Peace River Area Monitoring Program Committee
Suite 91, 305-4625 Varsity Dr NW
Calgary, AB, T3A 0Z9

Alberta Environment and Parks (AEP)
Air.Reporting@gov.ab.ca

March 15, 2018

Subject: Annual Report Submission for the PRAMP 986 AQM station

Peace Rive Area Monitoring Program Committee (PRAMP) is pleased to submit the ambient air monitoring annual report conducted at the PRAMP 986 AQM Station in the year of 2017.

The air monitoring program consists of continuous air monitoring and VOC canister sampling program. All the air monitoring activities were conducted by contractors.

Sampling Program	Monitoring Activities Conducted By	Sample Analysis Conducted By	Data/Report Review and Prepared By	Electronic Submission Conducted By
Continuous ambient air	Maxxam Analytics	Maxxam Analytics	Maxxam Analytics	Maxxam Analytics
VOC Canister	Maxxam Analytics	InnoTech Alberta Inc	InnoTech Alberta Inc	Not Applicable

Notification of Changes Made After Monthly Report Issuance

- January 2017 All Parameters: During annual review an error was discovered in the dataset that was originally submitted to Alberta's Ambient Air Quality Data Warehouse. Data on January 5, from hour 09:00 to 14:00 was incorrectly flagged for all parameters. These hours were correctly flagged in the monthly report to reflect the power failure and recovery period that occurred during these hours. The revised data were submitted to Alberta's Ambient Air Quality Data Warehouse by March 15, 2018.
- January 2017 Station Temperature: During annual review an error was discovered in the operational time that was indicated in the monthly report. The original uptime of 99.5% was edited to 99.3%, to correctly account for five hours of downtime that occurred due to a power failure on January 5. Station temperature is not required to be submitted to Alberta's Ambient Air Quality Data Warehouse.
- February – March 2017 Wind Speed: During annual review an error was discovered in the wind speed dataset. Following the wind system upgrade in February 2017, it was discovered that the supplier had not made necessary modifications to their indicated wind speed, resulting in data being under-reported by a factor of 4.5%. The wind system was calibrated on April 5, during which the wind speed gain was adjusted. This offset has been applied to data collected between February 15, hour 20:00 to March 31, hour 23:00. The monthly average did not change. The hourly averages have changed slightly from those originally reported. The revised wind data were submitted to Alberta's Ambient Air Quality Data Warehouse on March 15, 2018.

As the PRAMP Technical Program Managers, we have reviewed and verified this report and that the information is complete, accurate and representative of the monitoring results, reporting timeframe and the specified analysis, summarization and reporting requirements. We also verify all air data that

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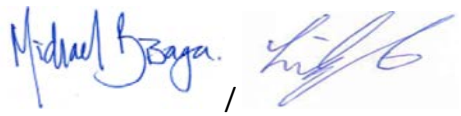
are required by the AMD to be electronically submitted to Alberta's Ambient Air Quality Data Warehouse have been submitted by the time of this report submission.

Should you have any questions, please don't hesitate to contact us.

Respectfully,



Michael Bisaga / Lily Lin
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2017 ANNUAL AMBIENT AIR MONITORING REPORT

PEACE RIVER AREA MONITORING PROGRAM COMMITTEE

THREE CREEKS 986B STATION

JOB #: 8449-2017-67-A

JANUARY - DECEMBER

2017

Attention: LILY LIN

Prepared For:

pramp
PEACE RIVER AREA MONITORING PROGRAM

Prepared By:

Maxxam
A Bureau Veritas Group Company

DATE: **March 14, 2018**

Prepared by:

Wunmi Adekanmbi, M.Sc., EPt.
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Reviewed by:

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Supervisor, Customer Service, Air Services

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TABLE OF CONTENTS

List of Acronyms

AAAQO	Alberta Ambient Air Quality Objectives and Guidelines Summary
AEP	Alberta Environment and Parks
AMD	Air Monitoring Directive
AT	Ambient Temperature
BP	Barometric Pressure
CH_4	Methane
hr	Hour
hrs	Hours
inHg	inches of Mercury
kph	Kilometers per hour
mbar	Millibar
NMHC	Non-methane Hydrocarbon
ppb	Parts per billion
ppm	Parts per million
PRAMP	Peace River Area Monitoring Program
QA	Quality Assurance
QC	Quality Control
RH	Relative Humidity
s/n	Serial Number
SOP	Standard Operating Procedure
SO_2	Sulphur Dioxide
STNTPX	Station Temperature
THC	Total Hydrocarbons
TRS	Total Reduced Sulphur
UPS	Universal Power System
vs.	versus
WS	Wind Speed
WD	Wind Direction
°C	Degrees Celsius

SUMMARY

Between January and December 2017, Maxxam Analytics was contracted to manage the ambient air quality monitoring and maintenance activities at the Three Creeks 986b Station, near Peace River Oil Sands Area 2, Alberta. The monitoring station provides continuous meteorological measurements and air quality data for non-compliance parameters, as requested by the PRAMP Committee.

In accordance with the AMD, Chapter 6: Ambient Data Quality, section 4.6, data presented in this report has undergone the Post-Final Validation Procedures, which include a cursory inspection of annual charts. If errors or omissions in the data are suspected or discovered after the initial submittal of data (monthly report), the post-validation step serves to re-evaluate the affected data. Corrections were identified in the January, February and March monthly reports, all of which required resubmission to Alberta's Ambient Air Quality Data Warehouse.

Annual summaries for monthly mean, maximum and minimum values, as well as comparisons to historical values from 2016 are presented on the following pages.

There were no ambient concentrations in excess of the Alberta Ambient Air Quality Objectives and Guidelines. Operational uptime and data capture for all equipment was above the 90% criterion, as required by the Alberta Air Monitoring Directive.

The canister monitoring program yielded one station triggered sample collection in 2017.

Any deviations or modifications made to the sampling or analytical methods during the monitoring period are outlined in Section 1.0 Discussion. On this basis, Maxxam is issuing this completed report to Peace River Area Monitoring Program Committee.

Should you have any questions concerning the results or if we can be of further assistance, please contact us at 403-219-3677 or toll-free at 1-800-386-7247.

1.0 Discussion

Included in this report are annual summary tables and charts for the 2017 PRAMP monitoring program at the Three Creeks 986b Station. Parameters that are monitored include: Sulphur Dioxide (SO_2), Total Reduced Sulphur (TRS), Total Hydrocarbon (THC), Methane (CH_4), Non-Methane Hydrocarbon (NMHC), Relative Humidity (RH), Barometric Pressure (BP), Ambient Temperature (AT), Station Temperature (STNTPX), Wind Speed (WS) and Wind Direction (WD).

The air monitoring trailer was located at Latitude 56°22'34.0"N and Longitude 116°56'25.9"W for the monitoring period.

All monitoring analyzers and meteorological systems met the 90% operational uptime requirements during the monitoring period.

All data collected during the monitoring period were within the objectives outlined in the Alberta Ambient Air Quality Objectives and Guidelines Summary (AAAQOs).

There was no external station audit performed during the monitoring period.

As a monitoring method for identifying hydrocarbon, reduced sulphur and VOC compounds, a station triggered canister collection occurred once in 2017.

NMHC Trigger Threshold (ppm)	Date	Time	Concentration (ppm)	Tested Y/N
5-min Average > 0.3	16-Feb	20:10	0.31	Y

Notification of Changes Made After Monthly Report Issuance

January 2017 All Parameters: During annual review an error was discovered in the dataset that was originally submitted to Alberta's Ambient Air Quality Data Warehouse. Data on January 5, from hour 09:00 to 14:00 was incorrectly flagged for all parameters. These hours were correctly flagged in the monthly report to reflect the power failure and recovery period that occurred during these hours. Accordingly, the revised data will be submitted to Alberta's Ambient Air Quality Data Warehouse by March 15, 2018.

January 2017 Station Temperature: During annual review an error was discovered in the operational time that was indicated in the monthly report. The original uptime of 99.5% was edited to 99.3%, to correctly account for five hours of downtime that occurred due to a power failure on January 5. Station temperature is not required to be submitted to Alberta's Ambient Air Quality Data Warehouse.

February 2017 Wind Speed: During annual review an error was discovered in the wind speed dataset. Following the wind system upgrade in February 2017, it was discovered that the supplier had not made necessary modifications to their indicated wind speed, resulting in data being under-reported by a factor of 4.5%. The wind system was calibrated on April 5, during which the wind speed gain was adjusted. This offset has been applied to data collected between February 15, hour 20:00 to February 28, hour 23:00. The monthly average did not change. The hourly averages have changed slightly from those originally reported. Accordingly, the revised wind data will be submitted to Alberta's Ambient Air Quality Data Warehouse by March 15, 2018.

March 2017 Wind Speed: During annual review an error was discovered in the wind speed dataset. Following the wind system upgrade in February 2017, it was discovered that the supplier had not made necessary modifications to their indicated wind speed, resulting in data being under-reported by a factor of 4.5%. The wind system was calibrated on April 5, during which the wind speed gain was adjusted. This offset has been applied to all data collected during the month of March. The monthly average did not change. The hourly averages have changed slightly from those originally reported. Accordingly, the revised wind data will be submitted to Alberta's Ambient Air Quality Data Warehouse on March 15, 2018.

The summaries of the monthly maintenance report for the monitoring period are presented below:

SULPHUR DIOXIDE (SO_2)	
January	• Operational time for the monitoring period was 99.3%, equivalent to five hours of downtime. • Four hours of downtime were recorded from hour 09:00 to hour 12:00 on January 5, due to a power failure. Data collected at hour 13:00 was invalidated as the analyzer was recovering from the power failure.
February	• Operational time for the monitoring period was 100%. • Following a successful shut-down calibration on February 4, the sample pump was rebuilt. A successful post-repair calibration was subsequently performed. Operational time was not impacted due to this maintenance.
March	• Operational time for the monitoring period was 100%. No operational issues were identified this month.
April	• Operational time for the monitoring period was 100%. No operational issues were identified this month.
May	• Operational time for the monitoring period was 100%. No operational issues were identified this month.
June	• Operational time for the monitoring period was 99.7%, equivalent to two hours of downtime. These were incurred due to a power failure that occurred on June 30, from hour 06:00 to 07:00.
July	• Operational time for the monitoring period was 100%. No operational issues were identified this month.
August	• Operational time, for the monitoring period was 99.1%, equivalent to seven hours of downtime. These were incurred on August 24, between the hours of 14:00 to 20:00, due to a power failure and the subsequent recovery period of the analyzer.
September	• Operational time for the monitoring period was 98.1%, equivalent to fourteen hours of downtime. • Due to two power failures that occurred on September 13, hours 10:00 to 12:00 and September 14, hour 22:00 to September 15, hour 06:00, twelve hours of downtime were recorded. • Data collected at hour 13:00 on September 13 was invalidated as the analyzer was recovering from the power failure. A zero/span check was completed at hour 07:00 on September 15 as a quality check following the power failure. However, the response was poor possibly because the zero/span system was stabilizing. More time was allowed and a successful zero/span check was completed at hour 20:00. Two more hours of downtime were therefore incurred.

SULPHUR DIOXIDE (SO_2)	
October	• Operational time for the monitoring period was 99.1%, equivalent to seven hours of downtime. • An additional zero/span check was conducted on October 2 to assess span response after a drift towards the upper acceptance limit; the result was valid. The analyzer then spanned above the upper acceptance limit on October 3, prompting an immediate site visit where the routine monthly calibration was successfully completed and the perm tube was replaced. A repeat span check was performed on October 4 to provide a reference for updating the expected span value. Two hours of downtime were incurred due to the additional quality checks. • Following the stabilization of the newly-installed perm tube, the expected span value was adjusted on October 7. • Due to a power failure that occurred from hour 22:00 on October 6, to hour 02:00 on October 7, five hours of downtime were recorded.
November	• Operational time for the monitoring period was 100%. • Following a successful as-found response check on November 9, the case fan was replaced. A successful routine monthly multi-point calibration was subsequently completed. Operational time was not impacted due to this maintenance.
December	• Operational time for the monitoring period was 100%. No operational issues were identified this month.

TOTAL REDUCED SULPHUR (TRS)	
January	• Operational time for the monitoring period was 99.3%, equivalent to five hours of downtime. • Four hours of downtime were recorded from hour 09:00 to hour 12:00 on January 5, due to a power failure. Data collected at hour 13:00 was invalidated as the analyzer was recovering from the power failure.
February	• Operational time for the monitoring period was 99.7%, equivalent to two hours of downtime. • The routine monthly calibration was performed on February 4. The as-found high point value obtained from the calibration was 8.1% off the reference value. This was within the tolerance limits of +/-10%. However, as a precaution, an as-found response check was completed on February 5, using an alternate calibrator. The result was 1.2% off reference value. No further action was taken.
March	• Operational time for the monitoring period was 99.9%, equivalent to one hour of downtime. • An analyzer upgrade was implemented on March 7. The Thermo 43i analyzer (s/n: 1314057760) was removed following a successful shut-down calibration. The replacement analyzer was a trace level model, Thermo 43i TL (s/n: 1152940011). A successful installation calibration was subsequently completed. One hour of downtime was recorded due to this event. • The zero/span oven temperature was adjusted during the March 7 site visit. The analyzer was allowed time to stabilize and the expected span value was updated on March 8.
April	• Operational time for the monitoring period was 100%. No operational issues were identified this month.
May	• Operational time for the monitoring period was 100%. No operational issues were identified this month.
June	• Operational time for the monitoring period was 99.7%, equivalent to two hours of downtime. These were incurred due to a power failure that occurred on June 30, from hour 06:00 to 07:00.
July	• Operational time for the monitoring period was 100%. No operational issues were identified this month.
August	• Operational time for the monitoring period was 99.1%, equivalent to seven hours of downtime. These were incurred on August 24, between the hours of 14:00 and 20:00, due to a power failure and the subsequent recovery period of the analyzer.

TOTAL REDUCED SULPHUR (TRS)	
September	• Operational time for the monitoring period was 98.1%, equivalent to fourteen hours of downtime. • Due to two power failures that occurred on September 13, hours 10:00 to 12:00 and September 14, hour 22:00 to September 15, hour 06:00, twelve hours of downtime were recorded. • Data collected at hour 13:00 on September 13 was invalidated as the analyzer was recovering from the power failure. A zero/span check was completed at hour 07:00 on September 15 as a quality check following the power failure. However, the response was poor possibly because the zero/span system was stabilizing. More time was allowed and a successful zero/span check was completed at hour 20:00. Two more hours of downtime were therefore incurred.
October	• Operational time for the monitoring period was 99.3%, equivalent to five hours of downtime. These were incurred due to a power failure that occurred from hour 22:00 on October 6, to hour 02:00 on October 7.
November	• Operational time for the monitoring period was 99.9%, equivalent to one hour of downtime. This was incurred due to an additional zero/span check performed on November 8 to assess a biased low span drift.
December	• Operational time for the monitoring period was 98.7%, equivalent to ten hours of downtime. • The analyzer spanned towards the lower acceptance limit on December 26. A repeat span check revealed it was not a trending drift. However, as a precaution, a site visit was scheduled. Upon arrival at the station, the exhaust tube was found frozen due to extremely low temperatures. The tube was defrosted and a successful repeat calibration was completed on December 27, confirming analyzer performance. Six hours of downtime were incurred due to this event. • Two additional zero-span checks were conducted on December 30 to assess the analyzer in response to another biased low span drift. The results were not trending. The span response recovered afterwards. No further issues were identified. Four hours of downtime were recorded due to the additional quality checks.

