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 842 AQM station

Peace Rive Area Monitoring Program Committee (PRAMP) is pleased to submit the ambient air monitoring annual report conducted at the PRAMP 842 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 Meteorological Parameters (except Station Temperature): 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, at hour 13:00 was incorrectly flagged as invalid. The monthly report contained the correct, valid ambient concentrations recorded at that hour. The revised data were submitted to Alberta's Ambient Air Quality Data Warehouse on 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.
- July 2017 THC/CH4/NMHC: During annual review an error was discovered in the discussion for THC/CH4/NMHC. The monthly report incorrectly stated the air conditioning system was installed on June 17, rather than July 17, 2017. There was no impact to the original dataset that was submitted to Alberta's Ambient Air Quality Data Warehouse.

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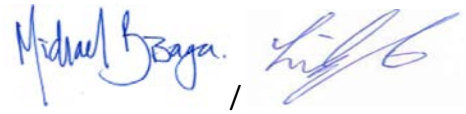
As the PRAMP Technical Program Managers, we have reviewed and verified this report and that the information is complete, accurate and representative of the monitoring results, reporting timeframe and the specified analysis, summarization and reporting requirements. We also verify all air data that are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



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2017 ANNUAL AMBIENT AIR MONITORING REPORT

PEACE RIVER AREA MONITORING PROGRAM COMMITTEE

THREE CREEKS 842B STATION

JOB #: 8449-2017-80-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**

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List of Acronyms

AAAQO	Alberta Ambient Air Quality Objectives and Guidelines Summary
A/C	Air Conditioning
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
PMT	Photomultiplier Tube
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
UV	Ultraviolet
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 842b 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. Corrections were identified in the July monthly report; however, the dataset submitted to Alberta's Ambient Air Quality Data Warehouse was not impacted.

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. Four contraventions were reported to Alberta Environment and Parks as certain criterion required by the Alberta Air Monitoring Directive were not met.

The canister monitoring program yielded one station triggered sample collection in 2017. However, following data validation, the event was not deemed valid.

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 403-219-3661 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 842b 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°16'26.8"N and Longitude 116°58'53.1"W for the monitoring period.

With the exception of the THC/CH_4/NMHC analyzer in September and the TRS analyzer in December, the equipment and meteorological systems met the 90% operational uptime requirements during the monthly monitoring period. Accordingly, two contraventions were reported to AEP.

In September 2017, the operational uptime for THC/CH_4/NMHC was less than the 90% requirement. Analyzer malfunction, maintenance, analyzer replacement and quality assurance activities contributed to a total of 220 hours of downtime. This was reported under **AEP reference number 329861.**

In December 2017, the operational uptime for TRS was less than the 90% requirement. Extreme cold temperatures impacted the TRS analyzer, causing a failed calibration. Data was invalidated back to the determined point of failure, incurring 111 hours of downtime. This was reported under **AEP reference number 333776.**

Two contraventions were reported to AEP regarding non-compliance with AMD requirements.

The wind system malfunctioned after a power failure on August 24. Due to equipment availability, it was not possible to install an AMD compliant wind system (Model 05305), based on the regulation that came into effect on July 30, 2017. Instead, an older system (Model 05103) was installed as a temporary measure, in an effort to protect operational uptime. This contravention was reported under **AEP reference number 329922.**

On October 18, a multi-point calibration was performed on the THC/CH_4/NMHC analyzer. While all the calibration points passed, the as-found high-point was not stable for 15 minutes as required in the AMD's calibration acceptance criteria. This contravention was reported under **AEP reference number 332164.**

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.

1.0 Discussion continued…

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	12-Nov	10:10	0.4	N

During the month of November, minute data was treated to exclude data representative of poor injections. The hourly and 5-minute averages were then re-calculated. Following this data treatment, the 5-minute average, initially recorded at 10:10 was less than 0.3 ppm, rendering the canister event invalid.

Notification of Changes Made After Monthly Report Issuance

January 2017 All Meteorological Parameters (except Station Temperature): 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, at hour 13:00 was incorrectly flagged as invalid. The monthly report contained the correct, valid ambient concentrations recorded at that hour. Accordingly, the revised data will be submitted to Alberta's Ambient Air Quality Data Warehouse on 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 on 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 hourly averages have changed slightly from those originally reported and the monthly average was revised from 1.4 to 1.5 kph. Accordingly, the revised wind data will be submitted to Alberta's Ambient Air Quality Data Warehouse on March 15, 2018.

July 2017 THC/CH_4/NMHC: During annual review an error was discovered in the discussion for THC/CH_4/NMHC. The monthly report incorrectly stated the air conditioning system was installed on June 17, rather than July 17, 2017. There was no impact to the original dataset that was submitted to Alberta's Ambient Air Quality Data Warehouse.

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 5 hours of downtime. These were incurred on January 5 due to a power failure and the subsequent recovery period of the analyzer.
February	• Operational time for the monitoring period was 100%. No operational issues were identified.
March	• Operational time for the monitoring period was 100%. No operational issues were identified.
April	• Operational time for the monitoring period was 100%. No operational issues were identified.
May	• Operational time for the monitoring period was 100%. No operational issues were identified.
June	• Operational time for the monitoring period was 99.9%, equivalent to one hour of downtime. This was incurred due to a power failure that occurred on June 28 at hour 08:00.
July	• Operational time for the monitoring period was 100%. No operational issues were identified.
August	• Operational time for the monitoring period was 98.5%, equivalent to eleven hours of downtime. These were incurred on August 2 and August 24, due to power failures and the subsequent recovery period of the analyzer.
September	• Operational time for the monitoring period was 100%. No operational issues were identified.
October	• 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 from hour 22:00 on October 6, to hour 03:00 on October 7. • One instance of maximum instantaneous data was discarded on October 6 at hour 11:00, due to a brief power outage. Minute data collected from 11:34-11:39 was discarded as it was impacted by the power outage, and the hourly data was re-averaged.
November	• Operational time for the monitoring period was 98.5%, equivalent to eleven hours of downtime. • The analyzer spanned towards the upper acceptance limit on November 19. A repeat zero/span check was completed on November 20 and the results did not show a trending drift. However as a precaution, an as-found response check was scheduled. During the as-found response check on November 23, a PMT temperature alarm was observed. A shut-down calibration was therefore completed in order to investigate the issue. The PMT fan was changed and the UV lamp was calibrated. A post-repair calibration was subsequently performed. As the shut-down calibration met AMD requirements, no data was discarded due to this event. Eleven hours of downtime were, however, recorded due to the additional quality checks.
December	• Operational time for the monitoring period was 100%. • Following a successful shut-down calibration on December 7, the resident analyzer (API 100A, s/n: 838) was removed for maintenance in order to address the PMT temperature alarm experienced during the November monitoring period. A successful installation calibration was subsequently completed for the replacement analyzer (Thermo 43i, s/n: 835033373).

TOTAL REDUCED SULPHUR (TRS)	
January	• Operational time for the monitoring period was 91.1%, equivalent to 66 hours of downtime. • A shut-down calibration was performed on January 4 prior to a scheduled maintenance. Maintenance was conducted on the converter and the thermocouple; a successful post-repair calibration was subsequently completed. Two hours of downtime were incurred due to this maintenance event. • The analyzer did not span correctly after a power failure that occurred on January 5. It was determined that the converter had failed during the power failure. The converter was replaced on January 7, followed by a successful post-repair calibration. Data was invalidated back to just before the power failure occurred, which was on January 5 at hour 08:00. Sixty hours of downtime were incurred as a result. • An additional zero/span check was triggered remotely on January 18 and a 3-point repeat calibration was performed onsite on January 20, as quality assurance measures. This is because the analyzer was showing biased low zero and biased high span trends, within acceptance limits. Four hours of downtime were recorded as a result of these additional quality checks.
February	• Operational time for the monitoring period was 92.1%, equivalent to 53 hours of downtime. • An analyzer and converter upgrade was implemented in February. The Thermo 43i analyzer (s/n: 1226154720) was removed on February 1, following a shut-down calibration. The replacement analyzer was a trace level model, Thermo 43i TL (s/n: 1162460023). The new analyzer was allowed time to stabilize and the installation calibration was completed on February 2. Nineteen hours of downtime were recorded during the stabilization period. • The analyzer spanned towards the upper acceptance limit on February 12. An additional span check, initiated on February 13, across hours 07:00 and 08:00, confirmed the high drift. Two hours of downtime were recorded due to this additional quality check. • A repeat calibration was initiated at hour 09:00 on February 14, however, it was aborted as the desired response was not reached at low point. The analyzer was restored to as-found settings and a shut-down calibration was successfully completed. A leak check was performed on the converter and the SO_2 scrubber material was renewed. The analyzer was allowed time to stabilize but response checks indicated there were still converter issues. The converter was left overnight to cool so the technician could dismantle and clean the converter prior to adjusting the operating temperature on February 15. The post-repair calibration was successfully completed on February 15. Thirty-two hours of downtime were recorded due to the additional quality checks and maintenance activities.
March	• Operational time for the monitoring period was 100%. No operational issues were identified.
April	• Operational time for the monitoring period was 100%. No operational issues were identified.
May	• Operational time for the monitoring period was 100%. No operational issues were identified.
June	• Operational time for the monitoring period was 99.9%, equivalent to one hour of downtime. This was incurred due to a power failure that occurred on June 28 at hour 08:00.
July	• Operational time for the monitoring period was 100%. No operational issues were identified.

TOTAL REDUCED SULPHUR (TRS)	
August	• Operational time for the monitoring period was 98.7%, equivalent to ten hours of downtime. These were incurred on August 2 and August 24, due to power failures and the subsequent recovery period of the analyzer.
September	• Operational time for the monitoring period was 100%. No operational issues were identified.
October	• 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 from hour 22:00 on October 6, to hour 03:00 on October 7. • One instance of maximum instantaneous data was discarded on October 6 at hour 11:00, due to a brief power outage. Minute data collected from 11:32-11:38 was discarded as it was impacted by the power outage, and the hourly data was re-averaged.
November	• Operational time for the monitoring period was 99.3%, equivalent to five hours of downtime. • The analyzer spanned towards the lower acceptance limit on November 3. A repeat zero/span check was completed later that day and the results did not show a trending drift. One hour of downtime was recorded due to the additional quality check. • The analyzer spanned towards the upper acceptance limit on November 23. A repeat zero/span check was completed later that day and the results did not show a trending drift. However as a precaution, an as-found response check was completed on the same day. The results met AMD requirements. Data collected at hour 19:00, immediately after the as-found response check, was excluded as the analyzer was stabilizing towards ambient baseline concentrations. Four hours of downtime were recorded due to this event.
December	• Operational time for the monitoring period was 85.1%, equivalent to 111 hours of downtime. • The 90% operational time was not achieved during the monitoring period and was reported under **AEP reference number 333776.** • The analyzer spanned outside the lower acceptance limit on December 26. A repeat span check and subsequent scheduled zero-span check results were within limits but still drifting low. As a precaution, a site visit was scheduled. Upon arrival at the station, the exhaust tube was found frozen due to extremely low temperatures. An as-found response check was attempted on December 29 but was unsuccessful. The results were confirmed with an alternate set of calibration equipment. Following several troubleshooting attempts, the problem was traced to the scrubber material which may have been impacted by low temperatures. The scrubber material was renewed and a successful post-repair calibration was performed on the same day. A leak check was conducted after the calibration, as a quality check. The results met AMD requirements. • Data was invalidated back to the last valid zero-span check recorded before the analyzer exhibited an abrupt drift in span response. This was determined to be on December 25 at hour 02:00. 111 hours of downtime were recorded due to this event.

TOTAL HYDROCARBONS (THC), METHANE (CH_4) & NON-METHANE HYDROCARBONS (NMHC)	
January	• Operational time for the monitoring period was 99.1%, equivalent to 7 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 hours 13:00 and 14:00 were invalidated as the analyzer was recovering from the power failure. • The span gas cylinder was replaced on January 20. An additional span check was triggered afterwards; one hour of downtime was incurred as a result. • Slight, sporadic noise was noted for the NMHC parameter when sampling ambient air and this is reflected in the NMHC instantaneous maximum data. With the exception of two isolated instances (January 2 at hour 10:00 - 0.21 ppm; and January 7 at hour 18:00 - 0.25 ppm) this noise remained below the acceptable threshold for this parameter based on AMD requirements (0.2 ppm) and, at all times, remained below a level that might trigger a VOC canister (0.3 ppm). This noise had minimal effect on hourly average data and given the analyzer was demonstrated to be operating within accepted limits, this noise is considered not to be significant. Data was monitored closely so that appropriate action could be taken if data quality deteriorated. • No canister event was recorded.
February	• Operational time for the monitoring period was 100%. No operational issues were identified. • No canister event was recorded.
March	• Operational time for the monitoring period was 100%. • Slight, sporadic noise was noted for the NMHC parameter when sampling ambient air and this is reflected in the NMHC instantaneous maximum data. With the exception of two isolated instances (March 9 at hour 18:00 - 0.23 ppm; and March 26 at hour 17:00 - 0.20 ppm) this noise remained below the acceptable threshold for this parameter based on AMD requirements (0.2 ppm) and, at all times, remained below a level that might trigger a VOC canister (0.3 ppm). This noise had minimal effect on hourly average data and given the analyzer was demonstrated to be operating within accepted limits, this noise is considered not to be significant. Data was monitored closely so that appropriate action could be taken if data quality deteriorated. • No canister event was recorded.

