



Hamilton Air Monitoring Network
2017 Annual
Air Quality Monitoring Report

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SECTION 1- OVERVIEW

Executive Summary

Since May 1st, 2003, the industrial air shed monitoring network in the City of Hamilton has been operated, serviced and maintained by the Hamilton Air Monitoring Network (HAMN). HAMN is a group of industries that are committed to the ongoing measurement of local air quality as part of the Ministry of the Environment and Climate Change (MOECC) industrial Source Emissions Monitoring (SEM) program.

HAMN has successfully completed its 14th year of operation and has consecutively collected >97% valid data. HAMN has contributed approximately \$525,000 in upgrading the network with new stations and state-of-the-art air monitoring equipment.

Individual companies participating in the MOECC SEM program are required to submit an annual summary report of their air quality monitoring results obtained during the previous calendar year.

This report contains an overview of the HAMN network, historical trends for major air pollutants and an explanation of the roles and responsibilities of HAMN and the MOECC in the SEM program. The complete 2017 monitoring results are provided in a separate appendix to this report.

Some of the highlights of this report include:

- Sulphur Dioxide (SO₂) levels remain well below MOECC criteria.
- Over the past 4 years, hours over the Total Reduced Sulphur (TRS) odour threshold of 10 ppb have remained relatively stable at 3 HAMN stations, with the exception of STN29102. This station indicates an increase in the number of hours over the TRS odour threshold.
- There have been no exceedances of Nitrogen Dioxide (NO₂) air quality standards.
- Annual concentrations of Inhalable Particulate (PM₁₀) have remained consistent over the past 5 years. PM₁₀ levels continue to exceed the 24 hour interim Ambient Air Quality Criterion (AAQC) of 50 µg/m³.
- STN29180 exceeded the annual Total Suspended Particulate (TSP) criterion of 60 µg/m³. In 2017, the average of the 3 industry sites used for trend graphing was 49 µg/m³.
- Based on the location of the air monitoring stations and their proximity to local sources, it is evident that road dust and fugitive emissions continue to be major contributors which elevate ambient particulate levels.
- None of the Benzo[a]Pyrene (BaP) sampling sites met the annual standard of 0.01 ng/m³. A total of 8 events (24 hour average) were over 1.10 ng/m³ (previous AAQC). There were no exceedances of the Upper Risk Threshold (URT) limit of 5.00 ng/m³.
- None of the Benzene sampling sites met the annual standard of 0.45 µg/m³. A total of 14 exceedances of the 24 hour AAQC limit of 2.3 µg/m³ were recorded. There were no exceedances of the URT of 100 µg/m³.

The MOECC performs regular audits of HAMN activities and processes related to the collection of air quality data under the MOECC SEM program. The audits provide an indication of the effectiveness of quality control activities used by station operators and data management staff. The overall valid data recovery and audit success rates continue to surpass ministry criteria.

Hamilton Air Monitoring Network Overview

Since May 1st, 2003, the point source air monitoring network in the City of Hamilton has been funded, operated, serviced and maintained by the Hamilton Air Monitoring Network (HAMN).

The Hamilton industrial area is made up of various industrial sectors including integrated iron and steel plants, chemical producers, manufacturing facilities and several recycling facilities. With the close proximity of these facilities to each other and the complexity of meteorological conditions, assessing sources of industrial emissions has always been a difficult task.

HAMN represents participating industries that are committed to conducting their own air quality monitoring as part of the MOECC's SEM program. The SEM program is designed to identify, monitor and report the levels of target pollutants near industrial facilities.

Table 1 – HAMN Participating Industries

ArcelorMittal Dofasco G.P.	Birla Carbon	HARSCO (at ArcelorMittal Dofasco)
ArcelorMittal Hamilton East	City of Hamilton	Ruetgers Canada
Bartek Ingredients	Contanda Terminals Canada	Shell Canada Ltd
Baycoat Ltd.	Federal Marine Terminals	Terrapure
Biox Canada Ltd	Lafarge Canada - Jones Road	Triple M Metal LP
Bunge Canada	Lafarge Hamilton Slag	Stelco - Hamilton Works

Annual Report Overview

Companies participating in the MOECC's SEM program are required to submit an annual summary report of their air quality monitoring results obtained during the previous calendar year. This report summarizes HAMN's 2017 air quality data as per the MOECC's reporting requirements and includes an overview of the network, historical trends, data statistics, and an explanation of the roles and responsibilities of HAMN and the MOECC in the SEM program. The complete 2017 monitoring results are provided in a separate appendix to this report.

Public Web Based Data Access

Since June 1st, 2009, the HAMN website (www.hamnair.ca) has been available to the general public. Current and historical hourly data from all real-time continuous analyzers can be accessed through the website at www.hamnair.ca. In addition, non-continuous air quality data such as Volatile Organic Compounds (VOC), Polycyclic Aromatic Hydrocarbons (PAH) and Total Suspended Particulate (TSP) are made available on the website. The website provides general information on network operations, HAMN structure, funding, and the MOECC's role in HAMN. The website also provides a detailed description of contaminants measured and sampling methodologies. HAMN annual reports are posted online.

SECTION 2 - AIR QUALITY SUMMARY DATA POLLUTANT TRENDS

An important tool used for air pollution data analysis is the evaluation of pollutant trends. Data collected from the HAMN air monitoring sites are summarized and illustrated in the following 'historical trend' graphs. Trend analysis is a useful approach to examine how a pollutant behaves over time. Some data trend categories include the following:

- **Hourly Data** How a given pollutant behaves during an average day.
- **Monthly Data** How a given pollutant behaves during an average month.
- **Seasonal Data** How inversions affect the dispersion of pollutants in the local air shed.
- **Annual Data** How a given pollutant behaves during the course of the year.
- **Historical Data** How data behaves over several years.

These analyses help in assessing the impacts of emission reduction initiatives, deciding where to deploy monitors and gauging the effectiveness of provincial pollution abatement and control legislation.

The following graphs and bar charts provide annual trends for the pollutants monitored at selected monitoring locations. Figure 20 in Appendix 4 provides the locations of the individual monitoring stations.

A summary table for each pollutant (if applicable) is provided indicating:

- Maximum 1 Hr Average Value
- Maximum 24 Hr Average Value
- Number of Events over the 10 Minute Standard
- Number of Events over the ½ Hr Standards and Upper Risk Thresholds (URTs)
- Number of Events over the 1 Hr AAQCs and Standards
- Number of Days over the 24 Hr AAQCs, Standards and URTs
- Annual Mean
- Percent Valid Data

Data for 2017 is available in Appendix 7 "Summary Statistics and Data Set 2017".

Air Quality Monitoring – Sulphur Dioxide

Characteristics

Sulphur Dioxide (SO₂) belongs to the family of Sulphur Oxide gases (SO_x). These gases dissolve easily in water. Sulphur is prevalent in many raw materials including crude oil, coal, and ores that contain common metals like aluminum, copper, zinc, lead and iron. SO_x gases are formed when fuels containing sulphur, such as coal or oil, are burned, when gasoline is extracted from oil or when metals are processed from sulfide ores. SO₂ dissolves in water vapour to form an acid which interacts with other gases and particles in the air to form sulphate particulates and other products that can be harmful to people and the environment.

Sources of SO₂ include industrial facilities that derive their products from raw materials like metallic ore, coal, and crude oil, or that utilize coal or oil to produce or process heat. Examples include steel industries, electric utilities, petroleum refineries, cement manufacturing and metal processing facilities.

Ontario Criteria for SO₂ are:

½ hour running average (Standard) 0.300 ppm
 1 hour running average (Standard) 0.250 ppm
 24 hour running average (Standard) 0.100 ppm
 Annual average (AAQC) 0.020 ppm

Sulphur Dioxide levels in Hamilton remain well below the MOECC's annual objective. In 2017 the annual mean for STN29102 was 0.007 ppm compared to STN29567 at 0.003 ppm.

There were no exceedances of any criteria.

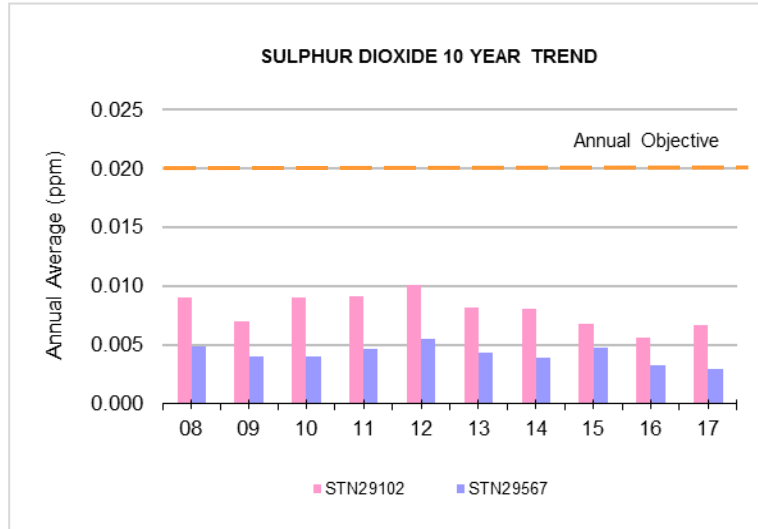


Figure 1

Annual average SO₂ trend over the past 10 years from STN29102 and STN29567. STN29567 was commissioned in 2009.

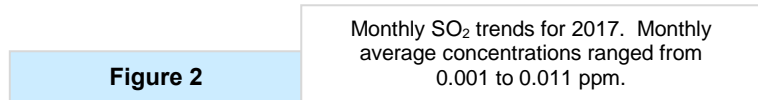


Figure 2

Monthly SO₂ trends for 2017. Monthly average concentrations ranged from 0.001 to 0.011 ppm.

Table 2		Sulphur Dioxide Statistics						
Station	Maximum ½ Hr Running Average	Maximum 1 Hr Running Average	Maximum 24 Hr Running Average	No. of Events > ½ Hr Standard	No. of Events > 1 Hr Standard	No. of Events > 24 Hr Standard	Annual Mean	Percent Valid Data
	ppm	ppm	ppm				ppm	
STN29102	0.162	0.139	0.054	0	0	0	0.007	99.9
STN29567	0.164	0.152	0.044	0	0	0	0.003	99.8

Air Quality Monitoring – Total Reduced Sulphur (TRS)

Characteristics

Total Reduced Sulphur (TRS) is a term used for a class of compounds that have offensive odours similar to rotten eggs; these compounds are a common basis for odour complaints. Common sources of TRS compounds are the steel industry (coke ovens and blast furnace releases), and pulp and paper mills. TRS compounds are not normally considered a health hazard except at very high concentrations.

The odour threshold for TRS is 10 parts per billion (ppb).

Ontario Criteria for TRS are:

10 minute running average (Standard)	9 ppb
1 hour clock odour threshold (RT)	10 ppb
24 hour running average (Standard)	4 ppb
½ hour running average (URT)	143 ppb
24 hour running average (URT)	48 ppb

In 2017, 14 hours over the 10 ppb odour threshold were recorded at STN29102. STN29168 recorded 2 hours above 10 ppb and STN29567 recorded 1 hour. STN29163 did not record any hours above 10 ppb.

The TRS annual averages were 0.3 ppb for STN29102, 0.1 ppb for STN29163, 0.1 ppb for STN29168, and 0.2 ppb for STN29567.

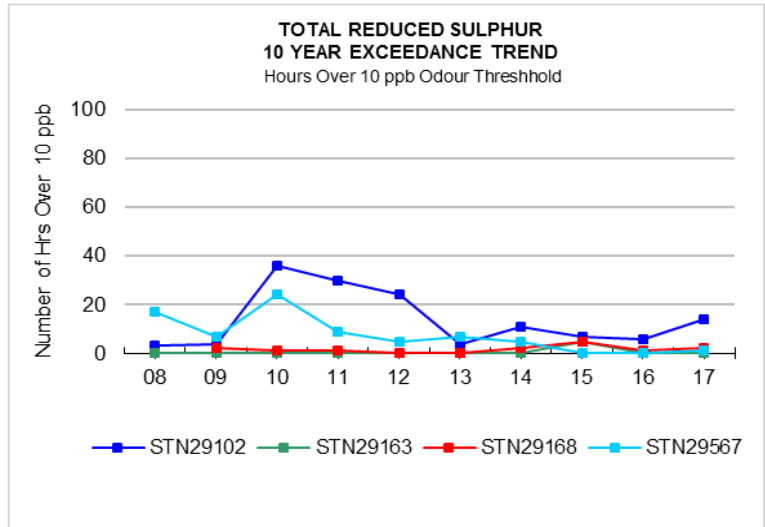


Figure 3

Historical annual TRS trends for the number of hours over the odour threshold of 10 ppb for the past 10 years.

Figure 4

Annual TRS trends for the number of hours over the odour threshold of 10 ppb for the past 3 years.

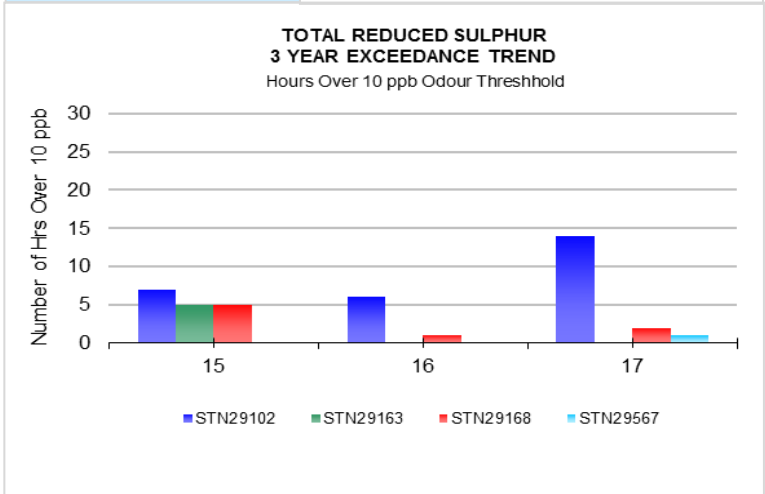


Table 3 Total Reduced Sulphur Statistics											
Station	Maximum 10 Min Running Average	Maximum ½ Hr Running Average	Maximum 1 Hr Clock Average	Maximum 24 Hr Running Average	No. of Events > 10 Min Standard	No. of Events > 1 Hr RT	No. of Events > 24 Hr Standard	No. of Events > ½ Hr URT	No. of Events > 24 Hr URT	Annual Mean	Percent Valid Data
	ppb	ppb	ppb	ppb						ppb	
STN29102	91.2	53.6	28.3	5.6	176	14	2	0	0	0.3	99.8
STN29163	26.6	12.3	6.4	1.3	3	0	0	0	0	0.1	99.6
STN29168	47.8	30.1	15.5	2.2	18	2	0	0	0	0.1	99.0
STN29567	31.3	24.8	16.8	1.6	27	1	0	0	0	0.2	99.8

Air Quality Monitoring – Oxides of Nitrogen (NO_x)

Characteristics

Oxides of Nitrogen (NO_x) is the generic term used for a group of highly reactive gases, all of which contain nitrogen and oxygen in varying amounts. The MOECC lists criteria for NO_x as Oxides of Nitrogen which is defined as the sum of Nitrogen Dioxide and Nitric Oxide (NO₂ + NO). Nitric Oxide (NO) is a colorless and odourless gas which is emitted from combustion sources. Nitrogen Dioxide (NO₂) is a reddish brown gas that causes the brown layer commonly seen over many urban areas.

