



Ambient Air Monitoring Report

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Executive Summary

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Executive Summary

Porcupine Gold Mines is a subsidiary of Goldcorp Canada Ltd., situated in Timmins, Ontario.

In order to monitor potential air quality effects and ensure mitigation efforts are effective, Goldcorp has established an ambient air monitoring network. The data generated are used to assess the air quality where people live, measure compliance with provincial standards, compare changes to air quality over time, provide information about regional background levels of monitored pollutants, inform the public and raise awareness of local air quality.

The ambient air monitoring network has been approved by the Ministry of the Environment and Climate Change (MOECC) and will continue to operate throughout the life of the mining operations. In accordance with MOECC's reporting requirements, this is the Annual Ambient Air Monitoring Report for 2014.

Conclusions:

During 2014 there were:

- a) No exceedances of the continuous NO₂ 24 hour and 1 hour running average Ambient Air Quality Criteria (AAQC) or of the ½ hour running average O. Reg. 419/05 standard.
- b) 10 exceedances of the continuous PM₁₀ 24 hour running average AAQC, 4 at STN72138 (Hollinger Park) and 6 at STN72139 (Hollinger Office).
- c) No exceedances of the non-continuous 24 hour clock TSP, PM₁₀ or suspended metals AAQCs, standards or guidelines.
- d) 8 exceedances of the non-continuous 30 day standard for Total Dustfall, 5 exceedances at STN72143 (Snowmobile Crossing) and 1 each at STN72135 (Extendicare), STN72136 (MRCA) and STN72142 (Aura Lake).
- e) Annual PM₁₀ averages of 8 µg/m³ at STN72135 (Hollinger Ext.), 11 µg/m³ at STN72138 (Hollinger Park), 12 µg/m³ at STN72139 (Hollinger Office) and 8 µg/m³ at STN72140 (Goldmine Tour).
- f) 42 calibrations were conducted on continuous samplers, all of which met criteria.

1.0 Introduction

Porcupine Gold Mines is a subsidiary of Goldcorp Canada Ltd., situated in Timmins, Ontario.

In order to monitor potential air quality effects and ensure mitigation efforts are effective, Goldcorp has established an ambient air monitoring network. The network reports continuous and non-continuous measurements of air quality data at various sites located around Goldcorp's Porcupine mining operations. The data generated are used to assess the air quality where people live, measure compliance with provincial standards, compare changes to air quality over time, provide information about regional background levels of monitored pollutants, inform the public and raise awareness of local air quality.

The ambient air monitoring network has been approved by the Ministry of the Environment and Climate Change (MOECC) and will continue to operate throughout the life of the mining operations. In accordance with MOECC's reporting requirements, this is the Annual Ambient Air Monitoring Report for 2014.

2.0 Goldcorp - Ambient Air Monitoring Network

The ambient air monitoring network consists of a meteorological station and 5 continuous stations that report data for Total Suspended Particulate (TSP), Inhalable Particulate (PM₁₀) and Nitrogen Oxides (NO_x). In addition, there are 6 stations that collect non-continuous data for TSP, PM₁₀, metals, Total Dustfall, passive Sulphur Dioxide (SO₂) and passive Nitrogen Dioxide (NO₂).

2.1 Parameters Monitored

2.1.1 Particulate Matter (PM)

Particulate Matter (PM) consists of airborne particles in solid or liquid form, except pure water, that are microscopic in size. Particulate matter can be classified depending on its size, the MOECC identifies the following sizes of PM:

- 1) **Settleable Particulate Matter (Total Dustfall)** - Dustfall consists of very coarse particulate matter fractions that settle quickly under the influence of gravity.
- 2) **Suspended Particulate Matter (SP or TSP)** - airborne particulate matter with an upper size limit of approximately 44 micro metres (µm) in aerodynamic equivalent diameter.
- 3) **Particulate Matter < 10 microns (PM₁₀)** - airborne particulate matter with a mass median diameter less than 10 µm.
- 4) **Particulate Matter < 2.5 microns (PM_{2.5})** - airborne particulate matter with a mass median diameter less than 2.5 µm.

2.1.2 Metals

A number of trace metals which can cause human health impacts are present in airborne particulate matter. Concentrations of trace metals can be determined in a laboratory by analyzing the particulate matter collected on filters.

2.1.3 Nitrogen Oxides (NO, NO₂, NO_x)

Nitrogen Oxides (NO_x) are usually defined as the sum of Nitric Oxide (NO) and Nitrogen Dioxide (NO₂). NO₂ is a reddish-brown gas with a pungent and irritating odour. It transforms in the air to form gaseous nitric acid and organic nitrates. NO₂ also plays a major role in atmospheric reactions that produce ground-level ozone, a major component of smog.

In the case of air quality assessments, e.g. air quality reports such as the current report, NO₂, not NO_x, is the reference contaminant. NO_x Ambient Air Quality Criteria (AAQC) with 1 hour and 24 hour averaging times should only be compared to monitored NO₂ data.

2.1.4 Sulphur Dioxide (SO₂)

Sulphur Dioxide (SO₂) is a colourless gas that smells like burnt matches. SO₂ belongs to the family of sulphur oxide (SO_x) gases, these gases dissolve easily in water. Sulphur is prevalent in many raw materials. SO_x gases are formed when fuels containing sulphur are burned, when gasoline is extracted from oil or when metals are processed from sulphide ores.

2.2 Sampling Program Methodology

The Goldcorp ambient air monitoring network utilizes various types of sampling equipment. AirPointer® samplers measure continuous TSP, PM₁₀ and Nitrogen Oxides. Hivol, Dustfall and passive samplers are used to measure non-continuous TSP, PM₁₀, metals, Total Dustfall, SO₂ and NO₂ data. Station locations are illustrated in Figure 1. The parameters monitored are listed in Table 1 and station Universal Transverse Mercator (UTM) data are tabulated in Table 2.

- **AirPointer® - Continuous TSP**

TSP data is continuously monitored throughout the year by an Airpointer® system utilizing a Thermo Scientific model ADR1500 Dust Monitor. The ADR1500 utilizes light scattering photometer (nephelometer) technology to measure airborne particulate. The intensity of the light scattered by airborne particles passing through the sensing chamber is linearly proportional to their concentration. AirPointer® TSP measurements cannot be used to report exceedances because the measurement method is not officially designated. The collected TSP data is considered as “indicative” and should be used only for information purposes.

- **AirPointer® - Continuous PM₁₀**

PM₁₀ data is continuously monitored throughout the year by an AirPointer® system utilizing a Thermo Scientific model 5030 SHARP. The 5030 SHARP automatically measures and records airborne particulate concentration levels in micrograms per cubic metre (µg/m³) using a combination of beta attenuation and light scattering technology. This monitor meets U.S. EPA and International Particulate Monitoring Regulations.

- **AirPointer® - Continuous Nitrogen Oxides**

NO, NO₂ and NO_x are continuously monitored throughout the year by an AirPointer® system utilizing a Thermo Scientific model 42i. The model 42i uses chemiluminescence technology to measure the amount of Nitrogen Oxides in the air.

- **Hivol - Non-continuous TSP and PM₁₀**

Non-continuous TSP and PM₁₀ samples are collected every 6 days according to the National Air Pollutant Surveillance (NAPS) schedule. Samples are collected on filter media for a 24 hour period from midnight to midnight. TSP samples are collected with a Tisch model 5170 Hivol sampler. PM₁₀ samples are collected with a Tisch model 6070 Hivol sampler.

Hivol samplers draw ambient air at a constant flow rate in order to collect suspended particulate matter onto a filter. Each filter is weighed before and after exposure to determine the total loading due to collected particulate.

Non-continuous TSP and PM₁₀ Hivol samplers meet US EPA and International Particulate Monitoring Regulations.

- **Hivol - Non-continuous Metals**

TSP Hivol filters are analyzed every 18 days (NAPS schedule) by an accredited laboratory for a specified list of metals. PM₁₀ Hivol filters are analyzed every 30 days. Metal concentrations are determined using Inductively Coupled Plasma Mass Spectrometry (ICP-MS). Results are reported in µg/m³, analyses include; Arsenic (As), Cadmium (Cd), Chromium (Cr), Cobalt (Co), Copper (Cu), Iron (Fe, as Fe₂O₃), Lead (Pb), Magnesium (Mg, as MgO), Manganese (Mn), Nickel (Ni), Selenium (Se), Sulphur (S), Vanadium (V), Zinc (Zn) and Sulphate (SO₄).

- **Non-continuous Total Dustfall**

Containers (Dustfall jars) of a standard size and shape are set up at selected sampling sites so that particulate matter can settle into them for periods of about 30 days. The collected samples are then sent to an accredited laboratory for analyses of both soluble and insoluble portions which are combined to calculate the Total Dustfall. Results are reported as grams per square metre per 30 days (g/m²/30d).

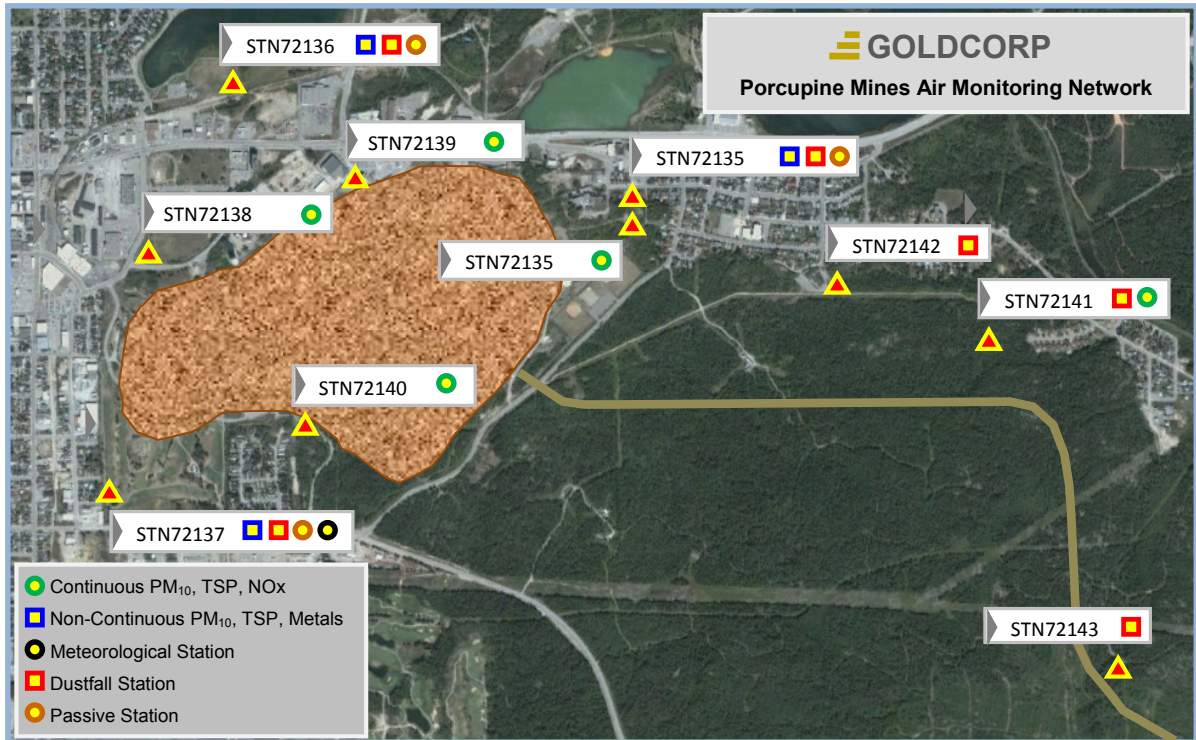
- **Non-continuous Passive SO₂ / NO₂**

Passive sampling utilizes laboratory prepared filter cartridges which are installed at selected sampling sites for exposure to ambient air for periods of about 30 days. After exposure the cartridges are removed and submitted to an accredited laboratory for analysis. The analysis provides an estimate of monthly average spatial concentrations for SO₂ and NO₂. SO₂ analysis is determined by ion chromatography and NO₂ analysis is determined by spectrophotometry.

• **Meteorological Data**

Meteorological data is monitored continuously throughout the year by a 10 metre meteorological station. Parameters monitored include; Wind Speed (WS), Wind Direction (WD), Ambient Temperature (AT), Relative Humidity (RH), Barometric Pressure (BP) and Precipitation (PRECP).

Goldcorp Air Monitoring Network Overview - Figure 1



| | | | | |
|--|----------------|-----------------|-----------------|--|
| Porcupine Gold Mines Ambient Air Monitoring Network | | By : DC | Figure 1 | |
| | True North | Approx. Scale : | 1:14000 | |
| Goldcorp - Porcupine Gold Mines - Timmins, Ontario | Date Revised : | 31 July, 2015 | | |

Parameters Monitored at Each Station - Table 1

| Station Identifier | TSP | HiVol TSP | PM ₁₀ | HiVol PM ₁₀ | NO _x | Metals | Passive SO ₂ | Passive NO ₂ | Total Dustfall | MET |
|--------------------------------|-----|-----------|------------------|------------------------|-----------------|--------|-------------------------|-------------------------|----------------|-----|
| STN72135 - Hollinger Ext. | ✓ | | ✓ | | ✓ | | | | | |
| STN72138 - Hollinger Park | ✓ | | ✓ | | ✓ | | | | | |
| STN72139 - Hollinger Office | ✓ | | ✓ | | ✓ | | | | | |
| STN72140 - Goldmine Tour | ✓ | | ✓ | | ✓ | | | | | |
| STN72141 - Claimpost Trail | ✓ | | ✓ | | ✓ | | | | ✓ | |
| STN72135 - Extendicare | | ✓ | | ✓ | | ✓ | ✓ | ✓ | ✓ | |
| STN72136 - MRCA | | ✓ | | ✓ | | ✓ | ✓ | ✓ | ✓ | |
| STN72137 - Shania Twain | | ✓ | | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ |
| STN72142 - Aura Lake | | | | | | | | | ✓ | |
| STN72143 - Snowmobile Crossing | | | | | | | | | ✓ | |

Note: Claimpost Trail (STN72141) commissioned July 01, 2014.

