



# 2016 Surface Water Quality Summary

## Regional Watershed Monitoring Program

August 2017

Environmental Monitoring and Data Management  
Restoration and Infrastructure Division



Toronto and Region  
**Conservation**  
*for The Living City®*

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Report prepared by: Lyndsay Cartwright, Data Analyst, Environmental Monitoring and Data Management, Restoration and Infrastructure Division

Reviewed by: Scott Jarvie, Associate Director, Environmental Monitoring and Data Management, Restoration and Infrastructure Division

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## **1. Introduction**

Since 2002, the Toronto and Region Conservation Authority (TRCA) has monitored stream water quality at selected locations within the watersheds in and around the Toronto region on a monthly basis. These activities have been undertaken as part of TRCA's Regional Watershed Monitoring Program (RWMP) in partnership with the Ontario Ministry of the Environment and Climate Change (OMOECC) and the City of Toronto. The data collected are shared with partner municipalities and other external agencies. The results are used for planning, implementation and reporting activities including the development of watershed plans and report cards as well as watershed characterization reports in support of source water protection planning.

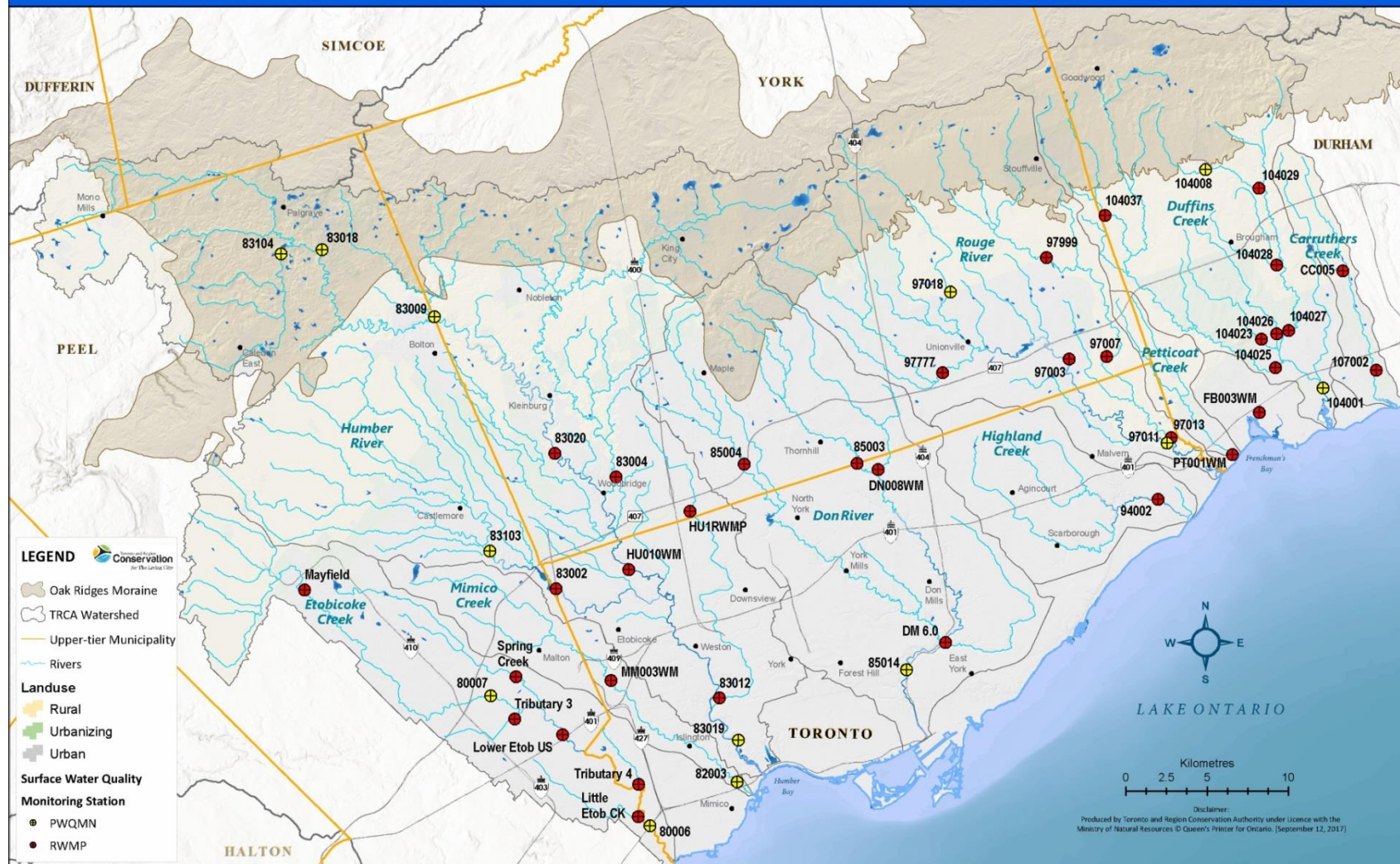
This report presents results for selected parameters from the 2016 surface water quality sampling. It provides a general overview and description of the range of water quality conditions across the TRCA jurisdiction during 2016. Results include data collected as part of the Provincial Water Quality Monitoring Network (PWQMN) and RWMP. This report and associated data can assist in identifying areas of concern, elevated levels of contaminants and can be used to affirm both poor and good water quality in different land use areas. The 2016 results should be interpreted with caution since water quality samples were collected independent of precipitation, and one year of data is insufficient to represent normal conditions at stations and watersheds. For example, 12 monthly samples from one site may be biased towards baseflow or stormwater runoff conditions. The 2011-2015 Surface Water Quality Summary report should be used as the most recent characterization of stream water quality across the region (TRCA 2017).