Oxides of Nitrogen form when air is heated to over 675°C, usually during combustion processes. The primary man-made sources of NO_x are motor vehicles, and industrial, commercial, and residential sources that burn fuels. NO_x can also be formed naturally by lightning. Emissions of NO_x consist mainly of NO and to a lesser extent NO₂. In the atmosphere NO is converted to NO₂. NO_x causes a wide variety of health impacts in humans as well as other environmental impacts.

Ontario Criteria for NO₂ are:

1 hour running average (AAQC) 0.200 ppm
 24 hour running average (AAQC) 0.100 ppm

O.Reg 419 Standards for NO_x are:

1 hour running average (Standard) 0.261 ppm
 24 hour running average (Standard) 0.131 ppm

There were no exceedances of the NO₂ or NO_x criteria.

The annual average NO₂ for both STN29102 and STN29567 was 0.011 ppm.

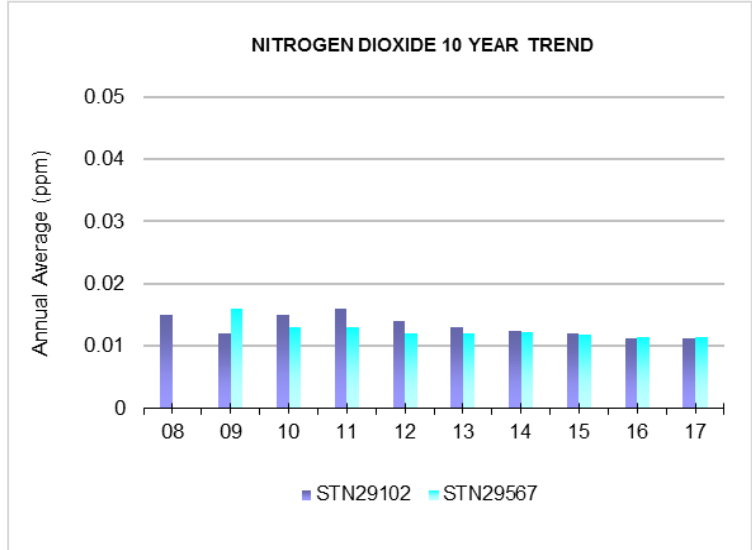


Figure 5

Annual average NO₂ trend over the past 10 years. The NO₂ analyzer at STN29567 was commissioned in 2009.

Figure 6

Monthly NO₂ trends for 2017. Monthly average concentrations ranged from 0.009 to 0.016 ppm.

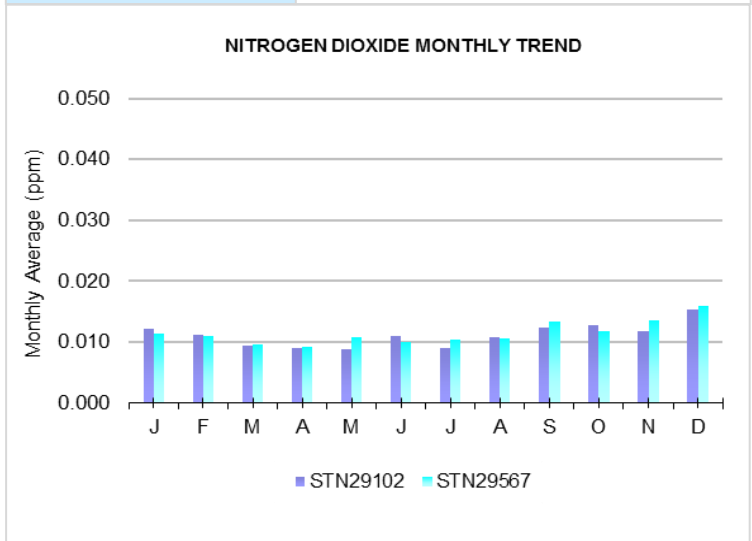


Table 4 Oxides of Nitrogen Statistics										
Station	NO ₂ Maximum 1 Hr Running Average	NO _x Maximum 1 Hr Running Average	NO ₂ Maximum 24 Hr Running Average	NO _x Maximum 24 Hr Running Average	No. of Events > 1 Hr NO ₂ AAQC	No. of Events > 1 Hr NO _x Standard	No. of Events > 24 Hr NO ₂ AAQC	No. of Events > 24 Hr NO _x Standard	NO ₂ Annual Mean	Percent Valid Data
	ppm		ppm						ppm	
STN29102	0.047	0.159	0.032	0.055	0	0	0	0	0.011	99.7
STN29567	0.047	0.173	0.031	0.064	0	0	0	0	0.011	99.7

Air Quality Monitoring – Total Suspended Particulate (TSP)

Characteristics

Total Suspended Particulate (TSP) includes all particulate material smaller than 44 µm (44 micrometres or 44 microns) in diameter. Some particles such as dust, dirt, soot, or smoke are large or dark enough to be seen with the naked eye. The largest TSP particles have diameters similar to the diameter of a human hair (about 50 µm) while others are so small they can only be detected using an electron microscope.

Ontario Criteria for TSP are:

24 hour clock average (AAQC) 120 µg/m³
 Annual geometric mean (AAQC) 60 µg/m³

Ontario Criteria for Manganese (Mn) are:

24 hour clock average (Standard) 0.4 µg/m³
 24 hour clock average (URT) 4.0 µg/m³

A substantial portion of TSP is related to industrial activities, road dusts, agricultural dusts and other sources of airborne soils. The TSP values in Figure 7 illustrate the geometric means from 3 industrial monitoring sites and are representative of the impacts experienced by those communities bordering on the industrial area. In 2017, the average of the 3 industry sites was 49 µg/m³.

Figure 8 illustrates the 7 year network average Manganese (Mn) concentrations from 5 industrial monitoring sites. Manganese is represented in the statistics as it commonly exceeds the 24 Hr AAQC.

Table 5 summarizes statistics for 6 TSP monitoring sites. STN29180 exceeded the annual objective of 60 µg/m³.

Note: Samples from STN29166 do not include metals analysis.

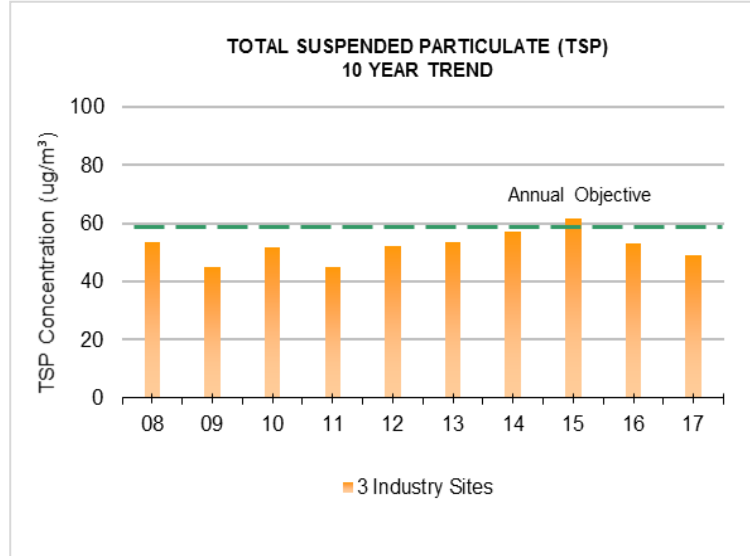


Figure 7

Network annual average TSP trend over the past 10 years.

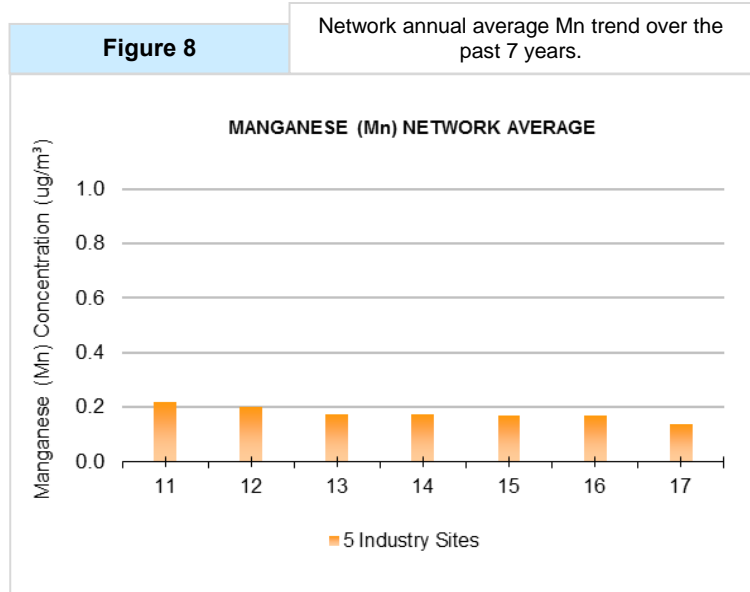


Figure 8

Network annual average Mn trend over the past 7 years.

Table 5 Total Suspended Particulate Statistics								
Station	Number of Valid Samples	TSP	Mn	No. of Events > 24 Hr AAQC TSP	No. of Events > 24 Hr AAQC Mn	No. of Events > 24 Hr URT Mn	Annual Mean µg/m ³	Percent Valid Data
		Maximum 24 Hr Clock Average µg/m ³	Maximum 24 Hr Clock Average µg/m ³					
STN29102	59	176	0.447	2	1	0	44	96.7
STN29160	59	129	1.470	1	10	0	45	96.7
STN29164	58	140	0.385	3	0	0	58	95.1
STN29166	61	121	n/a	1	n/a	n/a	44	100.0
STN29180	58	263	0.712	4	3	0	62	95.1
STN29567	61	156	0.851	3	11	0	41	100.0

Air Quality Monitoring – Inhalable Particulate Matter (PM₁₀)

Characteristics

Particulate Matter (PM) is a complex mixture of extremely small particles and liquid droplets. PM is made up of a number of components including acids (such as nitrates and sulphates), organic chemicals, metals and soil or dust particles.

The size of particles is directly linked to their potential for causing health problems. There is concern about particles that are 10 micrometers in diameter or smaller (PM₁₀) because they can enter the lungs. Once inhaled, these particles can affect the heart and lungs causing serious health effects.

Primary particles are emitted directly from sources such as construction sites, unpaved roads, fields, smokestacks or fires. Other particles are formed in complex reactions in the atmosphere from gases such as SO₂ and NO_x that are emitted from power plants, industries and automobiles.

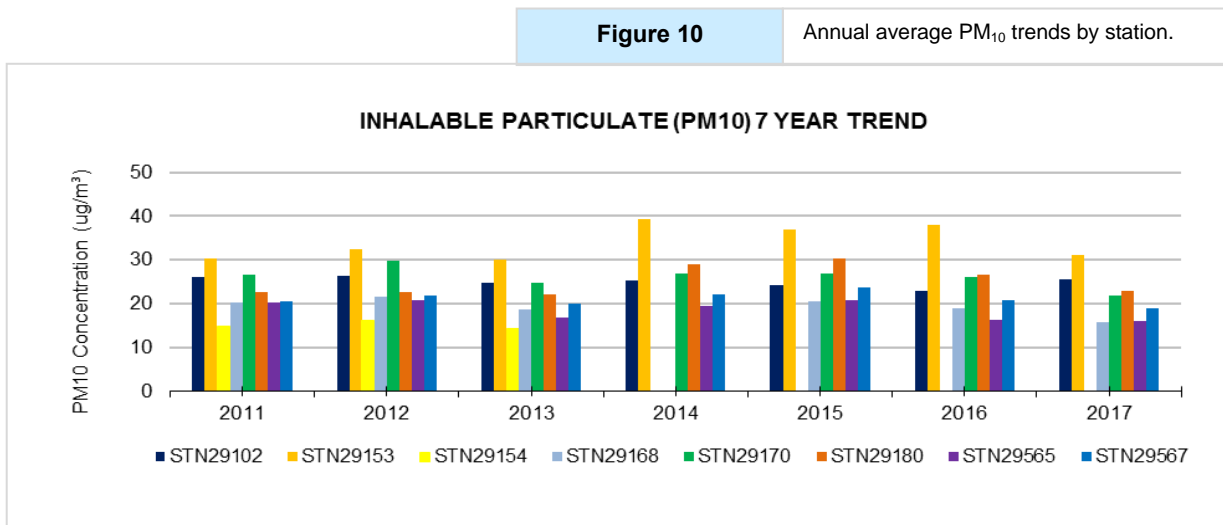
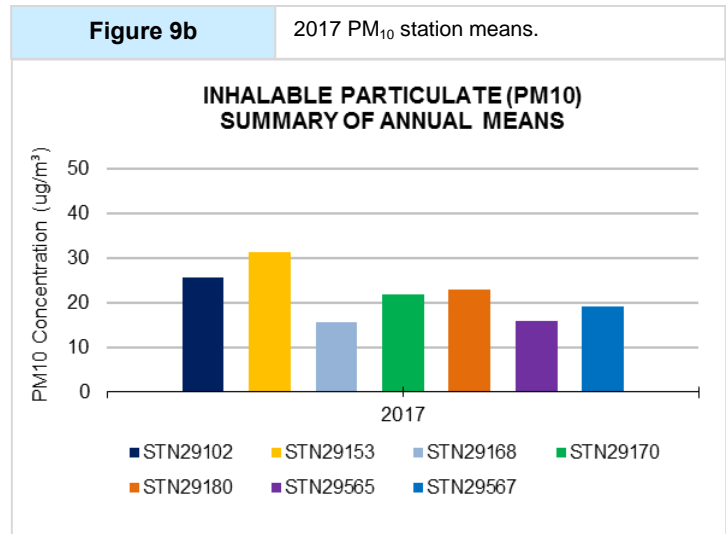
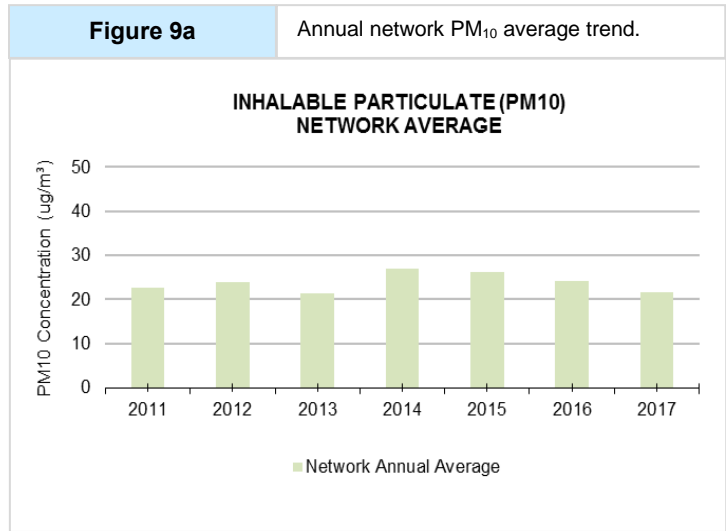
Ontario Criteria for PM₁₀ is:

24 hour running average (AAQC) 50 µg/m³

Figure 9a – Represents the annual network average PM₁₀ trend over the past 7 years.