TOTAL HYDROCARBONS (THC), METHANE (CH_4) & NON-METHANE HYDROCARBONS (NMHC)	
January	• Operational time for the monitoring period was 97.7%, equivalent to 17 hours of downtime. • Recorded concentrations started showing a gradual decline from the late hours of January 9. This prompted an immediate site visit as it was suspected that gas pressures were dropping. The fuel (hydrogen) and span gas cylinders were replaced and the routine monthly calibration was completed on January 10. Eleven hours of downtime were recorded due to this event. • A drift was observed in span concentrations after the monthly calibration as a new span gas of different concentration was installed. • Four hours of downtime were recorded from hour 09:00 to hour 12:00 on January 5, due to a power failure. Data collected at hours 13:00 and 14:00 were invalidated as the analyzer was recovering from the power failure. • No canister event was recorded.
February	• Operational time for the monitoring period was 99.9%, equivalent to one hour of downtime. • One hour of downtime was recorded on February 22, at hour 13:00, as the analyzer was recovering from a brief power outage. • One canister event was recorded on February 16 at 20:10, at a concentration of 0.31 ppm.
March	• Operational time for the monitoring period was 100%. No operational issues were identified this month. • No canister event was recorded.
April	• Operational time for the monitoring period was 100%. No operational issues were identified this month. • No canister event was recorded.
May	• Operational time for the monitoring period was 100%. • Data was recorded at concentrations higher than historical between May 23 and May 29. An extensive review was conducted, all QC/QA activities surrounding the time-frame met AMD requirements and the analyzer was operating within standard performance specifications. This range of data is therefore considered valid. • No canister event was recorded.
June	• Operational time for the monitoring period was 99.4%, equivalent to four hours of downtime. • Two hours of downtime were incurred on June 30, from hour 06:00 to 07:00, due to a brief power failure. Data collected on June 26 at hour 15:00 and on June 30 at hour 08:00, were discarded as the analyzer was recovering from power failures. • No canister event was recorded.
July	• Operational time for the monitoring period was 100%. No operational issues were identified this month. • No canister event was recorded.

TOTAL HYDROCARBONS (THC), METHANE (CH_4) & NON-METHANE HYDROCARBONS (NMHC)	
August	• Operational time for the monitoring period was 96.0%, equivalent to thirty hours of downtime. • The channels were placed in "maintenance" mode on August 10 at hour 15:00 while the sample manifold was being cleaned; one hour of downtime was incurred. • The fuel (hydrogen) and span gas cylinders were exchanged during the site visit on August 10. A repeat zero/span check was conducted on August 11, to provide a reference for updating the expected span value, following the span gas change. One hour of downtime was recorded due to the additional zero/span check. • Following a successful shut-down calibration on August 16, column conditioning was conducted overnight. A successful post-repair calibration was completed on August 17. Twenty hours of downtime were recorded due to this maintenance event. • Eight hours of downtime were incurred on August 24, between the hours of 14:00 to 21:00, due to a power failure and the subsequent recovery period of the analyzer. • No canister event was recorded.
September	• Operational time for the monitoring period was 98.1%, equivalent to fourteen hours of downtime. • Due to two power failures that occurred on September 13, hours 10:00 to 12:00 and September 14, hour 22:00 to September 15, hour 06:00, twelve hours of downtime were recorded. • Data collected at hour 13:00 on September 13 was invalidated as the analyzer was recovering from the power failure; one hour of downtime was incurred. A zero/span check was initiated at hour 07:00 on September 15 to assess analyzer response following the power failure. This span verification extended to hour 08:00, causing an unintended hour of downtime. • No canister event was recorded.
October	• Operational time for the monitoring period was 99.1%, equivalent to seven hours of downtime. • Due to a power failure and the subsequent recovery period that occurred from hour 22:00 on October 6, to hour 03:00 on October 7, six hours of downtime were recorded. • The carrier (nitrogen) gas was changed out on October 16. As a quality assessment, a zero/span check was triggered after the replacement. One hour of downtime was recorded due to the additional quality check. • No canister event was recorded.
November	• Operational time for the monitoring period was 100%. No operational issues were identified this month. • No canister event was recorded.

TOTAL HYDROCARBONS (THC), METHANE (CH_4) & NON-METHANE HYDROCARBONS (NMHC)	
December	• Operational time for the monitoring period was 97.8%, equivalent to sixteen hours of downtime. • On December 5, the fuel (hydrogen) gas ran out, causing the analyzer to span outside acceptance limits. The fuel (hydrogen) gas cylinder was replaced on December 6 by client site contacts. A successful zero-span verification was completed afterwards, confirming analyzer performance. Sixteen hours of downtime were recorded due to this event. • No canister event was recorded.

WIND SPEED (WS) & WIND DIRECTION (WD)	
January	• Operational time for the monitoring period was 99.5%, equivalent to four hours of downtime. • Four hours of downtime were recorded from hour 09:00 to hour 12:00 on January 5, due to a power failure.
February	• Operational time for the monitoring period was 100%. • The wind system was upgraded on February 15. The RM Young 05103VK (s/n: 43711) was removed following a successful shut-down calibration. Subsequently, an RM Young 05305VK (s/n: 129612) was installed and calibrated. • Following the wind system upgrade, it was discovered that the supplier had not made necessary modifications to their indicated wind speed, resulting in data being under-reported by a factor of 4.5%. The wind system was calibrated on April 5, during which the wind speed gain was adjusted. This offset has been applied to data collected between February 15, hour 20:00 to February 28, hour 23:00.
March	• Operational time for the monitoring period was 100%. • Following the wind system upgrade in February 2017, it was discovered that the supplier had not made necessary modifications to their indicated wind speed, resulting in data being under-reported by a factor of 4.5%. The wind system was calibrated on April 5, during which the wind speed gain was adjusted. This offset has been applied to all data collected during the month of March.
April	• Operational time for the monitoring period was 100%. • Following the wind system upgrade in February 2017, it was discovered that the manufacturer had made an error in units that resulted in data being under-reported by a factor of 4.5%. The wind system was calibrated on April 5, during which the wind speed gain was adjusted. This offset was corrected for data collected between April 1 and April 5.
May	• Operational time for the monitoring period was 100%. No operational issues were identified this month.
June	• Operational time for the monitoring period was 99.7%, equivalent to two hours of downtime. These were incurred due to a power failure that occurred on June 30, from hour 06:00 to 07:00.
July	• Operational time for the monitoring period was 100%. No operational issues were identified this month.
August	• Operational time for the monitoring period was 99.2%, equivalent to six hours of downtime. These were incurred due to a power failure that occurred on August 24, between the hours of 14:00 to 19:00.
September	• Operational time for the monitoring period was 98.3%, equivalent to twelve hours of downtime. These were incurred due to two power failures that occurred on September 13, hours 10:00 to 12:00 and September 14, hour 22:00 to September 15, hour 06:00.

WIND SPEED (WS) & WIND DIRECTION (WD)	
October	• Operational time for the monitoring period was 95.8%, equivalent to thirty-one hours of downtime. • Due to a power failure that occurred from hour 22:00 on October 6, to hour 02:00 on October 7, five hours of downtime were recorded. • The wind system recorded anomalous data between October 25, hour 08:00 and October 26, hour 09:00, likely due to prevalent weather conditions at the time. The data was excluded, resulting in twenty-six hours of downtime.
November	• Operational time for the monitoring period was 100%. No operational issues were identified this month.
December	• Operational time for the monitoring period was 100%. No operational issues were identified this month.

RELATIVE HUMIDITY (RH)	
January	• Operational time for the monitoring period was 99.5%, equivalent to four hours of downtime. • Four hours of downtime were recorded from hour 09:00 to hour 12:00 on January 5, due to a power failure.
February	• Operational time for the monitoring period was 100%. No operational issues were identified this month.
March	• Operational time for the monitoring period was 100%. No operational issues were identified this month.
April	• Operational time for the monitoring period was 100%. No operational issues were identified this month.
May	• Operational time for the monitoring period was 100%. No operational issues were identified this month.
June	• Operational time for the monitoring period was 99.7%, equivalent to two hours of downtime. These were incurred due to a power failure that occurred on June 30, from hour 06:00 to 07:00.
July	• Operational time for the monitoring period was 100%. No operational issues were identified this month.
August	• Operational time for the monitoring period was 99.2%, equivalent to six hours of downtime. These were incurred due to a power failure that occurred on August 24, between the hours of 14:00 to 19:00.
September	• Operational time for the monitoring period was 98.3%, equivalent to twelve hours of downtime. These were incurred due to two power failures that occurred on September 13, hours 10:00 to 12:00 and September 14, hour 22:00 to September 15, hour 06:00.
October	• Operational time for the monitoring period was 99.3%, equivalent to five hours of downtime. These were incurred due to a power failure that occurred from hour 22:00 on October 6, to hour 02:00 on October 7.
November	• Operational time for the monitoring period was 100%. No operational issues were identified this month.
December	• Operational time for the monitoring period was 100%. No operational issues were identified this month.

BAROMETRIC PRESSURE (BP)	
January	• Operational time for the monitoring period was 99.5%, equivalent to four hours of downtime. • Four hours of downtime were recorded from hour 09:00 to hour 12:00 on January 5, due to a power failure.
February	• Operational time for the monitoring period was 100%. No operational issues were identified this month. • The reporting unit for Barometric Pressure was changed from inHg to millibar, as per client request.
March	• Operational time for the monitoring period was 100%. No operational issues were identified this month.
April	• Operational time for the monitoring period was 100%. No operational issues were identified this month.
May	• Operational time for the monitoring period was 100%. No operational issues were identified this month.
June	• Operational time for the monitoring period was 99.7%, equivalent to two hours of downtime. These were incurred due to a power failure that occurred on June 30, from hour 06:00 to 07:00.
July	• Operational time for the monitoring period was 100%. No operational issues were identified this month.
August	• Operational time for the monitoring period was 99.2%, equivalent to six hours of downtime. These were incurred due to a power failure that occurred on August 24, between the hours of 14:00 to 19:00.
September	• Operational time for the monitoring period was 98.3%, equivalent to twelve hours of downtime. These were incurred due to two power failures that occurred on September 13, hours 10:00 to 12:00 and September 14, hour 22:00 to September 15, hour 06:00.
October	• Operational time for the monitoring period was 99.3%, equivalent to five hours of downtime. These were incurred due to a power failure that occurred from hour 22:00 on October 6, to hour 02:00 on October 7.
November	• Operational time for the monitoring period was 100%. No operational issues were identified this month.
December	• Operational time for the monitoring period was 100%. No operational issues were identified this month.

AMBIENT TEMPERATURE (AT)	
January	• Operational time for the monitoring period was 99.5%, equivalent to four hours of downtime. • Four hours of downtime were recorded from hour 09:00 to hour 12:00 on January 5, due to a power failure.
February	• Operational time for the monitoring period was 100%. No operational issues were identified this month.
March	• Operational time for the monitoring period was 100%. No operational issues were identified this month.
April	• Operational time for the monitoring period was 100%. No operational issues were identified this month.
May	• Operational time for the monitoring period was 100%. No operational issues were identified this month.
June	• Operational time for the monitoring period was 99.7%, equivalent to two hours of downtime. These were incurred due to a power failure that occurred on June 30, from hour 06:00 to 07:00.
July	• Operational time for the monitoring period was 100%. No operational issues were identified this month.
August	• Operational time for the monitoring period was 99.2%, equivalent to six hours of downtime. These were incurred due to a power failure that occurred on August 24, between the hours of 14:00 to 19:00.
September	• Operational time for the monitoring period was 98.3%, equivalent to twelve hours of downtime. These were incurred due to two power failures that occurred on September 13, hours 10:00 to 12:00 and September 14, hour 22:00 to September 15, hour 06:00.
October	• Operational time for the monitoring period was 99.3%, equivalent to five hours of downtime. These were incurred due to a power failure that occurred from hour 22:00 on October 6, to hour 02:00 on October 7.
November	• Operational time for the monitoring period was 100%. No operational issues were identified this month.
December	• Operational time for the monitoring period was 100%. No operational issues were identified this month.

STATION TEMPERATURE (STNTPX)	
January	• Operational time for the monitoring period was 99.3%, equivalent to five hours of downtime. • Five hours of downtime were recorded from hour 09:00 to hour 13:00 on January 5, due to a power failure.
February	• Operational time for the monitoring period was 100%. No operational issues were identified this month.
March	• Operational time for the monitoring period was 100%. No operational issues were identified this month.
April	• Operational time for the monitoring period was 100%. No operational issues were identified this month.
May	• Operational time for the monitoring period was 100%. No operational issues were identified this month.
June	• Operational time for the monitoring period was 99.7%, equivalent to two hours of downtime. These were incurred due to a power failure that occurred on June 30, from hour 06:00 to 07:00.
July	• Operational time for the monitoring period was 100%. No operational issues were identified this month.
August	• Operational time for the monitoring period was 99.2%, equivalent to six hours of downtime. These were incurred due to a power failure that occurred on August 24, between the hours of 14:00 to 19:00.
September	• Operational time for the monitoring period was 98.3%, equivalent to twelve hours of downtime. These were incurred due to two power failures that occurred on September 13, hours 10:00 to 12:00 and September 14, hour 22:00 to September 15, hour 06:00.
October	• Operational time for the monitoring period was 99.3%, equivalent to five hours of downtime. These were incurred due to a power failure that occurred from hour 22:00 on October 6, to hour 02:00 on October 7.
November	• Operational time for the monitoring period was 100%. No operational issues were identified this month.
December	• Operational time for the monitoring period was 100%. No operational issues were identified this month.

2.0 Project Personnel

Mike Bisaga and Lily Lin were the contacts for Peace River Area Monitoring Program Committee and the Maxxam field operators were Christopher Wesson, Limin Li, Michael Espiritu and Raja Ashraf.

3.0 Plant Monthly Required AMD Summary

There were no ambient concentrations in excess of the Alberta Ambient Air Quality Objectives and Guidelines. Operational uptime and data capture for all equipment was above the 90% criterion, as required by the Alberta Air Monitoring Directive.