TOTAL HYDROCARBONS (THC), METHANE (CH_4) & NON-METHANE HYDROCARBONS (NMHC)	
April	• Operational time for the monitoring period, was 95.6%, equivalent to 32 hours of downtime. • The analyzer malfunctioned on April 6. It was reset onsite on April 7; a successful zero-span check was completed afterwards. Twenty-five hours of downtime were recorded due to this event. • The NMHC span response drifted above the upper acceptance limit on April 21. Two additional span checks were triggered on April 22 to assess span response and the results confirmed the drift. A successful repeat calibration was performed on April 23 and the expected span value was subsequently updated. • As the repeat calibration met AMD requirements, no data was discarded due to this event. However, seven hours of downtime were recorded due to the additional quality checks. • Slight, sporadic noise was noted for the NMHC parameter when sampling ambient air and this is reflected in the NMHC instantaneous maximum data. With the exception of two isolated instances (April 5 at hour 23:00 - 0.23 ppm; and April 6 at hour 25:00 - 0.21 ppm) this noise remained below the acceptable threshold for this parameter based on AMD requirements (0.2 ppm) and, at all times, remained below a level that might trigger a VOC canister (0.3 ppm). This noise had minimal effect on hourly average data and given the analyzer was demonstrated to be operating within accepted limits, this noise is considered not to be significant. Data was monitored on a daily basis so that appropriate action could be taken if data quality deteriorated. • No canister event was recorded.
May	• Operational time for the monitoring period was 100%. • Slight, sporadic noise was noted for the NMHC parameter when sampling ambient air and this is reflected in the NMHC instantaneous maximum data. With the exception of one isolated instance (May 9 at hour 23:00 - 0.22 ppm) this noise remained below the acceptable threshold for this parameter based on AMD requirements (0.2 ppm) and, at all times, remained below a level that might trigger a VOC canister (0.3 ppm). This noise had minimal effect on hourly average data and given the analyzer was demonstrated to be operating within accepted limits, this noise is considered not to be significant. However, as this observation has persisted over an extended period of time, the analyzer was replaced on June 14. • No canister event was recorded.

TOTAL HYDROCARBONS (THC), METHANE (CH_4) & NON-METHANE HYDROCARBONS (NMHC)	
June	• Operational time, for the monitoring period was 98.6%, equivalent to ten hours of downtime. • The NMHC analyzer was recording some noise when sampling ambient air over the past several weeks, and this was reflecting in the NMHC instantaneous maximum data. The situation was being monitored as this noise had minimal effect on hourly average and the analyzer was demonstrated to be operating within accepted limits. However, as this observation has persisted over an extended period of time, the Thermo 55i (s/n: 1433563261) analyzer was replaced on June 14, following a successful shut-down calibration. A successful installation calibration was subsequently performed on Thermo 55i (s/n: 1236656188), the replacement analyzer. Nine hours of downtime were recorded due to this event. • One hour of downtime was recorded due to a power failure that occurred on June 28, at hour 08:00. • No canister event was recorded.
July	• Operational time for the monitoring period was 99.9%, equivalent to one hour of downtime. • The scheduled zero/span check was not executed on July 18. Upon an immediate site visit, the span gas regulator was found shut-off, blocking the release of the span gas. This is likely a result of interference from trailer activities on July 17, while the air conditioning system was being installed. The span gas regulator was reset and the gas pressure was corrected. A successful zero/span check was subsequently completed. As this event was limited to the source of the span gas, and the analyzer or the zero/span system was not impacted, no data was discarded. However, one hour of downtime was recorded due to the unsuccessful zero/span attempt. • No canister event was recorded.
August	• Operational time, for the monitoring period was 98.1%, equivalent to fourteen hours of downtime. • The routine monthly calibration was performed on August 30. • The channels were placed in "maintenance" mode on August 10 at hour 10:00, while the sample manifold was being cleaned. One hour of downtime was recorded. • Thirteen hours of downtime were incurred on August 2, August 24 and August 25, due to power failures and the subsequent recovery period of the analyzer. • No canister event was recorded this month.

TOTAL HYDROCARBONS (THC), METHANE (CH_4) & NON-METHANE HYDROCARBONS (NMHC)	
September	• Operational time for the monitoring period was 69.4%, equivalent to 220 hours of downtime. • The 90% operational time was not achieved during the monitoring period and was reported under **AEP reference number 329861.** • Upon arrival at the station on September 15 for a scheduled monthly calibration, the analyzer (Thermo 55i, s/n: 1236656188) was found recording anomalous concentrations. Troubleshooting was completed and it was determined that the internal switching valve had failed. Data review revealed that this malfunction occurred after the daily zero/span check completed earlier that day. As these are very delicate components that should not be repaired in the field, arrangements were made to mobilize an alternate analyzer to the station. A replacement analyzer (Thermo 55i, s/n: 1505664392) was installed on September 16 and column conditioning was run overnight. A post-repair calibration was attempted on September 17, however, the Methane component of the calibration did not stabilize at zero. The problem was traced to a slightly unstable baseline signal and changes were made to the processing to address this. A successful post-repair calibration was completed on September 18. The expected span value was updated after the daily zero/span check on September 19. Data was invalidated back to the last valid zero/span check on September 15. Eighty-three hours of downtime were incurred due to this event. • Instability was noted in Methane's span response as evidenced by a sudden drift in the results of the scheduled and additional span checks of September 20. A shut-down calibration attempted later that day proved abortive, as a 15-minute stabilization was not achieved at as-found high point, due to intermittent anomalous injections. The actuator operation and alignment were checked, gas supply pressures were verified and adjusted, and the zero chromatograph was reset. A successful post-repair calibration was subsequently completed. Data was invalidated to the point when anomalous injections were identified, determined to be hour 01:00 of September 20. Fifteen hours of downtime were recorded due to this event. • In response to a "low-concentration" alarm triggered on September 26 at hour 23:00, a technician was dispatched to the site on September 27. A shut-down calibration attempt proved unsuccessful. The analyzer was therefore removed and the original analyzer (Thermo 55i, s/n: 1236656188, removed for maintenance on September 15 and now repaired) was re-installed. Column conditioning was performed overnight and a successful installation calibration was completed on September 28. Data was invalidated to the point when a decline in concentrations was identified, determined to be hour 07:00 of September 23. 122 hours of downtime were recorded due to this event. • No canister event was recorded.

TOTAL HYDROCARBONS (THC), METHANE (CH_4) & NON-METHANE HYDROCARBONS (NMHC)	
October	• Operational time, for the monitoring period was 98.0%, equivalent to 15 hours of downtime. • Through-out the month, sporadic instances of low CH_4 concentrations were recorded from the analyzer. Such data are indicative of an intermittent issue with the switching valve within the analyzer. This analyzer demonstrated similar problems in August which were rectified by off-site maintenance and replacement of the switch valve. Improvement in the frequency and duration of poor injections was gained, but not eliminated during October. Based on historical data and Maxxam's internal guidelines, CH_4 concentrations ≤ 1.80 ppm were considered poor injections. Given the low frequency and short duration of each event it is considered that these errors have a minimal impact on the reliability or accuracy of the data collected over the month. However, to eliminate bias, impacted CH_4 minutes, along with the corresponding THC and NMHC values, were excluded and the corresponding hourly averages were re-calculated. Arrangements were made to replace the analyzer in November. • Higher frequency and longer duration of poor injections were observed on October 4. This prompted an immediate site visit where the fuel (Hydrogen) gas was changed out and the zero air pressure was adjusted, as corrective actions. Seven hours of data collected from hour 08:00 to hour 14:00 were excluded and two more hours of downtime were recorded due to the corrective actions taken. • The routine monthly calibration was performed on October 18. The calibration passed at all points but did not meet the 15-minute stabilization period requirement for the as-found high point, as there were few outlying concentrations attributed to the ongoing, low-impact, sporadic poor injections. This calibration is considered sufficient to validate data processed by this analyzer. Such a conclusion is supported by the proven linearity demonstrated by the multi-point calibration and the stability of the daily zero/span verification recorded during the month. This contravention was reported under **AEP reference number 332164.** • Due to a power failure that occurred from hour 22:00 on October 6, to hour 03:00 on October 7, six hours of downtime were recorded. • One instance of maximum instantaneous data was discarded on October 6 at hour 11:00, due to a brief power outage. Minute data collected from 11:33-11:44 was discarded as it was impacted by the power outage, and the hourly data was re-averaged. • No canister event was recorded.

TOTAL HYDROCARBONS (THC), METHANE (CH_4) & NON-METHANE HYDROCARBONS (NMHC)	
November	• Operational time, for the monitoring period was 97.4%, equivalent to nineteen hours of downtime. • The sporadic instances of low CH_4 concentrations observed in October, attributed to poor sample injections, continued into November. Following a successful shut-down calibration on November 17, troubleshooting/maintenance was performed in an attempt to fix the injection problem. The actuator, which had recently been replaced, was realigned and the column chamber fittings were checked and tightened. A successful post-repair calibration was subsequently completed. However, the analyzer continued to record poor sample injections. It was decided that the analyzer be replaced for off-site maintenance. On November 23, following a successful shut-down calibration, the analyzer (Thermo 55i, s/n: 1236656188) was removed. A replacement (Thermo 55i, s/n: 1505664392) was subsequently installed, followed by a successful installation calibration. Seventeen hours of downtime were recorded due to these additional quality activities. • Based on historical data and Maxxam's internal guidelines, CH_4 concentrations ≤ 1.80 ppm were considered poor injections. Between November 1 and November 23 (when the analyzer was replaced), impacted CH_4 minutes, along with the corresponding THC and NMHC values, were excluded and the corresponding hourly averages were re-calculated. Hourly data with more than fifteen invalid minutes were discarded as per AMD requirement. Two hours of data collected on November 12 at hour 09:00 (09:00-10:00 for maximum instantaneous data), and November 15 at hour 18:00, were invalidated as a result. • One canister event was recorded on November 12 at 10:10, at a concentration of 0.4 ppm. The sample was collected by the local site contacts for analysis. However, following the minute data correction as explained above, the 5-minute average concentration at 10:10 on November 12 no longer records above 0.3 ppm, as it had been recalculated. This is, therefore, not considered a valid event.
December	• Operational time, for the monitoring period was 96.8%, equivalent to twenty-four hours of downtime. • Due to low fuel (Hydrogen) gas pressure, the analyzer recorded anomalous low hourly and span concentrations on December 5, prompting an immediate site visit. The fuel (Hydrogen) gas cylinder was replaced on December 6. As a quality check, a zero-span check was triggered after the replacement. The result was within limits. Twenty-two hours of downtime were recorded due to this event. • Following a successful shut-down calibration on December 7, the zero air generator was replaced for maintenance purposes. A successful post-repair calibration was completed subsequently. One hour of downtime was recorded due to this maintenance event. • One hour of downtime was recorded on December 28 at hour 19:00 due to an interference from station activities. • No canister event was recorded.

WIND SPEED (WS) & WIND DIRECTION (WD)	
January	• Operational time, for the monitoring period was 99.5%, equivalent to 4 hours of downtime. These were incurred on January 5 due to a power failure.
February	• Operational time, for the monitoring period, was 100%. • The wind system, RM Young 05305VK (s/n: 92411), was calibrated on February 14. • 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 0.45%. 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.
June	• Operational time, for the monitoring period was 95.1%, equivalent to 35 hours of downtime. These were incurred due to a malfunction of the wind system that occurred on June 27. The wind system, RM Young (s/n: 92411), was replaced with RM Young (s/n: 110980) on May 29, followed by a successful installation calibration.
July	• Operational time, for the monitoring period was 96.0%, equivalent to 30 hours of downtime. • There was an electronic failure of the wind system on July 9. On July 10, the resident wind system, RM Young 05305VK (s/n: 110980), was removed for maintenance and a replacement, RM Young 05305VK (s/n: 65521), was installed. The replacement wind system was calibrated on July 11. Thirty hours of downtime were recorded due to this event.

WIND SPEED (WS) & WIND DIRECTION (WD)

August

• Operational time, for the monitoring period was 95.8%, equivalent to 31 hours of downtime.
• Nine hours of downtime were incurred on August 2 and August 24, due to power failures.
• The wind system malfunctioned after the power failure on August 24. Twenty-two hours of downtime were recorded. Due to equipment availability, it was not possible to install an AMD compliant wind system (Model 05305). Instead, an older system (Model 05103) was installed as a temporary measure, in an effort to protect operational uptime. While this is a technical deviation from the AMD (Chapter 4, Section 2.5, Table 2), there is minimal effect on data quality except under calm conditions. The starting threshold for wind speed and direction is the only difference between the two wind systems; the starting threshold for Model 05305 is 0.5 mS-1 versus 1.0 mS-1 for Model 05103. Under all other conditions, the two wind systems generate equivalent data. Data collected with Model 05103 was from August 25, at hour 18:00 to August 30, at hour 09:00 and the calm percentage for this time frame was 13.4%. The hours of data below the starting threshold of 3.6 kph are identified below and should be considered less reliable as they were recorded with a wind sensor resolution of 1.0 mS-1. This contravention was reported under **AEP reference number 329922.**

Date	Time	WSP	WDR
		kph	degwdr
2017/08/28	03:00	2.8	222
2017/08/28	05:00	1.1	229
2017/08/28	06:00	0.5	210
2017/08/28	07:00	1.5	173
2017/08/28	19:00	2.6	225
2017/08/28	20:00	1.3	64
2017/08/28	21:00	1.2	105
2017/08/28	22:00	2.5	116
2017/08/28	23:00	2.6	106
2017/08/29	00:00	3.0	76
2017/08/29	02:00	3.3	66
2017/08/29	03:00	0.7	71
2017/08/29	04:00	1.7	72
2017/08/29	05:00	1.5	73
2017/08/29	06:00	3.2	67

September

• Operational time, for the monitoring period, was 100%. No operational issues were identified.

October

• Operational time, for the monitoring period was 95.7%, equivalent to 32 hours of downtime.
• Due to a power failure that occurred from hour 22:00 on October 6, to hour 03:00 on October 7, six 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.

December

• Operational time for the monitoring period was 100%. No operational issues were identified.

