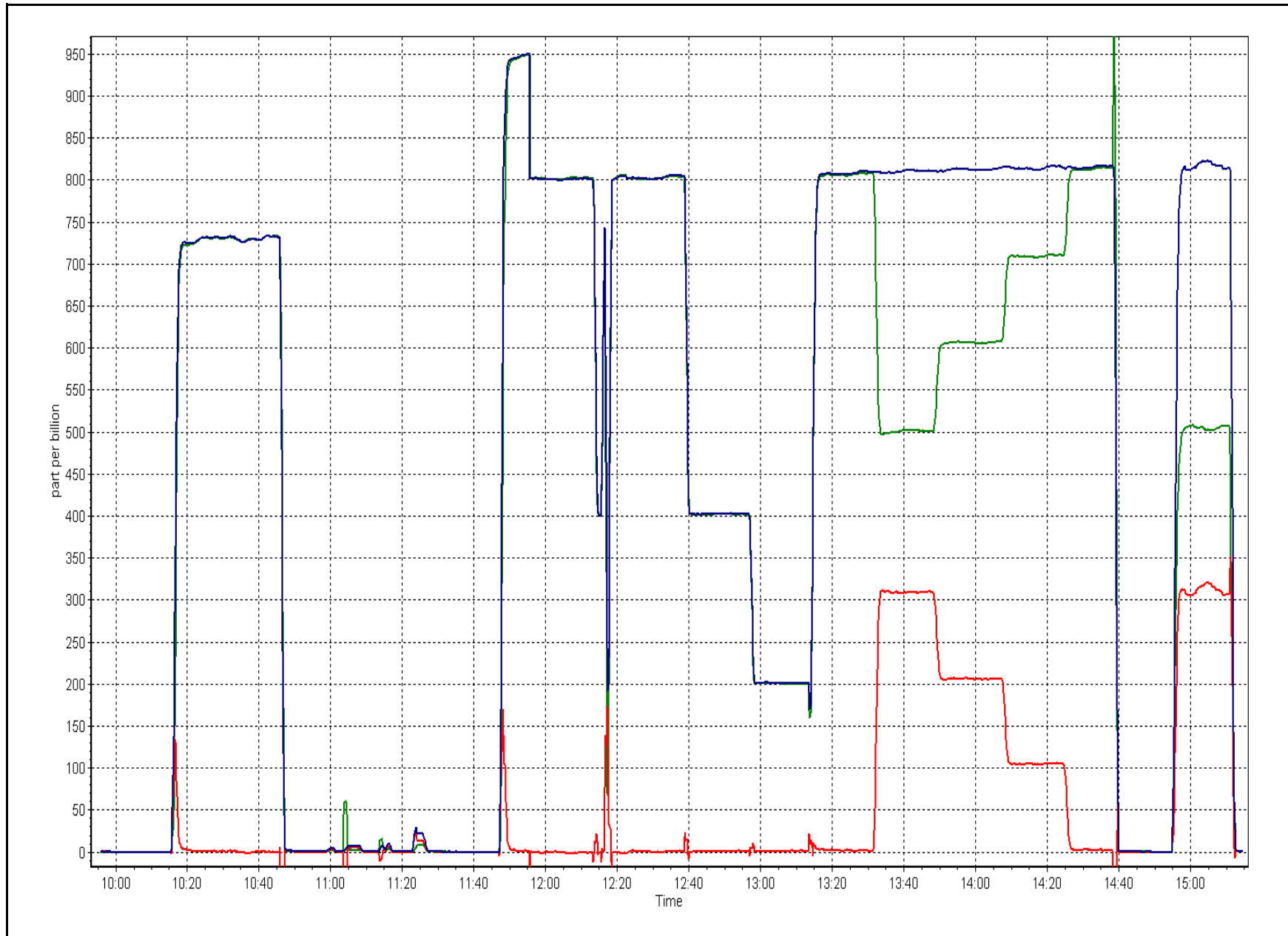
Calibration Date	July 5, 2016	Previous Calibration	June 9, 2016
Station Number	Conklin Community	Station Number	AMS 21
Start Time (MST)	9:55	End Time (MST)	15:15
Analyzer make	Thermo 42i	Analyzer serial #	1501663731

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	N/A	Correlation Coefficient	0.999947
311.6	309.0	1.0083		
206.7	205.9	1.0041	Slope	1.009438
103.8	105.0	0.9884		
			Intercept	-0.920059

NO₂ Calibration Curve







Wood Buffalo Environmental Association

SHARP CALIBRATION

STATION INFORMATION

Calibration Date:	July 7, 2016	Previous Calibration:	June 14, 2016
Station Name:	Conklin Community	Station Number:	AMS 21
Start Time (MST):	10:45	End Time (MST):	11:45
Calibrator Make/Model:	Delta Cal	Calibrator Serial Number:	1451

SHARP INFORMATION

Particulate Fraction:	PM2.5		
Make/Model:	Thermo / SHARP 5030		
Serial Number:	7494		
C ₁₄ Source SN:	CM-0404		
Confirmation of Time settings:	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Parameters Checked:	T1 <input checked="" type="checkbox"/>	T2 <input checked="" type="checkbox"/>	T3 <input checked="" type="checkbox"/>
	T4 <input checked="" type="checkbox"/>	P3 <input checked="" type="checkbox"/>	Main Flow <input checked="" type="checkbox"/>
		Beta <input type="checkbox"/>	Neph <input checked="" type="checkbox"/>

CALIBRATION DATA

Temperature (°C)

Sensor	Indicated	Measured	Difference (Limit +/- 2.0°C)	Final Indicated
T1	17.0	18.5	1.5	18.0
T2	28.0	na	na	28.0
T3	26.0	na	na	26.0
T4	37.0	na	na	37.0
RH (%)	52.0	na	na	52.0

Pressure (Hpa)

Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	941	941.3	0.3	941

Main Flow (Lph)

Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1004	1010	6	1010	1004

Nephelometer Calibration

Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	169		169
Neph	-0.2		-0.2
C14	12.3		12.3
Indicated Concentration (ug/m3)	-0.2	no	-0.2
Offset 1			
Offset 2			

Leak Check (Quarterly)

Leak Check Date:	June 14, 2016	Previous Leak Check Date:	March 24, 2016
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	Measured		Difference LPM (Limit +/- 0.42 LPM)
Flow without adaptor (LPM):	16.75		0.04
*Flow with adaptor (LPM):	16.71		

*Note - do not attach adaptor without shutting off the pump first

Mass Foil Calibration (Annually)

Foil Calibration Date:	June 14, 2016	Previous Foil Calibration:	March 24, 2016
Zeroed?:			
Foil Mass:	2805		
Previous Correction Factor:	7056	Mass foil set S/N:	2598
New Correction Factor:	5603		

INSPECTION DATA

Item	Condition	Date of install or rebuild
Cyclone	Good / cleaned	07/07/2016
Pump	Good	21/03/2016
Filter Tape	Good	21/03/2016
Mass Foil Cal Set	na	14/06/2016
HEPA filter	Good	24/03/2016

NOTES:

Cyclone head cleaned. Only adjusted T1. No adjustments made to neph cal.

Calibration Performed By:	Asad Hidayat
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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 500
CENOVUS
CHRISTINA LAKE
JULY 2016**

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

August 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CENOVUS CHRISTINA LAKE (AMS 500)
 JULY 2016

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	701	37	43	99.19	6	0	2	0
H2S (ppb) Average	701	36	43	99.06	1	0	0	0
NO2 (ppb) Average	701	37	43	99.19	11	0	3	-
NO (ppb) Average	701	37	43	99.19	8	-	2	-
NOX (ppb) Average	701	37	43	99.19	18	-	5	-
Temperature 2 m (C) Average	744	0	0	100	28.2	-	21.8	-
Relative Humidity (%) Average	744	0	0	100	98	-	86	-
Wind Speed 10 m (km/h) Average	744	0	0	100	26	-	15	-
Wind Direction 10 m (deg) Average	744	0	0	100	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CENOVUS CHRISTINA LAKE (AMS 500)
 JULY 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	701	0.5	1	-	0	0	0	0	0	1	6
H2S (ppb) Average	701	0.1	0	-	0	0	0	0	0	0	1
NO2 (ppb) Average	701	1.2	1	-	0	0	0	1	2	3	11
NO (ppb) Average	701	0.7	1	-	0	0	0	0	1	2	8
NOX (ppb) Average	701	1.9	2	-	0	0	1	1	2	4	18
Temperature 2 m (C) Average	744	17.79	4.4	-	6.4	12.5	14.4	17.4	21.2	24	28.2
Relative Humidity (%) Average	744	68.2	19	-	28	41	52	70	85	92	98
Wind Speed 10 m (km/h) Average	744	8.5	5	-	0	3	5	8	11	14	26
Wind Direction 10 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CENOVUS CHRISTINA LAKE (AMS 500)
JULY 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
SO2, NO2	20 Jul 2016 16:00	20 Jul 2016 21:00	6	Maintenance to calibration system
H2S	20 Jul 2016 15:00	20 Jul 2016 19:00	5	Maintenance to calibration system
H2S	29 Jul 2016 08:00	29 Jul 2016 09:00	2	Maintenance - verify daily QA response

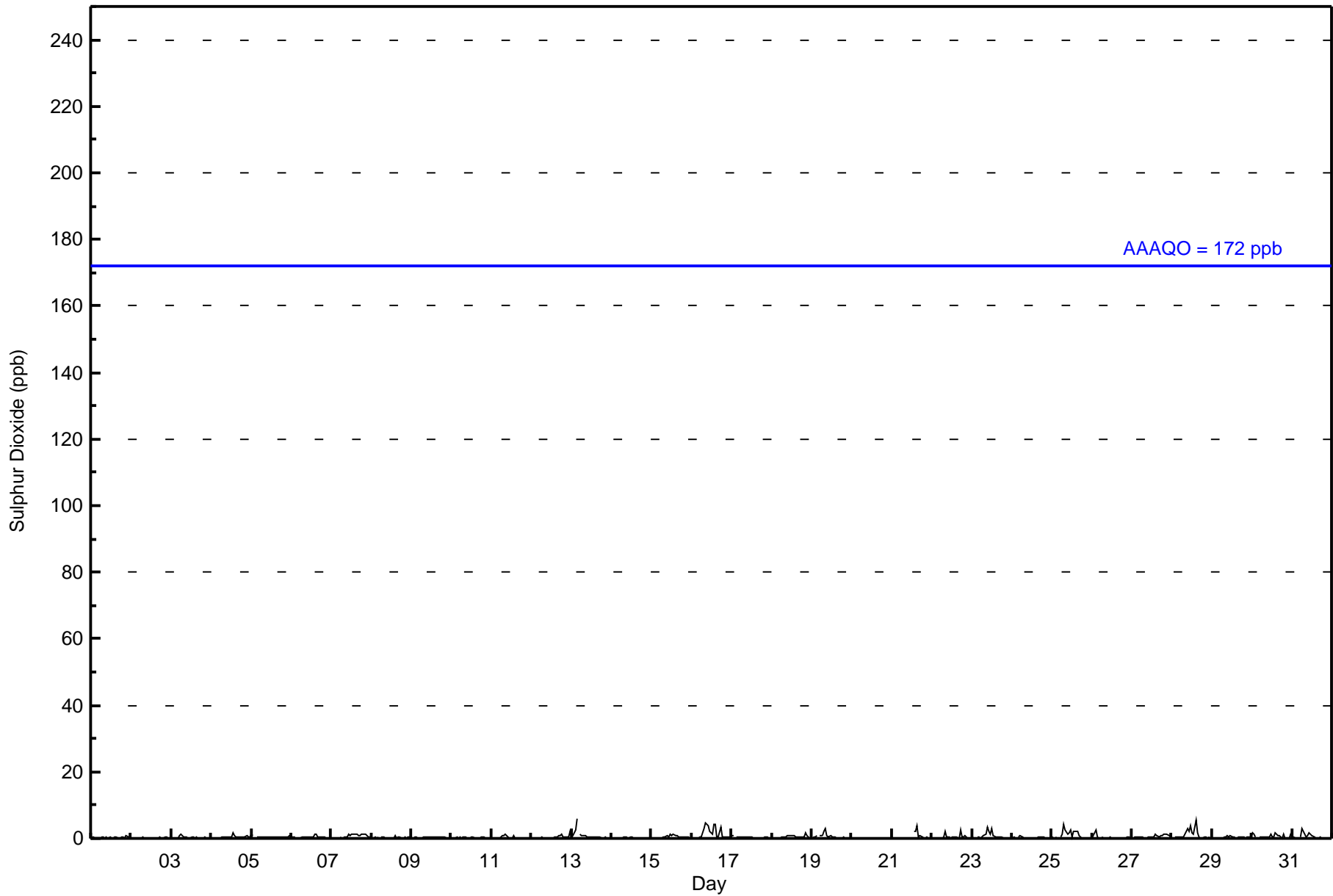


Number of Exceedences (AAAQO):		1-hr: 0 24-hr: 0		Hours in Service:		744																																										
Maximum Value: 6 ppb on Jul 13 04:00		Maximum Daily Average: 1.5 ppb on Jul 16		Hours of Data:		701																																										
Minimum Value: 0 ppb on Jul 14 02:00		Minimum Daily Average: 0.1 ppb on Jul 14		Hours of Missing Data:		43																																										
Maximum Diurnal Average: 0.9 ppb at hour 15		Minimum Diurnal Average: 0.2 ppb at hour 5		Hours of Calibration:		37																																										
Monthly Average: 0.5 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 4		Percent Operational Time:		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-Jul	1	0	0	0	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.3	1																						
2-Jul	0	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-Jul	Z	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1																						
4-Jul	0	Z	0	0	0	0	0	1	0	0	1	1	2	1	1	0	0	0	0	0	0	1	0	0	0.5	2																						
5-Jul	1	1	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.4	1																						
6-Jul	0	0	0	Z	0	0	0	0	0	0	0	1	1	0	1	1	1	1	0	0	0	0	0	0	0.4	1																						
7-Jul	0	0	0	0	Z	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0.7	1																						
8-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.3	1																						
9-Jul	Z	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-Jul	0	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-Jul	0	0	Z	0	0	0	1	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.3	1																						
12-Jul	0	0	0	Z	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	1	0.4	2																						
13-Jul	1	1	3	6	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	6																						
14-Jul	0	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-Jul	Z	0	0	0	0	0	0	1	0	1	0	1	1	1	1	1	0	1	0	0	0	0	0	0	0.4	1																						
16-Jul	0	Z	0	0	0	0	0	3	4	4	4	2	1	4	4	0	0	3	0	0	1	1	0	0	1.5	4																						
17-Jul	1	1	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																						
18-Jul	0	0	0	Z	0	0	0	0	0	1	1	1	1	1	0	0	1	0	0	2	1	0	0	0	0.5	2																						
19-Jul	0	0	0	1	Z	1	1	2	3	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.6	3																						
20-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	M	M	M	M	M	M	0	0	0	--	0																						
21-Jul	Z	0	0	0	0	0	0	C	C	C	C	C	C	2	2	4	1	1	0	0	0	1	0	0	--	4																						
22-Jul	0	Z	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	2	0	1	1	0	0	0	0.4	2																						
23-Jul	0	0	Z	0	0	0	0	1	1	4	2	1	3	1	0	0	0	0	0	0	0	0	0	0	0.7	4																						
24-Jul	0	0	0	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.2	1																						
25-Jul	0	0	0	0	Z	0	1	4	2	1	2	3	1	2	2	2	1	1	0	0	0	0	0	0	1.0	4																						
26-Jul	0	1	3	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.3	3																						
27-Jul	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0.6	1																						
28-Jul	1	Z	0	0	0	0	1	0	2	3	2	4	2	1	6	2	0	0	0	0	0	0	0	0	1.2	6																						
29-Jul	0	0	Z	0	0	0	0	0	0	1	1	1	0	1	0	0	1	0	0	0	0	0	0	0	0.3	1																						
30-Jul	1	1	1	Z	1	0	0	0	0	0	0	1	0	0	2	1	1	0	0	1	0	0	1	0	0.6	2																						
31-Jul	0	0	0	0	Z	0	3	2	0	1	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0.6	3																						
																								0.3	0.3	0.4	0.5	0.2	0.3	0.5	0.7	0.8	0.7	0.7	0.7	0.5	0.7	0.9	0.6	0.4	0.5	0.3	0.4	0.4	0.3	0.2	0.3	Diurnal Average
																								1	1	3	6	1	1	3	4	4	4	4	4	3	4	6	4	1	3	1	1	2	1	1	2	Diurnal Maximum
Z - zerospan C - Calibration M - Maintenance																																																
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb																																																



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Cenovus - Christina Lake - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Cenovus - Christina Lake - July 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	701	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: 701

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Cenovus - Christina Lake - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	45	42	28	19	22	39	42	39	42	49	69	88	33	35	68	41	701
11 - 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	45	42	28	19	22	39	42	39	42	49	69	88	33	35	68	41	701

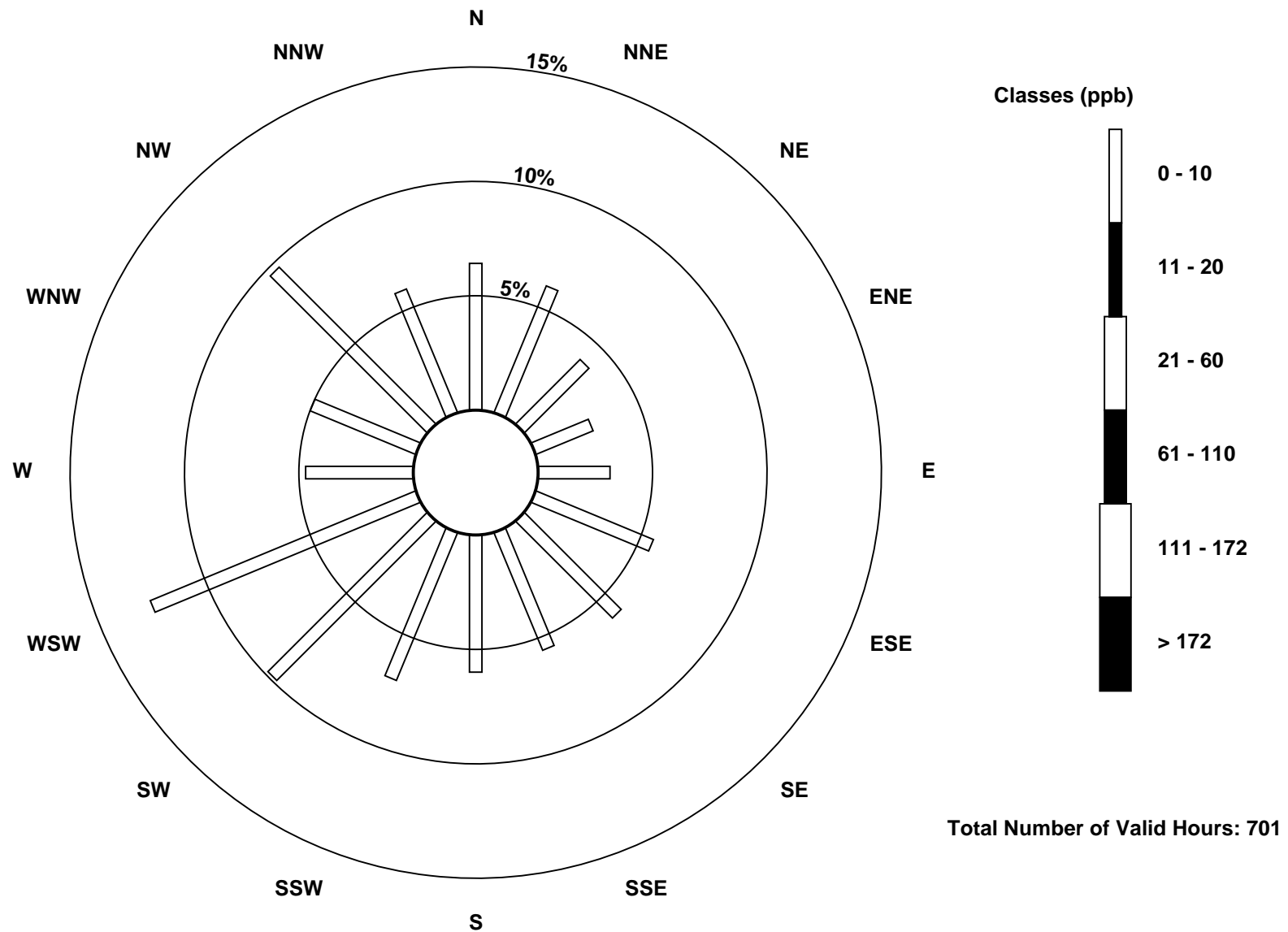
Total Number of Valid Hours: 701

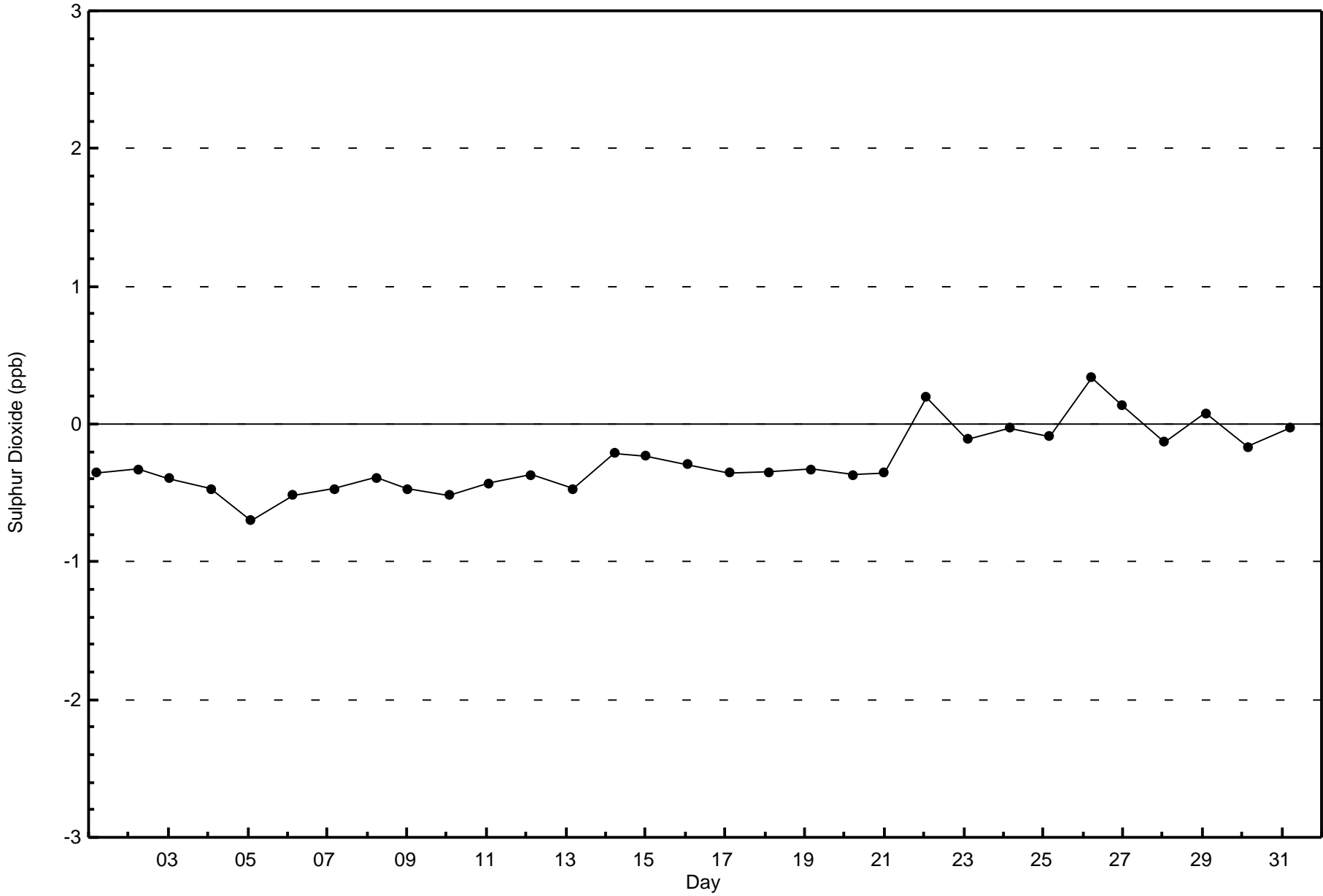
Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

Sulphur Dioxide (SO₂) - ppb
Cenovus - Christina Lake (AMS500)

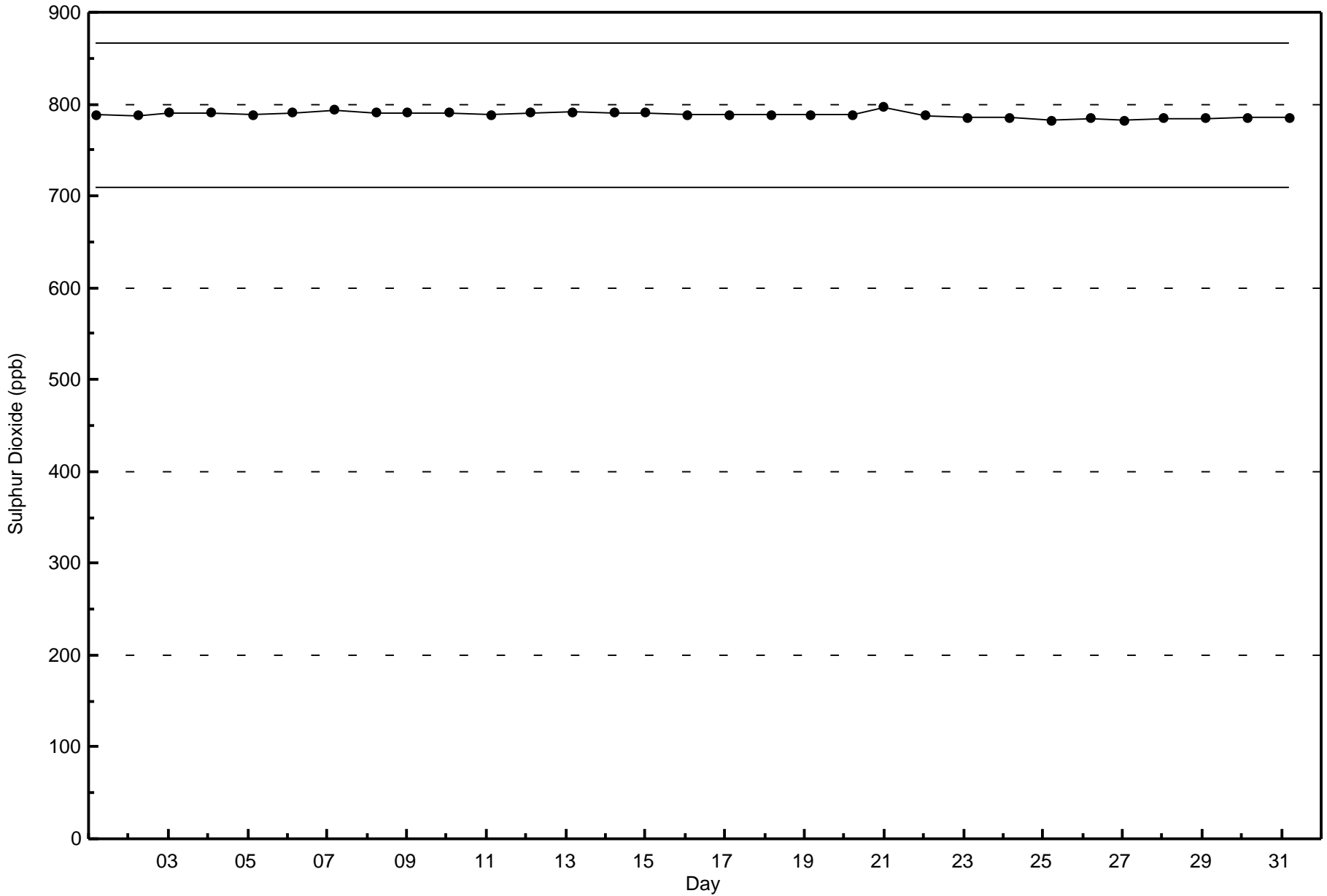






Wood Buffalo Environmental Association
Span Responses

Sulphur Dioxide (SO₂) - ppb
Cenovus - Christina Lake - July 2016



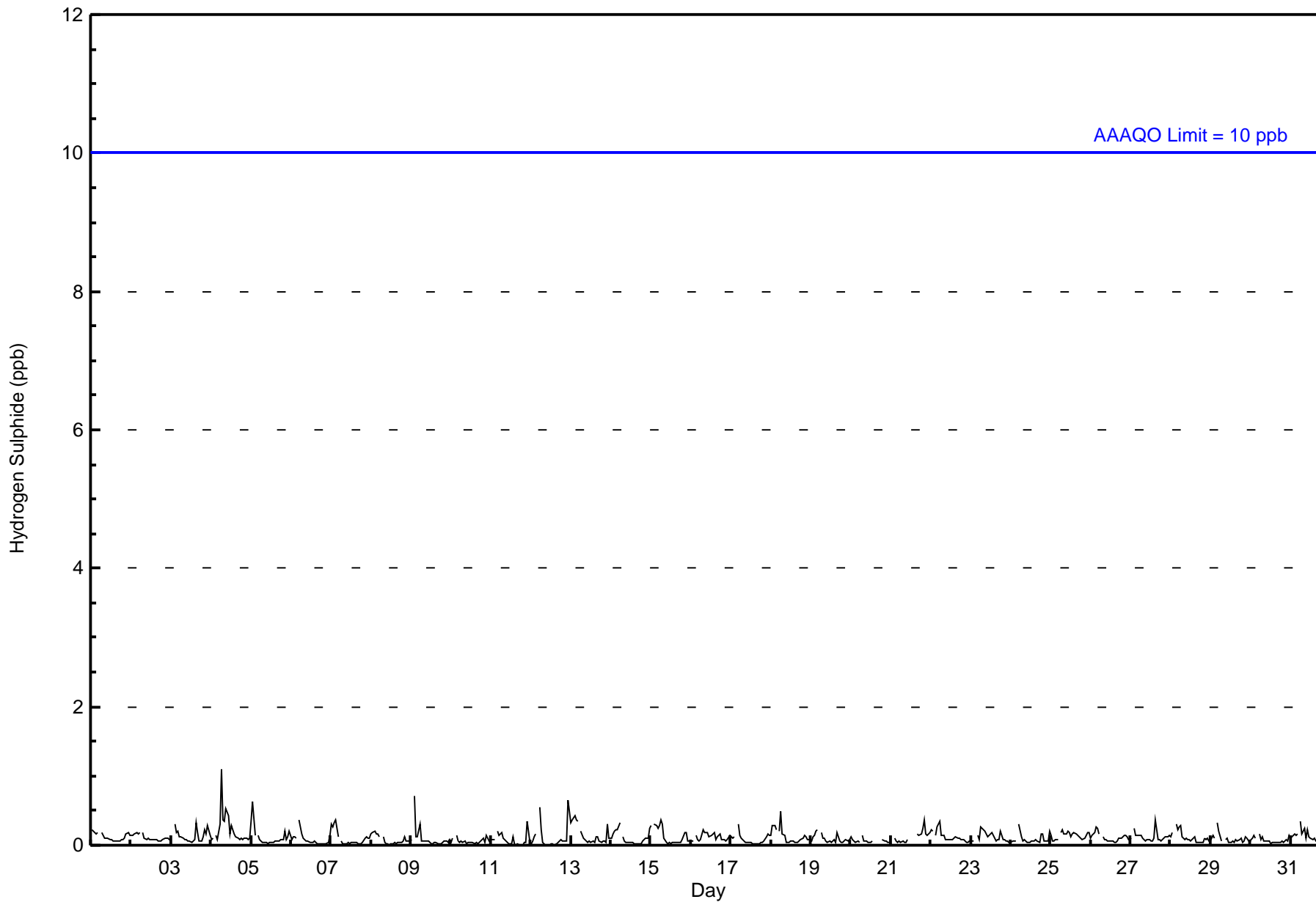


Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																	
Maximum Value: 1 ppb on Jul 4 07:00										Maximum Daily Average: 0.2 ppb on Jul 4										Hours of Data: 701							
Minimum Value: 0 ppb on Jul 12 10:00										Minimum Daily Average: 0.1 ppb on Jul 10										Hours of Missing Data: 43							
Maximum Diurnal Average: 0.2 ppb at hour 7										Minimum Diurnal Average: 0.1 ppb at hour 12										Hours of Calibration: 36							
Monthly Average: 0.1 ppb										Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 1										Percent Operational Time: 99.1							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
2-Jul	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	
3-Jul	0	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-Jul	0	0	Z	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
5-Jul	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	
6-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
7-Jul	0	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-Jul	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	
9-Jul	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	
10-Jul	0	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-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
12-Jul	0	0	0	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.1	1	
13-Jul	0	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-Jul	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	
15-Jul	0	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-Jul	0	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-Jul	0	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-Jul	0	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-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
20-Jul	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	M	M	M	M	M	0	0	0	0	0	0.1	0	
21-Jul	0	Z	0	0	0	0	0	0	0	0	0	C	C	C	C	C	0	0	0	0	0	0	0	0	0.1	0	
22-Jul	0	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-Jul	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
24-Jul	0	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-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
26-Jul	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
27-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
28-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
29-Jul	0	0	0	Z	0	0	0	M	M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
30-Jul	0	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-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0.2	1	
	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Diurnal Average		
	0	1	1	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	Diurnal Maximum	
Z - zerospan	C - Calibration	M - Maintenance																									
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb	24-hr 3 ppb																										



Wood Buffalo Environmental Association
Hourly Averages

Hydrogen Sulphide (H₂S) - ppb
Cenovus - Christina Lake - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Cenovus - Christina Lake - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	701	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: 701

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Cenovus - Christina Lake - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	44	43	27	19	24	37	42	40	44	48	71	92	31	32	66	41	701
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	44	43	27	19	24	37	42	40	44	48	71	92	31	32	66	41	701

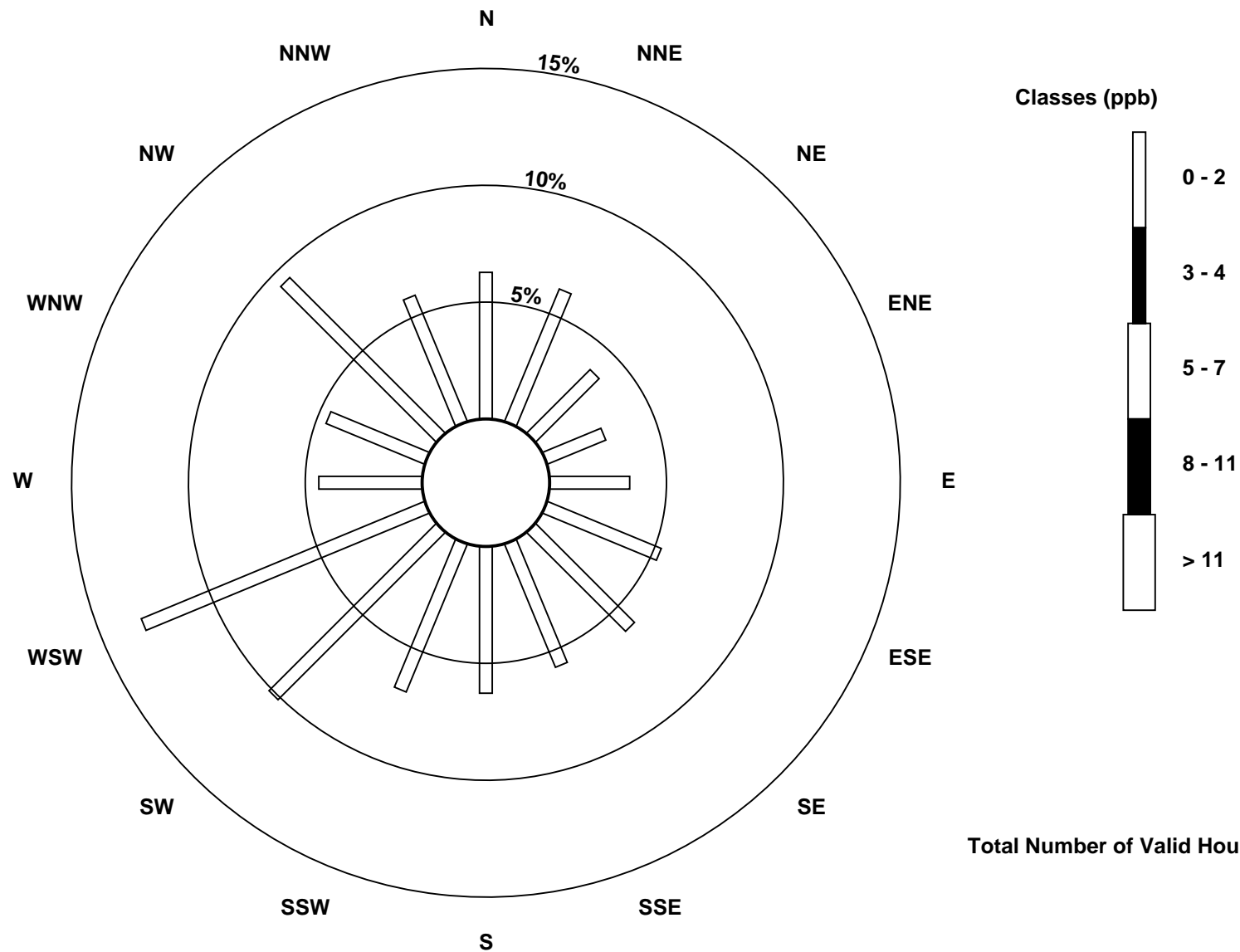
Total Number of Valid Hours: 701

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

Hydrogen Sulphide (H₂S) - ppb
Cenovus - Christina Lake (AMS500)

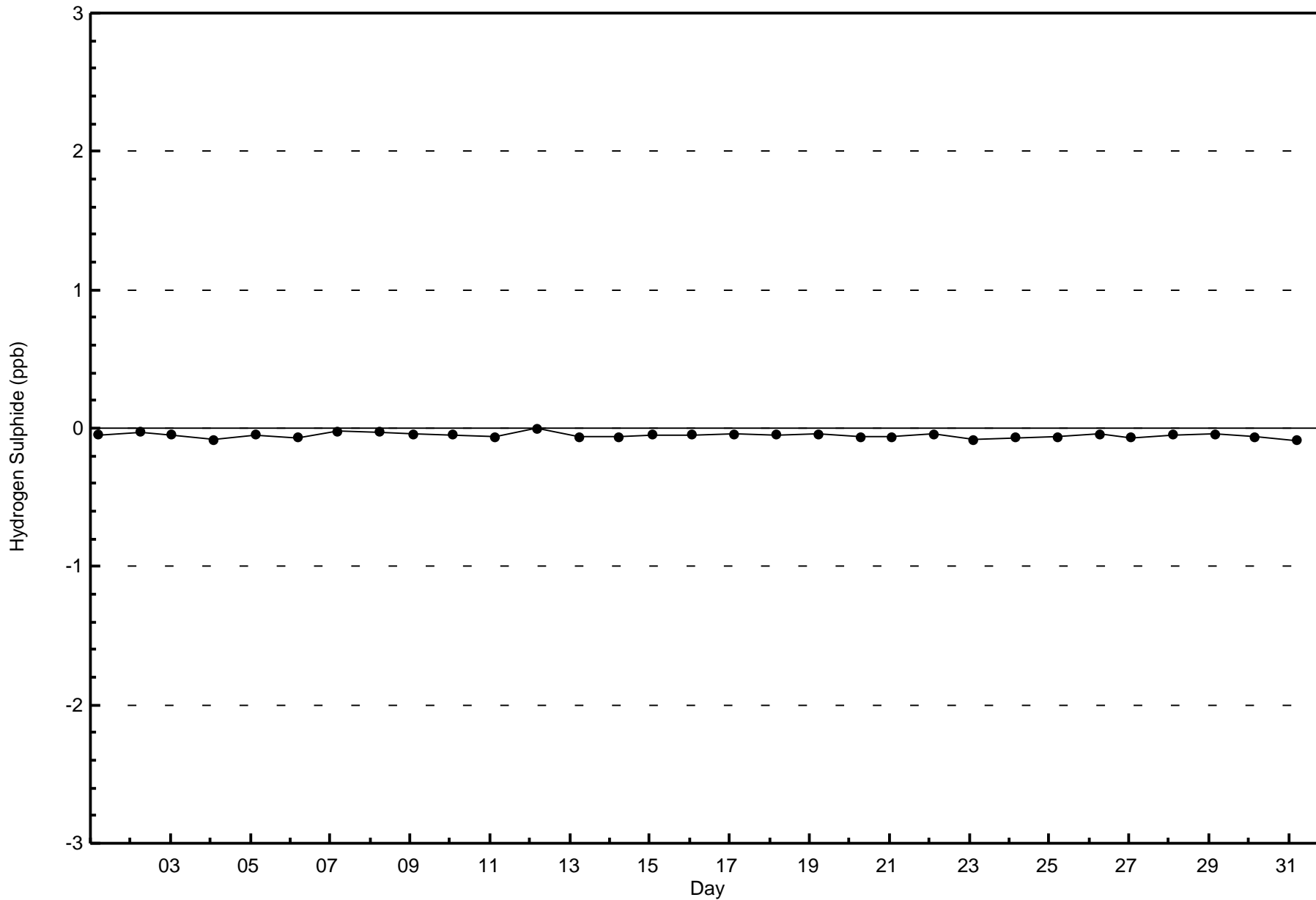


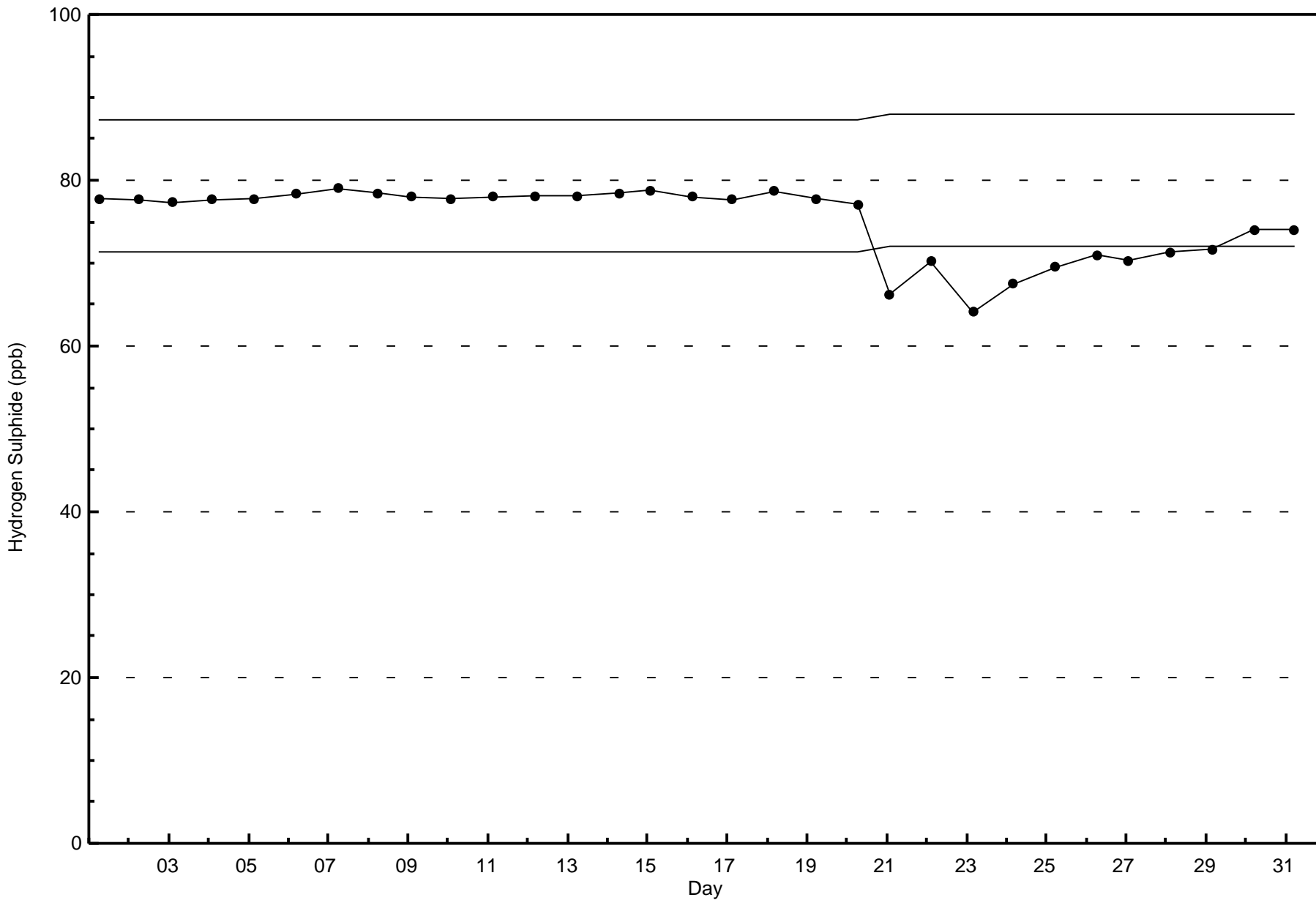
Total Number of Valid Hours: 701



Wood Buffalo Environmental Association
Zero Responses

Hydrogen Sulphide (H₂S) - ppb
Cenovus - Christina Lake - July 2016





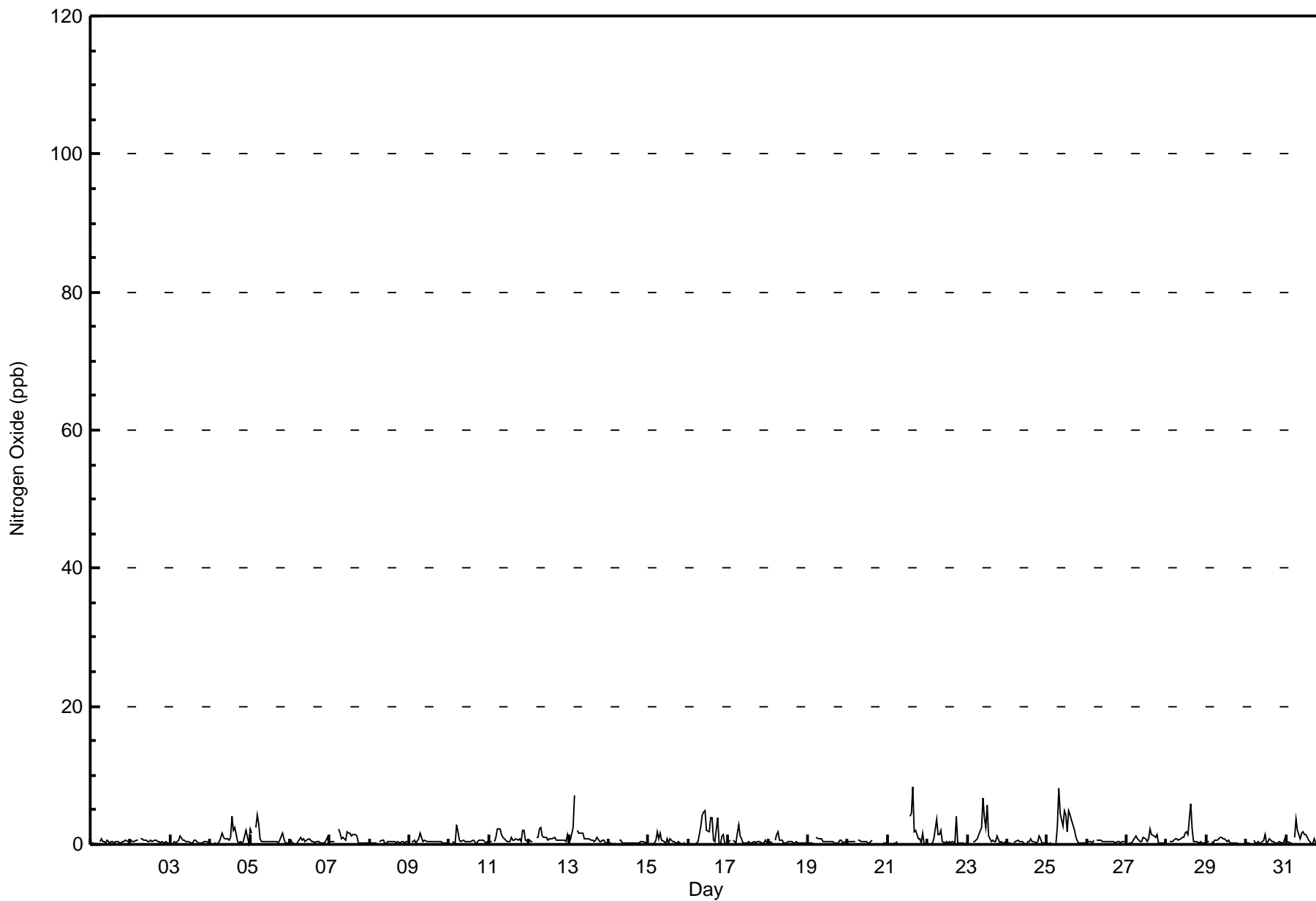


Maximum Value: 8 ppb on Jul 21 16:00														Maximum Daily Average: 2.0 ppb on Jul 25														Hours in Service: 744	
Minimum Value: 0 ppb on Jul 15 23:00														Minimum Daily Average: 0.3 ppb on Jul 14														Hours of Data: 701	
Maximum Diurnal Average: 1.3 ppb at hour 8														Minimum Diurnal Average: 0.3 ppb at hour 23														Hours of Missing Data: 43	
Monthly Average: 0.7 ppb														Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 2 P ₉₉ = 5														Hours of Calibration: 37	
																												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-Jul	0	0	0	0	Z	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0.3	1			
2-Jul	1	0	0	1	1	Z	1	1	1	1	0	0	1	0	1	1	0	1	0	0	0	0	0	0	0.5	1			
3-Jul	Z	0	0	0	0	1	1	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0.4	1			
4-Jul	0	Z	0	0	0	0	1	2	1	1	1	1	4	2	2	0	0	0	0	0	2	1	0	0	0.9	4			
5-Jul	2	2	Z	3	4	3	1	0	1	0	0	0	0	0	0	0	0	0	1	2	1	0	0	0	1.0	4			
6-Jul	1	0	0	Z	0	0	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0	1	0	0.4	1			
7-Jul	0	0	0	0	Z	2	2	1	1	1	2	2	2	1	1	1	1	0	0	0	0	0	0	0	0.8	2			
8-Jul	0	0	0	0	0	Z	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1			
9-Jul	Z	0	0	1	0	1	2	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	2			
10-Jul	0	Z	0	0	3	2	1	1	1	0	0	0	0	0	1	0	0	0	1	1	1	0	0	0	0.6	3			
11-Jul	0	0	Z	0	1	2	2	2	1	1	1	0	1	1	1	1	1	1	1	0	2	2	1	0	0.9	2			
12-Jul	1	0	0	Z	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0.9	2			
13-Jul	0	1	2	7	Z	2	2	2	2	1	1	1	1	1	0	1	1	0	0	1	1	0	0	0	1.2	7			
14-Jul	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			
15-Jul	Z	0	0	0	1	2	1	2	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0.5	2			
16-Jul	0	Z	0	0	0	0	0	3	4	5	5	2	2	4	4	1	0	4	0	0	1	1	0	0	1.6	5			
17-Jul	1	1	Z	1	0	2	3	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0.5	3			
18-Jul	0	0	0	Z	1	1	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2			
19-Jul	0	0	0	0	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0.4	1			
20-Jul	0	0	0	0	0	Z	1	1	0	0	0	0	0	0	1	M	M	M	M	M	M	M	0	0	0	--	1		
21-Jul	Z	0	0	0	0	0	0	C	C	C	C	C	C	4	4	8	2	2	1	1	0	2	0	0	--	8			
22-Jul	0	Z	0	0	1	4	1	2	2	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0.7	4			
23-Jul	0	0	Z	0	0	1	1	1	2	7	4	2	6	1	0	1	0	0	1	0	0	0	0	0	1.3	7			
24-Jul	0	0	0	Z	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	1	0.4	1			
25-Jul	0	0	0	0	Z	0	3	8	4	3	5	4	2	5	4	3	2	1	1	0	0	0	0	0	2.0	8			
26-Jul	0	0	0	0	1	Z	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1			
27-Jul	Z	0	0	0	1	1	1	1	0	0	1	1	0	1	2	1	1	1	1	0	0	0	0	0	0.7	2			
28-Jul	0	Z	0	0	1	1	1	1	1	1	1	2	2	1	6	2	0	0	0	0	0	0	0	0	1.0	6			
29-Jul	0	0	Z	0	0	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0.4	1			
30-Jul	0	0	0	Z	1	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	1	0.4	1			
31-Jul	0	0	0	0	Z	1	4	2	1	2	2	1	1	1	0	0	0	1	0	0	0	0	0	0	0.8	4			
																												Diurnal Average	
0.4														0.3														0.3	
2														2														2	
																												Diurnal Maximum	
Z - zerospan														C - Calibration														M - Maintenance	