As a monitoring method for identifying hydrocarbon, reduced sulphur and VOC compounds, a station triggered canister collection occurred once in 2017.

4.0 Calculations and Results

All calculations and reporting of results follow the methods described in the Air Monitoring Directive (Alberta Environment and Parks, 2016).

In February, 2017 the reporting unit for Barometric Pressure was changed from inHg to mbar, as per client request. For the purposes of annual data comparison, data reported from January 2016 to January 2017 was converted to mbar, using the conversion factor of 1 inHg is equivalent to 33.8639 mbar.

In March, 2017 the Thermo 43i TRS analyzer (s/n: 1314057760) was upgraded to a Thermo 43i TL (s/n: 1152940011). In April 2017, the reporting precision for PRAMP's TRS data was changed from one decimal place to two, to reflect the analyzer's measurement capability.

In April 2017, the reporting precision for SO_2 and TRS (non-trace level) data was changed from one decimal place to zero. Decimal resolution was revised to reflect the analyzer's actual measurement capability. Raw data will still be collected with several decimal places, but the reportable value will be based on the analyzer capability.

5.0 Methods and Procedures

The following methods and procedures were used to complete the test program:

Maxxam AIR SOP-00001 - Methane, Non-Methane Hydrocarbon Analyzer
Maxxam AIR SOP-00208: RM Young Wind Monitor Calibration
Maxxam AIR SOP-00209: Ambient Sulphur Monitoring

There were no deviations from the prescribed methods.

The following instruments were used to perform the test program:

Sulphur Dioxide - Thermo 43C UV Fluorescent Analyzer
Total Reduced Sulphur - Thermo 43i & Thermo 43i TL UV Fluorescent Analyzer
Methane, Non-Methane Hydrocarbon - Thermo 55i FID Analyzer
Wind System - RM Young Unit
Relative Humidity - RM Young Unit
Barometric Pressure - Met One Unit
Ambient Temperature - RM Young Unit
StationTemperature - Maxxam Supplied Unit
Datalogger - ESC 8832

APPENDIX I
CONTINUOUS MONITORING DATA RESULTS

SULPHUR DIOXIDE

SULPHUR DIOXIDE (SO_2) 2017 Monthly Averages & Frequency Distributions of 1-Hr Readings

Month	Number of Readings*	Operational Time (%)	% Readings in Concentration Range (ppb SO_2)						AAAQO** (ppb)		EXCEEDANCES		MONTHLY AVERAGE (ppb)
			≤ 20	20 < C ≤ 60	60 < C ≤ 110	110 < C ≤ 170	170 < C ≤ 340	> 340	1-HR	24-HR	1-HR	24-HR	
January	703	99.3	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	172	48.0	0	0	0.2
February	637	100.0	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	172	48.0	0	0	0.2
March	707	100.0	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	172	48.0	0	0	0.2
April	684	100.0	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	172	48.0	0	0	0
May	708	100.0	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	172	48.0	0	0	0
June	681	99.7	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	172	48.0	0	0	0
July	710	100.0	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	172	48.0	0	0	0
August	701	99.1	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	172	48.0	0	0	0
September	671	98.1	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	172	48.0	0	0	0
October	702	99.1	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	172	48.0	0	0	0
November	683	100.0	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	172	48.0	0	0	0
December	708	100.0	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	172	48.0	0	0	0
Annual	**8295**	**99.6**	**100.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**			**0**	**0**	**0**

**# of readings excluding calibration hours*

***If Alberta Ambient Air Quality Objectives and Guidelines are not available '-' is used*

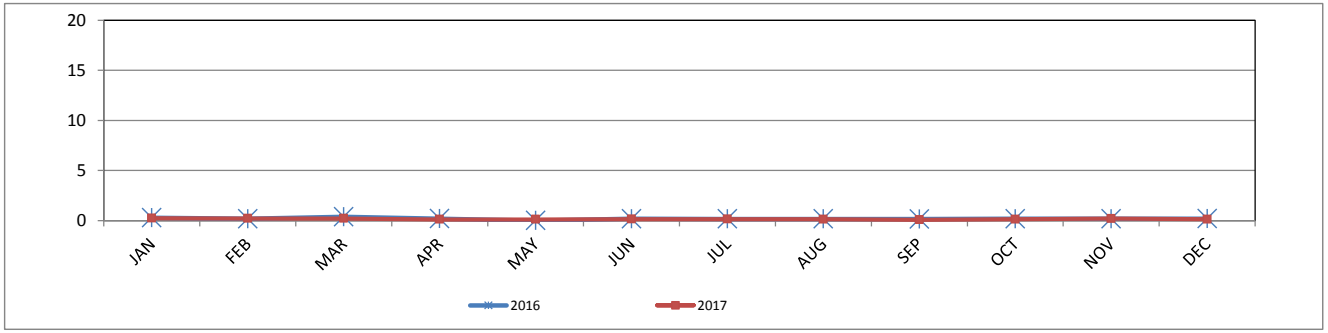
Alberta Ambient Air Quality Objectives Annual Average**	**8.0**	**ppb**
Annual Average for 2017	**0**	**ppb**

SULPHUR DIOXIDE (SO_2) 2017 vs. 2016 1-Hr Readings in ppb

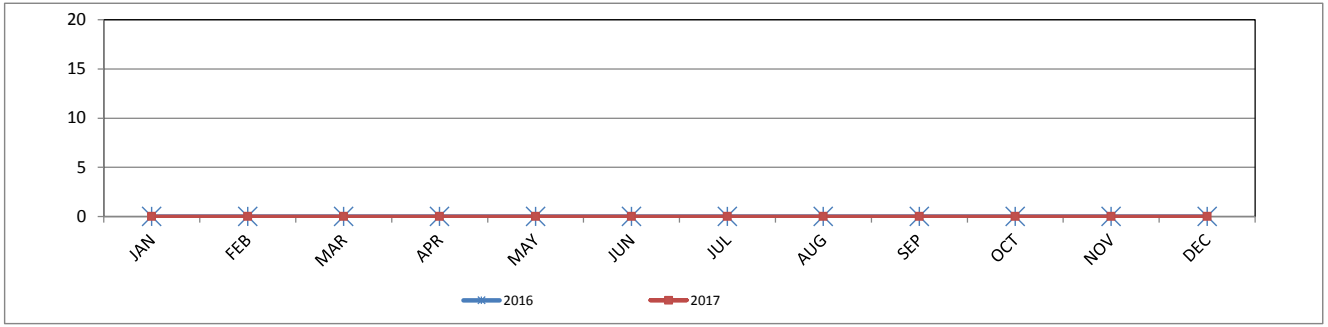
	2016			2017			
MONTH	**MEAN**	**MINIMUM**	**MAXIMUM**	**MEAN**	**MINIMUM**	**MAXIMUM**	**DIFFERENCE**
JAN	0.3	0.0	2.4	**0.2**	0.0	1.5	-0.1
FEB	0.2	0.0	1.5	0.2	0.0	4.4	0.0
MAR	**0.4**	0.0	2.0	0.2	0.0	2.3	-0.2
APR	0.2	0.0	1.8	0	0	2	0
MAY	0.0	0.0	0.0	0	0	1	0
JUN	0.2	0.0	**4.8**	0	0	3	0
JUL	0.2	0.0	1.3	0	0	2	0
AUG	0.2	0.0	1.1	0	0	2	0
SEP	0.1	0.0	1.6	0	0	1	0
OCT	0.2	0.0	1.1	0	0	1	0
NOV	0.2	0.0	1.6	0	0	3	0
DEC	0.2	0.0	1.6	0	0	**7**	0

Annual peak

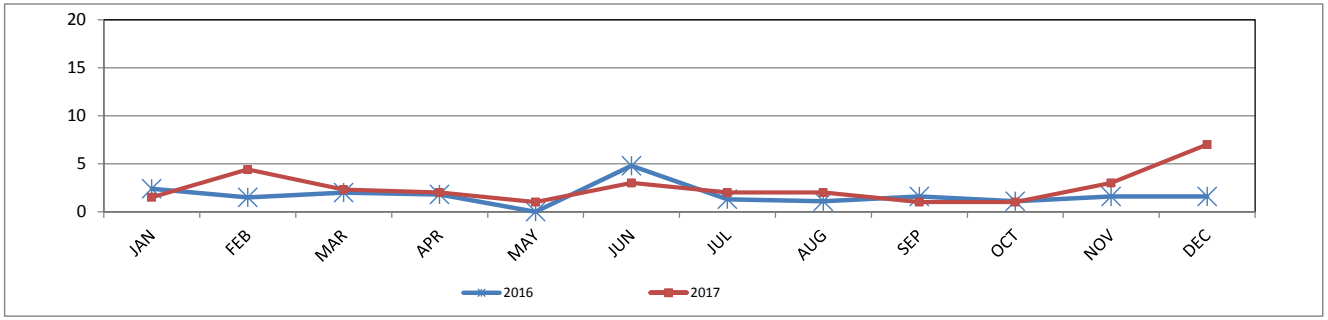
SULPHUR DIOXIDE (SO_2) 2017 vs. 2016 Monthly Mean in ppb



SULPHUR DIOXIDE (SO_2) 2017 vs. 2016 Monthly Minimum in ppb



SULPHUR DIOXIDE (SO_2) 2017 vs. 2016 Monthly Maximum in ppb



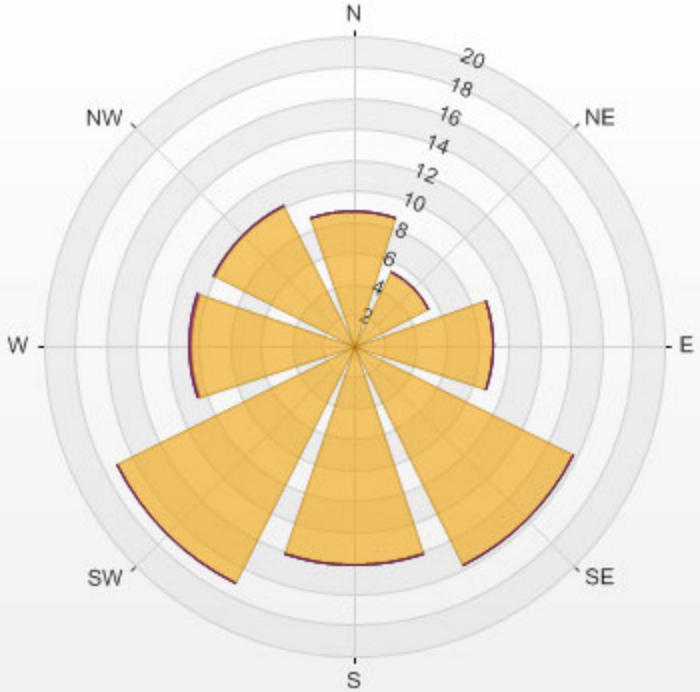
Wind: PRAMP_986
Poll.: PRAMP_986-SO_2 [ppb]
Periodically: 2017/01/01 00:00-2017/12/31 23:00
Type: PollutionRose
Direction: Blowing From (Wind Frequency)
Based On 1 Hr.

Calm: 8.95% Calm Avg: 0.19 [ppb]

Direction	0-3	3-10	10-85	85-170	>170.0	Total
N	8.7	0.0	0.0	0.0	0.0	8.7
NE	5.4	0.0	0.0	0.0	0.0	5.4
E	9.0	0.0	0.0	0.0	0.0	9.1
SE	15.9	0.0	0.0	0.0	0.0	15.9
S	14.2	0.0	0.0	0.0	0.0	14.2
SW	17.2	0.0	0.0	0.0	0.0	17.2
W	10.6	0.1	0.0	0.0	0.0	10.6
NW	10.1	0.0	0.0	0.0	0.0	10.1
Summary	91.0	0.1	0.0	0.0	0.0	91.1

% Icon Classes (ppb)	91 0-3	0 3-10	0 10-85	0 85-170	0 >170.0

PRAMP_986 Poll.: PRAMP_986-SO2[ppb] 2017/01/01 00:00 - 2017/12/31 23:00 Calm: 8.95% Calm Poll Avg: 0.19[ppb]



TOTAL REDUCED SULPHUR

TOTAL REDUCED SULPHUR (TRS) 2017 Monthly Averages & Frequency Distributions of 1-Hr Readings

Month	Number of Readings*	Operational Time (%)	% Readings in Concentration Range (ppb TRS)				AAAQO** (ppb)		EXCEEDANCES		MONTHLY AVERAGE (ppb)
			≤ 3	4 < C ≤ 10	11 < C ≤ 50	> 50	1-HR	24-HR	1-HR	24-HR	
January	704	99.3	100.0%	0.0%	0.0%	0.0%	-	-	-	-	0.3
February	636	99.7	100.0%	0.0%	0.0%	0.0%	-	-	-	-	0.3
March	705	99.9	100.0%	0.0%	0.0%	0.0%	-	-	-	-	0.3
April	684	100.0	100.0%	0.0%	0.0%	0.0%	-	-	-	-	0.26
May	708	100.0	100.0%	0.0%	0.0%	0.0%	-	-	-	-	0.30
June	681	99.7	100.0%	0.0%	0.0%	0.0%	-	-	-	-	0.33
July	709	100.0	100.0%	0.0%	0.0%	0.0%	-	-	-	-	0.39
August	701	99.1	100.0%	0.0%	0.0%	0.0%	-	-	-	-	0.41
September	672	98.1	98.7%	1.3%	0.0%	0.0%	-	-	-	-	0.51
October	704	99.3	100.0%	0.0%	0.0%	0.0%	-	-	-	-	0.29
November	683	99.9	100.0%	0.0%	0.0%	0.0%	-	-	-	-	0.27
December	698	98.7	100.0%	0.0%	0.0%	0.0%	-	-	-	-	0.28
Annual	**8285**	**99.5**	**99.9%**	**0.1%**	**0.0%**	**0.0%**					**0.33**

**# of readings excluding calibration hours*
***If Alberta Ambient Air Quality Objectives and Guidelines are not available '-' is used*