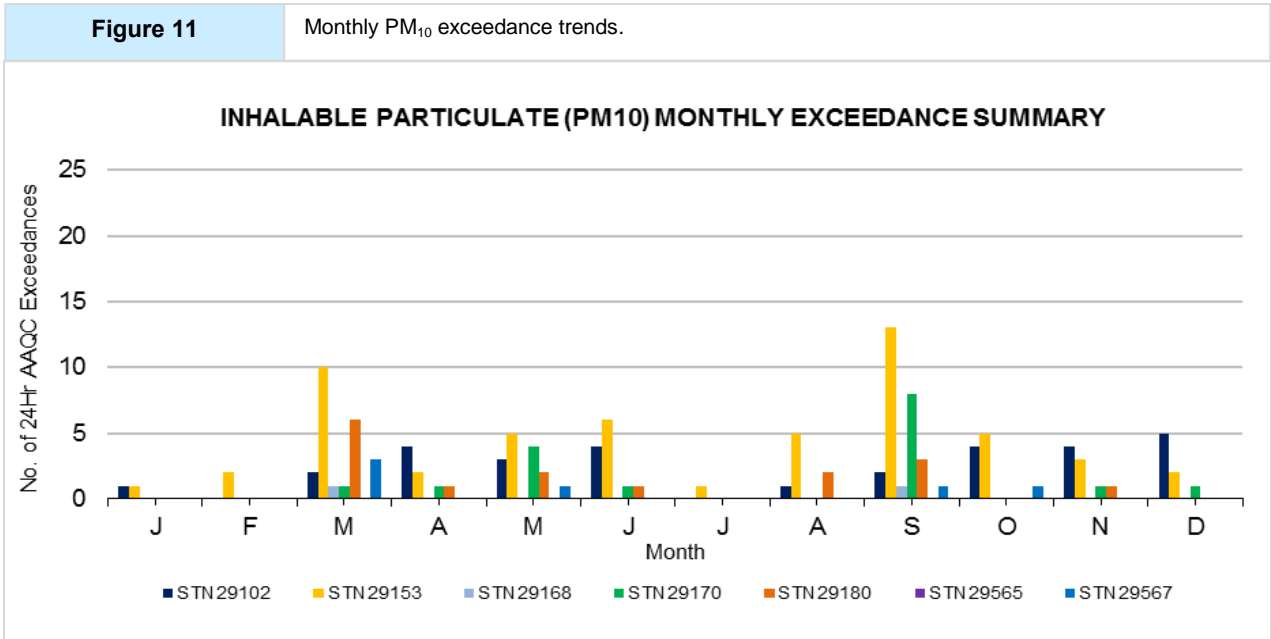
Figure 9b – Represents the 2017 annual PM₁₀ means from each station. Annual means ranged from 16 to 31 µg/m³.

Figure 10 – Represents the annual trend for each station over the past 7 years.



The MOECC decommissioned STN29154 in 2014, bringing the total number of particulate monitors to 7. In 2014, STN29168 was temporarily decommissioned from January to July, therefore no annual mean was available.

Figure 11 shows the number of 24 hour PM₁₀ AAQC exceedances in each month of 2017. STN29153 recorded the highest number (55), followed by STN29102 (30) and STN29170 (17). Table 6 provides statistics on data collected from the continuous PM₁₀ monitors in the network.



Station	Maximum 1 Hr Clock Average	Maximum 24 Hr Running Average	No. of Events > 24 Hr AAQC	Annual Mean	Percent Valid Data
	µg/m ³	µg/m ³		µg/m ³	
STN29102	753	193	30	25	99.7
STN29153	664	162	55	31	97.0
STN29168	157	57	2	16	99.3
STN29170	270	93	17	22	99.0
STN29180	275	223	16	23	94.0
STN29565	158	61	0	16	99.8
STN29567	647	195	6	19	100.0

Air Quality Monitoring – Polycyclic Aromatic Hydrocarbons (PAH)

Characteristics

Benzo[a]Pyrene (BaP) is a compound representative of a class of chemicals called Polycyclic Aromatic Hydrocarbons (PAH). BaP is a known carcinogen and is produced by the combustion of carbonaceous fuels (gasoline, diesel fuel, wood, coal, etc.) and tobacco. PAH are present in the atmosphere predominantly in particulate form. A less significant formation mechanism is the volatilization of lightweight polycyclic organic matter, which occurs in the production and use of naphthalene.

A scan of 8 PAH compounds are routinely analyzed by HAMN, however only BaP has Ontario criterion.

Ontario Criteria for Benzo[a]Pyrene are:

24 hour clock average (AAQC) 0.05 ng/m³
 24 hour clock average (URT) 5.00 ng/m³
 Annual average (Standard) 0.01 ng/m³

The principal source of BaP in Hamilton is coke oven emissions. Improvements made to the coke oven operations have led to dramatic reductions (65-85% since the mid-1990's) in the ambient BaP levels near and away from industry.

The 24 hour AAQC of 0.05 ng/m³ is below the current analytical method detection limit. The previous AAQC of 1.10 ng/m³ is used for historical comparison purposes.

In 2017, STN29547 reported 5 events over the 24 hour reference level of 1.10 ng/m³, STN29180 reported 3, and there were none at STN29567. There were no exceedances of the 5.00 ng/m³ URT limit.

None of the HAMN stations met the annual BaP standard of 0.01 ng/m³.

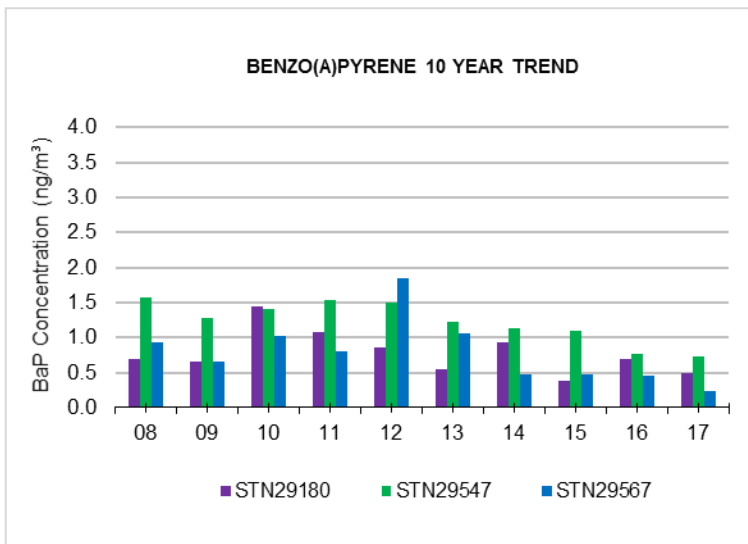


Figure 12

Annual average BaP trends over the past 10 years for STN29180, STN29547, and STN29567.

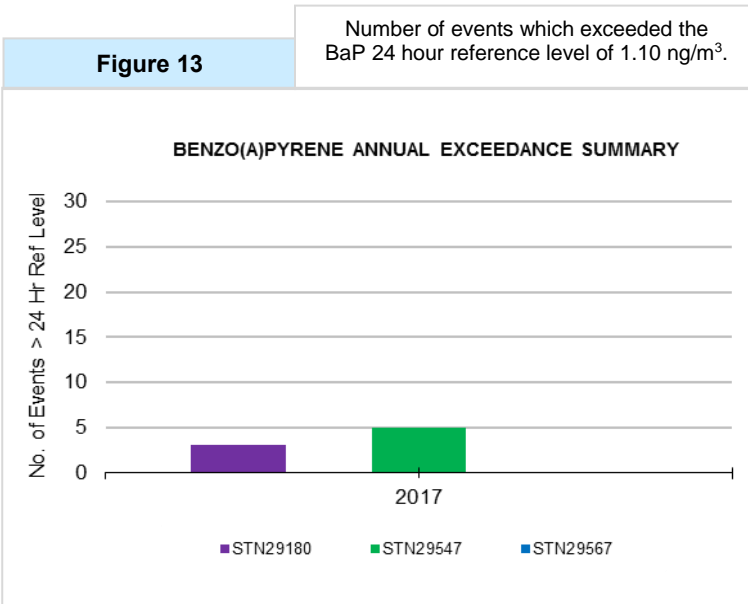


Figure 13

Number of events which exceeded the BaP 24 hour reference level of 1.10 ng/m³.

Station	Number of Valid Samples	Maximum 24 Hr Clock Average	No. of Events > 1.10 ng/m ³ 24 Hr Ref Level	No. of Events > 24 Hr URT	Annual Mean	Percent Valid Data
		ng/m ³			ng/m ³	
STN29180	28	3.03	3	0	0.49	93.3
STN29547	30	3.07	5	0	0.73	100.0
STN29567	30	0.94	0	0	0.24	100.0

Air Quality Monitoring – Volatile Organic Compounds (VOC)

Characteristics

Volatile Organic Compounds (VOCs) consist of various compounds including Benzene. Benzene is a volatile organic compound that has been classified as a human carcinogen. The main sources of Benzene are transportation, steel industry, petroleum distribution and refining, forest fires and wood combustion.

Industrial Benzene emissions arise primarily from the coke ovens and the associated by-products plants in the steel industry.

Ontario Criteria for Benzene are:

24 hour clock average (AAQC) 2.3 µg/m³
 24 hour clock average (URT) 100 µg/m³
 Annual average (AAQC) 0.45 µg/m³

Figure 14 represents annual averages for Benzene over the past 10 years.

Figure 15 illustrates annual means for Benzene at STN29102, STN29180, and STN29567.

None of the HAMN stations met the annual AAQC of 0.45 µg/m³.

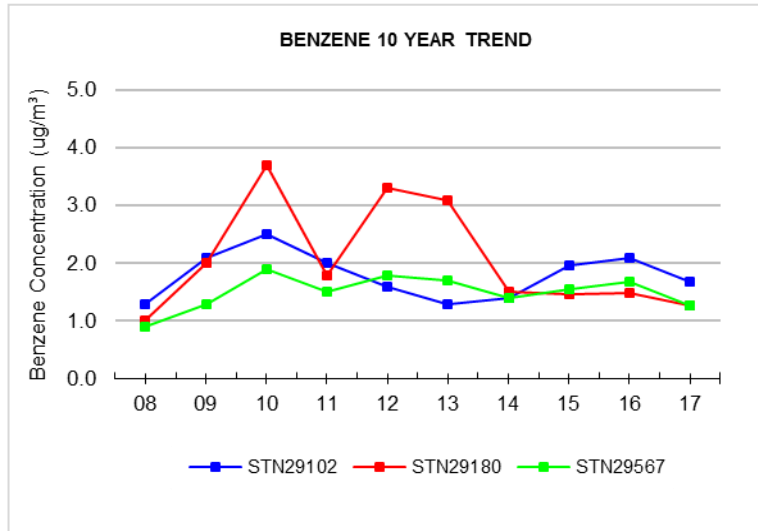


Figure 14

Annual average Benzene trends over the past 10 years for STN29102, STN29180, and STN29567.

Figure 15

Number of days which exceeded the Benzene 24 hour AAQC.

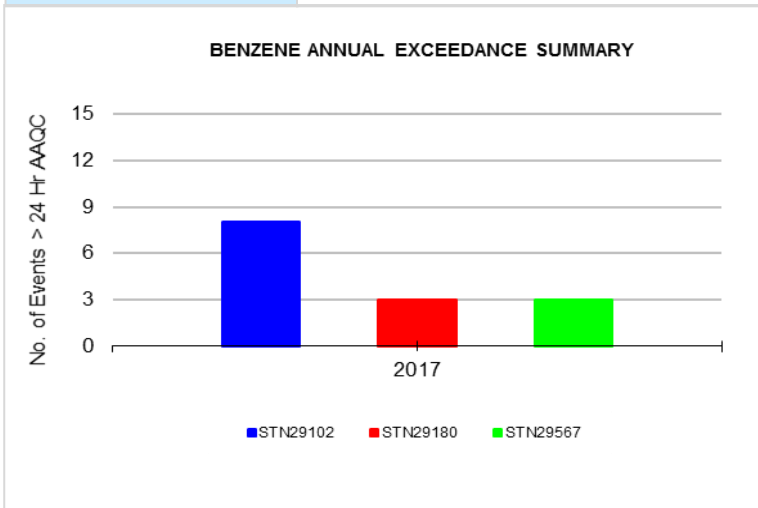


Table 8		Volatile Organic Compounds Benzene Statistics				
Station	Number of Valid Samples	Maximum 24 Hr Clock Average	No. of Events > 24 Hr AAQC	No. of Events > 24 Hr URT	Annual Mean	Percent Valid Data
		µg/m ³			µg/m ³	
STN29102	30	4.54	8	0	1.69	100.0
STN29180	28	3.38	3	0	1.25	93.3
STN29567	30	3.18	3	0	1.28	100.0

Appendix 1

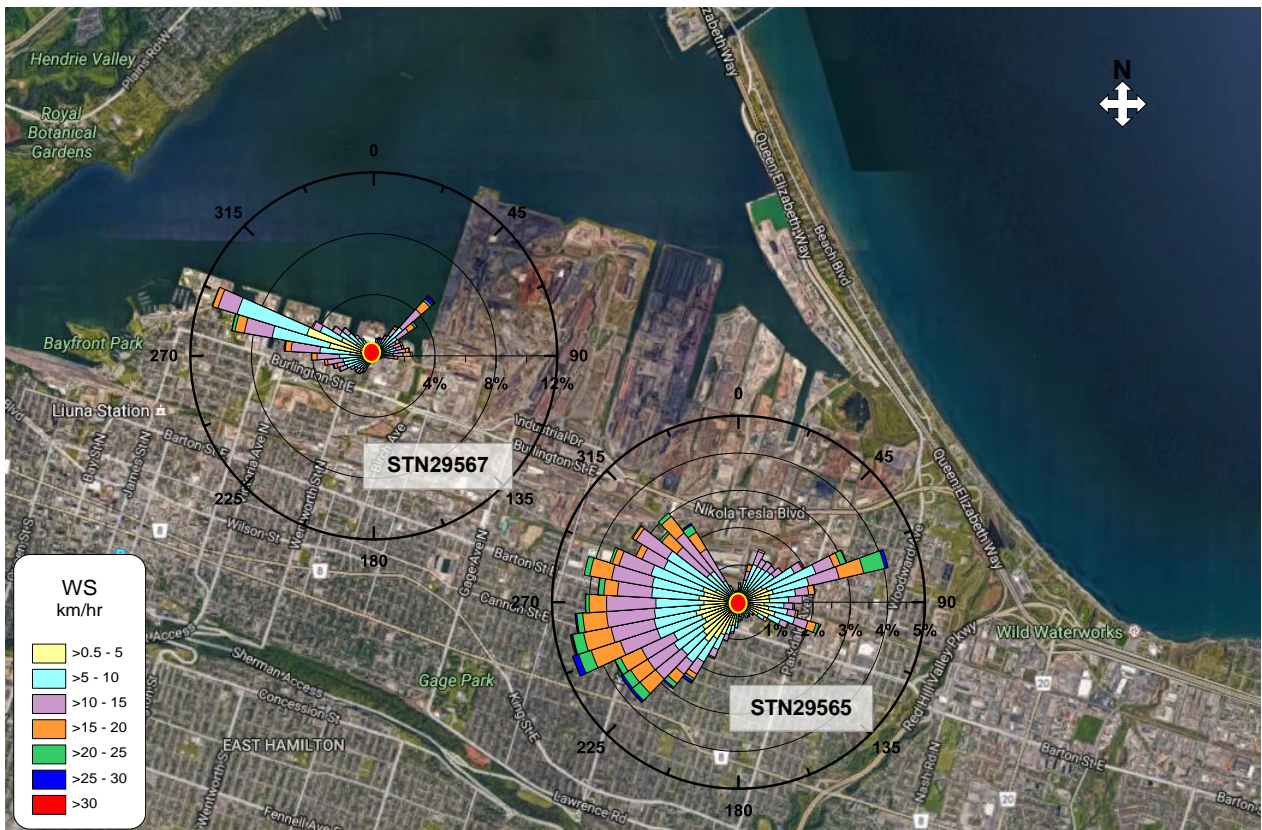
Wind Frequency Distribution 2017 Wind Rose

A wind rose, which is developed from meteorological observations, is used to show predominant wind speed and direction. Wind roses vary from one location to the next, and are a form of meteorological fingerprint. Figure 16 overlays annual wind roses from two meteorological stations (STN29567 and STN29565) superimposed on an aerial view of the Hamilton area.