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxide (NO) - ppb
Cenovus - Christina Lake - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxide (NO) - ppb
Cenovus - Christina Lake - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	701	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: 701

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxide (NO) - ppb
Cenovus - Christina Lake - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	45	42	28	19	22	39	42	39	42	49	69	88	33	35	68	41	701
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	45	42	28	19	22	39	42	39	42	49	69	88	33	35	68	41	701

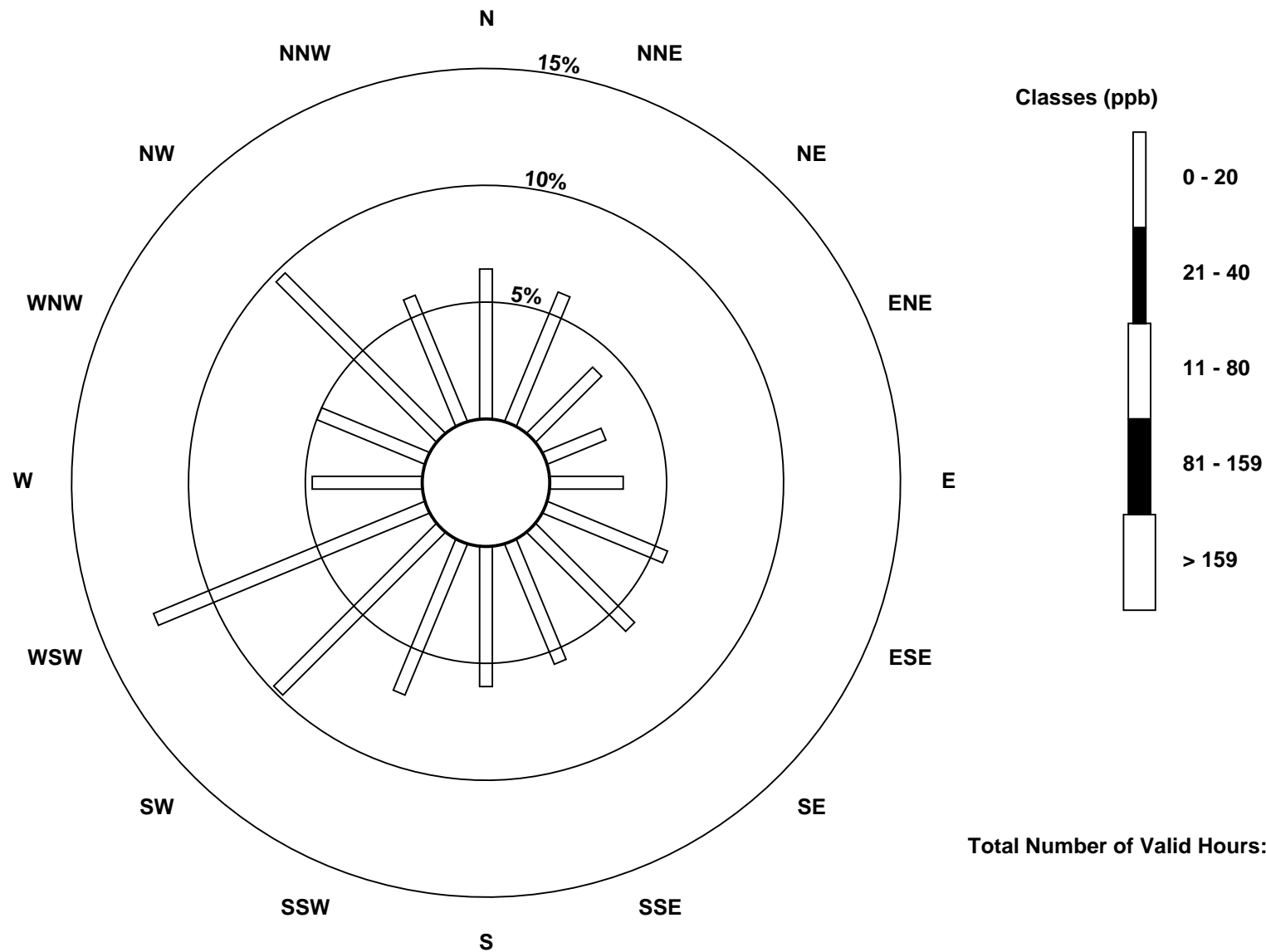
Total Number of Valid Hours: 701

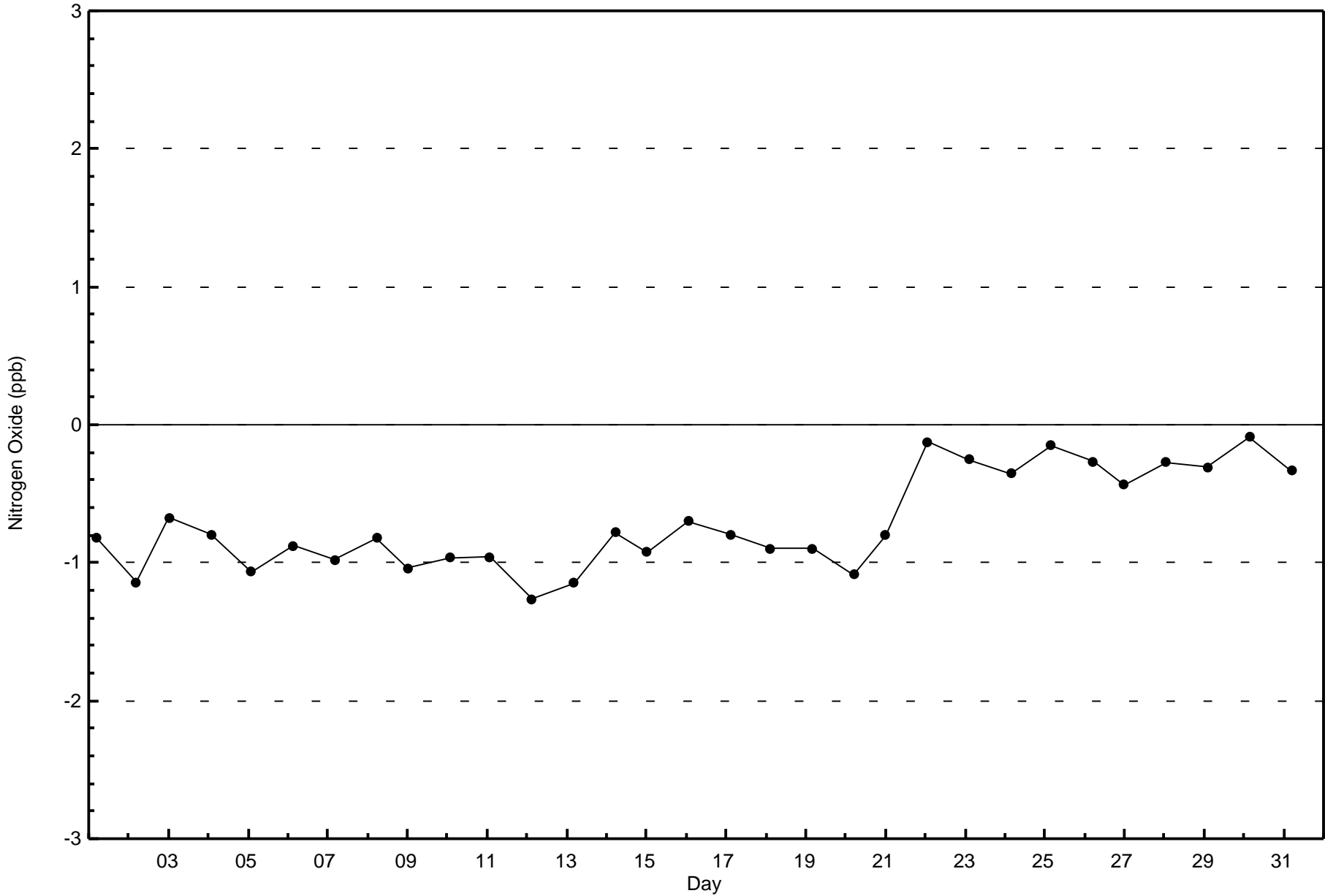
Total Number of Hours: 744

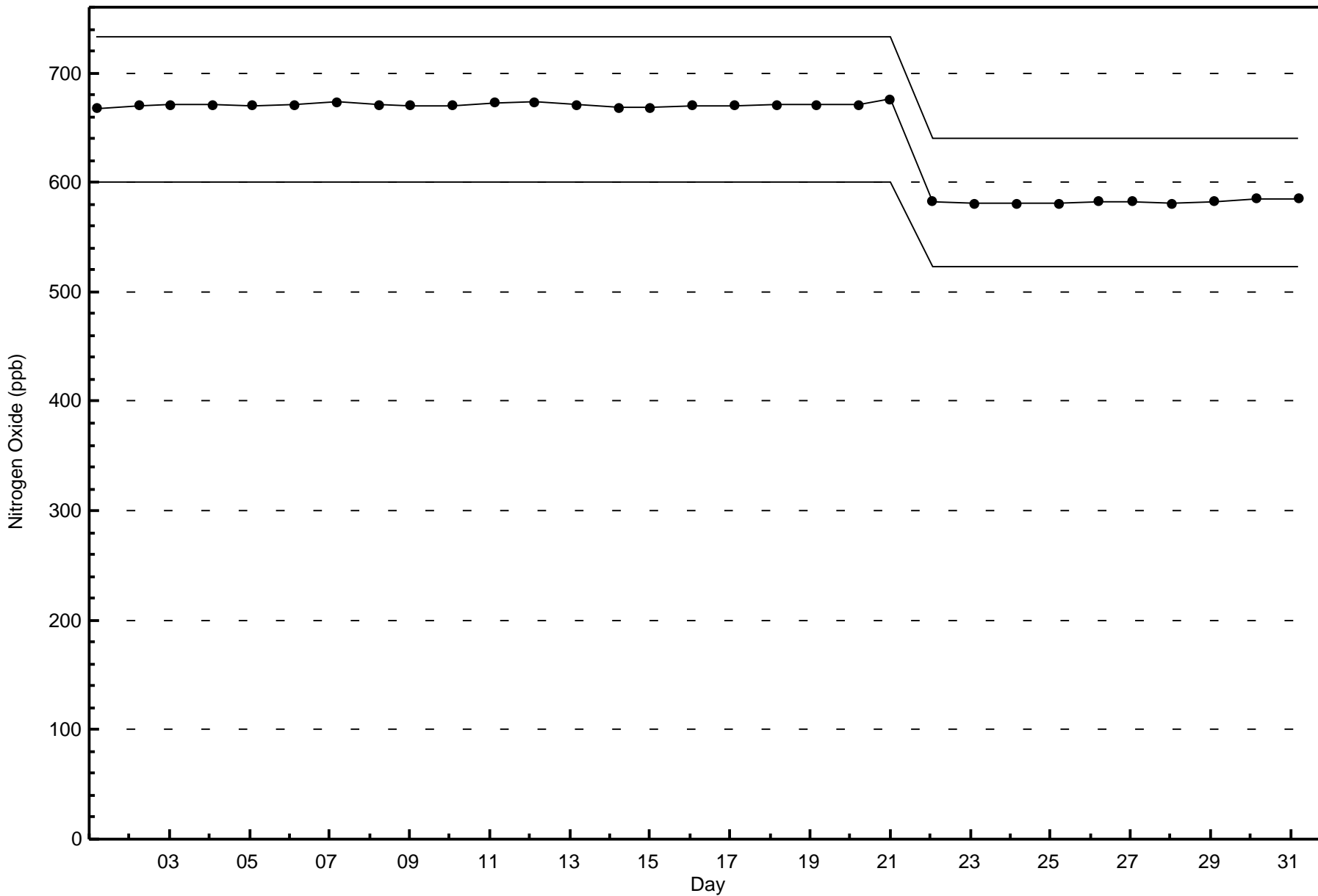


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Nitrogen Oxide (NO) - ppb
Cenovus - Christina Lake (AMS500)









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

Cenovus - Christina Lake - July 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 11 ppb on Jul 13 04:00	Maximum Daily Average: 3.2 ppb on Jul 16		Hours of Data:	701
Minimum Value: 0 ppb on Jul 4 19:00	Minimum Daily Average: 0.5 ppb on Jul 9		Hours of Missing Data:	43
Maximum Diurnal Average: 1.7 ppb at hour 6	Minimum Diurnal Average: 0.7 ppb at hour 19		Hours of Calibration:	37
Monthly Average: 1.2 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 O ₃ = 2 P ₉₀ = 3 P ₉₉ = 6		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-Jul	1	3	1	2	Z	2	2	1	1	1	1	0	1	0	0	1	0	0	0	0	0	1	1	3	1.0	3
2-Jul	4	2	3	1	3	Z	1	1	0	0	1	0	1	1	1	1	1	0	1	1	1	2	1	1	1.1	4
3-Jul	Z	2	3	2	1	2	2	1	1	1	1	1	1	2	4	2	1	1	1	2	1	2	1	1	1.5	4
4-Jul	0	Z	0	0	0	1	1	2	1	1	1	0	1	3	2	2	0	0	0	0	2	1	0	0	0.9	3
5-Jul	2	2	Z	2	3	3	1	0	0	0	0	0	0	0	0	0	0	0	1	4	2	0	1	4	1.1	4
6-Jul	2	1	0	Z	1	2	3	1	2	1	1	2	2	1	2	1	1	1	0	0	0	0	4	1	1.2	4
7-Jul	1	2	2	1	Z	4	3	1	1	1	2	2	2	2	3	2	2	0	1	0	1	1	1	1	1.5	4
8-Jul	2	2	2	1	2	Z	1	1	1	0	0	0	1	0	1	1	1	1	0	1	1	0	1	1	0.8	2
9-Jul	Z	0	2	1	1	1	2	1	1	0	0	0	1	0	0	1	0	0	0	0	1	0	0	1	0.5	2
10-Jul	0	Z	1	0	5	3	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	2	1	1	0.7	5
11-Jul	0	0	Z	1	0	2	3	2	2	1	0	0	0	1	0	0	0	0	0	0	4	5	1	1	1.1	5
12-Jul	1	1	1	Z	4	1	2	2	1	1	1	0	1	1	1	1	1	0	1	0	1	2	1	4	1.2	4
13-Jul	1	2	6	11	Z	3	2	2	2	1	1	1	1	1	1	2	3	0	2	4	3	2	1	2.2	11	
14-Jul	1	1	1	1	1	Z	1	1	1	1	1	1	1	1	0	0	0	0	0	1	1	0	0	0	0.7	1
15-Jul	Z	0	0	0	0	2	2	4	1	2	1	3	1	3	2	2	2	2	3	2	1	1	1	1	1.4	4
16-Jul	1	Z	1	1	1	2	2	6	8	6	6	4	3	5	5	2	3	6	1	1	2	5	2	2	3.2	8
17-Jul	3	3	Z	3	2	3	4	3	2	1	1	1	1	0	0	1	1	1	1	1	0	1	1	0	1.5	4
18-Jul	0	1	2	Z	0	1	2	1	1	0	0	1	1	0	0	0	0	0	0	0	2	1	0	0	0.7	2
19-Jul	0	0	1	2	Z	3	2	2	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.6	3
20-Jul	0	0	0	0	0	Z	2	1	0	0	0	0	0	0	0	M	M	M	M	M	M	M	0	0	--	2
21-Jul	Z	0	0	0	0	1	0	C	C	C	C	C	C	4	5	9	3	4	3	2	1	2	1	1	--	9
22-Jul	1	Z	1	1	1	2	1	1	2	1	1	1	1	1	1	2	1	7	1	1	2	1	0	0	1.3	7
23-Jul	0	0	Z	1	1	1	1	2	2	5	4	2	5	2	1	1	1	1	2	1	1	0	0	0	1.5	5
24-Jul	0	0	0	Z	1	1	1	0	0	0	0	0	0	0	1	1	0	0	1	2	3	0	0	2	0.7	3
25-Jul	1	0	1	1	Z	1	3	6	3	2	4	3	2	4	4	3	2	1	1	1	0	1	1	0	2.0	6
26-Jul	1	1	4	2	1	Z	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0.8	4
27-Jul	Z	1	1	1	2	2	1	1	0	0	1	0	0	0	3	2	2	2	2	0	0	1	0	1	1.0	3
28-Jul	1	Z	0	1	0	1	1	1	2	6	3	5	3	2	5	3	0	0	0	1	1	0	1	0	1.6	6
29-Jul	0	1	Z	0	0	1	0	1	1	1	1	1	0	1	0	0	1	1	0	0	0	1	1	0	0.6	1
30-Jul	2	2	2	Z	2	2	2	2	1	1	1	2	1	1	2	1	1	0	0	1	0	2	0	4	1.4	4
31-Jul	1	1	1	1	Z	1	3	3	1	2	3	3	3	1	1	0	0	1	0	0	0	0	0	0	1.1	3

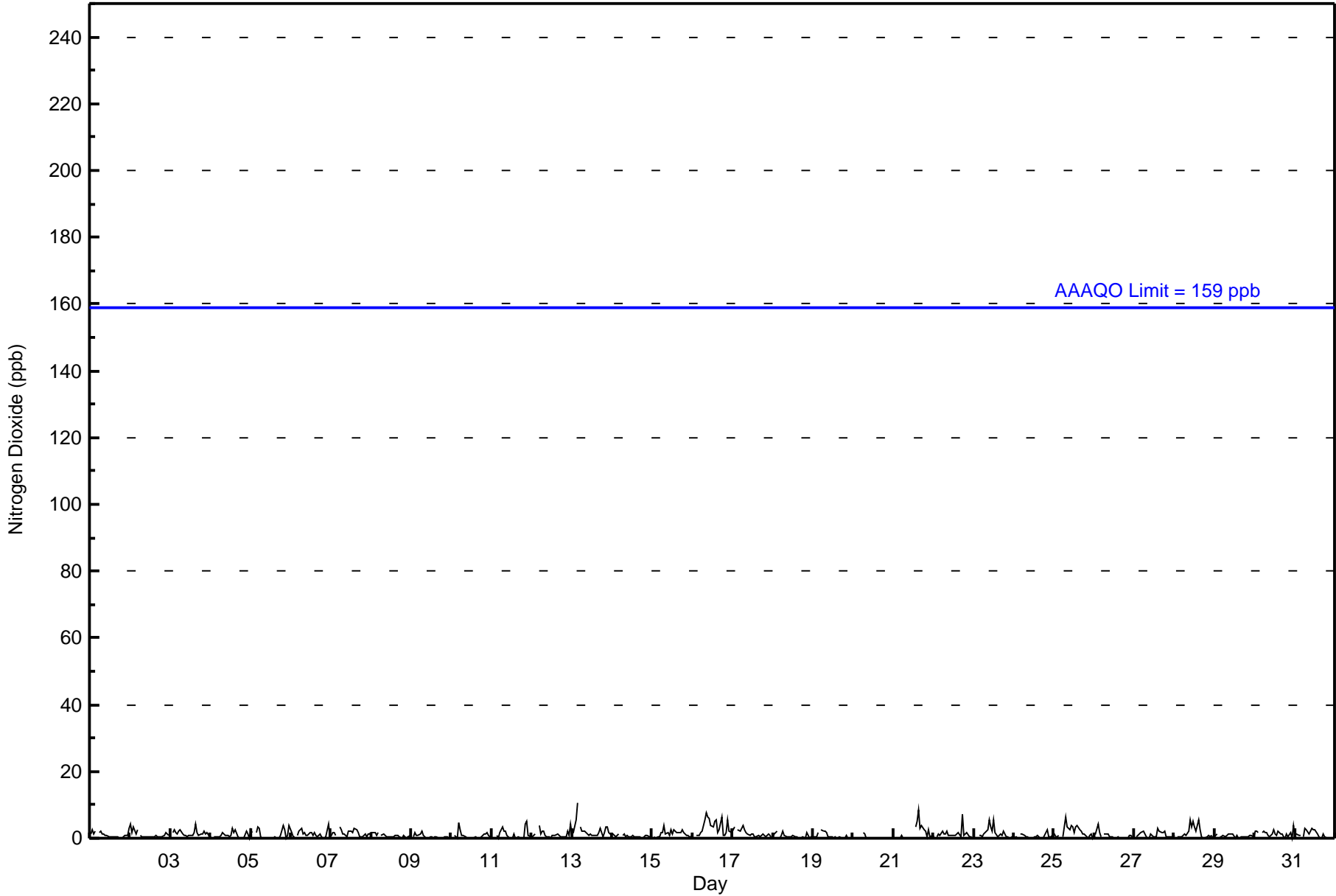
1.0	1.1	1.3	1.4	1.3	1.7	1.7	1.7	1.4	1.2	1.2	1.2	1.1	1.1	1.4	1.4	0.9	1.1	0.7	0.8	1.1	1.2	0.9	1.0	Diurnal Average		
4	3	6	11	5	4	4	4	6	8	6	6	5	5	5	5	9	3	7	3	4	4	5	4	4	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Cenovus - Christina Lake - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Cenovus - Christina Lake - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	701	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: 701

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Cenovus - Christina Lake - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	45	42	28	19	22	39	42	39	42	49	69	88	33	35	68	41	701
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	45	42	28	19	22	39	42	39	42	49	69	88	33	35	68	41	701

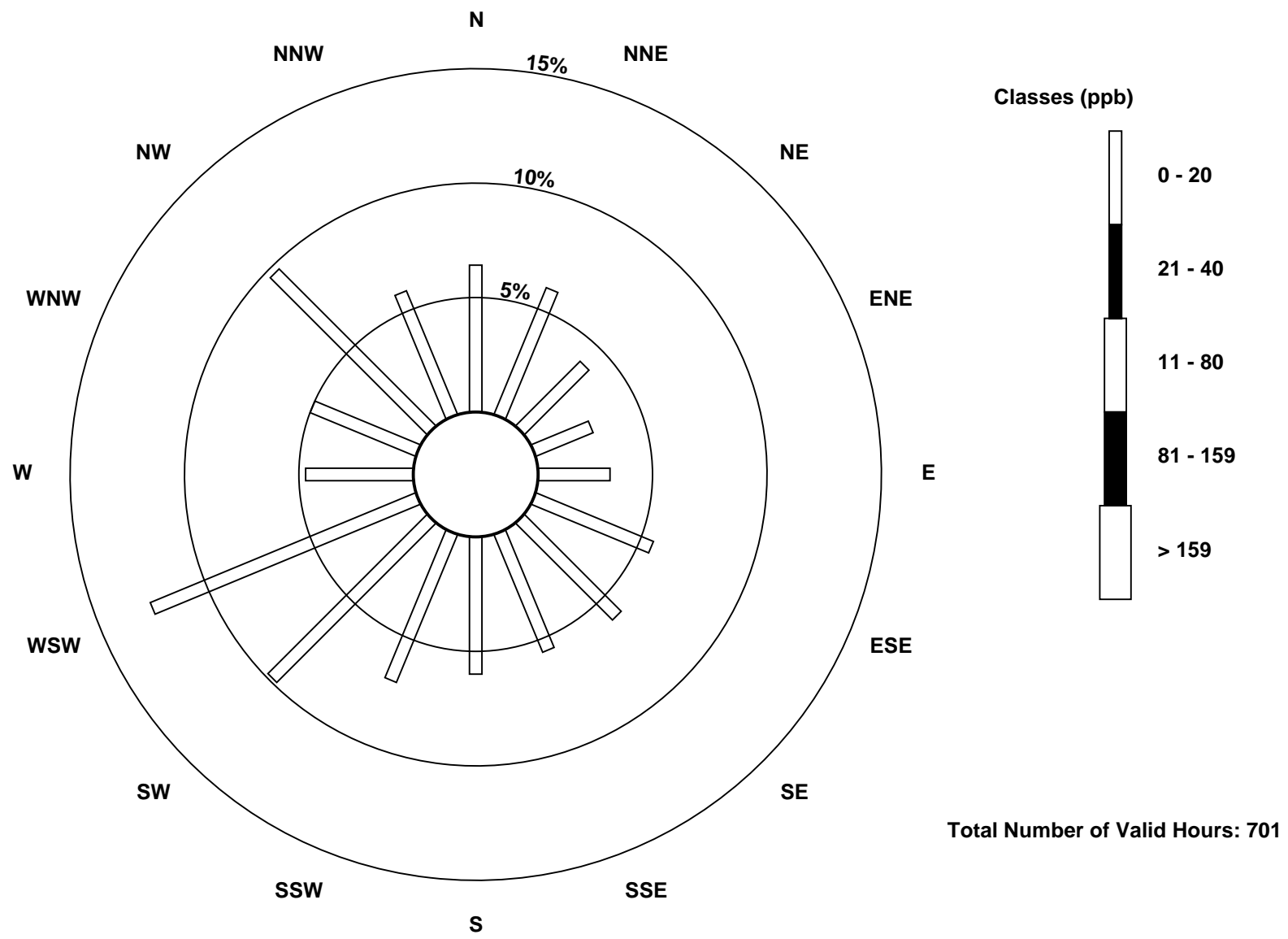
Total Number of Valid Hours: 701

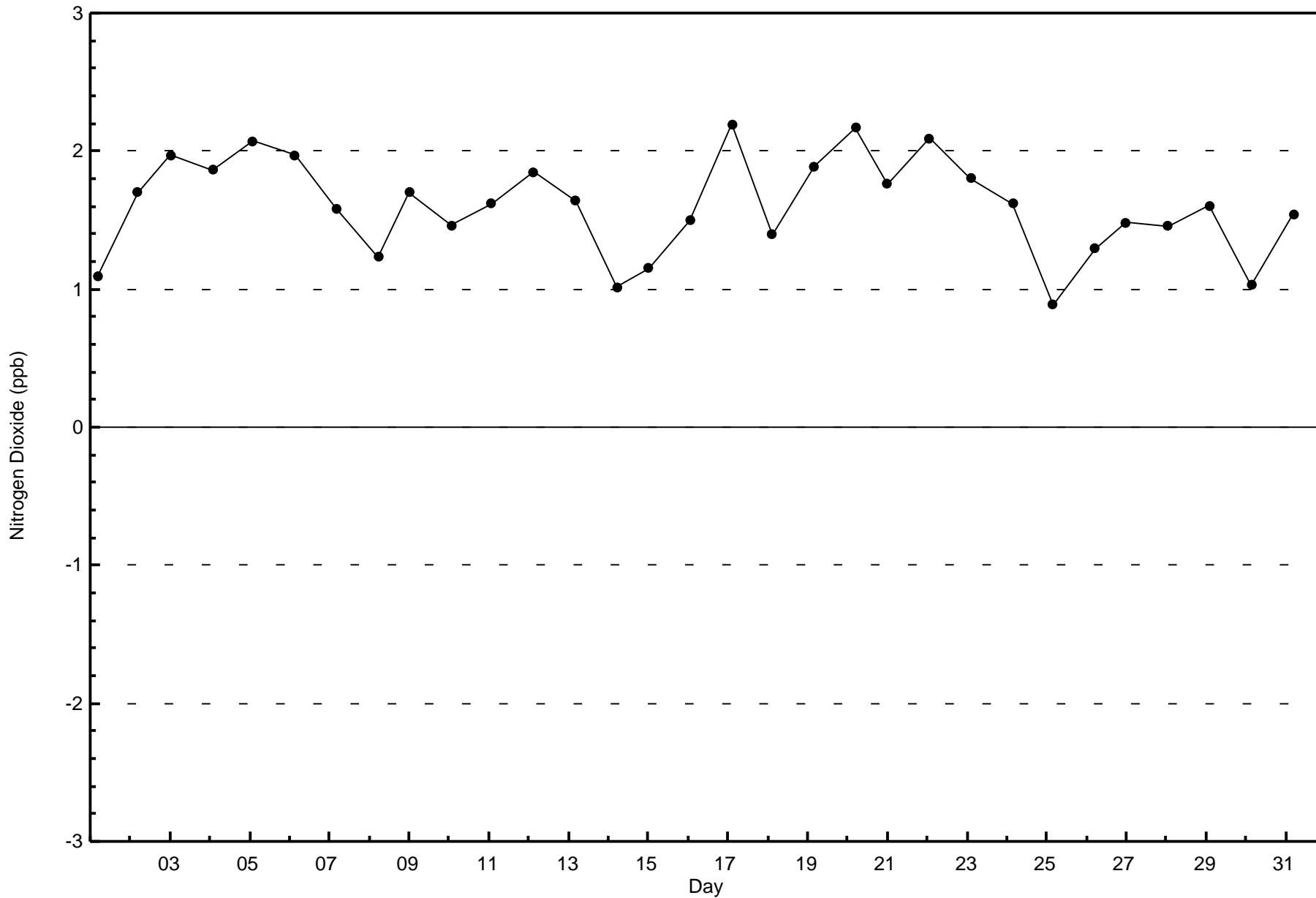
Total Number of Hours: 744

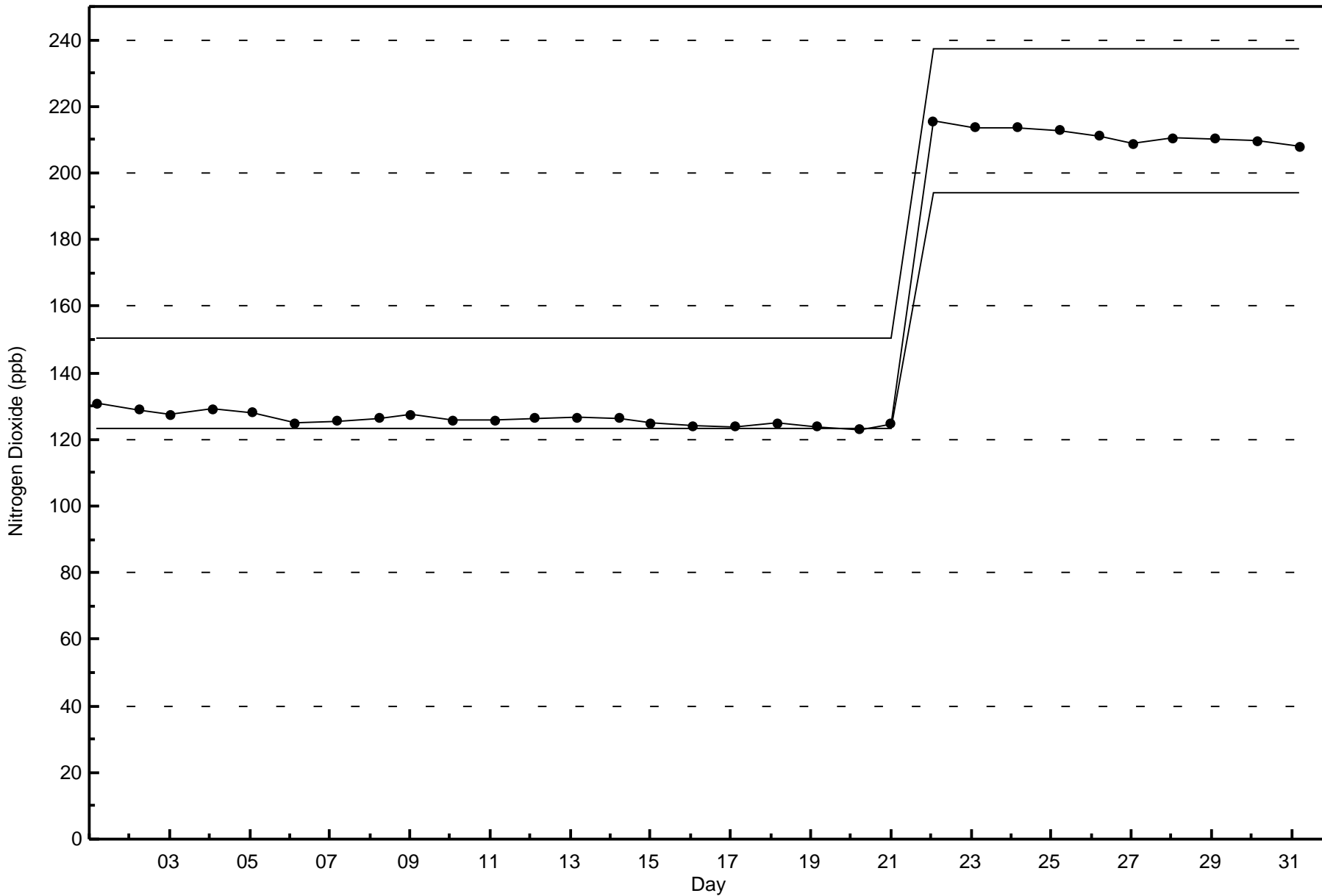


**Wood Buffalo Environmental Association
Wind Rose Jul 2016**

**Nitrogen Dioxide (NO₂) - ppb
Cenovus - Christina Lake (AMS500)**







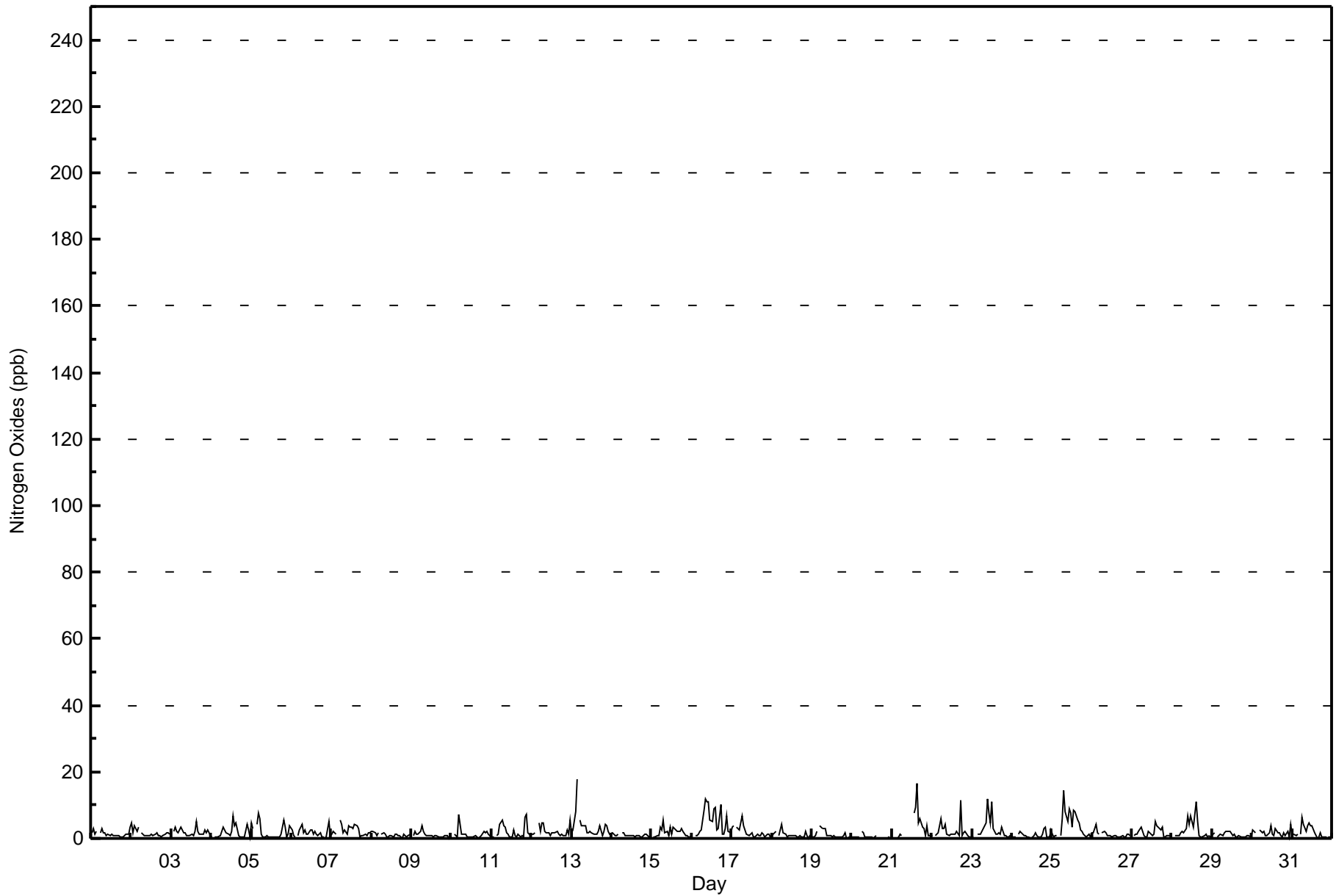


Maximum Value: 18 ppb on Jul 13 04:00		Maximum Daily Average: 4.8 ppb on Jul 16		Hours in Service: 744																																												
Minimum Value: 0 ppb on Jul 31 16:00		Minimum Daily Average: 0.9 ppb on Jul 14		Hours of Data: 701																																												
Maximum Diurnal Average: 3.0 ppb at hour 8		Minimum Diurnal Average: 1.1 ppb at hour 19		Hours of Missing Data: 43																																												
Monthly Average: 1.9 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 1 O ₃ = 2 P ₉₀ = 4 P ₉₉ = 11		Hours of Calibration: 37																																												
				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-Jul	1	3	1	2	Z	2	3	2	2	1	1	1	1	1	1	1	1	0	0	1	1	1	1	3	1.4	3																						
2-Jul	5	2	4	2	3	Z	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1.6	5																						
3-Jul	Z	2	3	2	1	3	3	2	2	1	1	1	1	2	5	2	1	1	1	3	2	2	1	1.9	5																							
4-Jul	1	Z	0	1	0	1	2	3	2	2	1	1	2	7	4	5	1	0	0	0	4	2	1	1.8	7																							
5-Jul	5	3	Z	4	8	6	1	0	1	1	0	0	0	1	0	0	0	1	5	3	0	1	4	2.1	8																							
6-Jul	3	1	0	Z	1	2	4	2	3	1	1	2	3	1	2	1	1	2	0	0	0	1	5	1	1.6	5																						
7-Jul	1	2	2	1	Z	6	4	2	2	1	4	4	4	3	4	4	3	1	1	1	1	1	1	2	2.4	6																						
8-Jul	2	2	2	1	2	Z	1	2	1	0	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1.1	2																						
9-Jul	Z	1	2	1	1	2	4	2	1	1	1	1	0	1	1	0	0	0	1	1	1	0	1	1	1.0	4																						
10-Jul	0	Z	1	1	7	4	1	1	1	0	1	0	0	0	1	1	0	0	1	2	2	2	1	1	1.3	7																						
11-Jul	0	0	Z	1	1	4	6	4	3	2	1	0	1	2	1	1	1	1	1	0	6	7	2	1	2.0	7																						
12-Jul	1	1	2	Z	5	2	5	5	2	2	2	1	2	2	2	2	1	1	1	1	1	2	1	6	2.1	6																						
13-Jul	2	2	8	18	Z	5	4	4	4	2	2	2	2	1	1	1	2	4	1	2	4	4	2	1	3.4	18																						
14-Jul	2	1	1	1	1	Z	2	2	1	1	1	1	1	1	1	0	1	1	1	1	1	0	1	0	0.9	2																						
15-Jul	Z	1	0	1	1	4	2	5	2	2	1	3	1	3	2	2	2	2	3	2	1	1	1	1	1.9	5																						
16-Jul	1	Z	1	1	1	2	2	8	12	11	11	6	5	9	9	3	3	10	1	1	3	7	2	2	4.8	12																						
17-Jul	3	4	Z	3	2	5	7	4	3	1	1	1	2	1	0	1	1	1	2	1	1	1	1	0	2.0	7																						
18-Jul	0	1	2	Z	1	2	4	2	1	1	1	1	1	1	1	0	1	0	1	0	0	2	1	0	1.1	4																						
19-Jul	0	1	1	2	Z	4	3	3	3	1	1	1	0	1	0	0	0	0	1	2	0	0	0	0	1.1	4																						
20-Jul	0	0	0	0	0	Z	2	2	1	0	0	0	0	0	1	M	M	M	M	M	M	M	0	0	--	2																						
21-Jul	Z	0	0	0	0	1	1	C	C	C	C	C	C	8	9	17	5	6	4	3	1	4	1	1	--	17																						
22-Jul	1	Z	1	1	2	6	3	3	4	1	1	1	1	1	1	2	1	11	1	2	2	1	0	0	2.1	11																						
23-Jul	1	0	Z	1	1	1	2	3	5	12	7	5	11	3	1	1	2	1	3	1	1	0	0	1	2.8	12																						
24-Jul	0	1	0	Z	1	2	1	1	1	1	0	0	1	1	2	1	1	1	1	3	3	0	0	2	1.1	3																						
25-Jul	1	0	1	1	Z	1	6	14	8	5	9	8	4	8	8	6	5	3	2	1	0	1	1	1	4.0	14																						
26-Jul	2	2	4	2	1	Z	2	2	2	1	1	1	1	1	1	0	0	1	0	0	1	1	1	1	1.2	4																						
27-Jul	Z	1	1	1	2	3	2	1	1	1	2	1	1	1	5	4	3	3	4	0	1	1	1	1	1.7	5																						
28-Jul	1	Z	1	1	1	2	2	2	3	7	4	7	5	4	11	5	1	0	0	1	1	1	1	0	2.6	11																						
29-Jul	1	2	Z	1	1	1	1	2	2	2	2	2	1	1	0	0	1	1	1	0	0	1	1	0	1.0	2																						
30-Jul	2	2	2	Z	2	2	2	2	1	1	2	4	1	1	3	2	2	1	0	2	1	2	0	4	1.8	4																						
31-Jul	1	1	1	1	Z	1	6	4	2	4	5	4	4	2	1	0	0	2	1	0	0	0	0	0	1.9	6																						
																								1.4	1.4	1.6	2.0	2.0	2.9	2.9	3.0	2.5	2.2	2.2	2.0	1.9	2.1	2.5	2.3	1.4	1.9	1.1	1.2	1.5	1.6	1.1	1.3	Diurnal Average
																								5	4	8	18	8	6	7	14	12	12	11	8	11	9	11	17	5	11	4	5	6	7	5	6	Diurnal Maximum
Z - zerospan C - Calibration M - Maintenance																																																



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Cenovus - Christina Lake - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Cenovus - Christina Lake - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	701	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: 701

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Cenovus - Christina Lake - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	45	42	28	19	22	39	42	39	42	49	69	88	33	35	68	41	701
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	45	42	28	19	22	39	42	39	42	49	69	88	33	35	68	41	701