RELATIVE HUMIDITY (RH)	
January	• Operational time for the monitoring period was 99.5%, equivalent to 4 hours of downtime. These were incurred on January 5 due to a power failure.
February	• Operational time for the monitoring period was 100%. No operational issues were identified.
March	• Operational time for the monitoring period was 100%. No operational issues were identified.
April	• Operational time for the monitoring period was 100%. No operational issues were identified.
May	• Operational time for the monitoring period was 100%. No operational issues were identified.
June	• Operational time, for the monitoring period was 99.9%, equivalent to one hour of downtime. This was incurred due to a power failure that occurred on June 28 at hour 08:00.
July	• Operational time for the monitoring period was 100%. No operational issues were identified.
August	• Operational time, for the monitoring period was 98.8%, equivalent to nine hours of downtime. These were incurred on August 2 and August 24, due to power failures.
September	• Operational time for the monitoring period was 100%. No operational issues were identified.
October	• 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 from hour 22:00 on October 6, to hour 03:00 on October 7.
November	• Operational time for the monitoring period was 100%. No operational issues were identified.
December	• Operational time for the monitoring period was 100%. No operational issues were identified.

BAROMETRIC PRESSURE (BP)	
January	• Operational time for the monitoring period was 99.5%, equivalent to 4 hours of downtime. These were incurred on January 5 due to a power failure.
February	• Operational time for the monitoring period was 100%. No operational issues were identified.
March	• Operational time for the monitoring period was 100%. No operational issues were identified.
April	• Operational time for the monitoring period was 100%. No operational issues were identified.
May	• Operational time for the monitoring period was 100%. No operational issues were identified.
June	• Operational time for the monitoring period was 99.9%, equivalent to one hour of downtime. This was incurred due to a power failure that occurred on June 28 at hour 08:00.
July	• Operational time for the monitoring period was 100%. No operational issues were identified.
August	• Operational time for the monitoring period was 98.8%, equivalent to 9 hours of downtime. These were incurred on August 2 and August 24, due to power failures.
September	• Operational time for the monitoring period was 100%. No operational issues were identified.
October	• Operational time for the monitoring period was 99.2%, equivalent to 6 hours of downtime. These were incurred due to a power failure that occurred from hour 22:00 on October 6, to hour 03:00 on October 7. • Minute data collected from 11:34-11:35 was discarded as it was impacted by a brief power outage, and the hourly data was re-averaged.
November	• Operational time for the monitoring period was 100%. No operational issues were identified.
December	• Operational time for the monitoring period was 100%. No operational issues were identified.

AMBIENT TEMPERATURE (AT)	
January	• Operational time, for the monitoring period was 99.5%, equivalent to 4 hours of downtime. These were incurred on January 5 due to a power failure.
February	• Operational time for the monitoring period was 100%. No operational issues were identified.
March	• Operational time for the monitoring period was 100%. No operational issues were identified.
April	• Operational time for the monitoring period was 100%. No operational issues were identified.
May	• Operational time for the monitoring period was 100%. No operational issues were identified.
June	• Operational time, for the monitoring period was 99.9%, equivalent to one hour of downtime. This was incurred due to a power failure that occurred on June 28 at hour 08:00.
July	• Operational time, for the monitoring period, was 100%. No operational issues were identified.
August	• Operational time, for the monitoring period was 98.8%, equivalent to nine hours of downtime. These were incurred on August 2 and August 24, due to power failures.
September	• Operational time for the monitoring period was 100%. No operational issues were identified.
October	• Operational time, for the monitoring period was 99.2%, equivalent to 6 hours of downtime. These were incurred due to a power failure that occurred from hour 22:00 on October 6, to hour 03:00 on October 7.
November	• Operational time for the monitoring period was 100%. No operational issues were identified.
December	• Operational time for the monitoring period was 100%. No operational issues were identified.

STATION TEMPERATURE (STNTPX)	
January	• Operational time for the monitoring period was 99.5%, equivalent to 5 hours of downtime. These were incurred on January 5 due to a power failure and the subsequent recovery period of the temperature sensor.
February	• Operational time for the monitoring period was 100%. • The internal thermostats were not operating optimally this month. The heater and A/C thermostats were running in parallel, for extended periods of time, as both thermostats were attempting to maintain individual temperatures. On February 14, adjustments were made to the thermostats in order to uphold the required internal temperature.
March	• Operational time for the monitoring period was 100%. No operational issues were identified.
April	• Operational time for the monitoring period was 100%. No operational issues were identified.
May	• Operational time for the monitoring period was 100%. No operational issues were identified.
June	• Operational time for the monitoring period was 99.9%, equivalent to one hour of downtime. This was incurred due to a power failure that occurred on June 28 at hour 08:00.
July	• Operational time for the monitoring period was 100%. • A new air conditioning unit was installed on July 17.
August	• Operational time for the monitoring period was 98.8%, equivalent to nine hours of downtime. These were incurred on August 2 and August 24, due to power failures.
September	• Operational time for the monitoring period was 100%. No operational issues were identified.
October	• Operational time for the monitoring period was 99.2%, equivalent to 6 hours of downtime. These were incurred due to a power failure that occurred from hour 22:00 on October 6, to hour 03:00 on October 7.
November	• Operational time for the monitoring period was 100%. No operational issues were identified.
December	• Operational time for the monitoring period was 100%. No operational issues were identified.

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, Raja Ashraf, Michael Espiritu and Russell Kirchner.

3.0 Plant Monthly Required AMD Summary

There were no ambient concentrations in excess of the Alberta Ambient Air Quality Objectives and Guidelines. Four contraventions were reported to Alberta Environment and Parks as certain criterion required by the Alberta Air Monitoring Directive were not met.

With the exception of the THC/CH_4/NMHC analyzer in September and the TRS analyzer in December, the equipment and meteorological systems met the 90% operational uptime requirements during the monthly monitoring period. Accordingly, two contraventions were reported to AEP.

In September 2017, the operational uptime for THC/CH_4/NMHC was less than the 90% requirement. Analyzer malfunction, maintenance, analyzer replacement and quality assurance activities contributed to a total of 220 hours of downtime. This was reported under **AEP reference number 329861.**

In December 2017, the operational uptime for TRS was less than the 90% requirement. Extreme cold temperatures impacted the TRS analyzer, causing a failed calibration. Data was invalidated back to the determined point of failure, incurring 111 hours of downtime. This was reported under **AEP reference number 333776.**

Two contraventions were reported to AEP regarding non-compliance with AMD requirements.

The wind system malfunctioned after a power failure on August 24. Due to equipment availability, it was not possible to install an AMD compliant wind system (Model 05305), based on the regulation that came into effect on July 30, 2017. Instead, an older system (Model 05103) was installed as a temporary measure, in an effort to protect operational uptime. This contravention was reported under **AEP reference number 329922**.

On October 18, a multi-point calibration was performed on the THC/CH_4/NMHC analyzer. While all the calibration points passed, the as-found high-point was not stable for 15 minutes as required in the AMD's calibration acceptance criteria. This contravention was reported under **AEP reference number 332164.**

As a monitoring method for identifying hydrocarbon, reduced sulphur and VOC compounds, a station triggered canister collection occurred once in 2017. During the month of November, minute data was treated to exclude data representative of poor injections. The hourly and 5-minute averages were then re-calculated. Following this data treatment, the 5-minute average, initially recorded at 10:10 was less than 0.3 ppm, rendering the canister event invalid.

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 has been converted to mbar, using the conversion factor of 1 inHg is equivalent to 33.8639 mbar.

In February, 2017 the Thermo 43i TRS analyzer (s/n: 1226154720) was upgraded to a Thermo 43i TL (s/n: 1162460023). 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 - API 100A & Thermo 43i 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 Model 05305 & Model 05103
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	705	99.3	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	172	48.0	0	0	0.1
February	637	100.0	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	172	48.0	0	0	0.1
March	707	100.0	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	172	48.0	0	0	0.1
April	685	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	683	99.9	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	697	98.5	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	172	48.0	0	0	0
September	684	100.0	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	172	48.0	0	0	0
October	703	99.2	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	172	48.0	0	0	0
November	676	98.5	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	172	48.0	0	0	0
December	705	100.0	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	172	48.0	0	0	0
Annual	**8300**	**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*

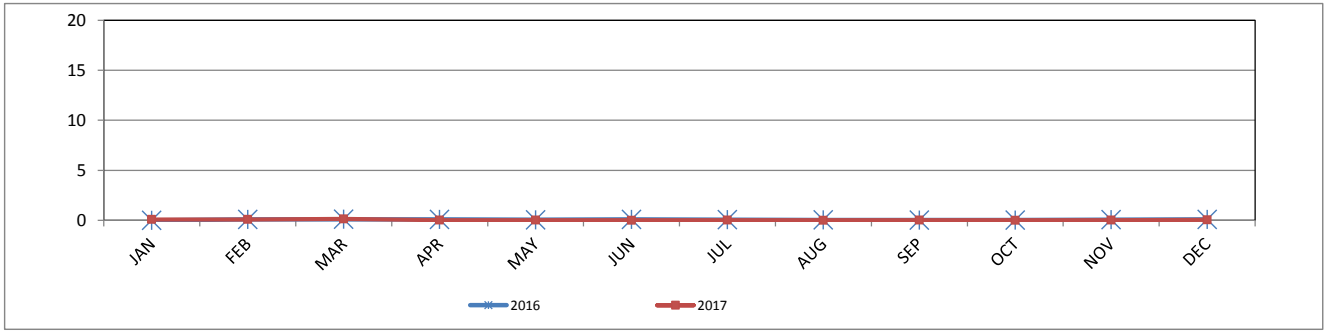
Alberta Ambient Air Quality Objectives Annual Average**	**8.0**	**ppb**
Annual Average for 2017	**0**	**ppb**

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

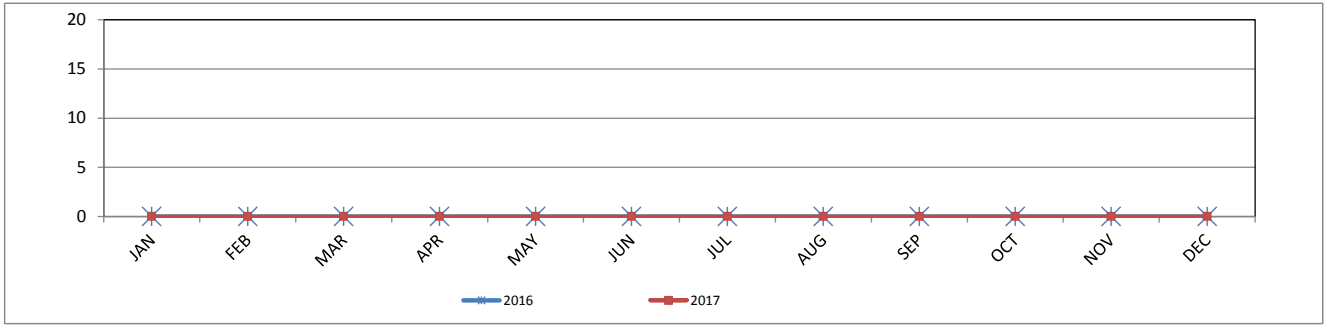
	2016			2017			
MONTH	**MEAN**	**MINIMUM**	**MAXIMUM**	**MEAN**	**MINIMUM**	**MAXIMUM**	**DIFFERENCE**
JAN	**0.1**	0.0	1.5	**0.1**	0.0	1.7	0.0
FEB	0.1	0.0	1.4	0.1	0.0	2.5	0.0
MAR	0.1	0.0	1.2	0.1	0.0	2.0	0.0
APR	0.1	0.0	1.3	0	0	1	0
MAY	0.1	0.0	1.1	0	0	1	0
JUN	0.1	0.0	**1.8**	0	0	1	0
JUL	0.1	0.0	1.2	0	0	**3**	0
AUG	0.0	0.0	1.3	0	0	1	0
SEP	0.0	0.0	1.1	0	0	1	0
OCT	0.0	0.0	0.7	0	0	1	0
NOV	0.1	0.0	1.2	0	0	3	0
DEC	0.1	0.0	0.9	0	0	2	0

Annual peak

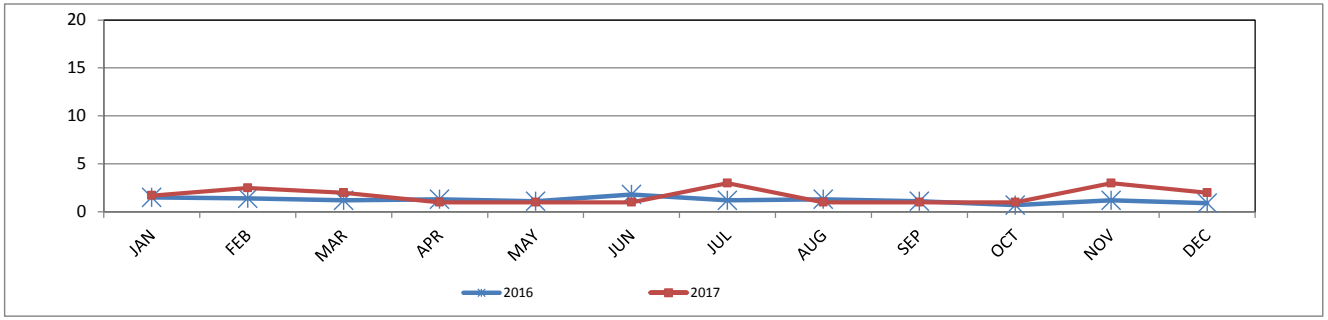
SULPHUR DIOXIDE (SO_2) 2017 vs. 2016 Monthly Mean in ppb



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



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



Wind: PRAMP_842

Poll.: PRAMP_842-SO_2 [ppb]

Periodically: 2017/01/01 00:00-2017/12/31 23:59

Type: PollutionRose

Direction: Blowing From (Wind Frequency)

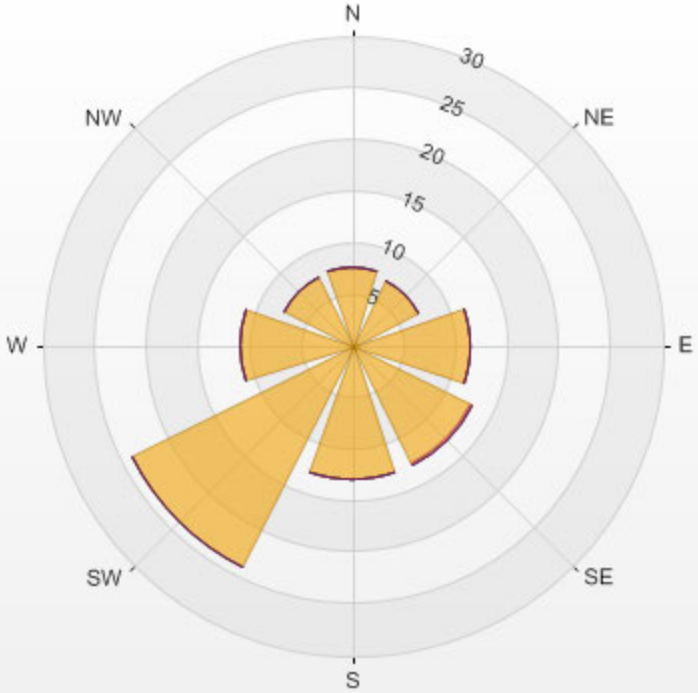
Based On 1 Hr.