UTM Station Coordinates - Table 2

| UTM Coordinate Datum | | | | | |
|--------------------------------|---|----------|-----------|------------|------------|
| Station Identifier | | UTM Zone | Easting | Northing | Elevation |
| STN72135 - Hollinger Ext. | ▶ | 17 U | 477685.60 | 5369116.12 | 329 metres |
| STN72138 - Hollinger Park | ▶ | 17 U | 476172.60 | 5368991.69 | 318 metres |
| STN72139 - Hollinger Office | ▶ | 17 U | 476860.57 | 5369232.07 | 326 metres |
| STN72140 - Goldmine Tour | ▶ | 17 U | 476626.00 | 5368461.41 | 324 metres |
| STN72141 - Claimpost Trail | ▶ | 17 U | 478831.56 | 5368717.43 | 319 metres |
| STN72135 - Extendicare | ▶ | 17 U | 477689.82 | 5369180.90 | 327 metres |
| STN72136 - MRCA | ▶ | 17 U | 476416.81 | 5369518.75 | 312 metres |
| STN72137 - Shania Twain | ▶ | 17 U | 476064.20 | 5368291.07 | 314 metres |
| STN72142 - Aura Lake | ▶ | 17 U | 478337.11 | 5368893.25 | 333 metres |
| STN72143 - Snowmobile Crossing | ▶ | 17 U | 479158.24 | 5367586.26 | 323 metres |

2.3 Summary of Network Operations and Enhancements

Air quality data and instrument performance are evaluated daily. Site visits to the non-continuous samplers are conducted weekly and continuous monitoring sites are visited as needed. Monthly data matrices, columnar data, station service logs and data edit records are retained in a historical database. During 2014 there were 42 calibrations on the continuous samplers, all of which met criteria. Details are found in Appendix C.

On July 01, 2014 a fifth continuous AirPointer® station was commissioned at Claimpost Trail. Data from this site has been included in this report.

2.3.1 Continuous Data

Data loggers are programmed to continuously scan the outputs from each of the continuous analyzers and process both five minute and hourly data averages. The data loggers have the capability to store several years' worth of data.

An Envitech Envista Air Resource Manager (ARM) application is used to poll the station data loggers and retrieve the collected data on an hourly basis. The data are then verified, quality assured and archived in a central database. The central database is backed up daily for contingency.

2.3.2 Non-continuous Data

TSP and PM₁₀ samples are collected on filter media on a 6 day NAPS schedule. Gravimetric results (total loading) are calculated and reported for each filter. Metal analyses are conducted on every third TSP filter and every fifth PM₁₀ filter. Filters are removed as soon as possible after exposure and submitted to an accredited laboratory for analysis. Laboratory reports are quality assured and submitted to the MOECC.

Dustfall data is collected using Dustfall jars on a monthly schedule. At the end of each month the exposed jars are retrieved and submitted for analyses.

Passive SO₂ and NO₂ data are collected on passive filter cartridges on a monthly schedule. At the end of each month, exposed cartridges are retrieved and submitted for analyses.

2.3.3 Quality Assurance

Quality assurance measures are implemented to ensure data integrity. The operation, service and maintenance of the stations and sampling equipment are in accordance with the manufacturers' operations manuals and protocols as outlined in the MOECC's 'Operations Manual for Air Quality Monitoring in Ontario', March 2008.

3.0 MOECC - AAQCs, Standards and Guidelines

The MOECC's AAQCs, standards and guidelines are based on the best scientific information available and are set at a level that safeguards human health and the natural environment. The effects considered may be based on health, odour, vegetation, soiling, visibility, corrosion or other effects. The relevant continuous PM₁₀ and Nitrogen Oxides (as NO₂), AAQC and O. Reg 419/05 standards are summarized in Table 3. Non-continuous TSP, PM₁₀, Metals and Total Dustfall AAQCs, standards and guidelines are summarized in Tables 4, 5 and 6. There are no listed AAQCs, standards or guidelines for passive SO₂ / NO₂ monitoring.

Continuous Ambient Air Quality Criteria and Standards - Table 3

| Contaminant Name | Criterion Type | Average Period | Average Type | Value | Units |
|--|----------------|----------------|--------------|-------|-------------------|
| Particulate Matter < 10µm – PM ₁₀ | Interim AAQC | 24 Hr | Running | 50 | µg/m ³ |
| Nitrogen Dioxide – NO ₂ | AAQC | 24 Hr | Running | 100 | ppb |
| Nitrogen Dioxide – NO ₂ | AAQC | 1 Hr | Running | 200 | ppb |
| Nitrogen Dioxide – NO ₂ | Standard | ½ Hr | Running | 250 | ppb |

Non-continuous TSP Ambient Air Quality Criteria and Standards - Table 4

| Contaminant Name | Criterion Type | Average Period | Average Type | Value | Units |
|------------------|----------------|----------------|--------------|-------|-------------------|
| TSP | AAQC | 24 Hr | Clock | 120 | µg/m ³ |
| Arsenic (As) | AAQC | 24 Hr | Clock | 0.3 | µg/m ³ |
| Cadmium (Cd) | AAQC | 24 Hr | Clock | 0.025 | µg/m ³ |
| Chromium (Cr) | AAQC | 24 Hr | Clock | 0.5 | µg/m ³ |
| Cobalt (Co) | AAQC | 24 Hr | Clock | 0.1 | µg/m ³ |
| Copper (Cu) | AAQC | 24 Hr | Clock | 50 | µg/m ³ |
| Iron (Fe) | AAQC | 24 Hr | Clock | 25 | µg/m ³ |
| Lead (Pb) | AAQC | 24 Hr | Clock | 0.5 | µg/m ³ |
| Magnesium (Mg) | AAQC | 24 Hr | Clock | 120 | µg/m ³ |
| Manganese (Mn) | AAQC | 24 Hr | Clock | 0.4 | µg/m ³ |
| Nickel (Ni) | AAQC | 24 Hr | Clock | 0.2 | µg/m ³ |
| Selenium (Se) | AAQC | 24 Hr | Clock | 10 | µg/m ³ |
| Vanadium (V) | AAQC | 24 Hr | Clock | 2 | µg/m ³ |
| Zinc (Zn) | AAQC | 24 Hr | Clock | 120 | µg/m ³ |

Non-continuous TSP Ambient Air Quality Criteria and Standards - Table 4 (cont.)

| Contaminant Name | Criterion Type | Average Period | Average Type | Value | Units |
|------------------|----------------|----------------|--------------|-------|-------------------|
| Arsenic (As) | Standard | 24 Hr | Clock | 0.025 | µg/m ³ |
| Copper (Cu) | Standard | 24 Hr | Clock | 50 | µg/m ³ |
| Iron (Fe) | Standard | 24 Hr | Clock | 25 | µg/m ³ |
| Lead (Pb) | Standard | 24 Hr | Clock | 0.5 | µg/m ³ |
| Magnesium (Mg) | Standard | 24 Hr | Clock | 120 | µg/m ³ |
| Nickel (Ni) | Standard | 24 Hr | Clock | 2 | µg/m ³ |
| Vanadium (V) | Standard | 24 Hr | Clock | 2 | µg/m ³ |
| Zinc (Zn) | Standard | 24 Hr | Clock | 120 | µg/m ³ |
| Arsenic (As) | Guideline | 24 Hr | Clock | 0.3 | µg/m ³ |
| Chromium (Cr) | Guideline | 24 Hr | Clock | 1.5 | µg/m ³ |
| Cobalt (Co) | Guideline | 24 Hr | Clock | 0.1 | µg/m ³ |
| Manganese (Mn) | Guideline | 24 Hr | Clock | 2.5 | µg/m ³ |
| Selenium (Se) | Guideline | 24 Hr | Clock | 10 | µg/m ³ |

Non-continuous PM₁₀ Ambient Air Quality Criteria - Table 5

| Contaminant Name | Criterion Type | Average Period | Average Type | Value | Units |
|------------------|----------------|----------------|--------------|-------|-------------------|
| PM ₁₀ | Interim AAQC | 24 Hr | Clock | 50 | µg/m ³ |
| Manganese (Mn) | AAQC | 24 Hr | Clock | 0.2 | µg/m ³ |
| Nickel (Ni) | AAQC | 24 Hr | Clock | 0.1 | µg/m ³ |

Non-continuous Total Dustfall Standard - Table 6

| Contaminant Name | Criterion Type | Average Period | Average Type | Value | Units |
|------------------|----------------|----------------|--------------|-------|-----------------------|
| Total Dustfall | Standard | 30 days | Clock | 7.0 | g/m ² /30d |

4.0 Continuous Data Statistics

The continuous data statistics have been summarized in the accompanying tables and include:

- Maximum 24 hour running averages
- Maximum 1 hour running averages
- Number of exceedances > 24 hour running average
- Number of valid clock hours
- Monthly and annual arithmetic means
- Annual geometric means (TSP only)
- Overall percent valid data
- Number of exceedances > 1 hour running average (NO₂ only)
- Maximum ½ hour running averages (NO₂ only)
- Number of exceedances > ½ hour running average (NO₂ only)

STN72135 PM₁₀ Data Statistics Summary - Table 7

| STN72135 | Max 24 Hr Running Avg | Events > 24 Hr AAQC | Valid Clock Hours | Monthly Mean | Percent Valid Data |
|-----------------|---|-------------------------------|-------------------------------|---|-----------------------------|
| Month | PM₁₀ µg/m ³ | PM₁₀ No. | PM₁₀ Hrs | PM₁₀ µg/m ³ | PM₁₀ % |
| January | 12 | 0 | 744 | 5 | 100.0 |
| February | 19 | 0 | 672 | 7 | 100.0 |
| March | 12 | 0 | 744 | 6 | 100.0 |
| April | 21 | 0 | 717 | 8 | 99.6 |
| May | 30 | 0 | 733 | 9 | 98.5 |
| June | 38 | 0 | 719 | 13 | 99.9 |
| July | 43 | 0 | 744 | 15 | 100.0 |
| August | 27 | 0 | 743 | 10 | 99.9 |
| September | 29 | 0 | 712 | 10 | 98.9 |
| October | 15 | 0 | 728 | 6 | 97.8 |
| November | 23 | 0 | 707 | 7 | 98.2 |
| December | 12 | 0 | 740 | 5 | 99.5 |
| Totals | | 0 | 8703 | | |
| Annual Mean | | | | 8 | 99.4 |

STN72138 PM₁₀ Data Statistics Summary - Table 8

| STN72138 | Max 24 Hr Running Avg | Events > 24 Hr AAQC | Valid Clock Hours | Monthly Mean | Percent Valid Data |
|-----------------|---------------------------------------|-------------------------|-------------------------|---------------------------------------|-----------------------|
| Month | PM ₁₀ µg/m ³ | PM ₁₀ No. | PM ₁₀ Hrs | PM ₁₀ µg/m ³ | PM ₁₀ % |
| January | 12 | 0 | 744 | 5 | 100.0 |
| February | 23 | 0 | 672 | 7 | 100.0 |
| March | 18 | 0 | 744 | 8 | 100.0 |
| April | 69 | 2 | 694 | 16 | 96.4 |
| May | 56 | 2 | 733 | 18 | 98.5 |
| June | 46 | 0 | 719 | 16 | 99.9 |
| July | 28 | 0 | 742 | 13 | 99.7 |
| August | 33 | 0 | 743 | 13 | 99.9 |
| September | 22 | 0 | 712 | 11 | 98.9 |
| October | 16 | 0 | 682 | 7 | 91.7 |
| November | 29 | 0 | 682 | 10 | 94.7 |
| December | 30 | 0 | 743 | 7 | 99.9 |
| Totals | | 4 | 8610 | | |
| Annual Mean | | | | 11 | 98.3 |

STN72139 PM₁₀ Data Statistics Summary - Table 9

| STN72139 | Max 24 Hr Running Avg | Events > 24 Hr AAQC | Valid Clock Hours | Monthly Mean | Percent Valid Data |
|-----------------|---------------------------------------|-------------------------|-------------------------|---------------------------------------|-----------------------|
| Month | PM ₁₀ µg/m ³ | PM ₁₀ No. | PM ₁₀ Hrs | PM ₁₀ µg/m ³ | PM ₁₀ % |
| January | 14 | 0 | 744 | 7 | 100.0 |
| February | 27 | 0 | 672 | 10 | 100.0 |
| March | 27 | 0 | 744 | 8 | 100.0 |
| April | 30 | 0 | 717 | 11 | 99.6 |
| May | 109 | 5 | 733 | 24 | 98.5 |
| June | 58 | 1 | 718 | 17 | 99.7 |
| July | 39 | 0 | 744 | 15 | 100.0 |
| August | 36 | 0 | 743 | 14 | 99.9 |
| September | 31 | 0 | 710 | 13 | 98.6 |
| October | 19 | 0 | 726 | 7 | 97.6 |
| November | 28 | 0 | 697 | 11 | 96.8 |
| December | 15 | 0 | 738 | 8 | 99.2 |
| Totals | | 6 | 8686 | | |
| Annual Mean | | | | 12 | 99.2 |

STN72140 PM₁₀ Data Statistics Summary - Table 10

| STN72140 | Max 24 Hr Running Avg | Events > 24 Hr AAQC | Valid Clock Hours | Monthly Mean | Percent Valid Data |
|-----------------|---------------------------------------|-------------------------|-------------------------|---------------------------------------|-----------------------|
| Month | PM ₁₀ µg/m ³ | PM ₁₀ No. | PM ₁₀ Hrs | PM ₁₀ µg/m ³ | PM ₁₀ % |
| January | 10 | 0 | 744 | 5 | 100.0 |
| February | 17 | 0 | 672 | 7 | 100.0 |
| March | 12 | 0 | 744 | 6 | 100.0 |
| April | 22 | 0 | 717 | 9 | 99.6 |
| May | 25 | 0 | 733 | 10 | 98.5 |
| June | 29 | 0 | 719 | 13 | 99.9 |
| July | 25 | 0 | 702 | 9 | 94.4 |
| August | 24 | 0 | 743 | 10 | 99.9 |
| September | 22 | 0 | 710 | 9 | 98.6 |
| October | 16 | 0 | 729 | 5 | 98.0 |
| November | 18 | 0 | 705 | 7 | 97.9 |
| December | 22 | 0 | 743 | 7 | 99.9 |
| Totals | | 0 | 8661 | | |
| Annual Mean | | | | 8 | 98.9 |