Wind roses summarize the occurrence of winds at a specific 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. Wind directions are always characterized by the direction from which the wind blew.

The majority and magnitude of branches for STN29567 indicate a predominant wind direction vector of west winds. The annual wind rose illustration for STN29565 indicates a predominant wind direction vector of southwest to northwest winds. Additional contributions of winds originate from the northeast at both locations.

2017 Annual Wind Roses - Figure 16



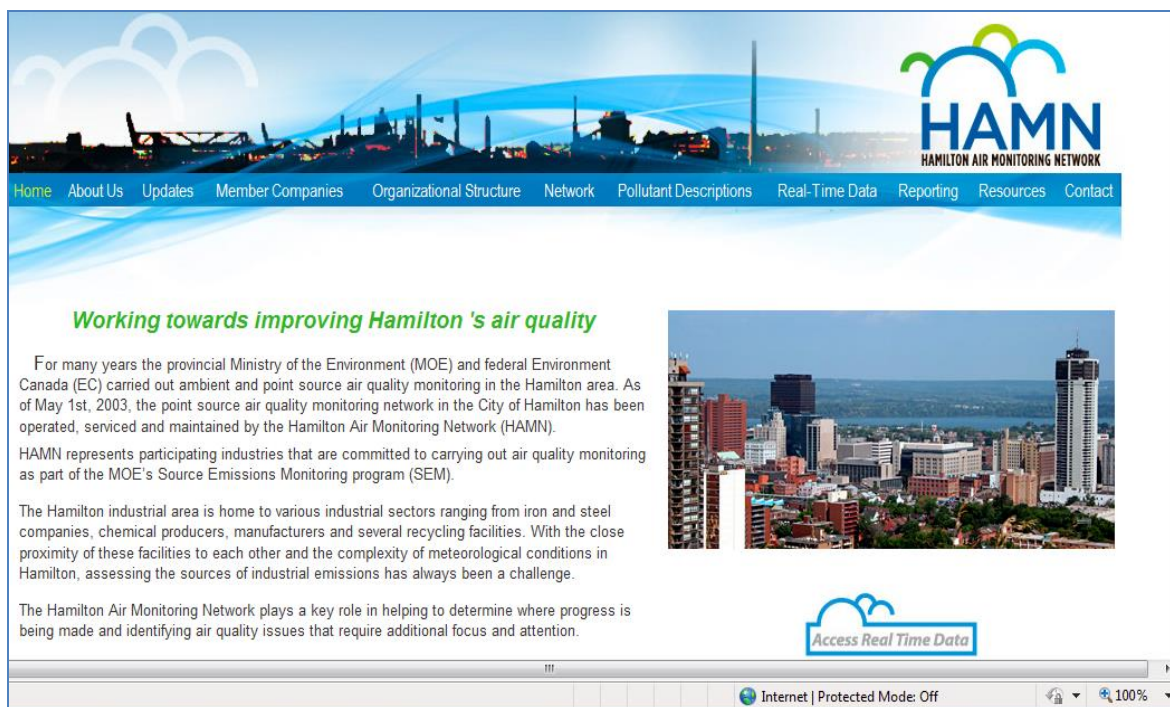
Appendix 2

Activities and Progress

Hamilton Air Monitoring Network (HAMN) Website

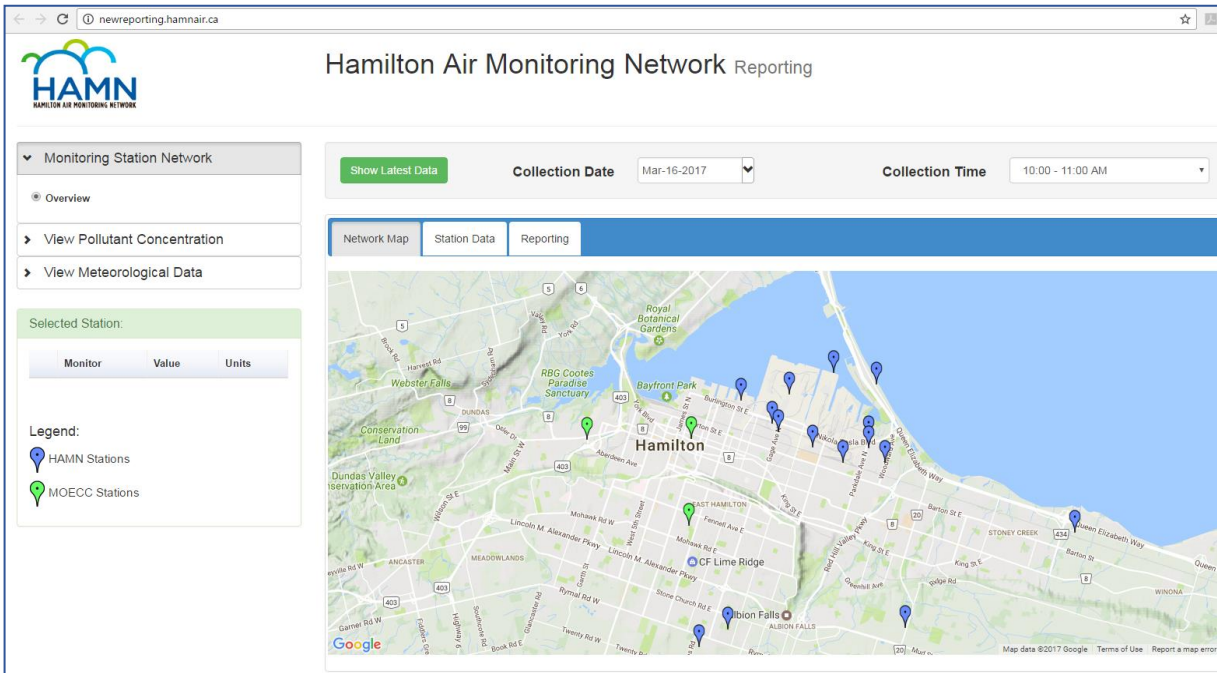
On June 1st, 2009, the HAMN website was made available to the general public. An upgraded website was launched on January 1st, 2017. Current and historical data from real time continuous analyzers and non-continuous data can be accessed through the website at www.hamnair.ca. The website provides general information on network operations such as HAMN structure, contaminants measured, sampling methods, funding, and the MOECC's role in HAMN. The website also provides public access to annual reports. In 2017, HAMN was supported by 18 companies that provided funding to support and operate the network.

HAMN Website Home Page - Figure 17



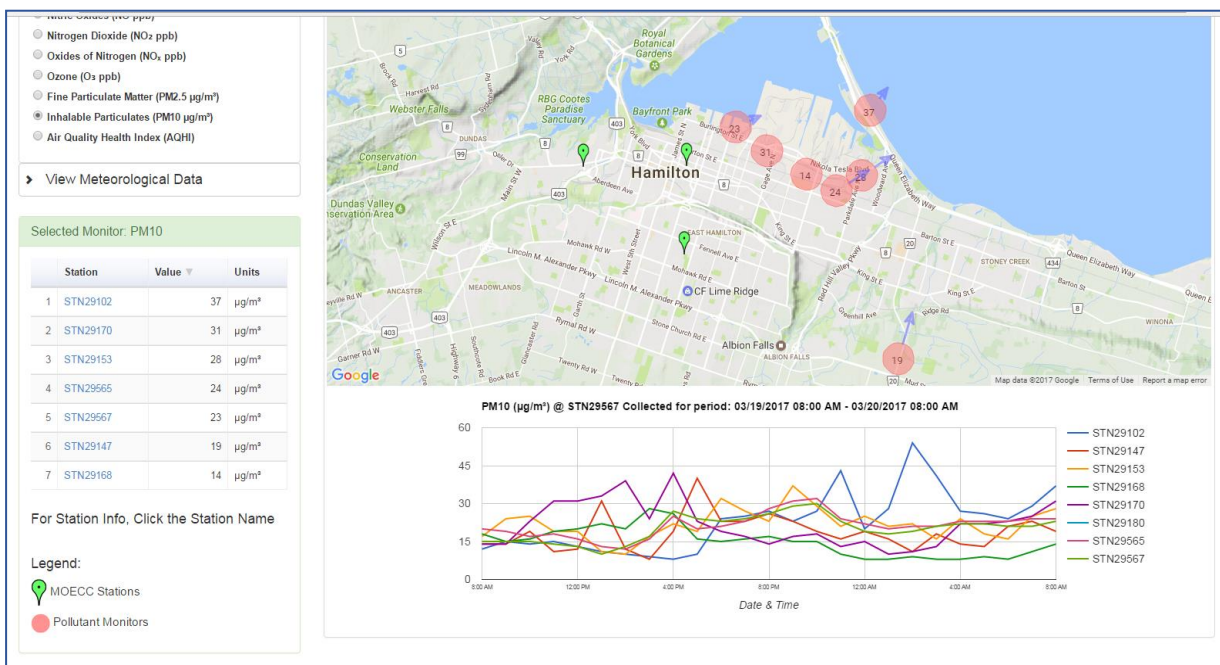
The main focus of the website is to provide access to real-time data for HAMN members, MOECC staff and the general public. Data is available from all continuous analyzers such as Sulphur Dioxide (SO₂), Total Reduced Sulphur (TRS), Oxides of Nitrogen (NO, NO₂, NO_x) and Inhalable Particulates (PM₁₀). There is also a compilation of non-continuous sampler measurements (e.g., VOC, PAH, TSP and metal data). Data is available for a number of meteorological stations that provide wind speed, wind direction and temperature.

Monitoring Station Network Overview - Figure 18



A series of simplified graphical and tabular displays make near real-time and historical data easily accessible. A number of report formats are available for data viewing and assessments.

Real Time Data Overview - Figure 19



Enhancements to the Network Monitoring Program

For 2018, HAMN will begin replacing real-time PM₁₀ (inhalable particulate) analyzers. Presently, there are 7 PM₁₀ analyzers in the network. Each analyzer is worth approximately \$50,000 and is capable of measuring both PM₁₀ and PM_{2.5} (respirable particulates) simultaneously.

Appendix 3

Legend

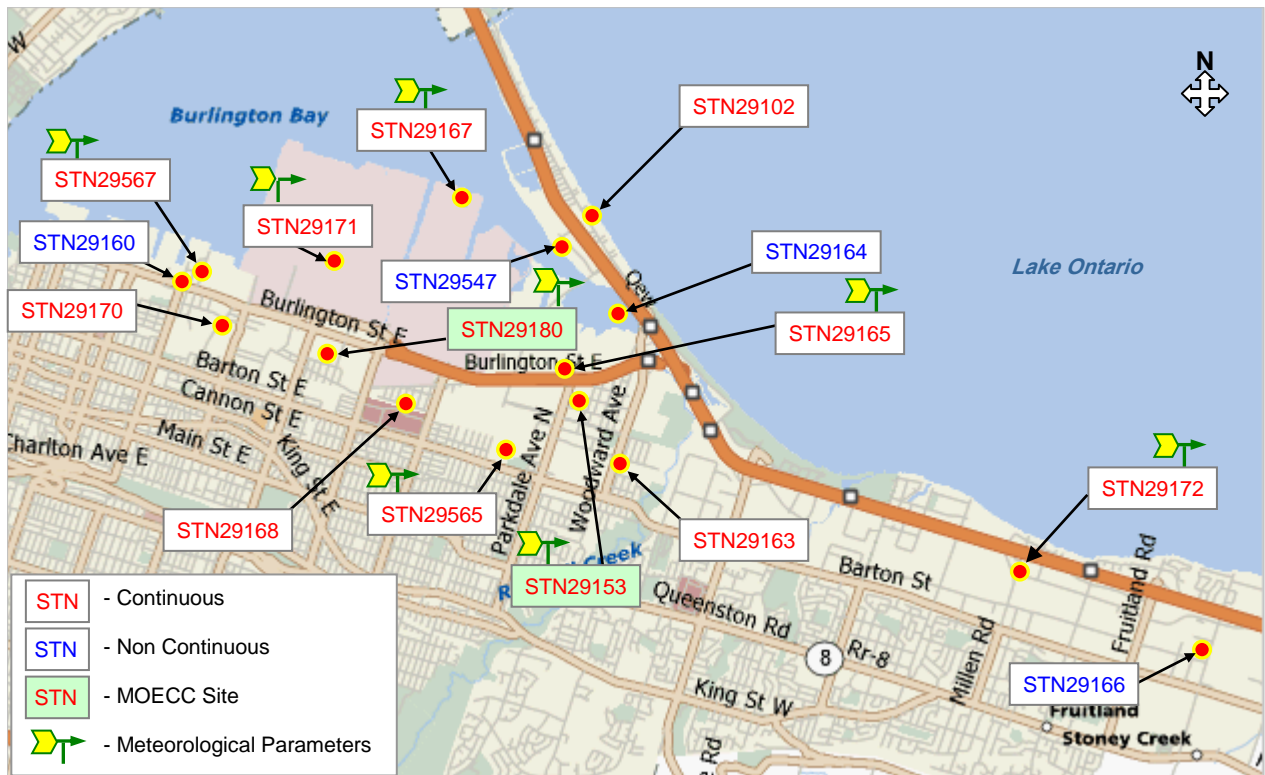
QA/QC	-	Quality Assurance/Quality Control
SEM	-	Source Emissions Monitoring
HAMN	-	Hamilton Air Monitoring Network
AAQC	-	Ambient Air Quality Criteria (Ontario)
EST	-	Eastern Standard Time
MOECC	-	Ministry of the Environment & Climate Change
NO	-	Nitric Oxide
NO₂	-	Nitrogen Dioxide
NO_x	-	Oxides of Nitrogen
PM₁₀	-	Inhalable Particulates less than 10 microns in diameter
SO₂	-	Sulphur Dioxide
TSP	-	Total Suspended Particulate
TRS	-	Total Reduced Sulphur
VOC	-	Volatile Organic Compounds
PAH	-	Polycyclic Aromatic Hydrocarbons
BaP	-	Benzo[a]Pyrene
MDL	-	Minimum Detection Limit
ng/m³	-	Nanograms (of contaminant) Per Cubic Meter (of air)
µg/m³	-	Micrograms (of contaminant) Per Cubic Meter (of air)
ppb	-	Parts (of contaminant) Per Billion (parts of air)
ppm	-	Parts (of contaminant) Per Million (parts of air)
Mn	-	Manganese
Fe	-	Iron
Continuous	-	Continuous 'Real Time' Monitoring
Non-Continuous	-	24 Hr samples collected on a 6 or 12 day schedule
URT	-	Upper Risk Threshold
RT	-	Reportable Threshold

Appendix 4

Where We Measure Air Quality Data in Hamilton

For many years the MOECC and Environment and Climate Change Canada (ECCC) carried out routine ambient monitoring in the Hamilton area. Since May 2003 HAMN's industrial air quality monitoring program has been responsible for collecting and reporting accurate, real time continuous measurements of ambient pollutants at several sites located around the industrial area (Figure 20). These pollutants include Sulphur Dioxide (SO₂), Total Reduced Sulphur (TRS), Oxides of Nitrogen (NO_x), and Inhalable Particulate Matter (PM₁₀). Sampling site labels with a weather vane icon are sites equipped with meteorological sensors. As well, there are 12 non-continuous air monitoring samplers in the HAMN network that collect data every 6th or 12th day on a rotating schedule. These samplers monitor such pollutants as Total Suspended Particulates (TSP), Volatile Organic Compounds (VOCs), Polycyclic Aromatic Hydrocarbons (PAH) and Metals. Table 9 identifies the parameters monitored at each site.