Calm: 5.68% Calm Avg: 0.04 [ppb]

Direction	0-3	3-10	10-85	85-170	>170.0	Total
N	7.6	0.0	0.0	0.0	0.0	7.6
NE	7.1	0.0	0.0	0.0	0.0	7.1
E	11.3	0.0	0.0	0.0	0.0	11.3
SE	12.9	0.0	0.0	0.0	0.0	12.9
S	13.0	0.0	0.0	0.0	0.0	13.0
SW	24.0	0.0	0.0	0.0	0.0	24.0
W	10.9	0.0	0.0	0.0	0.0	10.9
NW	7.5	0.0	0.0	0.0	0.0	7.5
Summary	94.3	0.0	0.0	0.0	0.0	94.3

% Icon Classes (ppb)	94 0-3	0 3-10	0 10-85	0 85-170	0 >170.0

PRAMP_842 Poll.: PRAMP_842-SO2[ppb] 2017/01/01 00:00 - 2017/12/31 23:59 Calm: 5.68% Calm Poll Avg: 0.04[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	643	91.1	100.0%	0.0%	0.0%	0.0%	-	-	-	-	0.3
February	586	92.1	100.0%	0.0%	0.0%	0.0%	-	-	-	-	0.2
March	706	100.0	100.0%	0.0%	0.0%	0.0%	-	-	-	-	0.2
April	685	100.0	100.0%	0.0%	0.0%	0.0%	-	-	-	-	0.15
May	708	100.0	100.0%	0.0%	0.0%	0.0%	-	-	-	-	0.17
June	682	99.9	100.0%	0.0%	0.0%	0.0%	-	-	-	-	0.19
July	709	100.0	100.0%	0.0%	0.0%	0.0%	-	-	-	-	0.19
August	698	98.7	100.0%	0.0%	0.0%	0.0%	-	-	-	-	0.21
September	685	100.0	100.0%	0.0%	0.0%	0.0%	-	-	-	-	0.18
October	703	99.2	100.0%	0.0%	0.0%	0.0%	-	-	-	-	0.16
November	680	99.3	100.0%	0.0%	0.0%	0.0%	-	-	-	-	0.18
December	600	85.1	100.0%	0.0%	0.0%	0.0%	-	-	-	-	0.17
Annual	**8085**	**97.1**	**100.0%**	**0.0%**	**0.0%**	**0.0%**					**0.19**

**# of readings excluding calibration hours*

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

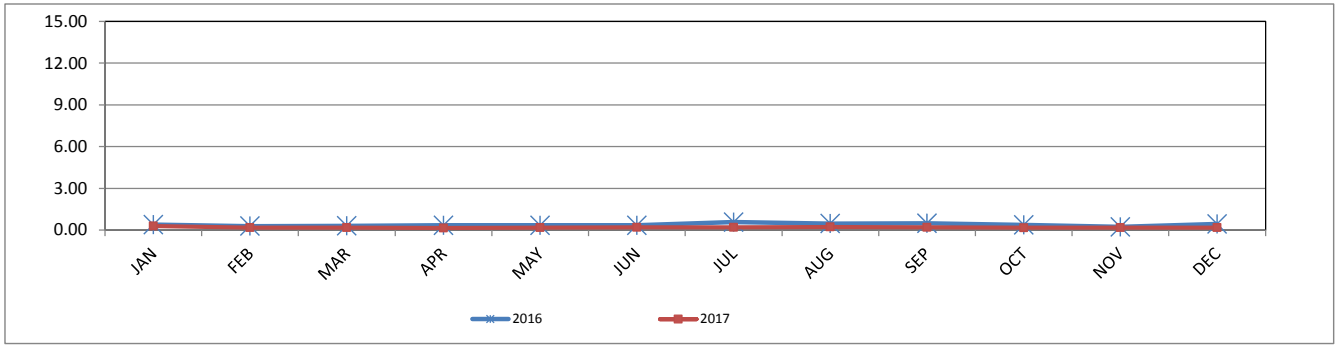
Alberta Ambient Air Quality Objectives Annual Average**	**-**	**ppb**
Annual Average for 2017	**0.19**	**ppb**

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

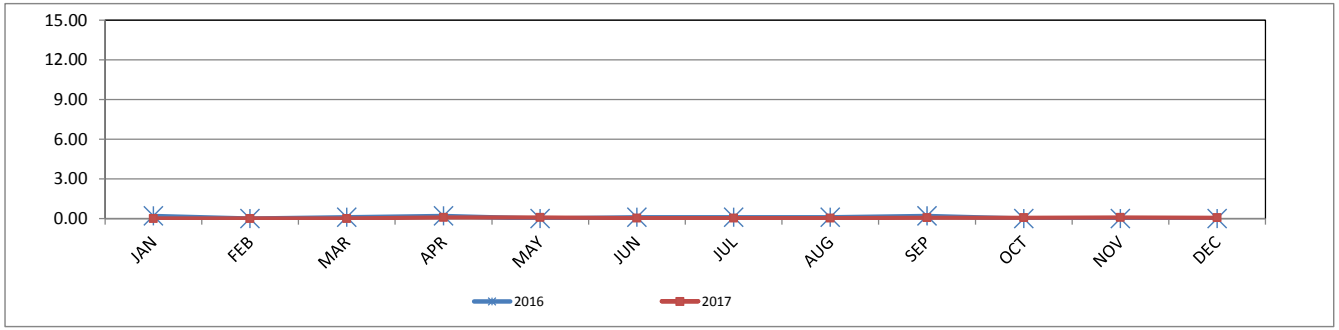
	2016			2017			
MONTH	**MEAN**	**MINIMUM**	**MAXIMUM**	**MEAN**	**MINIMUM**	**MAXIMUM**	**DIFFERENCE**
JAN	0.4	0.2	0.6	**0.3**	0.0	0.9	-0.1
FEB	0.3	0.0	0.6	0.2	0.0	0.6	-0.1
MAR	0.3	0.1	0.8	0.2	0.0	**1.1**	-0.1
APR	0.3	0.2	1.9	0.15	0.08	0.41	-0.19
MAY	0.3	0.0	1.4	0.17	0.08	0.81	-0.16
JUN	0.3	0.1	0.9	0.19	0.04	0.73	-0.15
JUL	**0.6**	0.1	2.5	0.19	0.03	1.02	-0.37
AUG	0.5	0.1	**3.6**	0.21	0.03	0.89	-0.25
SEP	0.5	0.2	1.5	0.18	0.06	0.73	-0.30
OCT	0.4	0.0	0.7	0.16	0.07	0.36	-0.20
NOV	0.2	0.0	0.5	0.18	0.08	0.50	-0.04
DEC	0.4	0.0	0.8	0.17	0.07	0.29	-0.27

Annual peak

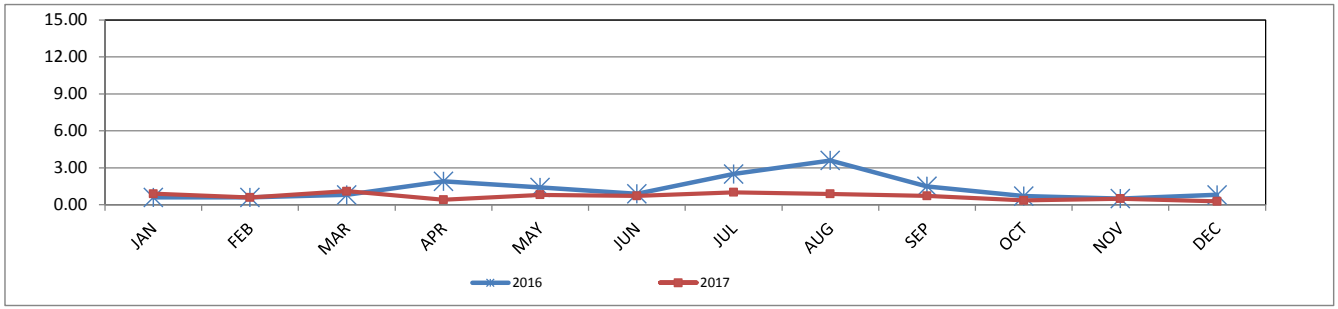
TOTAL REDUCED SULPHUR (TRS) 2017 vs. 2016 Monthly Mean in ppb



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



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



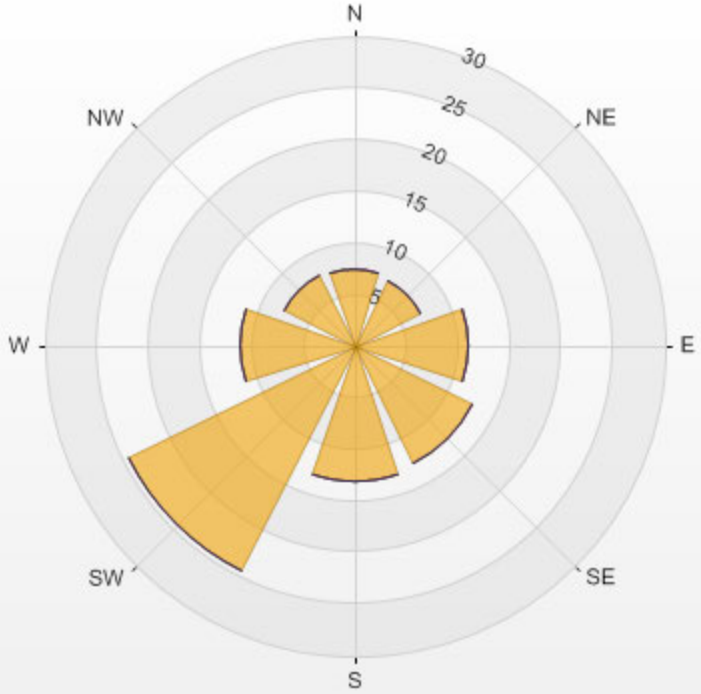
Wind: PRAMP_842
Poll.: PRAMP_842-TRS [ppb]
Periodically: 2017/01/01 00:00-2017/12/31 23:59
Type: PollutionRose
Direction: Blowing From (Wind Frequency)
Based On 1 Hr.

Calm: 5.43% Calm Avg: 0.20 [ppb]

Direction	0-1	1-3	3-10	>10.0	Total
N	7.4	0.0	0.0	0.0	7.4
NE	7.1	0.0	0.0	0.0	7.1
E	11.1	0.0	0.0	0.0	11.1
SE	12.8	0.0	0.0	0.0	12.8
S	13.1	0.0	0.0	0.0	13.1
SW	24.4	0.0	0.0	0.0	24.4
W	11.1	0.0	0.0	0.0	11.1
NW	7.6	0.0	0.0	0.0	7.6
Summary	94.5	0.0	0.0	0.0	94.6

% Icon Classes (ppb)	95 0-1	0 1-3	0 3-10	0 >10.0

PRAMP_842 Poll.: PRAMP_842-TRS[ppb] 2017/01/01 00:00 - 2017/12/31 23:59 Calm: 5.43% Calm Poll Avg: 0.20[ppb]



TOTAL HYDROCARBON

JOB # 8449-2017-80-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	702	99.1	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.94
February	639	100.0	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.88
March	707	100.0	100.0%	0.0%	0.0%	0.0%	-	-	-	-	2.02
April	654	95.6	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.97
May	708	100.0	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.96
June	674	98.6	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.88
July	709	99.9	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.93
August	696	98.1	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.96
September	476	69.4	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.99
October	694	98.0	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.97
November	668	97.4	100.0%	0.0%	0.0%	0.0%	-	-	-	-	2.01
December	681	96.8	98.5%	1.5%	0.0%	0.0%	-	-	-	-	2.03
Annual	**8008**	**96.1**	**99.9%**	**0.1%**	**0.0%**	**0.0%**					**1.96**

**# of readings excluding calibration hours*

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

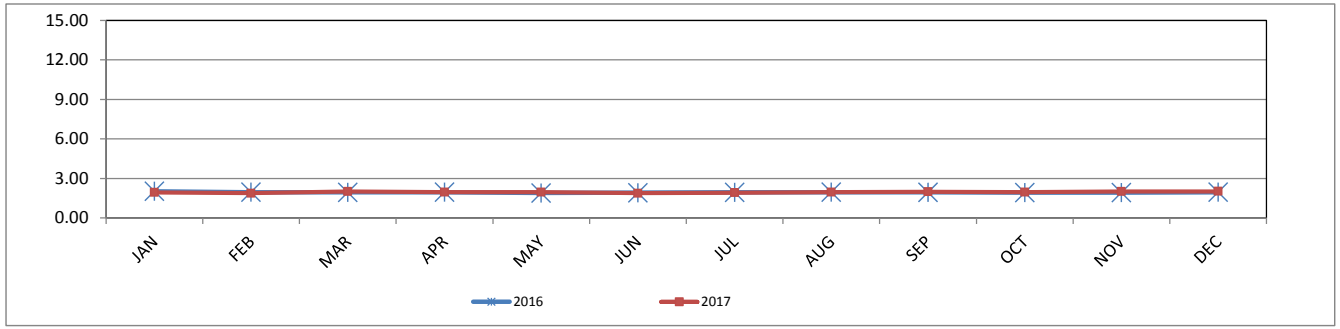
Alberta Ambient Air Quality Objectives Annual Average**	**-**	**ppm**
Annual Average for 2017	**1.96**	**ppm**