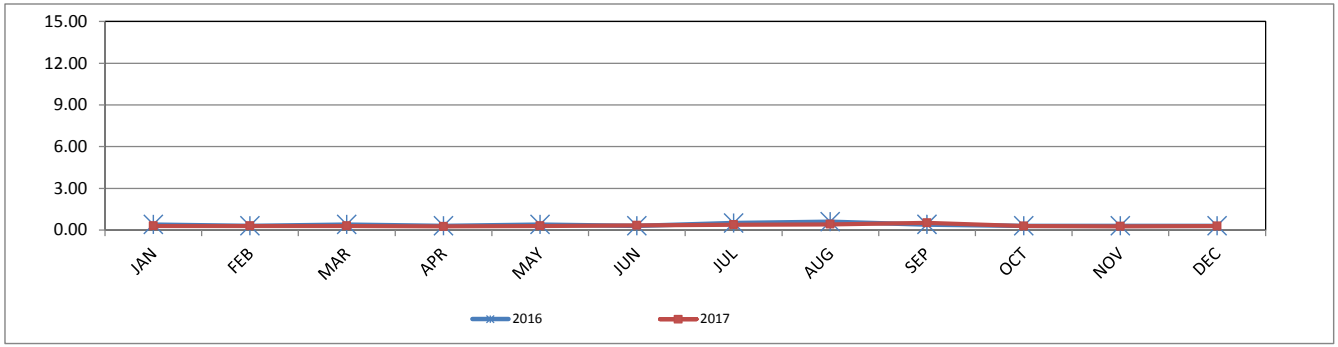
Alberta Ambient Air Quality Objectives Annual Average**	**-**	**ppb**
Annual Average for 2017	**0.33**	**ppb**

TOTAL REDUCED SULPHUR (TRS) 2017 vs. 2016 1-Hr Readings in ppb

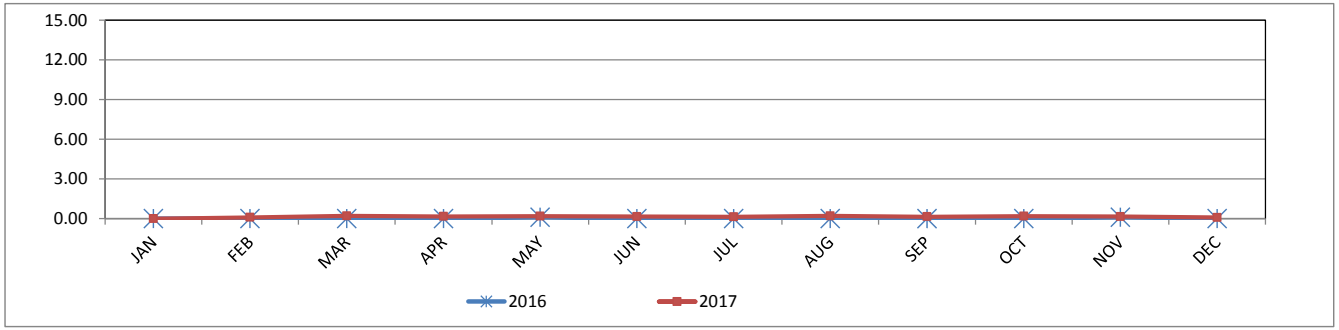
	2016			2017			
MONTH	**MEAN**	**MINIMUM**	**MAXIMUM**	**MEAN**	**MINIMUM**	**MAXIMUM**	**DIFFERENCE**
JAN	0.4	0.0	1.0	0.3	0.0	0.6	-0.1
FEB	0.3	0.0	0.9	0.3	0.1	1.2	0.0
MAR	0.4	0.0	3.4	0.3	0.2	1.7	-0.1
APR	0.3	0.0	3.6	0.26	0.17	0.50	-0.04
MAY	0.4	0.1	1.1	0.30	0.18	2.85	-0.10
JUN	0.3	0.0	0.8	0.33	0.16	1.20	0.03
JUL	0.5	0.0	2.0	0.39	0.13	1.73	-0.11
AUG	**0.6**	0.0	5.6	0.41	0.20	1.21	-0.19
SEP	0.4	0.0	**6.5**	**0.51**	0.15	**5.71**	0.11
OCT	0.3	0.0	2.7	0.29	0.18	0.70	-0.01
NOV	0.3	0.1	1.2	0.27	0.16	0.45	-0.03
DEC	0.3	0.0	1.3	0.28	0.08	0.93	-0.02

Annual peak

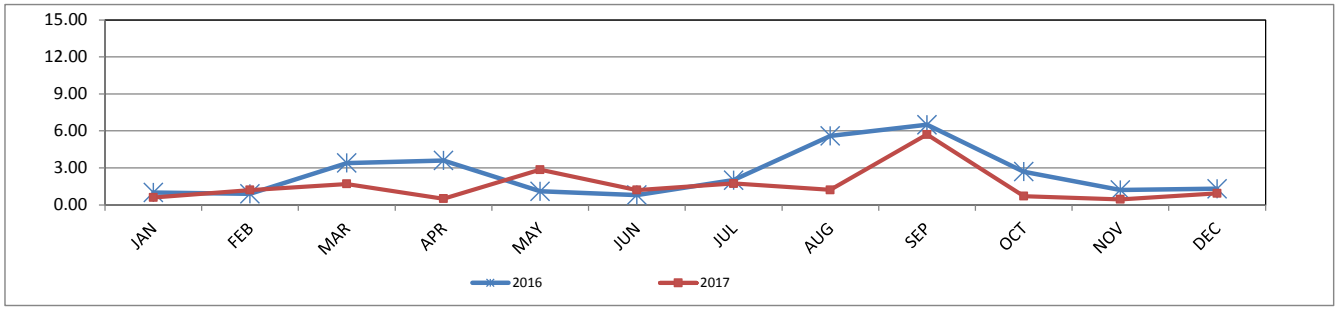
TOTAL REDUCED SULPHUR (TRS) 2017 vs. 2016 Monthly Mean in ppb



TOTAL REDUCED SULPHUR (TRS) 2017 vs. 2016 Monthly Minimum in ppb



TOTAL REDUCED SULPHUR (TRS) 2017 vs. 2016 Monthly Maximum in ppb

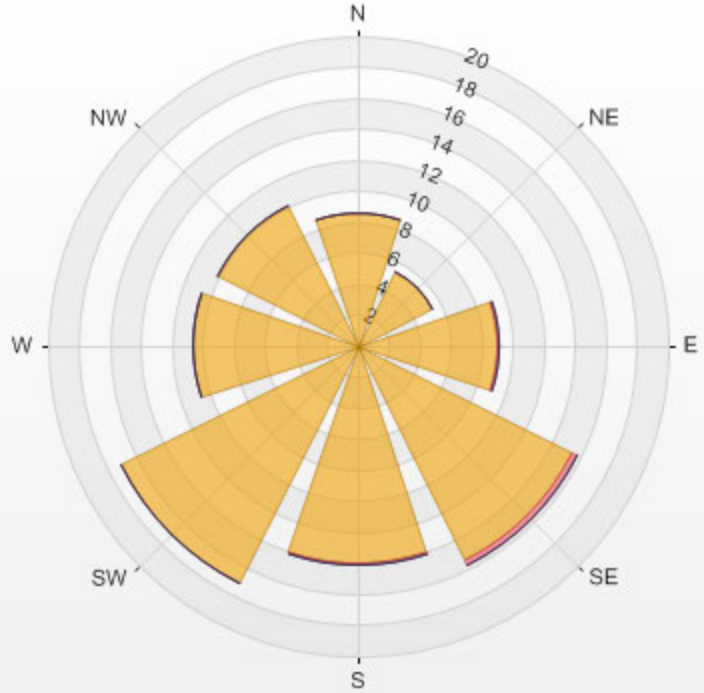


Wind: PRAMP_986
Poll.: PRAMP_986-TRS [ppb]
Periodically: 2017/01/01 00:00-2017/12/31 23:00
Type: PollutionRose
Direction: Blowing From (Wind Frequency)
Based On 1 Hr.

Calm: 8.93% Calm Avg: 0.49 [ppb]

Direction	0-1	1-3	3-10	>10.0	Total
N	8.6	0.0	0.0	0.0	8.6
NE	5.4	0.0	0.0	0.0	5.4
E	9.0	0.1	0.0	0.0	9.1
SE	15.5	0.4	0.0	0.0	15.9
S	14.1	0.1	0.0	0.0	14.1
SW	17.2	0.0	0.0	0.0	17.2
W	10.6	0.0	0.0	0.0	10.6
NW	10.2	0.0	0.0	0.0	10.2
Summary	90.4	0.6	0.0	0.0	91.1

PRAMP_986 Poll.: PRAMP_986-TRS[ppb] 2017/01/01 00:00 - 2017/12/31 23:00 Calm: 8.93% Calm Poll Avg: 0.49[ppb]



TOTAL HYDROCARBON

JOB # 8449-2017-67-A

TOTAL HYDROCARBONS (THC) 2017 Monthly Averages & Frequency Distributions of 1-Hr Readings

Month	Number of Readings*	Operational Time (%)	% Readings in Concentration Range (ppm THC)				AAAQO** (ppm)		EXCEEDANCES		MONTHLY AVERAGE (ppm)
			≤ 3.0	3.1 < C ≤ 10.0	10.1 < C ≤ 50.0	> 50.0	1-HR	24-HR	1-HR	24-HR	
January	692	97.7	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.99
February	637	99.9	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.91
March	708	100.0	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.92
April	685	100.0	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.92
May	708	100.0	99.7%	0.3%	0.0%	0.0%	-	-	-	-	1.99
June	680	99.4	99.9%	0.1%	0.0%	0.0%	-	-	-	-	1.90
July	710	100.0	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.92
August	677	96.0	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.99
September	671	98.1	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.99
October	703	99.1	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.93
November	685	100.0	99.9%	0.1%	0.0%	0.0%	-	-	-	-	2.04
December	692	97.8	98.7%	1.3%	0.0%	0.0%	-	-	-	-	2.16
Annual	**8248**	**99.0**	**99.9%**	**0.2%**	**0.0%**	**0.0%**					**1.97**

**# of readings excluding calibration hours*
***If Alberta Ambient Air Quality Objectives and Guidelines are not available '-' is used*

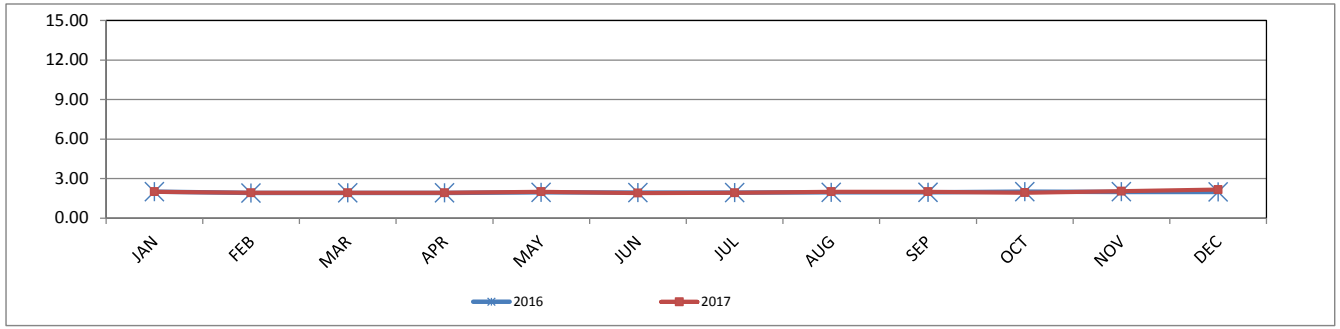
Alberta Ambient Air Quality Objectives Annual Average**	**-**	**ppm**
Annual Average for 2017	**1.97**	**ppm**

TOTAL HYDROCARBONS (THC) 2017 vs. 2016 1-Hr Readings in ppm

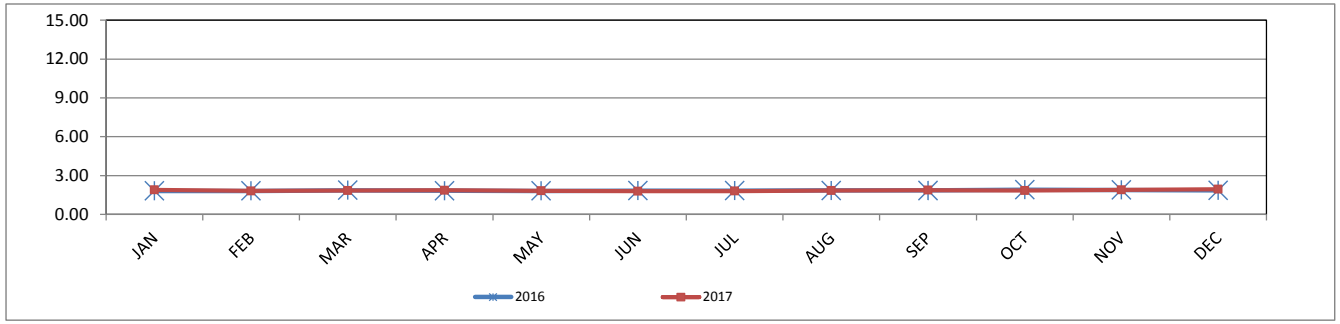
	2016			2017			
MONTH	**MEAN**	**MINIMUM**	**MAXIMUM**	**MEAN**	**MINIMUM**	**MAXIMUM**	**DIFFERENCE**
JAN	2.00	1.82	**3.18**	1.99	1.90	2.28	-0.01
FEB	1.90	1.82	2.06	1.91	1.81	2.11	0.01
MAR	1.92	1.87	2.26	1.92	1.85	2.12	0.00
APR	1.92	1.83	2.37	1.92	1.86	2.52	0.00
MAY	1.95	1.82	2.28	1.99	1.83	3.44	0.04
JUN	1.93	1.84	2.24	1.90	1.79	3.11	-0.03
JUL	1.92	1.84	2.40	1.92	1.80	2.50	0.00
AUG	1.95	1.85	2.21	1.99	1.84	2.65	0.04
SEP	1.95	1.85	2.25	1.99	1.88	2.64	0.04
OCT	**2.00**	1.92	2.17	1.93	1.84	2.36	-0.07
NOV	1.99	1.89	2.38	2.04	1.89	3.05	0.05
DEC	1.98	1.86	2.28	**2.16**	1.94	**3.59**	0.18

Annual peak

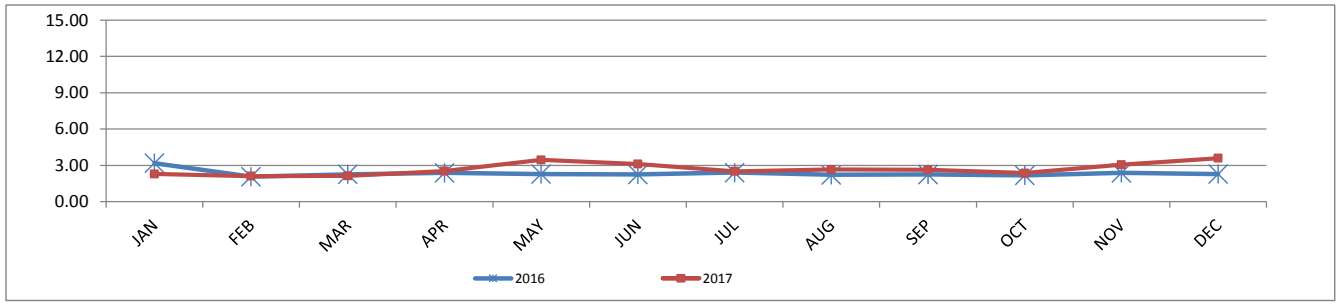
TOTAL HYDROCARBONS (THC) 2017 vs. 2016 Monthly Mean in ppm