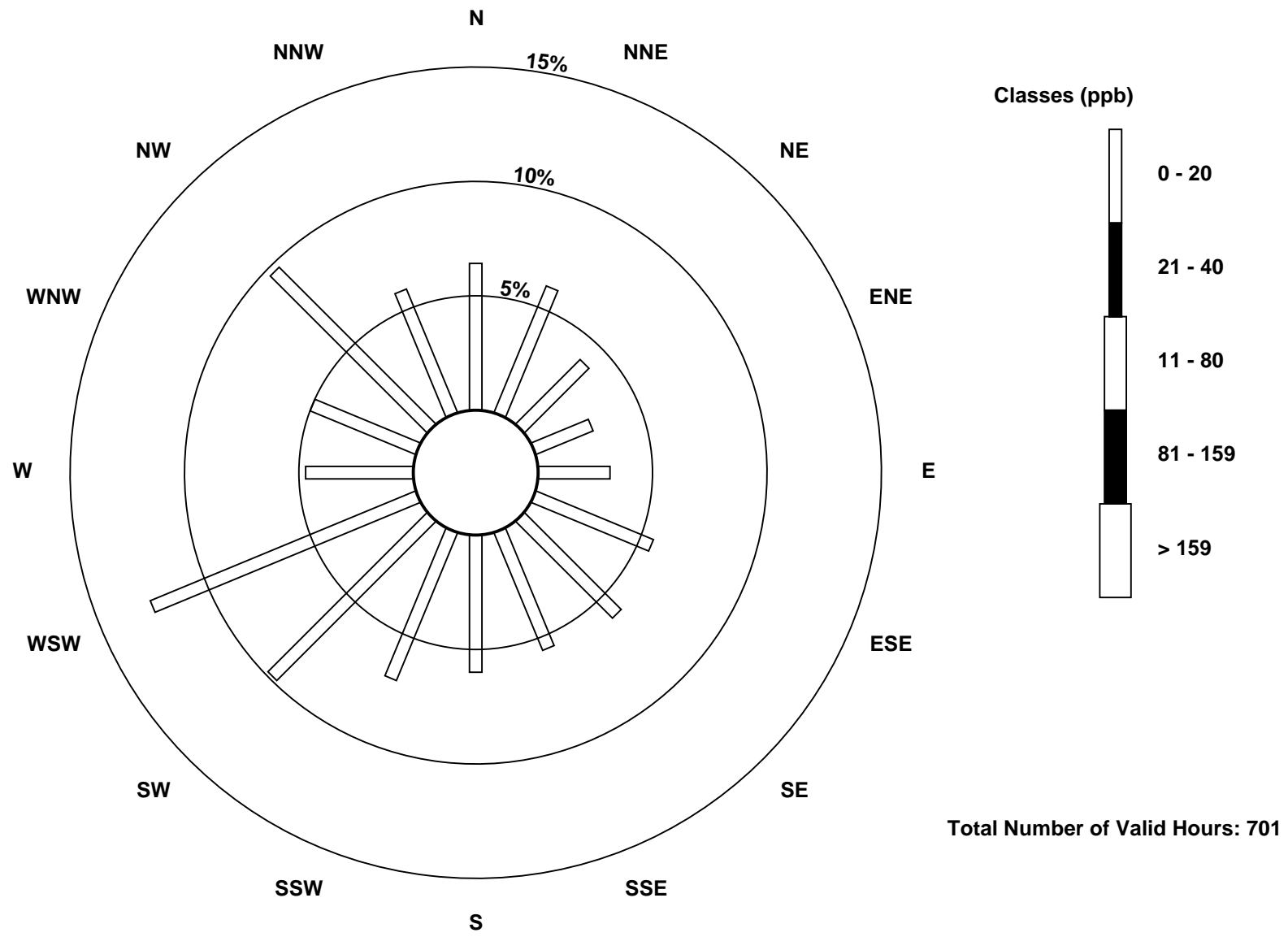
Total Number of Valid Hours: 701

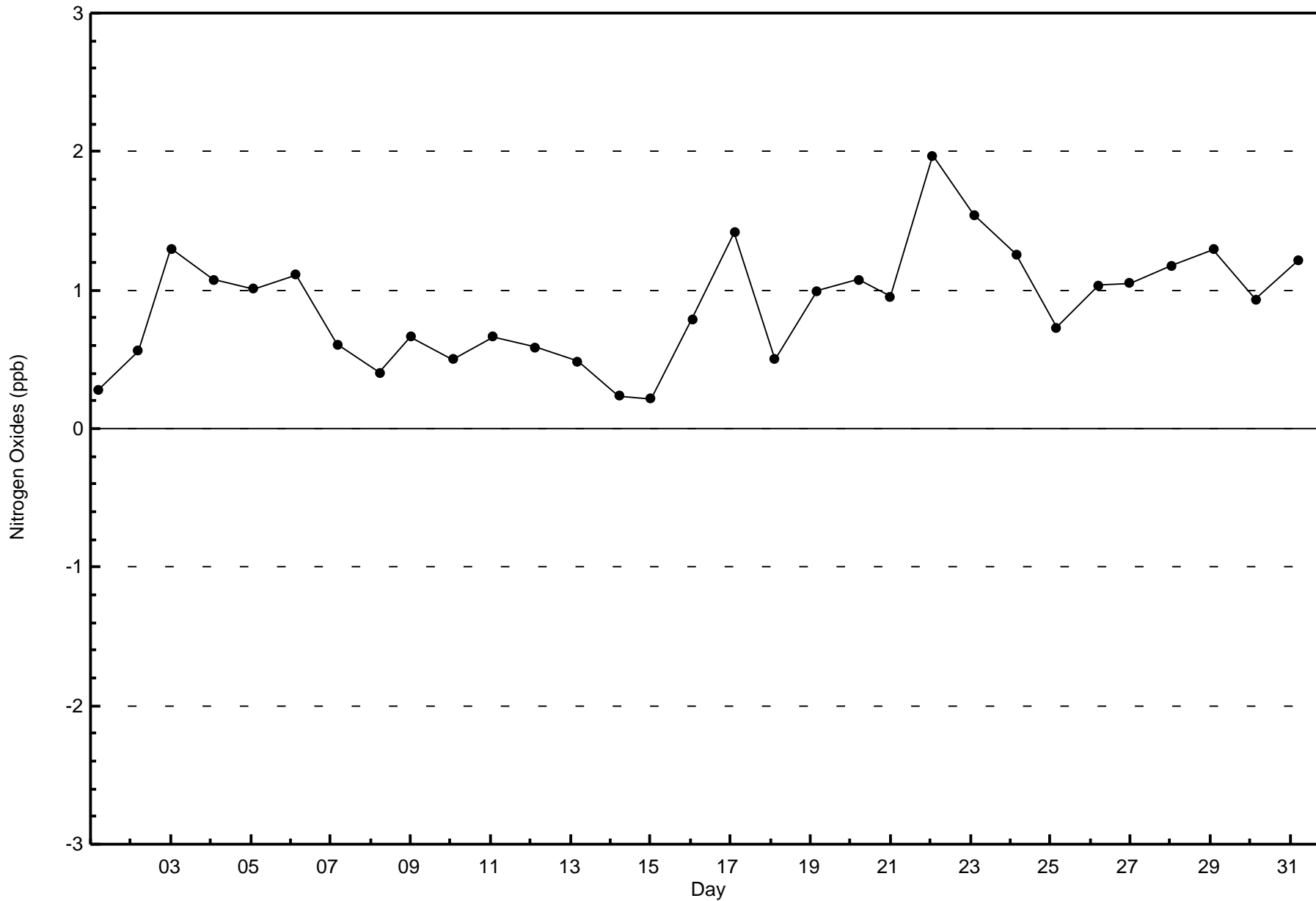
Total Number of Hours: 744

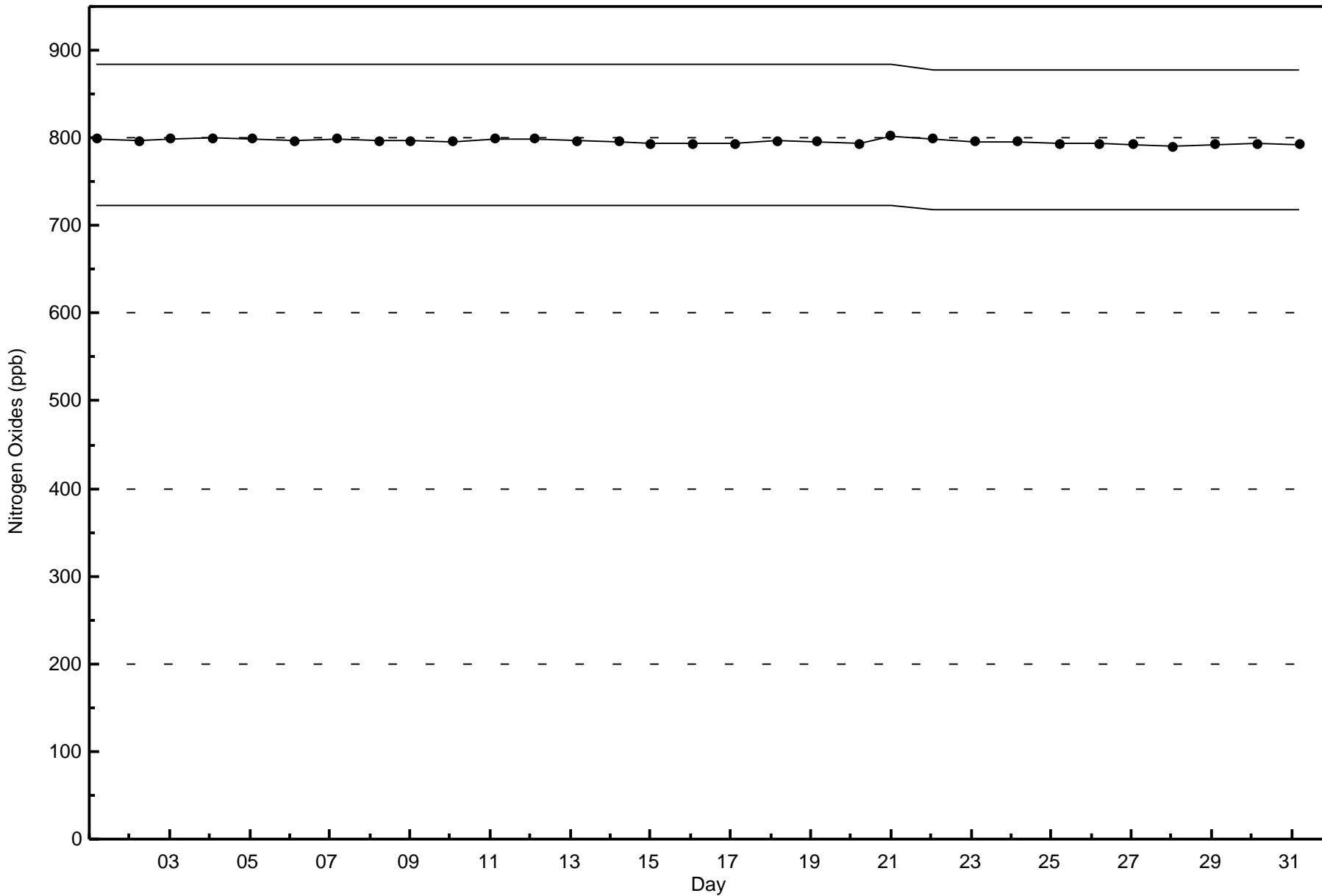


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Nitrogen Oxides (NO_x) - ppb
Cenovus - Christina Lake (AMS500)





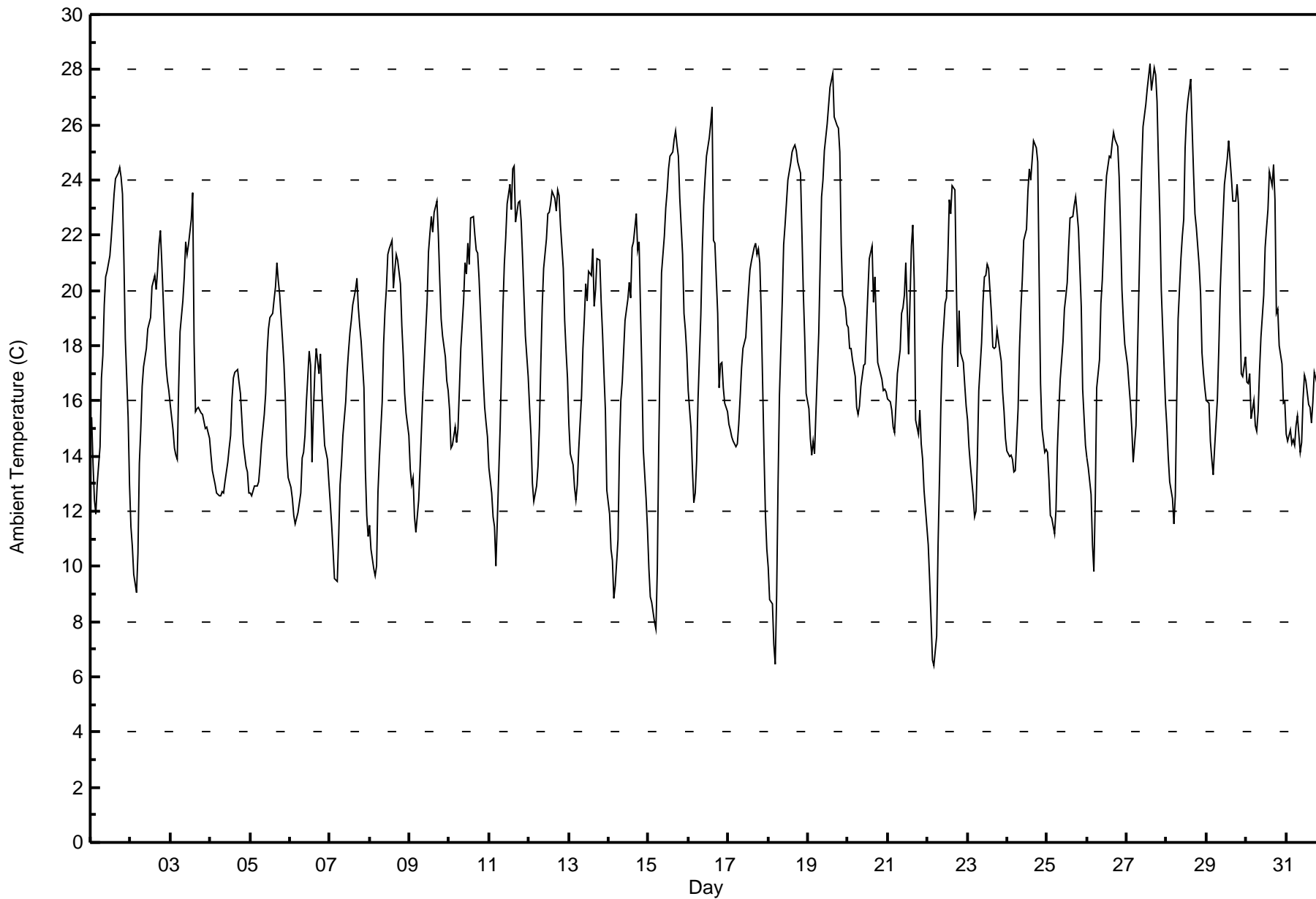




Wood Buffalo Environmental Association
Summary of Hour Averages

Ambient Temperature (AT) - C
Cenovus - Christina Lake - July 2016

Maximum Value: 28.2 C on Jul 27 15:00 Maximum Daily Average: 21.8 C on Jul 27																						Hours in Service: 744 Hours of Data: 744																									
Minimum Value: 6.4 C on Jul 22 05:00 Minimum Daily Average: 14.3 C on Jul 4 Maximum Diurnal Average: 22.3 C at hour 15 Minimum Diurnal Average: 12.0 C at hour 5 Monthly Average: 17.79 C Percentiles: P₁ = 8.0 P₁₀ = 12.5 Q₁ = 14.4 Median = 17.4 Q₃ = 21.2 P₉₀ = 24.0 P₉₉ = 27.6																						Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																							
1-Jul	15.4	13.7	12.4	11.9	13.0	14.3	16.8	17.6	19.5	20.5	20.7	21.2	21.9	22.7	23.5	24.1	24.3	24.5	24.1	23.5	21.1	18.3	15.4	13.0	18.9	24.5																					
2-Jul	11.4	10.7	9.7	9.0	10.5	13.7	15.0	16.5	17.3	17.9	18.6	18.8	19.0	20.1	20.5	20.0	20.8	21.6	22.2	21.0	18.4	17.3	16.7	16.4	16.8	22.2																					
3-Jul	15.9	14.9	14.3	14.0	13.9	16.5	18.5	19.6	20.5	21.7	21.3	21.7	22.6	23.5	18.1	15.6	15.7	15.8	15.5	15.3	15.0	15.1	14.6	17.3	23.5																						
4-Jul	14.0	13.5	13.2	13.0	12.7	12.6	12.7	12.7	13.1	13.8	14.3	14.7	16.1	16.8	17.0	17.1	16.7	16.3	15.4	14.4	13.6	13.4	12.7	14.3	21.1																						
5-Jul	12.7	12.5	12.9	12.9	12.9	13.1	13.7	14.4	15.5	16.3	17.8	18.6	19.0	19.2	19.7	20.1	21.0	20.3	19.8	18.2	17.3	16.1	14.0	13.2	16.3	21.0																					
6-Jul	12.9	12.5	11.9	11.6	11.8	12.0	12.6	13.9	14.1	14.8	16.0	17.8	17.3	13.8	15.6	17.1	17.9	17.0	17.7	16.3	15.4	14.4	13.9	13.1	14.6	17.9																					
7-Jul	12.3	11.5	10.6	9.6	9.4	11.1	13.0	13.7	14.8	16.0	17.0	17.8	18.5	18.9	19.5	20.0	20.4	19.4	18.7	18.2	16.5	13.5	11.9	11.1	15.1	20.4																					
8-Jul	11.5	10.6	9.9	9.6	10.0	12.7	13.9	16.0	18.0	19.3	20.1	21.3	21.5	21.8	20.1	20.8	21.3	21.1	20.2	18.7	17.6	16.3	15.5	14.7	16.8	21.8																					
9-Jul	13.5	13.0	13.2	11.8	11.3	12.4	13.6	15.0	16.4	17.5	19.6	21.4	22.1	22.7	22.1	22.8	23.2	22.0	20.4	19.0	18.3	17.6	16.7	16.4	17.6	23.2																					
10-Jul	15.7	14.3	14.4	15.0	14.5	15.0	16.4	17.9	19.6	21.0	20.6	21.7	21.0	22.6	22.7	22.0	21.5	21.4	20.4	18.0	16.8	15.8	15.2	14.7	18.3	22.7																					
11-Jul	13.6	12.7	11.8	11.5	10.0	11.6	15.0	17.2	19.3	20.9	21.9	23.1	23.8	22.9	24.4	24.5	22.5	23.2	23.2	22.5	21.2	19.8	18.3	16.9	18.8	24.5																					
12-Jul	15.8	14.8	13.0	12.4	12.9	13.7	15.0	17.3	19.4	20.8	21.9	22.8	22.8	23.1	23.6	23.3	22.9	23.6	23.4	22.4	20.8	18.9	17.8	16.8	19.1	23.6																					
13-Jul	15.1	14.1	13.7	12.9	12.4	12.9	14.2	16.2	17.9	19.0	20.2	19.6	20.7	20.5	21.5	19.4	20.0	21.2	21.1	19.6	18.4	17.0	15.7	12.8	17.3	21.5																					
14-Jul	11.9	10.6	10.2	8.9	9.3	11.0	14.2	16.0	16.7	17.8	18.9	19.7	20.3	19.7	21.6	21.8	22.8	21.4	21.8	19.3	17.0	14.2	12.5	11.3	16.2	22.8																					
15-Jul	9.9	8.9	8.7	8.0	7.7	9.9	14.3	17.8	20.6	22.0	23.0	23.6	24.4	24.9	25.0	25.5	25.8	25.3	24.9	23.3	21.3	19.2	18.6	17.7	18.8	25.8																					
16-Jul	16.4	15.0	13.5	12.3	12.7	13.8	16.1	19.1	21.4	23.1	24.0	24.9	25.5	26.0	26.7	21.8	21.7	19.2	16.5	17.3	17.4	16.5	15.9	15.6	18.8	26.7																					
17-Jul	15.1	14.9	14.7	14.6	14.3	14.5	15.1	16.1	17.2	17.9	18.3	19.2	20.0	20.7	21.0	21.6	21.7	21.3	21.5	21.0	19.2	14.1	11.9	10.6	17.4	21.7																					
18-Jul	9.9	8.8	8.6	7.1	6.5	9.0	12.9	16.2	19.6	21.6	22.4	23.2	24.0	24.6	25.0	25.1	25.3	25.1	24.7	24.3	22.1	19.9	18.3	16.3	18.4	25.3																					
19-Jul	15.7	14.7	14.0	14.5	14.1	15.6	18.5	20.9	23.4	24.0	25.1	26.0	26.7	27.4	27.6	27.9	26.3	26.0	25.9	25.0	21.7	19.8	19.4	18.8	21.6	27.9																					
20-Jul	18.7	17.9	17.9	17.5	16.9	15.7	15.5	15.8	16.5	17.3	17.3	18.7	19.9	21.2	21.6	19.6	20.5	18.9	17.4	17.2	16.8	16.4	16.4	16.3	17.8	21.6																					
21-Jul	16.1	16.0	15.7	15.0	14.8	15.9	17.0	17.9	19.2	19.4	19.8	21.0	17.7	19.6	21.6	22.4	20.3	15.3	14.8	15.7	14.5	13.9	12.7	11.5	17.0	22.4																					
22-Jul	10.8	9.5	8.1	6.6	6.4	7.5	10.8	13.2	15.9	17.9	19.5	19.7	21.3	23.3	22.8	23.8	23.7	20.3	17.2	19.3	17.7	17.4	16.6	15.8	16.0	23.8																					
23-Jul	15.3	14.4	13.7	12.6	11.8	12.0	13.9	16.4	18.1	19.6	20.5	20.5	20.9	20.8	19.2	17.9	17.9	17.9	18.6	17.8	17.4	16.3	15.6	14.6	16.8	20.9																					
24-Jul	14.2	14.0	14.1	13.9	13.4	13.5	15.7	17.9	19.3	20.4	21.8	22.2	23.6	24.4	24.0	24.7	25.4	25.2	24.7	20.4	16.6	15.0	14.1	14.2	18.9	25.4																					
25-Jul	14.1	13.1	11.9	11.7	11.2	12.1	14.3	15.6	16.8	18.2	19.3	19.8	20.3	21.6	22.6	22.7	23.1	23.4	22.8	22.2	19.4	16.4	15.4	14.4	17.6	23.4																					
26-Jul	13.9	13.6	12.6	10.8	9.8	12.5	16.5	17.5	19.5	20.4	21.8	23.3	24.2	24.9	24.8	25.3	25.7	25.5	25.2	24.1	22.2	20.1	18.9	18.1	19.6	25.7																					
27-Jul	17.3	16.6	15.9	15.0	13.8	15.1	17.5	19.9	22.3	24.4	25.9	26.8	27.3	27.7	28.2	27.2	28.1	27.8	26.8	24.7	22.7	20.0	17.2	15.9	21.8	28.2																					
28-Jul	15.0	14.0	13.1	12.5	11.5	12.6	16.0	19.0	21.2	22.0	22.6	25.1	26.3	26.9	27.7	25.9	24.2	22.8	22.3	20.9	19.9	17.7	17.0	16.5	19.7	27.7																					
29-Jul	16.0	15.9	14.5	13.9	13.3	14.3	16.1	17.9	20.1	21.4	22.7	23.8	24.8	25.4	24.8	24.1	23.2	23.2	23.8	23.1	19.4	17.0	16.9	17.6	19.7	25.4																					
30-Jul	16.7	16.6	17.0	15.3	16.0	15.1	14.9	15.6	17.1	18.3	19.8	21.5	22.2	22.9	24.3	23.8	24.6	23.3	19.2	19.3	18.0	17.3	15.9	16.0	18.8	24.6																					
31-Jul	14.8	14.5	14.9	14.4	14.6	14.4	15.1	15.4	14.1	14.5	16.1	16.9	16.7	15.9	15.8	15.2	15.9	17.0	16.8	16.3	15.6	14.8	14.2	13.6	15.3	17.0																					
																						14.2	13.5	12.9	12.3	12.0	13.1	15.0	16.7	18.2	19.3	20.3	21.2	21.7	22.1	22.3	22.0	22.1	21.5	20.9	20.0	18.4	16.8	15.7	14.9	Diurnal Average	
																						18.7	17.9	17.9	17.5	16.9	16.5	18.5	20.9	23.4	24.4	25.9	26.8	27.3	27.7	28.2	27.9	28.1	27.8	26.8	25.0	22.7	20.1	19.4	18.8	Diurnal Maximum	





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Cenovus - Christina Lake - July 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	26	3.49	3.49
10 - 20	474	63.71	67.20
> 20	244	32.80	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



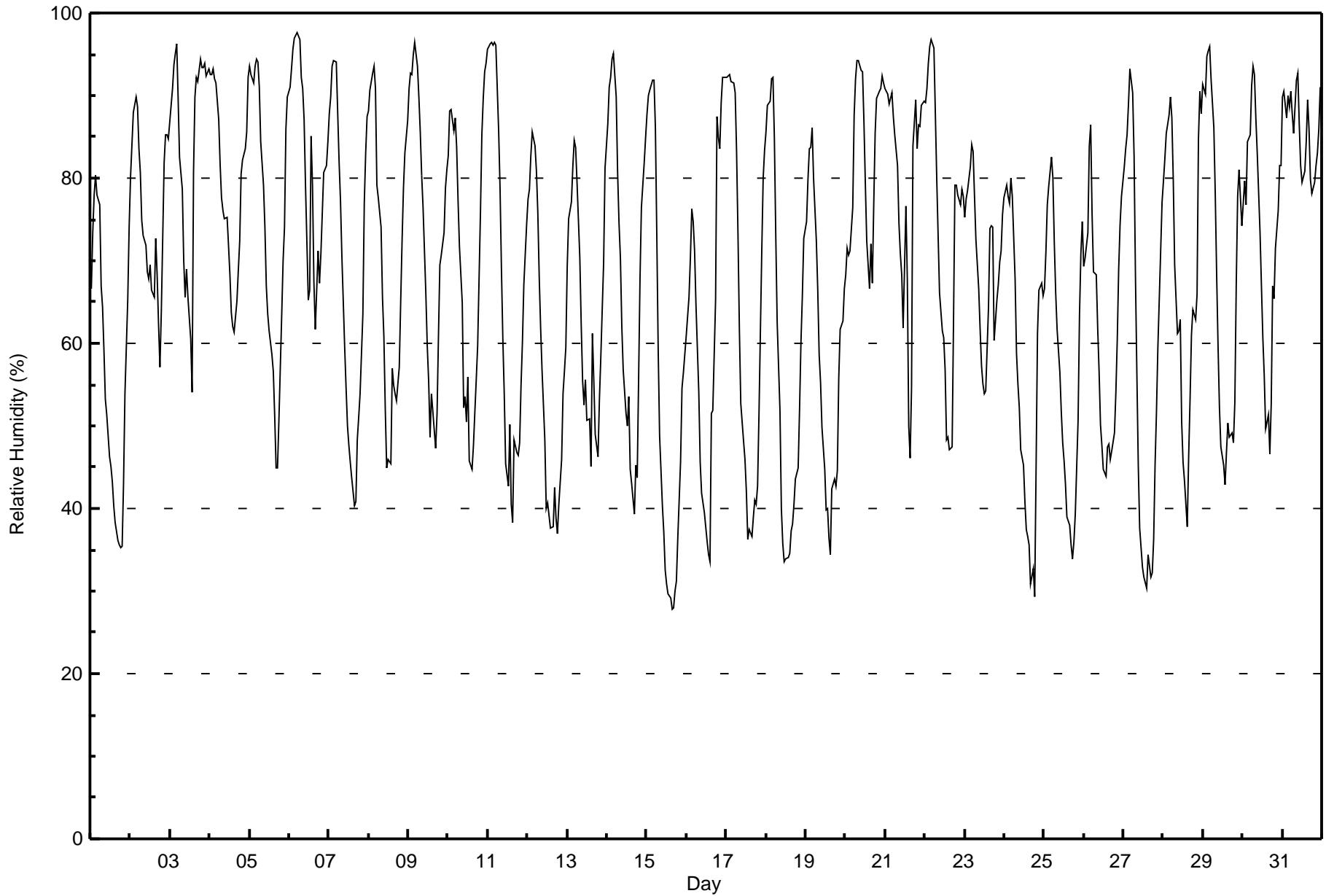
Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

Cenovus - Christina Lake - July 2016

Maximum Value: 98 % on Jul 6 06:00																		Maximum Daily Average: 85.9 % on Jul 31																		Hours in Service: 744	
Minimum Value: 28 % on Jul 15 16:00																		Minimum Daily Average: 53.7 % on Jul 15																		Hours of Data: 744	
Maximum Diurnal Average: 89.0 % at hour 5																		Minimum Diurnal Average: 49.2 % at hour 15																		Hours of Missing Data: 0	
Monthly Average: 68.2 %																		Percentiles: P ₁ = 31 P ₁₀ = 41 Q ₁ = 52 Median = 70 Q ₃ = 85 P ₉₀ = 92 P ₉₉ = 96																		Hours of Calibration: 0	
																																				Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24													
1-Jul	67	73	78	80	78	77	67	64	59	53	51	46	45	43	40	38	36	36	35	35	43	54	65	74	55.9	80											
2-Jul	80	84	88	90	89	84	81	75	73	72	69	68	70	67	66	73	68	62	57	64	82	85	85	85	75.6	90											
3-Jul	87	91	94	95	96	90	82	79	70	66	69	66	60	54	81	90	92	92	94	93	93	94	92	93	83.9	96											
4-Jul	93	93	93	92	92	87	82	78	76	75	75	72	68	64	62	61	65	69	72	80	82	84	86	92	78.8	93											
5-Jul	94	93	92	94	94	94	91	84	79	74	67	64	62	59	57	51	45	45	51	63	70	74	86	90	73.8	94											
6-Jul	91	93	96	97	97	98	97	92	91	87	79	65	66	85	79	67	62	71	67	71	76	81	82	84	82.3	98											
7-Jul	88	90	94	94	94	88	82	77	71	60	55	50	48	46	44	40	41	48	51	54	64	77	83	87	67.6	94											
8-Jul	88	91	93	94	91	79	78	74	66	61	52	45	46	45	57	55	54	53	57	65	72	79	83	87	69.3	94											
9-Jul	91	93	92	95	96	94	90	86	80	76	66	60	55	49	54	52	47	52	61	70	71	73	79	81	73.4	96											
10-Jul	83	88	88	86	87	84	77	72	65	52	54	51	56	46	45	48	52	56	60	76	85	90	93	94	70.2	94											
11-Jul	96	96	97	96	96	96	86	79	69	60	54	45	43	50	41	38	48	47	46	48	55	60	67	74	66.2	97											
12-Jul	77	79	83	86	84	81	76	68	62	57	48	40	41	39	38	38	43	39	37	40	46	54	57	60	57.1	86											
13-Jul	69	75	77	81	85	84	79	70	62	55	53	56	51	51	45	61	55	49	46	53	58	64	70	81	63.8	85											
14-Jul	87	91	92	94	95	90	81	75	70	62	57	52	50	54	45	43	39	45	44	56	68	77	82	85	68.0	95											
15-Jul	88	90	91	92	92	86	73	59	49	40	37	32	31	30	29	28	28	30	31	36	46	55	56	59	53.7	92											
16-Jul	61	66	70	76	75	71	65	54	46	42	41	39	36	34	34	52	52	65	88	85	84	89	92	92	62.8	92											
17-Jul	92	92	92	92	92	90	83	73	62	53	48	46	42	36	37	37	39	41	40	43	51	71	80	83	63.2	92											
18-Jul	86	89	89	92	92	85	73	62	52	40	36	34	34	34	35	37	38	41	44	45	52	60	66	73	57.8	92											
19-Jul	75	80	84	84	86	80	72	66	59	55	50	45	40	40	37	34	42	43	43	45	56	62	63	67	58.6	86											
20-Jul	68	71	71	71	77	88	92	94	94	93	93	87	79	72	67	72	67	77	85	90	91	91	92	92	82.2	94											
21-Jul	91	90	89	90	90	88	85	81	75	71	68	62	77	68	50	46	55	84	89	84	86	86	89	89	78.4	91											
22-Jul	89	91	94	96	97	96	88	80	73	66	62	61	57	48	49	47	48	63	79	79	78	77	79	78	73.9	97											
23-Jul	75	77	79	81	84	83	78	73	67	62	57	55	54	54	64	74	74	74	60	65	67	70	71	76	69.8	84											
24-Jul	78	79	78	77	80	78	68	59	55	52	47	45	41	37	37	36	31	33	29	45	61	66	67	66	56.0	80											
25-Jul	67	71	77	79	82	80	72	66	62	57	52	48	46	43	39	38	36	34	36	39	51	63	71	75	57.6	82											
26-Jul	69	70	73	84	86	76	69	68	62	57	50	48	45	44	47	48	46	47	49	54	61	69	74	78	61.4	86											
27-Jul	81	84	85	89	93	90	83	68	56	45	38	33	32	31	30	34	32	32	36	45	52	59	71	77	57.4	93											
28-Jul	80	82	85	88	90	87	80	70	61	62	63	51	46	43	38	46	53	61	64	63	66	85	90	88	68.4	90											
29-Jul	91	90	95	95	96	92	86	78	68	60	52	48	45	43	47	50	49	49	48	53	67	78	81	74	68.2	96											
30-Jul	77	80	77	84	85	91	94	93	87	83	73	67	61	56	50	51	47	53	67	65	72	76	81	82	73.0	94											
31-Jul	90	91	87	90	89	91	88	85	92	93	87	82	80	81	84	89	86	80	78	79	82	83	86	91	85.9	93											
82.1																		84.6																		Diurnal Average	
96																		97																		Diurnal Maximum	





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity (RH) - %
Cenovus - Christina Lake - July 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	63	8.47	8.47
40 - 60	192	25.81	34.27
60 - 80	238	31.99	66.26
80 - 100	251	33.74	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Speed: 26 km/h on Jul 24 20:00	Maximum Daily Speed Average: 14.0 km/h on Jul 24	Hours in Service: 744
Minimum Speed Value: 0 km/h on Jul 9 00:00	Minimum Daily Speed Average: 0.3 km/h on Jul 28	Hours of Data: 744
Maximum Diurnal Speed Average: 5.1 km/h at hour 13	Minimum Diurnal Speed Average: 1.4 km/h at hour 19	Hours of Missing Data: 0
Monthly Average Velocity: 2.4 km/h 274.6 deg	Percentiles: P ₁ = 1 P ₁₀ = 3 Q ₁ = 5 Median = 8 Q ₃ = 11 P ₉₀ = 14 P ₉₉ = 21	Percent Operational Time: 100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Jul	ESE4	ESE4	ESE5	ESE4	ESE4	ESE4	SE8	SSE8	SE9	SE11	ESE13	ESE11	ESE11	SE11	E11	ESE12	ESE13	ESE13	ESE14	SE12	SSE8	SSE7	ESE5	SE3	ESE8.3	ESE14	
2-Jul	SSE3	SSE3	SE4	SSE3	SSE3	E3	ESE7	SE11	SE11	SE11	ESE12	SE12	SE10	ESE13	E11	ESE11	ESE10	SE13	ESE13	SE11	SE6	SE5	SSE8	SSE8	SE7.9	SE13	
3-Jul	SE7	SE4	ESE5	ESE5	E3	SSE4	ESE6	SSE7	SE11	SE14	SSE16	SE15	SE13	SE11WNW12	W14WSW10	E4	S4	WSW7	W8WSW10	WSW9WSW11					S4.3	SSE16	
4-Jul	WSW10WSW10	WSW8	WSW9	WSW9	WSW11	WSW11	WSW9	WSW11	WSW11	WSW10	WSW11	W13	W11WNW10	NW11	NE6	NE8	NE7	NE8	NE7	NE8	NNE11	NW13	NW4	SW4	W5.8	NW13	
5-Jul	W8	W10	NW14	NW12	NW12	NW13	N13	NNE17	N15	N16	NNE18	N22	N24	NNE21	NE21	NE15	NNE18	NE15	NNE6	NW9	N6	E5	NNE3	WSW8	N10.3	N24	
6-Jul	W5	E4	ESE2	SSW2	SW3	SE2	SSW5	W6	W3	SW5	WSW3	NW7	NNW7	NE6	E7	E6	NE7	N9	NNE6	NE8	N7	N5	NNW7	NNW4	N2.0	N9	
7-Jul	NW8	NW4	WNW4	SW4	WSW4	NW6	N7	NNW8	NW6	NW8	NW11	NNW13	NW13	NW13	NW13	NW13	NNW12	N14	NNE12	NNE10	NE8	ESE3	SSE3	S3	NNW6.3	N14	
8-Jul	SE1	E2	S3	SE2	SE2	NNE3	ENE2	NE6	NE7	NNE4	E6	E10	ENE10	ESE7	SSE12	SE3	NE4	ENE8	ESE10	SE7	ENE6	NNE8	NE2	SE0	E4.0	SSE12	
9-Jul	SSE2	SSW2	W2	SSW3	WSW4	WNW5	NW3	NNE4	NNE5	NNE7	NNE7	N7	N9	NE8	NNE16	NE14	ENE12	E12	ENE15	ENE13	ENE9	ENE5	SE5	NE4	NE5.1	NNE16	
10-Jul	NNE3	SE2	NE2	NW7	NNW9	NW7	NNW4	NNE6	NNE6	ENE13	ENE12	NE11	NNE14	NNE14	ENE12	SE12	SE10	SSE7	NW5	NW5	NW9	ENE1	WNW1	SSE3	NE3.6	NNE14	
11-Jul	SE2	SSE1	SSE1	W1	S2	SSE3	NW3	NNW4	N5	N7	N9	N12	NNE15	NW18	N19	NNE17	NNE3	NNE16	N14	N12	NW11	NNW10	NW8	NW9	N6.9	N19	
12-Jul	NW8	NW2	SW3	SW4	WSW4	WNW8	NW8	NW8	NNW10	NNW13	NNW18	NNW21	N20	NNW20	NNW19	NNW19	N17	N17	N15	N14	NNW10	NNW6	NW8WNW10		NNW10.8	NNW21	
13-Jul	NW9	NW8WNW11	WNW7	NW10	NW11	NW12	NW13	NNW17	NNW17	N14	NNW16	NNW15	NNW11	N11	NW3	NW8	NW11	N12	NNW8	NNW9	NNW6	NW6	NNE3		NNW9.8	NNW17	
14-Jul	NNE2	N3	NE1	S2	SW4	W1	N4	NNE5	NNE9	NNE10	N8	NNE8	NE7	NE5	NNE9	NNW7	N8	ESE11	E10	ESE5	ESE3	SSW3	SSW4	S3	NE3.2	ESE11	
15-Jul	S4	S4	S4	S3	S4	S3	SSE3	SSE1	NE4	ESE3	ENE4	WSW2	NNW3	NNW6	NW6	N7	NNW9	NW10	NNW9	NNW2	SW7	SW8	SW9WSW10		W1.8	NW10	
16-Jul	WSW8	SW4	SW6	SW5	WSW8	SW6	SW5	WNW7	NNW10	NNW14	NNW15	NNW14	NW15	NNW15	NNW15	N11	WNW9	W14	SSW7	SSW4	WSW7	NW14	NW6	NW10	WNW7.7	WNW15	
17-Jul	NW9	NW9	NW8	NW9	NW9	NW9	NNW9	NNW9	NNW12	N16	NNE15	N12	N11	N11	NNE11	N10	N10	N7	N11	N8	NNE5	SSW4	S4	S4	NNW7.6	N16	
18-Jul	S2	SSE3	SW3	S3	SSE4	SSE2	SE2	SSE3	S5	SW6	S7	SW9	WSW9	SW9	SW9	SW10	WSW10	SSW9	SSW10	SW10	SSW8	S6	SSW6	S6	SSW5.8	SW10	
19-Jul	S5	SSE3	SSE2	E2	ENE3	ESE2	S6	S7	SSW7	SSW9	SSW10	SSW14	SW14	WSW15	WSW15	SW15	WSW13	WSW14	WSW13	W12	NW12	SW6	SW9	WSW7	SW7.3	WSW15	
20-Jul	SW6	WSW7	WSW8	WSW9	WSW9	SW8	SW8	SW7	SW8	SW8	SW8	WSW11	SW12	WSW13	W13	NW16	WNW13	NW14	WSW10	SW8	WSW8	SW9	SW10	SW10	WSW8.4	NW16	
21-Jul	WSW11	WSW10	WSW9	WSW7	SW7	SW9	SW11	WSW13	WSW14	WSW15	WSW15	W17	WNW20	WNW17	WNW22	WNW20	WNW18	WNW14	WSW10	W11	WSW10	NNW10	NNE8	NNE5	W10.4	WNW22	
22-Jul	NE6	E5	SE4	SSE4	SE3	SE3	SE7	SSE9	S12	SSW13	SSW13	SSW16	S15	SW18	SW14	SSW13	SSW20	WSW12	SSW11	S8	SSW9	WSW9	WSW9	SW8	SSW8.3	SSW20	
23-Jul	SW8	WSW8	WSW9	WSW8	SW5	SW8	WSW6	W9	W11	WNW11	WNW11	W13	W14	W11	N6	E7	SE7	SSW4	WSW12	SW8	SW7	SW9	WSW8	SW6	WSW6.7	W14	
24-Jul	SW9	SW10	SW9	SW10	SSW10	SW11	SW12	SW14	WSW14	WSW16	WSW19	WSW18	WSW21	WSW21	WSW19	WSW21	WSW25	WSW21	W22	NW26	NW10	SW8	WSW9	WSW10	WSW14.0	NW26	
25-Jul	WSW12	SW8	SW9	SW10	WSW9	WSW9	WSW7	NW17	WNW14	W13	W14	NW17	NW16	NW12	WNW13	NW14	WNW12	WNW10	NNW6	NNE3	ESE6	ESE5	ESE4	ESE5	WNW7.2	NW17	
26-Jul	SSE7	S4	SE3	E3	SE2	S5	SSW7	SSW5	SSW9	SW13	SSW14	SSW14	SSW12	SSW12	SW11	SW12	SW13	SSW13	SW11	SW9	SSW8	S5	S8	S9	SSW8.0	SSW14	
27-Jul	SSW7	SSW4	SSE3	SSE4	SE4	SSE4	SSW4	SW7	SW7	WSW8	W7	WSW7	SW6	WNW5	W8	W8	WNW10	NW10	NNW12	NNE10	NNE8	NE1	SSW3	S3	W2.7	NNW12	
28-Jul	S2	S4	SSE3	S2	S4	ESE1	SE3	ENE4	ESE3	S1	ENE3	N3	NW12	WNW6	WNW11	NNE12	NE10	ESE10	E5	NE7	SW7	SW7	S4	S5	ENE0.3	NW12	
29-Jul	ENE3	W3	SSW5	SSW7	S6	SSW4	SSW5	WSW3	NW3	WSW5	WSW6	W4	E1	WSW6	WSW9	WSW11	SSW10	SSW6	SSW6	SSE4	S7	SSE4	S5	S8	SSW4.2	WSW11	
30-Jul	S5	SSW4	SSW2	SSW4	W12	SSW8	E5	SW7	SSW5	WSW8	WSW9	NW8	N5	ENE4	ENE6	E4	SE4	SSE9	S12	E10	ESE7	W4	SSW6	NW3	SSW2.4	W12	
31-Jul	S6	SSE5	E1	SW5	WSW5	WSW6	NNW12	W12	W12	NW10	WNW9	NNW11	NW14	WSW11	WSW12	WSW12	WSW7	W10	W11	WSW10	WSW10	WSW10	WSW10	WSW10	WSW10	W7.8	NW14

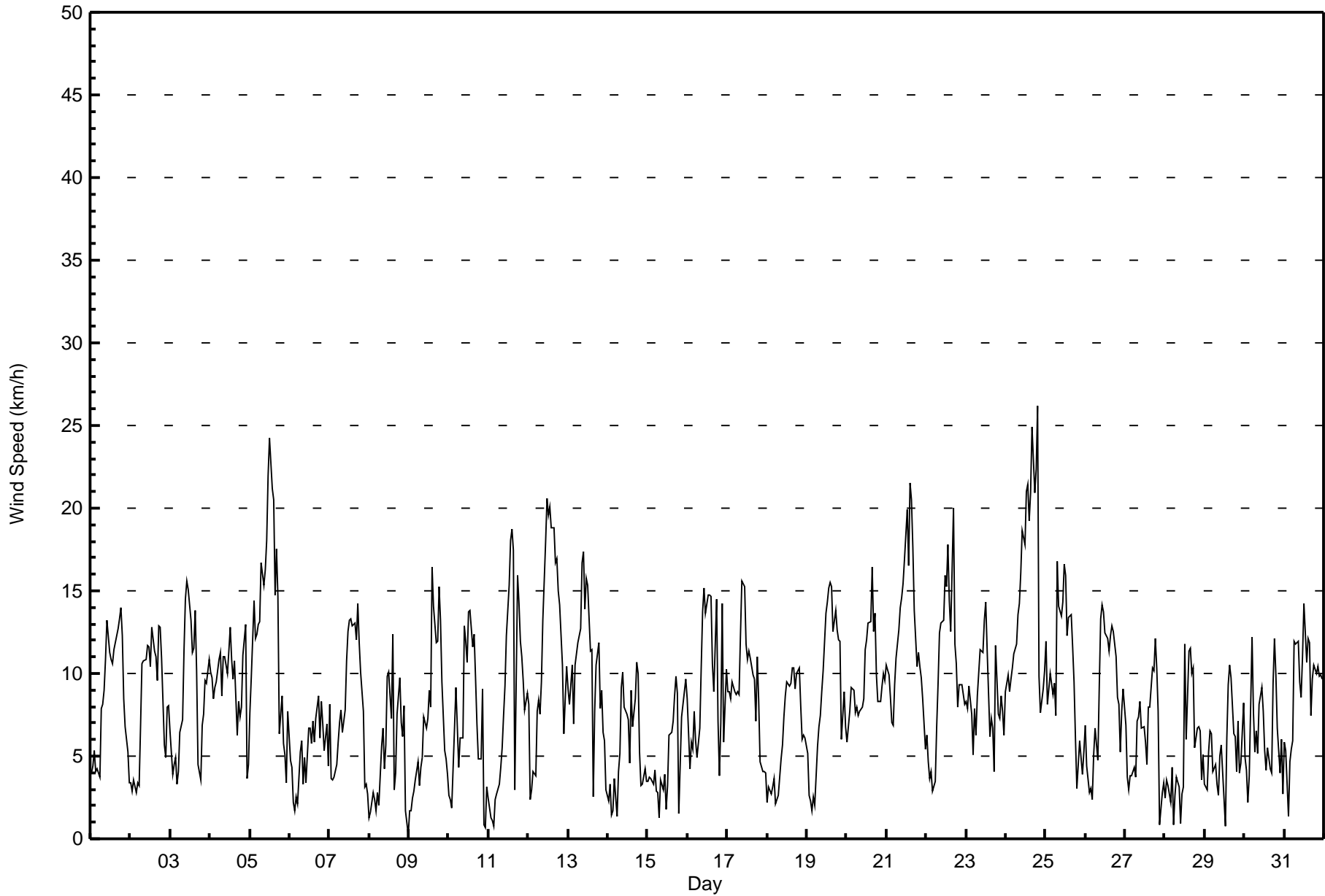
SW2.8	SW2.5	SW2.5	SW2.9	WSW3.2	WSW2.9	WSW1.9	W2.5	W2.7	NNW3.0	NNW2.8	NNW3.9	NW5.1	NNW4.2	NW4.6	NW3.4	NNW2.9	NW1.8	NNW1.4	NNW1.5	NNW1.5	W2.2	SW2.9	SW3.4		Diurnal Average
WSW12	SW10	NW14	NW12	NW12	NW13	N13	NW17	NNW17	NNW17	WSW19	N22	N24	WSW21	WNW22	WSW21	WSW25	WSW21	W22	NW26	NW12	NW14	SW10	WSW11		Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed (WS) - km/h
Cenovus - Christina Lake - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Cenovus - Christina Lake - July 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	218	29.30	29.30
6 - 11	347	46.64	75.94
12 - 19	161	21.64	97.58
20 - 28	18	2.42	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
Cenovus - Christina Lake - July 2016**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	6	13	8	9	14	20	21	29	30	20	13	8	8	4	10	5	218
6 - 11	21	17	16	5	9	12	17	10	12	22	51	67	13	16	38	21	347
12 - 19	16	12	3	6	1	8	6	3	3	10	10	20	13	14	24	12	161
20 - 28	2	1	1	0	0	0	0	0	0	1	0	5	1	3	1	3	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
Totals	45	43	28	20	24	40	44	42	45	53	74	100	35	37	73	41	744

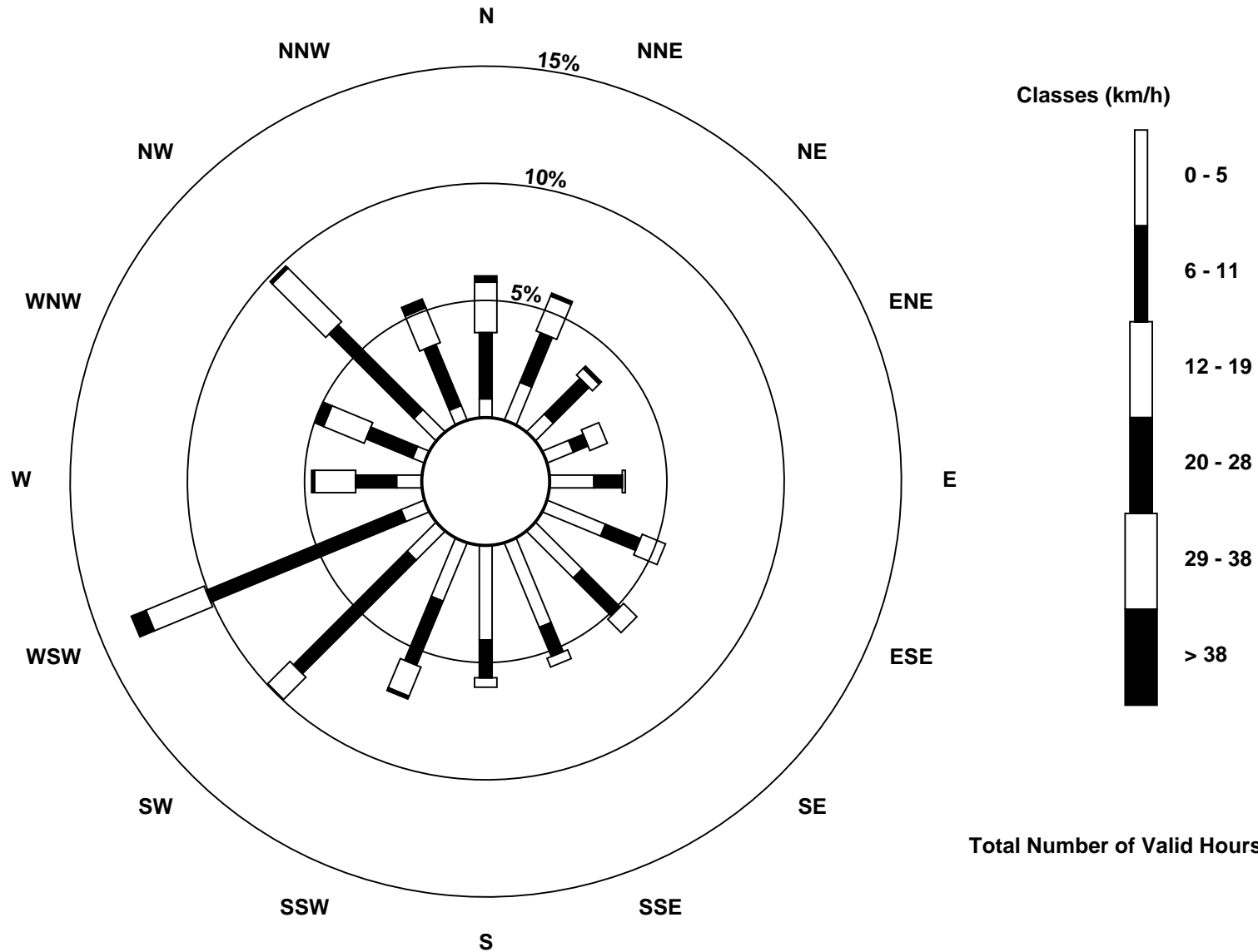
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