Hamilton Air Monitoring Network Map - Figure 20



Data generated are used to monitor air quality in and around the industrial area and determine which areas meet and/or exceed applicable O. Reg 419/05 standards, AAQCs, URTs, and ministry guidelines in order to develop pollution trends. The HAMN program encompasses operation of the sampling and monitoring network, laboratory analysis of air samples, and quality assurance activities to ensure the quality of the data collected.

HAMN provides the MOECC with real time access to continuous air monitoring data and submits quarterly and annual data summary reports of all continuous and non-continuous air monitoring data. HAMN provides immediate notification of AAQC, Standards and URT exceedances. The MOECC has real-time data access to the air quality information to assist them with abatement programs and complaint investigations.

HAMN Air Monitoring Network Configuration

Network Configuration - Table 9

Parameter	SO2	TRS	NOX	PM10	TSP	VOC	PAH	MET
					Metals			
STN29102	◆	◆	◆	◆	○	○		
STN29153				◆				◆
STN29160					○			
STN29163		◆						
STN29164					○			
STN29165								◆
STN29166					○			
STN29167								◆
STN29168		◆		◆				
STN29170				◆				
STN29171								◆
STN29180				◆	○	○	○	◆
STN29547							○	
STN29565				◆				◆
STN29567	◆	◆	◆	◆	○	○	○	◆

◆ Continuous ○ Non-Continuous

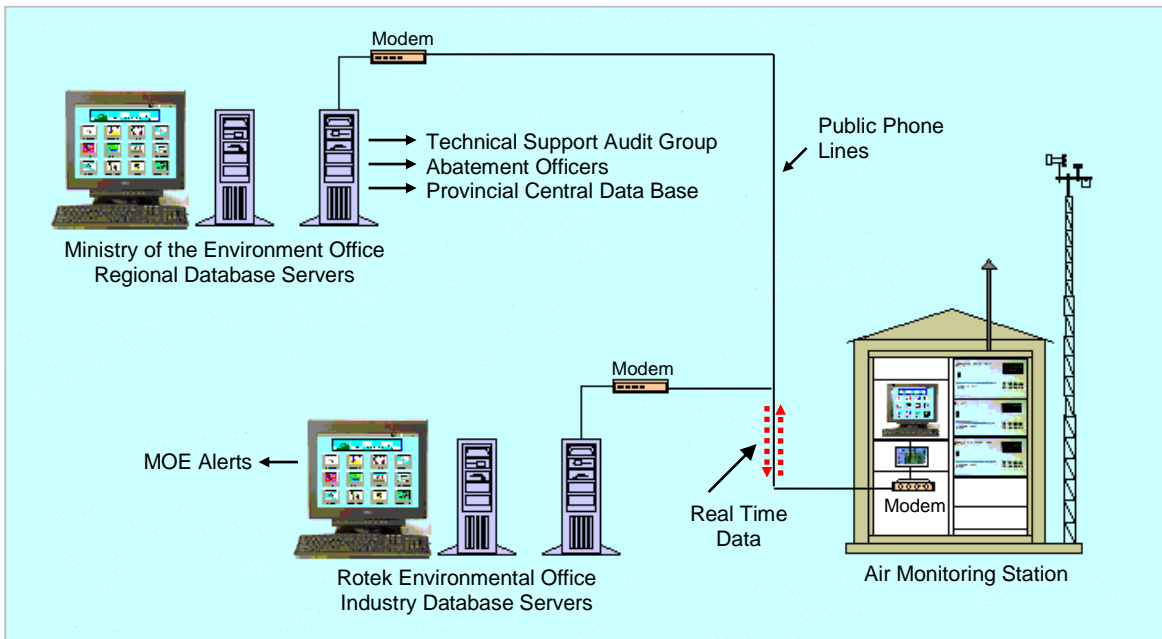
How We Measure Air Quality Data

Network data is used to provide HAMN members and the MOECC with accurate air quality information. The continuous monitoring sites in the network include instruments that measure ambient levels of gaseous and particulate air pollutants, and in some cases, meteorological parameters. The data signals from these analyzers and sensors must be averaged, digitized and processed according to detailed MOECC guidelines for collecting air quality monitoring data. Figure 21 illustrates the real-time movement of data to both industry and MOECC servers.

Telemetry System

Data that is received by HAMN operated servers is utilized for troubleshooting and rectifying network anomalies, generating reports, implementing QA/QC protocols and notifying both MOECC and industry personnel of exceedances and/or unusual air quality events. The MOECC database provides for real time oversight of network operations to ensure compliance with defined protocols and provides immediate access to daily pollutant trends for tracking of abatement program initiatives.

Telemetry System - Figure 21



Appendix 5

Ministry of the Environment & Climate Change (MOECC) Role in HAMN

In April of 2003 the MOECC launched a new program called Source Emissions Monitoring (SEM). This initiative requires that companies in Ontario assume the responsibility for monitoring air quality near their facilities.

The objectives of the air quality monitoring program near industrial point sources include the following:

- Assist in the prevention of possible adverse effects due to air emissions from an industrial facility.
- Demonstrate compliance with provincial regulatory air quality limits as set out in Regulation 419, Regulation 337 or in other regulatory instruments such as Orders and Certificates of Approval.
- Demonstrate conformance with Schedule 1, 2 and/or 3 standards set out in Regulation 419 and listed in the document "SUMMARY of STANDARDS and GUIDELINES to support Ontario Regulation 419: Air Pollution – Local Air Quality", and Ambient Air Quality Criteria listed in the document "ONTARIO'S AMBIENT AIR QUALITY CRITERIA" which are developed by the MOECC as a component of the MOECC standard setting process. These lists are updated periodically.
- Provide accurate and reliable data in support of air quality modeling calculations.
- Determine the impact of industrial air emissions on local air quality in adjacent communities and in the regional air shed.
- Provide accurate and reliable data as part of an integrated air quality management control system.
- Determine air quality improvements and trends in conjunction with industrial air emissions abatement programs.
- Provide data to assess local population and ecosystem exposure to air pollutants.

Links to the Ministry of the Environment & Climate Change (MOECC)

The HAMN air monitoring network is funded and operated by 18 industrial members. HAMN has hired two consultants 1) Administrator - to oversee the network operations as per MOECC requirements, and a second 2) Service Contractor - to provide the service, repair and maintenance of the monitoring network.

The following is a list of requirements specified by the MOECC:

A) Data Access

- The MOECC has access to all continuous monitoring stations.
- MOECC can review and assess all raw air quality data collected by HAMN. Data corrections and/or edits are electronically logged and made available to the MOECC for review. Data is reviewed by the MOECC Air Quality Analyst and forwarded to District abatement staff should further investigation be required.
- The MOECC has access to all performance and calibration records.

B) Notification

- HAMN to notify the MOECC immediately of any exceedances of AAQC, Standards or URT exceedances.

C) **Reporting**

- HAMN to provide a monthly episode summary report.
- HAMN to provide a quarterly data summary report.
- HAMN to provide an annual data summary report.

D) **Auditing**

- MOECC staff will conduct routine auditing of all HAMN air monitoring samplers.
- MOECC audits conducted on continuous analyzers are performed with certified test gases.
- MOECC staff will conduct a performance check on all non-continuous samplers.
- Duplicate monitoring of HAMN samplers is conducted to verify system audits and laboratory analyses.

E) **Communication**

- 2 HAMN committees have been established to provide communication between HAMN members and the MOECC.
 - i. HAMN Steering Committee
The HAMN steering committee members include 6 HAMN members, HAMN Administrator, MOECC District abatement and MOECC Technical support staff.
 - ii. HAMN Technical Sub-Working Group.
This working group deals with the operation of the network. The group is comprised of MOECC technical support staff, the HAMN administrator and the network contractor who meet on a quarterly basis. On occasion, MOECC district abatement staff may be called in to discuss specific abatement issues.

F) **Service Contractor Performance Audit Review**

- HAMN conducts a yearly review of the service contractor's performance. Performance assessment criteria are determined by the MOECC 'Operations Manual for Air Quality Monitoring in Ontario' (March 2008).

Ministry of the Environment & Climate Change – Audit Program / HAMN Performance

The MOECC performs regular audits of activities and processes related to the collection of air quality data under the SEM program. The audit program provides an indication of the effectiveness of quality control activities used by station operators and data management staff. Performance audits are independent evaluations of data quality produced by the analyzers, and are performed in addition to the normal quality control activities. In addition to auditing analyzer and sampler performance, quality control activities of the operator, siting criteria, assessment of the complete sampling system, and completeness and quality of the site logging information is verified by MOECC staff and is incorporated in their audit reports.

The MOECC uses a conformance/non-conformance limit of $\pm 10\%$ of the test gas value or sampler air flow rate standard. Non-conformance with this criterion requires immediate and/or quick corrective action by station operators and data management individuals if data correction/editing are required. In such instances, a follow up audit by MOECC staff is required to ensure that appropriate corrective actions have been taken in a timely manner. For continuously monitored parameters (such as SO₂ or TRS) acquired with a telemetry system, a systems audit starting from the analyzer through to the operator's central computer is undertaken periodically. For non-continuous monitored parameters as TSP, PAH and VOCs, ministry staff conduct co-located duplicate sampling in addition to auditing sampler performance, sample handling, storage, and submission procedures. The MOECC's Laboratory Services Branch also participates in these audit activities with respect to the use and performance of private laboratories.

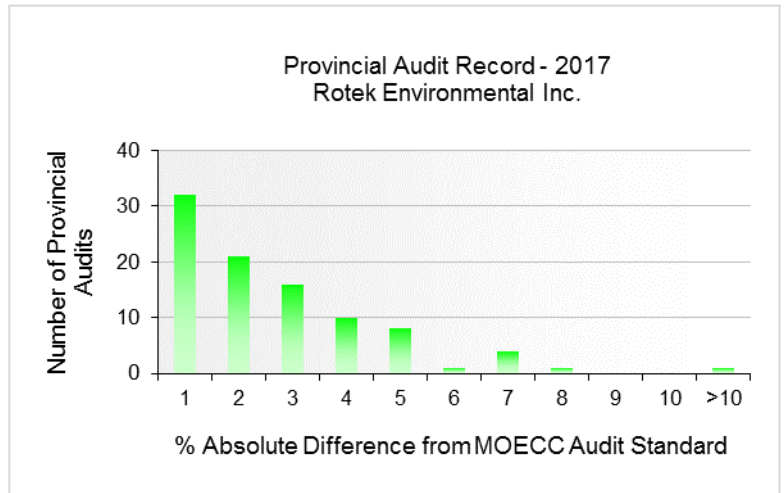
As described above the MOECC carries out a QA/QC function in ensuring quality of data. The QA/QC program is made up of two parts:

- 1) Auditing field samplers to ensure sampling equipment is being maintained and operated as per MOECC 'Operations Manual for Air Quality Monitoring in Ontario', March 2008.
- 2) Auditing contract laboratories to ensure analyses are carried out as per MOECC Standard Operating Procedures.

Ministry of the Environment & Climate Change Provincial Audit Record

In 2017 there were a total of 95 individual Provincial audits of continuous and non-continuous air monitoring equipment operated and maintained by Rotek Environmental Inc. Of the 95 audits, 94 were certified by the MOECC as being acceptable, a 98.9% audit success rate.

2017 Audit Record - Figure 22



Appendix 6

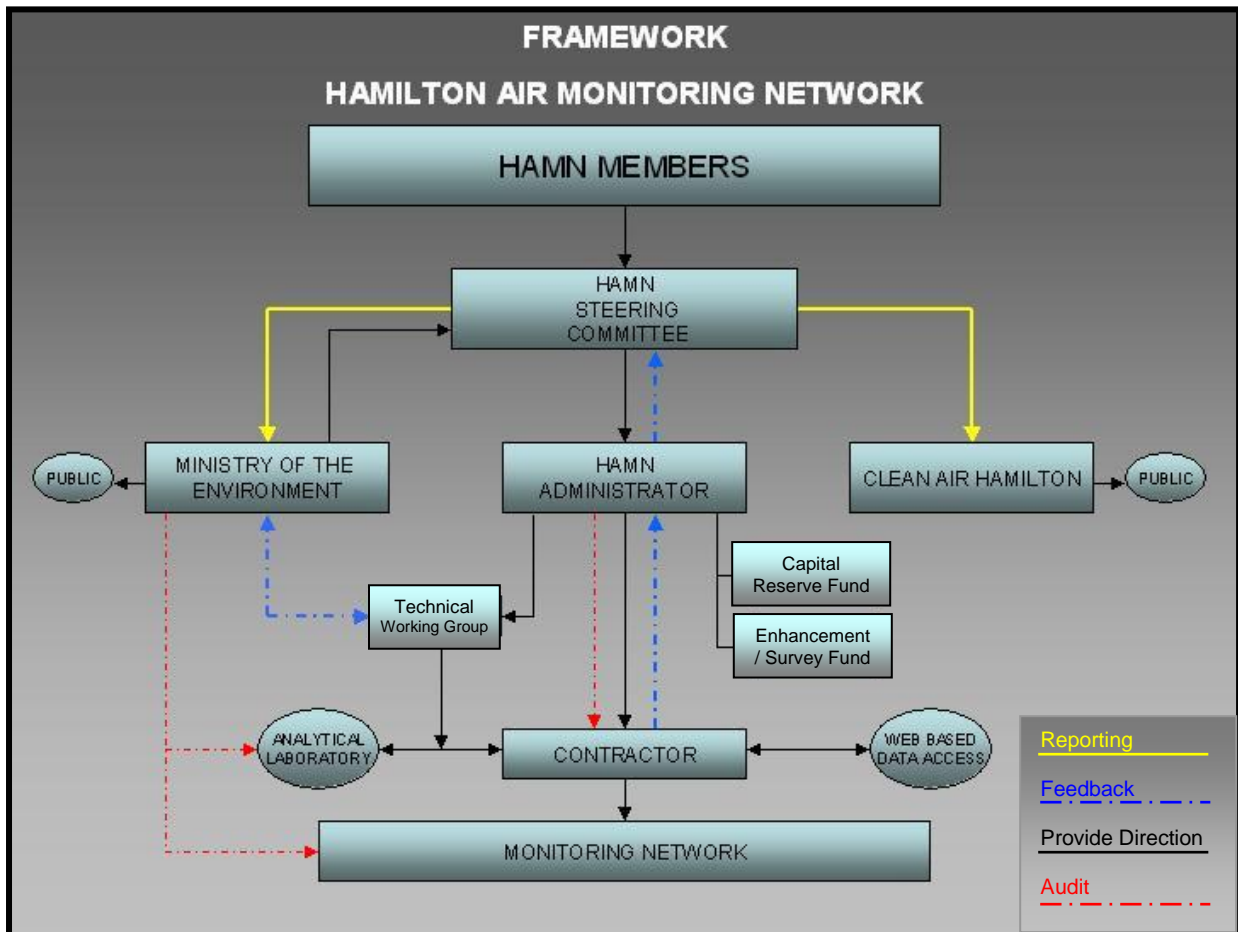
HAMN Structure

Working Committees:

- 1) **HAMN Steering Committee** - a management group comprising of 6 industry members, the HAMN administrator, and a representative from the MOECC. The mandate of this committee is to ensure that both the MOECC and the industrial partners' needs are met with regards to their SEM responsibilities.
- 2) **HAMN Technical Working Group** - a technical working group to deal with day to day issues related to the operation of the air monitoring network.