TOTAL HYDROCARBONS (THC) 2017 vs. 2016 Monthly Minimum in ppm



TOTAL HYDROCARBONS (THC) 2017 vs. 2016 Monthly Maximum in ppm



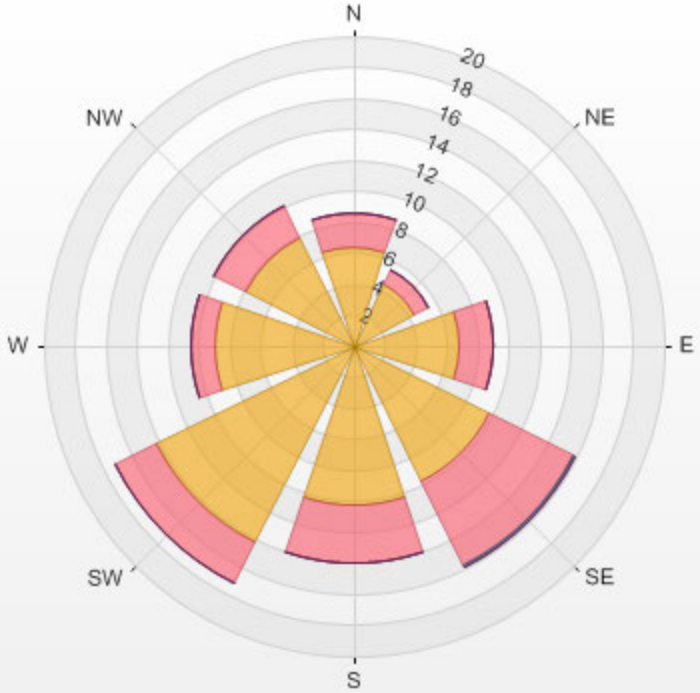
Wind: PRAMP_986
Poll.: PRAMP_986-THC [ppm]
Periodically: 2017/01/01 00:00-2017/12/31 23:00
Type: PollutionRose
Direction: Blowing From (Wind Frequency)
Based On 1 Hr.

Calm: 8.96% Calm Avg: 2.07 [ppm]

Direction	0-2	2-3	3-5	5-10	>10.0	Total
N	6.4	2.3	0.0	0.0	0.0	8.6
NE	4.4	1.0	0.0	0.0	0.0	5.4
E	6.9	2.2	0.0	0.0	0.0	9.1
SE	9.8	6.1	0.0	0.0	0.0	15.9
S	10.3	3.8	0.0	0.0	0.0	14.0
SW	14.2	3.0	0.0	0.0	0.0	17.2
W	9.0	1.5	0.0	0.0	0.0	10.5
NW	7.8	2.4	0.0	0.0	0.0	10.2
Summary	68.8	22.2	0.1	0.0	0.0	91.0

% Icon Classes (ppm)	69 0-2	22 2-3	0 3-5	0 5-10	0 >10.0

PRAMP_986 Poll.: PRAMP_986-THC55[ppm] 2017/01/01 00:00 - 2017/12/31 23:00 Calm: 8.96% Calm Poll Avg: 2.07[ppm]



METHANE

METHANE (CH_4) 2017 Monthly Averages & Frequency Distributions of 1-Hr Readings

Month	Number of Readings*	Operational Time (%)	% Readings in Concentration Range (ppm CH_4)				AAAQO** (ppm)		EXCEEDANCES		MONTHLY AVERAGE (ppm)
			≤ 3.0	3.1 < C ≤ 10.0	10.1 < C ≤ 50.0	> 50.0	1-HR	24-HR	1-HR	24-HR	
January	692	97.7	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.99
February	637	99.9	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.91
March	708	100.0	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.92
April	685	100.0	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.92
May	708	100.0	99.7%	0.3%	0.0%	0.0%	-	-	-	-	1.99
June	680	99.4	99.9%	0.1%	0.0%	0.0%	-	-	-	-	1.90
July	710	100.0	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.92
August	677	96.0	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.99
September	671	98.1	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.99
October	703	99.1	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.93
November	685	100.0	99.9%	0.1%	0.0%	0.0%	-	-	-	-	2.04
December	692	97.8	98.7%	1.3%	0.0%	0.0%	-	-	-	-	2.16
Annual	**8248**	**99.0**	**99.9%**	**0.2%**	**0.0%**	**0.0%**					**1.97**

**# of readings excluding calibration hours*
***If Alberta Ambient Air Quality Objectives and Guidelines are not available '-' is used*

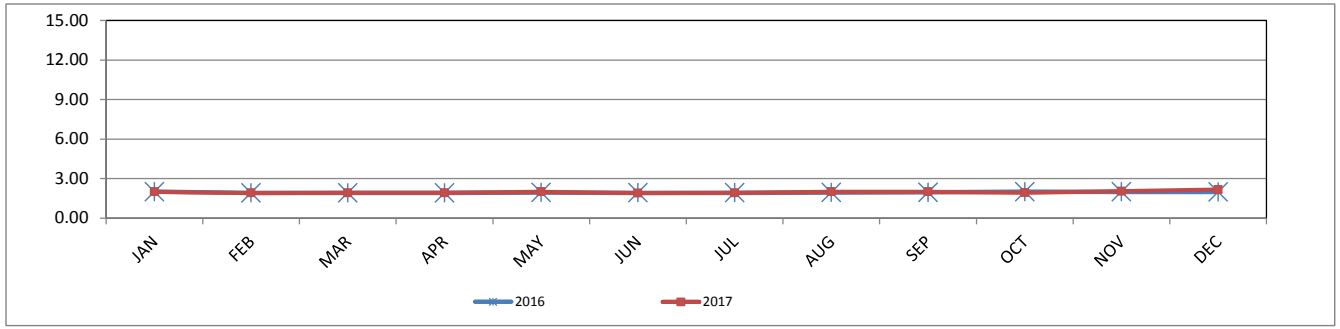
Alberta Ambient Air Quality Objectives Annual Average**	**-**	**ppm**
Annual Average for 2017	**1.97**	**ppm**

METHANE (CH_4) 2017 vs. 2016 1-Hr Readings in ppm

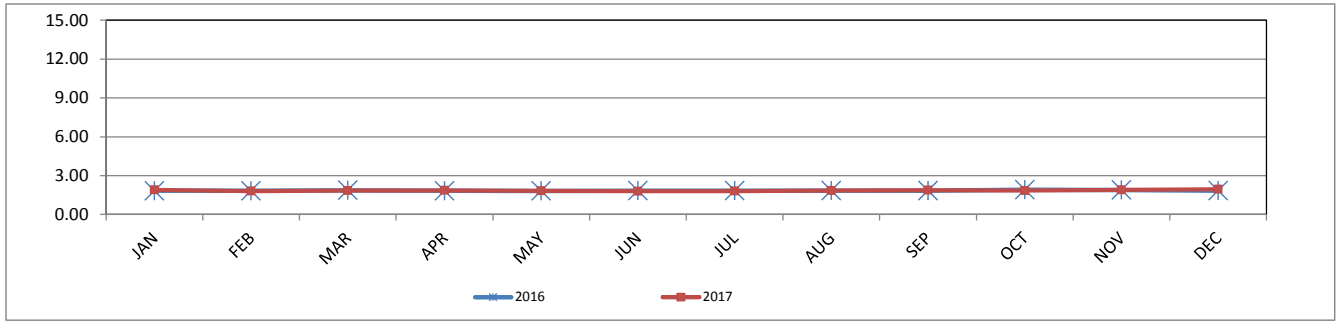
	2016			2017			
MONTH	**MEAN**	**MINIMUM**	**MAXIMUM**	**MEAN**	**MINIMUM**	**MAXIMUM**	**DIFFERENCE**
JAN	2.00	1.83	**3.03**	1.99	1.90	2.28	-0.01
FEB	1.91	1.83	2.07	1.91	1.81	2.11	0.00
MAR	1.92	1.87	2.26	1.92	1.85	2.12	0.00
APR	1.92	1.83	2.37	1.92	1.86	2.52	0.00
MAY	1.95	1.82	2.14	1.99	1.83	3.44	0.04
JUN	1.92	1.84	2.24	1.90	1.79	3.11	-0.02
JUL	1.92	1.84	2.40	1.92	1.80	2.50	0.00
AUG	1.95	1.85	2.21	1.99	1.84	2.65	0.04
SEP	1.95	1.85	2.25	1.99	1.88	2.64	0.04
OCT	**2.00**	1.92	2.15	1.93	1.84	2.36	-0.07
NOV	1.99	1.89	2.38	2.04	1.89	3.05	0.05
DEC	1.98	1.85	2.28	**2.16**	1.94	**3.59**	0.18

Annual peak

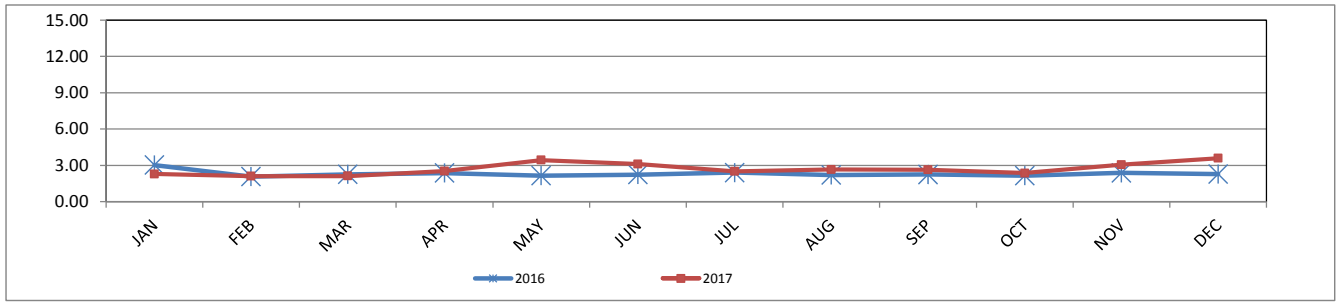
METHANE (CH_4) 2017 vs. 2016 Monthly Mean in ppm



METHANE (CH_4) 2017 vs. 2016 Monthly Minimum in ppm



METHANE (CH_4) 2017 vs. 2016 Monthly Maximum in ppm



Wind: PRAMP_986

Poll.: PRAMP_986-CH_4 [ppm]

Periodically: 2017/01/01 00:00-2017/12/31 23:00

Type: PollutionRose

Direction: Blowing From (Wind Frequency)

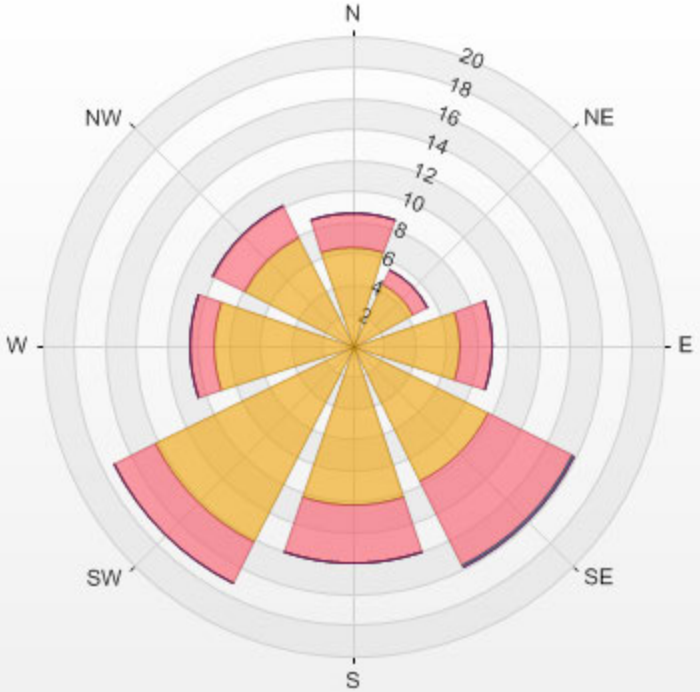
Based On 1 Hr.

Calm: 8.96% Calm Avg: 2.07 [ppm]

Direction	0-2	2-3	3-5	5-10	>10.0	Total
N	6.4	2.3	0.0	0.0	0.0	8.6
NE	4.4	1.0	0.0	0.0	0.0	5.4
E	6.9	2.2	0.0	0.0	0.0	9.1
SE	9.8	6.1	0.0	0.0	0.0	15.9
S	10.3	3.8	0.0	0.0	0.0	14.0
SW	14.2	3.0	0.0	0.0	0.0	17.2
W	9.0	1.5	0.0	0.0	0.0	10.5
NW	7.8	2.4	0.0	0.0	0.0	10.2
Summary	68.8	22.1	0.1	0.0	0.0	91.0

%	Icon	Classes (ppm)									
	69	0-2	22	2-3	0	3-5	0	5-10	0	>10.0

PRAMP_986 Poll.: PRAMP_986-CH4[ppm] 2017/01/01 00:00 - 2017/12/31 23:00 Calm: 8.96% Calm Poll Avg: 2.07[ppm]



NON-METHANE HYDROCARBON

NON-METHANE HYDROCARBONS (NMHC) 2017 Monthly Averages & Frequency Distributions of 1-Hr Readings

Month	Number of Readings*	Operational Time (%)	% Readings in Concentration Range (ppm NMHC)						AAAQO** (ppm)		EXCEEDANCES		MONTHLY AVERAGE (ppm)
			≤ 0.20	0.21 < C ≤ 0.50	0.51 < C ≤ 1.00	1.01 < C ≤ 2.00	2.01 < C ≤ 4.00	> 4.00	1-HR	24-HR	1-HR	24-HR	
January	692	97.7	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	0.00
February	637	99.9	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	0.00
March	708	100.0	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	0.00
April	685	100.0	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	0.00
May	708	100.0	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	0.00
June	680	99.4	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	0.00
July	710	100.0	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	0.00
August	677	96.0	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	0.00
September	671	98.1	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	0.00
October	703	99.1	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	0.00
November	685	100.0	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	0.00
December	692	97.8	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	0.00
Annual	**8248**	**99.0**	**100.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**					**0.00**

**# of readings excluding calibration hours*
***If Alberta Ambient Air Quality Objectives and Guidelines are not available '-' is used*