STN72141 PM₁₀ Data Statistics Summary - Table 11

| STN72141 | Max 24 Hr Running Avg | Events > 24 Hr AAQC | Valid Clock Hours | Monthly Mean | Percent Valid Data |
|-----------------|---------------------------------------|-------------------------|-------------------------|---------------------------------------|-----------------------|
| Month | PM ₁₀ µg/m ³ | PM ₁₀ No. | PM ₁₀ Hrs | PM ₁₀ µg/m ³ | PM ₁₀ % |
| January | n/a | n/a | n/a | n/a | n/a |
| February | n/a | n/a | n/a | n/a | n/a |
| March | n/a | n/a | n/a | n/a | n/a |
| April | n/a | n/a | n/a | n/a | n/a |
| May | n/a | n/a | n/a | n/a | n/a |
| June | n/a | n/a | n/a | n/a | n/a |
| July | 26 | 0 | 744 | 8 | 99.6 |
| August | 36 | 0 | 743 | 13 | 99.9 |
| September | 18 | 0 | 710 | 8 | 99.2 |
| October | 37 | 0 | 724 | 7 | 97.3 |
| November | 33 | 0 | 705 | 9 | 97.9 |
| December | 15 | 0 | 743 | 6 | 99.9 |
| Totals | | 0 | 4369 | | |
| Annual Mean | | | | ins* | 99.0 |

n/a – not available, station commissioned on July 01, 2014.

ins* – insufficient data to calculate mean

STN72135 NO₂ Data Statistics Summary - Table 12

| STN72135 | Max 24 Hr Running Avg | Max 1 Hr Running Avg | Max ½ Hr Running Avg | Events > 24 Hr AAQC | Events > 1 Hr AAQC | Events > ½ Hr O. Reg 419/05 | Valid Clock Hours | Monthly Mean | Percent Valid Data |
|-----------------|-----------------------|----------------------|----------------------|---------------------|--------------------|-----------------------------|-------------------|-----------------|--------------------|
| Month | NO ₂ | NO ₂ | NO ₂ | NO ₂ | NO ₂ | NO ₂ | NO ₂ | NO ₂ | NO ₂ |
| | ppb | ppb | ppb | No. | No. | No. | Hrs | ppb | % |
| January | 10 | 34 | 40 | 0 | 0 | 0 | 744 | 4 | 100.0 |
| February | 12 | 36 | 41 | 0 | 0 | 0 | 672 | 4 | 100.0 |
| March | 9 | 27 | 31 | 0 | 0 | 0 | 744 | 3 | 100.0 |
| April | 5 | 30 | 36 | 0 | 0 | 0 | 720 | 2 | 100.0 |
| May | 6 | 38 | 49 | 0 | 0 | 0 | 744 | 2 | 100.0 |
| June | 9 | 74 | 83 | 0 | 0 | 0 | 718 | 2 | 99.7 |
| July | 5 | 20 | 24 | 0 | 0 | 0 | 744 | 2 | 100.0 |
| August | 4 | 19 | 20 | 0 | 0 | 0 | 743 | 1 | 99.9 |
| September | 7 | 32 | 35 | 0 | 0 | 0 | 720 | 2 | 100.0 |
| October | 5 | 18 | 19 | 0 | 0 | 0 | 743 | 2 | 99.9 |
| November | 7 | 35 | 35 | 0 | 0 | 0 | 720 | 3 | 100.0 |
| December | 16 | 37 | 42 | 0 | 0 | 0 | 743 | 4 | 99.9 |
| Totals | | | | 0 | 0 | 0 | 8755 | | |
| Annual Mean | | | | | | | | 3 | 99.9 |

STN72138 NO₂ Data Statistics Summary - Table 13

| STN72138 | Max 24 Hr Running Avg | Max 1 Hr Running Avg | Max ½ Hr Running Avg | Events > 24 Hr AAQC | Events > 1 Hr AAQC | Events > ½ Hr O. Reg 419/05 | Valid Clock Hours | Monthly Mean | Percent Valid Data |
|-----------------|-----------------------|----------------------|----------------------|---------------------|--------------------|-----------------------------|-------------------|-----------------|--------------------|
| Month | NO ₂ | NO ₂ | NO ₂ | NO ₂ | NO ₂ | NO ₂ | NO ₂ | NO ₂ | NO ₂ |
| | ppb | ppb | ppb | No. | No. | No. | Hrs | ppb | % |
| January | 13 | 35 | 36 | 0 | 0 | 0 | 744 | 5 | 100.0 |
| February | 20 | 42 | 45 | 0 | 0 | 0 | 672 | 6 | 100.0 |
| March | 13 | 39 | 43 | 0 | 0 | 0 | 744 | 6 | 100.0 |
| April | 10 | 26 | 36 | 0 | 0 | 0 | 720 | 3 | 100.0 |
| May | 5 | 27 | 29 | 0 | 0 | 0 | 744 | 2 | 100.0 |
| June | 3 | 12 | 19 | 0 | 0 | 0 | 719 | 1 | 99.9 |
| July | 5 | 20 | 22 | 0 | 0 | 0 | 742 | 1 | 99.7 |
| August | 4 | 14 | 17 | 0 | 0 | 0 | 743 | 2 | 99.9 |
| September | 4 | 13 | 18 | 0 | 0 | 0 | 720 | 2 | 100.0 |
| October | 10 | 25 | 28 | 0 | 0 | 0 | 742 | 2 | 99.7 |
| November | 9 | 36 | 39 | 0 | 0 | 0 | 720 | 5 | 100.0 |
| December | 21 | 42 | 45 | 0 | 0 | 0 | 742 | 6 | 99.7 |
| Totals | | | | 0 | 0 | 0 | 8752 | | |
| Annual Mean | | | | | | | | 3 | 99.9 |

STN72139 NO₂ Data Statistics Summary - Table 14

| STN72139 | Max 24 Hr Running Avg | Max 1 Hr Running Avg | Max ½ Hr Running Avg | Events > 24 Hr AAQC | Events > 1 Hr AAQC | Events > ½ Hr O. Reg 419/05 | Valid Clock Hours | Monthly Mean | Percent Valid Data |
|-----------------|------------------------|------------------------|------------------------|------------------------|------------------------|-----------------------------|------------------------|------------------------|----------------------|
| Month | NO ₂ ppb | NO ₂ ppb | NO ₂ ppb | NO ₂ No. | NO ₂ No. | NO ₂ No. | NO ₂ Hrs | NO ₂ ppb | NO ₂ % |
| January | 11 | 30 | 32 | 0 | 0 | 0 | 385 | ins* | 51.7 |
| February | 15 | 30 | 34 | 0 | 0 | 0 | 672 | 5 | 100.0 |
| March | 9 | 31 | 37 | 0 | 0 | 0 | 744 | 5 | 100.0 |
| April | 7 | 25 | 27 | 0 | 0 | 0 | 720 | 3 | 100.0 |
| May | 6 | 25 | 30 | 0 | 0 | 0 | 744 | 3 | 100.0 |
| June | 6 | 21 | 28 | 0 | 0 | 0 | 719 | 3 | 99.9 |
| July | 6 | 26 | 30 | 0 | 0 | 0 | 706 | 2 | 100.0 |
| August | 4 | 14 | 18 | 0 | 0 | 0 | 743 | 2 | 99.9 |
| September | 5 | 25 | 28 | 0 | 0 | 0 | 709 | 2 | 100.0 |
| October | 10 | 24 | 27 | 0 | 0 | 0 | 743 | 3 | 99.9 |
| November | 10 | 35 | 38 | 0 | 0 | 0 | 720 | 5 | 100.0 |
| December | 18 | 35 | 36 | 0 | 0 | 0 | 741 | 6 | 99.6 |
| Totals | | | | 0 | 0 | 0 | 8346 | | |
| Annual Mean | | | | | | | | 4 | 95.9 |

ins* - insufficient data to calculate mean.

STN72140 NO₂ Data Statistics Summary - Table 15

| STN72140 | Max 24 Hr Running Avg | Max 1 Hr Running Avg | Max ½ Hr Running Avg | Events > 24 Hr AAQC | Events > 1 Hr AAQC | Events > ½ Hr O. Reg 419/05 | Valid Clock Hours | Monthly Mean | Percent Valid Data |
|-----------------|------------------------|------------------------|------------------------|------------------------|------------------------|-----------------------------|------------------------|------------------------|----------------------|
| Month | NO ₂ ppb | NO ₂ ppb | NO ₂ ppb | NO ₂ No. | NO ₂ No. | NO ₂ No. | NO ₂ Hrs | NO ₂ ppb | NO ₂ % |
| January | 9 | 31 | 31 | 0 | 0 | 0 | 744 | 4 | 100.0 |
| February | 12 | 35 | 39 | 0 | 0 | 0 | 672 | 4 | 100.0 |
| March | 8 | 34 | 34 | 0 | 0 | 0 | 744 | 4 | 100.0 |
| April | 6 | 16 | 20 | 0 | 0 | 0 | 717 | 2 | 99.6 |
| May | 4 | 18 | 19 | 0 | 0 | 0 | 744 | 1 | 100.0 |
| June | 4 | 16 | 18 | 0 | 0 | 0 | 719 | 1 | 99.9 |
| July | 2 | 9 | 11 | 0 | 0 | 0 | 744 | 1 | 94.9 |
| August | 4 | 15 | 18 | 0 | 0 | 0 | 742 | 1 | 99.9 |
| September | 5 | 12 | 14 | 0 | 0 | 0 | 699 | 1 | 98.5 |
| October | 6 | 20 | 23 | 0 | 0 | 0 | 740 | 2 | 99.5 |
| November | 10 | 29 | 30 | 0 | 0 | 0 | 717 | 4 | 99.6 |
| December | 15 | 41 | 42 | 0 | 0 | 0 | 744 | 5 | 100.0 |
| Totals | | | | 0 | 0 | 0 | 8726 | | |
| Annual Mean | | | | | | | | 2 | 99.3 |

STN72141 NO₂ Data Statistics Summary - Table 16

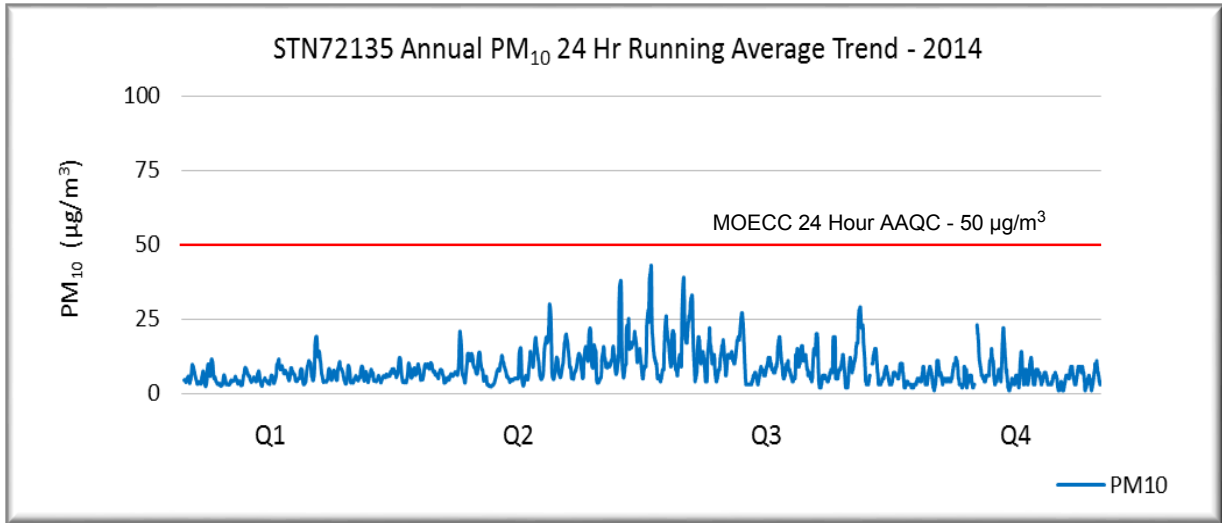
| STN72141 | Max 24 Hr Running Avg | Max 1 Hr Running Avg | Max ½ Hr Running Avg | Events > 24 Hr AAQC | Events > 1 Hr AAQC | Events > ½ Hr O. Reg 419/05 | Valid Clock Hours | Monthly Mean | Percent Valid Data |
|-----------------|-----------------------|----------------------|----------------------|---------------------|--------------------|-----------------------------|-------------------|-----------------|--------------------|
| Month | NO ₂ | NO ₂ | NO ₂ | NO ₂ | NO ₂ | NO ₂ | NO ₂ | NO ₂ | NO ₂ |
| | ppb | ppb | ppb | No. | No. | No. | Hrs | ppb | % |
| January | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| February | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| March | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| April | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| May | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| June | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| July | 2 | 12 | 13 | 0 | 0 | 0 | 744 | 1 | 100.0 |
| August | 2 | 10 | 13 | 0 | 0 | 0 | 742 | 1 | 99.7 |
| September | 2 | 13 | 19 | 0 | 0 | 0 | 699 | 1 | 97.1 |
| October | 3 | 13 | 15 | 0 | 0 | 0 | 677 | 1 | 91.0 |
| November | 5 | 25 | 26 | 0 | 0 | 0 | 719 | 1 | 99.9 |
| December | 5 | 12 | 12 | 0 | 0 | 0 | 744 | 1 | 100.0 |
| Totals | | | | 0 | 0 | 0 | 4325 | | |
| Annual Mean | | | | | | | | ins* | 98.0 |

n/a – not available, station commissioned on July 01, 2014.