These committees provide a continuous line of communication among the industrial partners, air monitoring network contractor, Clean Air Hamilton, and the MOECC. In February, 2003, HAMN acquired the services of an administrator to oversee the SEM project and ensure compliance with MOECC requirements and protocols.

HAMN Framework - Figure 23



Contacts

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Fax - 905 578 5167
Email - daszko@rotekinc.com
Web - www.rotekinc.com



Hamilton Air Monitoring Network
Appendix 7
2017 Summary Statistics and Data Set



Hamilton Air Monitoring Network - 2017 Statistics

HAMN Station ID		STN29102 - Beach Blvd, Hamilton			Monthly Statistics												
Parameter	Statistic	Average Type	Units	Q1			Q2			Q3			Q4			Annual Mean	
				J	F	M	A	M	J	J	A	S	O	N	D		
Sulphur Dioxide	SO2	Period Arithmetic Mean	Clock	ppb	7			5			7			8			7
		Monthly Arithmetic Mean	Clock	ppb	8	7	5	5	3	6	6	7	9	8	6	11	---
		Maximum ½ Hour	Running	ppb	95	83	109	66	80	100	115	114	162	151	126	97	---
		Maximum 1 Hour	Running	ppb	59	78	77	55	62	95	108	109	127	139	115	94	---
		Maximum 24 Hour	Running	ppb	28	29	36	24	22	26	35	49	54	39	20	32	---
		% Valid Data	---	%	100	100	99.9	99.9	100	99.6	100	100	99.9	100	99.4	100	99.9
Total Reduced Sulphur	TRS	Period Arithmetic Mean	Clock	ppb	0.4			0.2			0.1			0.6			0.3
		Monthly Arithmetic Mean	Clock	ppb	0.5	0.4	0.2	0.3	0.2	0.2	0.1	0.1	0.2	0.6	0.4	0.8	---
		Maximum 10 Minute	Running	ppb	91.2	18.9	71.9	19.6	8.3	9.3	2.7	4.8	15.0	63.3	16.6	28.7	---
		Maximum ½ Hour	Running	ppb	53.6	17.9	35.3	11.7	6.4	7.4	2.0	2.2	12.2	46.7	12.6	24.9	---
		Maximum 1 Hour	Clock	ppb	28.3	14.9	15.2	9.5	4.5	6.0	1.7	1.3	8.1	19.2	10.2	18.9	---
		Maximum 24 Hour	Running	ppb	2.5	2.9	2.4	2.1	0.7	1.5	0.2	0.2	1.3	4.3	1.8	5.6	---
		% Valid Data	---	%	99.9	99.9	99.9	99.7	99.9	99.7	99.9	99.9	99.3	99.9	99.4	100	99.8
Nitrogen Dioxide	NO2	Period Arithmetic Mean	Clock	ppb	11			10			11			13			11
		Monthly Arithmetic Mean	Clock	ppb	12	11	9	9	9	11	9	11	12	13	12	15	---
		Maximum 1 Hour	Running	ppb	36	41	46	47	37	39	37	39	43	41	42	44	---
		Maximum 24 Hour	Running	ppb	26	24	29	20	20	25	19	22	24	26	27	32	---
		% Valid Data	---	%	100	99.7	98.8	99.7	99.5	99.7	100	99.9	99.7	99.9	99.6	99.7	99.7
Oxides of Nitrogen	NOx	Period Arithmetic Mean	Clock	ppb	15			11			13			19			14
		Monthly Arithmetic Mean	Clock	ppb	17	15	12	11	11	14	11	14	18	18	18	24	---
		Maximum 1 Hour	Running	ppb	82	90	99	111	91	134	81	90	121	128	159	133	---
		Maximum 24 Hour	Running	ppb	40	31	43	32	30	33	27	27	35	37	55	53	---
		% Valid Data	---	%	100	99.7	98.8	99.7	99.5	99.7	100	99.9	99.7	99.9	99.6	99.7	99.7
Particulate Matter < 10 µm	PM10	Period Arithmetic Mean	Clock	µg/m ³	21			24			27			29			25
		Monthly Arithmetic Mean	Clock	µg/m ³	22	21	21	19	26	28	23	28	30	30	23	34	---
		Maximum 1 Hour	Clock	µg/m ³	178	180	753	450	535	176	92	138	119	229	149	458	---
		Maximum 24 Hour	Running	µg/m ³	53	46	137	95	193	72	50	68	64	76	69	153	---
		% Valid Data	---	%	99.9	100	99.7	99.9	97.4	99.9	100	100	99.9	100	100	100	99.7



2017 Standards, Guidelines and Upper Risk Thresholds Summary

O. Reg. 419/05 Standards, Guidelines, Upper Risk Thresholds and Ambient Air Quality Criteria							Number of Exceedances													
Parameter	Type	Average Period	Average Type	Value	Units	Q1			Q2			Q3			Q4			Total		
						J	F	M	A	M	J	J	A	S	O	N	D			
Sulphur Dioxide	SO2	Standard	½ Hr	Running	300	ppb	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sulphur Dioxide	SO2	Standard	1 Hr	Running	250	ppb	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sulphur Dioxide	SO2	Standard	24 Hr	Running	100	ppb	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Reduced Sulphur	TRS	Standard	10 Min	Running	9	ppb	26	18	8	10	0	1	0	0	6	37	17	53	176	
Total Reduced Sulphur	TRS	RT	1 Hr	Clock	10	ppb	2	2	1	0	0	0	0	0	2	0	7	14		
Total Reduced Sulphur	TRS	Standard	24 Hr	Running	4	ppb	0	0	0	0	0	0	0	0	1	0	1	2		
Total Reduced Sulphur	TRS	URT	½ Hr	Running	143	ppb	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Reduced Sulphur	TRS	URT	24 Hr	Running	48	ppb	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen Dioxide	NO2	AAQC	1 Hr	Running	200	ppb	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen Dioxide	NO2	AAQC	24 Hr	Running	100	ppb	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxides of Nitrogen (NO + NO2)	NOx	Standard	½ Hr	Running	327	ppb	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxides of Nitrogen (NO + NO2)	NOx	Standard	1 Hr	Running	261	ppb	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxides of Nitrogen (NO + NO2)	NOx	Standard	24 Hr	Running	131	ppb	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Particulate Matter < 10 µm	PM10	AAQC	24 Hr	Running	50	µg/m ³	1	0	2	4	3	4	0	1	2	4	4	5	30	
Suspended Particulate < 44 µm	SP	Standard	24 Hr	Running	120	µg/m ³	0	0	1	0	3	0	0	0	0	0	0	4	8	
Suspended Particulate < 44 µm	TSP	Standard	24 Hr	Clock	120	µg/m ³	0	0	0	0	0	1	0	0	0	0	0	1	2	
Cadmium	Cd	Standard	24 Hr	Clock	0.025	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cadmium	Cd	URT	24 Hr	Clock	0.25	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chromium	Cr	Guideline	24 Hr	Clock	1.5	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chromium	Cr	URT	24 Hr	Clock	5	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron - Ferric Oxide	Fe	Standard	24 Hr	Clock	25	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron	Fe	Standard	24 Hr	Clock	4	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Copper	Cu	Standard	24 Hr	Clock	50	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lead	Pb	Standard	24 Hr	Clock	0.5	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lead	Pb	URT	24 Hr	Clock	2	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manganese	Mn	AAQC	24 Hr	Clock	0.4	µg/m ³	0	0	0	0	0	0	0	0	0	1	0	0	1	
Manganese	Mn	URT	24 Hr	Clock	4	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nickel	Ni	Standard	24 Hr	Clock	2	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nickel	Ni	URT	24 Hr	Clock	2	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vanadium	V	Standard	24 Hr	Clock	2	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzene	C6H6	AAQC	24 Hr	Clock	2.3	µg/m ³	1	0	1	0	0	1	2	1	1	1	0	0	8	

Standard	O. Reg. 419/05 Standard
Guideline	MOECC Guideline
URT	O. Reg. 419/05 Upper Risk Threshold
RT	MOECC Reportable Threshold
AAQC	MOECC Ambient Air Quality Criteria
SP ½ Hour Standard (100 µg/m ³)	PM10 data used as surrogate for SP < 44 µm



Hamilton Air Monitoring Network - 2017 Statistics

HAMN Station ID		STN29153 - Parkdale, Hamilton				Monthly Statistics											
Parameter	Statistic	Average Type	Units	Q1			Q2			Q3			Q4		Annual Mean		
				J	F	M	A	M	J	J	A	S	O	N		D	
Particulate Matter < 10 µm	PM10	Period Arithmetic Mean	Clock	µg/m ³	28			32			36			28		31	
		Monthly Arithmetic Mean	Clock	µg/m ³	23	28	34	29	36	32	31	34	44	32	29	23	---
		Maximum 1 Hour	Clock	µg/m ³	114	178	244	664	500	183	225	185	221	242	118	108	---
		Maximum 24 Hour	Running	µg/m ³	51	73	84	79	162	68	61	67	76	66	56	59	---
		% Valid Data	---	%	91.1	99.7	94.9	99.9	96.6	100	96.5	99.9	93.3	100	92.4	99.9	97.0



2017 Standards, Guidelines and Upper Risk Thresholds Summary

O. Reg. 419/05 Standards, Guidelines, Upper Risk Thresholds and Ambient Air Quality Criteria							Number of Exceedances												
Parameter	Type	Average Period	Average Type	Value	Units	Q1			Q2			Q3			Q4		Total		
						J	F	M	A	M	J	J	A	S	O	N		D	
Particulate Matter < 10 µm	PM10	AAQC	24 Hr	Running	50	µg/m ³	1	2	10	2	5	6	1	5	13	5	3	2	55
Suspended Particulate < 44 µm	SP	Standard	24 Hr	Running	120	µg/m ³	0	0	0	0	1	0	0	0	0	0	0	0	1

Standard	O. Reg. 419/05 Standard
Guideline	MOECC Guideline
URT	O. Reg. 419/05 Upper Risk Threshold
RT	MOECC Reportable Threshold
AAQC	MOECC Ambient Air Quality Criteria
SP ½ Hour Standard (100 µg/m ³)	PM10 data used as surrogate for SP < 44 µm



Hamilton Air Monitoring Network - 2017 Statistics

HAMN Station ID		STN29163 - Brampton / Woodward, Hamilton				Monthly Statistics											
Parameter	Statistic	Average Type	Units	Q1			Q2			Q3			Q4		Annual Mean		
				J	F	M	A	M	J	J	A	S	O	N		D	
Total Reduced Sulphur	TRS	Period Arithmetic Mean	Clock	ppb	0.1			0.1			0.1			0.1		0.1	
		Monthly Arithmetic Mean	Clock	ppb	0.1	0.1	0.1	0.1	0.2	0.2	0.0	0.0	0.2	0.0	0.2	0.1	---
		Maximum 10 Minute	Running	ppb	1.9	2.4	3.5	5.5	4.3	4.0	0.9	1.5	7.0	4.2	6.7	26.6	---
		Maximum ½ Hour	Running	ppb	1.5	1.4	3.2	2.8	1.8	3.3	0.7	1.2	6.1	2.5	3.3	12.3	---
		Maximum 1 Hour	Clock	ppb	1.1	1.1	2.3	2.5	1.4	2.8	0.5	0.7	4.9	1.3	2.2	6.4	---
		Maximum 24 Hour	Running	ppb	0.6	0.4	0.5	0.3	0.5	0.8	0.4	0.3	1.3	0.2	1.0	0.7	---
		% Valid Data	---	%	99.9	99.9	99.7	100	99.9	100	99.9	99.9	99.6	100	99.9	96.9	99.6



2017 Standards, Guidelines and Upper Risk Thresholds Summary

O. Reg. 419/05 Standards, Guidelines, Upper Risk Thresholds and Ambient Air Quality Criteria							Number of Exceedances												
Parameter	Type	Average Period	Average Type	Value	Units	Q1			Q2			Q3			Q4		Total		
						J	F	M	A	M	J	J	A	S	O	N		D	
Total Reduced Sulphur	TRS	Standard	10 Min	Running	9	ppb	0	0	0	0	0	0	0	0	0	0	0	3	3
Total Reduced Sulphur	TRS	RT	1 Hr	Clock	10	ppb	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Reduced Sulphur	TRS	Standard	24 Hr	Running	4	ppb	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Reduced Sulphur	TRS	URT	½ Hr	Running	143	ppb	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Reduced Sulphur	TRS	URT	24 Hr	Running	48	ppb	0	0	0	0	0	0	0	0	0	0	0	0	0

Standard	O. Reg. 419/05 Standard
Guideline	MOECC Guideline
URT	O. Reg. 419/05 Upper Risk Threshold
RT	MOECC Reportable Threshold
AAQC	MOECC Ambient Air Quality Criteria
SP ½ Hour Standard (100 µg/m ³)	PM10 data used as surrogate for SP < 44 µm



Hamilton Air Monitoring Network - 2017 Statistics

HAMN Station ID		STN29168 - Christopher Park, Hamilton				Monthly Statistics											
Parameter	Statistic	Average Type	Units	Q1			Q2			Q3			Q4		Annual Mean		
				J	F	M	A	M	J	J	A	S	O	N		D	
Total Reduced Sulphur	TRS	Period Arithmetic Mean	Clock	ppb	0.2			0.1			0.1			0.1		0.1	
		Monthly Arithmetic Mean	Clock	ppb	0.1	0.2	0.3	0.1	0.3	0.0	0.0	0.1	0.2	0.1	0.1	0.1	---
		Maximum 10 Minute	Running	ppb	2.1	4.3	15.8	12.6	47.8	3.3	2.0	1.3	19.1	2.1	2.1	3.3	---
		Maximum ½ Hour	Running	ppb	1.3	3.1	10.9	5.1	30.1	3.0	1.7	1.1	12.8	1.8	1.9	2.7	---
		Maximum 1 Hour	Clock	ppb	0.7	2.0	8.2	3.0	15.5	2.3	1.2	0.7	7.9	1.6	1.3	1.9	---
		Maximum 24 Hour	Running	ppb	0.4	1.1	1.2	0.4	1.2	0.3	0.1	0.5	2.2	0.5	0.9	0.4	---
		% Valid Data	---	%	99.9	95.7	99.7	99.9	99.6	100	99.9	94.0	99.6	99.9	99.9	99.0	
Particulate Matter < 10 µm	PM10	Period Arithmetic Mean	Clock	µg/m ³	16			17			18			11		16	
		Monthly Arithmetic Mean	Clock	µg/m ³	11	17	21	17	18	16	18	15	21	13	11	9	---
		Maximum 1 Hour	Clock	µg/m ³	77	157	129	103	126	121	88	87	109	85	87	52	---
		Maximum 24 Hour	Running	µg/m ³	29	51	57	39	40	39	33	30	57	29	22	32	---
				% Valid Data	---	%	100	100	99.7	100	93.7	100	98.9	99.9	99.6	99.9	100