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

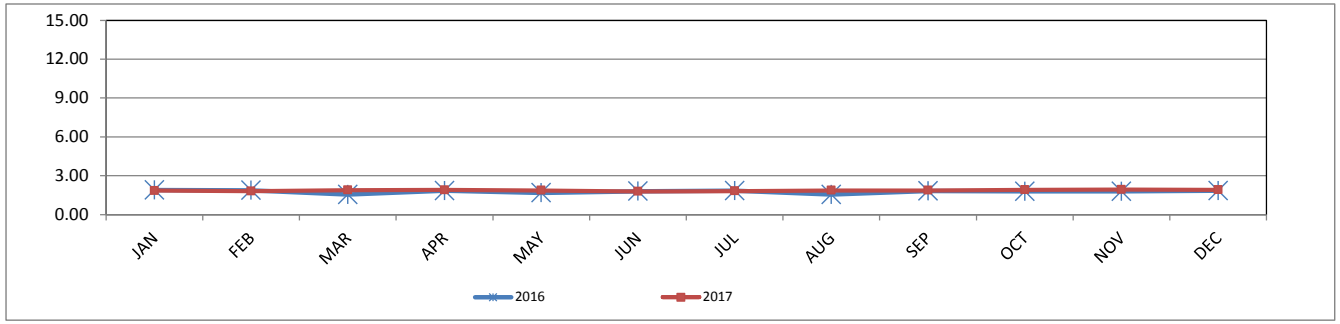
	2016			2017			
MONTH	**MEAN**	**MINIMUM**	**MAXIMUM**	**MEAN**	**MINIMUM**	**MAXIMUM**	**DIFFERENCE**
JAN	**2.03**	1.89	**2.75**	1.94	1.85	2.30	-0.09
FEB	1.96	1.87	2.12	1.88	1.80	2.89	-0.08
MAR	1.95	1.55	2.55	2.02	1.89	2.68	0.07
APR	1.96	1.85	2.41	1.97	1.90	2.58	0.01
MAY	1.90	1.68	2.40	1.96	1.87	2.61	0.06
JUN	1.92	1.80	2.16	1.88	1.79	2.25	-0.04
JUL	1.95	1.85	2.55	1.93	1.82	2.19	-0.03
AUG	1.96	1.55	2.67	1.96	1.87	2.65	0.00
SEP	1.94	1.82	2.58	1.99	1.87	2.27	0.05
OCT	1.93	1.79	2.20	1.97	1.91	2.23	0.04
NOV	1.93	1.79	2.53	2.01	1.93	2.22	0.09
DEC	1.96	1.85	2.23	**2.03**	1.92	**4.83**	0.06

Annual peak

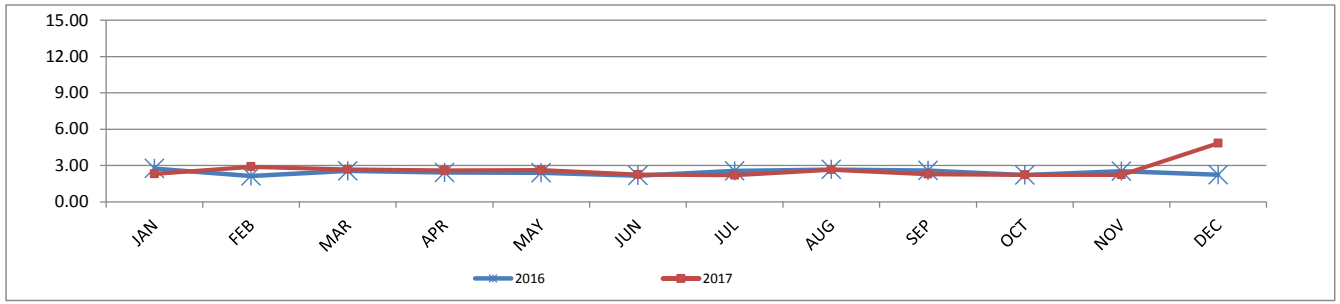
TOTAL HYDROCARBONS (THC) 2017 vs. 2016 Monthly Mean in ppm



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



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



Wind: PRAMP_842
Poll.: PRAMP_842-THC [ppm]
Periodically: 2017/01/01 00:00-2017/12/31 23:59
Type: PollutionRose
Direction: Blowing From (Wind Frequency)
Based On 1 Hr.

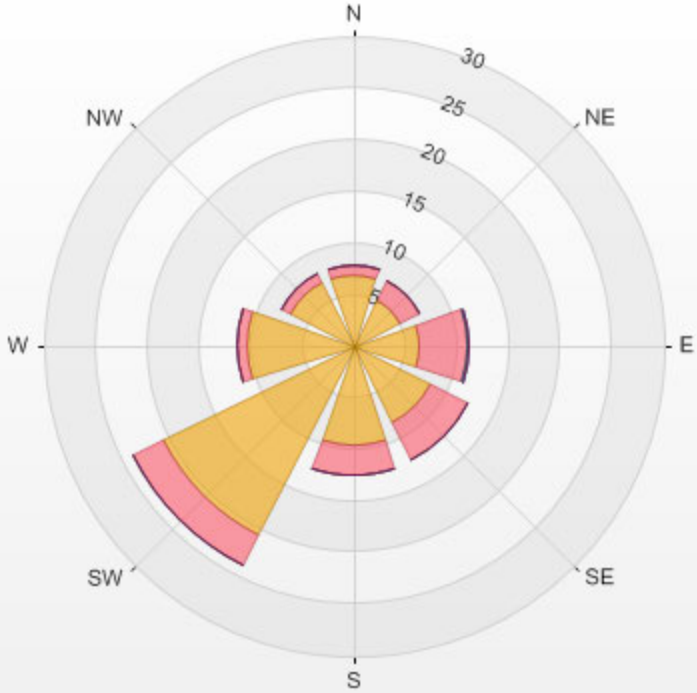
Calm: 5.83%

Calm Avg: 1.98 [ppm]

Direction	0-2	2-3	3-5	5-10	>10.0	Total
N	6.8	1.1	0.0	0.0	0.0	7.9
NE	5.0	2.1	0.0	0.0	0.0	7.2
E	6.4	4.7	0.1	0.0	0.0	11.2
SE	8.2	4.1	0.0	0.0	0.0	12.4
S	9.6	3.0	0.0	0.0	0.0	12.6
SW	20.6	3.3	0.0	0.0	0.0	23.9
W	10.3	1.0	0.0	0.0	0.0	11.3
NW	6.9	0.9	0.0	0.0	0.0	7.8
Summary	73.8	20.3	0.1	0.0	0.0	94.2

%	Icon	Classes (ppm)									
74		0-2	20		2-3	0		3-5	0		5-10	0		>10.0

PRAMP_842 Poll.: PRAMP_842-THC55[ppm] 2017/01/01 00:00 - 2017/12/31 23:59 Calm: 5.83% Calm Poll Avg: 1.98[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	702	99.1	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.94
February	639	100.0	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.88
March	707	100.0	100.0%	0.0%	0.0%	0.0%	-	-	-	-	2.02
April	654	95.6	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.97
May	708	100.0	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.96
June	674	98.6	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.88
July	709	99.9	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.93
August	696	98.1	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.96
September	476	69.4	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.99
October	694	98.0	100.0%	0.0%	0.0%	0.0%	-	-	-	-	1.97
November	668	97.4	100.0%	0.0%	0.0%	0.0%	-	-	-	-	2.01
December	681	96.8	98.5%	1.5%	0.0%	0.0%	-	-	-	-	2.03
Annual	**8008**	**96.1**	**99.9%**	**0.1%**	**0.0%**	**0.0%**					**1.96**

**# of readings excluding calibration hours*

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

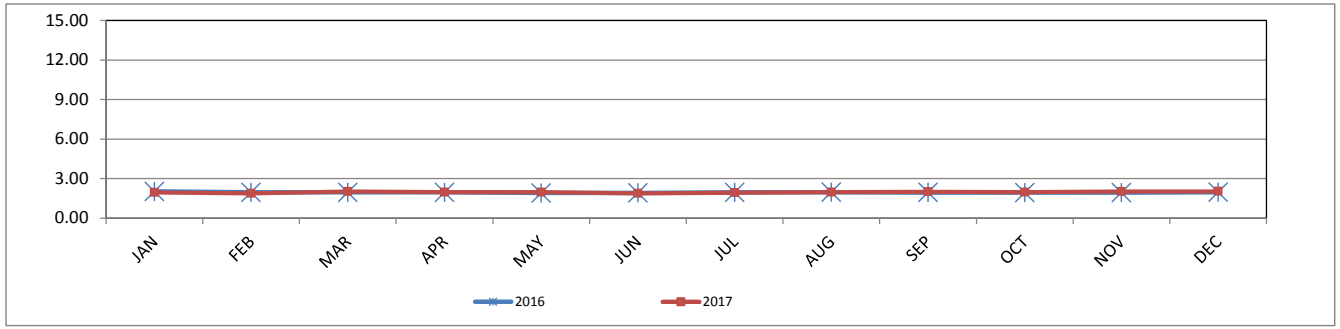
Alberta Ambient Air Quality Objectives Annual Average**	**-**	**ppm**
Annual Average for 2017	**1.96**	**ppm**

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

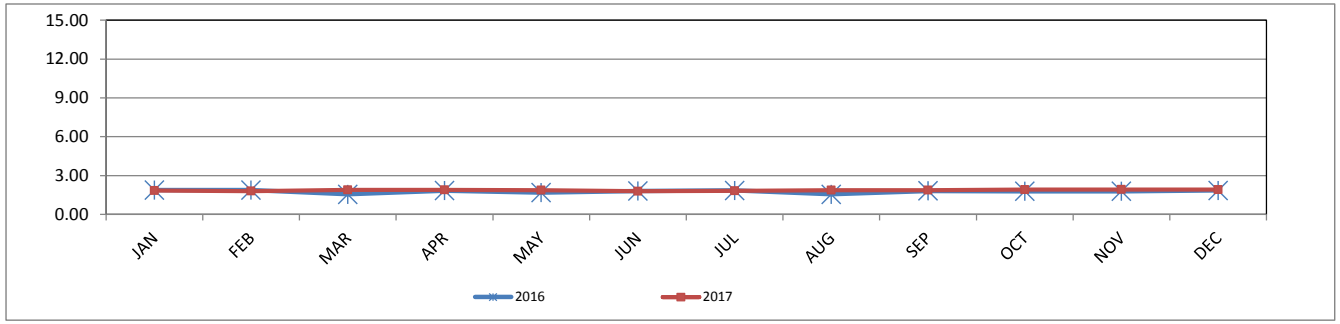
	2016			2017			
MONTH	**MEAN**	**MINIMUM**	**MAXIMUM**	**MEAN**	**MINIMUM**	**MAXIMUM**	**DIFFERENCE**
JAN	**2.02**	1.88	**2.74**	1.94	1.85	2.30	-0.08
FEB	1.95	1.87	2.10	1.88	1.80	2.89	-0.07
MAR	1.95	1.55	2.54	2.02	1.89	2.68	0.07
APR	1.95	1.84	2.40	1.97	1.90	2.58	0.01
MAY	1.90	1.68	2.40	1.96	1.87	2.60	0.06
JUN	1.92	1.80	2.16	1.88	1.79	2.25	-0.04
JUL	1.95	1.85	2.48	1.93	1.82	2.19	-0.03
AUG	1.96	1.55	2.67	1.96	1.87	2.65	0.00
SEP	1.94	1.82	2.58	1.99	1.87	2.27	0.05
OCT	1.93	1.79	2.20	1.97	1.91	2.23	0.04
NOV	1.93	1.79	2.52	2.01	1.93	2.22	0.09
DEC	1.96	1.85	2.23	**2.03**	1.92	**4.83**	0.06

Annual peak

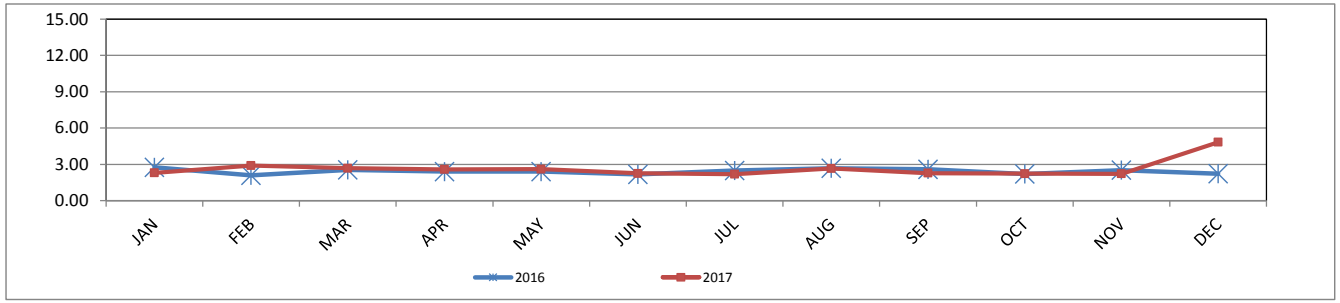
METHANE (CH_4) 2017 vs. 2016 Monthly Mean in ppm



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



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



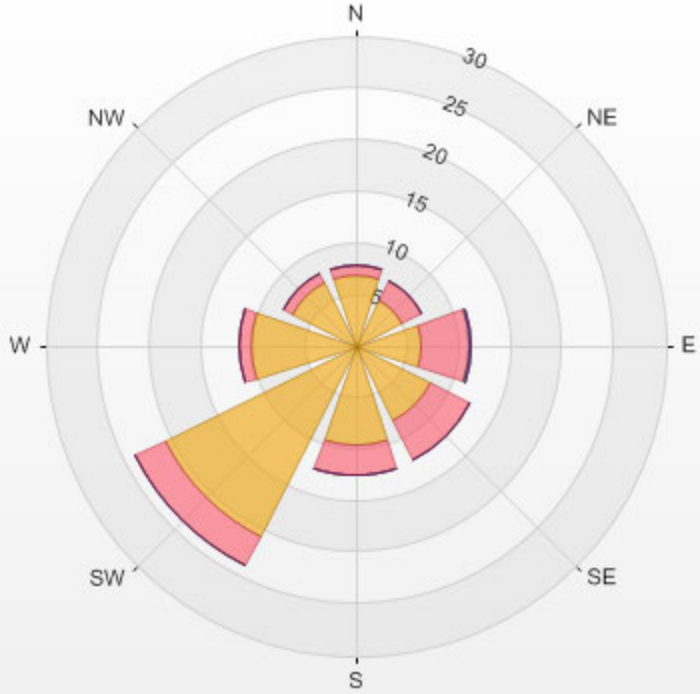
Wind: PRAMP_842
Poll.: PRAMP_842-CH_4 [ppm]
Periodically: 2017/01/01 00:00-2017/12/31 23:59
Type: PollutionRose
Direction: Blowing From (Wind Frequency)
Based On 1 Hr.