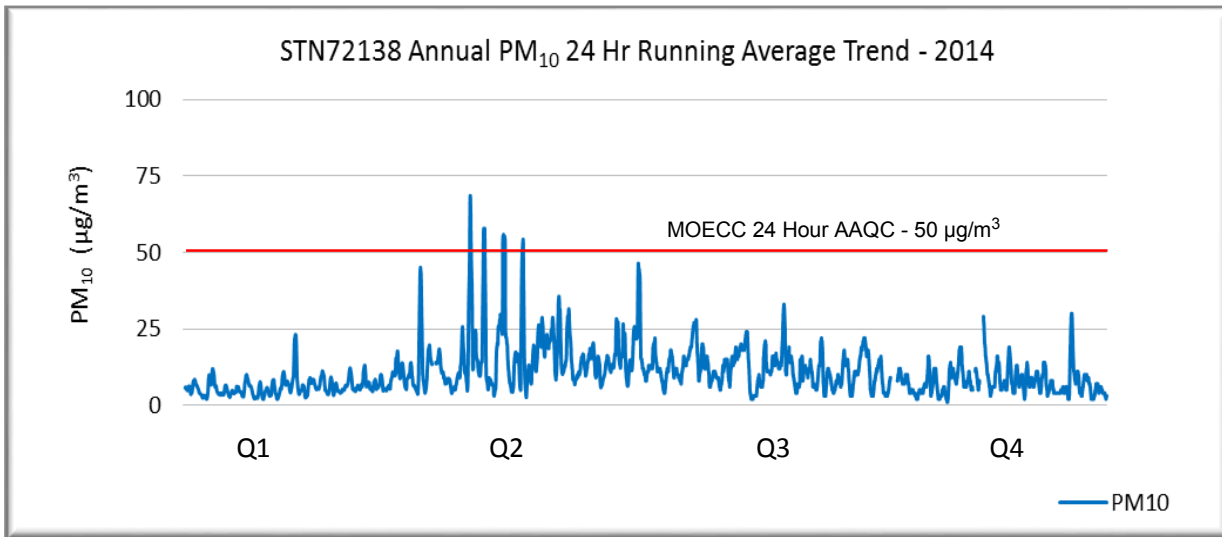
ins* - insufficient data to calculate mean.

4.1 Continuous PM₁₀ 24 Hr Running Average Trends

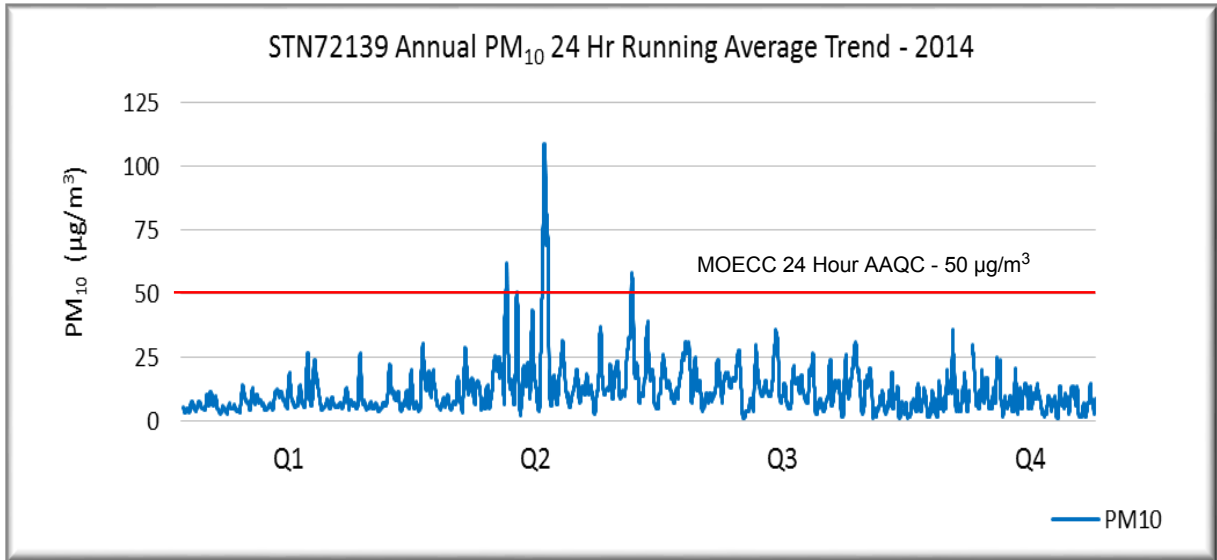
STN72135 PM₁₀ 24 Hr Running Average Trend - Figure 2



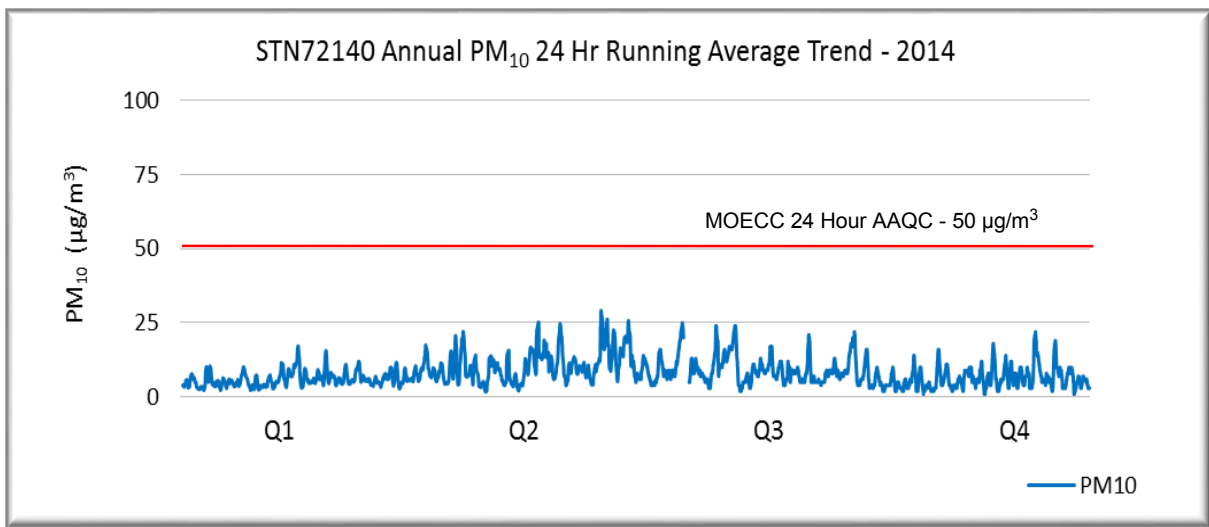
STN72138 PM₁₀ 24 Hr Running Average Trend - Figure 3



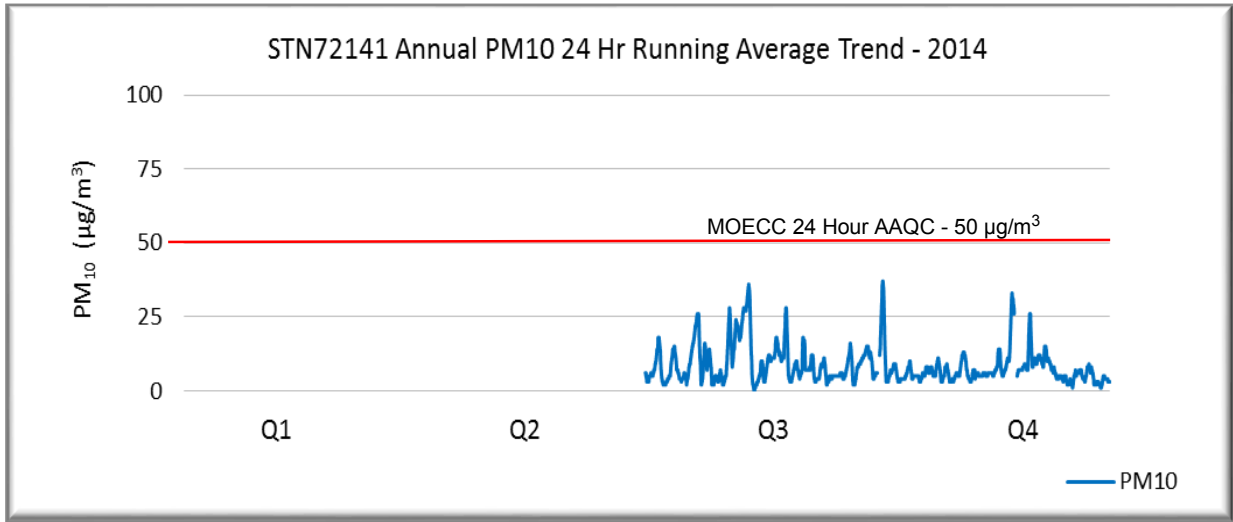
STN72139 PM₁₀ 24 Hr Running Average Trend - Figure 4



STN72140 PM₁₀ 24 Hr Running Average Trend - Figure 5



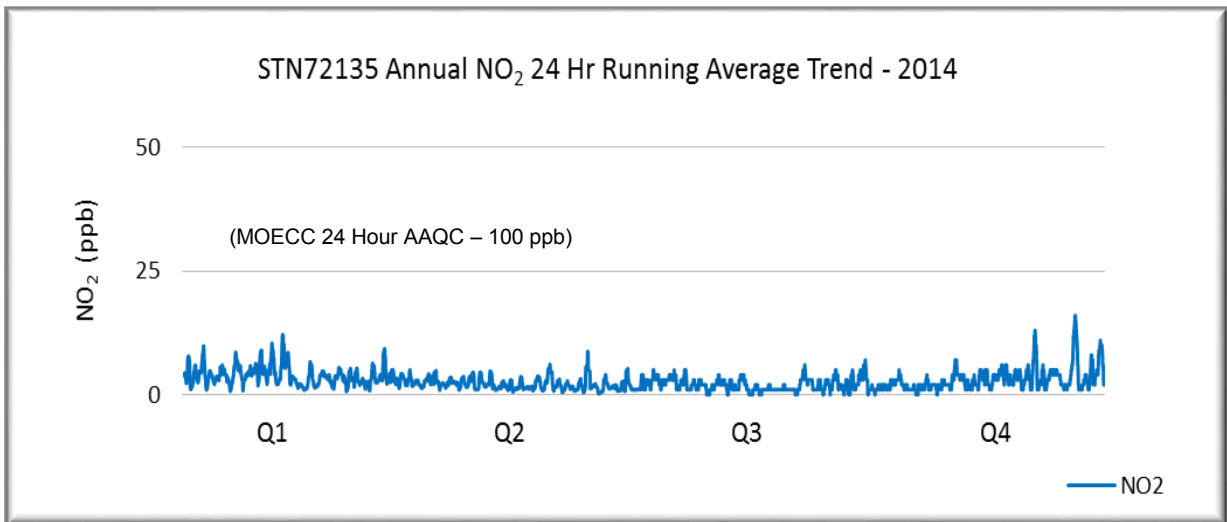
STN72141 PM₁₀ 24 Hr Running Average Trend - Figure 6



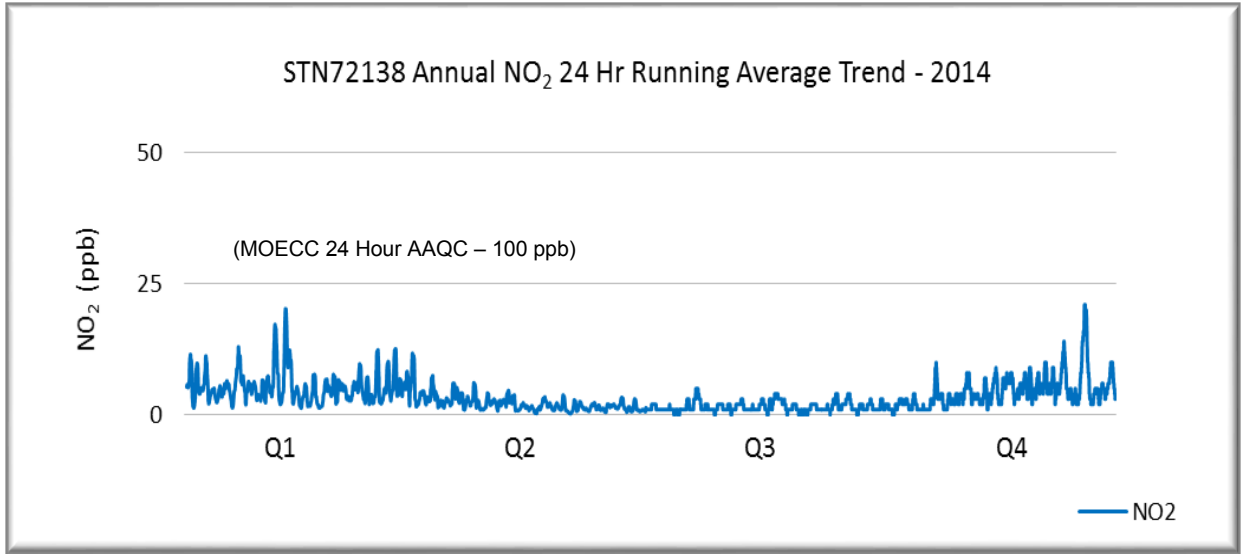
Note: Claimpost Trail (STN72141) commissioned July 01, 2014.