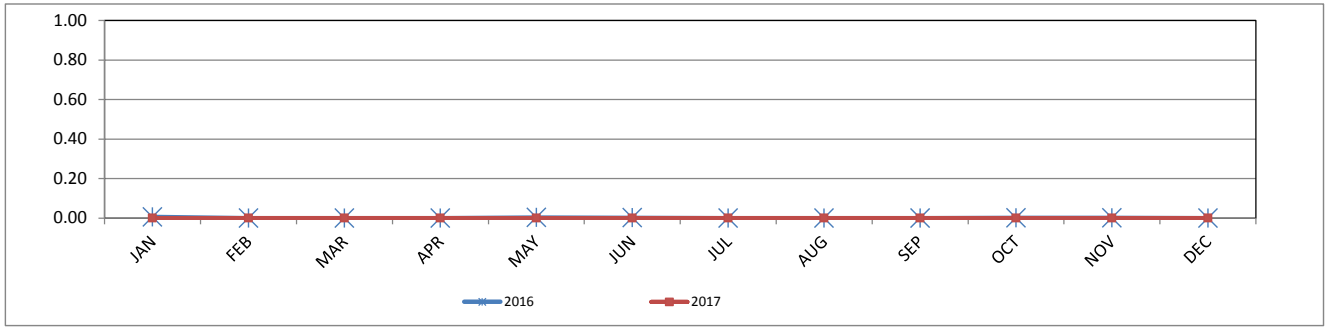
Alberta Ambient Air Quality Objectives Annual Average**	**-**	**ppm**
Annual Average for 2017	**0.00**	**ppm**

NON-METHANE HYDROCARBONS (NMHC) 2017 vs. 2016 1-Hr Readings in ppm

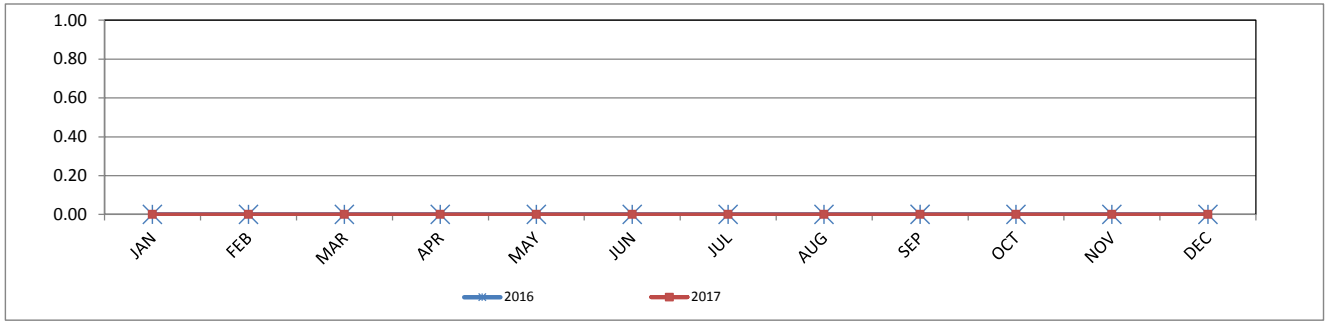
	2016			2017			
MONTH	**MEAN**	**MINIMUM**	**MAXIMUM**	**MEAN**	**MINIMUM**	**MAXIMUM**	**DIFFERENCE**
JAN	**0.01**	0.00	0.26	**0.00**	0.00	0.00	-0.01
FEB	0.00	0.00	0.00	0.00	0.00	0.08	0.00
MAR	0.00	0.00	0.04	0.00	0.00	0.02	0.00
APR	0.00	0.00	0.01	0.00	0.00	0.02	0.00
MAY	0.00	0.00	0.30	0.00	0.00	0.01	0.00
JUN	0.00	0.00	**0.32**	0.00	0.00	0.00	0.00
JUL	0.00	0.00	0.04	0.00	0.00	**0.09**	0.00
AUG	0.00	0.00	0.02	0.00	0.00	0.08	0.00
SEP	0.00	0.00	0.02	0.00	0.00	0.00	0.00
OCT	0.00	0.00	0.15	0.00	0.00	0.02	0.00
NOV	0.00	0.00	0.13	0.00	0.00	0.01	0.00
DEC	0.00	0.00	0.00	0.00	0.00	0.09	0.00

Annual peak

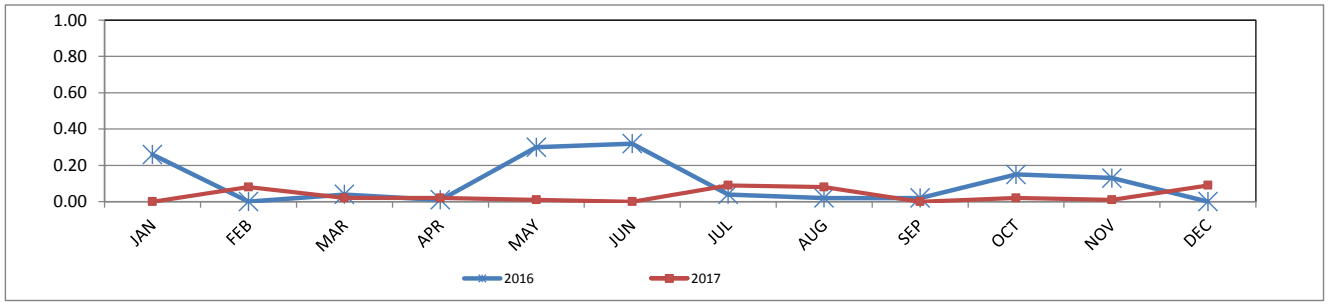
NON-METHANE HYDROCARBONS (NMHC) 2017 vs. 2016 Monthly Mean in ppm



NON-METHANE HYDROCARBONS (NMHC) 2017 vs. 2016 Monthly Minimum in ppm



NON-METHANE HYDROCARBONS (NMHC) 2017 vs. 2016 Monthly Maximum in ppm



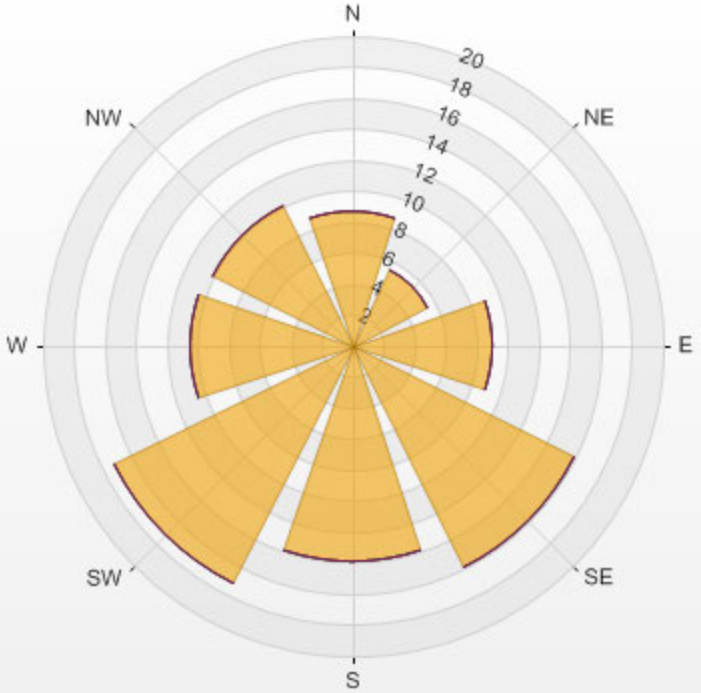
Wind: PRAMP_986
Poll.: PRAMP_986-NMHC [ppm]
Periodically: 2017/01/01 00:00-2017/12/31 23:00
Type: PollutionRose
Direction: Blowing From (Wind Frequency)
Based On 1 Hr.

Calm: 8.96% Calm Avg: 0.00 [ppm]

Direction	0-0.1	0.1-0.3	0.3-1	1-2	>2.0	Total
N	8.7	0.0	0.0	0.0	0.0	8.7
NE	5.4	0.0	0.0	0.0	0.0	5.4
E	9.1	0.0	0.0	0.0	0.0	9.1
SE	16.0	0.0	0.0	0.0	0.0	16.0
S	14.0	0.0	0.0	0.0	0.0	14.0
SW	17.2	0.0	0.0	0.0	0.0	17.2
W	10.6	0.0	0.0	0.0	0.0	10.6
NW	10.2	0.0	0.0	0.0	0.0	10.2
Summary	91.0	0.0	0.0	0.0	0.0	91.0

%	Icon	Classes (ppm)	91	0-0.1	0	0.1-0.3	0	0.3-1	0	1-2	0	>2.0

PRAMP_986 Poll.: PRAMP_986-NMHC[ppm] 2017/01/01 00:00 - 2017/12/31 23:00 Calm: 8.96% Calm Poll Avg: 0.00[ppm]



WIND SYSTEM

WIND SPEED (WS) 2017 Monthly Data Summary of 1-Hr & 24-Hr Readings

Month	Number of Readings*	Operational Time (%)	Monthly Average (kph)	Minimum 1-Hr Average (kph)	Maximum 1-Hr Average (kph)	Maximum 24-Hr Average (kph)
January	740	99.5	2.3	0.1	26.3	15.4
February	670	100.0	1.9	0.0	20.1	14.7
March	744	100.0	1.2	0.2	16.1	10.0
April	717	100.0	2.4	0.3	20.0	11.2
May	744	100.0	1.0	0.1	18.8	10.4
June	718	99.7	0.9	0.3	24.7	12.2
July	744	100.0	2.5	0.1	17.5	8.4
August	738	99.2	2.8	0.2	23.8	10.9
September	708	98.3	2.1	0.3	19.5	11.8
October	713	95.8	3.4	0.4	25.9	16.7
November	720	100.0	0.3	0.2	17.1	8.4
December	744	100.0	3.5	0.1	24.9	10.7
Annual	**8700**	**99.4**	**2.0**	**0.2**	**21.2**	**11.7**

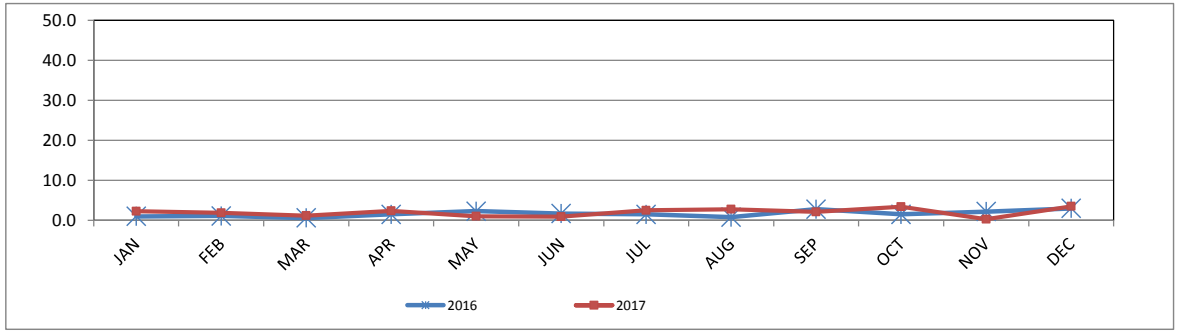
**# of readings excluding calibration hours*

WIND SPEED (WS) 2017 vs. 2016 1-Hr Readings in kph

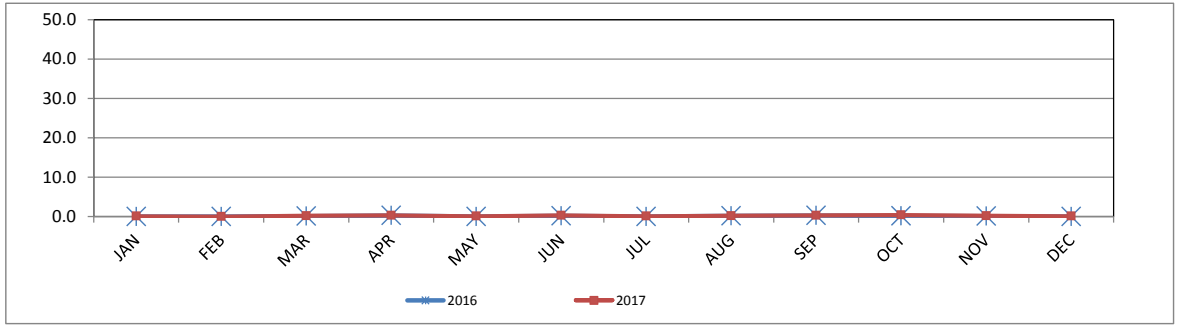
	2016			2017			
MONTH	**MEAN**	**MINIMUM**	**MAXIMUM**	**MEAN**	**MINIMUM**	**MAXIMUM**	**DIFFERENCE**
JAN	1.0	0.0	17.0	2.3	0.1	**26.3**	1.3
FEB	1.1	0.0	29.0	1.9	0.0	20.1	0.8
MAR	0.6	0.1	12.9	1.2	0.2	16.1	0.6
APR	1.5	0.3	**30.7**	2.4	0.3	20.0	0.9
MAY	2.3	0.0	24.9	1.0	0.1	18.8	-1.3
JUN	1.7	0.2	19.2	0.9	0.3	24.7	-0.8
JUL	1.5	0.0	16.4	2.5	0.1	17.5	1.0
AUG	0.8	0.2	15.4	2.8	0.2	23.8	2.0
SEP	2.8	0.3	23.5	2.1	0.3	19.5	-0.7
OCT	1.5	0.2	13.2	3.4	0.4	25.9	1.9
NOV	2.2	0.1	15.7	0.3	0.2	17.1	-1.9
DEC	**3.0**	0.0	27.1	**3.5**	0.1	24.9	0.5

Annual peak

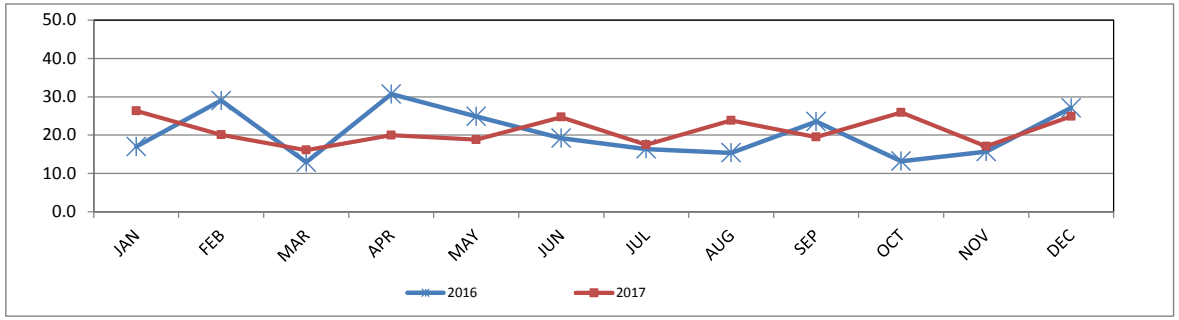
WIND SPEED (WS) 2017 vs. 2016 Monthly Mean in kph



WIND SPEED (WS) 2017 vs. 2016 Monthly Minimum in kph



WIND SPEED (WS) 2017 vs. 2016 Monthly Maximum in kph



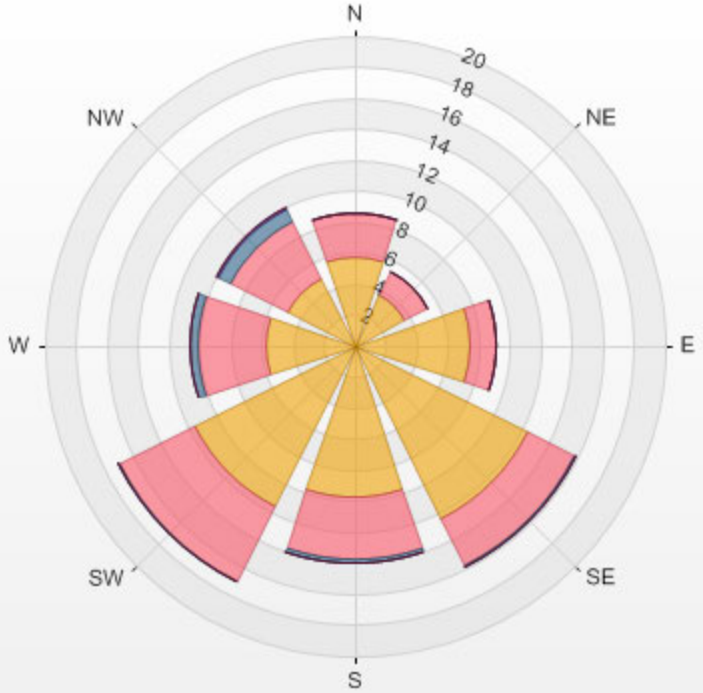
Wind: PRAMP_986
Monitor: WSP [kph]
Periodically: 2017/01/01 00:00-2017/12/31 23:00
Type: WindRose
Direction: Blowing From (Wind Frequency)
Based On 1 Hr.