Calm: 5.83% Calm Avg: 1.98 [ppm]

Direction	0-2	2-3	3-5	5-10	>10.0	Total
N	6.9	1.0	0.0	0.0	0.0	7.9
NE	5.0	2.2	0.0	0.0	0.0	7.2
E	6.4	4.7	0.1	0.0	0.0	11.2
SE	8.2	4.2	0.0	0.0	0.0	12.4
S	9.7	2.9	0.0	0.0	0.0	12.6
SW	20.6	3.2	0.0	0.0	0.0	23.9
W	10.3	1.1	0.0	0.0	0.0	11.3
NW	6.9	0.9	0.0	0.0	0.0	7.8
Summary	73.9	20.1	0.1	0.0	0.0	94.2

% Icon Classes (ppm)	74 0-2	20 2-3	0 3-5	0 5-10	0 >10.0

PRAMP_842 Poll.: PRAMP_842-CH4[ppm] 2017/01/01 00:00 - 2017/12/31 23:59 Calm: 5.83% Calm Poll Avg: 1.98[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	702	99.1	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	0.00
February	639	100.0	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	0.00
March	707	100.0	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	0.00
April	654	95.6	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	674	98.6	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	0.00
July	709	99.9	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	0.00
August	696	98.1	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	0.00
September	476	69.4	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	0.00
October	694	98.0	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	0.00
November	668	97.4	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	0.00
December	681	96.8	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	0.00
Annual	**8008**	**96.1**	**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*

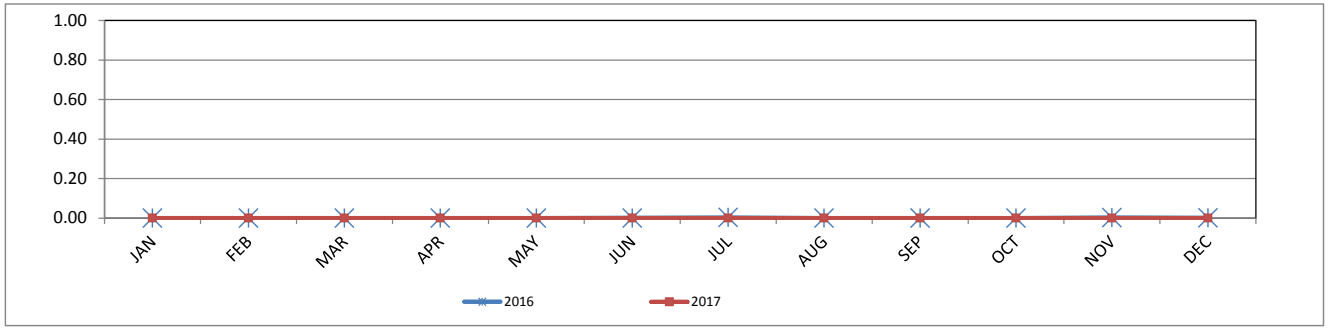
Alberta Ambient Air Quality Objectives Annual Average**	**-**	**ppm**
Annual Average for 2017	**0.00**	**ppm**

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

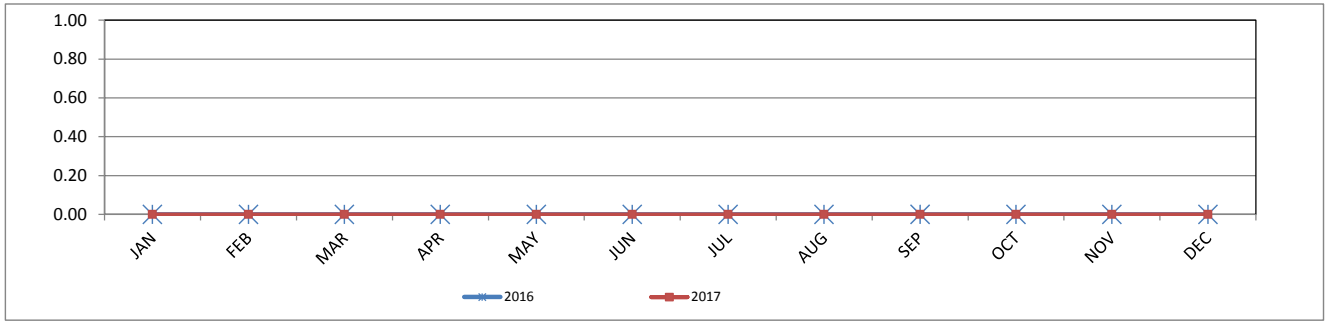
	2016			2017			
MONTH	**MEAN**	**MINIMUM**	**MAXIMUM**	**MEAN**	**MINIMUM**	**MAXIMUM**	**DIFFERENCE**
JAN	**0.00**	0.00	0.00	**0.00**	0.00	0.04	0.00
FEB	0.00	0.00	0.00	0.00	0.00	0.01	0.00
MAR	0.00	0.00	0.00	0.00	0.00	0.01	0.00
APR	0.00	0.00	0.00	0.00	0.00	0.02	0.00
MAY	0.00	0.00	0.03	0.00	0.00	**0.05**	0.00
JUN	0.00	0.00	0.08	0.00	0.00	0.00	0.00
JUL	0.00	0.00	0.10	0.00	0.00	0.00	0.00
AUG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SEP	0.00	0.00	0.01	0.00	0.00	0.00	0.00
OCT	0.00	0.00	0.04	0.00	0.00	0.00	0.00
NOV	0.00	0.00	**0.12**	0.00	0.00	0.02	0.00
DEC	0.00	0.00	0.11	0.00	0.00	0.00	0.00

Annual peak

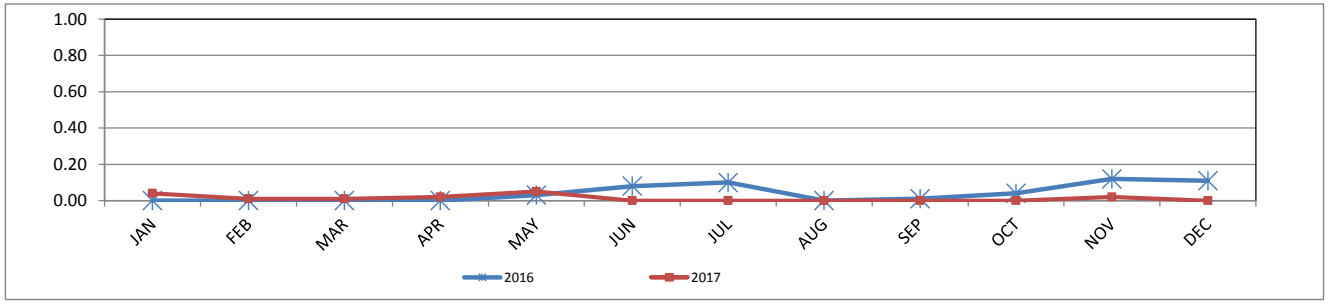
NON-METHANE HYDROCARBONS (NMHC) 2017 vs. 2016 Monthly Mean in ppm



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



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



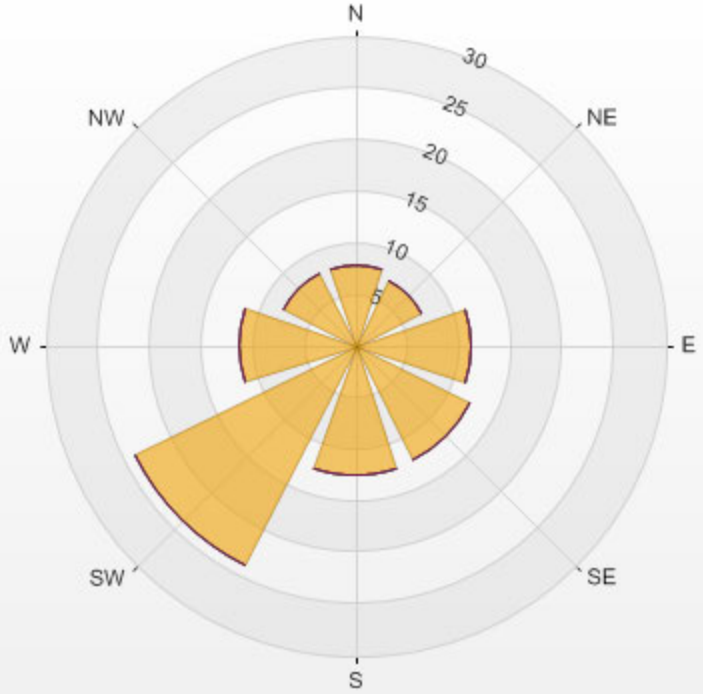
Wind: PRAMP_842
Poll.: PRAMP_842-NMHC [ppm]
Periodically: 2017/01/01 00:00-2017/12/31 23:59
Type: PollutionRose
Direction: Blowing From (Wind Frequency)
Based On 1 Hr.

Calm: 5.83% Calm Avg: 0.00 [ppm]

Direction	0-0.1	0.1-0.3	0.3-1	1-2	>2.0	Total
N	7.9	0.0	0.0	0.0	0.0	7.9
NE	7.2	0.0	0.0	0.0	0.0	7.2
E	11.2	0.0	0.0	0.0	0.0	11.2
SE	12.4	0.0	0.0	0.0	0.0	12.4
S	12.6	0.0	0.0	0.0	0.0	12.6
SW	23.9	0.0	0.0	0.0	0.0	23.9
W	11.3	0.0	0.0	0.0	0.0	11.3
NW	7.8	0.0	0.0	0.0	0.0	7.8
Summary	94.2	0.0	0.0	0.0	0.0	94.2

%	Icon	Classes (ppm)	94	0-0.1	0	0.1-0.3	0	0.3-1	0	1-2	0	>2.0

PRAMP_842 Poll.: PRAMP_842-NMHC[ppm] 2017/01/01 00:00 - 2017/12/31 23:59 Calm: 5.83% 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	4.3	0.5	30.7	20.3
February	672	100.0	3.4	0.2	33.9	26.6
March	744	100.0	1.5	0.2	24.6	14.0
April	720	100.0	2.5	0.1	19.9	14.1
May	744	100.0	2.4	0.4	30.7	13.0
June	685	95.1	2.6	0.4	22.9	12.7
July	714	96.0	5.3	0.0	29.6	17.3
August	713	95.8	5.6	0.2	31.6	17.5
September	720	100.0	3.4	0.5	31.6	17.4
October	712	95.7	5.3	0.2	34.6	20.0
November	720	100.0	1.1	0.4	22.2	12.7
December	744	100.0	6.1	0.0	23.2	16.4
Annual	**8628**	**98.5**	**3.6**	**0.3**	**28.0**	**16.8**

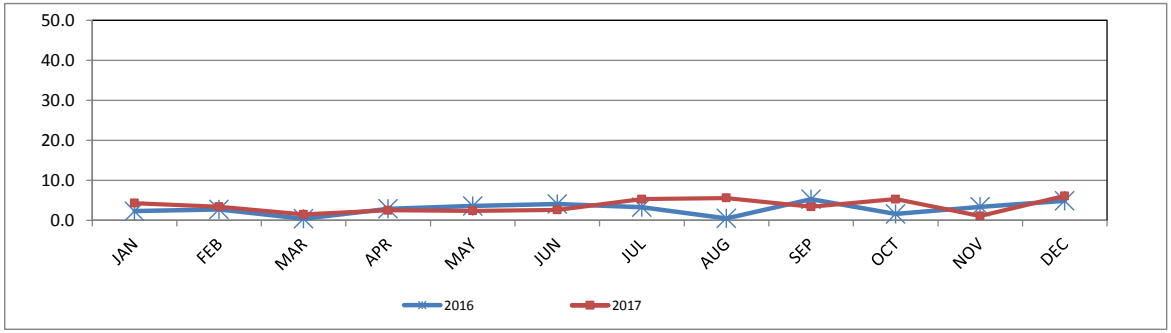
**# of readings excluding calibration hours*