4.2 Continuous NO₂ 24 Hr Running Average Trends

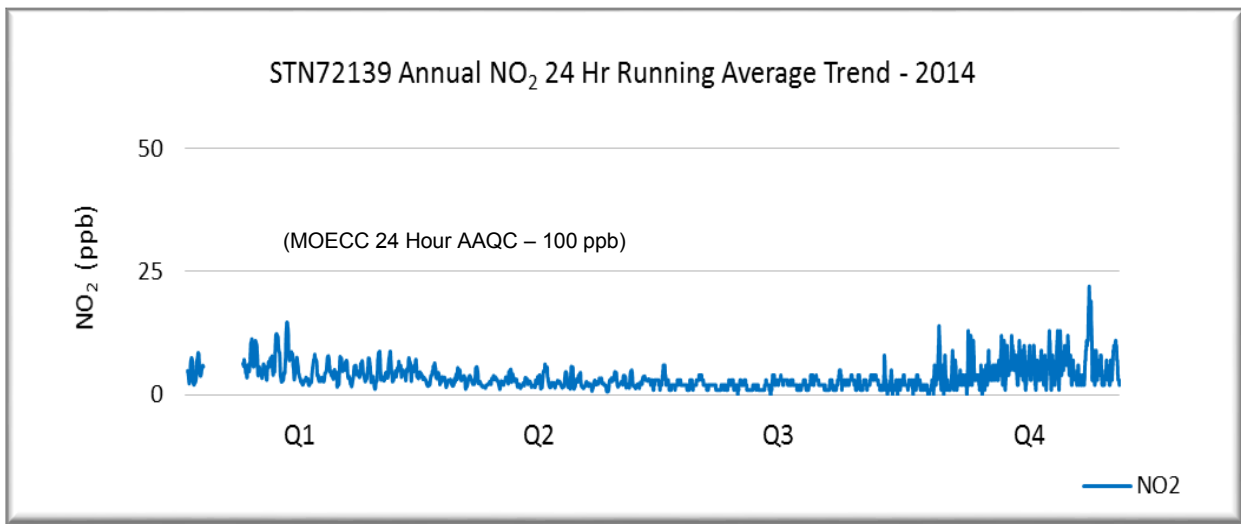
STN72135 NO₂ 24 Hr Running Average Trend - Figure 7



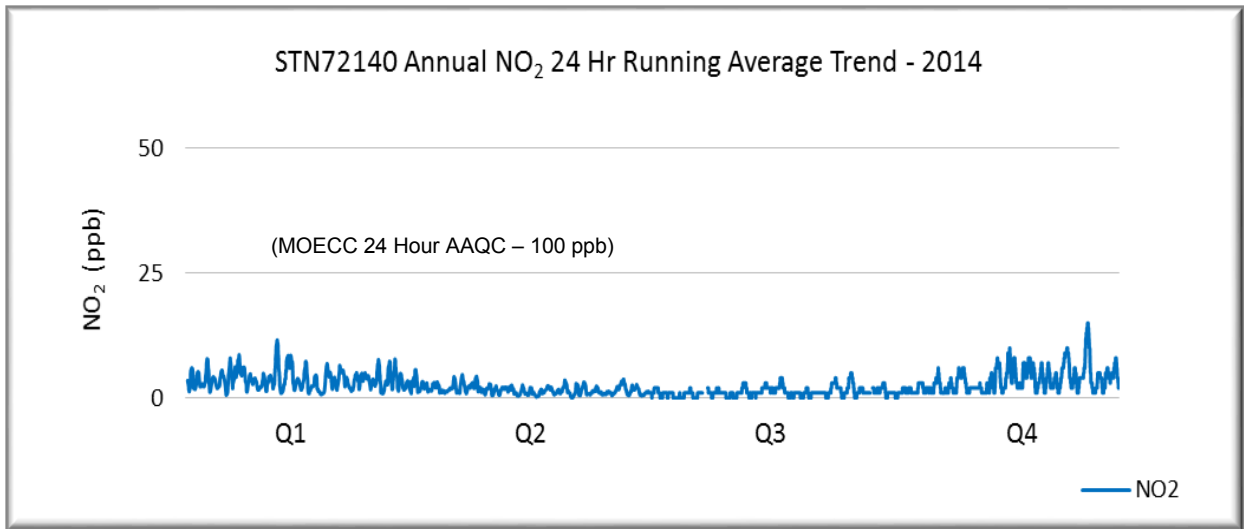
STN72138 NO₂ 24 Hr Running Average Trend - Figure 8



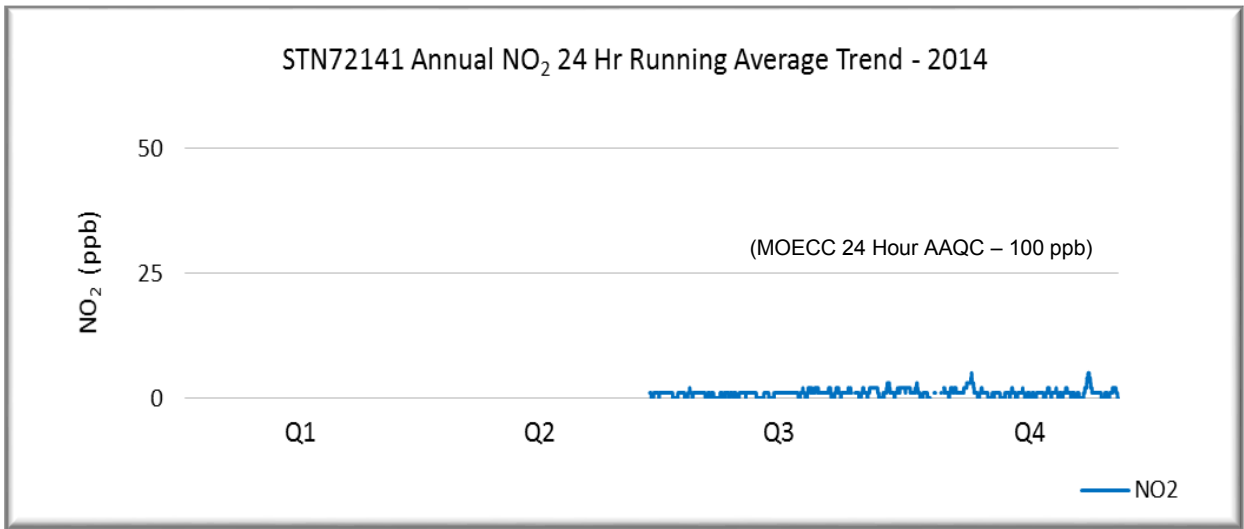
STN72139 NO₂ 24 Hr Running Average Trend - Figure 9



STN72140 NO₂ 24 Hr Running Average Trend - Figure 10



STN72141 NO₂ 24 Hr Running Average Trend - Figure 11



Note: Claimpost Trail (STN72141) commissioned July 01, 2014.

5.0 Non-continuous Data Statistics

Non-continuous TSP, PM₁₀ and metal data statistics have been summarized in Tables 17 and 18 and include:

- Parameter Reportable Detection Limit (RDL)
- Maximum 24 hour clock value
- Average 24 hour arithmetic mean

Geometric means and additional information on non-continuous data can be found in Appendix B.

For statistic trending and as per MOECC guidelines, non-detect parameters are reported as half of the Reportable Detection Limit for all non-continuous parameters.

Non-continuous TSP Data Summary - Table 17

| Station | | STN72135 Extendicare | | STN72136 MRCA | | STN72137 Shania Twain | |
|-----------|--------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|
| Parameter | RDL µg/m ³ | Annual Max µg/m ³ | Annual Avg µg/m ³ | Annual Max µg/m ³ | Annual Avg µg/m ³ | Annual Max µg/m ³ | Annual Avg µg/m ³ |
| TSP | 3 | 94 | 24 | 84 | 27 | 95 | 24 |
| Arsenic | 0.0037 | 0.0050 | 0.0020 | 0.0019 | 0.0019 | 0.0019 | 0.0019 |
| Cadmium | 0.0012 | 0.0006 | 0.0006 | 0.0006 | 0.0006 | 0.0006 | 0.0006 |
| Chromium | 0.0031 | 0.0092 | 0.0026 | 0.0049 | 0.0022 | 0.0095 | 0.0025 |
| Cobalt | 0.0012 | 0.0023 | 0.0007 | 0.0006 | 0.0006 | 0.0014 | 0.0006 |
| Copper | 0.0031 | 0.1630 | 0.0652 | 0.0897 | 0.0494 | 0.0661 | 0.0309 |
| Iron | 0.0310 | 3.4300 | 0.8091 | 2.2594 | 0.6863 | 2.7000 | 0.6776 |
| Lead | 0.0018 | 0.0073 | 0.0017 | 0.0047 | 0.0018 | 0.0040 | 0.0019 |
| Magnesium | 0.0310 | 1.1500 | 0.3005 | 0.6880 | 0.2977 | 1.4000 | 0.2885 |
| Manganese | 0.00061 | 0.0715 | 0.0161 | 0.0388 | 0.0119 | 0.0484 | 0.0113 |
| Nickel | 0.0018 | 0.0069 | 0.0018 | 0.0040 | 0.0019 | 0.0068 | 0.0019 |
| Selenium | 0.0061 | 0.0031 | 0.0031 | 0.0031 | 0.0031 | 0.0031 | 0.0031 |
| Sulphur | 0.0150 | 1.8800 | 0.4274 | 2.0100 | 0.4561 | 1.8900 | 0.4267 |
| Vanadium | 0.0031 | 0.0052 | 0.0018 | 0.0016 | 0.0016 | 0.0052 | 0.0017 |
| Zinc | 0.0031 | 0.0357 | 0.0184 | 0.0610 | 0.0214 | 0.1330 | 0.0239 |
| Sulphate | 0.05 | 5.64 | 1.28 | 6.03 | 1.43 | 5.67 | 1.28 |

Non-continuous PM₁₀ Data Summary - Table 18

| Station | | STN72135 Extendicare | | STN72136 MRCA | | STN72137 Shania Twain | |
|------------------|--------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|
| Parameter | RDL µg/m ³ | Annual Max µg/m ³ | Annual Avg µg/m ³ | Annual Max µg/m ³ | Annual Avg µg/m ³ | Annual Max µg/m ³ | Annual Avg µg/m ³ |
| PM ₁₀ | 3 | 42 | 13 | 44 | 15 | 39 | 15 |
| Arsenic | 0.0037 | 0.0019 | 0.0019 | 0.0019 | 0.0019 | 0.0019 | 0.0019 |
| Cadmium | 0.0012 | 0.0006 | 0.0006 | 0.0006 | 0.0006 | 0.0006 | 0.0006 |
| Chromium | 0.0031 | 0.0055 | 0.0019 | 0.0042 | 0.0019 | 0.0033 | 0.0017 |
| Cobalt | 0.0012 | 0.0006 | 0.0006 | 0.0006 | 0.0006 | 0.0006 | 0.0006 |
| Copper | 0.0031 | 0.0527 | 0.0217 | 0.0651 | 0.0199 | 0.0392 | 0.0171 |
| Iron | 0.0310 | 1.4500 | 0.3430 | 1.0300 | 0.3465 | 0.7640 | 0.3390 |
| Lead | 0.0018 | 0.0040 | 0.0015 | 0.0050 | 0.0019 | 0.0089 | 0.0024 |
| Magnesium | 0.0310 | 0.5200 | 0.1325 | 0.4530 | 0.1610 | 0.3630 | 0.1427 |
| Manganese | 0.00061 | 0.0311 | 0.0072 | 0.0235 | 0.0071 | 0.0170 | 0.0063 |
| Nickel | 0.0018 | 0.0033 | 0.0011 | 0.0029 | 0.0012 | 0.0037 | 0.0013 |
| Selenium | 0.0061 | 0.0031 | 0.0031 | 0.0031 | 0.0031 | 0.0031 | 0.0031 |
| Sulphur | 0.0150 | 1.1700 | 0.3052 | 1.1000 | 0.3503 | 1.1500 | 0.3434 |
| Vanadium | 0.0031 | 0.0016 | 0.0016 | 0.0016 | 0.0016 | 0.0016 | 0.0016 |
| Zinc | 0.0031 | 0.0240 | 0.0102 | 0.0376 | 0.0148 | 0.2450 | 0.0309 |
| Sulphate | 0.05 | 3.52 | 0.92 | 3.3 | 1.05 | 3.46 | 1.03 |

Non-continuous Total Dustfall and Passive SO₂ / NO₂ data statistics have been summarized in Tables 19 and 20.

Non-continuous Total Dustfall Data Summary - Table 19

| Month | STN72135 Extendicare | STN72136 MRCA | STN72137 Shania Twain | STN72141 Claimpost | STN72142 Aura Lake | STN72143 Snowmobile Crossing |
|-----------|-------------------------|-----------------------|--------------------------|-----------------------|-----------------------|------------------------------------|
| | g/m ² /30d | g/m ² /30d | g/m ² /30d | g/m ² /30d | g/m ² /30d | g/m ² /30d |
| January | 0.57 | 0.45 | 0.39 | 0.73 | 0.59 | 0.47 |
| February | 1.30 | 0.70 | 0.60 | 0.60 | 0.49 | 0.77 |
| March | 0.94 | 1.10 | 0.42 | 1.50 | 0.45 | 3.90 |
| April | 1.80 | 0.92 | 0.99 | 4.30 | 1.10 | 2.50 |
| May | 1.70 | 1.70 | 2.70 | 3.80 | 2.20 | 7.60 |
| June | 4.60 | 6.40 | 3.60 | 2.50 | 7.30 | 8.70 |
| July | 8.10 | 11.00 | 3.30 | 4.10 | 3.40 | 11.00 |
| August | 2.30 | 4.10 | 3.30 | 3.60 | 3.80 | 7.30 |
| September | 4.30 | 4.50 | 4.50 | 2.40 | 3.90 | 9.30 |
| October | 0.53 | 1.80 | 0.74 | 1.30 | 0.61 | 4.10 |
| November | 0.77 | 0.95 | 0.91 | 1.30 | 0.95 | 3.60 |
| December | 0.63 | 0.80 | 0.38 | 0.61 | 0.78 | 1.20 |

Non-continuous Passive SO₂ / NO₂ Data Summary - Table 20

| Month | STN72135 Extendicare | STN72136 MRCA | STN72137 Shania Twain | STN72135 Extendicare | STN72136 MRCA | STN72137 Shania Twain |
|-----------|-------------------------|------------------|--------------------------|-------------------------|------------------|--------------------------|
| | SO ₂ | SO ₂ | SO ₂ | NO ₂ | NO ₂ | NO ₂ |
| | ppb | ppb | ppb | ppb | ppb | ppb |
| January | 0.50 | 0.40 | 0.40 | 2.40 | 1.80 | 1.90 |
| February | 0.05 | 0.10 | 0.20 | 1.10 | 1.20 | 1.40 |
| March | 0.10 | 0.20 | 0.20 | 2.10 | 4.50 | 3.50 |
| April | 0.05 | 0.05 | 0.05 | 1.80 | 0.10 | 2.10 |
| May | 0.05 | 0.05 | 0.05 | 1.40 | 2.60 | 0.90 |
| June | 0.05 | 0.05 | 0.05 | 1.50 | 1.30 | 0.60 |
| July | 0.05 | 0.05 | 0.05 | 1.71 | 0.41 | 0.53 |
| August | 0.05 | 0.05 | 0.05 | 0.51 | 0.68 | 0.60 |
| September | 0.05 | 0.05 | 0.05 | 1.41 | 1.62 | 0.80 |
| October | 0.05 | 0.05 | 0.05 | 0.83 | 1.81 | 0.47 |
| November | 0.05 | 0.05 | 0.05 | 1.47 | 1.87 | 1.05 |
| December | 0.05 | 0.05 | 0.05 | 0.80 | 0.80 | 0.40 |