2017 Standards, Guidelines and Upper Risk Thresholds Summary

O. Reg. 419/05 Standards, Guidelines, Upper Risk Thresholds and Ambient Air Quality Criteria							Number of Exceedances												
Parameter	Type	Average Period	Average Type	Value	Units	Q1			Q2			Q3			Q4		Total		
						J	F	M	A	M	J	J	A	S	O	N		D	
Total Reduced Sulphur	TRS	Standard	10 Min	Running	9	ppb	0	0	5	2	7	0	0	0	4	0	0	0	18
Total Reduced Sulphur	TRS	RT	1 Hr	Clock	10	ppb	0	0	0	0	2	0	0	0	0	0	0	0	2
Total Reduced Sulphur	TRS	Standard	24 Hr	Running	4	ppb	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Reduced Sulphur	TRS	URT	½ Hr	Running	143	ppb	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Reduced Sulphur	TRS	URT	24 Hr	Running	48	ppb	0	0	0	0	0	0	0	0	0	0	0	0	0
Particulate Matter < 10 µm	PM10	AAQC	24 Hr	Running	50	µg/m ³	0	0	1	0	0	0	0	0	1	0	0	0	2
Suspended Particulate < 44 µm	SP	Standard	½ Hr	Running	100	µg/m ³	0	0	9	6	3	5	2	0	20	0	1	0	46
Suspended Particulate < 44 µm	SP	Standard	24 Hr	Running	120	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0

Standard	O. Reg. 419/05 Standard
Guideline	MOECC Guideline
URT	O. Reg. 419/05 Upper Risk Threshold
RT	MOECC Reportable Threshold
AAQC	MOECC Ambient Air Quality Criteria
SP ½ Hour Standard (100 µg/m ³)	PM10 data used as surrogate for SP < 44 µm



Hamilton Air Monitoring Network - 2017 Statistics

HAMN Station ID		STN29170 - Birmingham, Hamilton				Monthly Statistics											
Parameter	Statistic	Average Type	Units	Q1			Q2			Q3			Q4		Annual Mean		
				J	F	M	A	M	J	J	A	S	O	N		D	
Particulate Matter < 10 µm	PM10	Period Arithmetic Mean	Clock	µg/m ³	19			22			26			20		22	
		Monthly Arithmetic Mean	Clock	µg/m ³	17	21	20	19	26	23	23	22	32	22	19	17	---
		Maximum 1 Hour	Clock	µg/m ³	73	160	136	232	237	124	143	109	231	270	122	104	---
		Maximum 24 Hour	Running	µg/m ³	40	59	51	52	93	51	49	42	76	46	52	56	---
		% Valid Data	---	%	99.9	92.6	99.7	99.9	99.6	99.7	99.9	99.9	97.1	100	99.9	99.9	99.0



2017 Standards, Guidelines and Upper Risk Thresholds Summary

O. Reg. 419/05 Standards, Guidelines, Upper Risk Thresholds and Ambient Air Quality Criteria							Number of Exceedances												
Parameter	Type	Average Period	Average Type	Value	Units	Q1			Q2			Q3			Q4		Total		
						J	F	M	A	M	J	J	A	S	O	N		D	
Particulate Matter < 10 µm	PM10	AAQC	24 Hr	Running	50	µg/m ³	0	0	1	1	4	1	0	0	8	0	1	1	17
Suspended Particulate < 44 µm	SP	Standard	24 Hr	Running	120	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0

Standard	O. Reg. 419/05 Standard
Guideline	MOECC Guideline
URT	O. Reg. 419/05 Upper Risk Threshold
RT	MOECC Reportable Threshold
AAQC	MOECC Ambient Air Quality Criteria
SP ½ Hour Standard (100 µg/m ³)	PM10 data used as surrogate for SP < 44 µm



Hamilton Air Monitoring Network - 2017 Statistics

HAMN Station ID		STN29180 - Burlington / Gage, Hamilton				Monthly Statistics												
Parameter	Statistic	Average Type	Units	Q1			Q2			Q3			Q4			Annual Mean		
				J	F	M	A	M	J	J	A	S	O	N	D			
Particulate Matter < 10 µm	PM10	Period Arithmetic Mean	Clock	µg/m ³	---			24			26			20			23	
		Monthly Arithmetic Mean	Clock	µg/m ³	22	26	---	21	26	25	23	25	30	19	22	17	---	
		Maximum 1 Hour	Clock	µg/m ³	107	143	275	113	145	115	95	144	149	96	151	94	---	
		Maximum 24 Hour	Running	µg/m ³	50	65	223	57	71	58	48	64	67	39	54	50	---	
		% Valid Data	---	%	100	98.7	44.9	95.3	100	97.8	99.7	97.7	94.7	100	99.3	100	94.0	



2017 Standards, Guidelines and Upper Risk Thresholds Summary

O. Reg. 419/05 Standards, Guidelines, Upper Risk Thresholds and Ambient Air Quality Criteria							Number of Exceedances												
Parameter	Type	Average Period	Average Type	Value	Units	Q1			Q2			Q3			Q4			Total	
						J	F	M	A	M	J	J	A	S	O	N	D		
Particulate Matter < 10 µm	PM10	AAQC	24 Hr	Running	50	µg/m ³	0	0	6	1	2	1	0	2	3	0	1	0	16
Suspended Particulate < 44 µm	SP	Standard	½ Hr	Running	100	µg/m ³	2	0	80	6	13	14	4	7	3	2	6	2	139
Suspended Particulate < 44 µm	SP	Standard	24 Hr	Running	120	µg/m ³	0	0	1	0	0	0	0	0	0	0	0	0	1
Suspended Particulate < 44 µm	TSP	Standard	24 Hr	Clock	120	µg/m ³	0	0	0	0	1	0	0	1	2	0	0	0	4
Cadmium	Cd	Standard	24 Hr	Clock	0.025	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0
Cadmium	Cd	URT	24 Hr	Clock	0.25	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0
Chromium	Cr	Guideline	24 Hr	Clock	1.5	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0
Chromium	Cr	URT	24 Hr	Clock	5	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron - Ferric Oxide	Fe	Standard	24 Hr	Clock	25	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron	Fe	Standard	24 Hr	Clock	4	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0
Copper	Cu	Standard	24 Hr	Clock	50	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0
Lead	Pb	Standard	24 Hr	Clock	0.5	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0
Lead	Pb	URT	24 Hr	Clock	2	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0
Manganese	Mn	AAQC	24 Hr	Clock	0.4	µg/m ³	0	0	0	0	1	0	0	1	1	0	0	0	3
Manganese	Mn	URT	24 Hr	Clock	4	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0
Nickel	Ni	Standard	24 Hr	Clock	2	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0
Nickel	Ni	URT	24 Hr	Clock	2	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0
Vanadium	V	Standard	24 Hr	Clock	2	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzo [a] Pyrene	B[a]P	AAQC	24 Hr	Clock	0.05	ng/m ³	3	3	1	2	3	2	3	2	3	2	3	2	29
Benzo [a] Pyrene	B[a]P	Ref. Level	24 Hr	Clock	1.10	ng/m ³	0	1	0	1	0	0	0	0	0	1	0	0	3
Benzo [a] Pyrene	B[a]P	URT	24 Hr	Clock	5.00	ng/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzene	C6H6	AAQC	24 Hr	Clock	2.3	µg/m ³	0	1	0	1	0	0	0	0	0	1	0	0	3

Standard	O. Reg. 419/05 Standard
Guideline	MOECC Guideline
URT	O. Reg. 419/05 Upper Risk Threshold
RT	MOECC Reportable Threshold
AAQC	MOECC Ambient Air Quality Criteria
SP ½ Hour Standard (100 µg/m ³)	PM10 data used as surrogate for SP < 44 µm

*Q1 Period Arithmetic Mean and Monthly Arithmetic Mean for March unavailable due to insufficient data.



Hamilton Air Monitoring Network - 2017 Statistics

HAMN Station ID		STN29565 - Strathearne Avenue, Hamilton				Monthly Statistics											
Parameter	Statistic	Average Type	Units	Q1			Q2			Q3			Q4			Annual Mean	
				J	F	M	A	M	J	J	A	S	O	N	D		
Particulate Matter < 10 µm	PM10	Period Arithmetic Mean	Clock	µg/m ³	17			16			17			14			16
		Monthly Arithmetic Mean	Clock	µg/m ³	16	18	16	14	18	16	15	16	19	14	14	14	---
		Maximum 1 Hour	Clock	µg/m ³	73	101	60	90	158	119	113	118	83	78	50	68	---
		Maximum 24 Hour	Running	µg/m ³	33	61	32	29	44	47	26	49	49	37	27	43	---
		% Valid Data	---	%	98.1	100	100	100	99.7	100	100	100	99.7	100	99.9	99.9	99.8



2017 Standards, Guidelines and Upper Risk Thresholds Summary

O. Reg. 419/05 Standards, Guidelines, Upper Risk Thresholds and Ambient Air Quality Criteria							Number of Exceedances												
Parameter	Type	Average Period	Average Type	Value	Units	Q1			Q2			Q3			Q4			Total	
						J	F	M	A	M	J	J	A	S	O	N	D		
Particulate Matter < 10 µm	PM10	AAQC	24 Hr	Running	50	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0
Suspended Particulate < 44 µm	SP	Standard	½ Hr	Running	100	µg/m ³	0	0	0	3	4	5	3	4	0	0	0	0	19
Suspended Particulate < 44 µm	SP	Standard	24 Hr	Running	120	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0

Standard	O. Reg. 419/05 Standard
Guideline	MOECC Guideline
URT	O. Reg. 419/05 Upper Risk Threshold
RT	MOECC Reportable Threshold
AAQC	MOECC Ambient Air Quality Criteria
SP ½ Hour Standard (100 µg/m ³)	PM10 data used as surrogate for SP < 44 µm



2017 Standards, Guidelines and Upper Risk Thresholds Summary

O. Reg. 419/05 Standards, Guidelines, Upper Risk Thresholds and Ambient Air Quality Criteria							Number of Exceedances													
Parameter	Type	Average Period	Average Type	Value	Units	Q1			Q2			Q3			Q4			Total		
						J	F	M	A	M	J	J	A	S	O	N	D			
Sulphur Dioxide	SO2	Standard	½ Hr	Running	300	ppb	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sulphur Dioxide	SO2	Standard	1 Hr	Running	250	ppb	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sulphur Dioxide	SO2	Standard	24 Hr	Running	100	ppb	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Reduced Sulphur	TRS	Standard	10 Min	Running	9	ppb	0	0	6	4	6	2	0	0	7	0	0	2	27	
Total Reduced Sulphur	TRS	RT	1 Hr	Clock	10	ppb	0	0	1	0	0	0	0	0	0	0	0	0	1	
Total Reduced Sulphur	TRS	Standard	24 Hr	Running	4	ppb	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total Reduced Sulphur	TRS	URT	½ Hr	Running	143	ppb	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total Reduced Sulphur	TRS	URT	24 Hr	Running	48	ppb	0	0	0	0	0	0	0	0	0	0	0	0	0	
Nitrogen Dioxide	NO2	AAQC	1 Hr	Running	200	ppb	0	0	0	0	0	0	0	0	0	0	0	0	0	
Nitrogen Dioxide	NO2	AAQC	24 Hr	Running	100	ppb	0	0	0	0	0	0	0	0	0	0	0	0	0	
Oxides of Nitrogen (NO + NO2)	NOx	Standard	½ Hr	Running	327	ppb	0	0	0	0	0	0	0	0	0	0	0	0	0	
Oxides of Nitrogen (NO + NO2)	NOx	Standard	1 Hr	Running	261	ppb	0	0	0	0	0	0	0	0	0	0	0	0	0	
Oxides of Nitrogen (NO + NO2)	NOx	Standard	24 Hr	Running	131	ppb	0	0	0	0	0	0	0	0	0	0	0	0	0	
Particulate Matter < 10 µm	PM10	AAQC	24 Hr	Running	50	µg/m ³	0	0	3	0	1	0	0	0	1	1	0	0	6	
Suspended Particulate < 44 µm	SP	Standard	½ Hr	Running	100	µg/m ³	1	0	46	0	5	9	1	0	3	5	2	4	76	
Suspended Particulate < 44 µm	SP	Standard	24 Hr	Running	120	µg/m ³	0	0	1	0	0	0	0	0	0	0	0	0	1	
Suspended Particulate < 44 µm	TSP	Standard	24 Hr	Clock	120	µg/m ³	0	0	0	0	1	0	1	0	0	1	0	0	3	
Cadmium	Cd	Standard	24 Hr	Clock	0.025	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0	
Cadmium	Cd	URT	24 Hr	Clock	0.25	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0	
Chromium	Cr	Guideline	24 Hr	Clock	1.5	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0	
Chromium	Cr	URT	24 Hr	Clock	5	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0	
Iron - Ferric Oxide	Fe	Standard	24 Hr	Clock	25	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0	
Iron	Fe	Standard	24 Hr	Clock	4	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0	
Copper	Cu	Standard	24 Hr	Clock	50	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0	
Lead	Pb	Standard	24 Hr	Clock	0.5	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0	
Lead	Pb	URT	24 Hr	Clock	2	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0	
Manganese	Mn	AAQC	24 Hr	Clock	0.4	µg/m ³	1	0	1	0	1	0	3	0	1	1	2	1	11	
Manganese	Mn	URT	24 Hr	Clock	4	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0	
Nickel	Ni	Standard	24 Hr	Clock	2	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0	
Nickel	Ni	URT	24 Hr	Clock	2	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0	
Vanadium	V	Standard	24 Hr	Clock	2	µg/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0	
Benzo [a] Pyrene	B[a]P	AAQC	24 Hr	Clock	0.05	ng/m ³	3	2	2	3	3	1	3	2	2	2	2	1	26	
Benzo [a] Pyrene	B[a]P	Ref. Level	24 Hr	Clock	1.10	ng/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0	
Benzo [a] Pyrene	B[a]P	URT	24 Hr	Clock	5.00	ng/m ³	0	0	0	0	0	0	0	0	0	0	0	0	0	
Benzene	C6H6	AAQC	24 Hr	Clock	2.3	µg/m ³	0	0	0	0	0	0	0	0	1	1	1	0	3	

Standard	O. Reg. 419/05 Standard
Guideline	MOECC Guideline
URT	O. Reg. 419/05 Upper Risk Threshold
RT	MOECC Reportable Threshold
AAQC	MOECC Ambient Air Quality Criteria
SP ½ Hour Standard (100 µg/m ³)	PM10 data used as surrogate for SP < 44 µm



Station : 29567
Location : Niagara St / Land St, Hamilton
Reporting Period : 01 January, 2017 to 31 December, 2017

Sample Matrix : SUMMA Canisters
Method : GC/MS (TO15A)
Valid Samples - No. / % : 30 / 100%

Table with columns: VOC Parameter, AAQC 24 Hr, URT 24 Hr, RDL, and 24 monthly columns (07-Jan-17 to 24-Jun-17), Ave, Max, Min, Samples > AAQC, Samples > URT.