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

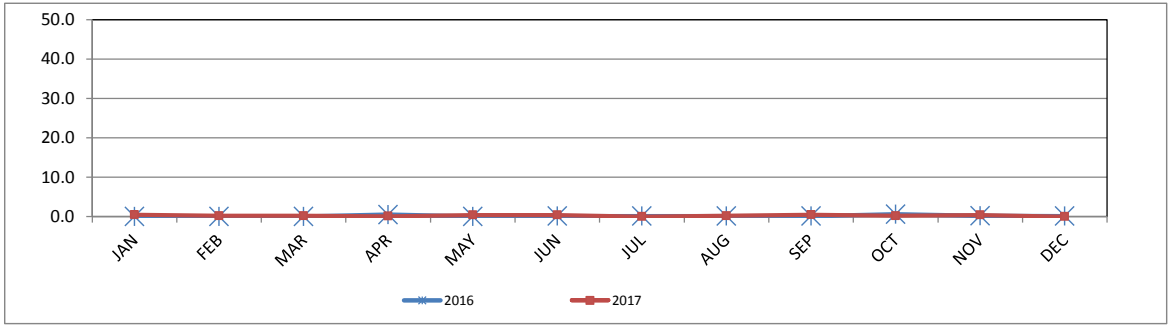
	2016			2017			
MONTH	**MEAN**	**MINIMUM**	**MAXIMUM**	**MEAN**	**MINIMUM**	**MAXIMUM**	**DIFFERENCE**
JAN	2.3	0.0	**33.8**	4.3	0.5	30.7	2.0
FEB	2.7	0.0	29.9	3.4	0.2	33.9	0.7
MAR	0.4	0.0	17.2	1.5	0.2	24.6	1.1
APR	2.9	0.5	30.6	2.5	0.1	19.9	-0.4
MAY	3.6	0.0	27.5	2.4	0.4	30.7	-1.2
JUN	4.1	0.1	33.7	2.6	0.4	22.9	-1.5
JUL	3.3	0.1	27.8	5.3	0.0	29.6	2.0
AUG	0.5	0.1	19.7	5.6	0.2	31.6	5.1
SEP	**5.3**	0.1	24.6	3.4	0.5	31.6	-1.9
OCT	1.6	0.6	16.3	5.3	0.2	**34.6**	3.7
NOV	3.4	0.2	25.3	1.1	0.4	22.2	-2.3
DEC	4.9	0.1	27.7	**6.1**	0.0	23.2	1.2

Annual peak

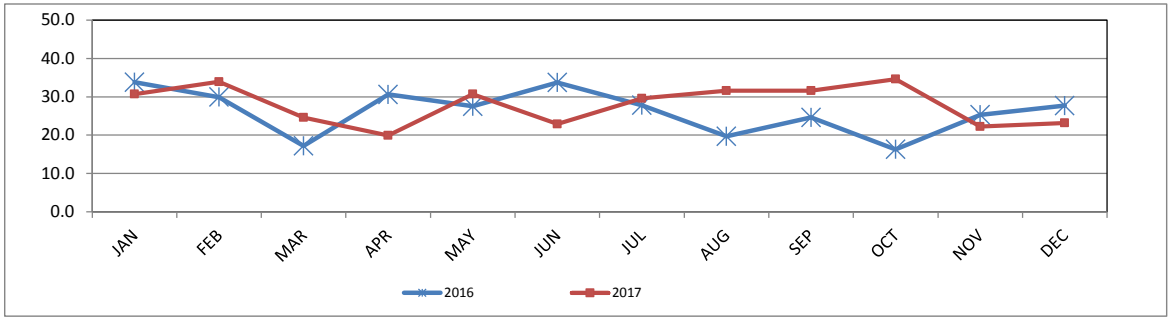
WIND SPEED (WS) 2017 vs. 2016 Monthly Mean in kph



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



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



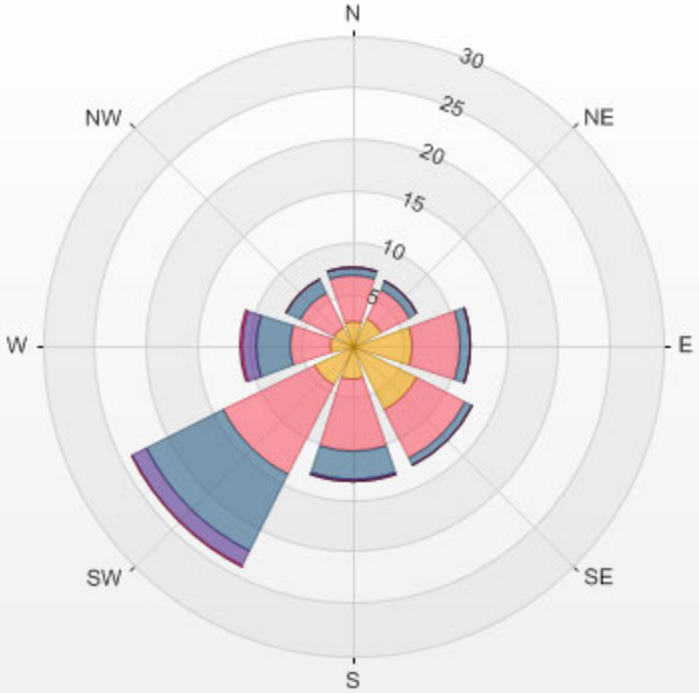
Wind: PRAMP_842
Monitor: WSP [kph]
Periodically: 2017/01/01 00:00-2017/12/31 23:59
Type: WindRose
Direction: Blowing From (Wind Frequency)
Based On 1 Hr.

Calm: 5.71%

Direction	1.8-6.0	6.0-12.0	12.0-20.0	20.0-29.0	29.0-39.0	>39.0	Total
N	2.5	4.3	0.8	0.0	0.0	0.0	7.6
NE	3.1	3.1	0.9	0.0	0.0	0.0	7.0
E	5.8	4.7	1.0	0.0	0.0	0.0	11.4
SE	7.0	5.1	0.8	0.0	0.0	0.0	12.9
S	3.3	6.9	2.7	0.2	0.0	0.0	13.1
SW	4.2	9.8	8.3	1.5	0.1	0.0	24.0
W	2.2	3.9	3.3	1.4	0.1	0.0	10.9
NW	1.9	3.7	1.6	0.1	0.0	0.0	7.3
Summary	30.1	41.5	19.4	3.2	0.2	0.0	94.3

%	Icon	Classes (kph)	30	1.8-6.0	41	6.0-12.0	19	12.0-20.0	3	20.0-29.0	0	29.0-39.0	0	>39.0

PRAMP_842 2017/01/01 00:00 - 2017/12/31 23:59 Calm: 5.71% Calm Wind Avg Speed: 1.13(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	78	42	97	92
February	672	100.0	76	39	97	96
March	744	100.0	66	29	95	79
April	720	100.0	66	18	97	92
May	744	100.0	55	15	96	92
June	719	99.9	60	19	96	83
July	744	100.0	65	20	96	87
August	735	98.8	64	20	95	85
September	720	100.0	70	26	96	86
October	738	99.2	71	15	96	91
November	720	100.0	82	54	96	90
December	744	100.0	73	40	96	92
Annual	**8740**	**99.8**	**69**	**28**	**96**	**89**

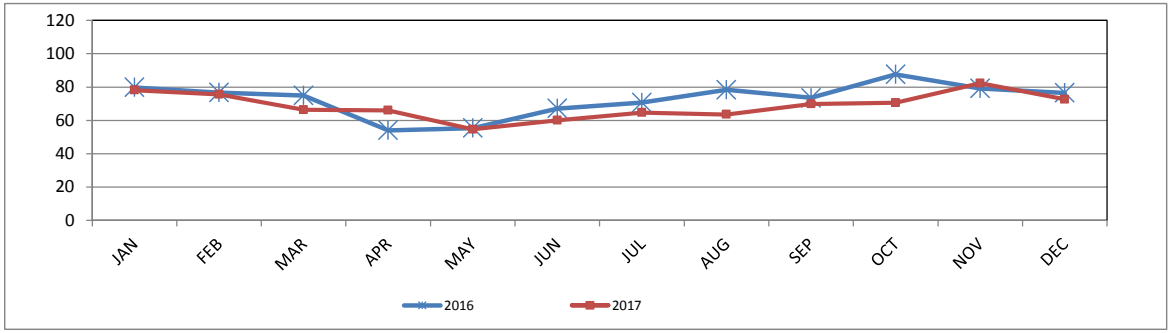
**# of readings excluding calibration hours*

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

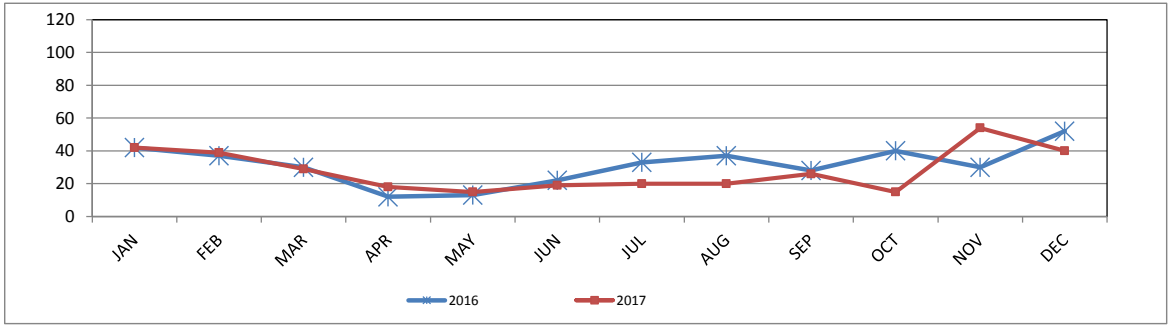
	2016			2017			
MONTH	**MEAN**	**MINIMUM**	**MAXIMUM**	**MEAN**	**MINIMUM**	**MAXIMUM**	**DIFFERENCE**
JAN	80	42	94	78	42	**97**	-2
FEB	77	37	96	76	39	97	-1
MAR	75	30	97	66	29	95	-8
APR	54	12	97	66	18	97	12
MAY	55	13	**98**	55	15	96	-1
JUN	67	22	96	60	19	96	-7
JUL	71	33	96	65	20	96	-6
AUG	78	37	96	64	20	95	-15
SEP	74	28	98	70	26	96	-4
OCT	**88**	40	98	71	15	96	-17
NOV	79	30	97	**82**	54	96	3
DEC	77	52	95	73	40	96	-4

Annual peak

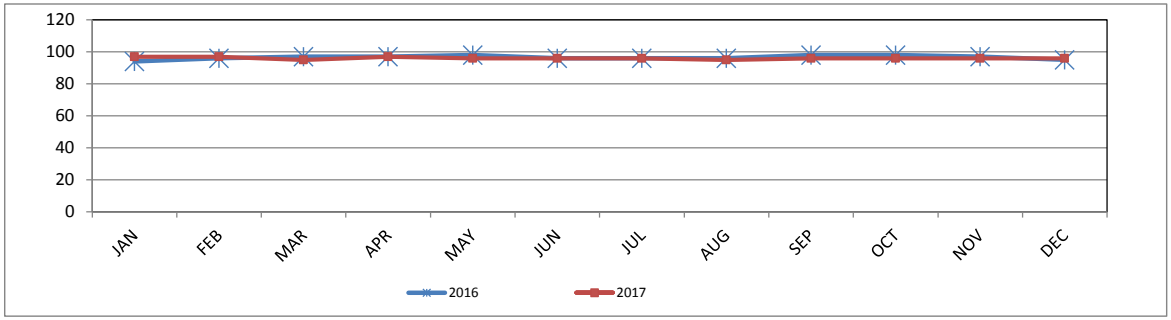
RELATIVE HUMIDITY (RH) 2017 vs. 2016 Monthly Mean in %



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	941	914	960	958
February	672	100.0	938	913	962	961
March	744	100.0	942	924	965	964
April	720	100.0	942	927	956	955
May	744	100.0	941	925	955	953
June	719	99.9	940	928	954	953
July	744	100.0	943	936	957	953
August	735	98.8	943	932	958	957
September	720	100.0	942	928	958	956
October	738	99.2	940	919	960	958
November	720	100.0	940	916	960	958
December	744	100.0	948	923	970	967
Annual	**8740**	**99.8**	**942**	**924**	**960**	**958**

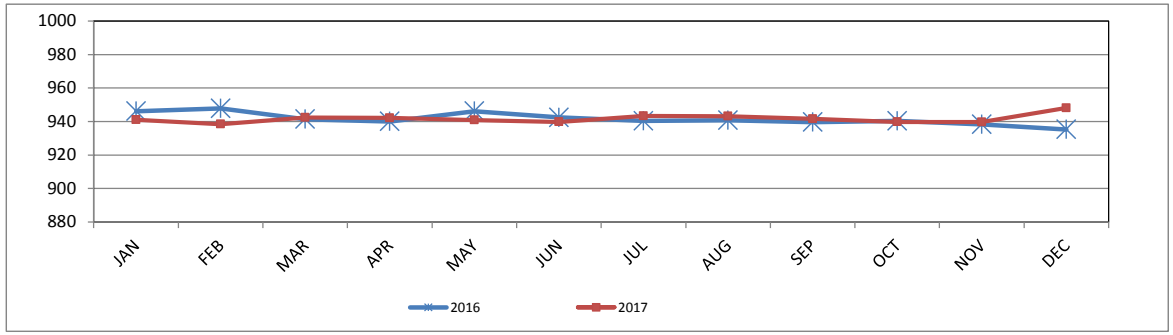
**# of readings excluding calibration hours*

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

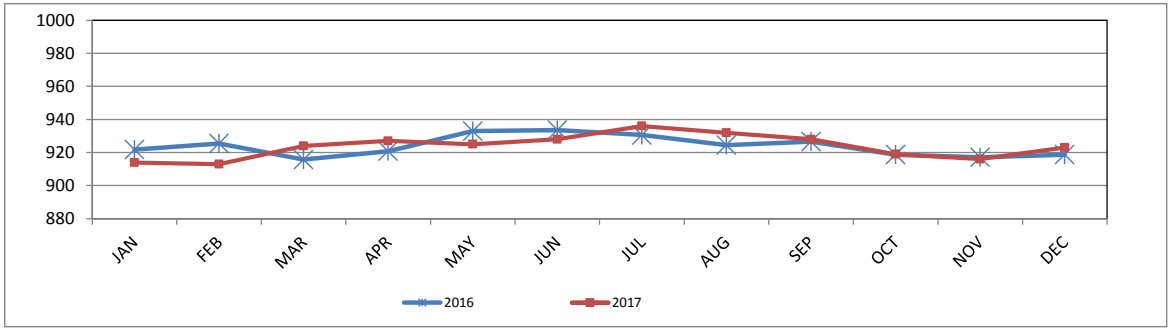
	2016			2017			
MONTH	**MEAN**	**MINIMUM**	**MAXIMUM**	**MEAN**	**MINIMUM**	**MAXIMUM**	**DIFFERENCE**
JAN	946	922	**972**	941	914	960	-5
FEB	**948**	926	963	938	913	962	-9
MAR	941	916	957	942	924	965	1
APR	940	921	954	942	927	956	2
MAY	946	933	957	941	925	955	-5
JUN	942	934	954	940	928	954	-3
JUL	940	931	952	943	936	957	3
AUG	941	924	951	943	932	958	3
SEP	940	927	951	942	928	958	2
OCT	940	919	961	940	919	960	-1
NOV	938	917	956	940	916	960	1
DEC	935	919	955	**948**	923	**970**	13