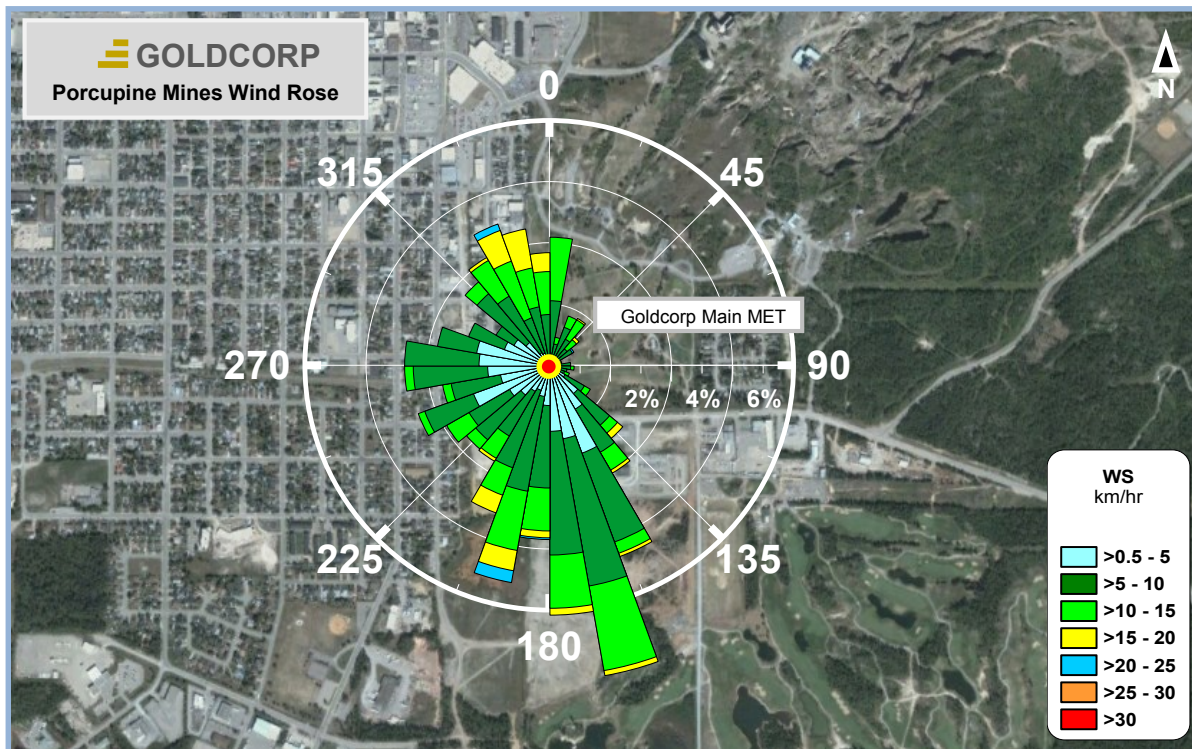
6.0 Wind Frequency Distribution



To illustrate wind frequency distribution information, distributions of wind speeds, and the frequency of the varying wind directions, we have included a wind rose graphic superimposed on an aerial view of the Goldcorp mine property.

Wind roses summarize the occurrence of winds at a location, showing their strength, direction and frequency. Each branch of the rose represents wind coming from that direction, with north to the top of the graphic. The branches are divided into segments of different colours, which represent wind speed ranges from that direction. The length of each segment within a branch is proportional to the frequency of winds blowing within the corresponding range of speeds from that direction.

The majority and magnitude of branches in the 2014 wind rose below indicate predominant wind directions out of the south (these branches represent the plot data when the wind was blowing from this vector). A wind frequency distribution table has been included for 2014 which summarizes wind frequency distribution in tabular format (Table 21).

Wind Frequency Distribution - Wind Rose - Figure 12



| | | | | |
|--|---|-----------------|------------------|---|
| Wind Rose – Annual, 2014 Meteorological Station |  | By : BB | Figure 12 |  |
| | True North | Approx. Scale : | 1:14000 | |
| Goldcorp - Porcupine Gold Mines - Timmins, Ontario | Date Revised : | 09 Apr, 2015 | | |

Wind Frequency Distribution Table - Table 21

| Wind Speed Class | 0.5 - 5 | 5 - 10 | 10 - 15 | 15 - 20 | 20 - 25 | 25 - 30 | > 30 | All |
|------------------|---------|--------|---------|---------|---------|---------|-------|-------|
| | km/hr | km/hr | km/hr | km/hr | km/hr | km/hr | km/hr | |
| Wind Direction | % | % | % | % | % | % | % | % |
| N | 2.06 | 5.98 | 4.78 | 1.90 | 0.32 | 0.05 | 0.02 | 15.11 |
| NE | 1.32 | 2.08 | 1.00 | 0.14 | 0.01 | 0.00 | 0.00 | 4.55 |
| E | 1.28 | 2.68 | 0.95 | 0.08 | 0.01 | 0.01 | 0.00 | 5.01 |
| SE | 7.08 | 4.13 | 1.84 | 0.31 | 0.03 | 0.01 | 0.00 | 13.40 |
| S | 6.29 | 9.11 | 5.66 | 1.80 | 0.45 | 0.00 | 0.00 | 23.31 |
| SW | 4.34 | 7.38 | 3.15 | 0.53 | 0.00 | 0.00 | 0.00 | 15.40 |
| W | 5.07 | 5.51 | 0.63 | 0.02 | 0.00 | 0.00 | 0.00 | 11.23 |
| NW | 2.85 | 5.66 | 2.65 | 0.72 | 0.07 | 0.02 | 0.00 | 11.97 |
| All | 30.29 | 42.53 | 20.66 | 5.50 | 0.89 | 0.09 | 0.02 | 100.0 |

7.0 Valid Data Percentages

Overall, the percentage of continuous valid pollutant data recovery was 98.7% for 2014, exceeding the Ministry's minimum target of 90% and desirable target of 95%. The percent valid data recovery for non-continuous (TSP, PM₁₀, metals and Total Dustfall) was 99.7%.

7.1 Missing / Invalid Data Summary

Notwithstanding the minimum 90% valid data performance measure, emitters are to notify (as soon as practical) the MOECC of any system or equipment failures resulting in missing data of 24 hours or more in length and of the plans and schedule for repairing the failed system or equipment. Tables 22 and 23 detail problems that resulted in significant data losses along with remedial actions.

Missing / Invalid Continuous Data Summary - Table 22

| Station | Parameter | Start Date | Start Time | End Date | End Time | Description | Corrective Action |
|----------|---------------------------------------|------------|------------|----------|----------|---------------------|-------------------|
| | | | EST | | EST | | |
| STN72139 | NO, NO ₂ , NO _x | Jan 07 | 16:00 | Jan 22 | 14:00 | Pump Failure | Replaced Pump |
| STN72139 | TSP | Jan 07 | 16:00 | Jan 22 | 14:00 | Pump Failure | Replaced Pump |
| STN72140 | TSP | Jul 21 | 21:00 | Jul 23 | 09:00 | Power Failure | Restored Power |
| STN72140 | PM ₁₀ | Jul 21 | 21:00 | Jul 23 | 09:00 | Power Failure | Restored Power |
| STN72140 | NO, NO ₂ , NO _x | Jul 21 | 21:00 | Jul 23 | 09:00 | Power Failure | Restored Power |
| STN72138 | PM ₁₀ | Oct 07 | 06:00 | Oct 09 | 09:00 | Pump Failure | Replaced Pump |
| STN72141 | NO, NO ₂ , NO _x | Oct 21 | 06:00 | Oct 22 | 19:00 | Circuit Board Fault | Reset Circuit |
| STN72135 | TSP | Dec 29 | 09:00 | Dec 31 | 23:00 | Unstable Response | Replaced Sampler |

Missing / Invalid Non-continuous Data Summary - Table 23

| Station | Parameter | Date | Description | Corrective Action |
|----------|------------------|--------|---------------|-------------------|
| STN72135 | PM ₁₀ | Jan 05 | Power Failure | Restored Power |
| STN72135 | TSP | Mar 18 | Power Failure | Restored Power |
| STN72135 | TSP Metals | Mar 18 | Power Failure | Restored Power |

8.0 Data Editing

A data validation process to filter out erroneous data is critical to maximize data integrity. Validation can be done using automated or manual procedures. Regardless of the process followed, judgment to accept or reject suspicious or unusual data is required. Many factors need to be considered in this process, which requires regular inspection of all data by experienced staff that have an understanding of local pollutant and climatic conditions as well as knowledge of air monitoring principles and analyzer behaviour.

9.0 Exceedance Summary

This report summarizes the continuous and non-continuous monitoring results according to MOECC reporting requirements. The continuous and non-continuous data sets are provided in separate appendices to this report.

When reporting the number of continuous exceedances, there may be multiple consecutive running averages that exceed the AAQC or standard. If the consecutive averages occur within a single clock-based averaging period, they are to be reported as a single exceedance. If they are spread across 2 clock-based averaging periods and greater than 24 consecutive hours, they are to be reported as 2 exceedances. The exceedance value reported is the highest recorded value during the exceedance episode.

A 24 hour clock average is defined as the midnight to midnight average. A 24 hour running average is the average of the current hour and the preceding 23 hours.

Continuous exceedance dates, times and averages are summarized in Table 24 and non-continuous exceedances are summarized in Table 25.

During 2014 there were:

- a) No exceedances of the continuous NO₂ 24 hour and 1 hour running average AAQCs or of the ½ hour running average O.Reg 419/05 standard.
- b) 10 exceedances of the continuous PM₁₀ 24 hour running average AAQC, 4 at STN72138 (Hollinger Park) and 6 at STN72139 (Hollinger Office).
- c) No exceedances of the non-continuous 24 hour clock TSP, PM₁₀ or Suspended Metals AAQCs, standards or guidelines.
- d) 8 exceedances of the non-continuous 30 day standard for Total Dustfall, 5 exceedances at STN72143 (Snowmobile Crossing) and 1 each at STN72135 (Extendicare), STN72136 (MRCA) and STN72142 (Aura Lake).

Continuous Parameter Exceedance Summary - Table 24

| Station | Parameter | Criterion Exceeded | Exceedance Count | Start Date | Start Time | End Date | End Time | Exceedance Value |
|----------|------------------|--------------------|------------------|------------|------------|----------|----------|-----------------------|
| STN72138 | PM ₁₀ | 24 Hr Interim AAQC | 1 | Apr 24 | 04:00 | Apr 24 | 16:00 | 69 µg/m ³ |
| STN72138 | PM ₁₀ | 24 Hr Interim AAQC | 1 | Apr 29 | 14:00 | Apr 30 | 03:00 | 58 µg/m ³ |
| STN72138 | PM ₁₀ | 24 Hr Interim AAQC | 1 | May 07 | 06:00 | May 08 | 04:00 | 56 µg/m ³ |
| STN72138 | PM ₁₀ | 24 Hr Interim AAQC | 1 | May 14 | 23:00 | May 15 | 07:00 | 54 µg/m ³ |
| STN72139 | PM ₁₀ | 24 Hr Interim AAQC | 1 | May 10 | 15:00 | May 11 | 02:00 | 62 µg/m ³ |
| STN72139 | PM ₁₀ | 24 Hr Interim AAQC | 1 | May 14 | 21:00 | May 14 | 22:00 | 51 µg/m ³ |
| STN72139 | PM ₁₀ | 24 Hr Interim AAQC | 3 | May 25 | 08:00 | May 27 | 12:00 | 109 µg/m ³ |
| STN72139 | PM ₁₀ | 24 Hr Interim AAQC | 1 | Jun 29 | 16:00 | Jun 30 | 11:00 | 58 µg/m ³ |