Wind Speed (WS) - km/h
Cenovus - Christina Lake (AMS500)





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Cenovus - Christina Lake - July 2016

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



Wood Buffalo Environmental Association
Summary of Hour Averages

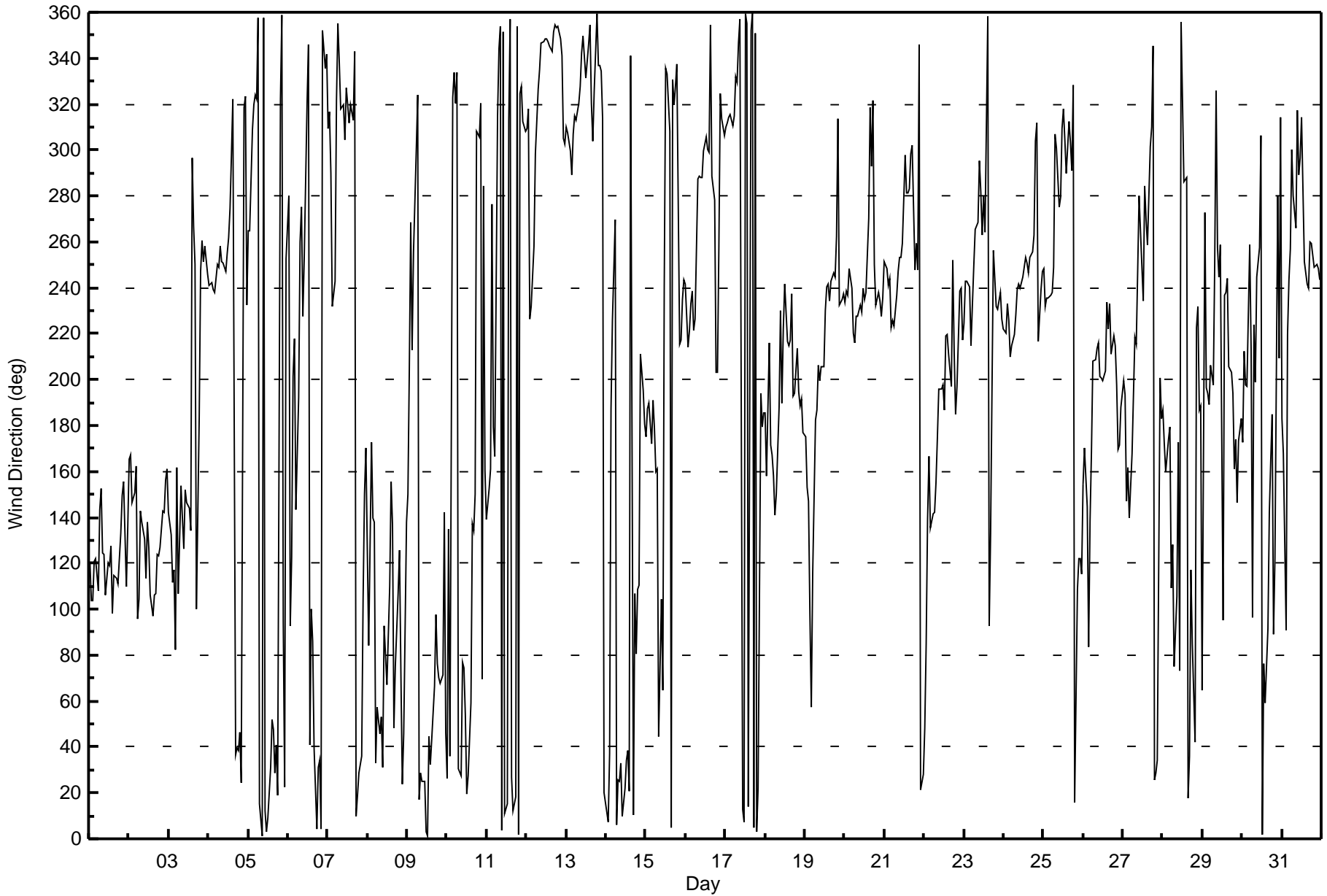
Wind Direction (WD) - deg
Cenovus - Christina Lake - July 2016

Direction of Maximum Speed: 304 deg on Jul 24 20:00 Direction of Maximum Daily Speed Average: 246.9 deg on Jul 24	Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0
Direction of Minimum Speed: 138 deg on Jul 9 00:00 Direction of Minimum Daily Speed Average: 0.3 deg on Jul 28	Percent Operational Time: 100.0
Monthly Average Direction: 263.5 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-Jul	120	104	104	121	122	108	143	153	124	124	106	120	119	128	99	115	114	111	122	133	149	156	110	136	121.8
2-Jul	165	167	146	151	162	96	104	143	138	131	113	138	127	106	97	106	107	124	123	127	143	142	156	161	127.4
3-Jul	142	132	112	117	83	162	107	154	140	126	152	146	144	134	296	267	250	183	247	260	251	258	246	175.2	
4-Jul	241	242	242	239	238	250	249	258	251	251	247	255	262	274	298	322	37	40	38	46	24	319	324	233	273.2
5-Jul	265	265	309	320	324	322	358	15	1	357	12	3	9	31	52	48	29	41	19	322	359	95	23	253	2.8
6-Jul	280	93	122	201	218	143	192	260	275	228	254	320	346	41	100	86	39	4	31	34	4	352	336	342	3.3
7-Jul	309	317	290	232	243	321	355	338	318	320	304	327	320	312	320	313	343	10	19	29	36	104	150	170	332.4
8-Jul	126	84	173	140	138	33	58	46	53	31	93	80	67	110	155	137	48	75	107	126	72	24	46	138	86.5
9-Jul	150	205	268	213	256	301	324	17	29	25	25	3	1	44	32	43	67	98	76	70	68	71	142	46	48.0
10-Jul	26	135	36	323	333	321	334	31	27	77	74	54	20	27	59	137	134	150	308	305	320	70	284	161	39.3
11-Jul	139	153	161	276	180	166	315	344	354	4	351	11	15	313	357	27	12	18	354	2	325	328	312	308	352.4
12-Jul	310	318	227	232	258	298	313	326	335	346	347	348	349	347	346	343	351	354	353	354	348	341	305	303	338.4
13-Jul	310	307	299	289	307	315	313	320	328	342	350	340	331	346	355	320	304	326	359	337	337	334	313	20	328.6
14-Jul	12	7	38	187	226	270	6	26	25	33	10	22	34	38	21	341	11	107	80	109	111	211	195	180	38.6
15-Jul	175	187	190	172	191	179	160	161	44	104	65	240	336	333	308	5	331	320	328	337	215	217	235	243	269.0
16-Jul	242	214	222	233	238	221	227	287	288	288	288	300	306	300	299	355	288	278	203	203	258	325	314	306	283.2
17-Jul	310	312	314	315	310	315	332	330	347	357	13	8	359	355	14	352	360	5	351	3	22	194	180	186	345.2
18-Jul	186	158	216	172	167	158	141	150	188	230	190	222	242	217	215	217	237	193	194	214	194	189	192	177	203.5
19-Jul	175	153	147	97	57	116	182	187	206	200	206	205	230	240	242	234	243	246	245	262	313	232	235	237	229.4
20-Jul	234	238	237	248	240	220	216	228	227	232	229	240	235	238	270	318	293	321	250	232	238	235	228	235	248.5
21-Jul	252	248	241	244	223	226	223	237	247	254	253	259	298	282	282	283	299	302	248	259	247	346	21	28	268.1
22-Jul	48	85	139	167	135	142	142	155	175	196	196	198	187	219	219	211	197	252	212	185	197	239	240	217	198.0
23-Jul	225	243	243	241	215	233	249	266	269	295	282	263	280	264	358	92	133	196	256	232	231	234	238	227	251.7
24-Jul	222	220	233	226	210	215	219	228	239	242	240	245	249	253	251	246	253	255	263	304	312	217	239	247	246.9
25-Jul	248	232	235	236	237	238	249	307	301	275	279	309	318	304	290	312	303	291	328	16	109	122	122	115	283.5
26-Jul	155	170	145	83	139	169	208	209	213	216	201	201	199	204	234	222	233	211	219	215	198	170	171	188	202.8
27-Jul	199	194	147	162	140	168	193	218	216	247	280	250	234	284	270	259	301	310	345	26	29	34	201	183	259.0
28-Jul	187	172	160	174	179	109	128	75	106	173	73	356	322	286	288	18	36	117	85	42	223	232	187	189	72.4
29-Jul	65	272	197	194	189	206	198	250	326	258	245	259	95	237	238	244	206	203	194	161	174	147	173	183	210.3
30-Jul	172	213	198	197	259	213	97	224	199	245	257	306	2	76	59	92	142	165	185	89	122	280	209	314	199.1
31-Jul	183	168	91	220	243	257	300	280	266	317	289	296	314	251	247	242	240	260	260	249	249	250	249	244	261.9

233.6 225.4 233.3 231.7 238.7 246.1 250.0 272.3 276.8 284.7 282.5 294.7 313.4 294.5 308.0 309.6 300.9 321.8 297.7 330.3 288.2 261.2 234.6 231.6
 Diurnal Average

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





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
Cenovus - Christina Lake - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 107 deg on Jul 29 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: 7 deg on Jul 19 00:00 Percentiles: P ₁ = 9 P ₁₀ = 15 Q ₁ = 19 Median = 25 Q ₃ = 37 P ₉₀ = 56 P ₉₉ = 90																									
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-Jul	40	26	21	22	20	34	14	14	22	20	20	25	27	31	28	25	20	22	16	15	8	21	26	25	40
2-Jul	23	40	30	41	25	23	20	21	19	16	19	17	17	22	20	17	34	18	15	16	34	14	15	12	41
3-Jul	21	25	10	27	45	26	26	37	19	18	16	18	18	70	44	18	22	56	61	23	31	18	24	17	70
4-Jul	16	15	17	15	14	17	18	28	19	18	20	19	18	23	28	19	29	11	11	10	14	20	73	41	73
5-Jul	35	24	11	12	12	13	18	17	20	19	20	21	19	23	17	23	23	16	46	15	44	39	85	36	85
6-Jul	56	73	41	55	49	67	39	41	56	27	61	50	74	35	29	39	50	22	36	32	17	27	19	35	74
7-Jul	15	70	45	31	34	28	21	35	42	45	39	24	29	30	28	30	45	20	15	13	18	31	48	36	70
8-Jul	90	69	48	57	91	40	64	26	26	52	48	30	26	47	18	75	33	17	25	32	15	14	80	98	98
9-Jul	46	63	48	35	46	26	30	36	29	22	36	51	23	39	15	23	18	16	11	11	11	30	20	48	63
10-Jul	81	50	83	25	15	20	48	25	36	23	16	23	20	23	30	22	24	41	95	62	17	98	102	51	102
11-Jul	42	73	86	79	45	70	52	47	37	36	34	33	27	23	25	38	73	18	22	17	13	14	10	8	86
12-Jul	9	89	39	26	25	20	17	26	29	26	24	23	22	26	22	24	20	24	23	18	15	20	9	11	89
13-Jul	11	12	10	35	19	16	13	17	18	22	26	23	26	30	36	92	39	16	18	20	16	15	19	39	92
14-Jul	15	13	77	78	39	67	34	39	22	28	35	70	35	90	40	43	42	21	23	26	30	26	17	25	90
15-Jul	20	15	29	26	20	16	26	83	43	60	67	96	85	79	55	56	35	30	22	84	17	14	19	18	96
16-Jul	17	65	13	36	16	31	32	32	23	22	25	30	29	30	31	76	44	32	21	36	31	29	50	11	76
17-Jul	12	13	12	12	12	14	20	24	24	22	22	28	34	32	40	36	30	38	25	20	30	19	20	21	40
18-Jul	35	39	35	25	15	58	36	44	35	62	46	39	39	42	39	35	35	25	24	25	13	8	8	7	62
19-Jul	7	41	38	54	25	56	33	20	28	26	29	20	29	28	29	26	26	22	20	33	13	45	25	25	56
20-Jul	25	22	21	18	16	13	13	20	19	22	21	24	24	23	39	15	30	15	23	21	21	20	18	20	39
21-Jul	19	17	18	20	20	21	20	23	23	21	20	22	20	25	20	21	33	27	20	21	18	33	13	37	37
22-Jul	16	36	35	18	30	22	17	23	17	22	25	21	20	22	21	21	19	52	25	18	18	21	18	13	52
23-Jul	17	16	14	18	33	16	31	31	23	36	35	23	29	27	64	26	22	66	20	18	17	17	19	20	66
24-Jul	16	17	20	20	17	18	20	22	22	25	24	23	25	22	22	23	22	21	18	25	39	16	17	21	39
25-Jul	17	16	13	17	16	17	47	17	27	28	27	20	20	33	29	26	35	41	30	64	25	17	34	33	64
26-Jul	14	21	50	18	52	20	28	53	28	24	22	22	28	28	25	27	29	21	21	20	15	20	14	15	53
27-Jul	16	29	55	33	23	16	31	21	24	31	54	57	71	78	53	39	38	30	28	11	9	80	57	14	80
28-Jul	27	31	24	63	17	83	53	34	46	91	64	81	31	65	46	33	36	27	47	38	45	37	34	48	91
29-Jul	38	68	34	11	15	40	32	65	73	71	52	71	107	56	28	24	23	17	19	34	9	26	41	12	107
30-Jul	16	43	72	58	26	28	57	35	33	25	26	41	62	48	46	52	62	52	41	31	48	56	57	79	79
31-Jul	24	23	74	28	42	33	25	31	28	24	28	28	19	20	22	20	23	24	19	18	16	17	17	20	74
	90	89	86	79	91	83	64	83	73	91	67	96	107	90	64	92	73	66	95	84	48	98	102	98	
	Diurnal Maximum																								



Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	July 21, 2016	Last Calibration	June 10, 2016
Station Name	Cenovus - Christina Lake	Station Number	AMS 500
Reason:	Routine		
Start Time (MST)	7:18	End Time (MST)	11:30
Gas Cert Reference	LL107928	Station temp.	22 Deg C
Cal Gas Concentration	50 ppm	Cal Gas Exp Date	Sep-8-2018
Calibrator Make/Model	API T700	Serial Number	451
ZAG Make/Model	API 701	Serial Number	404
DACS make/model	Campbell Scientific CR3000	DACS serial No.	2575

Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 1000 ppb		PMT voltage	-697	-698
Analyzer IP address	192.168.1.43		Lamp voltage	834	834
Calculated slope	0.997676	0.995595	Chamber temp	45.3	44.9
Calculated intercept	0.651923	-0.119287	Pressure	674.6	674.9
Analyzer Background	12.6	12.1	Flow	0.596	0.597
Analyzer Coefficient	1.004	1.004	Intensity	91	90

Analyzer make Thermo 43i Analyzer serial # 118148497

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.6	----
as found span	5000	79.3	793.0	796.6	0.996
calibrator zero	5000	0.0	0.0	0.2	----
high point	5000	79.3	793.0	796.6	0.996
second point	5000	39.7	397.0	399.1	0.995
third point	5000	19.8	198.0	198.8	0.996
as left zero	5000	0.0	0.0	0.1	----
as left span	5000	79.3	793.0	798.5	0.993
Average Correction Factor					0.995

Corrected As found 797.2 Previous response 794.2 % change -0.4%

Notes:

Changed inlet filter after as founds. Adjusted zero.

Calibration Performed By: Evan Magill



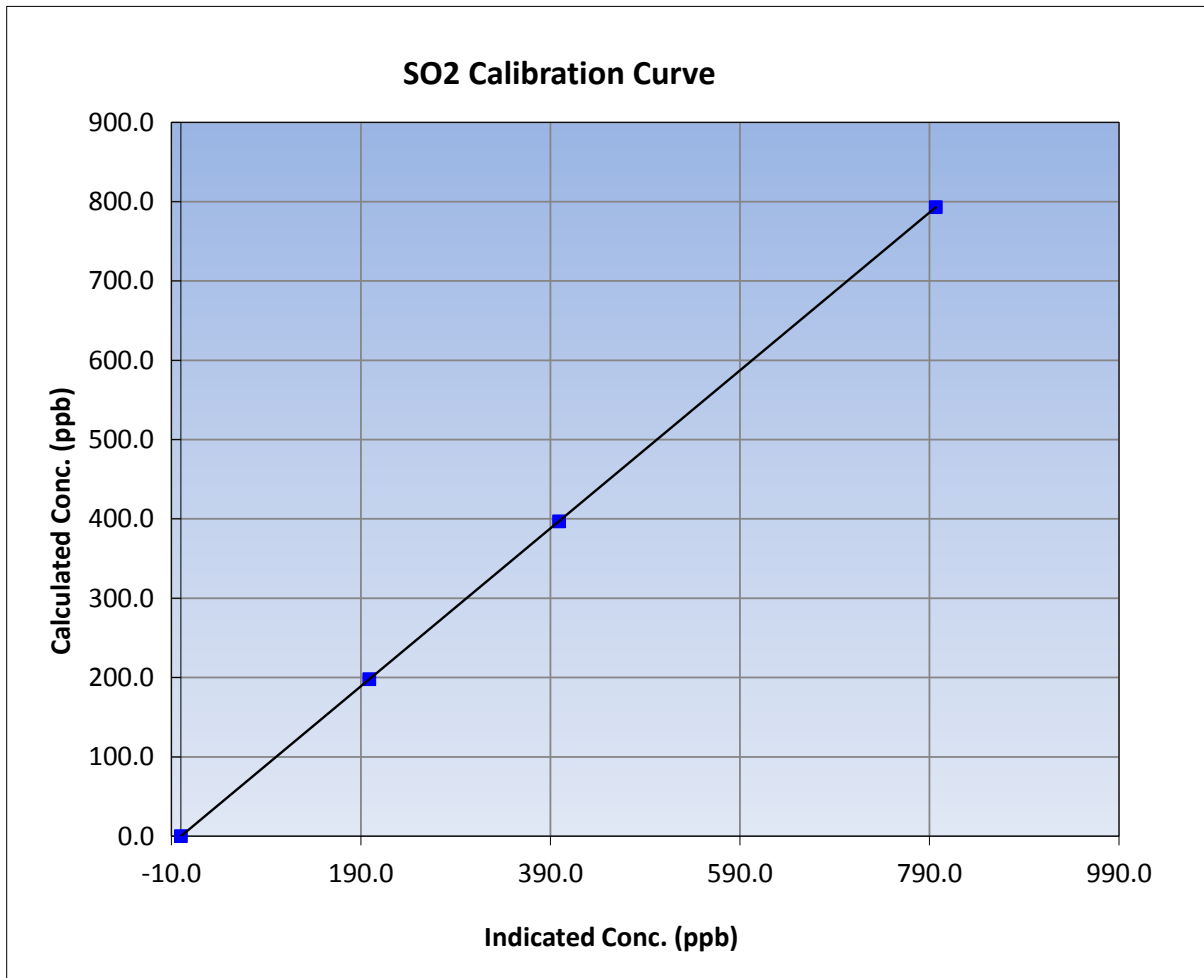
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	July 21, 2016	Previous Calibration	June 10, 2016
Station Name	Cenovus - Christina Lake	Station Number	AMS 500
Start Time (MST)	7:18	End Time (MST)	11:30
Analyzer make	Thermo 43i	Analyzer serial #	118148497

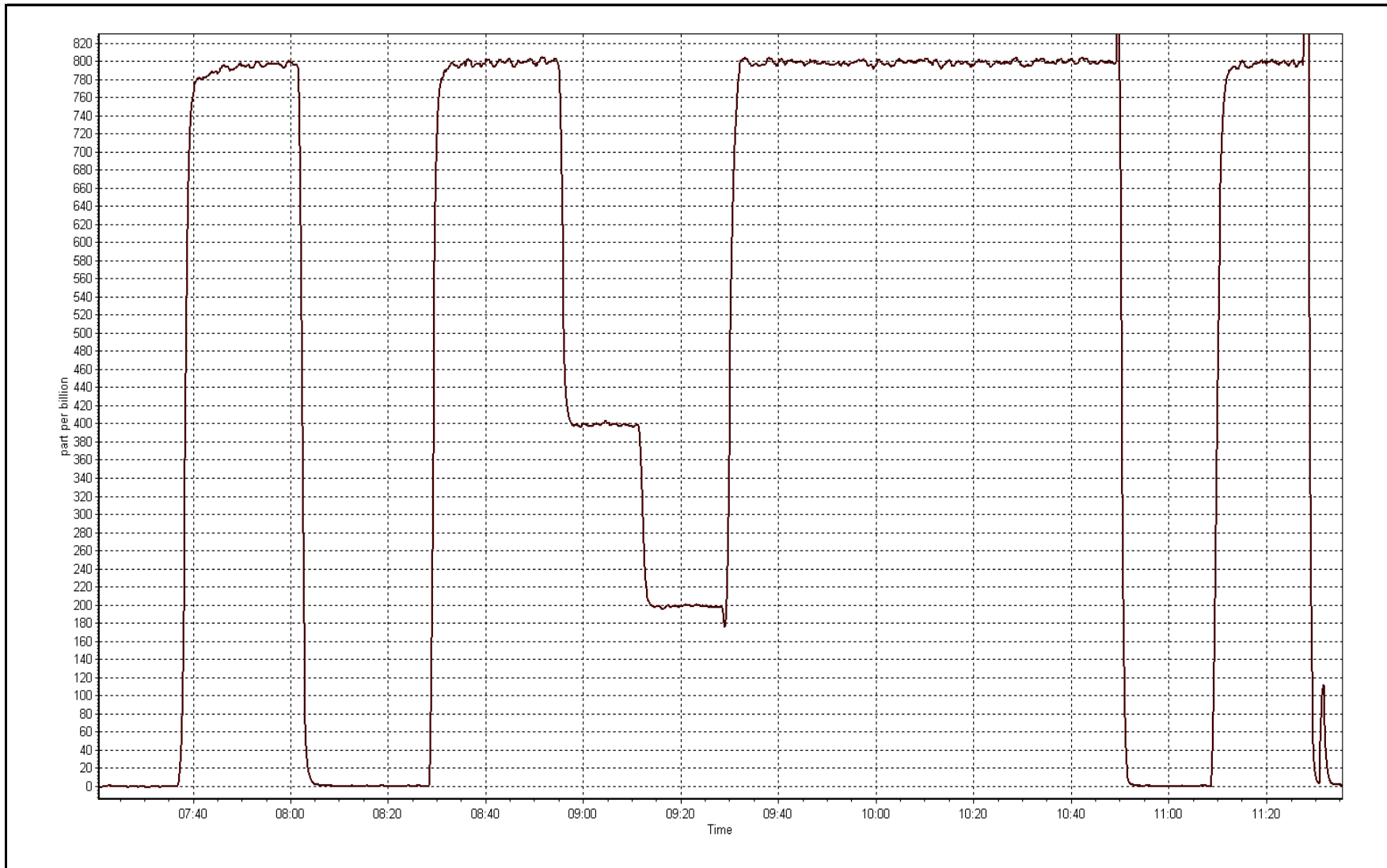
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	----	Correlation Coefficient	1.000000
793.0	796.6	0.9955		
397.0	399.1	0.9949	Slope	0.995595
198.0	198.8	0.9958		
			Intercept	-0.119287



SO2 Calibration Plot

Date: July 21, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	July 20, 2016	Last Calibration	June 9, 2016
Station Name	Cenovus	Station Number	AMS 500
Reason:	Other: H2S gas cylinder change		
Start Time (MST)	13:55	End Time (MST)	18:27
Gas Cert Reference	LL23598	Station temp.	22 Deg C
Cal Gas Concentration	10.2 ppm	Cal Gas Exp Date	5/30/2016
Calibrator Make/Model	API 700	Serial Number	451
ZAG air Make/Model	API 701	Serial Number	404
DACS make/model	Campbell Scientific CR3000	Serial Number	2575
SO2 gas concentration	50 ppm	SO2 gas cert/exp	LL107928 09-Aug-18

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-681	-681
Analyzer IP address	192.168.1.42		Lamp voltage	972	966
Calculated slope	0.995414	1.034630	Chamber temp	45	45
Calculated intercept	0.091501	0.031039	Pressure	651.7	651.7
Analyzer Background	1.53	1.53	Flow	0.434	0.436
Analyzer Coefficient	0.861	0.861	Intensity	90	89
			Converter temp.	310	310

Analyzer make/model	Thermo 43i-TLE	Analyzer serial #	1008841400
Converter make/model	Thermo 340	Converter serial #	328702539

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.1	----
as found span	5000	39.3	80.2	79.2	1.013
as left zero	5000	0.0	0.0	0.0	----
as left span	5000	78.5	80.1	77.4	1.035
Average Correction Factor					

Corrected As found	79.2	Previous response	80.4	% change	2.2%
--------------------	------	-------------------	------	----------	------

Notes:

Replaced H2S gas cylinder after as founds. As Lefts reflects the new H2S gas concentration. Calibration was conducted the next day.

Calibration Performed By: Evan Magill



Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	July 21, 2016	Last Calibration	June 9, 2016
Station Name	Cenovus	Station Number	AMS 500
Reason:	Routine		
Start Time (MST)	11:35	End Time (MST)	15:07
Gas Cert Reference	LL30650	Station temp.	22 Deg C
Cal Gas Concentration	5.1 ppm	Cal Gas Exp Date	12/02/2019
Calibrator Make/Model	API 700	Serial Number	2445
ZAG air Make/Model	API 701	Serial Number	404
DACS make/model	Campbell Scientific CR3000	Serial Number	2575
SO2 gas concentration	50 ppm	SO2 gas cert/exp	LL107928 09-Aug-18

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-681	-681
Analyzer IP address	192.168.1.42		Lamp voltage	972	965
Calculated slope	0.995414	0.998454	Chamber temp	45	45
Calculated intercept	0.091501	0.006254	Pressure	651.7	652.6
Analyzer Background	1.53	1.52	Flow	0.434	0.438
Analyzer Coefficient	0.861	0.861	Intensity	90	91
			Converter temp.	310	310

Analyzer make/model	Thermo 43i-TLE	Analyzer serial #	1008841400
Converter make/model	Thermo 340	Converter serial #	328702539

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.1	----
as found span	5000	78.5	80.1	80.9	0.989
SO2 scrubber check	5000	19.8	198.0	1.4	----
calibrator zero	5000	0.0	0.0	-0.1	----
high point	5000	78.5	80.1	80.1	0.999
second point	5000	39.3	40.1	40.3	0.996
third point	5000	19.6	20.0	20.0	0.999
as left zero	5000	0.0	0.0	0.0	----
as left span	5000	78.5	80.1	80.9	0.990
Average Correction Factor					0.998

Corrected As found	81.0	Previous response	80.3	% change	-0.8%
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Notes:

H2S gas cylinder replaced yesterday. Changed inlet filter and scrubber check done after as founds. No adjustments but used new high point values.

Calibration Performed By: Evan Magill



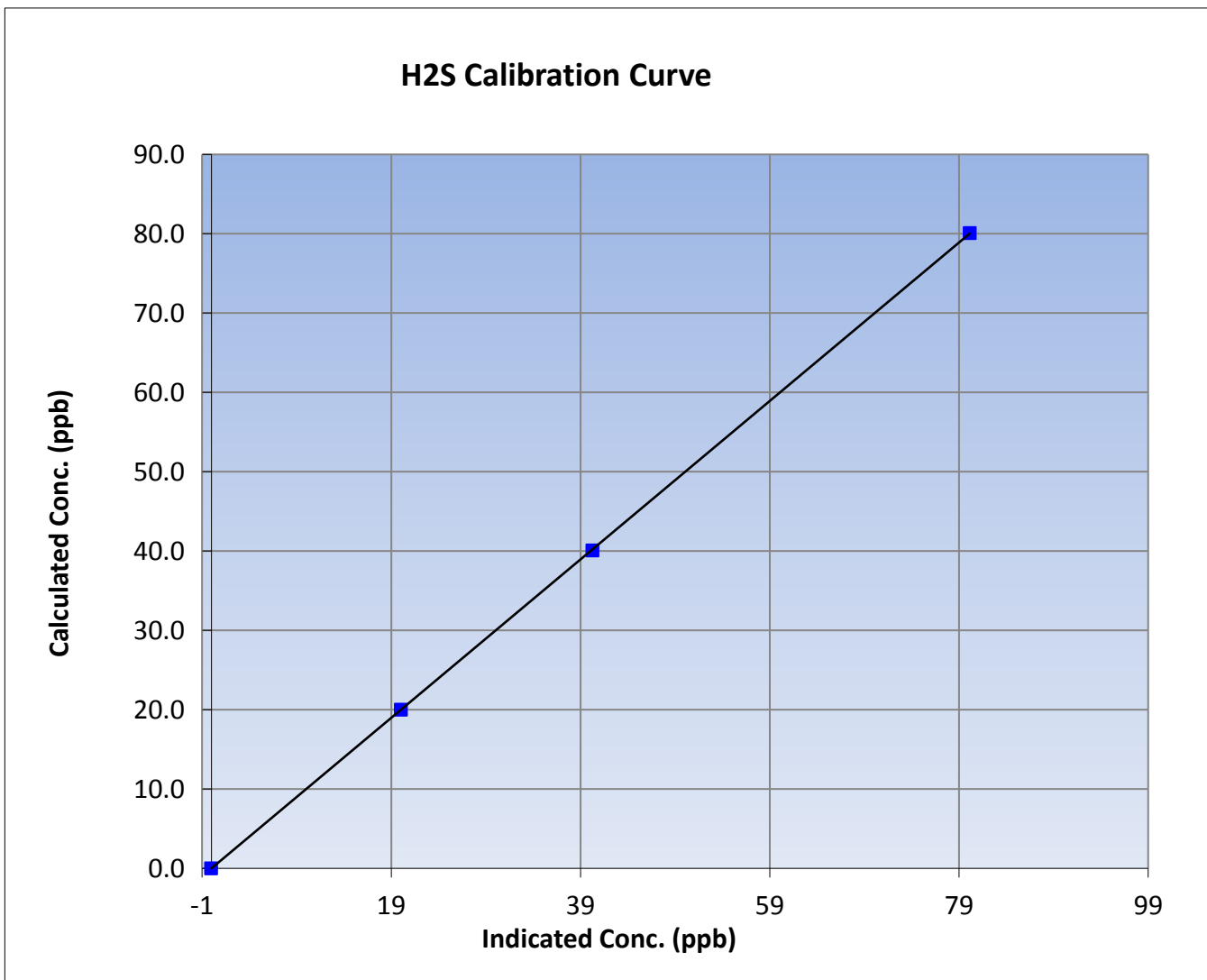
Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	July 21, 2016	Previous Calibration	June 9, 2016
Station Name	Cenovus	Station Number	AMS 500
Start Time (MST)	11:35	End Time (MST)	15:07
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1008841400

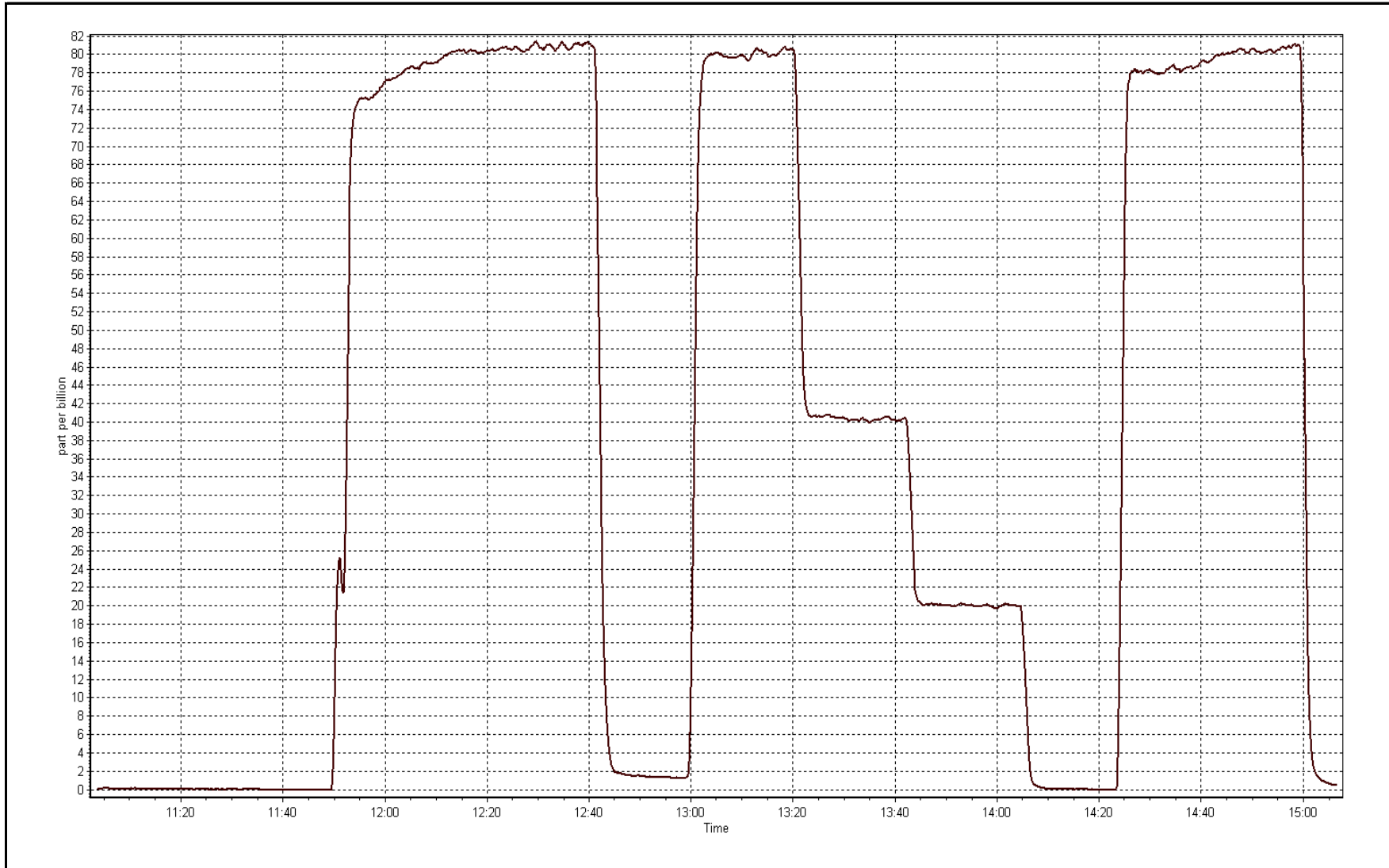
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999994
80.1	80.1	0.9993		
40.1	40.3	0.9957	Slope	0.998454
20.0	20.0	0.9991		
			Intercept	0.006254



H2S Calibration Plot

Date: July 21, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	July 21, 2016	Previous Calibration	June 10, 2016
Station Name	Cenovus	Station Number	AMS 500
Reason:	Routine		
Start Time (MST)	7:18	End Time (MST)	11:30
NO Cal Gas Conc	50.5 ppm	Gas Cert Reference	LL107928
NOx Cal Gas Conc	50.8 ppm	Cal Gas Expiry Date	Sep-8-2018
Calibrator	API T700	Serial Number	451
Zero air Generator	Teledyne API T701	Serial Number	4604

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	2575
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.996416	0.995867	1.011125
	Data Offset	1.983109	1.793378	0.235027
Current Calibration	Data Slope	0.997054	0.995505	0.990943
	Data Offset	0.701879	0.499032	-0.442438

Analyzer Information

Analyzer make/model	API T200	Analyzer serial #	723
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.72		192.168.1.72	
NO coefficient	0.905		0.914	
NOx coefficient	0.907		0.914	
NO2 coefficient	1.000		1.000	
NO bkgrnd	1.9		0.4	
NOx bkgrnd	2.6		1.4	
Chamber Temp	50	Deg C	50	Deg C
Moly Temp	315.4	Deg C	314.6	Deg C
PMT voltage	826	V	826	V
PMT Temp	6.9	Deg C	6.9	Deg C
O3 flow	85	ccm	85	ccm
R Cell press NO	4.2	mmHg	4	mmHg
R Cell Press Nox	4.2	mmHg	4	mmHg
NO sample flow	0.485	lpm	0.483	lpm
Nox sample Flow	0.479	lpm	0.478	lpm

Notes:

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



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date: July 21, 2016 Station Number: AMS 500

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	0.9	-0.7	1.5	----	----
as found span	5000	79.3	805.7	800.9	4.8	801.9	795.9	6.0	1.0048	1.0064
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.3	-0.1	-0.2	----	----
high point	5000	79.3	805.7	800.9	4.8	807.3	803.9	3.4	0.9980	0.9963
second point	5000	39.6	402.3	400.0	2.4	403.5	402.2	1.4	0.9970	0.9945
third point	5000	19.8	201.2	200.0	1.2	200.0	199.2	0.8	1.0059	1.0038
as left zero	5000	0.0	0.0	0.0	0.0	0.0	0.2	-0.2	----	----
as left span	5000	79.3	805.7	597.0	208.7	807.0	597.2	209.8	0.9984	0.9996
Average Correction Factor									1.0003	0.9982

Corrected As found NO_x= 801.0 NO= 796.5 Percent Change NO_x= 0.7% NO= 0.7%
 Previous Response NO_x= 806.6 NO= 802.5

GPT Calibration Data

Dilution Flow (total) 5000 ccm Source Gas Flow 79.30 ccm NOx ref calc conc = 805.7 ppb NO ref calc conc = 800.9 ppb

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
1st NO ref point		4.8	807.7	802.1	-0.2	0.9976	0.9986	----	----
1st NO2 (600)	597.0	209.9	808.7	597.0	211.7	0.9963	----	0.9913	100.9%
2nd NO2 (400)	668.1	138.7	808.9	668.1	140.8	0.9960	----	0.9854	101.5%
3rd NO2 (200)	731.9	74.9	808.8	731.9	76.8	0.9962	----	0.9748	102.6%
2nd NO ref point		4.8	807.8	802.0	5.7	0.9974	0.9986	----	----
Average Correction Factor						0.9965		0.9838	101.6%

Calibration Performed By: Evan Magill



Wood Buffalo Environmental Association

NO_x Calibration Summary

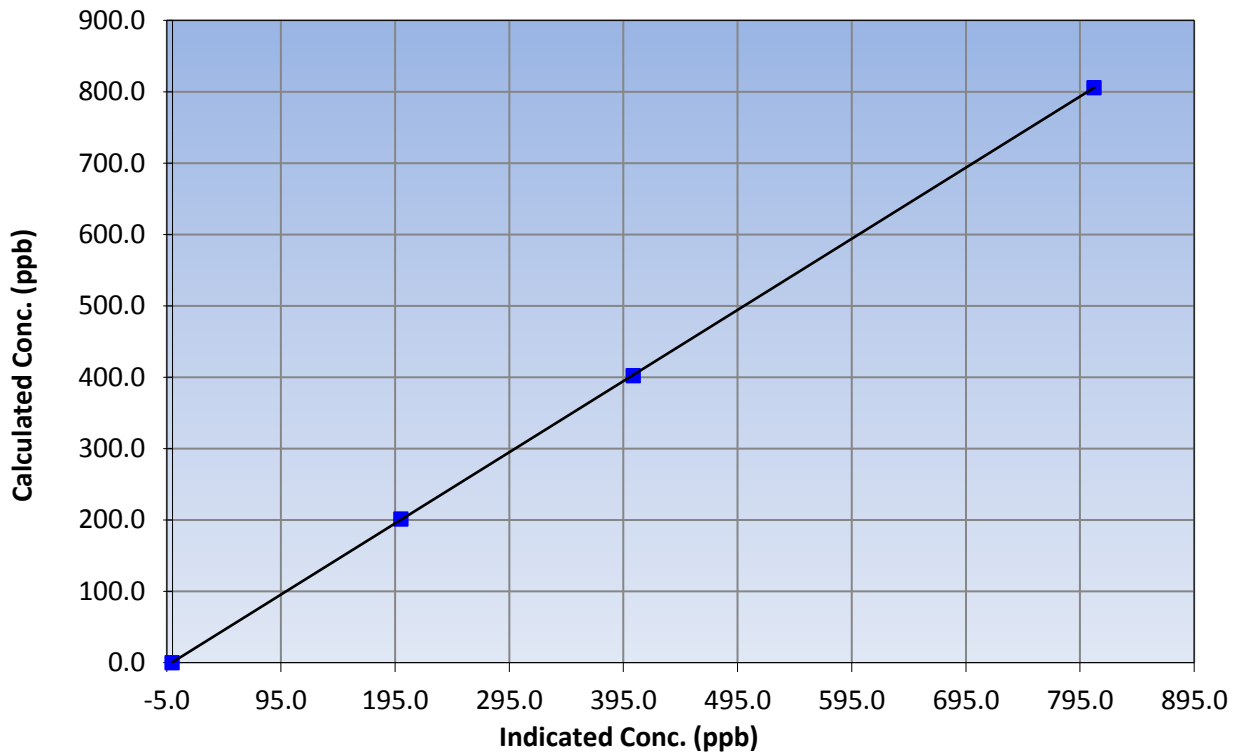
Station Information

Calibration Date	July 21, 2016	Previous Calibration	June 10, 2016
Station Name	Cenovus	Station Number	AMS 500
Start Time (MST)	7:18	End Time (MST)	11:30
Analyzer make	API T200	Analyzer serial #	723

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.3	----	Correlation Coefficient	0.999995
805.7	807.3	0.9980		
402.3	403.5	0.9970	Slope	0.997054
201.2	200.0	1.0059		
			Intercept	0.701879

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

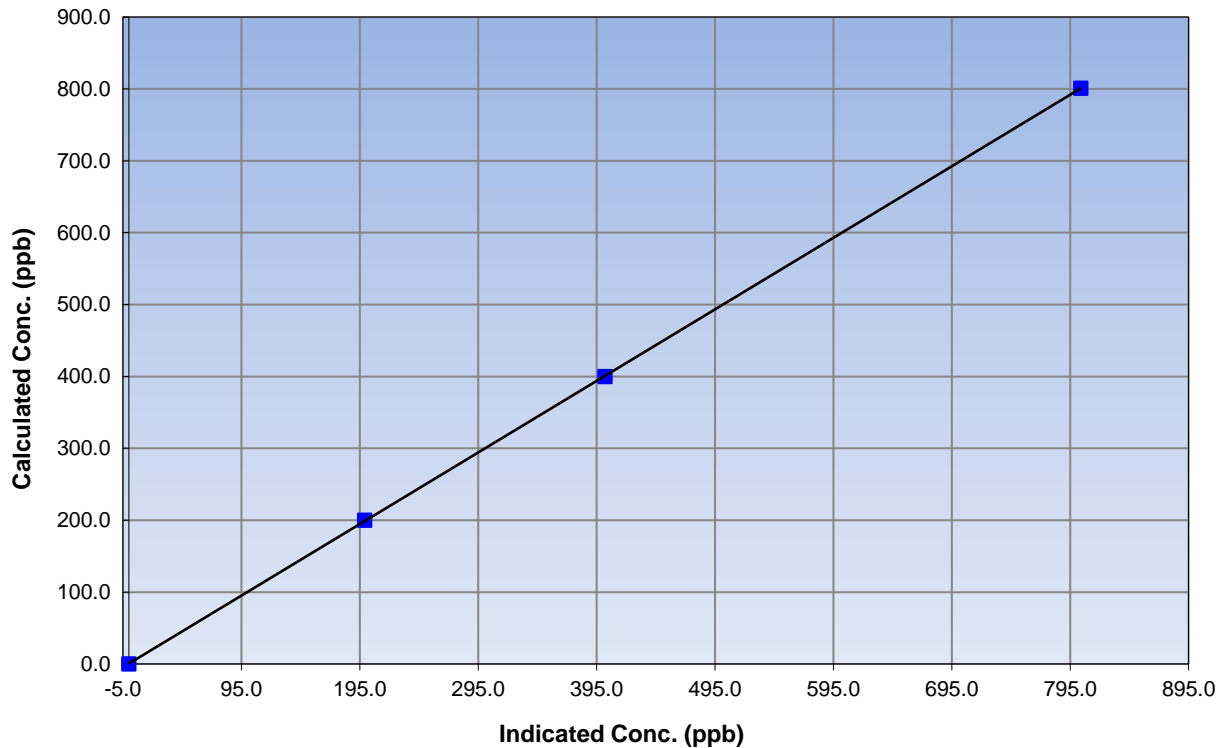
Station Information

Calibration Date	July 21, 2016	Previous Calibration	June 10, 2016
Station Name	Cenovus	Station Number	AMS 500
Start Time (MST)	7:18	End Time (MST)	11:30
Analyzer make	API T200	Analyzer serial #	723

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999993
800.9	803.9	0.9963		
400.0	402.2	0.9945	Slope	0.995505
200.0	199.2	1.0038		
			Intercept	0.499032

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

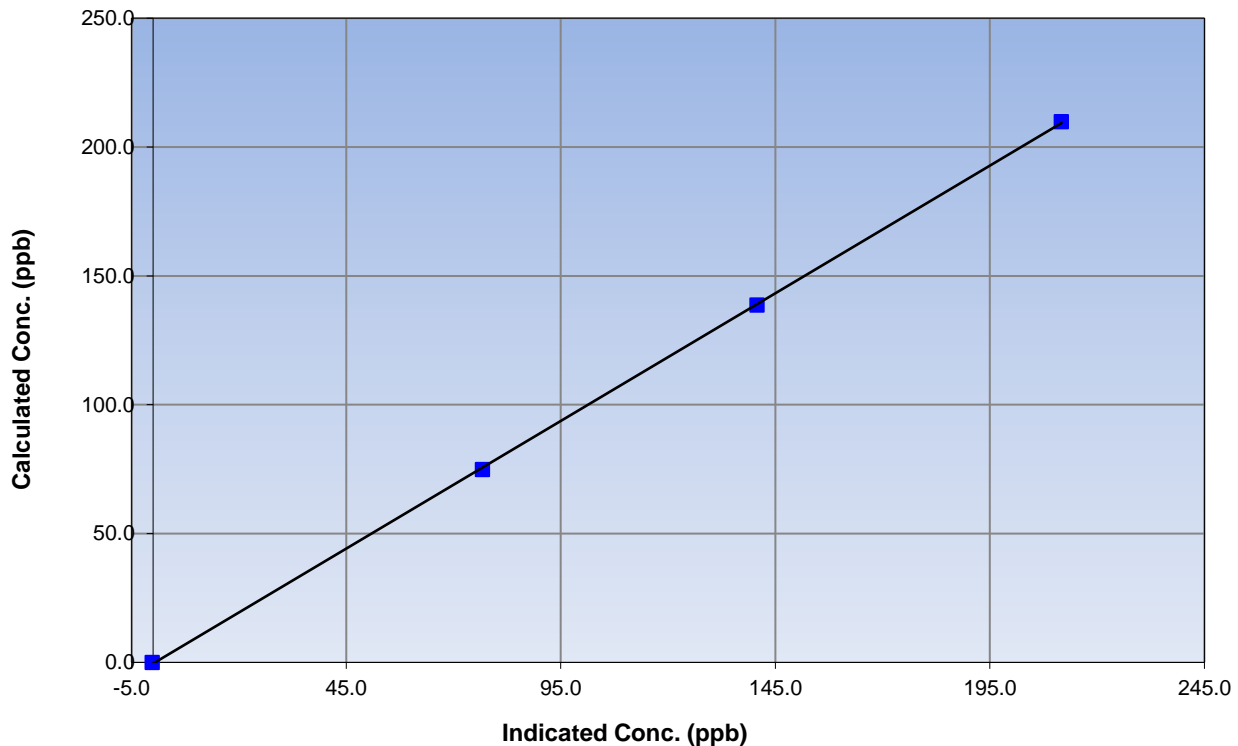
Station Information

Calibration Date	July 21, 2016	Previous Calibration	June 10, 2016
Station Number	Cenovus	Station Number	AMS 500
Start Time (MST)	7:18	End Time (MST)	11:30
Analyzer make	API T200	Analyzer serial #	723