Calm: 8.98%

Direction	1.8-7.8	7.8-15.6	15.6-23.4	23.4-31.2	31.2-39.0	>39.0	Total
N	5.8	2.8	0.1	0.0	0.0	0.0	8.6
NE	3.6	1.7	0.0	0.0	0.0	0.0	5.3
E	7.5	1.7	0.0	0.0	0.0	0.0	9.2
SE	12.5	3.3	0.2	0.0	0.0	0.0	16.0
S	9.9	3.9	0.3	0.0	0.0	0.0	14.1
SW	11.6	5.4	0.1	0.0	0.0	0.0	17.1
W	5.8	4.4	0.5	0.0	0.0	0.0	10.6
NW	4.8	4.2	0.9	0.1	0.0	0.0	10.0
Summary	61.5	27.3	2.2	0.1	0.0	0.0	91.0

%	Icon	Classes (kph)											
		61	1.8-7.8	27	7.8-15.6	2	15.6-23.4	0	23.4-31.2	0	31.2-39.0	0	>39.0

PRAMP_986 2017/01/01 00:00 - 2017/12/31 23:00 Calm: 8.98% Calm Wind Avg Speed: 1.12(kph)



RELATIVE HUMIDITY

RELATIVE HUMIDITY (RH) 2017 Monthly Data Summary of 1-Hr & 24-Hr Readings

Month	Number of Readings*	Operational Time (%)	Monthly Average (%)	Minimum 1-Hr Average (%)	Maximum 1-Hr Average (%)	Maximum 24-Hr Average (%)
January	740	99.5	75	43	96	91
February	672	100.0	73	37	98	96
March	744	100.0	65	30	93	77
April	720	100.0	66	17	97	94
May	744	100.0	55	17	98	94
June	718	99.7	62	20	99	86
July	744	100.0	67	23	99	89
August	738	99.2	65	24	98	86
September	708	98.3	71	28	98	84
October	739	99.3	72	18	100	92
November	720	100.0	79	60	96	92
December	744	100.0	70	44	99	91
Annual	**8731**	**99.7**	**68**	**30**	**98**	**89**

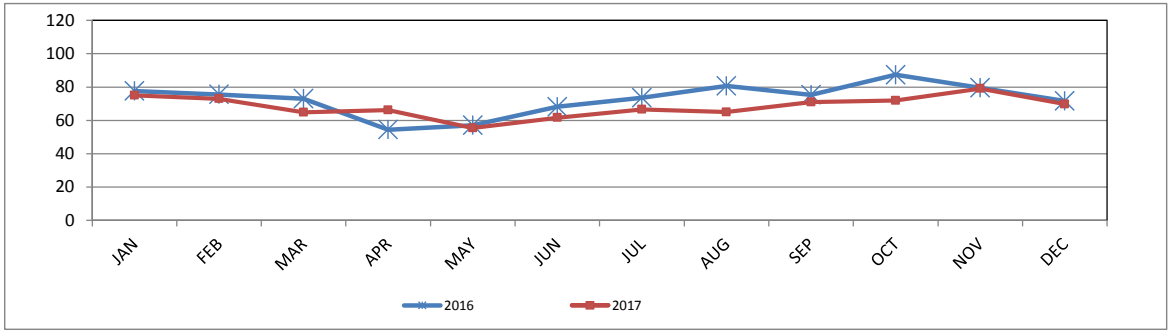
**# of readings excluding calibration hours*

RELATIVE HUMIDITY (RH) 2017 vs. 2016 1-Hr Readings in %

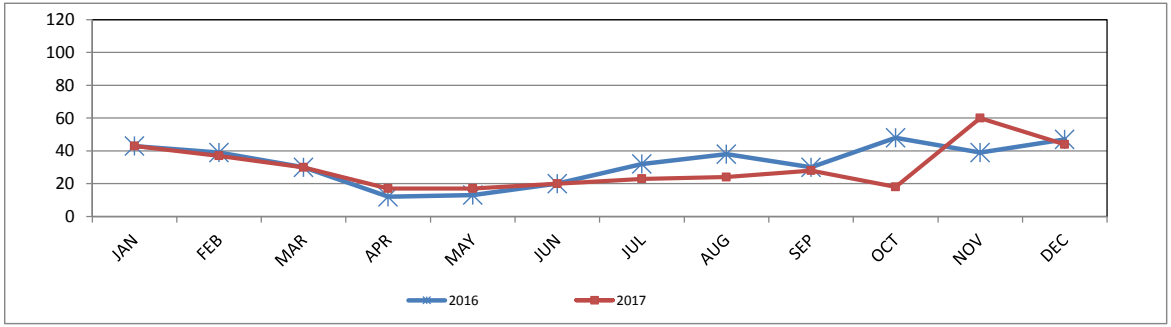
	2016			2017			
MONTH	**MEAN**	**MINIMUM**	**MAXIMUM**	**MEAN**	**MINIMUM**	**MAXIMUM**	**DIFFERENCE**
JAN	78	43	93	75	43	96	-3
FEB	76	39	96	73	37	98	-3
MAR	73	30	95	65	30	93	-8
APR	54	12	96	66	17	97	12
MAY	57	13	99	55	17	98	-2
JUN	68	20	98	62	20	99	-7
JUL	74	32	**99**	67	23	99	-7
AUG	81	38	99	65	24	98	-16
SEP	75	30	99	71	28	98	-4
OCT	**87**	48	98	72	18	**100**	-15
NOV	80	39	99	**79**	60	96	-1
DEC	72	47	93	70	44	99	-2

Annual peak

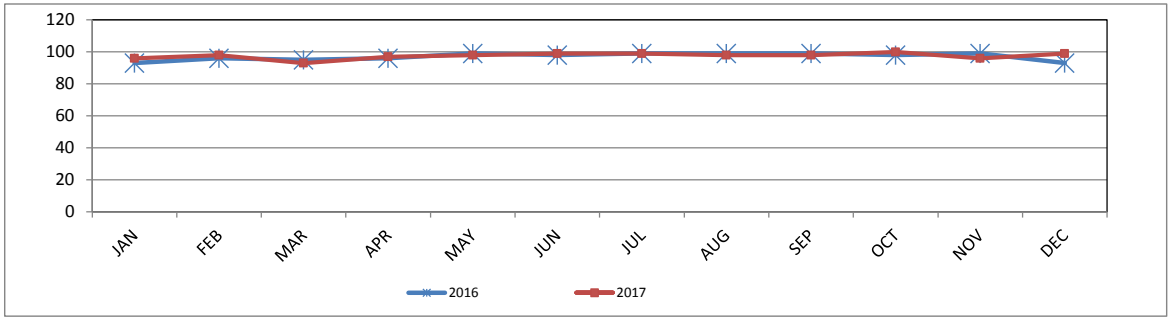
RELATIVE HUMIDITY (RH) 2017 vs. 2016 Monthly Mean in %



RELATIVE HUMIDITY (RH) 2017 vs. 2016 Monthly Minimum in %



RELATIVE HUMIDITY (RH) 2017 vs. 2016 Monthly Maximum in %



BAROMETRIC PRESSURE

BAROMETRIC PRESSURE (BP) 2017 Monthly Data Summary of 1-Hr & 24-Hr Readings

Month	Number of Readings*	Operational Time (%)	Monthly Average (millibar)	Minimum 1-Hr Average (millibar)	Maximum 1-Hr Average (millibar)	Maximum 24-Hr Average (millibar)
January	740	99.5	940	914	948	948
February	672	100.0	938	912	961	960
March	744	100.0	942	923	965	963
April	720	100.0	941	927	956	955
May	744	100.0	940	925	954	952
June	718	99.7	939	927	954	953
July	744	100.0	943	936	956	953
August	738	99.2	943	931	958	957
September	708	98.3	941	927	958	956
October	739	99.3	939	918	959	957
November	720	100.0	939	915	959	957
December	744	100.0	947	922	971	968
Annual	**8731**	**99.7**	**941**	**923**	**958**	**957**

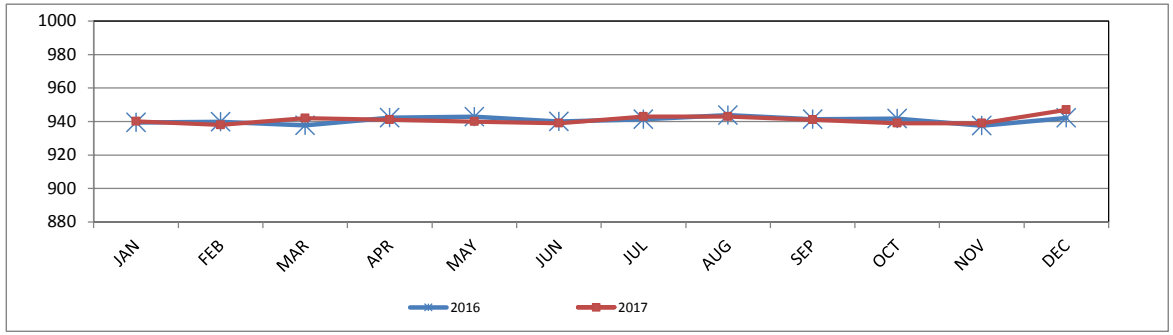
**# of readings excluding calibration hours*

BAROMETRIC PRESSURE (BP) 2017 vs. 2016 1-Hr Readings in millibar

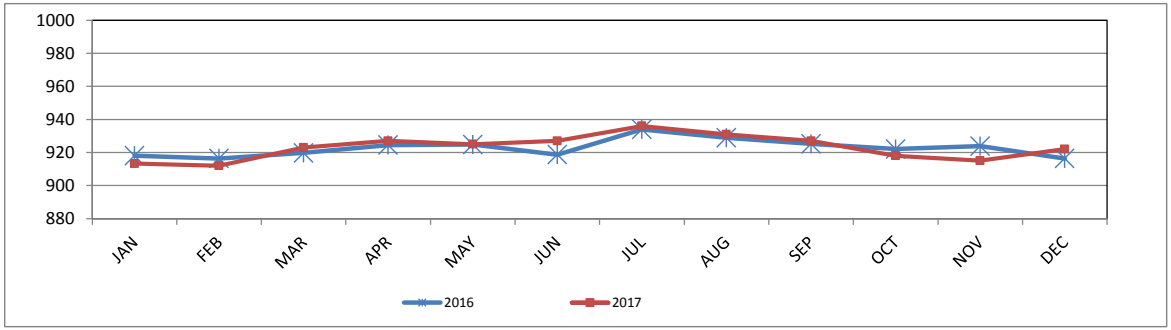
	2016			2017			
MONTH	**MEAN**	**MINIMUM**	**MAXIMUM**	**MEAN**	**MINIMUM**	**MAXIMUM**	**DIFFERENCE**
JAN	939	918	951	940	913	960	1
FEB	940	916	955	938	912	961	-2
MAR	938	920	956	942	923	965	4
APR	942	924	954	941	927	956	-1
MAY	943	925	959	940	925	954	-3
JUN	940	919	952	939	927	954	-1
JUL	941	934	952	943	936	956	2
AUG	**944**	929	955	943	931	958	-1
SEP	941	925	953	941	927	958	0
OCT	942	922	954	939	918	959	-3
NOV	937	924	957	939	915	959	2
DEC	942	916	**971**	**947**	922	**971**	5

Annual peak

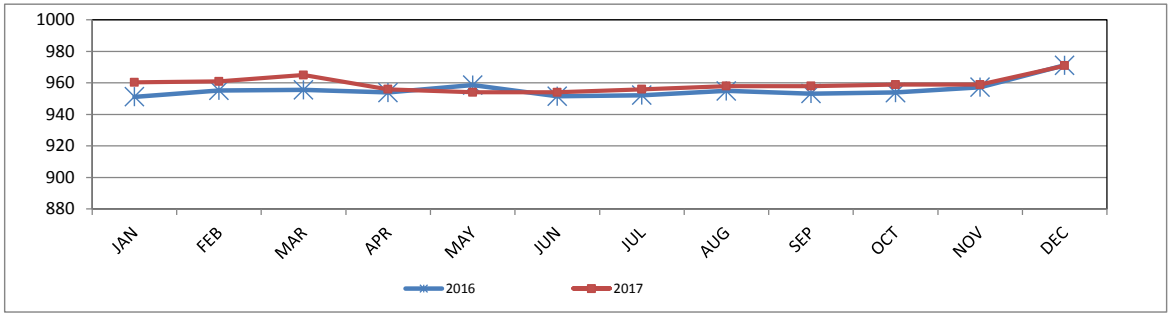
BAROMETRIC PRESSURE (BP) 2017 vs. 2016 Monthly Mean in millibar