Non-continuous Parameter Exceedance Summary - Table 25

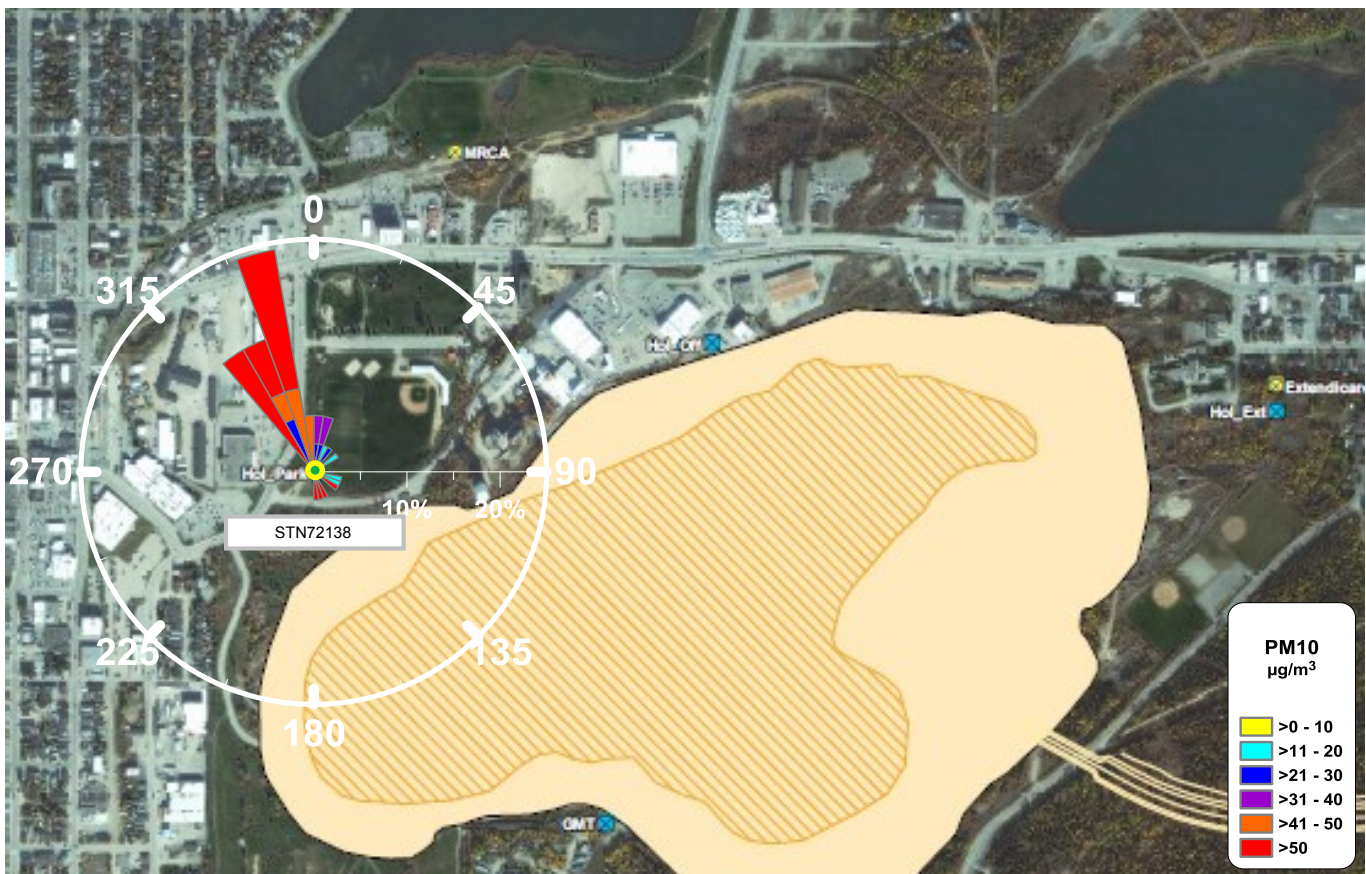
| Station | Parameter | Criterion Exceeded | Exceedance Count | Start Date | Start Time | End Date | End Time | Exceedance Value |
|----------|----------------|--------------------|------------------|------------|------------|----------|----------|----------------------------|
| STN72143 | Total Dustfall | 30 day standard | 1 | May 01 | 00:00 | May 31 | 24:00 | 7.6 g/m ² /30d |
| STN72142 | Total Dustfall | 30 day standard | 1 | Jun 01 | 00:00 | Jun 30 | 24:00 | 7.3 g/m ² /30d |
| STN72143 | Total Dustfall | 30 day standard | 1 | Jun 01 | 00:00 | Jun 30 | 24:00 | 8.7 g/m ² /30d |
| STN72135 | Total Dustfall | 30 day standard | 1 | Jul 01 | 00:00 | Jul 31 | 24:00 | 8.1 g/m ² /30d |
| STN72136 | Total Dustfall | 30 day standard | 1 | Jul 01 | 00:00 | Jul 31 | 24:00 | 11.0 g/m ² /30d |
| STN72143 | Total Dustfall | 30 day standard | 1 | Jul 01 | 00:00 | Jul 31 | 24:00 | 11.0 g/m ² /30d |
| STN72143 | Total Dustfall | 30 day standard | 1 | Aug 01 | 00:00 | Aug 31 | 24:00 | 7.3 g/m ² /30d |
| STN72143 | Total Dustfall | 30 day standard | 1 | Sep 01 | 00:00 | Sep 30 | 24:00 | 9.3 g/m ² /30d |

10.0 Continuous PM₁₀ Exceedance Episode Pollution Roses

The following PM₁₀ pollution roses graphically illustrate the PM₁₀ exceedance episodes.

The rose branches show the percentage of time pollutants come from a particular direction. Branches should therefore point to the source of PM₁₀. The branches are divided into segments of different colours, with the colours representing PM₁₀ concentration ranges. The length of each segment within a branch is proportional to the frequency of PM₁₀ concentration ranges from that direction.

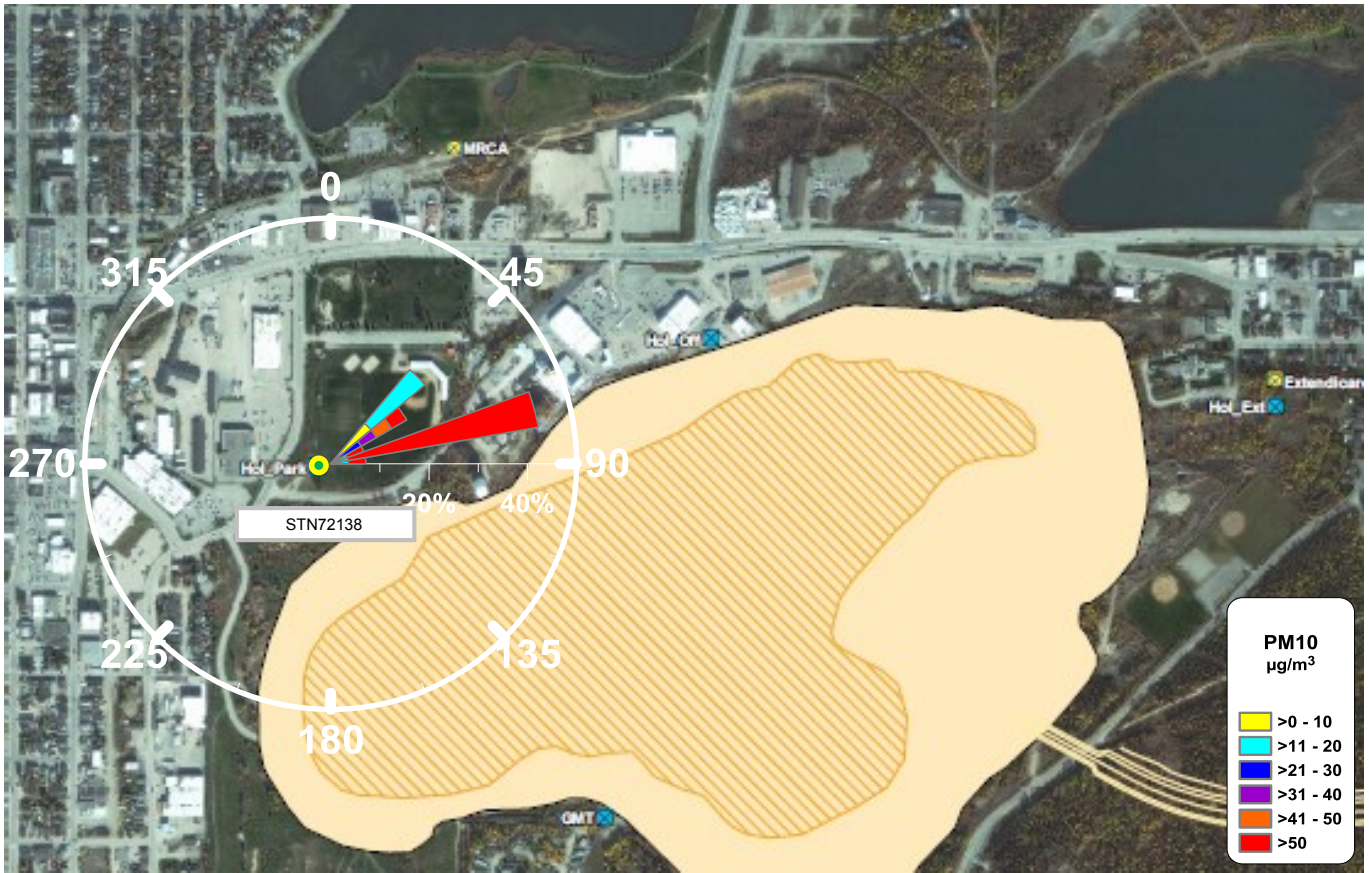
PM₁₀ Pollution Rose – STN72138 April 24th - Figure 13



| | | | | |
|--|----------------|-----------------|------------------|--------------|
| STN72138 PM₁₀ Pollution Rose April 24th | ↑ | By : JP | Figure 13 | ROTEK |
| | True North | Approx. Scale : | 1:22,500 | |
| Goldcorp Porcupine Mines Timmins Ontario | Date Revised : | 20 Jan, 2015 | | |

Exceedance is due to inhalable particulate (PM₁₀) levels from both the north northwest and south through southeast of the air monitoring station.

PM₁₀ Pollution Rose – STN72138 April 29th - 30th - Figure 14





| | | | | |
|--|----------------|-----------------|------------------------------|--|
| STN72138 PM₁₀ Pollution Rose April 29th - 30th | | By : JP | Figure 14 1:22,500 | |
| | True North | Approx. Scale : | | |
| Goldcorp Porcupine Mines Timmins Ontario | Date Revised : | 20 Jan, 2015 | | |

Exceedance is due to inhalable particulate (PM₁₀) levels from the east northeast of the air monitoring station.

PM₁₀ Pollution Rose – STN72138 May 7th - 8th - Figure 15



| | | | | |
|--|---|-----------------|------------------|---|
| STN72138 PM₁₀ Pollution Rose May 7th - 8th |  | By : JP | Figure 15 |  |
| | True North | Approx. Scale : | 1:22,500 | |
| Goldcorp Porcupine Mines Timmins Ontario | Date Revised : | 20 Jan, 2015 | | |

Exceedance is due to inhalable particulate (PM₁₀) levels from the west northwest and southwest of the air monitoring station.

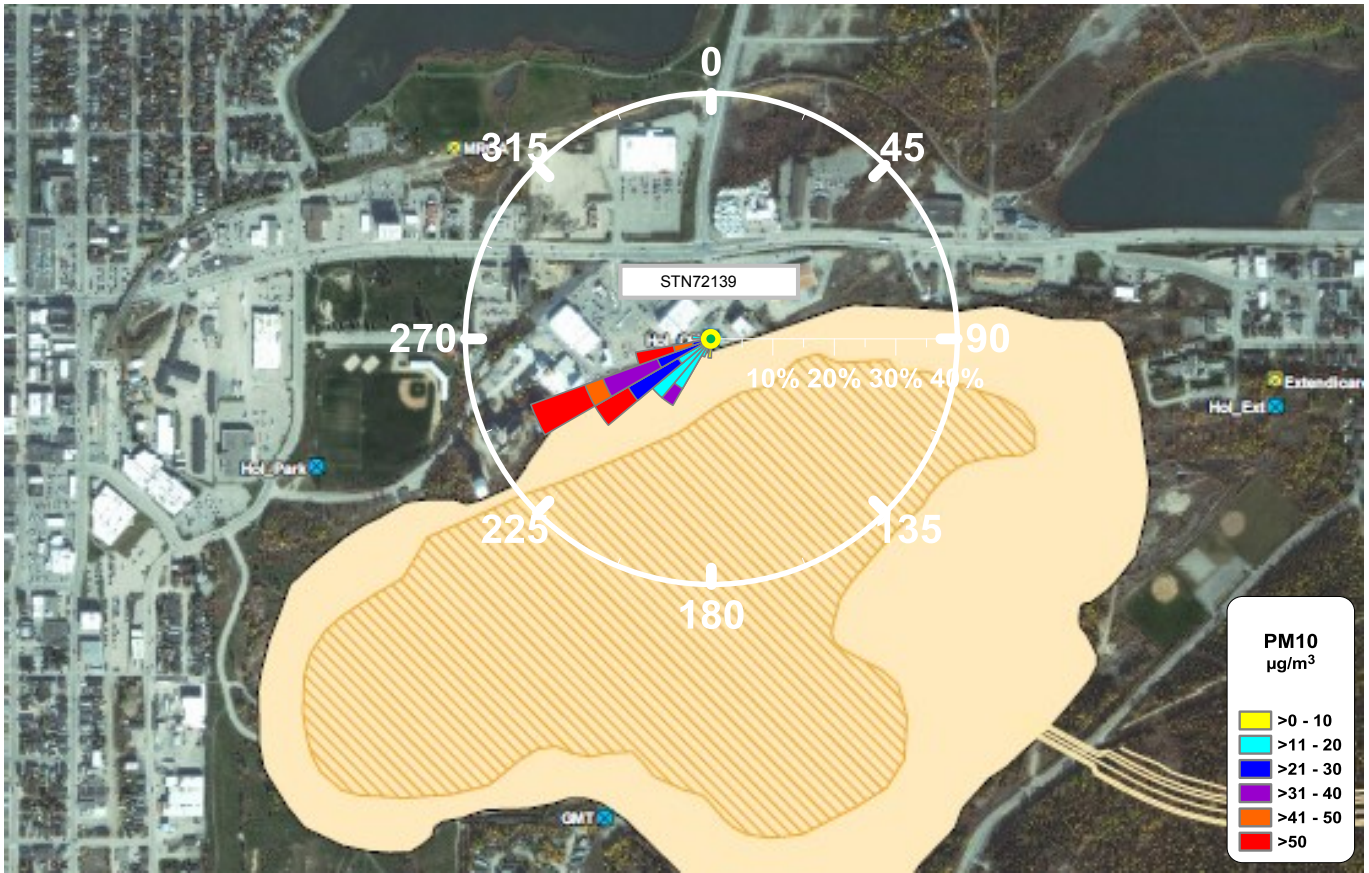
PM₁₀ Pollution Rose – STN72138 May 14th - 15th - Figure 16





| | | | | |
|--|------------|-----------------|------------------|--------------|
| STN72138 PM₁₀ Pollution Rose May 14th - 15th | ↑ | By : JP | Figure 16 | ROTEK |
| | True North | Approx. Scale : | 1:22,500 | |
| | | Date Revised : | 20 Jan, 2015 | |

Exceedance is due to inhalable particulate (PM₁₀) levels from the west southwest of the air monitoring station.