Calibration Information

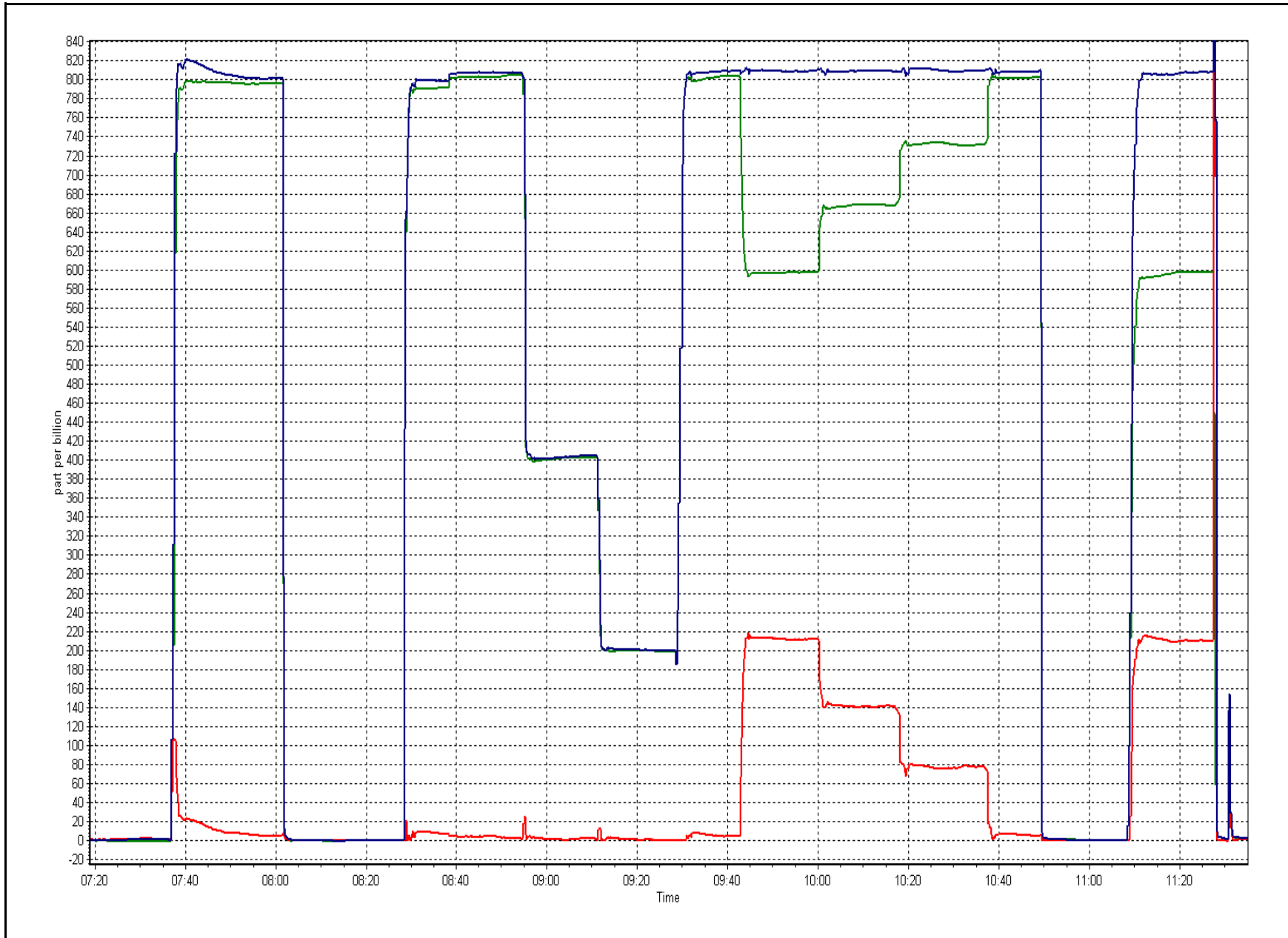
Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	N/A	Correlation Coefficient	0.999942
209.9	211.7	0.9913		
138.7	140.8	0.9854	Slope	0.990943
74.9	76.8	0.9748		
			Intercept	-0.442438

NO₂ Calibration Curve



NOX Calibration Plot

Date: July 21, 2016





WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 502
CONOCOPHILLIPS
SURMONT
JULY 2016**

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

August 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONOCOPHILLIPS SURMONT (AMS 502)
 JULY 2016

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

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	706	36	38	99.73	19	0	5	0
H2S (ppb) Average	706	36	38	99.73	3	0	1	0
NO2 (ppb) Average	706	36	38	99.73	10	0	4	-
NO (ppb) Average	706	36	38	99.73	15	-	4	-
NOX (ppb) Average	706	36	38	99.73	20	-	8	-
Temperature 2 m (C) Average	742	0	2	99.73	27	-	21.8	-
Relative Humidity (%) Average	742	0	2	99.73	98	-	90	-
Wind Speed 10 m (km/h) Average	742	0	2	99.73	34	-	23	-
Wind Direction 10 m (deg) Average	742	0	2	99.73	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONOCOPHILLIPS SURMONT (AMS 502)
 JULY 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	706	1.7	3	-	0	0	0	1	1	4	19
H2S (ppb) Average	706	0.4	0	-	0	0	0	0	1	1	3
NO2 (ppb) Average	706	1.4	1	-	0	0	1	1	2	3	10
NO (ppb) Average	706	1	2	-	0	0	0	0	1	3	15
NOX (ppb) Average	706	2.4	3	-	0	0	1	1	3	5	20
Temperature 2 m (C) Average	742	17.72	3.7	-	5.5	13.4	15.1	17.3	20.4	22.9	27
Relative Humidity (%) Average	742	67.6	17	-	27	44	55	68	82	90	98
Wind Speed 10 m (km/h) Average	742	11.8	5	-	0	6	8	11	15	19	34
Wind Direction 10 m (deg) Average	742	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONOCOPHILLIPS SURMONT (AMS 502)
JULY 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
ALL PARAMETERS	20 Jul 2016 11:00	20 Jul 2016 12:00	2	Maintenance - wiring/data logger upgrades



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

ConocoPhillips - Surmont - July 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 19 ppb on Jul 12 16:00	Maximum Daily Average: 5.2 ppb on Jul 25		Hours of Data:	706
Minimum Value: 0 ppb on Jul 23 05:00	Minimum Daily Average: 0.4 ppb on Jul 9		Hours of Missing Data:	38
Maximum Diurnal Average: 2.8 ppb at hour 12	Minimum Diurnal Average: 0.9 ppb at hour 22		Hours of Calibration:	36
Monthly Average: 1.7 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 O ₃ = 1 P ₉₀ = 4 P ₉₉ = 15		Percent Operational Time:	99.7

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	1	2	Z	1	1	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0.5	2
2-Jul	1	1	0	Z	1	1	1	1	0	0	1	0	0	0	0	1	1	1	1	1	1	1	1	1	0.6	1
3-Jul	1	1	1	1	Z	2	2	1	1	1	0	1	1	0	1	1	1	2	1	0	0	0	0	0	0.8	2
4-Jul	0	0	0	0	0	Z	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	2	1	0.5	2
5-Jul	Z	1	1	2	1	2	2	2	1	1	1	1	2	1	1	1	1	1	3	3	1	0	0	0	1.2	3
6-Jul	0	Z	1	1	1	0	1	1	0	1	2	3	1	1	0	0	1	1	0	0	0	1	0	0	0.8	3
7-Jul	1	1	Z	0	1	1	8	1	3	3	2	10	4	4	4	5	6	3	6	4	2	2	2	1	3.2	10
8-Jul	1	1	1	Z	1	1	0	0	0	0	1	1	1	0	0	0	1	1	1	1	0	0	0	0	0.5	1
9-Jul	0	0	0	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0.4	1
10-Jul	0	0	1	1	1	Z	1	0	0	0	0	0	0	0	0	0	1	1	1	2	1	1	0	1	0.5	2
11-Jul	Z	9	8	4	4	5	3	2	1	1	2	2	1	1	5	1	1	1	0	0	1	2	2	2	2.5	9
12-Jul	2	Z	1	2	1	1	4	4	1	1	9	7	6	2	5	19	15	18	7	1	1	1	4	7	5.2	19
13-Jul	7	5	Z	2	3	9	10	6	2	8	4	5	5	1	0	11	10	2	2	2	3	1	1	1	4.3	11
14-Jul	0	0	0	Z	1	1	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	1	1	1	0.5	1
15-Jul	1	0	1	1	Z	1	4	7	7	5	6	5	4	3	3	3	2	2	2	1	1	1	1	1	2.6	7
16-Jul	2	1	1	1	0	Z	1	1	1	3	14	7	12	7	3	2	7	11	4	2	1	2	9	4	4.0	14
17-Jul	Z	4	2	1	1	1	6	1	1	1	2	3	4	1	2	5	0	2	9	5	4	3	2	2	2.8	9
18-Jul	2	Z	4	4	2	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1	1	1.1	4
19-Jul	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	3	2	1	1	13	3	1	0	1	1	1.6	13
20-Jul	1	1	0	Z	4	2	1	1	1	0	M	M	C	C	C	C	C	1	1	1	0	0	0	0	--	4
21-Jul	0	0	0	0	Z	0	0	0	0	0	1	6	3	2	6	6	11	5	8	1	1	1	0	0	2.4	11
22-Jul	0	0	0	0	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0.8	1
23-Jul	Z	3	1	0	0	0	0	4	2	7	1	2	3	1	1	1	5	1	1	1	0	0	0	0	1.5	7
24-Jul	1	Z	1	1	1	0	0	0	0	1	1	1	1	1	1	1	1	1	13	15	1	1	0	0	1.8	15
25-Jul	0	0	Z	0	0	0	1	3	5	17	17	16	14	15	14	7	2	1	1	1	1	1	2	1	5.2	17
26-Jul	1	1	1	Z	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1
27-Jul	0	0	0	0	Z	1	1	0	0	3	1	5	8	7	3	5	3	4	4	3	2	1	1	1	2.4	8
28-Jul	1	1	1	1	1	Z	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	0	1	1	0.7	1
29-Jul	Z	1	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0.6	1
30-Jul	1	Z	1	0	0	0	0	0	1	2	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0.6	2
31-Jul	0	1	Z	1	1	1	1	1	0	0	2	4	3	2	2	2	1	1	1	1	1	0	0	1	1.2	4

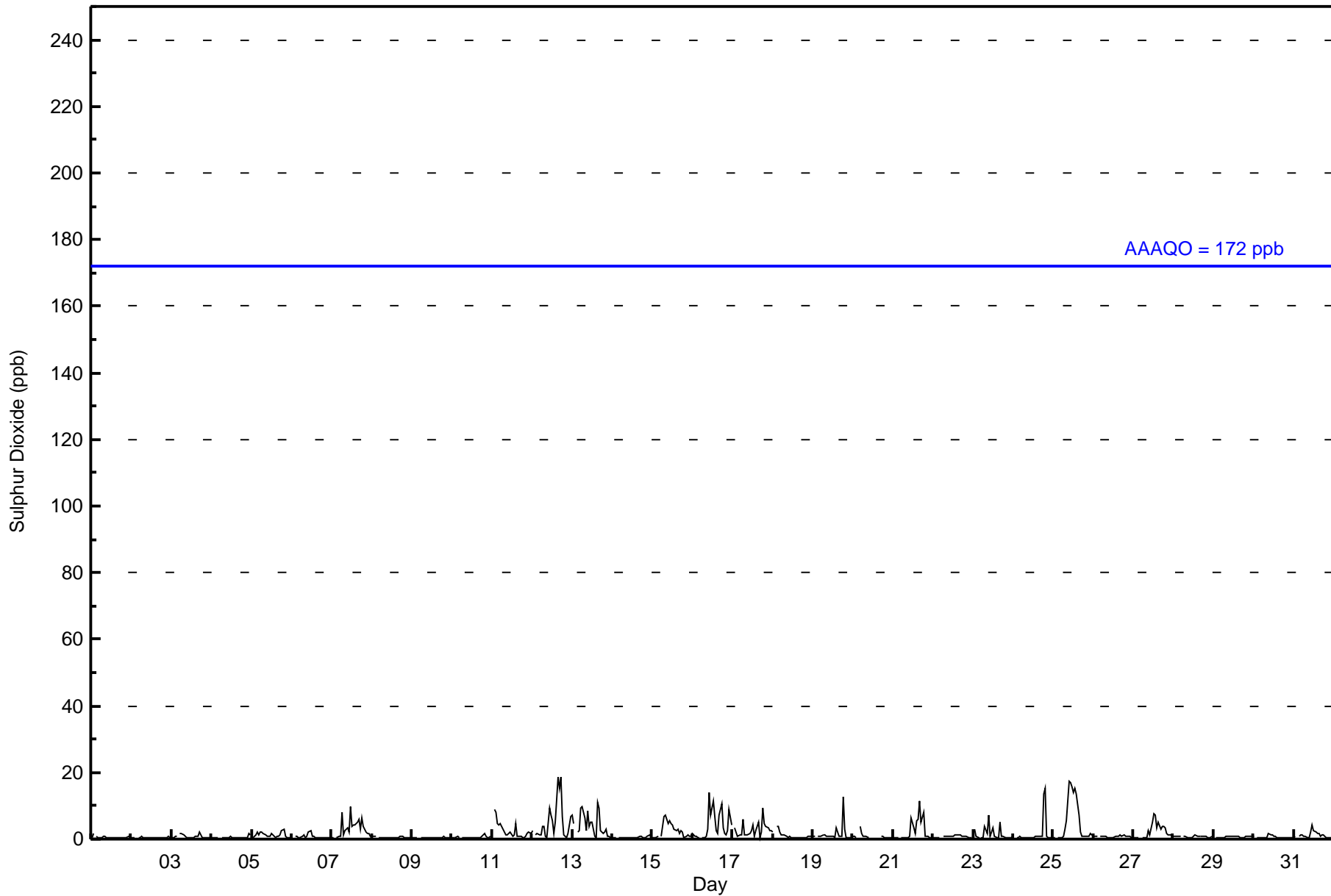
1.0	1.3	1.1	1.0	1.1	1.3	1.7	1.4	1.2	2.0	2.4	2.8	2.6	1.9	2.0	2.6	2.5	2.1	2.7	1.7	0.9	0.9	1.2	1.0	Diurnal Average	
7	9	8	4	4	9	10	7	7	17	17	16	14	15	14	19	15	18	13	15	4	3	9	7	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
ConocoPhillips - Surmont - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
ConocoPhillips - Surmont - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	689	97.59	97.59
11 - 20	17	2.41	100.00
21 - 60	0	0.00	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 706

Total Number of Hours: 744



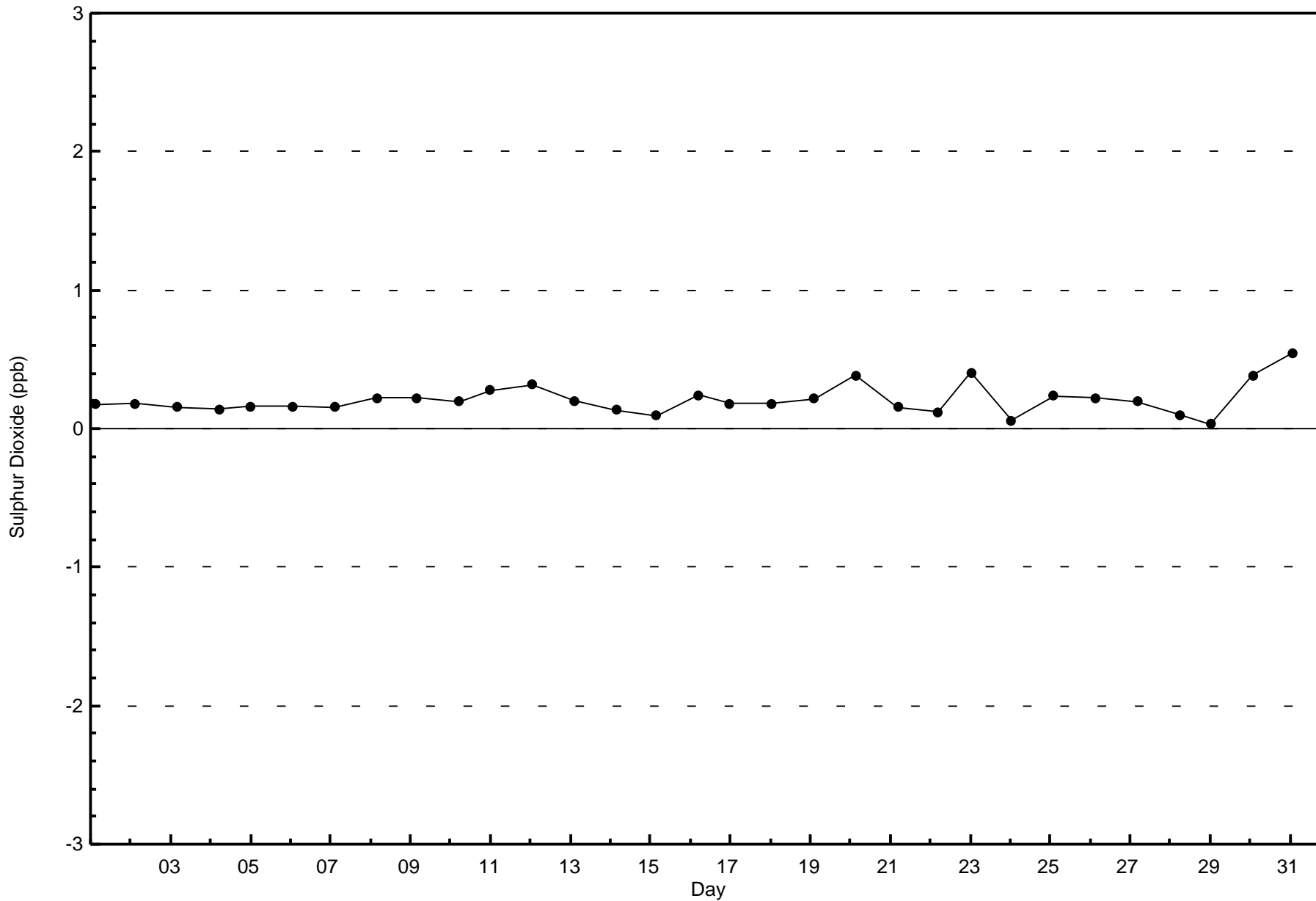
**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
ConocoPhillips - Surmont - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	60	32	13	14	15	16	47	14	26	32	31	71	91	66	59	102	689
11 - 20	0	0	0	0	0	0	0	0	0	0	0	0	0	6	9	2	17
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	60	32	13	14	15	16	47	14	26	32	31	71	91	72	68	104	706

Total Number of Valid Hours: 706

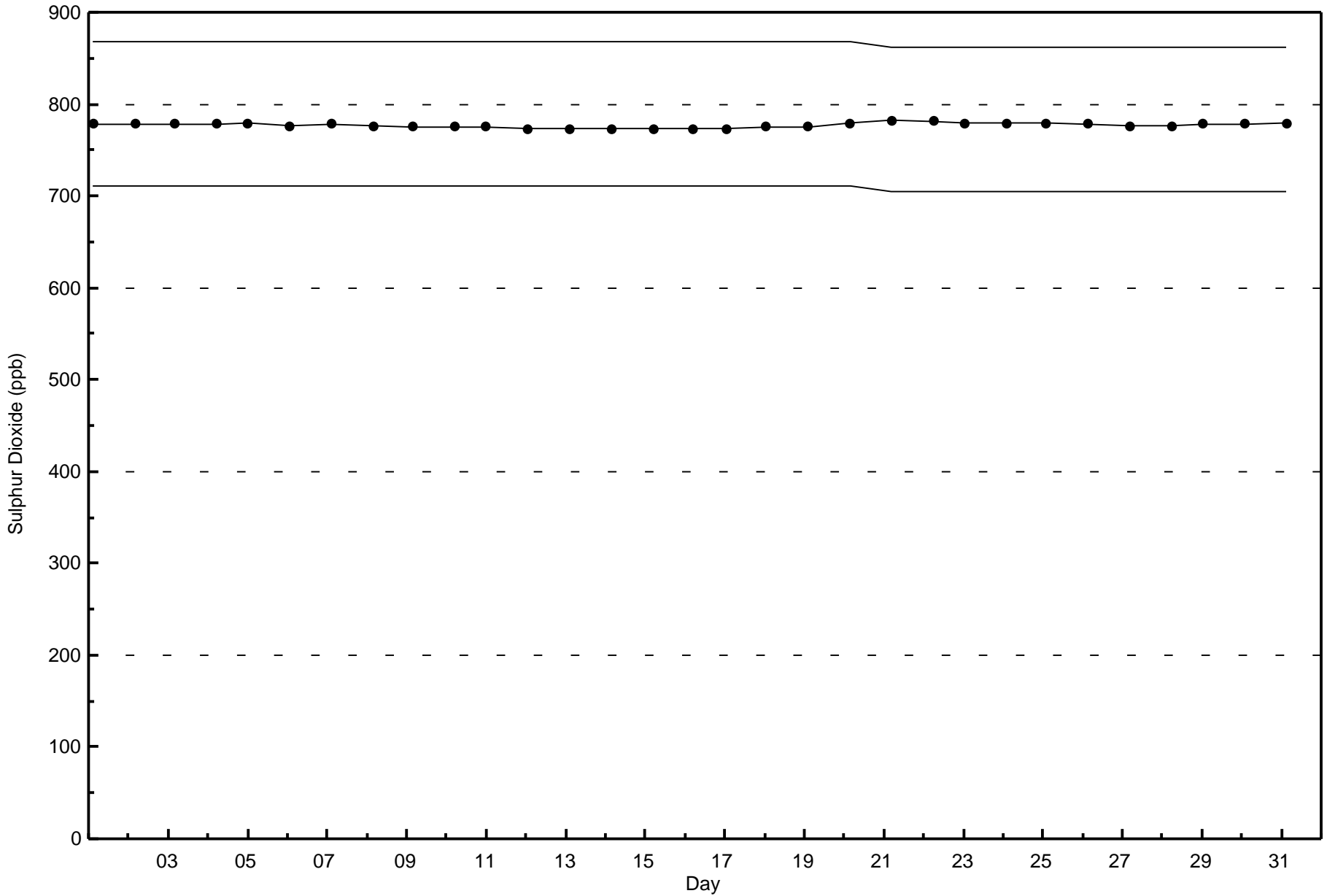
Total Number of Hours: 744





Wood Buffalo Environmental Association
Span Responses

Sulphur Dioxide (SO₂) - ppb
ConocoPhillips - Surmont - July 2016





Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 3 ppb on Jul 7 21:00	Maximum Daily Average: 0.7 ppb on Jul 7		Hours of Data:	706
Minimum Value: 0 ppb on Jul 14 10:00	Minimum Daily Average: 0.2 ppb on Jul 4		Hours of Missing Data:	38
Maximum Diurnal Average: 0.6 ppb at hour 3	Minimum Diurnal Average: 0.3 ppb at hour 10		Hours of Calibration:	36
Monthly Average: 0.4 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 1 P ₉₉ = 2		Percent Operational Time:	99.7

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-Jul	0	0	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
2-Jul	0	0	0	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
3-Jul	0	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	
4-Jul	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
5-Jul	1	Z	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	1	0.6	1	
6-Jul	0	0	Z	0	0	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0.4	1
7-Jul	1	1	0	Z	0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	3	1	0	1	0.7	3
8-Jul	0	1	1	0	Z	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.4	1	
9-Jul	0	0	2	1	2	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2	
10-Jul	0	0	1	0	0	1	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0.4	1	
11-Jul	0	Z	1	1	1	1	1	1	0	0	0	0	1	1	0	1	1	1	0	0	1	0	0	0	0.5	1	
12-Jul	0	0	Z	0	0	0	1	1	1	0	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	0.6	1
13-Jul	1	1	1	Z	1	1	1	1	1	1	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	0.7	1
14-Jul	1	1	1	1	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
15-Jul	0	0	0	0	0	Z	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
16-Jul	0	0	0	0	0	0	Z	0	0	1	1	1	1	1	1	0	1	1	1	1	1	0	0	1	1	0.5	1
17-Jul	1	Z	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0.5	1
18-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
19-Jul	0	0	0	Z	0	0	0	0	0	0	C	C	C	C	C	0	0	0	0	1	1	0	0	0	0	0.3	1
20-Jul	0	0	0	0	Z	0	0	0	0	0	M	M	0	1	0	1	0	0	0	0	0	0	0	0	0	0.3	1
21-Jul	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	2	1	2	0.5	2	
22-Jul	3	0	1	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.4	3	
23-Jul	0	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0.4	1	
24-Jul	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	0.3	1	
25-Jul	0	1	1	Z	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.4	1
26-Jul	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
27-Jul	0	0	0	0	0	Z	0	0	0	0	0	1	0	0	0	0	1	0	1	1	2	1	2	0	0.5	2	
28-Jul	0	1	0	1	1	1	Z	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0.4	1	
29-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.2	1	
30-Jul	0	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2	1	
31-Jul	0	1	1	Z	1	1	1	1	1	1	1	0	1	1	0	0	0	0	1	0	0	0	0	0	0.6	1	

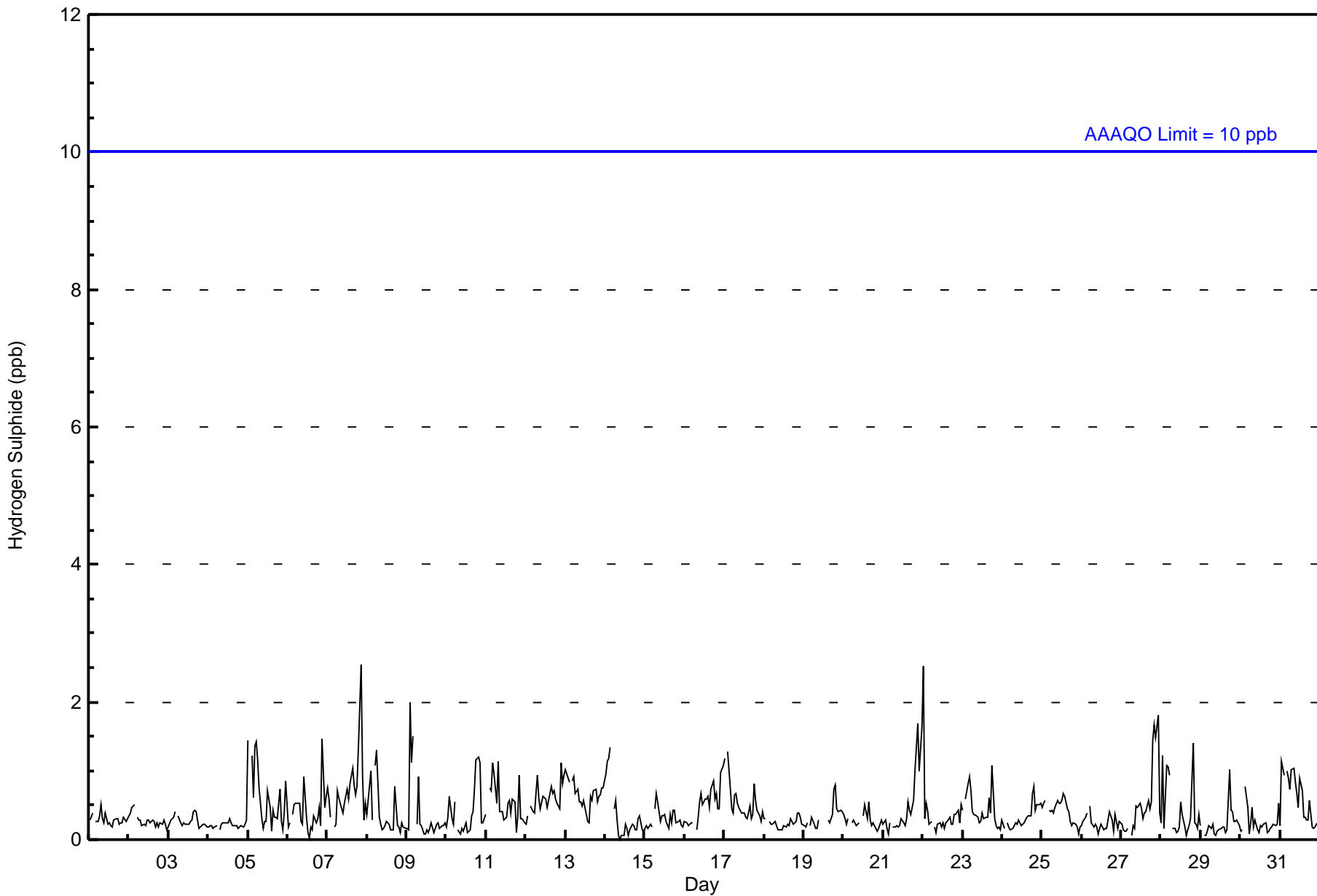
0.5	0.4	0.6	0.5	0.5	0.5	0.5	0.4	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.4	0.4	Diurnal Average		
3	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	2	2	2	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Hydrogen Sulphide (H₂S) - ppb
ConocoPhillips - Surrmont - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
ConocoPhillips - Surmont - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	704	99.72	99.72
3 - 4	2	0.28	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 706

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
ConocoPhillips - Surmont - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	60	31	13	14	15	15	47	14	26	32	29	73	92	72	69	102	704
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	60	31	13	14	15	15	47	14	26	32	29	73	92	72	69	104	706

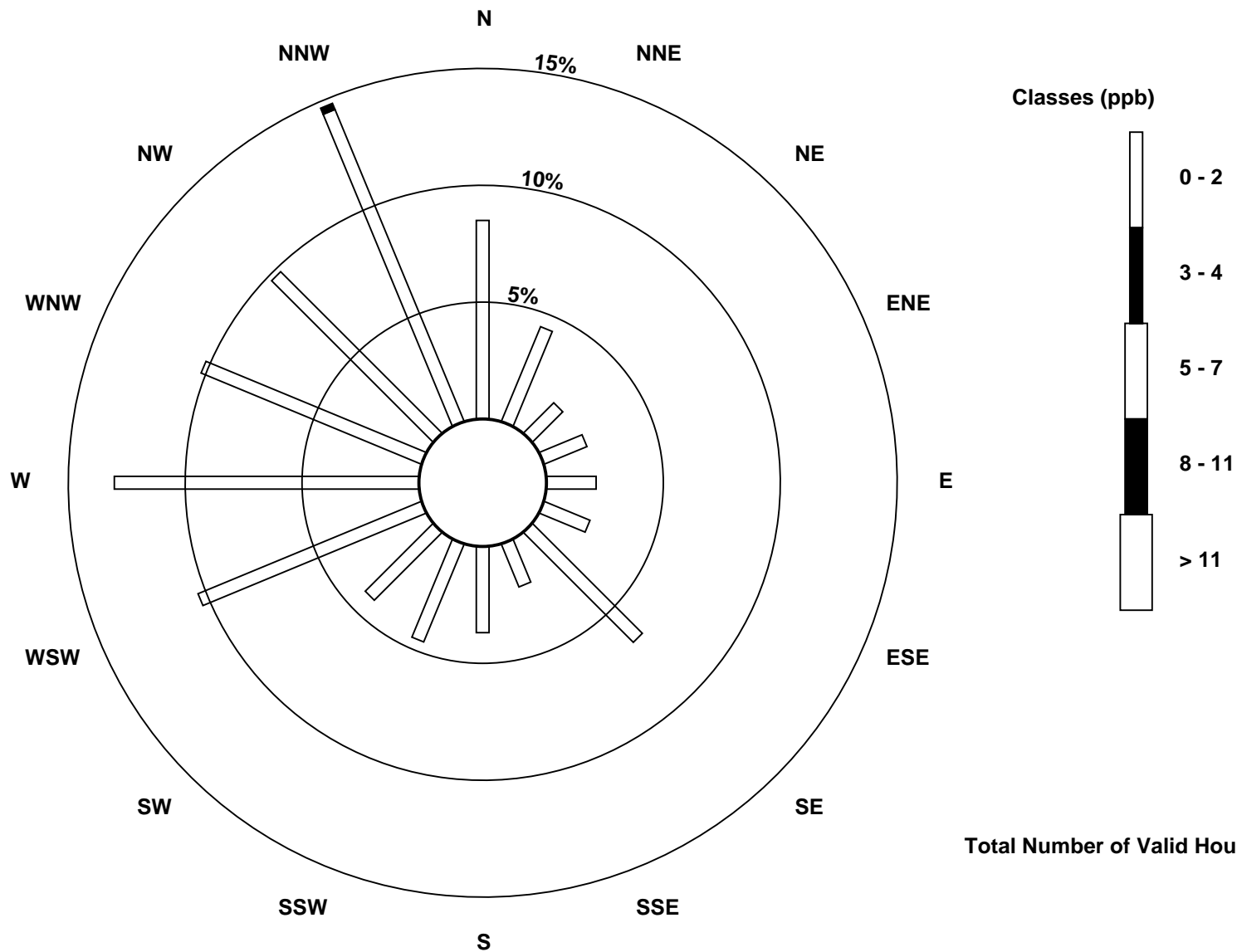
Total Number of Valid Hours: 706

Total Number of Hours: 744

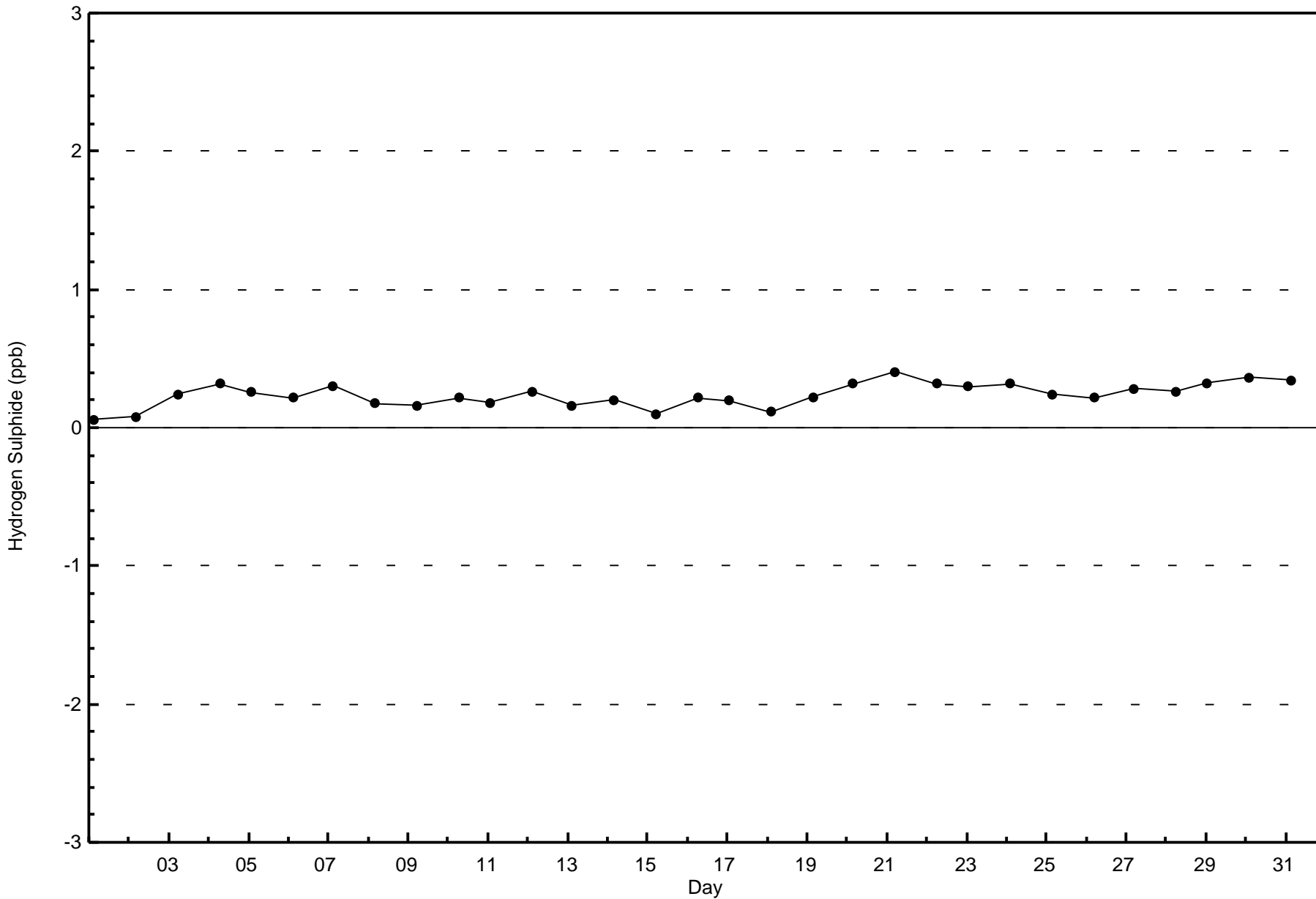


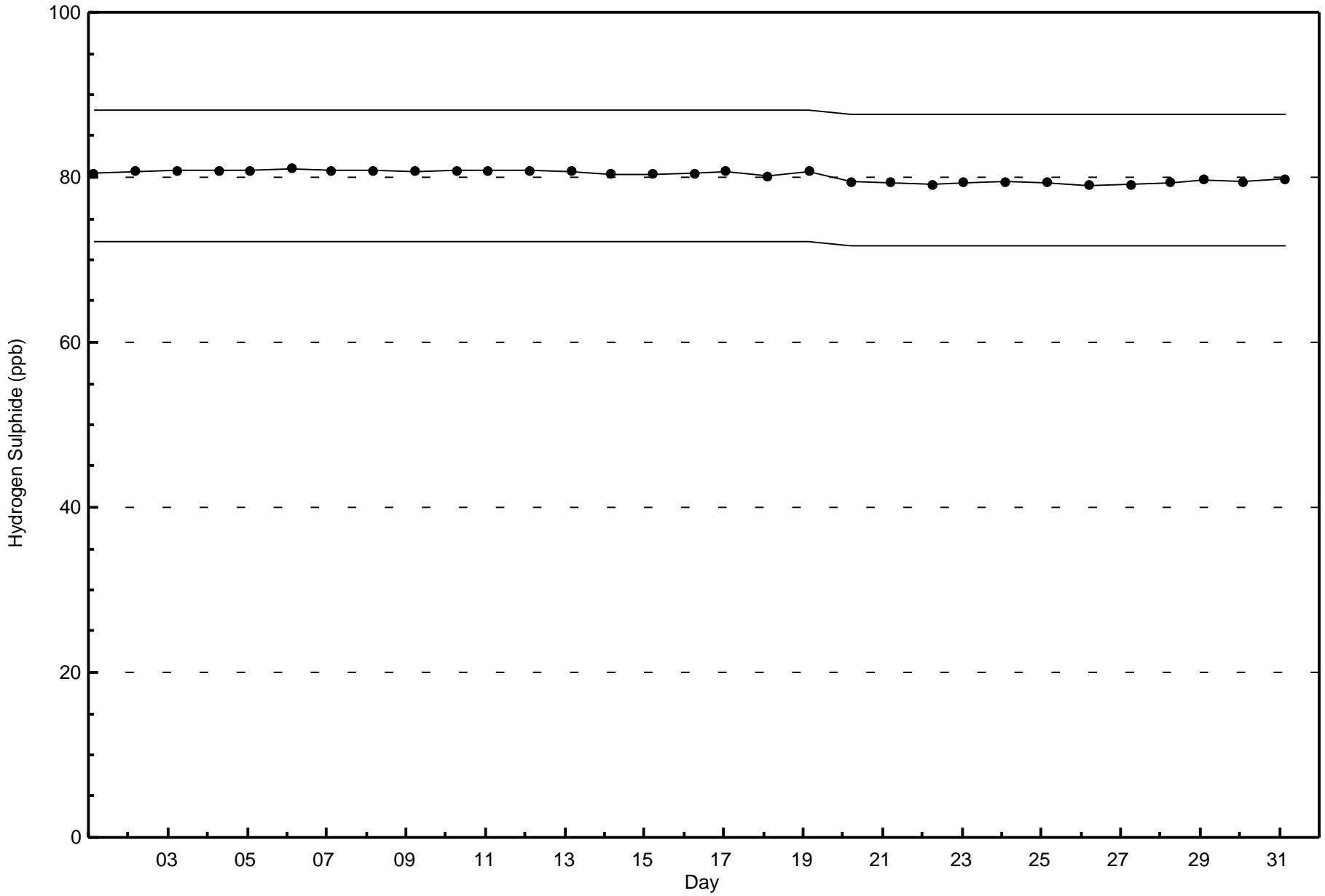
Wood Buffalo Environmental Association
Wind Rose Jul 2016

Hydrogen Sulphide (H₂S) - ppb
ConocoPhillips - Surmont (AMS502)



Total Number of Valid Hours: 706







Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxide (NO) - ppb

ConocoPhillips - Surmont - July 2016

Maximum Value: 15 ppb on Jul 1 08:00		Maximum Daily Average: 3.9 ppb on Jul 13		Hours in Service: 744																						
Minimum Value: 0 ppb on Jul 1 01:00		Minimum Daily Average: 0.1 ppb on Jul 15		Hours of Data: 706																						
Maximum Diurnal Average: 2.0 ppb at hour 11		Minimum Diurnal Average: 0.3 ppb at hour 22		Hours of Missing Data: 38																						
Monthly Average: 1.0 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 3 P ₉₉ = 10		Hours of Calibration: 36																						
				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-Jul	0	0	Z	0	0	1	0	15	7	0	14	1	3	2	2	5	3	1	1	0	0	0	0	0	2.5	15
2-Jul	0	0	1	Z	0	0	0	2	1	0	2	1	2	0	0	1	0	1	0	1	0	0	1	0	0.7	2
3-Jul	0	1	0	0	Z	0	1	2	2	2	1	1	1	3	1	1	2	2	0	0	0	0	0	0	0.9	3
4-Jul	0	0	0	0	1	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	1	0.3	2
5-Jul	Z	0	2	2	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0	1	1	0	0	0	0.5	2
6-Jul	0	Z	0	0	0	0	0	1	0	0	1	1	0	0	0	0	1	1	0	0	0	1	0	1	0.3	1
7-Jul	0	0	Z	0	1	1	11	1	3	3	1	7	2	2	2	3	3	1	3	1	1	1	1	1	2.2	11
8-Jul	2	1	1	Z	1	1	1	1	1	1	1	2	1	1	1	2	2	1	0	1	0	0	0	0	0.9	2
9-Jul	0	0	0	0	Z	0	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0.2	1
10-Jul	0	0	0	0	0	Z	1	1	1	2	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0.3	2
11-Jul	Z	1	1	0	0	1	2	1	1	1	1	2	0	2	4	1	0	0	0	0	0	1	1	1	1.1	4
12-Jul	1	Z	1	1	2	2	3	3	1	1	4	3	2	1	2	7	7	8	3	1	1	2	4	9	2.9	9
13-Jul	8	5	Z	5	6	10	8	4	3	6	2	3	3	1	1	7	5	2	4	1	4	1	1	1	3.9	10
14-Jul	1	1	0	Z	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
15-Jul	0	0	0	0	Z	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
16-Jul	0	0	0	0	0	Z	0	0	0	1	6	3	4	2	1	1	2	3	1	1	0	1	3	1	1.4	6
17-Jul	Z	1	1	1	1	1	3	2	1	1	1	2	2	1	1	2	0	1	2	1	1	0	1	1	1.1	3
18-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0.3	1
19-Jul	0	0	Z	0	0	0	0	0	1	0	1	0	0	1	1	1	0	0	10	2	1	1	1	0	1.0	10
20-Jul	0	0	0	Z	3	1	0	0	0	0	M	M	C	C	C	C	C	0	0	0	0	1	0	0	--	3
21-Jul	0	1	0	0	Z	0	0	0	0	1	1	6	2	1	4	4	9	4	6	0	1	0	0	0	1.9	9
22-Jul	0	0	0	0	0	Z	1	1	1	3	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.6	3
23-Jul	Z	0	1	0	0	0	0	3	1	5	0	1	2	0	0	0	3	0	0	0	0	0	0	0	0.8	5
24-Jul	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	10	0	0	0	0	0.8	10
25-Jul	0	0	Z	0	0	0	0	2	3	11	11	10	9	10	8	4	1	1	0	0	0	1	0	0	3.2	11
26-Jul	0	1	0	Z	2	1	1	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0.5	2
27-Jul	0	0	0	0	Z	0	0	0	0	2	1	3	3	3	1	2	0	0	0	0	0	0	0	0	0.7	3
28-Jul	0	0	1	0	0	Z	0	1	0	0	1	0	0	1	0	0	1	1	0	0	0	0	0	0	0.3	1
29-Jul	Z	0	0	0	0	0	0	0	0	1	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0.5	1
30-Jul	0	Z	0	0	0	0	0	0	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0.2	1
31-Jul	0	1	Z	0	1	1	1	1	0	0	4	5	3	2	1	1	1	1	1	0	0	0	0	0	1.0	5
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan		C - Calibration				M - Maintenance																				

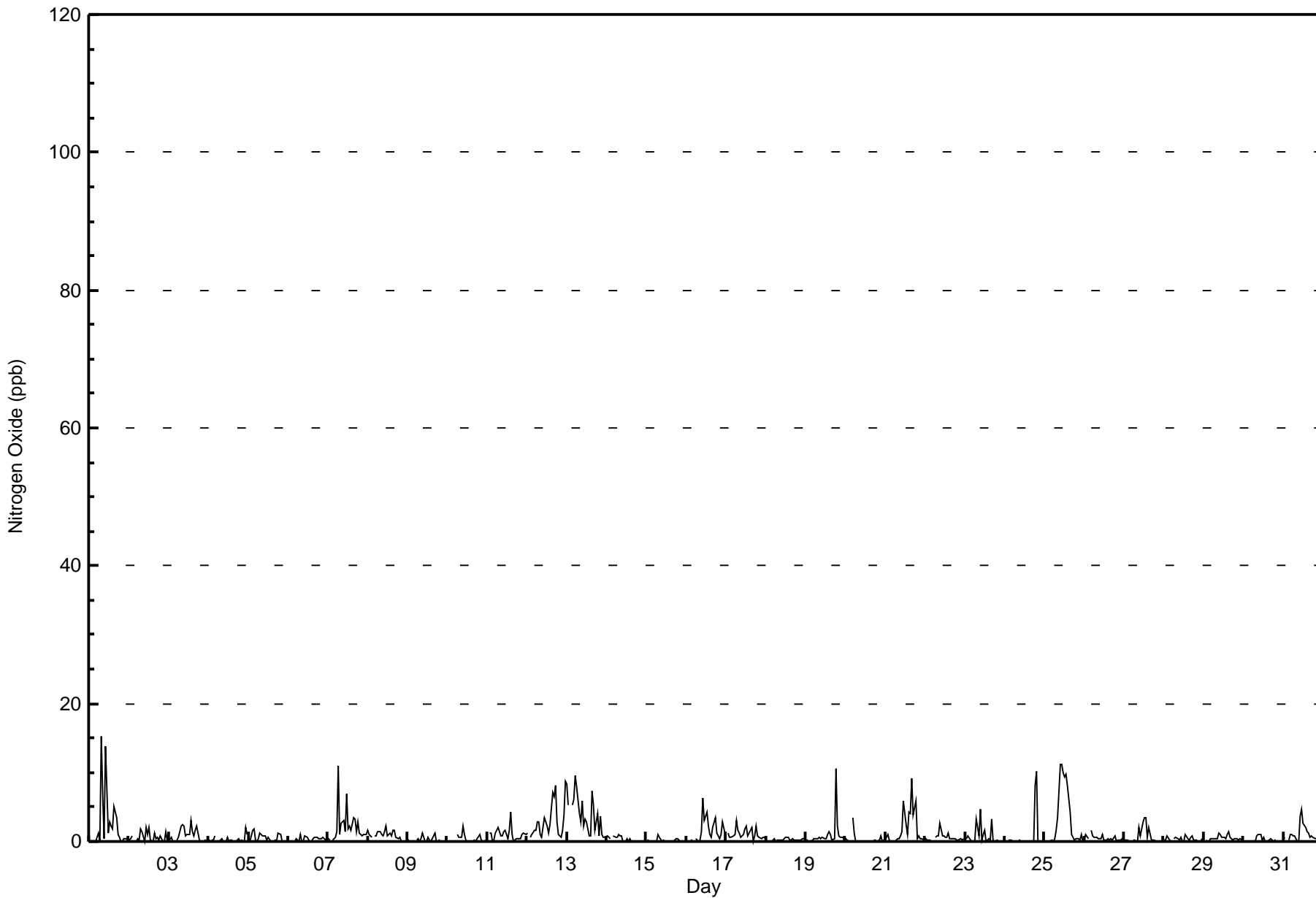


Wood Buffalo Environmental Association

Hourly Averages

Nitrogen Oxide (NO) - ppb

ConocoPhillips - Surmont - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxide (NO) - ppb
ConocoPhillips - Surmont - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	706	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: 706