Note 1: All non detectable results are reported as 1/2 the detection limit.

Note 2: Due to ambient air quality sampling methodology and laboratory analytics a Reportable Detection Limit (RDL) can fluctuate from sample to sample. Therefore the reported 1/2 RDL values, for example the reported value may be above or below RDL indicated in the RDL column. Note all data presented is actual data as reported from the laboratory and modified to meet the MOECC 1/2 detection limit reporting requirement.



Hamilton Air Monitoring Network - PAH Report

STN29180 - PAH - Burlington / Gage, Hamilton

PAH Parameter	07-Jan-17	19-Jan-17	31-Jan-17	12-Feb-17	24-Feb-17	08-Mar-17	20-Mar-17	01-Apr-17	13-Apr-17	25-Apr-17	07-May-17	19-May-17	31-May-17	12-Jun-17	24-Jun-17
BENZO(A)ANTHRACENE	0.16	0.13	0.16	0.36	3.07	0.21	No Power at Station		0.11	1.20	0.11	0.18	0.14	0.42	0.13
CHRYSENE	0.38	0.32	0.42	0.83	5.59	0.34		0.29	3.11	0.24	0.47	0.31	0.78	0.24	
BENZO(B)FLUORANTHENE	0.30	0.29	0.38	0.95	6.74	0.47		0.27	5.19	0.20	0.55	0.25	0.62	0.25	
BENZO(K)FLUORANTHENE	0.28	0.26	0.30	0.86	3.65	0.12		0.23	3.45	0.13	0.33	0.23	0.58	0.16	
BENZO(A)PYRENE (B[a]P)	0.17	0.20	0.20	0.50	3.03	0.12		0.25	1.51	0.12	0.16	0.13	0.34	0.15	
INDENO(123CD)PYRENE	0.19	0.27	0.29	0.77	3.18	0.16		0.29	3.24	0.16	0.27	0.18	0.37	0.17	
DIBENZO(A,H)ANTHRACENE	0.09	0.06	0.05	0.20	0.71	0.07		0.04	0.85	0.03	0.07	0.14	0.19	0.13	
BENZO(GHI)PERYLENE	0.21	0.29	0.37	0.92	3.33	0.25		0.37	3.57	0.12	0.29	0.27	0.47	0.26	

PAH Parameter	06-Jul-17	18-Jul-17	30-Jul-17	11-Aug-17	23-Aug-17	04-Sep-17	16-Sep-17	28-Sep-17	10-Oct-17	22-Oct-17	03-Nov-17	15-Nov-17	27-Nov-17	09-Dec-17	21-Dec-17	Ave	Max	Min
BENZO(A)ANTHRACENE	0.20	0.37	0.29	0.12	0.14	0.10	0.19	0.25	0.46	1.39	0.51	0.24	0.60	0.16	0.29	0.42	3.07	0.10
CHRYSENE	0.34	0.52	0.34	0.19	0.18	0.17	0.36	0.34	0.59	2.08	0.62	0.36	1.00	0.37	0.49	0.76	5.59	0.17
BENZO(B)FLUORANTHENE	0.38	0.51	0.44	0.24	0.23	0.20	0.59	0.54	1.40	4.14	0.92	0.51	0.65	0.26	0.32	0.99	6.74	0.20
BENZO(K)FLUORANTHENE	0.27	0.56	0.48	0.25	0.31	0.07	0.23	0.18	0.44	1.75	0.40	0.21	0.70	0.29	0.34	0.61	3.65	0.07
BENZO(A)PYRENE (B[a]P)	0.25	0.39	0.35	0.19	0.20	0.11	0.24	0.27	0.56	2.24	0.47	0.23	0.71	0.29	0.37	0.49	3.03	0.11
INDENO(123CD)PYRENE	0.27	0.51	0.37	0.21	0.24	0.14	0.34	0.30	0.69	2.24	0.52	0.47	0.68	0.30	0.33	0.61	3.24	0.14
DIBENZO(A,H)ANTHRACENE	0.13	0.20	0.13	0.07	0.07	0.06	0.10	0.15	0.20	0.51	0.21	0.13	0.14	0.11	0.08	0.18	0.85	0.03
BENZO(GHI)PERYLENE	0.40	0.60	0.38	0.20	0.29	0.17	0.47	0.38	0.65	1.96	0.47	0.60	0.59	0.23	0.29	0.66	3.57	0.12

Measurement units	: ng/m ³	Number of Sample Dates	30
Minimum detection limit (MDL)	: 0.1 ng/m ³	Number of Valid Samples	28
Reported values < 0.1 ng/m ³	: Target compound meets identification criteria but is < MDL	Percent Valid Data (%)	93.3
Reported '0.00' values	: Analyte not detected	Maximum 24 Hr B[a]P	3.03
B[a]P 24 Hour AAQC	: 0.05 ng/m ³	Number of Samples > 24 Hour B[a]P AAQC	28
B[a]P 24 Hour Reference Level	: 1.10 ng/m ³	Number of Samples > B[a]P Ref. Level	3
B[a]P O.Reg 419/05 URT 24 Hour Objective	: 5.00 ng/m ³	Number of Samples > B[a]P URT	0
B[a]P AAQC Annual arithmetic mean	: 0.01 ng/m ³	Annual B[a]P Arithmetic Mean	0.49

Note: " --- " indicates invalid sample



Hamilton Air Monitoring Network - PAH Report

STN29547 - PAH - Pier 25, Hamilton

PAH Parameter	07-Jan-17	19-Jan-17	31-Jan-17	12-Feb-17	24-Feb-17	08-Mar-17	20-Mar-17	01-Apr-17	13-Apr-17	25-Apr-17	07-May-17	19-May-17	31-May-17	12-Jun-17	24-Jun-17
BENZO(A)ANTHRACENE	0.38	0.25	0.10	0.79	0.06	0.98	0.73	0.15	0.66	0.00	0.34	0.12	0.83	0.11	2.26
CHRYSENE	0.93	0.58	0.27	1.89	0.15	2.26	1.44	0.45	1.63	0.10	0.76	0.28	1.65	0.25	3.11
BENZO(B)FLUORANTHENE	0.84	0.54	0.23	1.65	0.34	1.99	1.08	0.43	2.29	0.07	0.97	0.34	1.89	0.21	4.71
BENZO(K)FLUORANTHENE	0.63	0.44	0.17	1.48	0.06	1.14	0.74	0.30	1.25	0.05	0.45	0.22	1.69	0.21	3.67
BENZO(A)PYRENE (B[a]P)	0.37	0.32	0.13	1.07	0.00	0.94	0.78	0.29	0.78	0.14	0.26	0.13	0.51	0.09	3.07
INDENO(123CD)PYRENE	0.39	0.38	0.19	1.45	0.12	1.32	0.78	0.34	1.39	0.14	0.48	0.21	1.13	0.16	4.23
DIBENZO(A,H)ANTHRACENE	0.13	0.08	0.03	0.32	0.04	0.25	0.21	0.06	0.50	0.00	0.11	0.06	0.33	0.14	0.88
BENZO(GHI)PERYLENE	0.65	0.43	0.21	1.61	0.14	1.69	0.92	0.40	1.23	0.19	0.79	0.23	1.59	0.26	4.63

PAH Parameter	06-Jul-17	18-Jul-17	30-Jul-17	11-Aug-17	23-Aug-17	04-Sep-17	16-Sep-17	28-Sep-17	10-Oct-17	22-Oct-17	03-Nov-17	15-Nov-17	27-Nov-17	09-Dec-17	21-Dec-17	Ave	Max	Min
BENZO(A)ANTHRACENE	0.65	1.99	1.37	0.35	1.08	0.85	0.71	0.08	0.56	0.11	0.11	0.25	0.45	1.30	0.00	0.59	2.26	0.00
CHRYSENE	1.10	2.45	1.95	0.55	1.40	1.47	1.01	0.10	0.66	0.20	0.12	0.31	0.91	2.73	0.10	1.03	3.11	0.10
BENZO(B)FLUORANTHENE	1.45	2.87	3.07	0.78	1.87	2.41	1.76	0.16	1.95	0.35	0.27	0.38	0.74	1.92	0.04	1.25	4.71	0.04
BENZO(K)FLUORANTHENE	1.22	2.96	2.92	0.84	1.99	0.86	0.78	0.00	0.56	0.14	0.03	0.11	0.82	2.06	0.06	0.93	3.67	0.00
BENZO(A)PYRENE (B[a]P)	0.85	2.51	1.98	0.52	1.48	1.02	0.84	0.06	0.71	0.18	0.00	0.17	0.77	1.83	0.07	0.73	3.07	0.00
INDENO(123CD)PYRENE	1.01	2.78	2.75	0.63	1.73	1.19	1.05	0.07	1.02	0.18	0.11	0.23	0.68	1.73	0.07	0.93	4.23	0.07
DIBENZO(A,H)ANTHRACENE	0.34	0.77	0.68	0.16	0.40	0.36	0.31	0.04	0.29	0.09	0.06	0.09	0.16	0.27	0.06	0.24	0.88	0.00
BENZO(GHI)PERYLENE	1.10	3.01	2.71	0.63	1.99	1.29	1.15	0.08	0.88	0.19	0.07	0.21	0.53	1.32	0.00	1.00	4.63	0.00

Measurement units	: ng/m ³	Number of Sample Dates	30
Minimum detection limit (MDL)	: 0.1 ng/m ³	Number of Valid Samples	30
Reported values < 0.1 ng/m ³	: Target compound meets identification criteria but is < MDL	Percent Valid Data (%)	100.0
Reported '0.00' values	: Analyte not detected	Maximum 24 Hr B[a]P	3.07
B[a]P 24 Hour AAQC	: 0.05 ng/m ³	Number of Samples > 24 Hour B[a]P AAQC	28
B[a]P 24 Hour Reference Level	: 1.10 ng/m ³	Number of Samples > B[a]P Ref. Level	5
B[a]P O.Reg 419/05 URT 24 Hour Objective	: 5.00 ng/m ³	Number of Samples > B[a]P URT	0
B[a]P AAQC Annual arithmetic mean	: 0.01 ng/m ³	Annual B[a]P Arithmetic Mean	0.73

Note: " --- " indicates invalid sample



Hamilton Air Monitoring Network - PAH Report

STN29567 - PAH - Niagara / Land, Hamilton

PAH Parameter	07-Jan-17	19-Jan-17	31-Jan-17	12-Feb-17	24-Feb-17	08-Mar-17	20-Mar-17	01-Apr-17	13-Apr-17	25-Apr-17	07-May-17	19-May-17	31-May-17	12-Jun-17	24-Jun-17
BENZO(A)ANTHRACENE	0.10	0.06	0.27	0.18	0.34	0.14	0.10	0.07	0.10	0.34	0.07	0.25	0.09	0.11	0.00
CHRYSENE	0.31	0.18	0.76	0.44	1.09	0.20	0.29	0.20	0.31	1.04	0.16	0.52	0.22	0.31	0.05
BENZO(B)FLUORANTHENE	0.20	0.14	0.76	0.64	1.78	0.40	0.31	0.17	0.26	1.41	0.11	0.63	0.22	0.25	0.07
BENZO(K)FLUORANTHENE	0.20	0.11	0.48	0.39	0.56	0.11	0.22	0.12	0.20	0.81	0.08	0.38	0.17	0.21	0.00
BENZO(A)PYRENE (B[a]P)	0.12	0.08	0.31	0.23	0.29	0.08	0.26	0.20	0.22	0.44	0.09	0.22	0.10	0.11	0.05
INDENO(123CD)PYRENE	0.15	0.12	0.54	0.51	1.03	0.18	0.35	0.20	0.26	0.81	0.11	0.34	0.16	0.16	0.07
DIBENZO(A,H)ANTHRACENE	0.08	0.00	0.10	0.11	0.16	0.05	0.05	0.00	0.03	0.19	0.00	0.08	0.13	0.14	0.08
BENZO(GHI)PERYLENE	0.16	0.11	0.66	0.46	1.26	0.28	0.52	0.25	0.32	0.80	0.07	0.38	0.28	0.25	0.16

PAH Parameter	06-Jul-17	18-Jul-17	30-Jul-17	11-Aug-17	23-Aug-17	04-Sep-17	16-Sep-17	28-Sep-17	10-Oct-17	22-Oct-17	03-Nov-17	15-Nov-17	27-Nov-17	09-Dec-17	21-Dec-17	Ave	Max	Min
BENZO(A)ANTHRACENE	0.13	0.07	0.07	0.08	0.06	0.07	0.21	0.04	0.75	0.65	0.08	0.29	0.36	0.00	0.70	0.19	0.75	0.00
CHRYSENE	0.23	0.09	0.08	0.11	0.09	0.12	0.40	0.00	0.74	1.09	0.09	0.41	0.88	0.05	1.26	0.39	1.26	0.00
BENZO(B)FLUORANTHENE	0.32	0.11	0.13	0.16	0.08	0.15	0.69	0.12	1.77	2.22	0.16	0.62	0.63	0.00	0.87	0.51	2.22	0.00
BENZO(K)FLUORANTHENE	0.16	0.11	0.10	0.14	0.09	0.06	0.30	0.00	0.53	0.83	0.00	0.20	0.68	0.03	0.92	0.27	0.92	0.00
BENZO(A)PYRENE (B[a]P)	0.18	0.11	0.11	0.11	0.09	0.08	0.29	0.00	0.74	0.81	0.00	0.21	0.63	0.05	0.94	0.24	0.94	0.00
INDENO(123CD)PYRENE	0.19	0.11	0.12	0.11	0.10	0.11	0.39	0.03	0.70	1.13	0.07	0.42	0.58	0.07	0.84	0.33	1.13	0.03
DIBENZO(A,H)ANTHRACENE	0.11	0.06	0.04	0.00	0.00	0.05	0.11	0.00	0.25	0.26	0.05	0.10	0.12	0.05	0.13	0.08	0.26	0.00
BENZO(GHI)PERYLENE	0.29	0.13	0.07	0.13	0.09	0.14	0.49	0.00	0.59	1.04	0.00	0.47	0.47	0.00	0.76	0.35	1.26	0.00

Measurement units : ng/m³
 Minimum detection limit (MDL) : 0.1 ng/m³
 Reported values < 0.1 ng/m³ : Target compound meets identification criteria but is < MDL
 Reported '0.00' values : Analyte not detected
 B[a]P 24 Hour AAQC : 0.05 ng/m³
 B[a]P 24 Hour Reference Level : 1.10 ng/m³
 B[a]P O.Reg 419/05 URT 24 Hour Objective : 5.00 ng/m³
 B[a]P AAQC Annual arithmetic mean : 0.01 ng/m³

Number of Sample Dates	30
Number of Valid Samples	30
Percent Valid Data (%)	100.0
Maximum 24 Hr B[a]P	0.94
Number of Samples > 24 Hour B[a]P AAQC	26
Number of Samples > B[a]P Ref. Level	0
Number of Samples > B[a]P URT	0
Annual B[a]P Arithmetic Mean	0.24

Note: " --- " indicates invalid sample