Annual peak

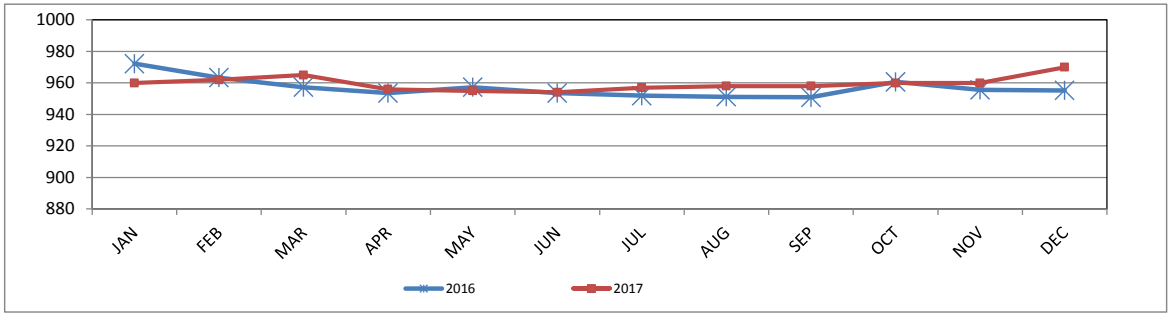
BAROMETRIC PRESSURE (BP) 2017 vs. 2016 Monthly Mean in millibar



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	-8.6	-31.7	8.8	4.0
February	672	100.0	-8.9	-32.2	9.7	5.8
March	744	100.0	-6.4	-28.6	13.1	5.4
April	720	100.0	2.7	-8.4	13.7	6.5
May	744	100.0	12.1	-2.6	27.3	20.4
June	719	99.9	15.1	1.4	27.1	21.4
July	744	100.0	16.7	3.8	30.1	21.0
August	735	98.8	16.2	2.5	31.0	21.8
September	720	100.0	11.1	-4.3	29.0	18.8
October	738	99.2	3.1	-9.2	20.6	12.5
November	720	100.0	-10.7	-24.6	3.5	0.8
December	744	100.0	-10.0	-39.9	5.5	4.4
Annual	**8740**	**99.8**	**2.7**	**-14.5**	**18.3**	**11.9**

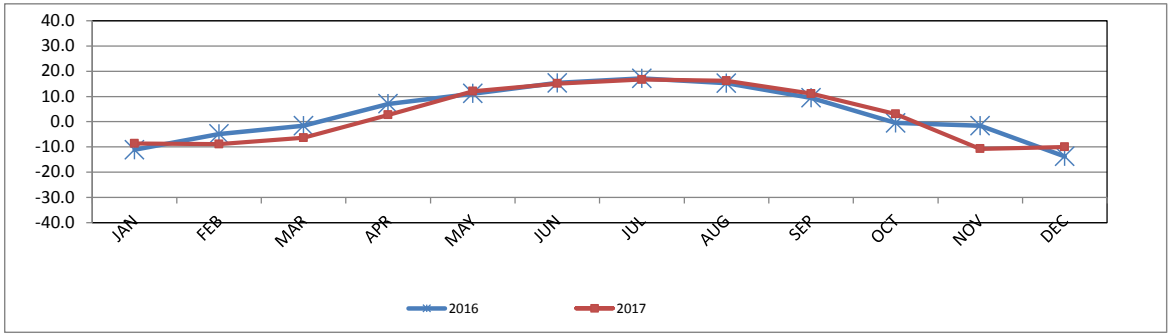
**# of readings excluding calibration hours*

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

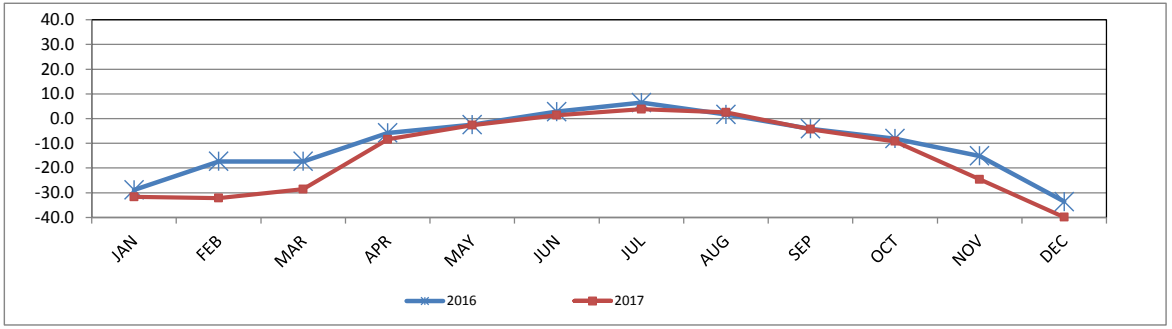
	2016			2017			
MONTH	**MEAN**	**MINIMUM**	**MAXIMUM**	**MEAN**	**MINIMUM**	**MAXIMUM**	**DIFFERENCE**
JAN	-11.2	-28.9	5.4	-8.6	-31.7	8.8	2.5
FEB	-4.9	-17.3	7.7	-8.9	-32.2	9.7	-4.0
MAR	-1.6	-17.3	13.7	-6.4	-28.6	13.1	-4.8
APR	7.1	-5.8	27.8	2.7	-8.4	13.7	-4.4
MAY	11.1	-2.5	**29.1**	12.1	-2.6	27.3	0.9
JUN	15.3	2.8	28.5	15.1	1.4	27.1	-0.2
JUL	**17.1**	6.5	27.9	**16.7**	3.8	30.1	-0.5
AUG	15.2	1.7	26.1	16.2	2.5	**31.0**	1.0
SEP	9.4	-4.1	22.0	11.1	-4.3	29.0	1.7
OCT	-0.5	-8.1	7.8	3.1	-9.2	20.6	3.6
NOV	-1.6	-15.1	18.1	-10.7	-24.6	3.5	-9.1
DEC	-13.8	-33.6	2.3	-10.0	-39.9	5.5	3.8

Annual peak

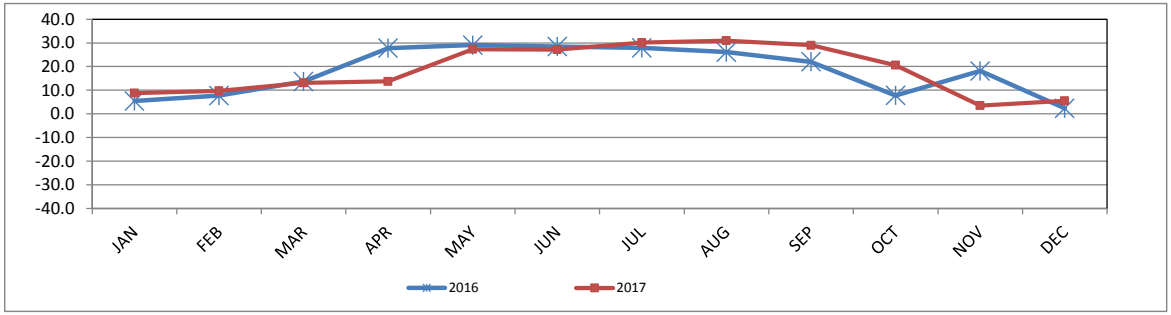
AMBIENT TEMPERATURE (AT) 2017 vs. 2016 Monthly Mean in °C



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	21.2	18.6	22.9	22.3
February	672	100.0	21.3	18.2	25.7	22.7
March	744	100.0	22.2	19.3	24.7	23.3
April	720	100.0	23.1	21.5	25.0	23.6
May	744	100.0	22.5	20.3	31.0	25.4
June	719	99.9	20.6	18.8	23.2	22.5
July	744	100.0	22.8	20.5	38.3	27.8
August	735	98.8	22.7	20.7	24.0	23.2
September	720	100.0	21.9	18.6	25.8	22.8
October	738	99.2	20.6	18.4	23.1	22.1
November	720	100.0	21.5	19.2	23.2	22.7
December	744	100.0	21.3	17.7	24.1	22.7
Annual	**8739**	**99.8**	**21.8**	**19.3**	**25.9**	**23.4**

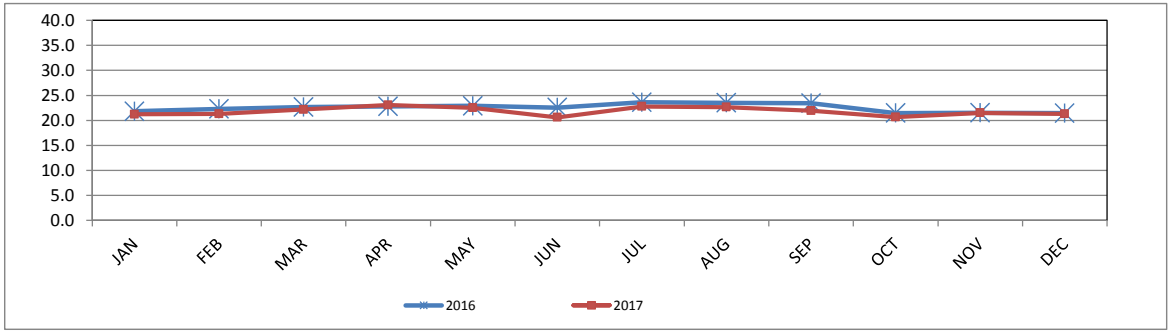
**# of readings excluding calibration hours*

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

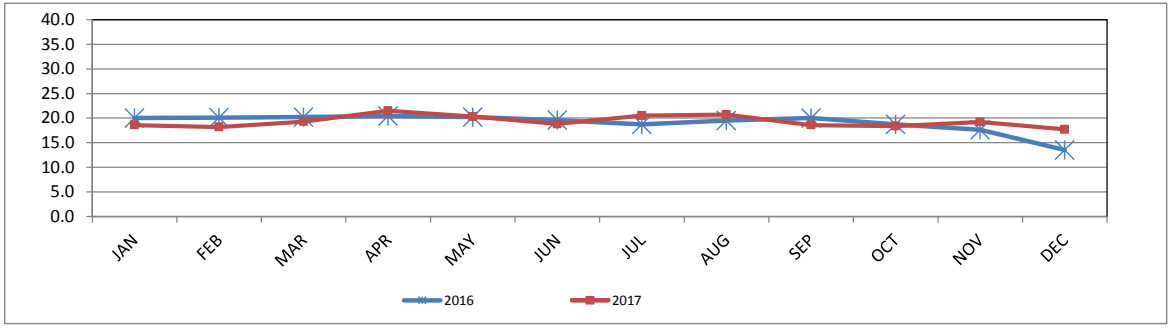
	2016			2017			
MONTH	**MEAN**	**MINIMUM**	**MAXIMUM**	**MEAN**	**MINIMUM**	**MAXIMUM**	**DIFFERENCE**
JAN	21.8	20.0	23.0	21.2	18.6	22.9	-0.6
FEB	22.3	20.1	23.7	21.3	18.2	25.7	-1.0
MAR	22.7	20.2	24.6	22.2	19.3	24.7	-0.5
APR	22.8	20.4	24.8	**23.1**	21.5	25.0	0.3
MAY	22.9	20.2	25.0	22.5	20.3	31.0	-0.4
JUN	22.6	19.6	25.4	20.6	18.8	23.2	-1.9
JUL	**23.6**	18.7	**26.3**	22.8	20.5	**38.3**	-0.8
AUG	23.5	19.5	25.3	22.7	20.7	24.0	-0.9
SEP	23.4	20.0	25.7	21.9	18.6	25.8	-1.5
OCT	21.5	18.7	25.2	20.6	18.4	23.1	-0.8
NOV	21.5	17.6	25.5	21.5	19.2	23.2	0.0
DEC	21.4	13.5	24.0	21.3	17.7	24.1	-0.1

Annual peak

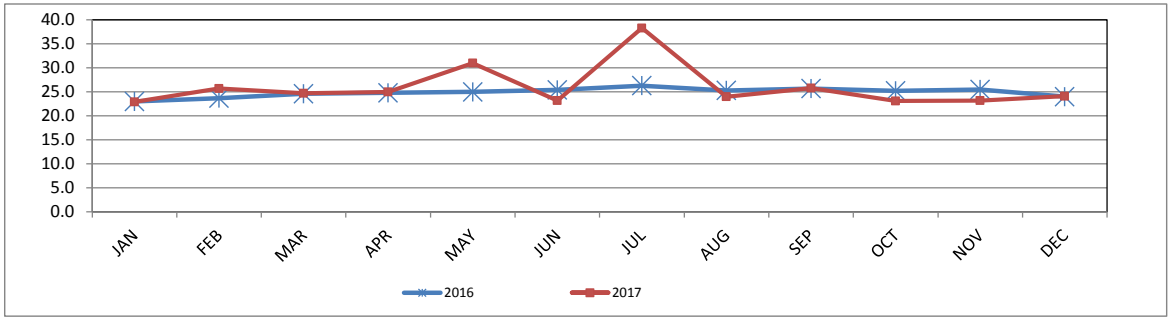
STATION TEMPERATURE (STNTPX) 2017 vs. 2016 Monthly Mean in °C



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



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

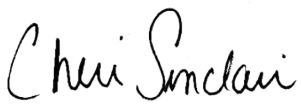


APPENDIX II
REPORT CERTIFICATION FORM

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 842b 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)