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxide (NO) - ppb
ConocoPhillips - Surmont - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	60	32	13	14	15	16	47	14	26	32	31	71	91	72	68	104	706
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	60	32	13	14	15	16	47	14	26	32	31	71	91	72	68	104	706

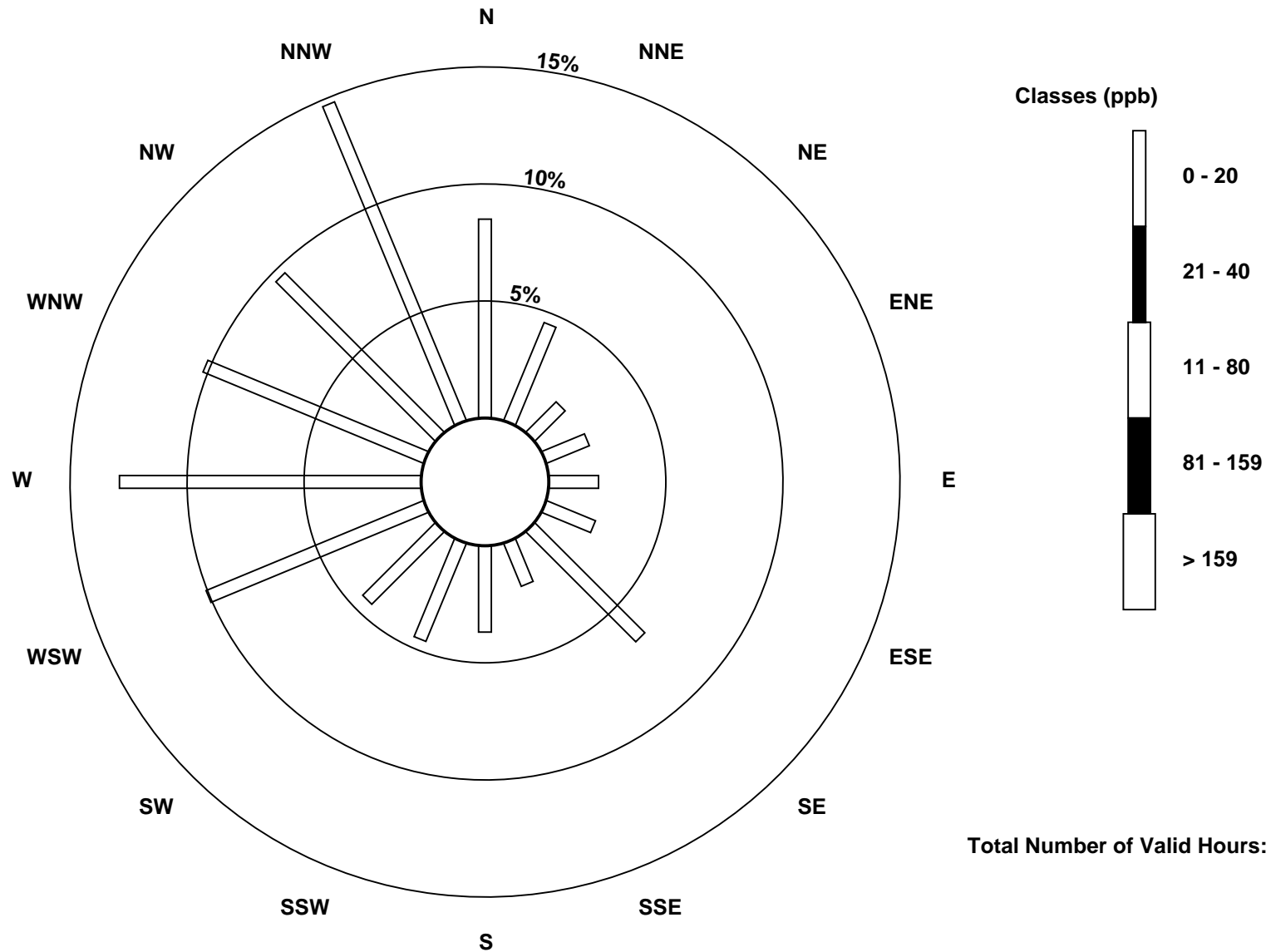
Total Number of Valid Hours: 706

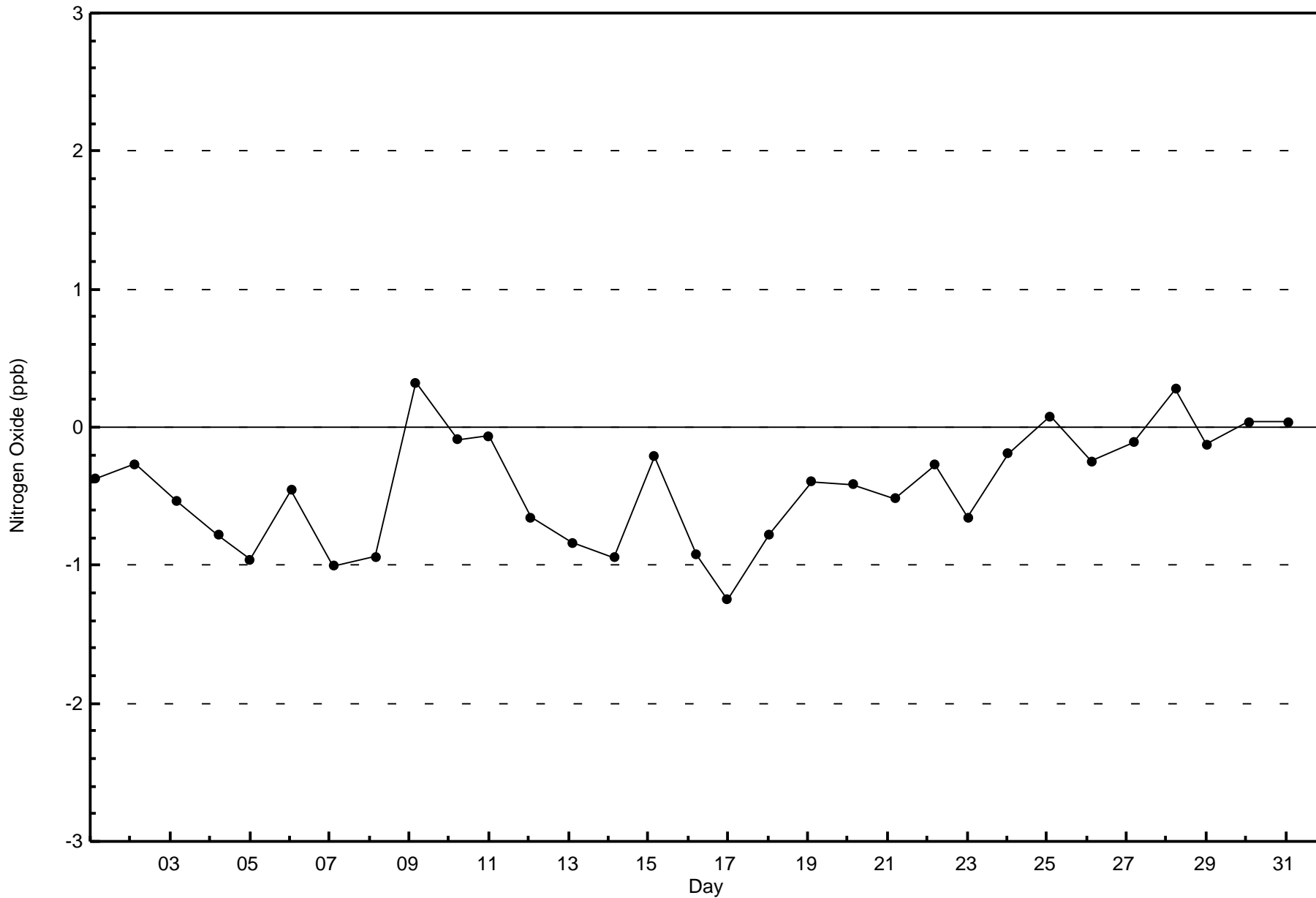
Total Number of Hours: 744

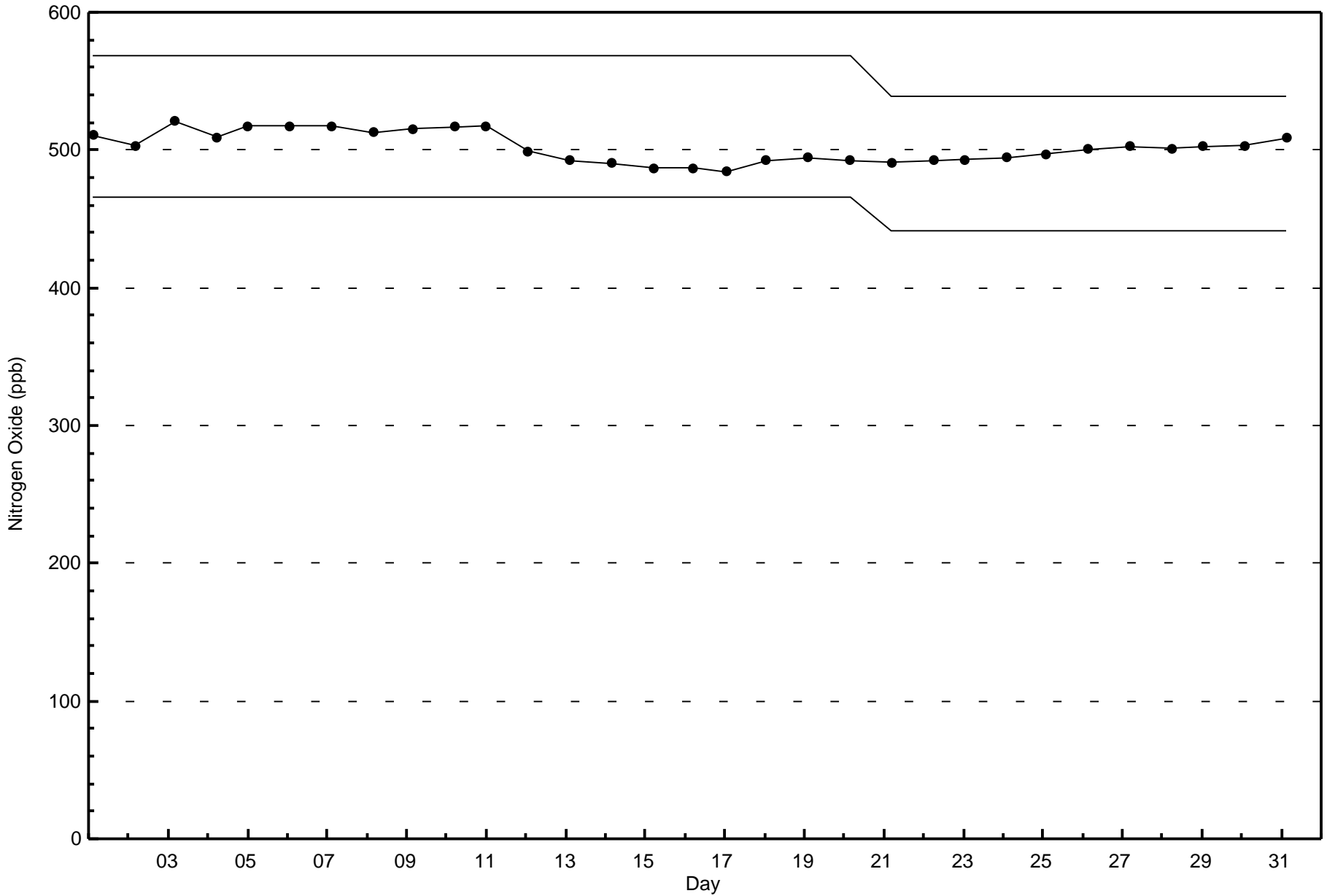


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Nitrogen Oxide (NO) - ppb
ConocoPhillips - Surmont (AMS502)









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

ConocoPhillips - Surmont - July 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 10 ppb on Jul 13 01:00	Maximum Daily Average: 3.8 ppb on Jul 13		Hours of Data:	706
Minimum Value: 0 ppb on Jul 4 11:00	Minimum Daily Average: 0.4 ppb on Jul 4		Hours of Missing Data:	38
Maximum Diurnal Average: 1.8 ppb at hour 6	Minimum Diurnal Average: 0.8 ppb at hour 21		Hours of Calibration:	36
Monthly Average: 1.4 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 1 O ₃ = 2 P ₉₀ = 3 P ₉₉ = 7		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-Jul	1	2	Z	1	1	2	1	5	4	2	1	1	3	2	2	5	3	2	1	1	0	0	1	1	1.8	5
2-Jul	1	1	1	Z	1	2	2	2	2	1	1	3	1	1	1	2	1	1	1	1	1	0	3	2	1.3	3
3-Jul	1	2	2	2	Z	3	3	3	2	2	1	1	2	2	2	1	2	3	1	0	1	1	0	0	1.6	3
4-Jul	0	0	0	0	0	Z	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	0.4	1
5-Jul	Z	0	1	1	1	1	2	2	1	1	1	1	2	1	1	1	1	1	1	2	1	0	1	1	0.9	2
6-Jul	1	Z	2	1	1	1	2	3	2	1	3	3	2	1	0	1	1	1	1	1	1	1	1	1	1.2	3
7-Jul	1	1	Z	1	1	1	4	2	3	2	2	4	3	2	2	3	4	2	3	2	2	2	2	2	2.2	4
8-Jul	2	2	2	Z	1	2	2	1	0	0	0	0	1	1	1	2	2	1	1	1	1	1	1	0	1.1	2
9-Jul	0	0	0	0	Z	2	1	1	1	1	0	1	1	1	1	0	1	1	0	0	0	1	3	1	0.7	3
10-Jul	1	1	1	1	1	Z	2	1	1	1	0	0	0	0	0	1	1	0	1	1	1	0	1	1	0.8	2
11-Jul	Z	8	8	7	6	7	5	3	2	1	2	2	1	1	3	1	2	1	1	1	1	2	1	1	2.9	8
12-Jul	1	Z	3	3	4	3	2	3	2	2	3	2	2	1	2	6	4	6	3	1	1	3	6	10	3.1	10
13-Jul	10	8	Z	7	7	8	5	3	3	4	3	3	2	1	1	6	5	2	4	1	5	2	1	1	3.8	10
14-Jul	0	0	1	Z	2	0	1	1	1	0	0	0	1	1	1	1	1	1	0	0	0	1	1	0	0.6	2
15-Jul	1	1	0	1	Z	2	2	4	3	2	3	2	2	1	1	2	1	1	2	1	0	1	1	1	1.4	4
16-Jul	1	1	1	1	0	Z	1	1	1	1	4	2	3	2	1	2	3	5	2	2	1	2	5	3	1.9	5
17-Jul	Z	3	3	3	4	3	4	3	3	1	1	1	2	1	1	2	1	2	4	3	2	2	2	2	2.3	4
18-Jul	2	Z	5	2	2	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1.1	5
19-Jul	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	6	1	1	1	0	0	1.2	6
20-Jul	1	1	1	Z	2	1	1	1	1	0	M	M	C	C	C	C	C	0	0	0	0	1	0	0	--	2
21-Jul	0	1	0	0	Z	0	0	1	0	0	1	2	1	1	2	3	4	2	3	1	1	1	1	1	1.1	4
22-Jul	2	1	1	1	1	Z	1	1	1	2	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0.8	2
23-Jul	Z	2	1	0	0	0	1	1	1	2	0	1	2	0	0	0	3	1	1	1	0	0	0	0	0.8	3
24-Jul	1	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	4	5	0	0	0	0	0.6	5
25-Jul	0	0	Z	0	0	0	1	1	2	4	4	5	3	2	3	2	1	1	1	1	0	0	1	1	1.4	5
26-Jul	1	1	1	Z	3	1	1	1	1	1	1	2	1	1	1	1	1	2	4	1	3	2	2	3	1.5	4
27-Jul	1	1	1	1	Z	1	1	1	0	1	1	2	4	3	1	3	2	2	3	2	1	1	1	1	1.4	4
28-Jul	1	1	2	1	1	Z	1	1	1	1	0	1	1	2	1	0	0	1	1	1	2	2	2	1	1.0	2
29-Jul	Z	0	1	0	1	1	1	1	1	2	1	1	1	1	1	2	1	0	1	0	0	0	1	1	0.8	2
30-Jul	1	Z	0	0	0	0	1	2	1	2	2	1	2	1	0	1	1	1	0	0	0	0	0	1	0.7	2
31-Jul	0	3	Z	2	2	2	1	2	1	1	3	3	3	2	2	1	1	1	1	0	0	0	0	0	1.3	3

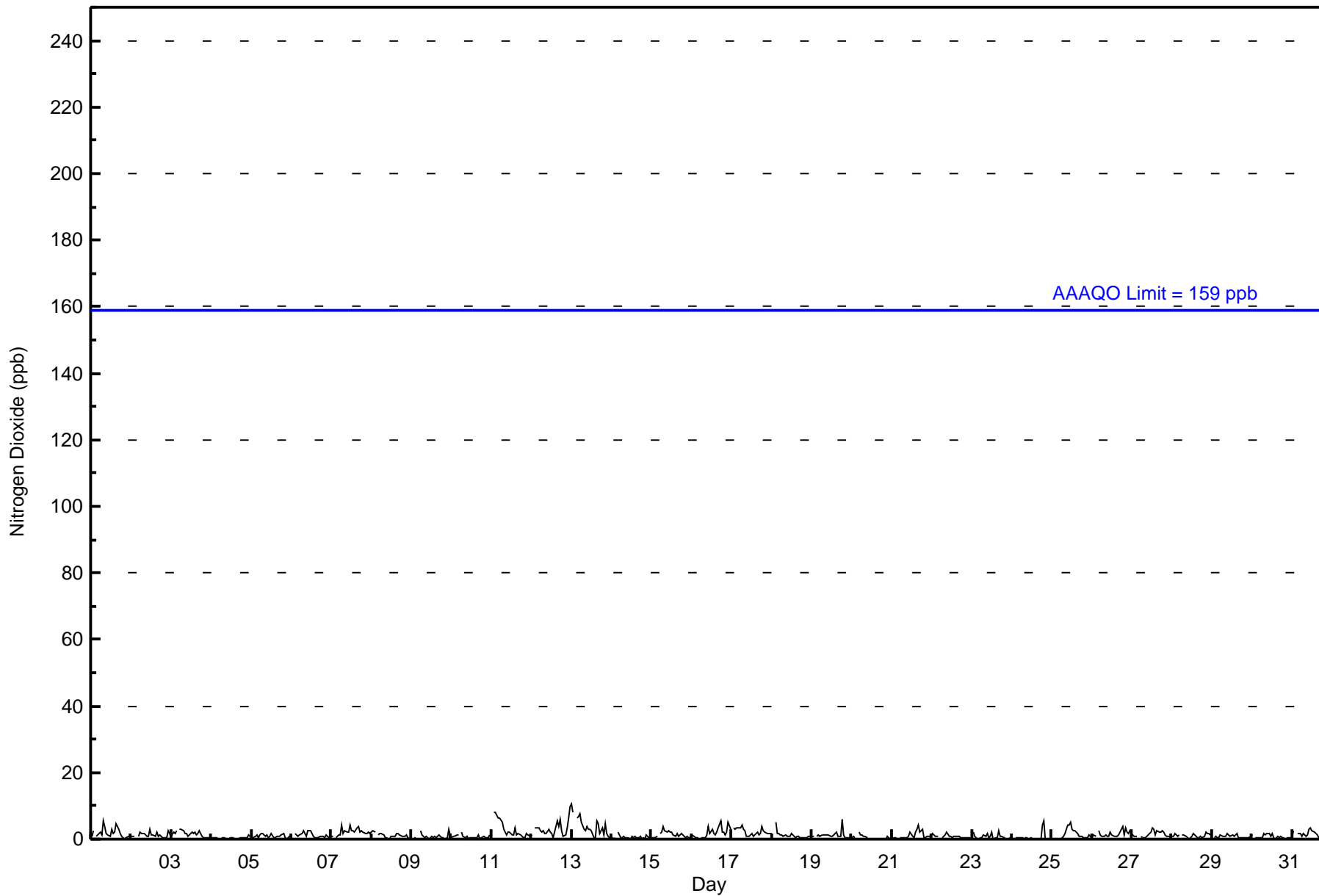
1.2	1.6	1.5	1.5	1.7	1.8	1.6	1.6	1.3	1.3	1.4	1.6	1.6	1.1	1.2	1.7	1.6	1.4	1.6	1.0	0.8	0.9	1.2	1.2	Diurnal Average
10	8	8	7	7	8	5	5	4	4	4	5	4	3	3	6	5	6	6	5	5	3	6	10	Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
ConocoPhillips - Surmont - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
ConocoPhillips - Surmont - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	706	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: 706

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
ConocoPhillips - Surmont - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	60	32	13	14	15	16	47	14	26	32	31	71	91	72	68	104	706
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	60	32	13	14	15	16	47	14	26	32	31	71	91	72	68	104	706

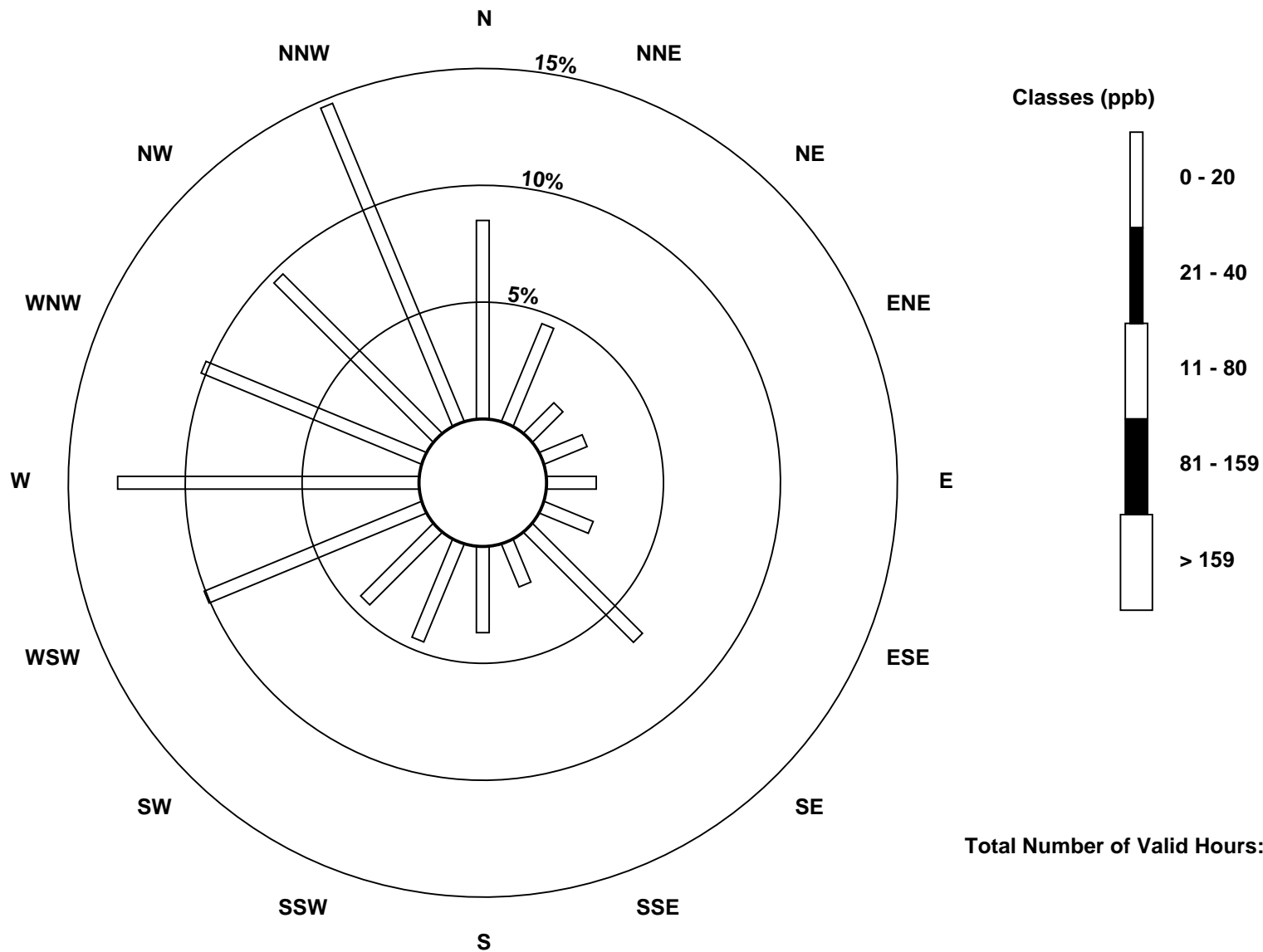
Total Number of Valid Hours: 706

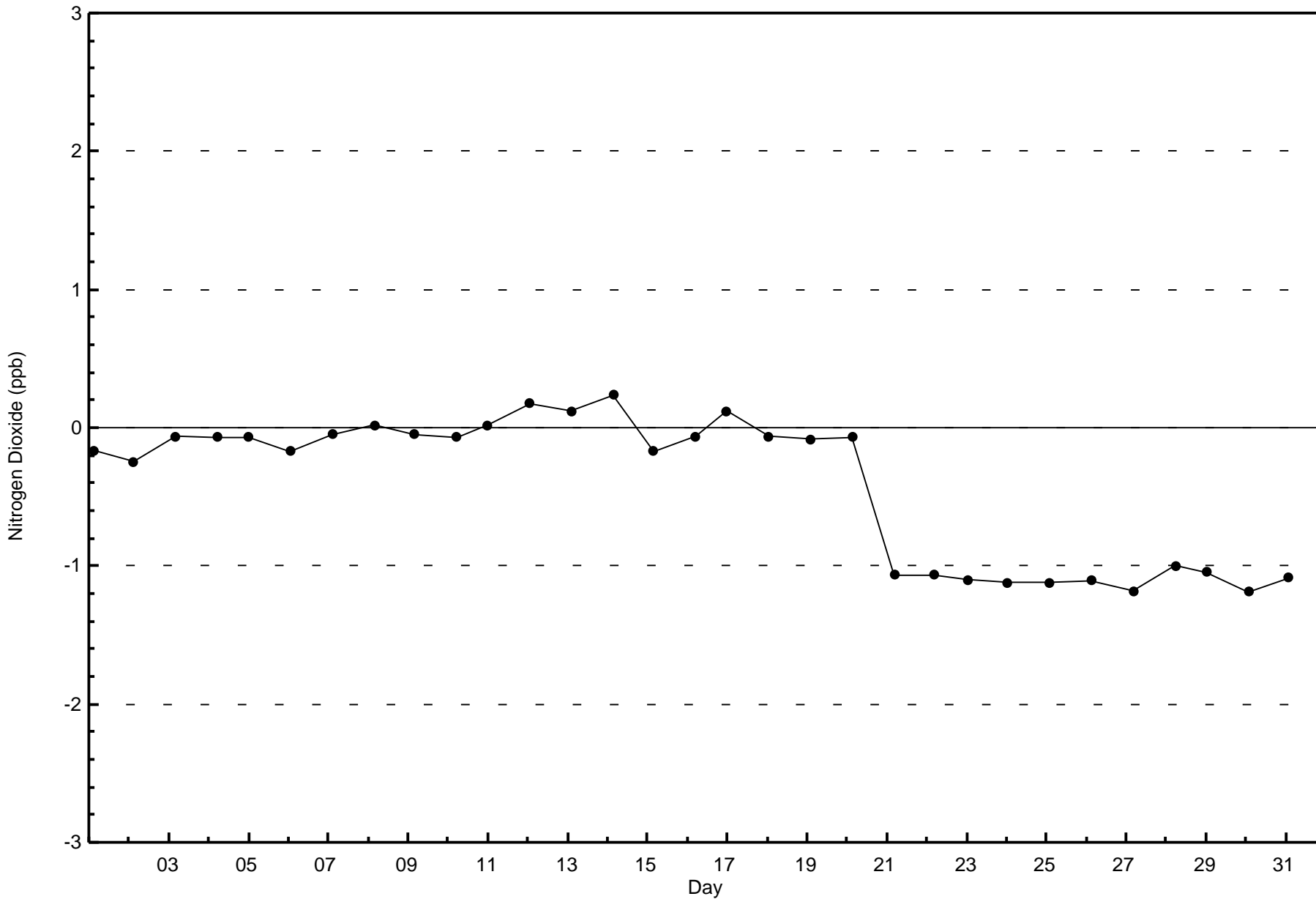
Total Number of Hours: 744

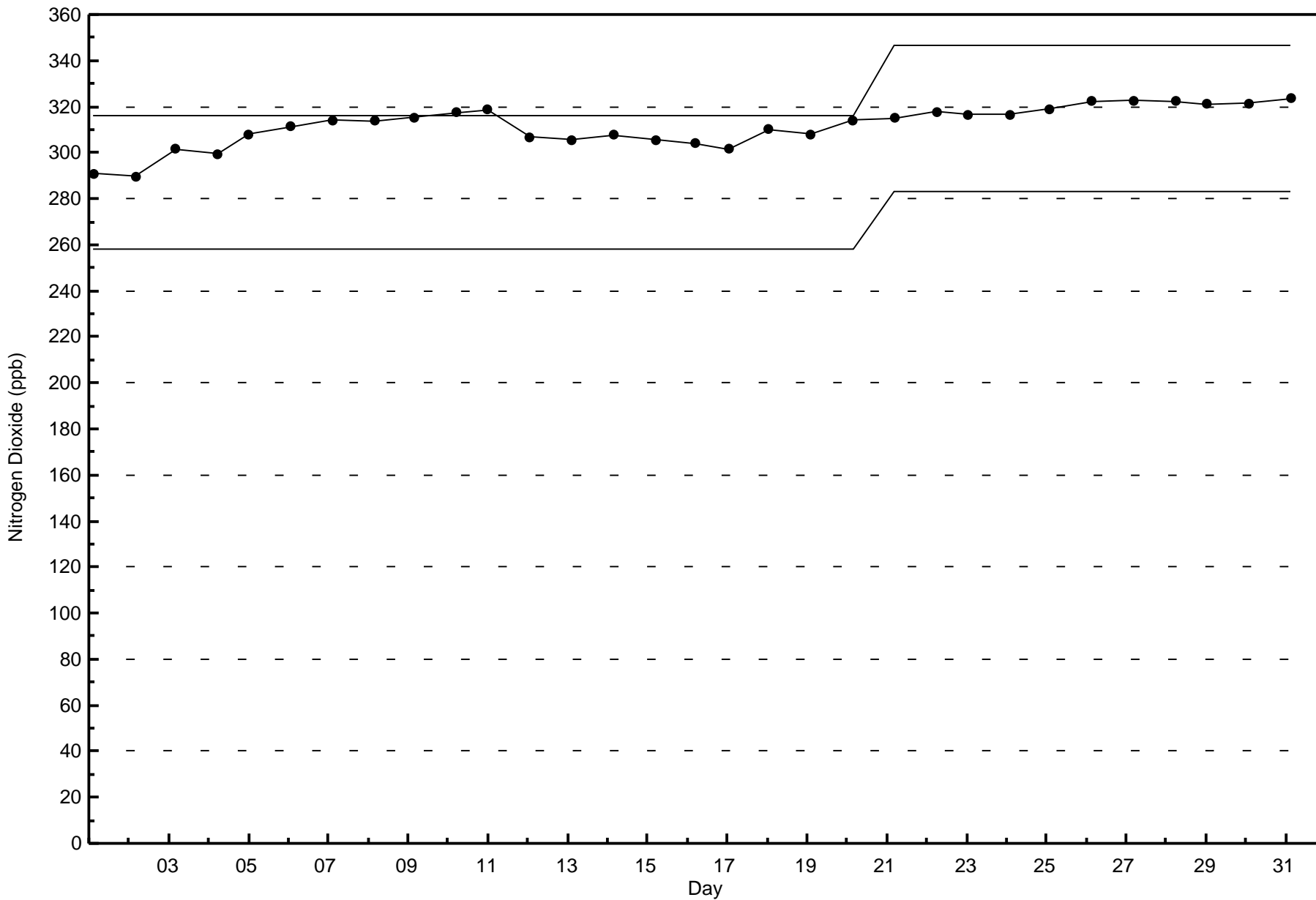


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Nitrogen Dioxide (NO₂) - ppb
ConocoPhillips - Surmont (AMS502)









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxides (NO_x) - ppb

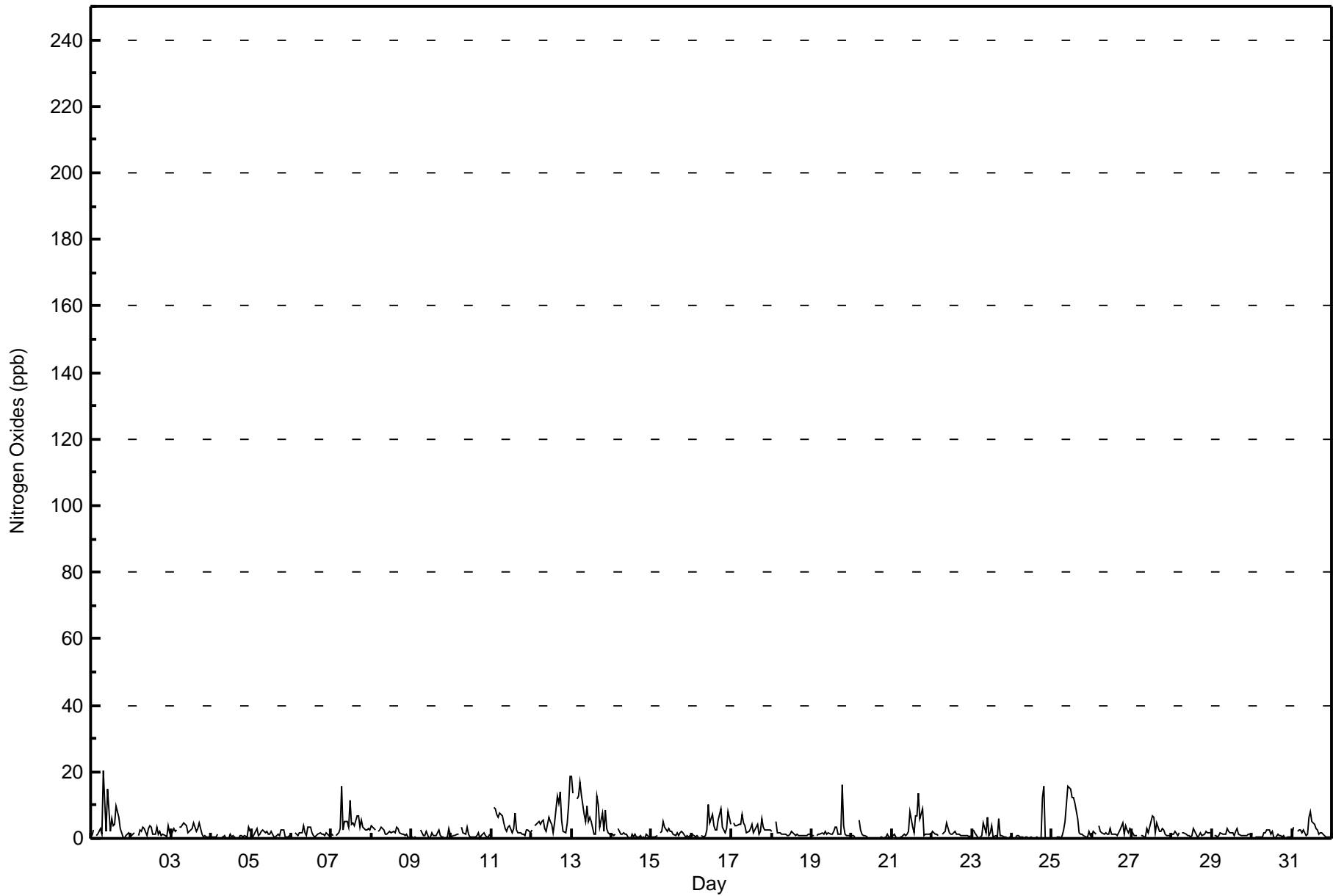
ConocoPhillips - Surmont - July 2016

Maximum Value: 20 ppb on Jul 1 08:00																		Maximum Daily Average: 7.7 ppb on Jul 13						Hours in Service: 744		
Minimum Value: 0 ppb on Jul 4 11:00																		Minimum Daily Average: 0.7 ppb on Jul 4						Hours of Data: 706		
Maximum Diurnal Average: 3.4 ppb at hour 12																		Minimum Diurnal Average: 1.2 ppb at hour 21						Hours of Missing Data: 38		
Monthly Average: 2.4 ppb																		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 1 Q ₃ = 3 P ₉₀ = 5 P ₉₉ = 15						Hours of Calibration: 36		
																		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-Jul	1	2	Z	1	1	3	1	20	11	2	15	2	6	4	4	10	6	3	2	1	0	1	2	1	4.3	20
2-Jul	1	1	2	Z	1	2	2	3	3	1	3	4	3	1	1	3	1	2	1	1	1	0	4	2	1.9	4
3-Jul	1	3	2	2	Z	3	4	5	4	4	2	2	3	5	3	2	3	5	1	0	1	0	1	0	2.5	5
4-Jul	0	1	0	1	1	Z	0	1	1	0	0	1	0	1	0	0	0	1	1	0	1	0	3	2	0.7	3
5-Jul	Z	0	2	3	1	1	2	3	2	2	1	1	2	1	0	1	1	1	3	3	1	0	1	1	1.4	3
6-Jul	0	Z	2	1	1	2	2	4	2	1	3	3	2	1	0	1	1	2	1	1	1	2	1	1	1.5	4
7-Jul	1	1	Z	1	2	3	16	3	5	5	3	11	4	5	4	7	7	3	6	3	3	3	3	2	4.4	16
8-Jul	4	3	3	Z	2	2	3	2	1	1	2	2	2	2	2	3	3	2	1	1	1	1	1	0	2.0	4
9-Jul	0	0	0	0	Z	3	2	1	1	2	0	1	2	1	1	1	2	1	0	1	0	0	3	1	1.0	3
10-Jul	1	1	1	1	1	Z	3	2	1	3	1	1	0	0	0	1	2	0	1	2	1	0	1	1	1.1	3
11-Jul	Z	9	9	7	7	8	7	4	3	2	3	4	2	3	7	2	2	2	1	1	1	3	2	2	4.0	9
12-Jul	3	Z	4	4	5	4	5	5	3	2	7	5	4	2	5	13	10	14	6	2	2	5	10	19	6.0	19
13-Jul	19	14	Z	12	13	17	13	7	5	10	5	6	5	1	1	13	10	3	8	2	8	3	2	1	7.7	19
14-Jul	1	1	1	Z	3	1	1	2	1	1	0	0	1	1	1	0	1	1	0	0	0	1	1	0	0.9	3
15-Jul	0	1	0	1	Z	2	2	5	3	2	3	2	2	1	1	2	1	2	2	2	0	1	1	1	1.6	5
16-Jul	1	1	1	1	0	Z	1	1	1	3	10	5	7	4	2	3	5	9	3	3	2	3	8	4	3.3	10
17-Jul	Z	5	4	4	4	4	7	5	4	2	2	3	4	2	2	4	1	2	6	3	3	2	2	2	3.4	7
18-Jul	2	Z	5	2	2	2	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1.3	5
19-Jul	1	1	Z	1	1	1	2	1	2	1	2	1	1	2	3	3	1	1	16	4	1	1	1	1	2.2	16
20-Jul	1	1	1	Z	5	2	1	1	1	0	M	M	C	C	C	C	C	0	0	0	0	1	0	0	--	5
21-Jul	0	1	1	0	Z	0	0	1	1	1	2	8	3	2	7	7	13	6	9	1	1	1	1	1	3.0	13
22-Jul	2	2	1	1	1	Z	1	2	2	5	2	1	1	2	2	1	1	1	1	1	1	1	1	1	1.4	5
23-Jul	Z	3	2	0	0	1	1	5	2	6	1	2	4	0	1	1	6	1	1	1	0	0	0	0	1.5	6
24-Jul	1	Z	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	12	16	0	0	0	0	1.5	16
25-Jul	0	0	Z	0	0	0	1	3	5	15	15	15	12	12	11	6	2	1	1	1	1	0	2	1	4.6	15
26-Jul	1	2	1	Z	4	2	2	1	2	1	1	3	1	1	1	1	2	3	5	1	4	2	2	3	2.0	5
27-Jul	2	1	1	1	Z	1	1	0	0	3	2	5	7	6	2	5	2	2	3	2	1	1	1	1	2.2	7
28-Jul	1	1	2	1	2	Z	1	2	1	1	1	0	1	3	1	1	1	2	1	1	2	2	2	2	1.3	3
29-Jul	Z	1	1	0	1	2	1	1	1	3	2	2	2	1	2	3	1	1	1	1	1	1	1	1	1.3	3
30-Jul	1	Z	0	0	0	0	1	2	2	3	3	1	2	0	0	1	1	1	0	1	0	0	0	1	0.9	3
31-Jul	1	3	Z	2	3	2	2	2	1	1	7	8	5	4	3	2	1	2	2	1	0	0	0	0	2.3	8
1.8 2.2 1.8 1.9 2.4 2.7 2.8 3.1 2.3 2.8 3.3 3.4 3.1 2.3 2.4 3.3 3.0 2.3 3.1 1.8 1.2 1.2 1.8 1.8																		Diurnal Average								
19 14 9 12 13 17 16 20 11 15 15 15 12 12 11 13 13 14 16 16 8 5 10 19																		Diurnal Maximum								
Z - zerospan			C - Calibration			M - Maintenance																				



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
ConocoPhillips - Surmont - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
ConocoPhillips - Surmont - July 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	706	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: 706

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
ConocoPhillips - Surmont - July 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	60	32	13	14	15	16	47	14	26	32	31	71	91	72	68	104	706
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	60	32	13	14	15	16	47	14	26	32	31	71	91	72	68	104	706

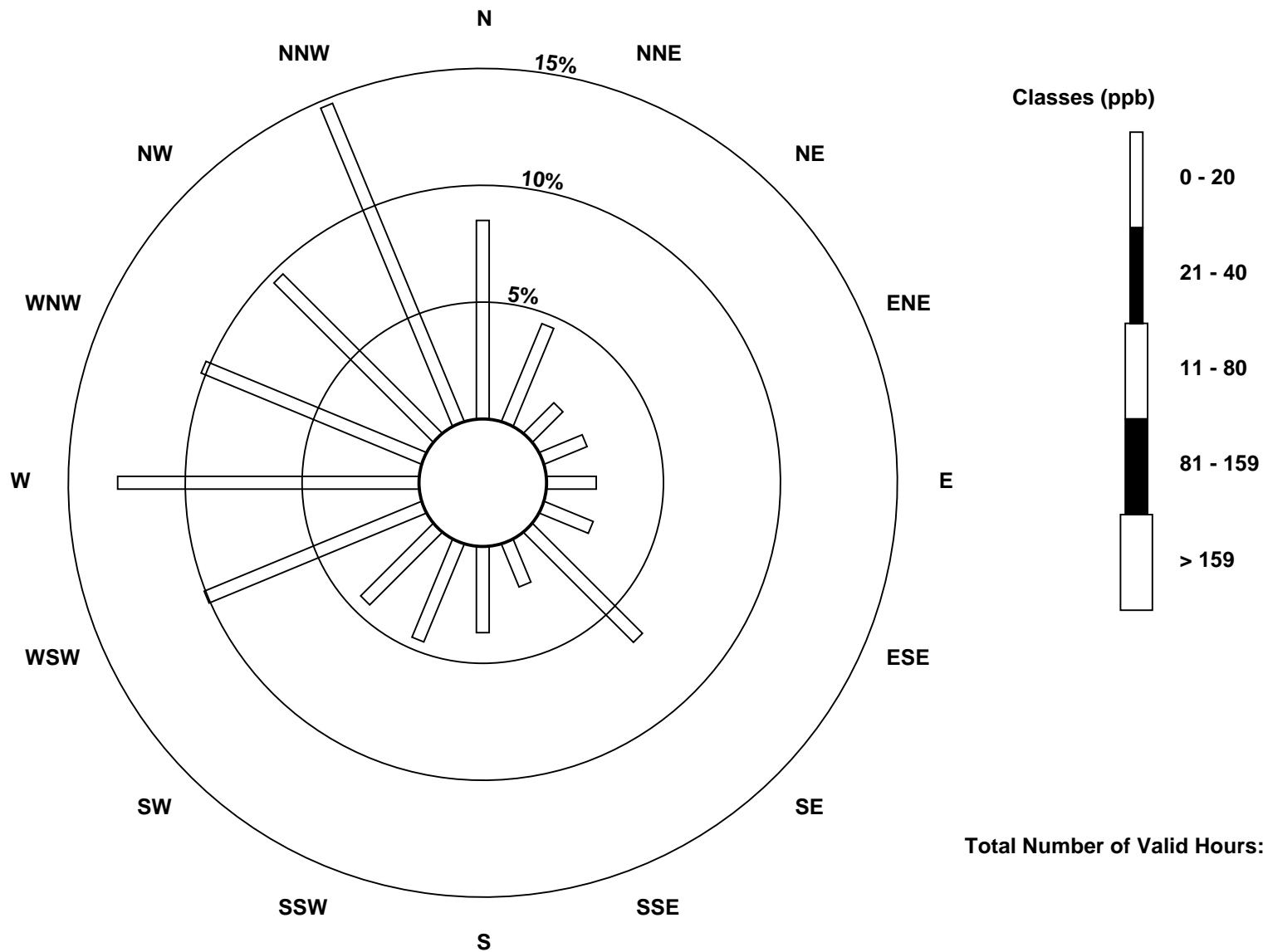
Total Number of Valid Hours: 706

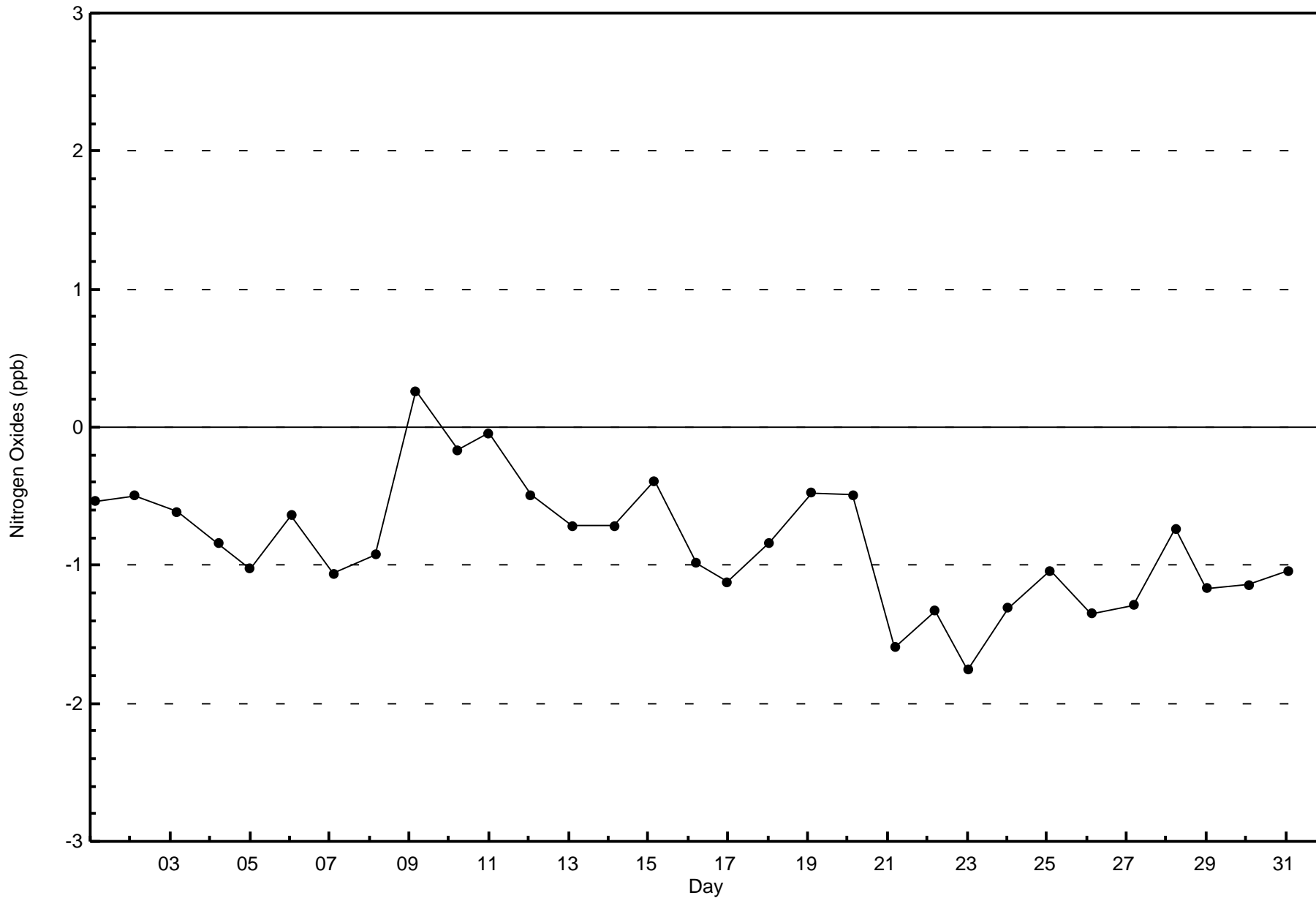
Total Number of Hours: 744

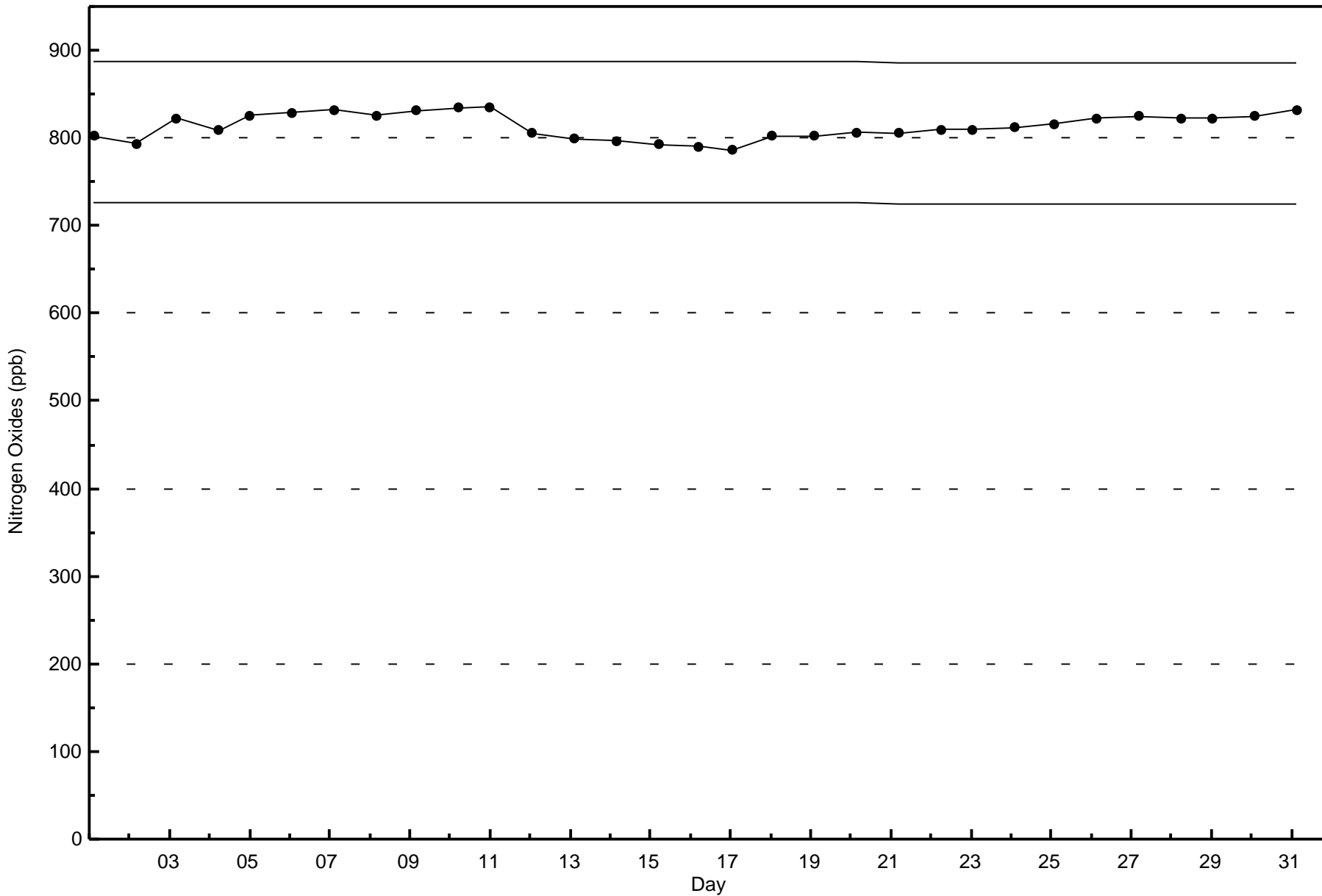


Wood Buffalo Environmental Association
Wind Rose Jul 2016

Nitrogen Oxides (NO_x) - ppb
ConocoPhillips - Surmont (AMS502)