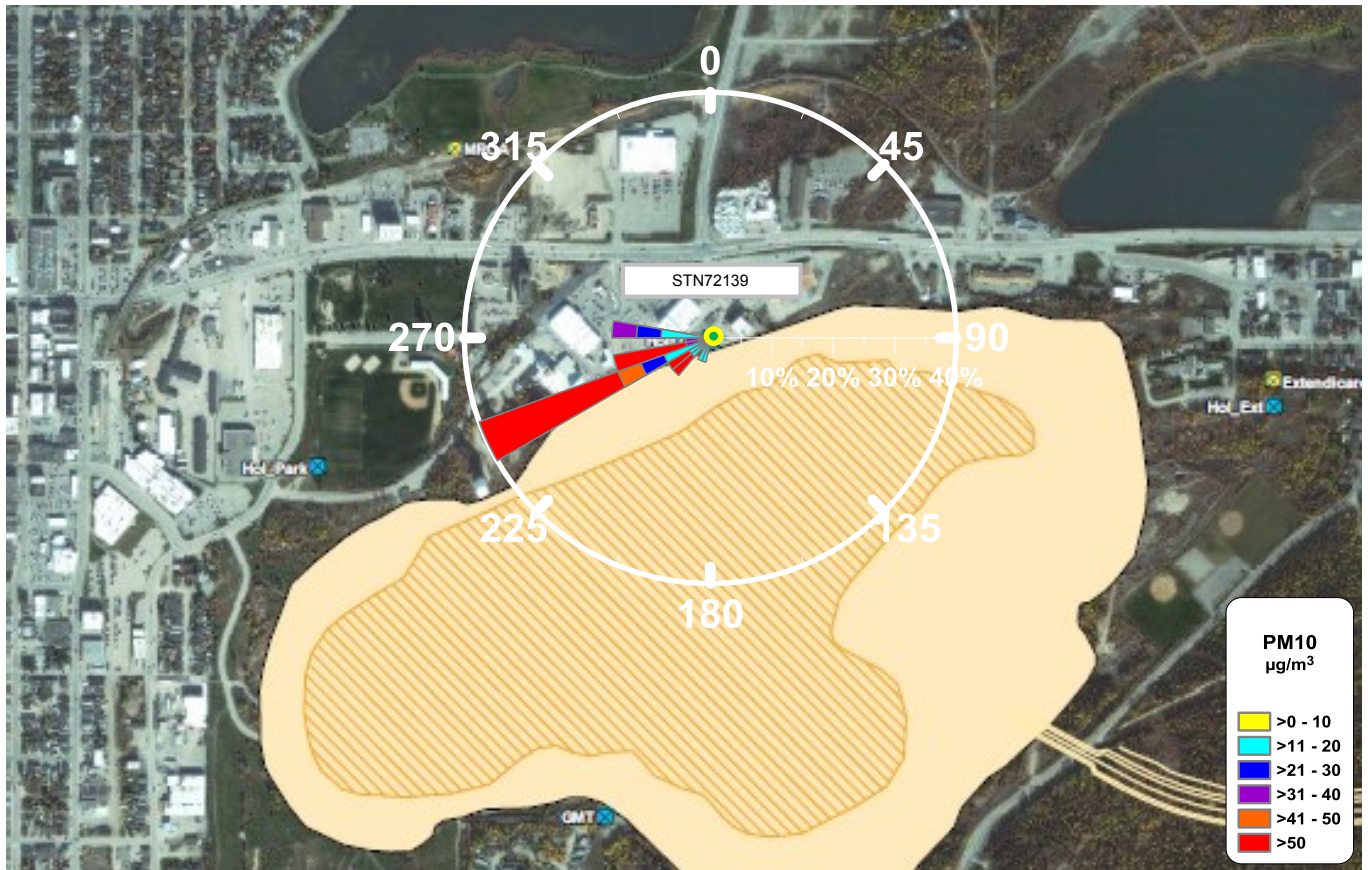
PM₁₀ Pollution Rose – STN72139 May 10th - 11th - Figure 17



| | | | | |
|--|---|-----------------|------------------|---|
| STN72139 PM₁₀ Pollution Rose May 10th - 11th |  | By : JP | Figure 17 |  |
| | True North | Approx. Scale : | 1:22,500 | |
| Goldcorp Porcupine Mines Timmins Ontario | Date Revised : | 20 Jan, 2015 | | |

Exceedance is due to inhalable particulate (PM₁₀) levels from the west southwest of the air monitoring station.

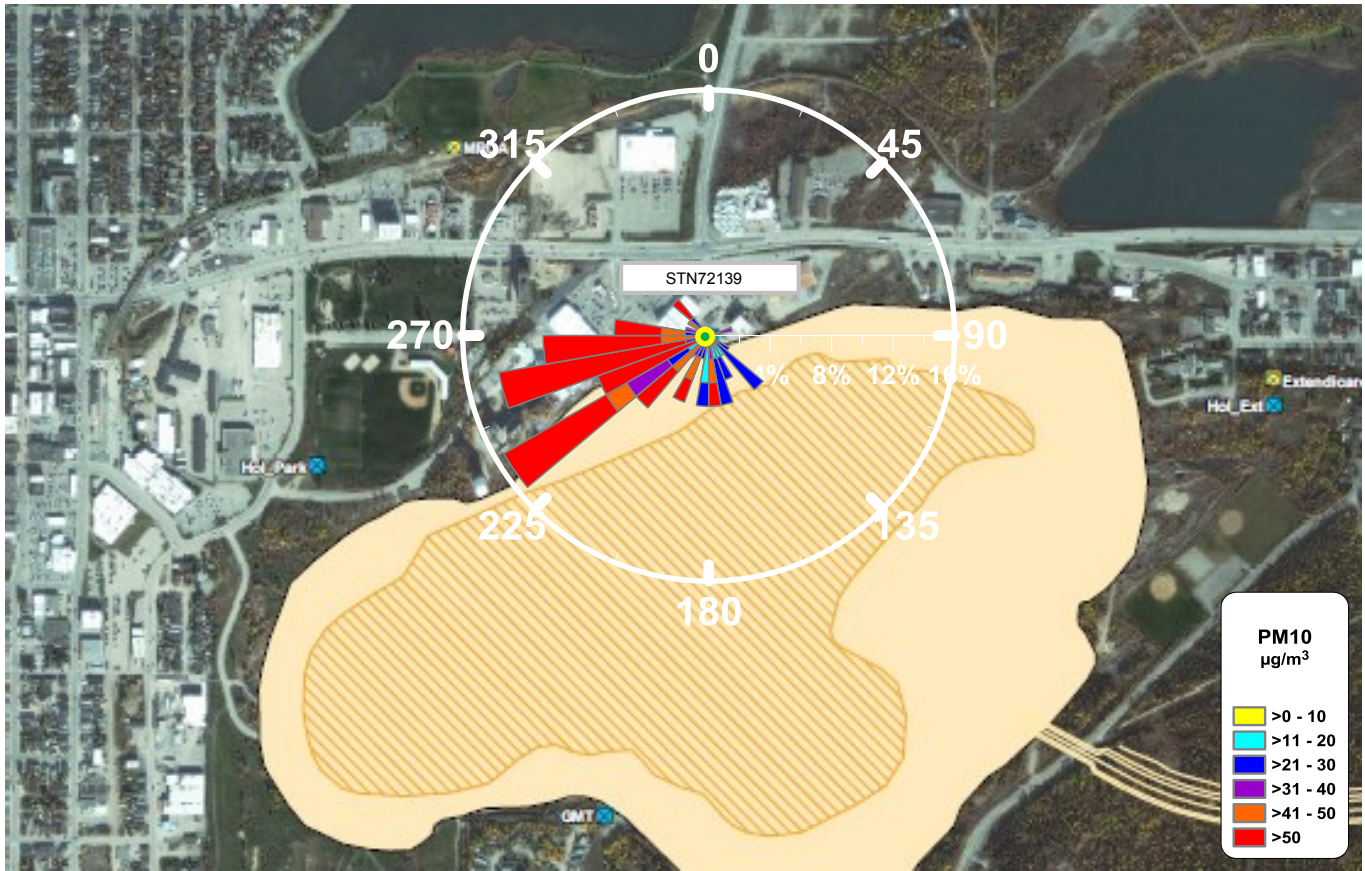
PM₁₀ Pollution Rose – STN72139 May 14th - Figure 18





| | | | | |
|--|----------------|-----------------|------------------|--|
| STN72139 PM₁₀ Pollution Rose May 14th | | By: JP | Figure 18 | |
| | True North | Approx. Scale : | 1:22,500 | |
| Goldcorp Porcupine Mines Timmins Ontario | Date Revised : | 20 Jan, 2015 | | |

Exceedance is due to inhalable particulate (PM₁₀) levels from the west southwest of the air monitoring station.

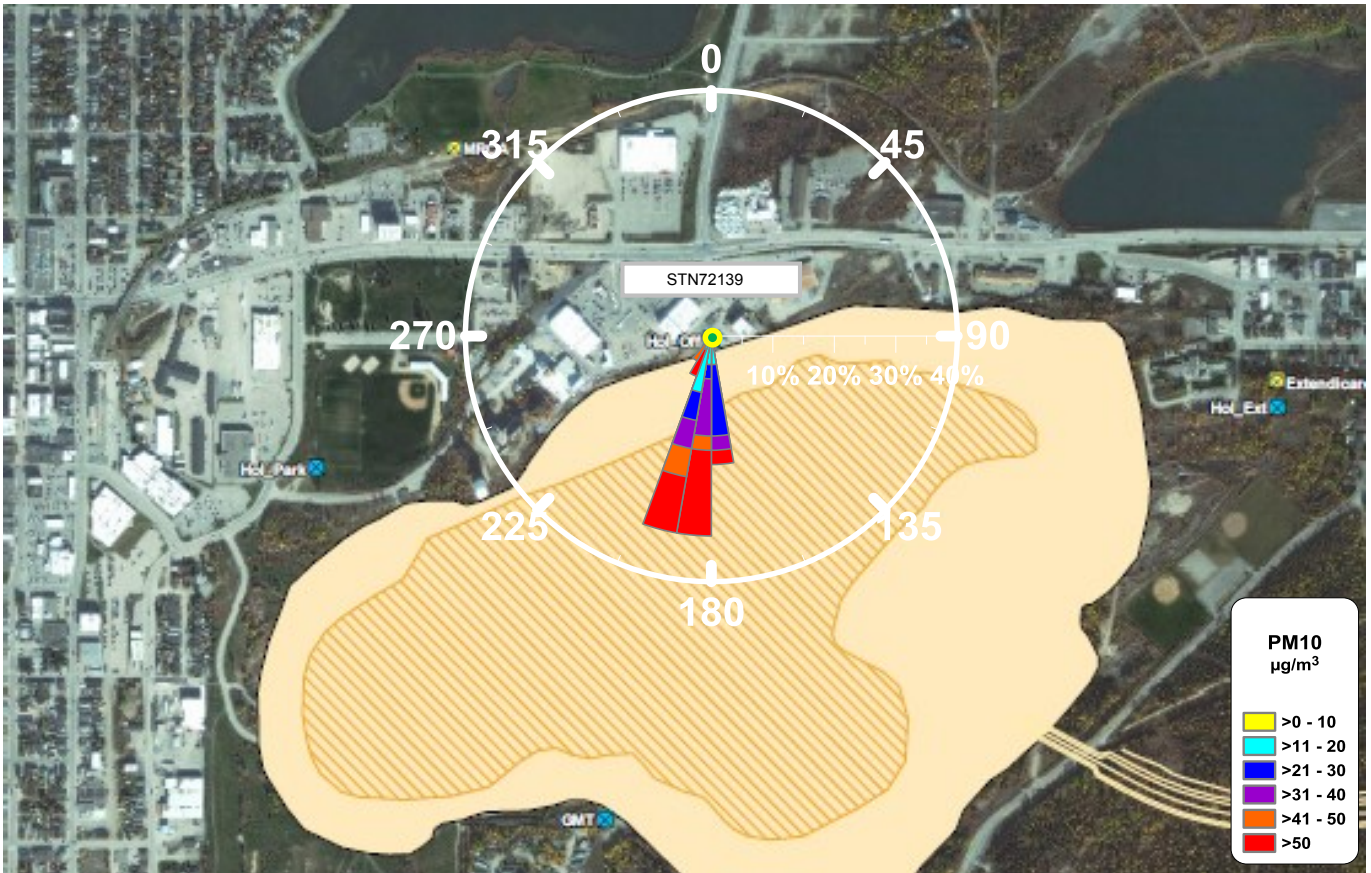
PM₁₀ Pollution Rose – STN72139 May 25th - 27th - Figure 19





| | | | | |
|--|---|-----------------|------------------|---|
| STN72139 PM₁₀ Pollution Rose May 25th - 27th |  | By : JP | Figure 19 |  |
| | True North | Approx. Scale : | 1:22,500 | |
| Goldcorp Porcupine Mines Timmins Ontario | Date Revised : | 20 Jan, 2015 | | |

Exceedance is due to inhalable particulate (PM₁₀) levels from the west through southwest of the air monitoring station.

PM₁₀ Pollution Rose – STN72139 June 29th - 30th - Figure 20



| | | | | |
|---|---|-----------------|------------------|---|
| STN72139 PM₁₀ Pollution Rose June 29th - 30th |  | By : JP | Figure 20 |  |
| | True North | Approx. Scale : | 1:22,500 | |
| Goldcorp Porcupine Mines Timmins Ontario | Date Revised : | 20 Jan, 2015 | | |

Exceedance is due to inhalable particulate (PM₁₀) levels from the south of the air monitoring station.

11.0 Conclusions

During 2014 there were:

- a) No exceedances of the continuous NO₂ 24 hour and 1 hour running average AAQCs or of the ½ hour running average O.Reg 419/05 standard.
- b) 10 exceedances of the continuous PM₁₀ 24 hour running average AAQC, 4 at STN72138 (Hollinger Park) and 6 at STN72139 (Hollinger Office).
- c) No exceedances of the non-continuous 24 hour clock TSP, PM₁₀ or suspended metals AAQCs, standards or guidelines.
- d) 8 exceedances of the non-continuous 30 day standard for Total Dustfall, 5 exceedances at STN72143 (Snowmobile Crossing) and 1 each at STN 72135 (Extencicare), STN72136 (MRCA) and STN72142 (Aura Lake).
- e) Annual PM₁₀ averages of 8 µg/m³ at STN72135 (Hollinger Ext.), 11 µg/m³ at STN72138 (Hollinger Park), 12 µg/m³ at STN72139 (Hollinger Office) and 8 µg/m³ at STN72140 (Goldmine Tour).
- f) 42 calibrations were conducted on continuous samplers, all of which met criteria.