BAROMETRIC PRESSURE (BP) 2017 vs. 2016 Monthly Minimum in millibar



BAROMETRIC PRESSURE (BP) 2017 vs. 2016 Monthly Maximum in millibar



AMBIENT TEMPERATURE

AMBIENT TEMPERATURE (AT) 2017 Monthly Data Summary of 1-Hr & 24-Hr Readings

Month	Number of Readings*	Operational Time (%)	Monthly Average (°C)	Minimum 1-Hr Average (°C)	Maximum 1-Hr Average (°C)	Maximum 24-Hr Average (°C)
January	740	99.5	-9.1	-34.7	8.6	4.8
February	672	100.0	-9.2	-33.5	9.6	5.1
March	744	100.0	-6.8	-32.0	11.4	5.5
April	720	100.0	3.0	-8.6	15.3	7.4
May	744	100.0	12.8	-2.2	29.6	21.4
June	718	99.7	15.8	1.6	29.0	22.3
July	744	100.0	17.1	4.4	30.1	21.5
August	738	99.2	16.7	3.9	30.4	21.5
September	708	98.3	11.6	-4.7	29.8	18.1
October	739	99.3	3.6	-9.2	21.5	13.5
November	720	100.0	-11.0	-26.2	3.7	0.0
December	744	100.0	-10.2	-41.2	6.7	4.5
Annual	**8731**	**99.7**	**2.9**	**-15.2**	**18.8**	**12.1**

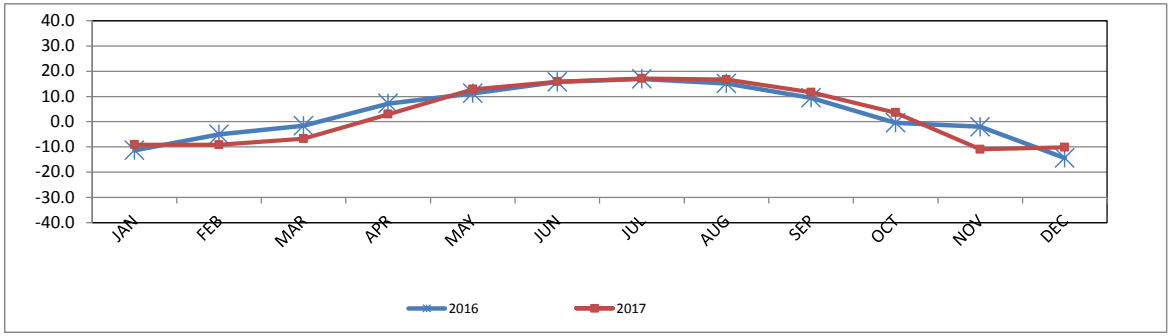
**# of readings excluding calibration hours*

AMBIENT TEMPERATURE (AT) 2017 vs. 2016 1-Hr Readings in °C

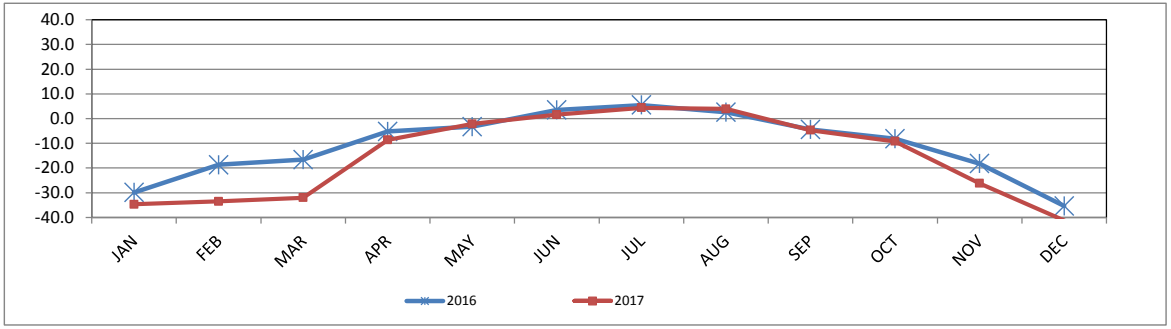
	2016			2017			
MONTH	**MEAN**	**MINIMUM**	**MAXIMUM**	**MEAN**	**MINIMUM**	**MAXIMUM**	**DIFFERENCE**
JAN	-11.4	-29.9	5.9	-9.1	-34.7	8.6	2.2
FEB	-5.1	-18.7	9.3	-9.2	-33.5	9.6	-4.1
MAR	-1.7	-16.6	12.0	-6.8	-32.0	11.4	-5.1
APR	7.2	-5.2	28.2	3.0	-8.6	15.3	-4.2
MAY	11.2	-3.3	**29.9**	12.8	-2.2	29.6	1.6
JUN	15.8	3.5	28.1	15.8	1.6	29.0	0.1
JUL	**16.9**	5.5	26.4	**17.1**	4.4	30.1	0.2
AUG	15.1	2.6	26.3	16.7	3.9	**30.4**	1.6
SEP	9.5	-4.4	22.9	11.6	-4.7	29.8	2.1
OCT	-0.4	-8.2	8.3	3.6	-9.2	21.5	4.0
NOV	-2.0	-18.2	16.5	-11.0	-26.2	3.7	-8.9
DEC	-14.4	-35.4	2.7	-10.2	-41.2	6.7	4.2

Annual peak

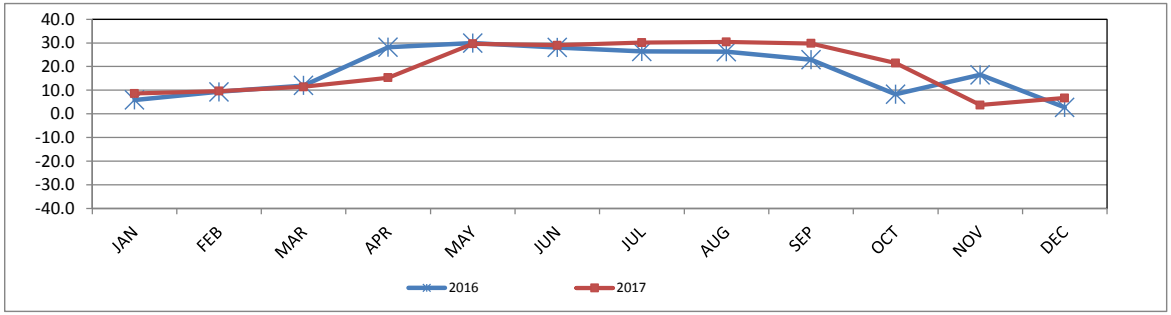
AMBIENT TEMPERATURE (AT) 2017 vs. 2016 Monthly Mean in °C



AMBIENT TEMPERATURE (AT) 2017 vs. 2016 Monthly Minimum in °C



AMBIENT TEMPERATURE (AT) 2017 vs. 2016 Monthly Maximum in °C



STATION TEMPERATURE

STATION TEMPERATURE (STNTPX) 2017 Monthly Data Summary of 1-Hr & 24-Hr Readings

Month	Number of Readings*	Operational Time (%)	Monthly Average (°C)	Minimum 1-Hr Average (°C)	Maximum 1-Hr Average (°C)	Maximum 24-Hr Average (°C)
January	739	99.3	21.6	18.2	23.1	22.1
February	672	100.0	21.7	18.9	23.0	22.1
March	744	100.0	21.4	19.0	22.8	21.8
April	720	100.0	21.3	19.4	22.9	21.7
May	744	100.0	21.1	17.6	23.0	22.1
June	718	99.7	21.0	19.6	23.1	21.5
July	744	100.0	21.0	19.6	22.4	21.5
August	738	99.2	21.3	19.3	22.8	21.6
September	708	98.3	21.4	19.9	25.8	22.5
October	739	99.3	22.1	19.6	24.3	23.3
November	720	100.0	23.2	19.9	24.6	23.8
December	744	100.0	23.1	21.3	24.4	23.9
Annual	**8730**	**99.7**	**21.7**	**19.4**	**23.5**	**22.3**

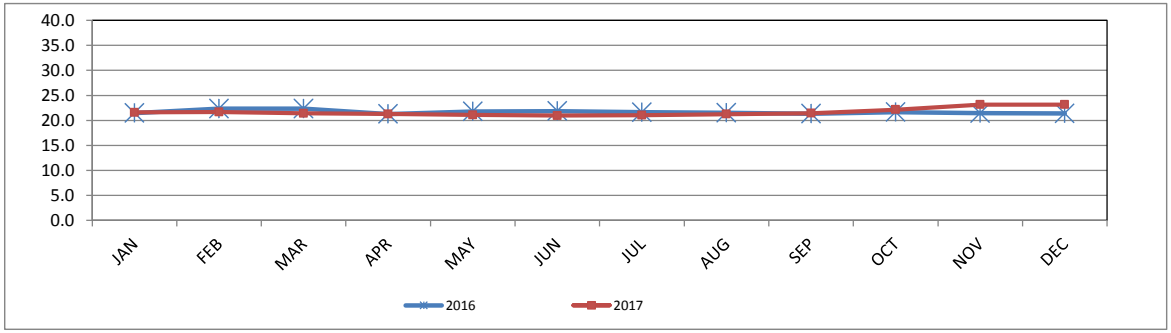
**# of readings excluding calibration hours*

STATION TEMPERATURE (STNTPX) 2017 vs. 2016 1-Hr Readings in °C

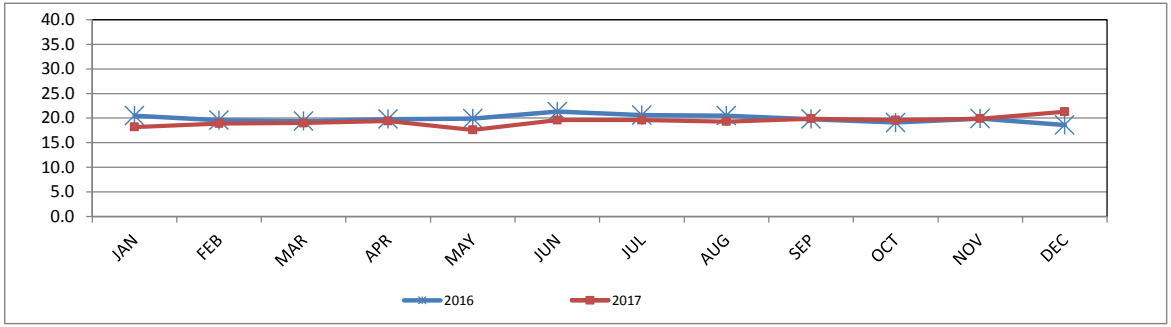
	2016			2017			
MONTH	**MEAN**	**MINIMUM**	**MAXIMUM**	**MEAN**	**MINIMUM**	**MAXIMUM**	**DIFFERENCE**
JAN	21.5	20.5	22.7	21.6	18.2	23.1	0.1
FEB	**22.4**	19.6	23.9	21.7	18.9	23.0	-0.7
MAR	22.3	19.4	**24.8**	21.4	19.0	22.8	-0.9
APR	21.3	19.8	23.5	21.3	19.4	22.9	0.0
MAY	21.8	19.9	23.0	21.1	17.6	23.0	-0.7
JUN	21.9	21.3	22.8	21.0	19.6	23.1	-0.9
JUL	21.6	20.6	22.5	21.0	19.6	22.4	-0.6
AUG	21.5	20.5	22.9	21.3	19.3	22.8	-0.2
SEP	21.4	19.8	23.0	21.4	19.9	**25.8**	0.1
OCT	21.6	19.1	23.1	22.1	19.6	24.3	0.5
NOV	21.4	19.9	23.1	**23.2**	19.9	24.6	1.7
DEC	21.4	18.6	22.8	23.1	21.3	24.4	1.8

Annual peak

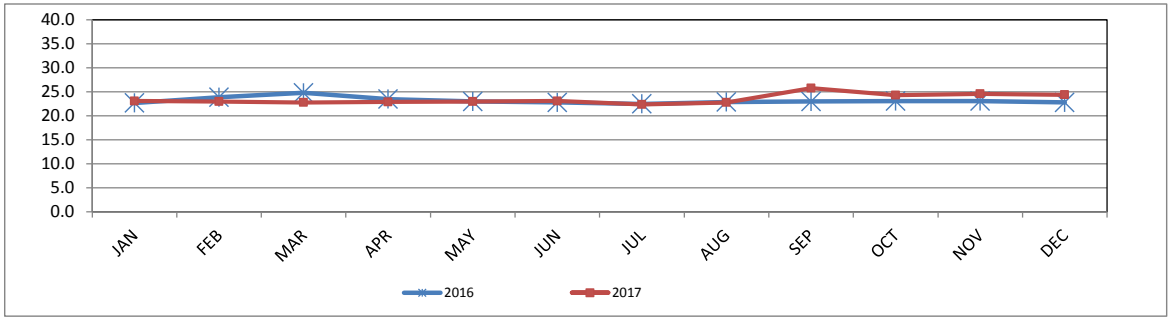
STATION TEMPERATURE (STNTPX) 2017 vs. 2016 Monthly Mean in °C



STATION TEMPERATURE (STNTPX) 2017 vs. 2016 Monthly Minimum in °C



STATION TEMPERATURE (STNTPX) 2017 vs. 2016 Monthly Maximum in °C

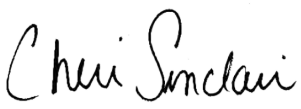


APPENDIX II
REPORT CERTIFICATION FORM

Report Certification Form

Alberta Airshed (if applicable)	**EPA Approval or Code of Practice Registration #** (if applicable)
YES	**NA**
Company Name (if applicable)	**Industrial Operation Name** (if applicable)
Peace River Area Monitoring Program	**Three Creeks 986b Station**
Name of the Representative of the Person Responsible	**Position / Title of the Representative of the Person Responsible**
Mike Bisaga / Lily Lin	**Technical Program Managers**
Is an External Party Certifying the Report?	
■ **Yes** ☐ **No**	
Name of External Person Certifying the Report	**Position / Title of External Person Certifying the Report**
Cheri Sinclair	**Supervisor, Customer Service, Air Services**
Company Name for External Person Certifying the Report	**Identification of Qualifications / Professional Designations of the External Person Certifying the Report**
Maxxam Analytics, A Bureau Veritas Group Company	**B.Sc.**

Maxxam Analytics is the designated contractor conducting monitoring and reporting activities. I certify that the submitted data has been (a) reviewed and validated as per the AMD Chapter 6: Ambient Data Quality. I certify that the submitted report (b) accurately reflects the monitoring results and reporting timeframe and (c) meets the specified analysis, summarization and reporting requirements as per the AMD Chapter 9: Reporting.



Signature of the External Person Certifying the Report

14-Mar-2018

Report Issued Date (dd-mon-yyyy)