Wood Buffalo Environmental Association
Summary of Hour Averages

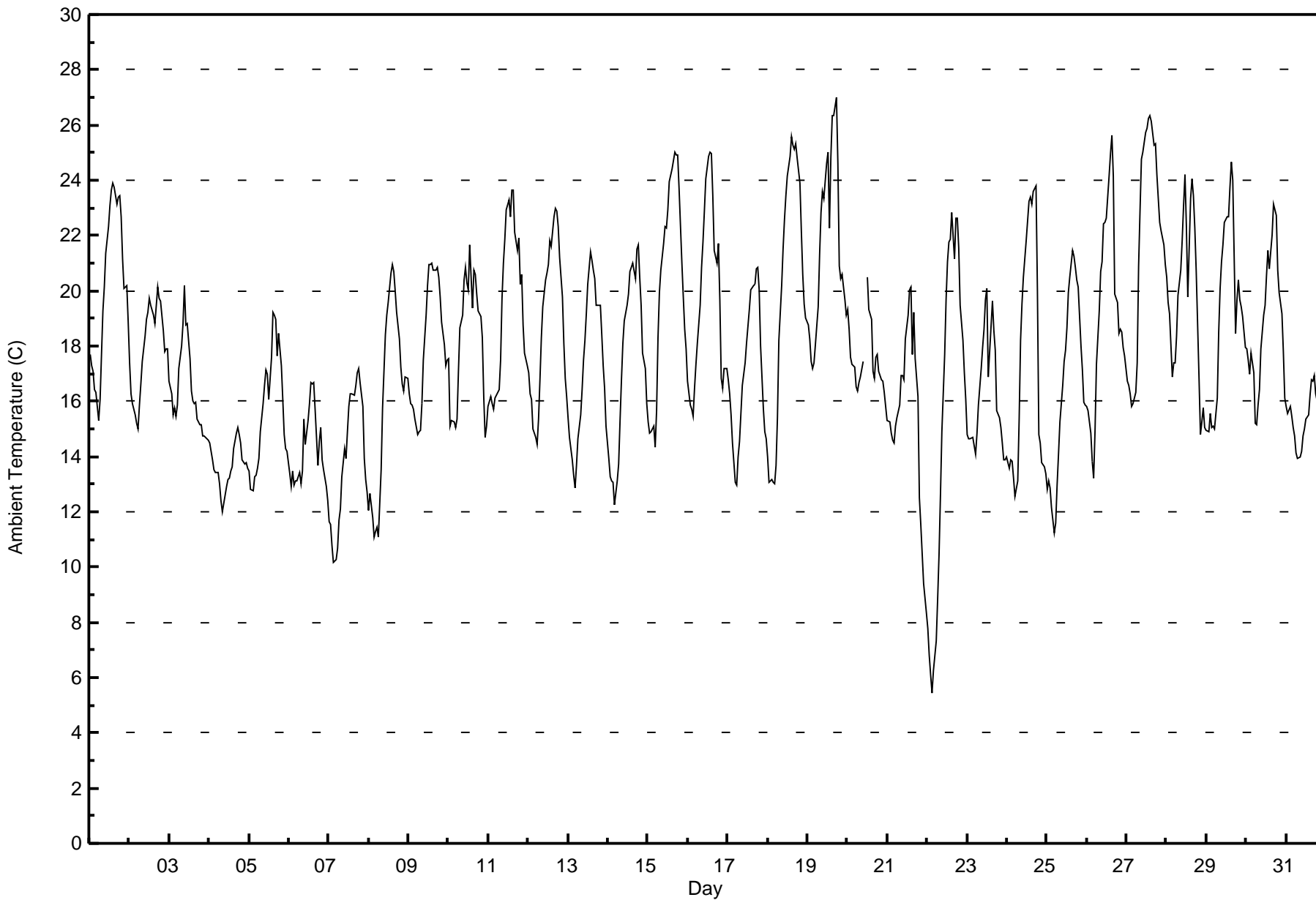
Ambient Temperature (AT) - C
ConocoPhillips - Surmont - July 2016

Maximum Value: 27.0 C on Jul 19 18:00 Maximum Daily Average: 21.8 C on Jul 27																				Hours in Service: 744 Hours of Data: 742																												
Minimum Value: 5.5 C on Jul 22 04:00 Minimum Daily Average: 13.6 C on Jul 4 Maximum Diurnal Average: 21.2 C at hour 16 Minimum Diurnal Average: 14.2 C at hour 5 Monthly Average: 17.72 C Percentiles: P ₁ = 8.8 P ₁₀ = 13.4 Q ₁ = 15.1 Median = 17.3 Q ₃ = 20.4 P ₉₀ = 22.9 P ₉₉ = 25.7																				Hours of Missing Data: 2 Hours of Calibration: 0 Percent Operational Time: 99.7																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Jul	17.7	17.3	17.1	16.4	16.3	15.3	16.1	17.7	19.3	20.2	21.3	22.3	23.1	23.6	23.9	23.7	23.1	23.4	23.4	22.7	21.2	20.1	20.2	18.8	20.2	23.9																						
2-Jul	17.4	16.3	15.9	15.5	15.2	15.0	15.8	16.6	17.4	18.4	18.9	19.2	19.7	19.5	19.1	18.8	19.5	20.2	19.8	19.6	18.6	17.8	17.9	17.9	17.9	20.2																						
3-Jul	16.7	16.3	15.5	15.8	15.5	15.9	17.2	18.0	18.8	20.2	18.8	18.8	17.5	16.4	16.0	15.9	16.0	15.3	15.2	15.2	14.8	14.8	14.7	14.6	16.4	20.2																						
4-Jul	14.5	14.2	13.9	13.5	13.4	13.4	13.0	12.4	12.0	12.3	12.9	13.2	13.5	13.6	14.3	14.8	15.0	14.8	14.5	13.9	13.7	13.8	13.6	13.6	15.0																							
5-Jul	13.5	12.8	12.8	13.3	13.3	13.6	13.9	14.9	15.9	16.6	17.1	17.0	16.1	17.6	19.2	19.1	19.0	17.7	18.5	17.3	16.1	14.8	14.3	14.2	15.8	19.2																						
6-Jul	13.4	12.9	13.5	13.0	13.1	13.1	13.4	13.0	13.5	15.3	14.4	15.3	15.9	16.7	16.6	16.7	15.7	13.7	14.5	15.1	13.9	13.5	12.9	12.4	14.2	16.7																						
7-Jul	11.7	11.5	10.8	10.2	10.3	10.7	11.7	12.1	13.3	14.3	13.9	14.9	15.8	16.3	16.3	16.2	16.6	17.0	17.2	16.7	15.8	13.9	13.2	12.7	13.9	17.2																						
8-Jul	12.1	12.6	11.8	11.1	11.3	11.4	11.1	13.5	15.8	17.1	18.4	19.1	19.6	20.6	21.0	20.7	20.0	19.2	18.2	17.3	16.6	16.4	16.9	16.8	16.2	21.0																						
9-Jul	16.3	15.9	15.9	15.7	15.4	14.8	14.9	14.9	15.9	17.5	19.1	20.2	20.9	21.0	21.0	20.7	20.8	20.9	20.5	19.8	18.9	18.1	17.3	17.5	18.1	21.0																						
10-Jul	17.6	15.1	15.3	15.3	15.0	15.4	17.1	18.6	19.1	20.4	20.8	20.3	20.1	21.6	19.4	20.8	20.6	19.9	19.3	19.1	18.3	16.2	14.7	15.1	18.1	21.6																						
11-Jul	15.8	16.2	15.9	15.7	16.1	16.2	16.4	17.5	19.7	21.0	21.9	22.9	23.3	22.7	23.6	23.7	22.1	21.5	21.9	20.2	20.6	18.8	17.7	17.3	19.5	23.7																						
12-Jul	17.0	16.3	16.1	15.0	14.7	14.5	15.4	16.8	18.3	19.4	20.4	20.6	21.0	21.8	21.6	22.7	23.0	22.9	22.3	21.2	19.8	18.1	16.8	16.2	18.8	23.0																						
13-Jul	15.4	14.7	13.9	13.3	12.9	13.7	14.7	15.5	16.4	17.5	18.2	19.2	20.2	21.4	21.1	20.8	20.4	19.5	19.5	19.5	18.4	17.3	16.5	15.1	17.3	21.4																						
14-Jul	13.9	13.3	13.1	13.1	12.3	13.1	13.7	15.3	16.8	18.1	18.9	19.5	19.9	20.7	20.9	21.0	20.4	21.5	21.6	20.5	19.5	17.8	17.2	15.9	17.4	21.6																						
15-Jul	15.2	14.9	14.9	15.1	14.3	15.7	18.3	19.9	20.8	21.7	22.3	22.3	22.9	24.0	24.4	24.7	25.0	24.9	24.9	23.7	21.0	19.8	18.6	17.9	20.3	25.0																						
16-Jul	16.7	15.8	15.7	15.5	16.5	17.3	18.1	19.5	20.9	21.8	22.9	24.0	24.9	25.0	23.4	21.5	21.0	21.7	19.7	16.8	16.5	17.2	17.2	19.8	25.0																							
17-Jul	16.8	16.3	15.5	14.5	13.0	13.0	14.0	14.6	15.6	16.6	17.4	18.1	18.7	19.3	20.0	20.2	20.2	20.8	20.8	20.0	18.0	15.7	14.9	14.6	17.0	20.8																						
18-Jul	14.0	13.0	13.2	13.1	13.0	13.7	15.4	18.2	20.2	21.5	22.6	23.5	24.2	24.8	25.6	25.3	25.1	25.3	24.8	23.9	22.2	20.6	19.5	19.0	20.1	25.6																						
19-Jul	18.8	18.2	17.4	17.2	17.4	18.0	19.4	21.3	22.8	23.6	23.3	24.6	25.0	22.3	24.8	26.4	26.3	27.0	24.6	20.9	20.5	20.6	19.7	19.1	21.6	27.0																						
20-Jul	19.3	18.6	17.6	17.4	17.2	16.5	16.4	16.7	16.9	17.4	M	M	20.5	19.3	19.0	17.1	16.9	17.6	17.7	17.1	16.8	16.7	16.3	15.8	17.5	20.5																						
21-Jul	15.3	15.3	14.8	14.6	14.5	15.1	15.4	15.9	17.0	16.9	16.8	18.3	19.1	20.0	20.1	17.7	19.2	17.5	16.2	12.5	11.5	10.5	9.4	8.3	15.5	20.1																						
22-Jul	7.8	6.8	6.1	5.5	6.3	7.3	8.8	10.5	12.6	14.9	17.7	19.7	21.0	21.8	21.9	22.8	21.2	22.6	22.6	21.6	19.5	18.2	17.0	16.1	15.4	22.8																						
23-Jul	14.8	14.6	14.6	14.7	14.4	14.1	14.8	15.9	17.2	18.0	18.6	19.7	20.1	16.9	18.7	19.6	18.6	17.8	15.6	15.4	15.0	14.5	13.9	13.9	16.3	20.1																						
24-Jul	14.0	13.6	13.9	13.8	13.2	12.6	13.1	15.4	18.2	19.5	20.5	21.8	22.5	23.2	23.4	23.1	23.6	23.8	20.0	14.8	14.5	13.8	13.6	13.4	17.5	23.8																						
25-Jul	12.8	13.1	12.9	12.2	11.2	11.6	13.0	14.1	15.2	16.6	17.4	17.8	18.7	19.9	20.5	21.4	21.3	20.8	20.4	20.1	18.0	17.2	16.0	15.9	16.6	21.4																						
26-Jul	15.8	15.6	14.8	13.8	13.2	14.9	17.3	19.3	20.7	21.1	22.4	22.5	22.6	24.1	25.0	25.6	24.2	19.9	19.6	18.5	18.6	18.5	17.9	17.6	19.3	25.6																						
27-Jul	16.7	16.6	16.3	15.8	15.9	16.3	17.4	20.9	22.9	24.8	25.0	25.7	25.9	26.2	26.3	26.1	25.3	25.3	24.2	23.3	22.5	22.2	21.7	20.9	21.8	26.3																						
28-Jul	20.5	19.6	19.2	16.9	17.4	17.4	18.4	19.8	20.8	21.8	23.1	24.2	22.3	19.8	23.3	24.0	23.5	22.3	20.7	16.8	14.8	15.2	15.8	15.1	19.7	24.2																						
29-Jul	15.0	14.9	15.6	15.1	15.1	15.0	16.1	18.5	20.1	21.0	21.7	22.4	22.7	22.7	23.7	24.6	24.0	18.4	19.7	20.4	19.7	19.4	19.1	18.0	19.3	24.6																						
30-Jul	17.9	17.5	17.0	17.7	17.0	15.2	15.2	15.8	16.4	17.9	19.1	19.5	20.5	21.4	20.8	22.0	23.1	22.9	22.8	20.8	19.9	19.2	17.8	16.1	18.9	23.1																						
31-Jul	15.8	15.5	15.8	15.5	15.1	14.7	14.1	13.9	14.0	14.2	14.8	15.0	15.3	15.5	16.2	16.8	16.7	16.9	16.3	15.7	15.5	14.8	14.5	13.8	15.3	16.9																						
																								15.5	15.0	14.7	14.4	14.2	14.3	15.2	16.4	17.6	18.6	19.4	20.1	20.4	20.6	21.0	21.2	20.9	20.4	20.0	18.8	17.8	16.9	16.4	15.8	Diurnal Average
																								20.5	19.6	19.2	17.7	17.4	18.0	19.4	21.3	22.9	24.8	25.0	25.7	25.9	26.2	26.3	26.4	26.3	27.0	24.9	23.9	22.5	22.2	21.7	20.9	Diurnal Maximum
M - Maintenance																																																



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature (AT) - C
ConocoPhillips - Surrmont - July 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
ConocoPhillips - Surmont - July 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	9	1.21	1.21
10 - 20	524	70.62	71.83
> 20	209	28.17	100.00

Total Number of Valid Hours: 742

Total Number of Hours: 744



Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

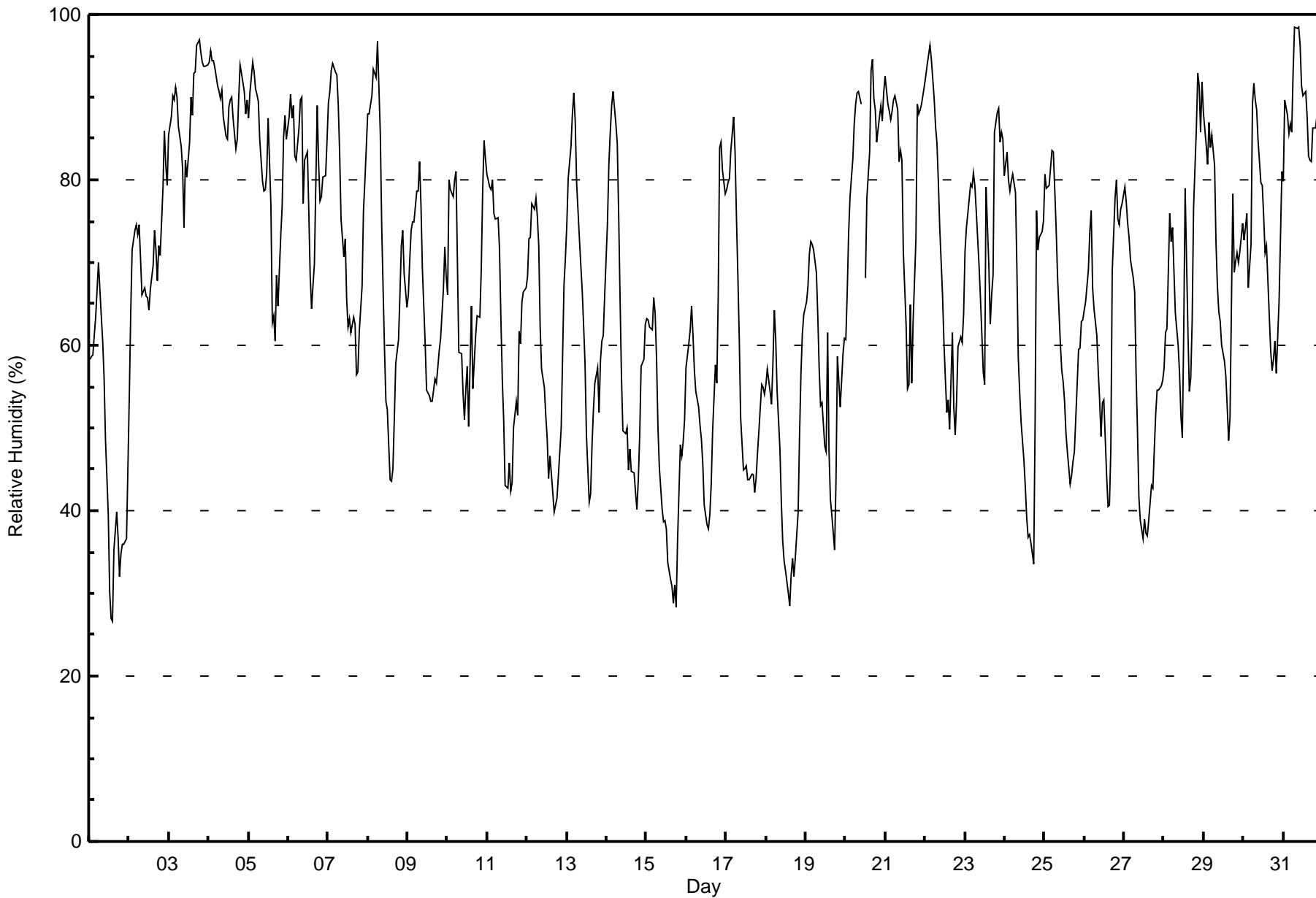
ConocoPhillips - Surmont - July 2016

Maximum Value: 98 % on Jul 31 10:00																			Maximum Daily Average: 90.1 % on Jul 4						Hours in Service: 744																			
Minimum Value: 27 % on Jul 1 15:00																			Minimum Daily Average: 46.0 % on Jul 15						Hours of Data: 742																			
Maximum Diurnal Average: 80.3 % at hour 6																			Minimum Diurnal Average: 54.4 % at hour 16						Hours of Missing Data: 2																			
Monthly Average: 67.6 %																			Percentiles: P ₁ = 31 P ₁₀ = 44 Q ₁ = 55 Median = 68 Q ₃ = 82 P ₉₀ = 90 P ₉₉ = 96						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-Jul	58	59	59	61	63	70	67	64	60	56	49	40	30	27	27	35	40	37	32	35	36	36	37	45	46.7	70																		
2-Jul	54	64	72	74	75	73	75	71	66	67	66	66	64	67	70	74	72	68	72	71	79	86	82	79	71.0	86																		
3-Jul	85	88	90	90	91	90	86	84	81	74	82	80	85	90	88	93	93	96	97	95	94	94	94	94	89.0	97																		
4-Jul	94	96	94	94	94	91	91	90	91	88	85	85	89	90	90	88	84	85	90	94	93	91	88	90	90.1	96																		
5-Jul	88	91	94	93	91	90	89	85	80	79	79	81	87	77	63	63	60	69	65	73	77	85	88	85	80.5	94																		
6-Jul	88	90	87	89	83	82	86	90	90	77	82	83	76	68	64	67	70	89	82	77	78	80	80	85	81.1	90																		
7-Jul	89	91	93	94	93	93	89	83	75	71	73	66	62	63	61	63	62	56	57	62	67	76	80	84	75.2	94																		
8-Jul	88	88	90	93	93	92	97	86	74	67	59	53	52	44	44	45	51	58	61	66	72	74	69	65	70.0	97																		
9-Jul	66	70	74	75	75	79	79	82	77	69	60	55	54	54	53	53	56	56	57	59	61	67	72	68	65.5	82																		
10-Jul	66	80	79	78	80	81	70	59	59	54	51	55	57	50	65	55	58	61	64	63	69	79	85	83	66.7	85																		
11-Jul	81	79	79	80	76	75	75	72	63	56	51	43	43	46	42	43	50	53	52	62	60	65	66	67	61.6	81																		
12-Jul	68	73	73	77	76	78	76	72	62	57	55	51	49	44	47	42	40	41	42	44	50	59	67	71	58.9	78																		
13-Jul	75	80	84	88	91	87	80	73	70	67	62	58	49	41	42	48	52	55	57	52	58	61	61	66	64.8	91																		
14-Jul	75	82	86	89	91	87	84	76	66	56	50	49	50	45	47	45	45	42	40	44	49	57	58	63	61.4	91																		
15-Jul	63	63	62	62	66	64	58	50	45	40	39	39	38	34	32	31	29	31	28	36	48	47	48	51	46.0	66																		
16-Jul	57	60	62	65	61	57	54	52	50	49	46	41	38	38	40	43	50	58	55	66	84	84	81	78	57.1	84																		
17-Jul	79	80	80	84	88	83	75	69	61	51	45	45	45	44	44	44	44	42	44	47	50	55	55	54	58.7	88																		
18-Jul	55	57	54	53	58	64	61	54	48	41	36	34	33	30	28	32	34	32	34	40	49	57	61	64	46.3	64																		
19-Jul	65	67	71	73	72	72	69	64	57	53	53	48	47	62	47	41	40	35	44	59	56	53	59	61	56.9	73																		
20-Jul	61	66	74	78	83	87	89	91	91	89	M	M	68	78	83	93	94	90	89	85	88	89	87	91	83.7	94																		
21-Jul	93	89	88	87	88	90	90	89	82	84	82	71	62	55	55	65	56	63	73	89	88	89	89	91	79.5	93																		
22-Jul	93	94	95	96	95	90	87	84	80	74	66	60	56	52	53	50	62	53	49	53	60	61	60	64	70.2	96																		
23-Jul	71	74	76	80	79	81	79	76	70	66	61	57	55	79	70	63	66	69	86	88	89	85	86	85	74.6	89																		
24-Jul	81	83	80	79	80	81	79	69	59	54	51	46	43	39	37	37	36	34	51	76	72	73	74	75	61.9	83																		
25-Jul	81	79	79	79	84	83	79	74	68	60	57	56	53	49	47	43	44	46	47	51	60	60	63	63	62.7	84																		
26-Jul	64	65	69	74	76	67	64	61	57	53	49	53	53	44	41	41	47	69	78	80	75	75	76	77	62.9	80																		
27-Jul	79	77	75	73	70	68	66	57	50	42	39	37	39	37	37	39	43	43	47	52	55	54	55	56	53.7	79																		
28-Jul	57	61	62	76	72	74	69	64	60	57	51	49	62	79	62	54	56	63	77	86	93	91	86	92	68.9	93																		
29-Jul	88	84	82	87	84	85	82	72	67	64	63	60	58	56	53	48	51	78	69	70	71	70	71	75	70.4	88																		
30-Jul	73	74	76	67	72	89	92	90	89	85	80	79	76	71	72	64	59	57	58	61	57	65	73	81	73.3	92																		
31-Jul	80	90	88	86	87	86	93	98	98	98	96	91	90	91	88	83	82	82	86	86	88	91	90	90	89.1	98																		
																			74.7	77.3	78.3	79.8	80.2	80.3	78.4	74.2	69.2	64.4	60.6	57.7	57.0	56.2	54.5	54.4	55.7	58.4	60.7	65.3	68.5	71.2	72.3	73.9	Diurnal Average	
																			94	96	95	96	95	93	97	98	98	98	96	91	90	91	90	93	94	96	97	95	94	94	94	94	Diurnal Maximum	
M - Maintenance																																												



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity (RH) - %
ConocoPhillips - Surmont - July 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity (RH) - %
ConocoPhillips - Surmont - July 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	0	0.00	0.00
20 - 40	49	6.60	6.60
40 - 60	206	27.76	34.37
60 - 80	274	36.93	71.29
80 - 100	213	28.71	100.00

Total Number of Valid Hours: 742

Total Number of Hours: 744

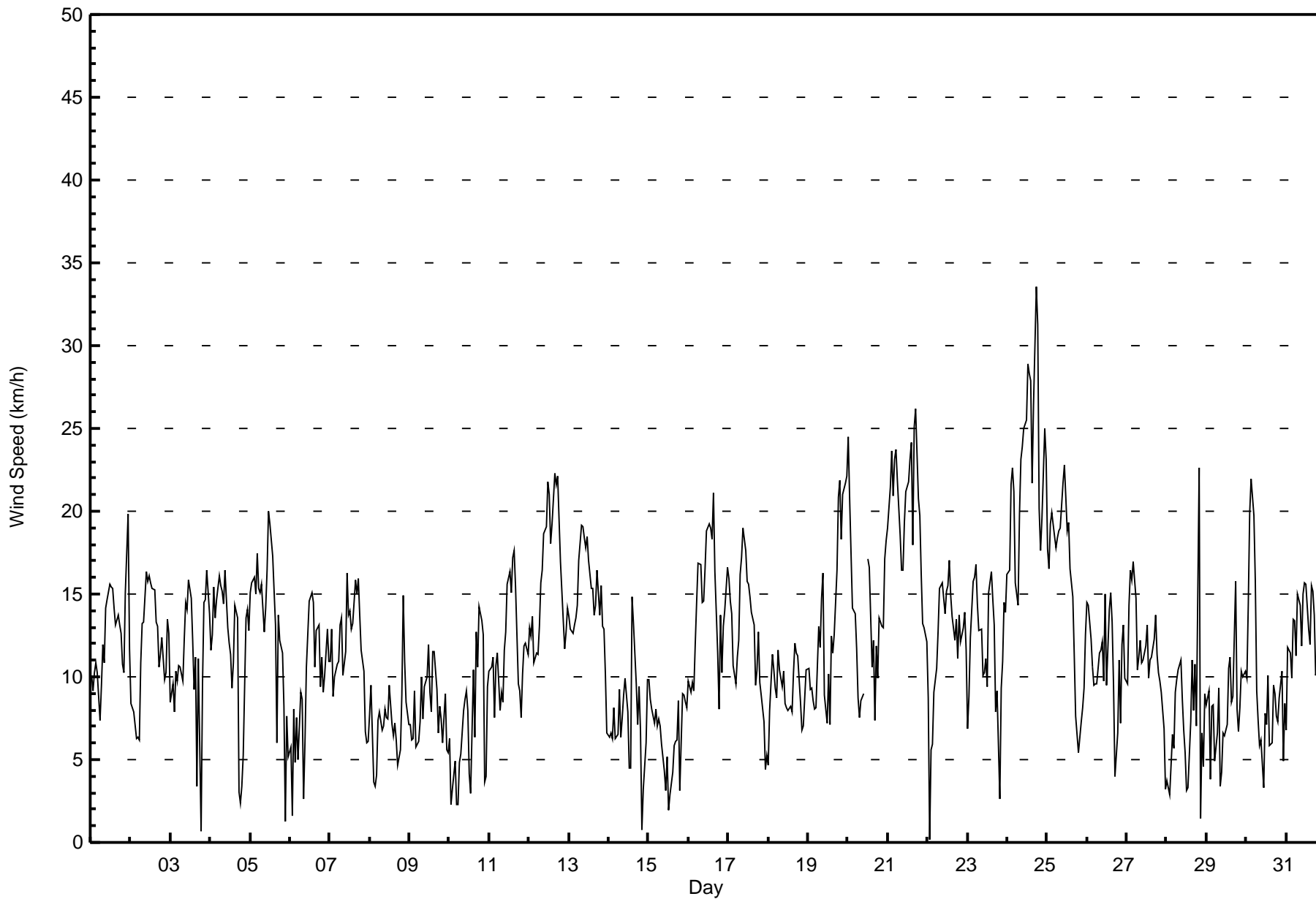


Maximum Speed: 34 km/h on Jul 24 18:00	Maximum Daily Speed Average: 22.1 km/h on Jul 24	Hours in Service: 744
Minimum Speed Value: 0 km/h on Jul 22 02:00	Minimum Daily Speed Average: 3.1 km/h on Jul 8	Hours of Data: 742
Maximum Diurnal Speed Average: 8.4 km/h at hour 5	Minimum Diurnal Speed Average: 4.0 km/h at hour 12	Hours of Missing Data: 2
Monthly Average Velocity: 5.7 km/h 293.2 deg	Percentiles: P ₁ = 2 P ₁₀ = 6 Q ₁ = 8 Median = 11 O ₃ = 15 P ₉₀ = 19 P ₉₉ = 26	Percent Operational Time: 99.7

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Jul	SSW10	SSW9	SSW10	SSW11	S10	SE7	S9	S12	SSE11	SE14	SE15	SE16	SE15	SE15	SSE14	S13	S14	S13	SSE13	SE11	SE10	SE15	SE20	S12	SSE11.3	SE20
2-Jul	SW8	SW8	SW8	S6	S6	SSE6	SE11	SE13	SE13	SE16	SE16	SE16	SE16	SE15	SE15	SE13	SE13	SE11	SE11	SE12	SE10	SE10	SSE13	S13	SSE10.6	SE16
3-Jul	S8	S10	SSW8	S10	SSW10	SSW11	S11	SE10	SE12	SE14	SE14	SE16	SSE15	W12	WNW9	WNW11	WSW3	NNW11	SSW1	WSW10	WSW14	W15	W16	WNW14	SSW5.5	W16
4-Jul	WNW12	W13	WNW15	W14	WNW15	WNW16	W16	W15	WNW14	W16	WNW13	WNW12	WNW11	W9	WSW11	WSW14	WSW14	NNW3	WSW2	SW3	W5	WNW14	NW14	NW13	WNW11.3	W16
5-Jul	NNW15	NNW16	NNW16	NNW15	NNW17	NNW15	NNW15	NNW16	NNE13	NNE14	NNE16	N20	NNW19	N17	N15	N13	N6	WNW14	WNW12	NW11	NNE8	ESE1	WNW8	NNW5	NNW12.3	N20
6-Jul	W6	NNW2	NNW8	WNW5	NW8	NW5	NNW9	N9	NW3	W6	NW11	N15	NNE15	N15	NNE14	NE11	NNE13	N13	N9	N11	N9	NNW10	NNW13	NNW11	N8.3	N15
7-Jul	NNW11	NNW13	NW9	WNW10	WNW11	NW11	NW13	N14	N10	N12	N16	NNW14	NNW14	NNW13	NNW13	NNW16	NNW15	NNW16	NNW14	NNW12	NNW10	NW7	WNW6	NW6	NNW11.2	N16
8-Jul	NW8	NNW9	W4	W3	WNW4	NNW7	NNW8	NNE7	ENE7	ENE8	E8	ESE7	ESE9	E7	E6	ESE7	E6	NNE5	E6	SE9	SSE15	SSE11	SSE8	ESE7	E3.1	SSE15
9-Jul	ENE7	NE6	N6	NNW9	N6	NNE6	NNE7	N10	NNE7	NE9	ENE10	E12	E9	ENE8	ENE12	ESE12	ESE9	ESE7	ENE8	ENE7	ENE6	SE9	SSW6	S5	ENE5.4	E12
10-Jul	SSE6	NW2	NW3	WSW5	WSW2	WNW2	N5	ENE5	ESE8	ESE9	E9	ENE8	SE4	E3	NE10	N6	N13	N11	NNW14	NNW13	N13	NE4	WNW4	NW9	NNE3.5	NNW14
11-Jul	NW10	NW11	NW11	NW8	NNW11	NNW11	NW8	N9	N8	N12	N13	N16	N16	NNW15	NNW17	N18	N15	N10	NNE9	NNE8	NNW10	NW12	NW12	NW11	NNW10.8	N18
12-Jul	NW13	NW12	NW14	NW11	NW11	NNW13	NNW16	NNW16	N19	NNW19	NNW22	NNW21	N18	NNW19	NW22	NW22	NNW22	NNW20	N17	N13	NW12	NW13	NW14	NNW15.8	NW22	
13-Jul	NW14	NW13	WNW13	NW13	NW14	NW14	NNW17	NNW19	NNW19	NNW18	NNW18	NNW18	NNW17	N15	N15	NNW14	NNW14	NNW16	NNW14	NNW15	NNW13	NNW13	NNW10	N7	NNW14.2	NNW19
14-Jul	N6	N7	NNW6	NNW8	NW6	NW7	NNW9	N6	NNE8	NE9	NNE10	NE8	NNE5	NNE4	NNE15	NNE13	NNE10	NNE7	NE9	ENE7	NNW1	W3	WSW6	WSW10	N5.7	NNE15
15-Jul	WSW10	W9	W8	W7	WSW8	W7	WNW7	NNW7	NNE6	NNE4	N3	WNW5	NNW2	NW3	N4	WNW6	N6	NW6	N9	W3	WSW9	WSW9	W8	W8	WNW4.8	WSW10
16-Jul	W10	W9	W10	W9	WNW12	W14	WNW17	WNW17	WNW15	NW15	NW17	WNW19	WNW19	NNW19	NNW18	N21	NNW16	NW11	NW8	NNW14	WNW10	WNW13	NW14	NNW17	NW12.9	N21
17-Jul	NNW16	NNW15	NNW14	NNW11	WNW10	WNW11	NW12	NNW16	NNW17	NNW19	NNW18	N16	NNW16	N15	N14	NNW13	NNE9	NNE10	NW13	WNW10	W9	W7	W4	W5	NNW11.2	NNW19
18-Jul	WSW5	WSW8	WSW11	SW10	SW9	SW9	WSW12	WSW10	WSW9	WSW10	WSW8	SW8	SW8	SSW8	WSW8	S10	SW12	SW11	SW11	SW8	SW7	SW7	SW9	WSW10	SW8.9	SSW12
19-Jul	SW11	SW9	WSW9	SW9	SW8	SW8	WSW13	WSW12	WSW15	WSW16	SW9	WSW7	WSW10	ESE7	WNW12	W11	W13	W16	NW21	WNW22	W18	W21	WSW22	W22	WSW12.0	W22
20-Jul	W24	W21	W17	WNW14	WNW14	WNW12	W9	WSW8	WSW9	W9	M	M	W17	WNW17	W11	NNW12	W7	W12	W10	W14	W13	W13	W17	WSW18	W12.8	W24
21-Jul	WSW19	WSW21	WSW24	W21	WSW23	WSW24	WSW22	W19	W16	W16	WNW19	WNW21	WNW22	WNW23	WNW24	NW18	WNW25	WNW26	NW21	NNW20	NNW16	NNW13	N13	NNW12	WNW17.2	WNW26
22-Jul	NNW9	NW0	SSW6	SW6	SSW9	SSW11	SSW13	S15	S16	S16	S14	SSW15	SSW15	SSW17	SSW15	SW14	WSW12	WSW13	SW11	W14	W12	W13	W14	W12	SW9.6	SSW17
23-Jul	W7	W9	W12	WNW16	W16	W17	WNW14	WNW13	WNW13	WNW10	W10	W11	WNW9	WSW15	WSW16	W15	NW13	N8	N9	WSW3	WSW9	WSW11	WSW14	WSW14	W10.5	W17
24-Jul	WSW16	WSW16	W22	WSW23	WSW21	WSW16	WSW14	WSW20	WSW23	W24	W25	WSW26	W29	W28	W28	W22	W26	W34	WNW31	WNW20	W18	W20	W25	W23	W22.1	W34
25-Jul	W18	W17	W19	W20	W18	W18	WNW18	WNW19	WNW19	WNW22	NW23	WNW21	NW19	NW19	NW17	NW15	N11	NE8	NE7	E5	ESE7	SE8	SE9	SE13	WNW10.3	NW23
26-Jul	SE14	S14	SSW12	SSW11	SSW9	SW10	SW10	SW11	SW12	SW12	SSW10	SE15	SE9	SSW14	SSW15	SSW13	WSW9	WSW4	SSE7	SE11	S7	S12	SSW13	SSW10	SSW9.6	SSW15
27-Jul	SW10	WSW14	WSW16	WSW16	WSW17	WSW15	WSW10	W11	WNW12	WNW11	NNW11	NNW12	NNW13	NW10	N11	NNW11	N12	N14	N11	NNW10	NNW10	NNW9	NNW7	NE3	WNW7.7	WSW17
28-Jul	NE4	NNE3	E3	NNW6	NNW6	NW9	NNW10	NNE10	NNE11	NNE9	E7	E5	N3	S3	ENE7	NE11	NE8	ESE11	S7	WNW23	WSW1	WNW7	W5	NW9	N3.2	WNW23
29-Jul	WSW8	WSW9	WSW4	WSW8	WSW8	W5	W7	WNW9	NNW3	SE4	SE7	S6	S7	SSE10	SSE11	S8	SSW9	W16	SSW8	SW7	SSW8	SSW10	SSW10	SW10	SW5.9	W16
30-Jul	WSW10	WSW14	W20	W22	W20	WSW16	SW9	SSW7	W6	N6	E3	E8	ESE7	SE10	SSW6	SSE6	SE10	ESE9	E8	ENE7	SE9	SE10	NNE5	WNW8	SW3.5	W22
31-Jul	WNW7	NNW12	NW11	NNW10	NNW13	NW13	NW11	NNW15	NNW14	NW12	NW15	NW16	NNW16	NW13	WNW12	WNW15	WNW15	WNW14	NW10	W11	WNW14	W14	WNW17	WNW18	NNW12.5	WNW18

W6.4	W7.1	W8.3	W8.4	W8.4	W7.3	WNW7.3	WNW6.2	NW4.9	NW4.6	NW4.2	NW4.0	NW4.9	NW4.6	NW5.1	NW5.7	NW5.6	NW6.3	NW5.4	NW5.2	WNW4.1	W5.2	W6.4	W7.1	Diurnal Average
W24	WSW21	WSW24	WSW23	WSW23	WSW24	WSW22	WSW20	WSW23	W24	W25	WSW26	W29	W28	W28	NW22	W26	W34	WNW31	WNW23	W18	W21	W25	W23	Diurnal Maximum

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





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
ConocoPhillips - Surmont - July 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	61	8.22	8.22
6 - 11	323	43.53	51.75
12 - 19	301	40.57	92.32
20 - 28	54	7.28	99.60
29 - 38	3	0.40	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 742

Total Number of Hours: 744



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
ConocoPhillips - Surmont - July 2016**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	4	6	3	1	5	1	2	0	2	1	1	9	9	5	6	6	61
6 - 11	26	18	10	12	9	14	20	9	13	24	27	32	29	20	29	31	323
12 - 19	29	8	0	1	1	1	24	5	12	11	3	27	39	40	33	67	301
20 - 28	2	0	0	0	0	0	1	0	0	0	0	11	19	11	5	5	54
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	3
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	61	32	13	14	15	16	47	14	27	36	31	79	98	77	73	109	742

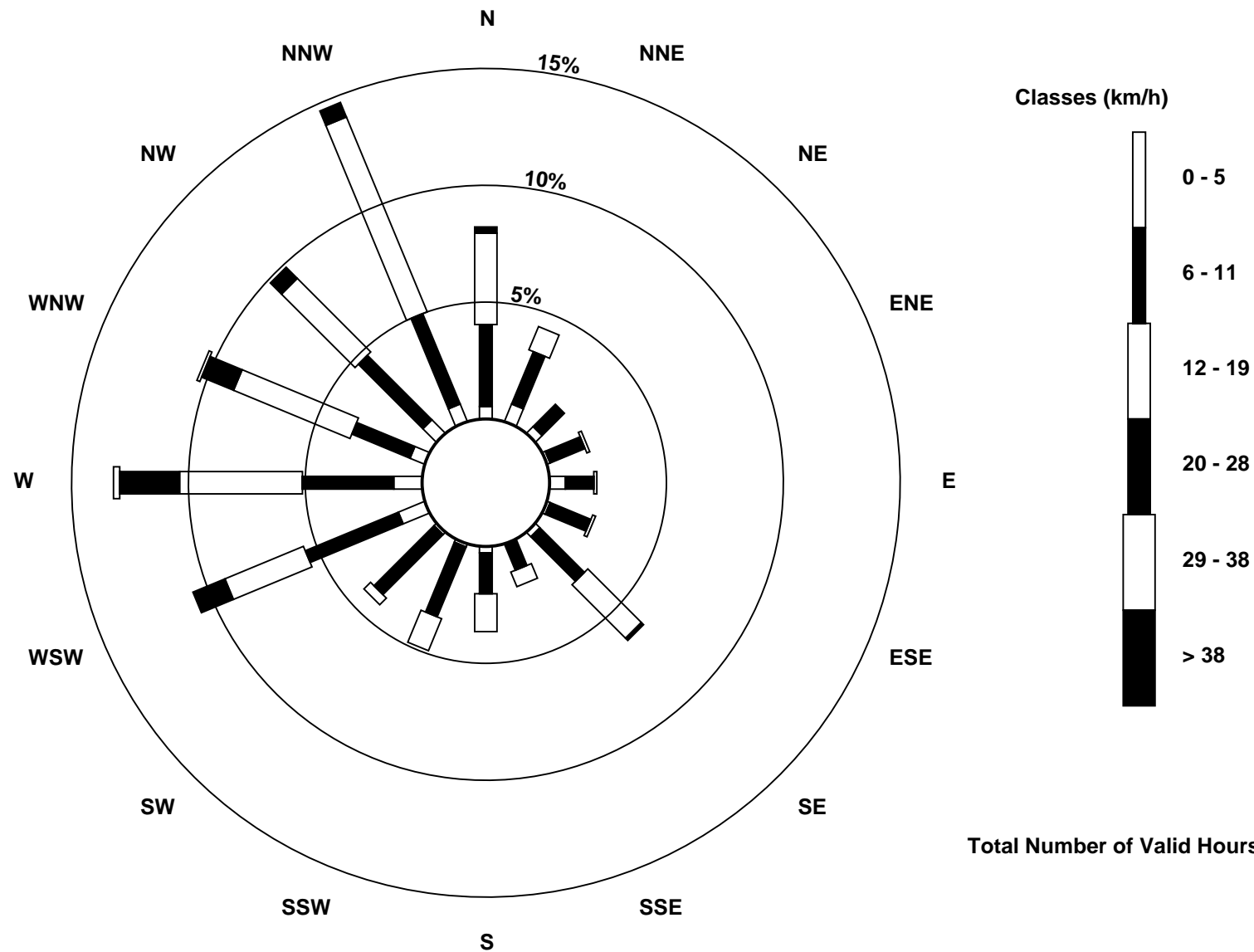
Total Number of Valid Hours: 742

Total Number of Hours: 744



Wood Buffalo Environmental Association
Wind Rose Jul 2016

Wind Speed (WS) - km/h
ConocoPhillips - Surmont (AMS502)





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
ConocoPhillips - Surmont - July 2016

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



Wood Buffalo Environmental Association
Summary of Hour Averages

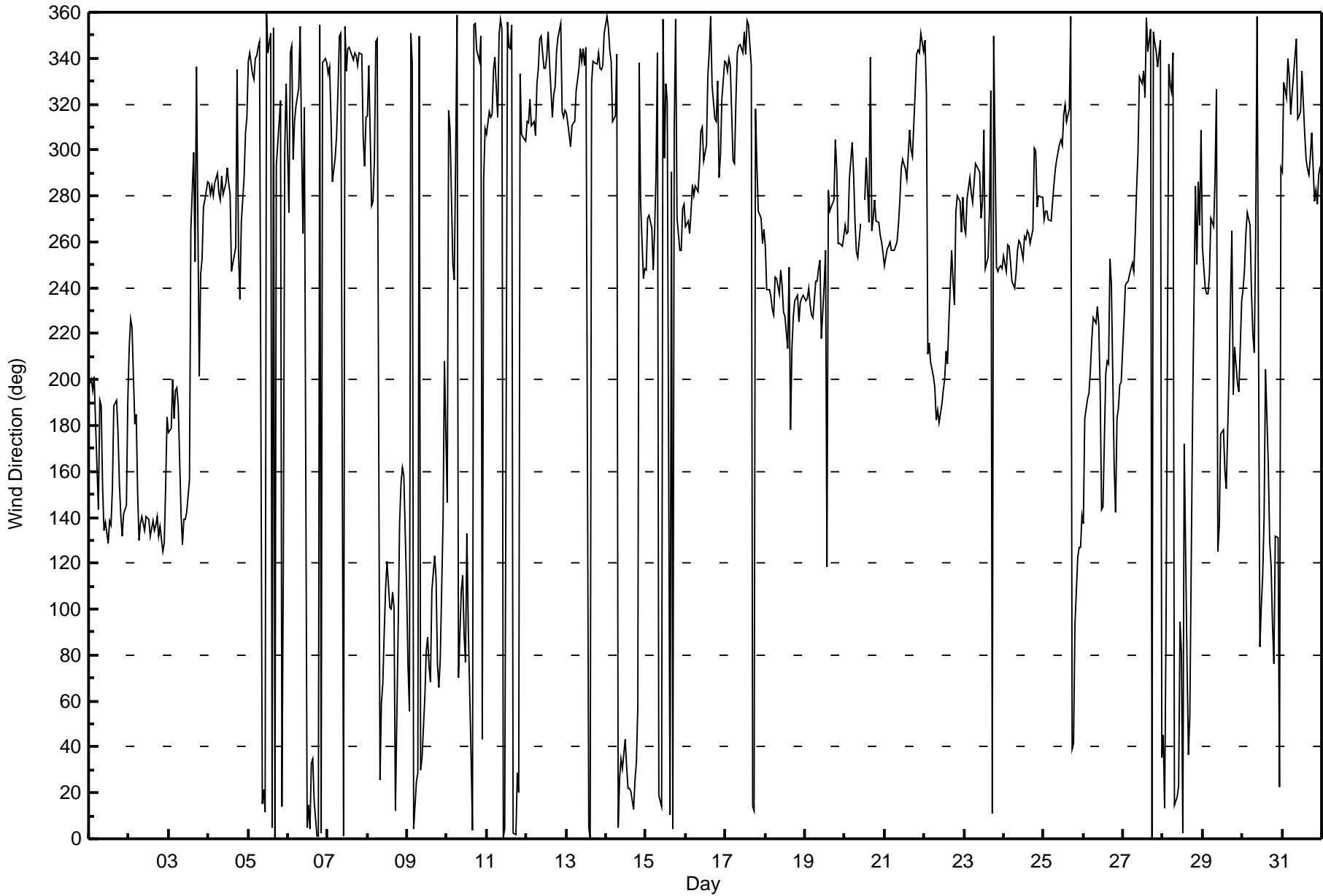
Wind Direction (WD) - deg
ConocoPhillips - Surmont - July 2016

Direction of Maximum Speed: 265 deg on Jul 24 18:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 264.3 deg on Jul 24	Hours of Data: 742
Direction of Minimum Speed: 324 deg on Jul 22 02:00	Direction of Minimum Daily Speed Average: 3.1 deg on Jul 8
Direction of Minimum Speed: 324 deg on Jul 22 02:00	Hours of Missing Data: 2
Monthly Average Direction: 294.6 deg	Percent Operational Time: 99.7

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Jul	198	200	195	202	180	143	191	188	153	134	138	129	139	136	153	189	191	177	154	141	132	141	145	191	161.3
2-Jul	214	226	223	181	185	151	130	137	140	134	141	140	139	132	139	134	137	140	132	136	125	129	153	184	146.7
3-Jul	177	179	200	183	195	196	189	142	128	139	139	142	156	265	282	299	251	336	202	246	252	275	278	286	209.7
4-Jul	286	281	285	280	285	290	281	278	289	281	286	292	286	281	247	251	257	335	256	235	268	288	308	314	282.0
5-Jul	339	342	333	330	340	341	345	347	15	21	12	360	342	351	5	353	0	293	303	321	14	119	299	329	344.9
6-Jul	273	342	345	296	312	319	327	354	305	264	319	5	15	5	33	35	17	1	1	355	3	338	340	338	351.0
7-Jul	333	336	314	286	296	306	326	350	351	1	354	334	344	345	343	339	342	341	337	342	342	305	293	314	334.2
8-Jul	315	337	276	277	296	347	348	26	59	68	90	109	121	101	100	108	101	12	93	138	155	162	158	108	93.9
9-Jul	75	55	351	338	4	25	28	350	30	36	62	82	88	75	68	108	123	114	76	66	78	138	208	176	66.1
10-Jul	147	317	309	250	243	297	359	70	108	115	89	77	133	92	36	4	355	355	343	339	350	43	287	309	12.7
11-Jul	307	317	315	315	335	341	314	350	357	353	0	4	356	345	344	354	2	2	29	20	333	307	306	304	341.4
12-Jul	312	312	322	311	312	306	329	336	348	350	336	336	340	351	338	314	324	328	343	349	355	317	314	317	330.9
13-Jul	316	312	301	311	312	312	326	335	344	338	344	337	345	5	0	329	339	338	337	342	335	335	337	351	334.1
14-Jul	358	353	344	339	313	315	342	5	26	35	31	43	32	22	22	20	13	25	34	57	338	277	244	248	5.9
15-Jul	247	270	272	266	248	265	290	343	19	14	357	297	329	321	10	291	5	309	357	270	256	256	275	276	291.7
16-Jul	266	269	264	274	285	280	284	282	293	308	310	296	302	333	343	358	329	314	313	330	288	298	322	338	306.9
17-Jul	338	334	340	337	295	294	321	342	345	346	342	351	342	356	355	337	14	12	318	293	274	270	259	265	333.3
18-Jul	258	239	239	236	230	228	245	244	238	248	241	230	228	213	249	178	214	228	234	236	225	234	235	237	232.5
19-Jul	235	236	240	233	228	227	243	243	248	252	218	241	256	118	282	274	275	279	305	291	260	259	258	262	258.3
20-Jul	267	264	264	287	303	290	269	256	253	268	M	M	278	297	268	341	265	271	278	269	268	263	260	255	273.7
21-Jul	250	257	258	260	256	256	256	260	267	278	292	296	292	287	298	309	300	297	326	342	343	342	351	343	288.2
22-Jul	348	324	211	216	208	201	197	183	186	181	189	195	200	212	207	225	256	243	232	273	280	278	264	280	222.9
23-Jul	267	263	279	288	281	277	286	294	292	290	270	278	308	248	253	275	326	11	349	249	247	249	250	248	277.9
24-Jul	254	247	259	258	251	243	240	247	256	261	259	253	262	261	265	264	260	265	301	299	275	280	279	279	264.3
25-Jul	270	273	273	270	269	277	285	292	296	302	305	302	315	320	312	318	358	39	41	93	122	127	127	141	295.8
26-Jul	138	183	192	194	204	217	227	224	232	224	196	143	145	203	208	207	253	242	162	142	183	187	198	199	194.6
27-Jul	226	241	242	243	246	251	247	263	282	299	332	329	335	323	357	343	353	0	351	347	343	336	348	35	301.8
28-Jul	45	13	90	338	328	325	342	14	18	23	94	81	2	172	77	37	54	120	187	284	250	286	267	309	1.6
29-Jul	258	240	237	238	246	270	267	288	327	125	136	176	178	161	152	177	203	265	193	214	206	198	195	235	215.0
30-Jul	239	248	264	273	267	238	219	212	264	358	84	101	115	140	205	163	129	119	94	76	132	131	23	292	217.7
31-Jul	291	330	323	340	332	316	325	332	348	314	315	317	334	307	296	292	289	297	307	278	282	276	289	293	308.8

274.5 276.2 275.1 274.2 274.6 277.3 284.8 296.4 305.2 310.7 320.8 322.5 312.9 307.8 316.6 312.9 313.0 310.8 325.5 312.7 288.7 269.9 272.8 278.8
 Diurnal Average

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





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
ConocoPhillips - Surmont - July 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 101 deg on Jul 3 19:00 Minimum Value: 5 deg on Jul 15 02:00 Percentiles: P ₁ = 7 P ₁₀ = 9 Q ₁ = 13 Median = 19 Q ₃ = 26 P ₉₀ = 42 P ₉₉ = 88																		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-Jul	19	18	18	20	31	20	26	19	25	18	23	23	21	22	28	27	22	27	27	18	9	9	10	26	31		
2-Jul	19	16	12	35	39	23	14	12	15	16	19	14	16	15	14	14	16	19	13	13	9	9	24	16	39		
3-Jul	25	23	20	15	19	20	21	26	16	16	12	16	41	18	51	19	67	41	101	11	10	10	8	10	101		
4-Jul	11	9	9	9	12	9	10	10	11	10	11	9	12	13	11	10	66	72	64	43	13	14	14	14	72		
5-Jul	12	10	13	15	10	11	13	15	25	17	18	19	15	16	19	19	55	9	20	23	18	91	28	39	91		
6-Jul	25	88	22	49	31	51	24	26	68	40	39	15	21	22	21	27	28	16	18	18	15	7	6	17	88		
7-Jul	18	19	21	11	16	20	18	17	25	30	21	24	20	22	19	15	18	15	18	16	14	31	28	26	31		
8-Jul	22	14	43	33	35	18	16	33	33	31	38	35	33	43	43	21	16	53	35	21	16	29	37	20	53		
9-Jul	20	15	17	6	26	14	19	17	20	17	28	28	35	32	28	19	17	19	18	14	13	30	33	44	44		
10-Jul	33	61	50	34	70	69	24	39	21	37	27	32	60	88	23	39	16	20	11	15	15	73	47	13	88		
11-Jul	15	14	15	22	16	14	22	19	19	20	25	26	24	20	21	20	23	28	22	38	21	12	12	12	38		
12-Jul	13	12	16	13	15	16	21	15	16	18	20	15	21	23	21	18	22	19	21	17	16	17	12	11	23		
13-Jul	11	13	11	13	13	13	15	15	18	23	20	19	25	25	21	25	30	14	16	13	13	9	12	17	30		
14-Jul	15	15	19	11	34	37	13	31	27	36	32	36	68	70	28	20	24	34	23	21	79	57	22	8	79		
15-Jul	9	5	6	14	11	9	17	31	38	76	79	60	91	84	63	60	76	52	25	67	16	9	7	8	91		
16-Jul	16	17	9	20	9	8	9	10	12	22	19	17	17	20	22	20	23	17	33	32	9	11	15	13	33		
17-Jul	12	15	12	19	11	8	21	13	16	18	19	28	27	25	26	28	21	27	22	14	5	34	25	18	34		
18-Jul	20	49	7	9	10	15	10	12	20	25	35	44	48	51	65	44	29	25	20	19	16	16	16	16	65		
19-Jul	17	16	15	17	16	19	15	15	16	13	26	31	38	51	22	24	13	14	25	12	11	9	8	9	51		
20-Jul	9	9	11	13	15	13	9	10	16	14	M	M	15	24	26	32	16	10	13	10	10	8	8	8	32		
21-Jul	8	9	8	8	9	8	9	10	12	13	13	13	14	14	21	24	16	12	24	12	11	16	14	10	24		
22-Jul	14	88	15	28	19	21	19	17	19	19	22	25	26	25	24	23	30	19	22	10	7	9	8	11	88		
23-Jul	43	27	19	8	8	8	12	11	14	25	19	24	33	19	14	16	30	19	18	65	9	8	6	9	65		
24-Jul	8	8	9	8	9	12	15	13	14	15	15	15	14	16	15	14	15	26	19	9	9	9	9	9	26		
25-Jul	9	9	9	9	8	9	12	13	15	15	17	16	24	23	24	34	30	22	16	23	10	10	11	9	34		
26-Jul	10	21	18	19	20	15	19	19	20	24	34	19	41	27	26	29	43	96	47	22	20	24	17	20	96		
27-Jul	18	13	11	10	8	9	8	11	10	30	30	36	28	42	31	33	19	20	16	13	12	10	16	31	42		
28-Jul	14	49	52	46	48	22	15	18	17	27	42	61	77	69	27	26	25	21	42	19	83	27	86	23	86		
29-Jul	25	10	53	27	21	56	18	10	64	75	60	64	39	34	27	36	39	31	28	14	17	17	18	18	75		
30-Jul	14	8	9	8	19	16	19	21	29	47	58	25	40	32	33	33	20	17	19	18	21	24	58	33	58		
31-Jul	50	22	18	20	12	27	36	23	14	30	22	16	19	23	12	12	9	14	32	9	9	12	10	9	50		
																		50 88 53 49 70 69 36 39 68 76 79 64 91 88 65 60 76 96 101 67 83 91 86 44 Diurnal Maximum									
M - Maintenance																											



Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	July 20, 2016	Last Calibration	June 28, 2016
Station Name	ConocoPhillips - Surmont	Station Number	AMS 502
Reason:	Routine		
Start Time (MST)	12:10	End Time (MST)	16:25
Gas Cert Reference	LL104215	Station temp.	21 Deg C
Cal Gas Concentration	48.3 ppm	Cal Gas Exp Date	12-Feb-18
Calibrator Make/Model	API T700	Serial Number	622
ZAG Make/Model	API 701	Serial Number	4865
DACS make/model	Campbell Scientific CR3000	DACS serial No.	9035

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	518	518
Analyzer IP address	192.168.1.43		Lamp voltage	1795	1759
Calculated slope	1.000499	1.003170	Chamber temp	50.0	50.0
Calculated intercept	0.328797	0.872999	Pressure	21.6	21.3
Analyzer Background	22.5	22.5	Flow	0.537	0.524
Analyzer Coefficient	1.003	1.003	Intensity	44	43
Analyzer make	API T100		Analyzer serial #	598	

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.4	----
as found span	5000	83.2	803.7	795.2	1.011
calibrator zero	5000	0.0	0.0	0.4	----
high point	5000	83.2	803.7	800.9	1.004
second point	5000	41.6	401.9	399.3	1.006
third point	5000	20.8	200.9	198.0	1.015
as left zero	5000	0.0	0.0	0.9	----
as left span	5000	83.2	803.7	789.7	1.018
Average Correction Factor					1.008

Corrected As found 794.8 Previous response 803.0 % change 1.0%

Notes:

Sample inlet filter replaced after as founds. Used new average for "high point" as it had slightly changed when compared to "as founds span". No adjustments made.

Calibration Performed By:

Asad Hidayat



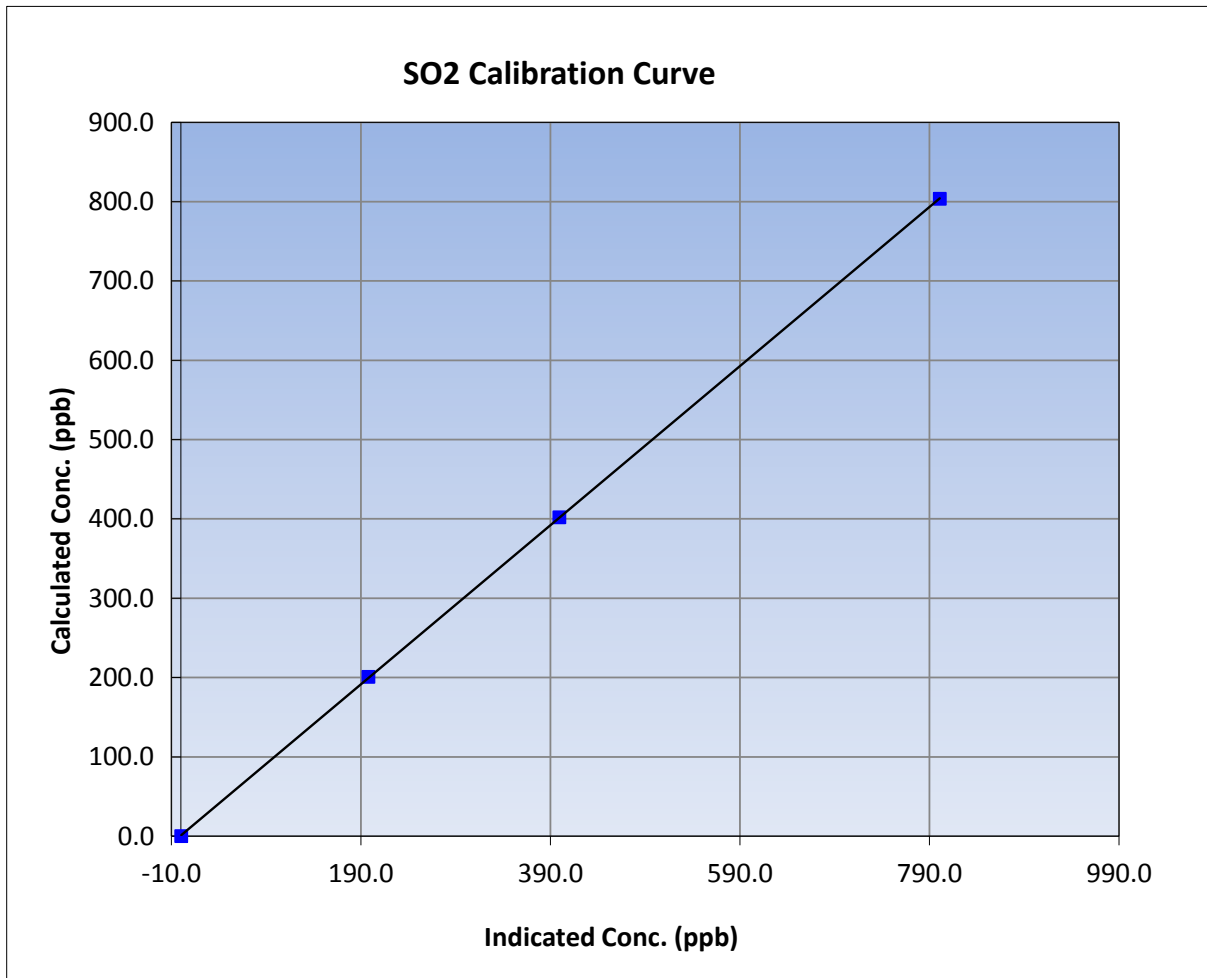
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	July 20, 2016	Previous Calibration	June 28, 2016
Station Name	ConocoPhillips - Surmont	Station Number	AMS 502
Start Time (MST)	12:10	End Time (MST)	16:25
Analyzer make	API T100	Analyzer serial #	598

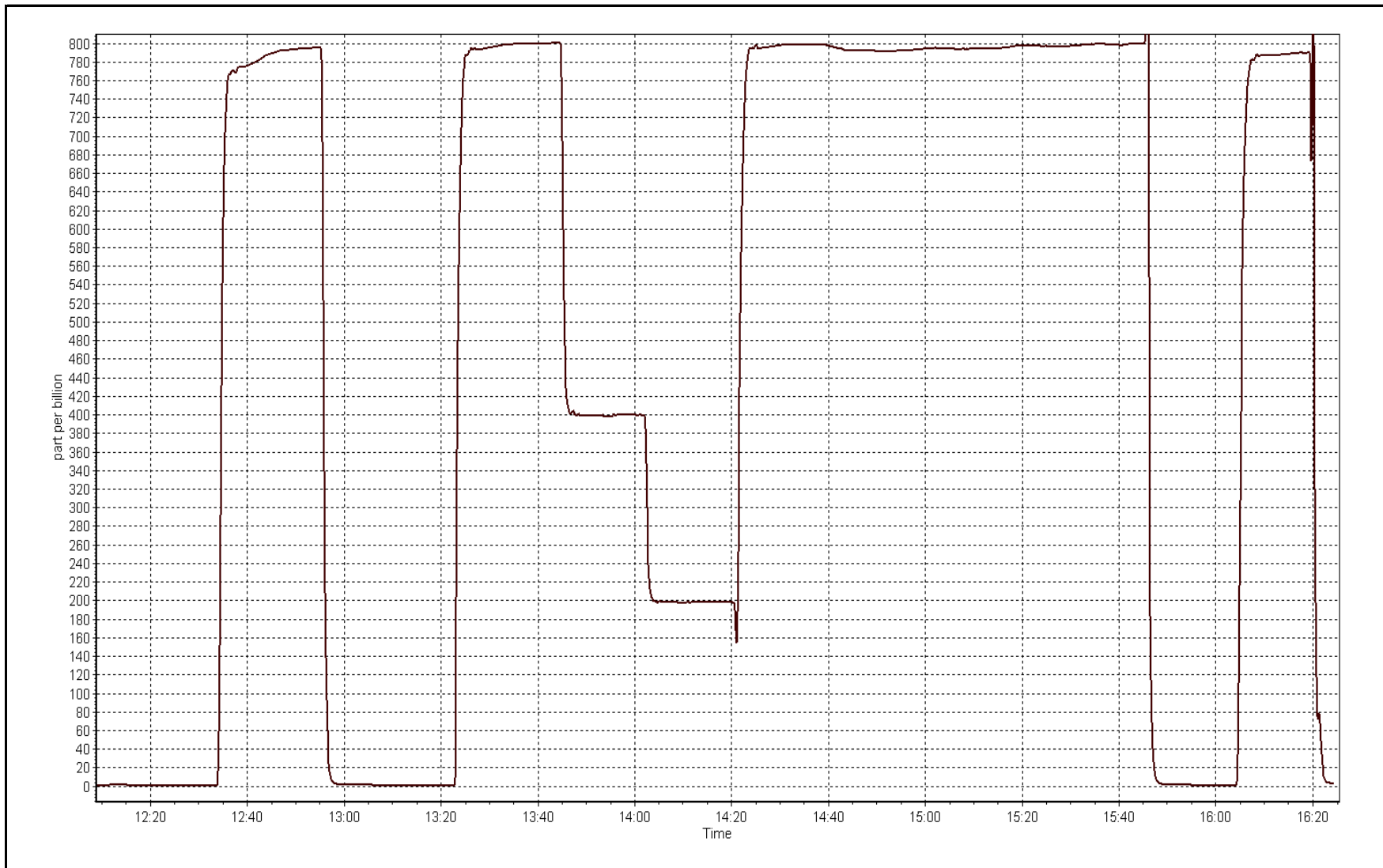
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.4	----	Correlation Coefficient	0.999988
803.7	800.9	1.0036		
401.9	399.3	1.0063	Slope	1.003170
200.9	198.0	1.0150		
			Intercept	0.872999



SO2 Calibration Plot

Date: July 20, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	July 19, 2016	Last Calibration	June 27, 2016
Station Name	ConocoPhillips	Station Number	AMS 502
Reason:	Routine		
Start Time (MST)	9:50	End Time (MST)	14:15
Gas Cert Reference	LL34303	Station temp.	21 Deg C
Cal Gas Concentration	10.4 ppm	Cal Gas Exp Date	30/05/2016
Calibrator Make/Model	API T700	Serial Number	622
ZAG air Make/Model	API 701	Serial Number	4865
DACS make/model	Campbell Scientific CR3000	Serial Number	7882
SO2 gas concentration	48.3 ppm	SO2 gas cert/exp	LL104215 12-Feb-18

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	497	497
Analyzer IP address	192.168.1.75		Lamp voltage	2420	2410
Calculated slope	0.995396	0.999825	Chamber temp	50.0	50.0
Calculated intercept	0.080731	-0.143129	Pressure	23.5	23.1
Analyzer Background	19.2	19.2	Flow (SLPM)	0.639	0.614
Analyzer Coefficient	0.969	0.95	Intensity	54	53
			Converter temp.	315	315

Analyzer make/model	API T101	Analyzer serial #	197
Converter make/model	N/A	Converter serial #	N/A

Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.3	----
as found span	5000	38.5	80.1	81.1	0.988
SO2 scrubber check	5000	20.7	200.0	3.8	----
calibrator zero	5000	0.0	0.0	0.3	----
high point	5000	38.5	80.1	80.3	0.997
second point	5000	19.3	40.1	40.1	1.000
third point	5000	12.1	25.2	25.3	0.996
as left zero	5000	0.0	0.0	0.3	----
as left span	5000	38.5	80.1	79.8	1.004
Average Correction Factor					0.998

Corrected As found	80.8	Previous response	80.4	% change	-0.5%
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Notes:

Sample inlet filter replaced after as founds. MFC on calibrator done after as founds. Adjusted span. Scrubber check completed after 3rd point.

Calibration Performed By: Asad Hidayat



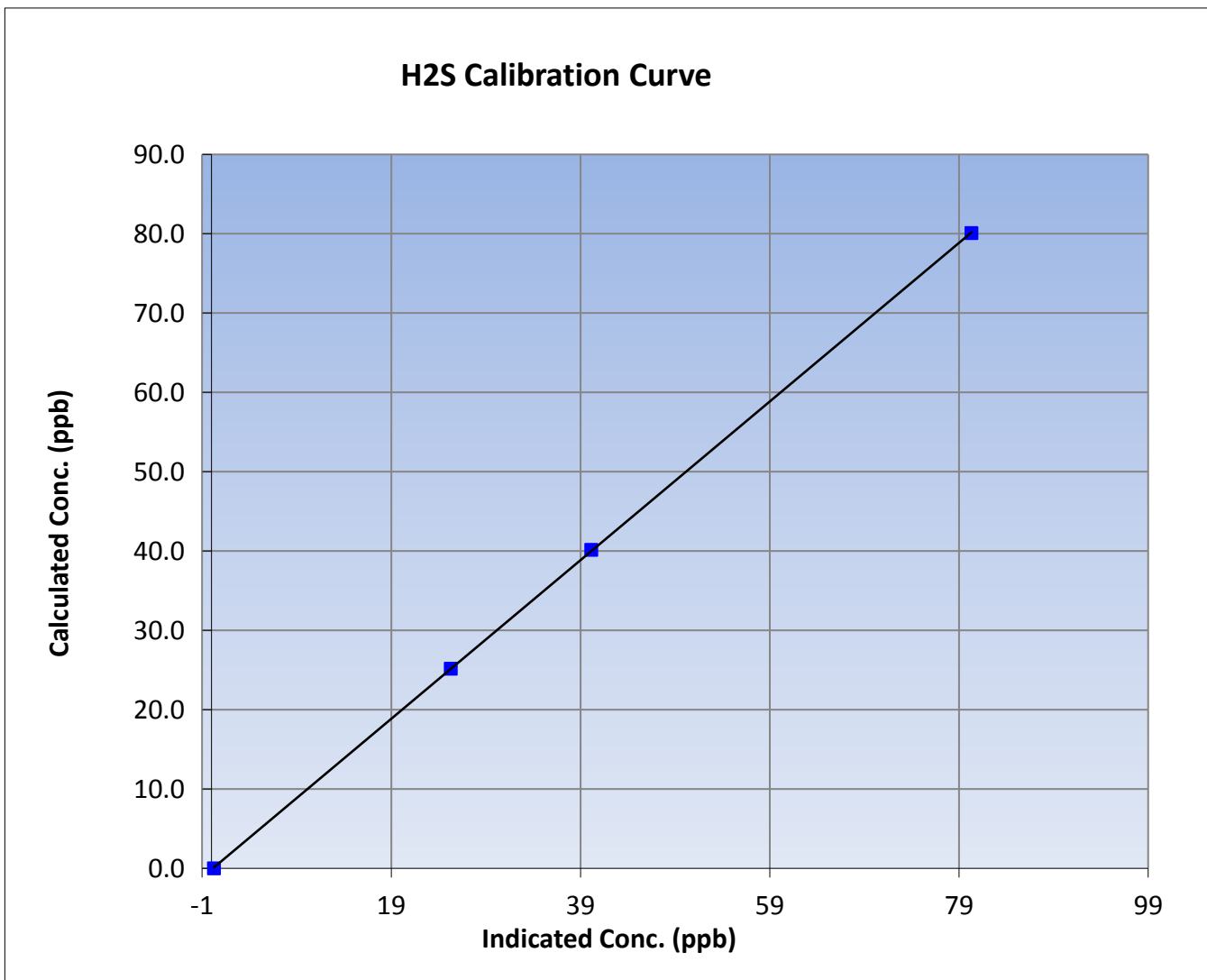
Wood Buffalo Environmental Association H2S Calibration Report

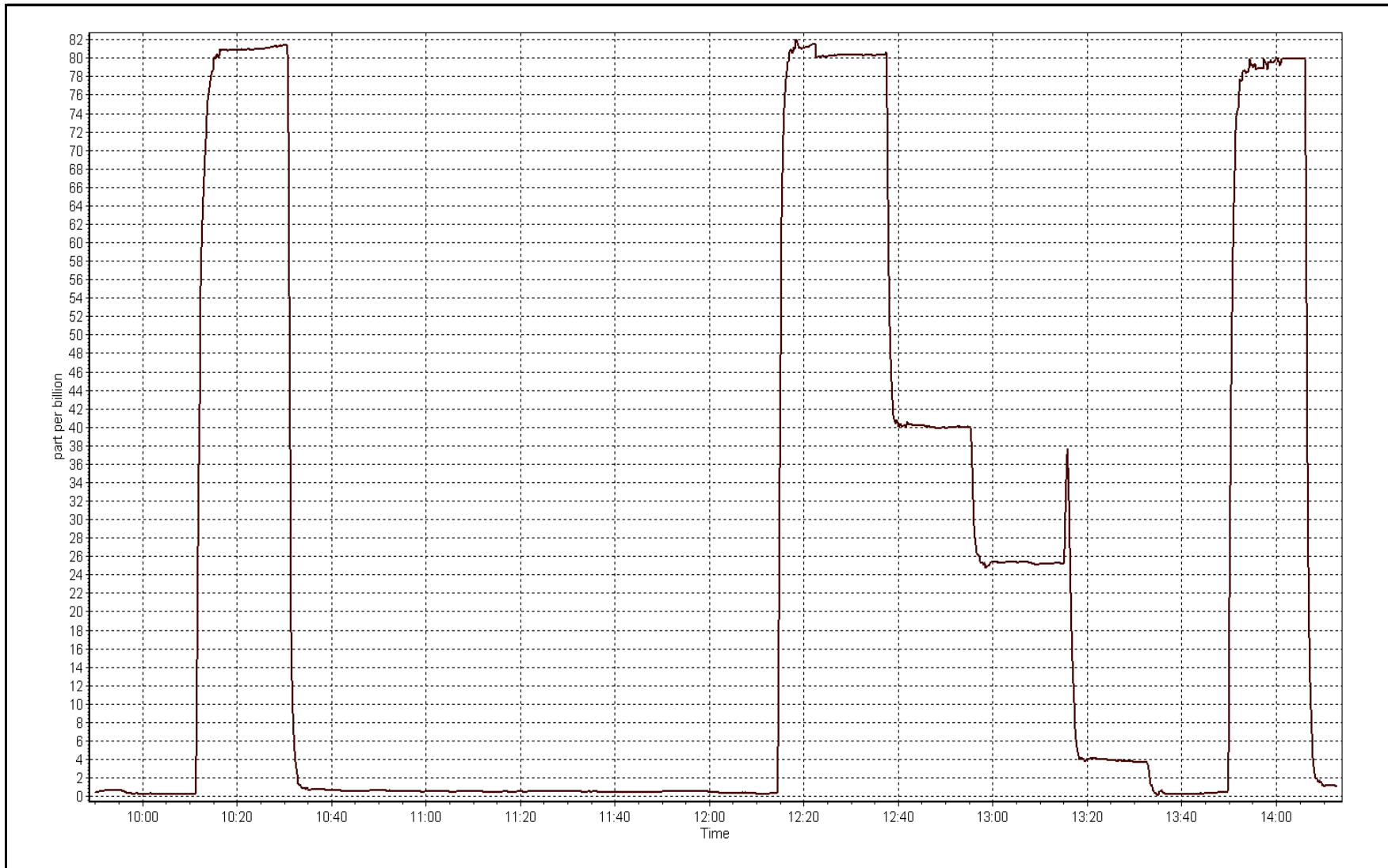
Station Information

Calibration Date	July 19, 2016	Previous Calibration	June 27, 2016
Station Name	ConocoPhillips	Station Number	AMS 502
Start Time (MST)	9:50	End Time (MST)	14:15
Analyzer make	API T101	Analyzer serial #	197

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	----	Correlation Coefficient	0.999986
80.1	80.3	0.9969		
40.1	40.1	1.0003	Slope	0.999825
25.2	25.3	0.9956		
			Intercept	-0.143129







Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	July 20, 2016	Previous Calibration	June 28, 2016
Station Name	ConocoPhillips	Station Number	AMS 502
Reason:	Routine		
Start Time (MST)	12:10	End Time (MST)	16:25
NO Cal Gas Conc	48.1 ppm	Gas Cert Reference	LL104215
NOX Cal Gas Conc	48.1 ppm	Cal Gas Expiry Date	12-Feb-18
Calibrator	API T700	Serial Number	622
Zero air Generator	Teledyne API T701	Serial Number	4865

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	9035
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.992112	0.992369	0.994480
	Data Offset	1.502614	1.466982	-0.765034
Current Calibration	Data Slope	0.996911	0.997842	0.996772
	Data Offset	1.697928	1.285008	-0.004355

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1218153356
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.42		192.168.1.42	
NO coefficient	1.091		1.084	
NOX coefficient	1.001		1.001	
NO2 coefficient	1.000		1.000	
NO bkgrnd	6.3		5.9	
NOX bkgrnd	6.5		7.1	
Chamber Temp	50.3	Deg C	50.2	Deg C
Moly Temp	324.5	Deg C	324.5	Deg C
PMT voltage	-867.3	V	-866.6	V
PMT Temp	-2.7	Deg C	-3	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	163.8	mmHg	162.9	mmHg
R Cell Press Nox	163.5	mmHg	162.7	mmHg
NO sample flow	0.666	lpm	0.66	lpm
Nox sample Flow	0.670	lpm	0.661	lpm

Notes:

Sample inlet filter replaced after as founds. Adjusted both zero and span.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

July 20, 2016

Station Number:

AMS 502

Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	0.1	-0.3	0.4	----	----
as found span	5000	83.2	800.4	800.4	0.0	805.1	803.3	1.8	0.9942	0.9964
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.5	-0.4	-0.1	----	----
high point	5000	83.2	800.4	800.4	0.0	801.5	800.9	0.5	0.9987	0.9993
second point	5000	41.6	400.2	400.2	0.0	400.1	400.4	-0.3	1.0004	0.9996
third point	5000	20.8	200.1	200.1	0.0	197.2	197.6	-0.5	1.0149	1.0125
as left zero	5000	0.0	0.0	0.0	0.0	-1.4	-0.3	-1.1	----	----
as left span	5000	83.2	800.4	493.6	306.7	805.1	494.7	310.4	0.9941	0.9978
Average Correction Factor									1.0047	1.0038

Corrected As found
Previous Response

NO_x= 805.0
NO_x= 805.2

NO= 803.5
NO= 805.1

Percent Change

NO_x= 0.0%

NO= 0.2%

GPT Calibration Data

Dilution Flow (total) 5000 ccm Source Gas Flow 83.20 ccm NOx ref calc conc = 800.4 ppb NO ref calc conc = 800.4 ppb

O3 Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
1st NO ref point		0.0	801.5	800.2	-0.1	0.9986	1.0003	----	----
1st NO2 (300)	493.6	306.5	801.5	493.6	307.8	0.9987	----	0.9958	100.4%
2nd NO2 (200)	588.0	212.2	800.2	588.0	212.3	1.0002	----	0.9999	100.0%
3rd NO2 (100)	688.3	111.9	801.0	688.3	112.8	0.9992	----	0.9926	100.8%
2nd NO ref point		0.0	801.6	800.9	0.7	0.9985	0.9993	----	----
Average Correction Factor						0.9991		0.9961	100.4%

Calibration Performed By:

Asad Hidayat



Wood Buffalo Environmental Association

NO_x Calibration Summary

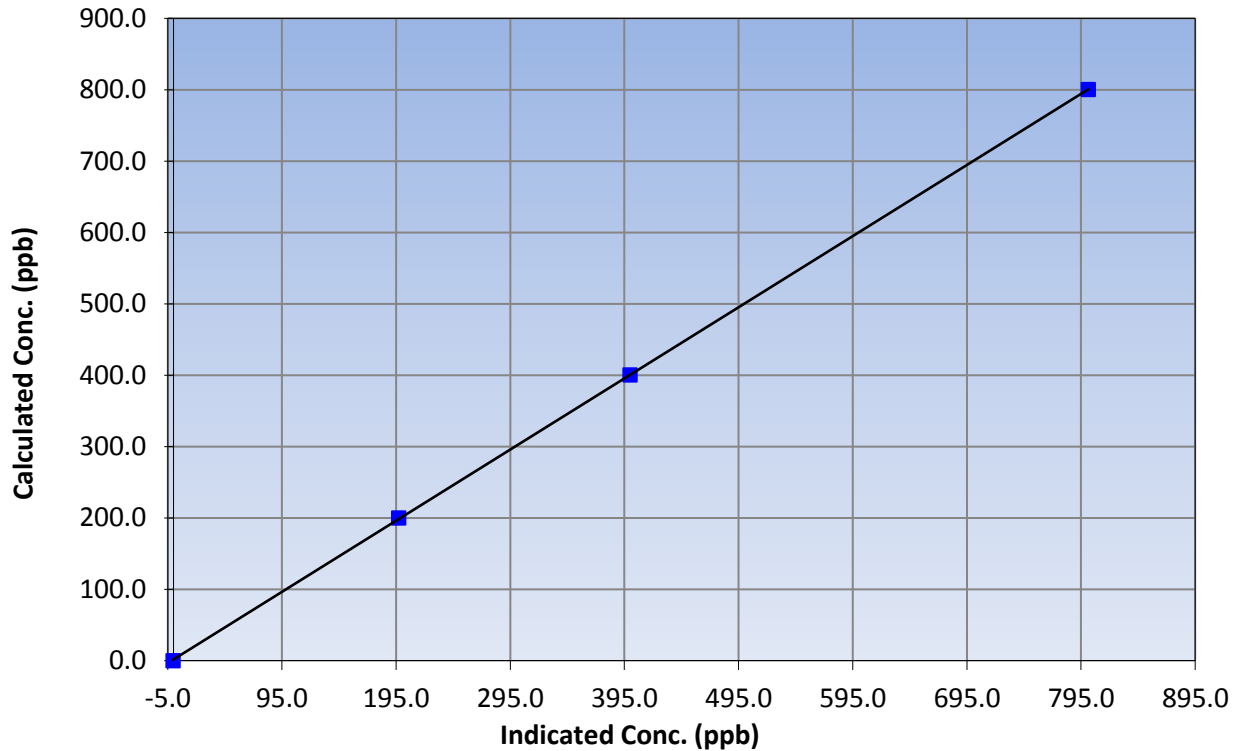
Station Information

Calibration Date	July 20, 2016	Previous Calibration	June 28, 2016
Station Name	ConocoPhillips	Station Number	AMS 502
Start Time (MST)	12:10	End Time (MST)	16:25
Analyzer make	Thermo 42i	Analyzer serial #	1218153356

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.5	----	Correlation Coefficient	0.999985
800.4	801.5	0.9987		
400.2	400.1	1.0004	Slope	0.996911
200.1	197.2	1.0149		
			Intercept	1.697928

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

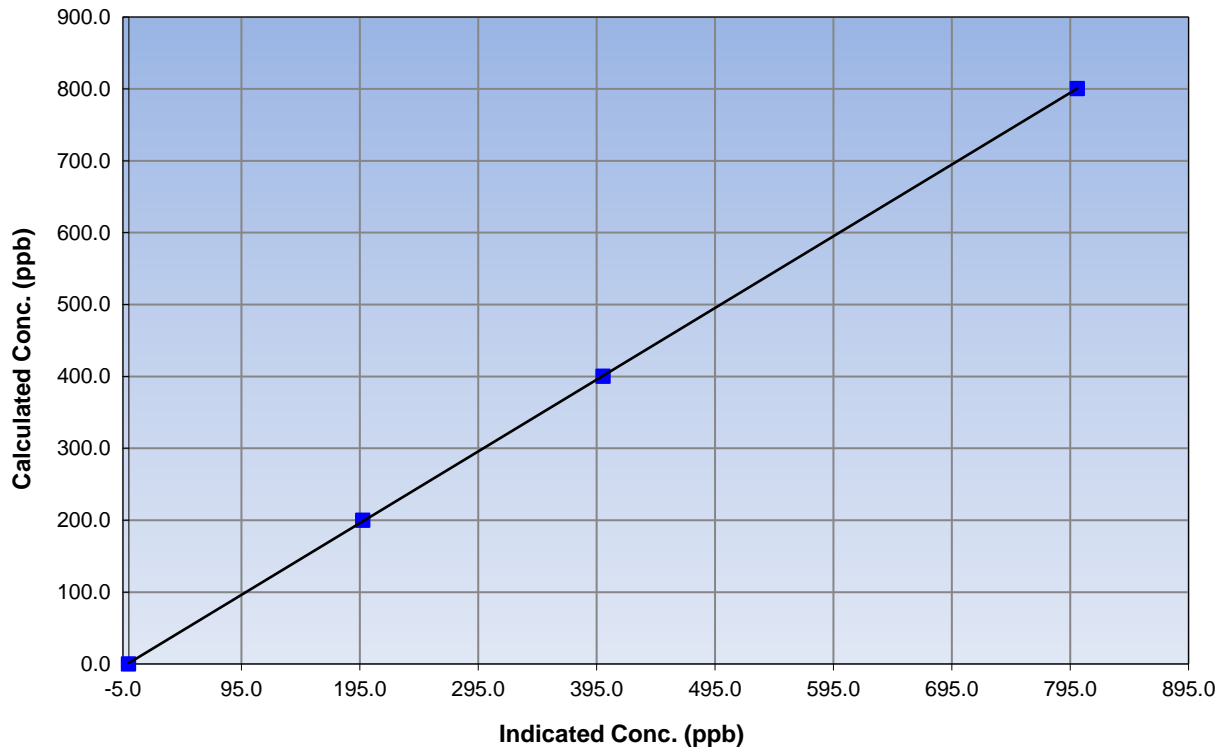
Station Information

Calibration Date	July 20, 2016	Previous Calibration	June 28, 2016
Station Name	ConocoPhillips	Station Number	AMS 502
Start Time (MST)	12:10	End Time (MST)	16:25
Analyzer make	Thermo 42i	Analyzer serial #	1218153356

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.4	N/A	Correlation Coefficient	0.999989
800.4	800.9	0.9993		
400.2	400.4	0.9996	Slope	0.997842
200.1	197.6	1.0125		
			Intercept	1.285008

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

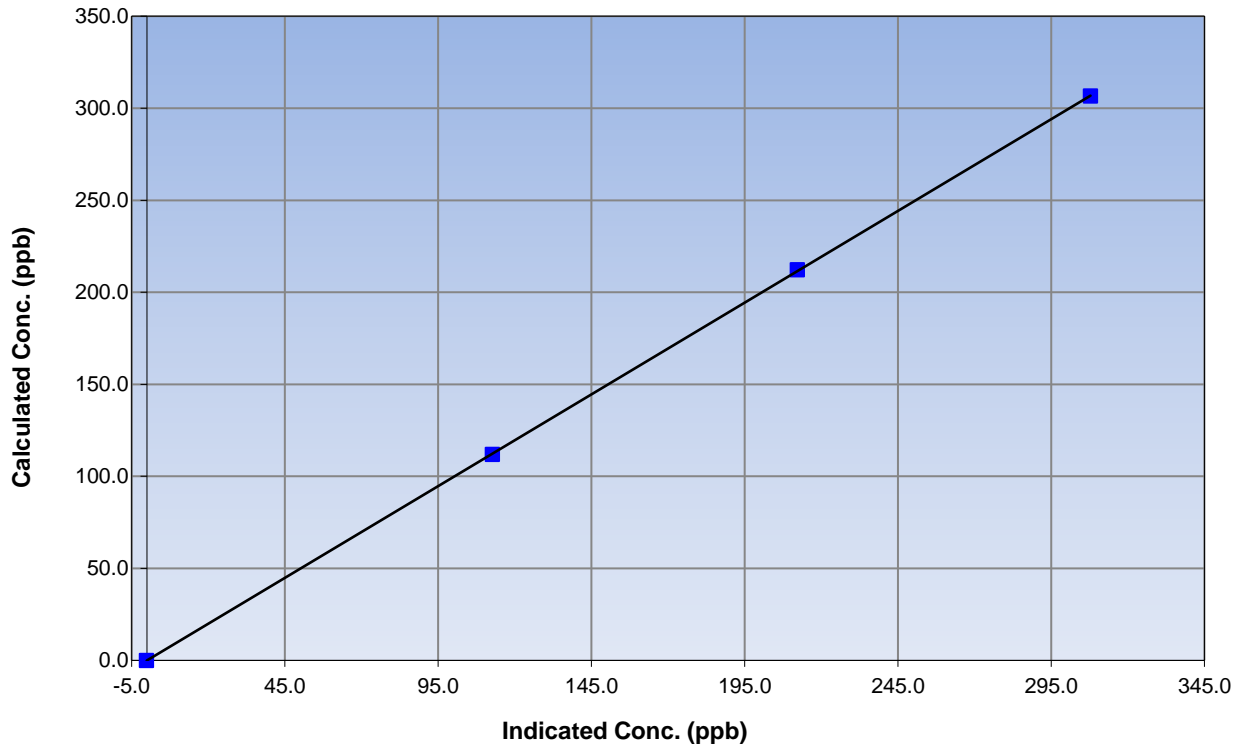
Station Information

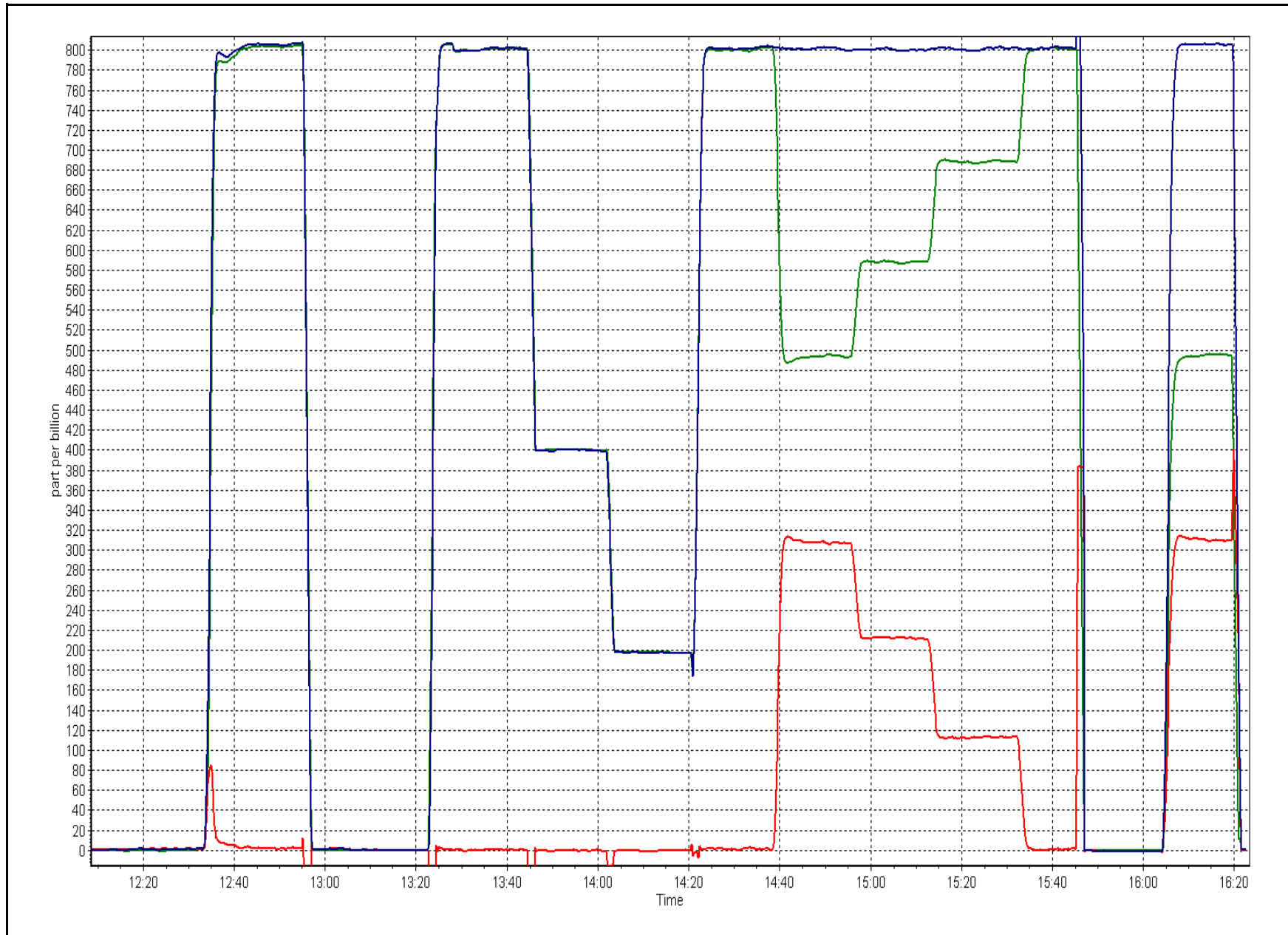
Calibration Date	July 20, 2016	Previous Calibration	June 28, 2016
Station Number	ConocoPhillips	Station Number	AMS 502
Start Time (MST)	12:10	End Time (MST)	16:25
Analyzer make	Thermo 42i	Analyzer serial #	1218153356

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999986
306.5	307.8	0.9958		
212.2	212.3	0.9999	Slope	0.996772
111.9	112.8	0.9926		
			Intercept	-0.004355

NO₂ Calibration Curve







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