## **2. Methods**

Surface water quality samples were collected at 47 stations throughout the TRCA's jurisdiction in 2016 (Figure 1). Sample collection and laboratory analysis were carried out through several partnerships which are outlined below:

- 13 stations were sampled by TRCA under the OMOECC's PWQMN
- 34 stations were sampled by TRCA for the RWMP

**FIGURE 1: CURRENT PWQMN/RWMP WATER QUALITY MONITORING LOCATIONS 2016**



Monthly samples were collected using in-stream “grab” techniques following the OMOECC PWQMN protocol (OMOE 2003) and also included *in-situ* measurements (e.g. water temperature, pH and dissolved oxygen) collected using a hand-held water quality multi-probe (YSI or ProDSS). Water quality samples were collected throughout the year, typically in the third week of each month, irrespective of precipitation. Samples from the 13 stations that are part of the PWQMN partnership were submitted to the OMOECC Rexdale Laboratory. The remaining samples from stations or months not included in the PWQMN (e.g. December to March) were submitted to the City of Toronto Dee Avenue Laboratory in order to augment water quality data from these stations, and to maintain a year-round dataset (Table 1).

The two laboratories analyzed a standard suite of nutrients, metals, microbiological and conventional water quality parameters (Table 2). The 16 parameters in boldface are those that were selected for discussion in this report and include all the PWQMN recommended indicator parameters as well as additional forms of nitrogen (ammonia+ammonium, nitrate, nitrite and total Kjeldahl nitrogen), *Escherichia coli* and several metals. These parameters provide a quick but comprehensive overview of the water quality at each station. Elevated concentrations of these parameters may point to natural and/or anthropogenic sources within the watershed.

The results for each parameter were compared to the Provincial Water Quality Objectives (PWQO) guidelines where applicable. The PWQOs are a set of numerical and narrative ambient surface water quality criteria that represent a desirable level of water quality. These guidelines were developed to protect all forms of aquatic life and all aspects of their aquatic life cycles during indefinite exposure to the water as well as protecting recreational water usage based on public health considerations and aesthetics (OMOE 1994). When PWQO guidelines were not available, other objectives were used such as Canadian Water Quality Guidelines (CWQG; CCME 2007) and Recommended Water Quality Guidelines for the Protection of Aquatic Life under the Canadian Environmental Sustainability Indicators (CESI) Initiative (EC 2012). All laboratory results that were reported as less than the minimum detection limit (MDL) were set to the MDL value for the purposes of interpretation. Surface water quality data are maintained in a relational SQL database that is part of the TRCA’s corporate database web applications. For the purpose of this report, no project sites and/or their associated wet event sampling were included. Only method E3516A was used for the analysis of total phosphorus data from the OMOECC Rexdale Laboratory.

Water quality laboratory results for 2016 for each parameter are presented in box plots which summarize the distribution of values for each parameter over the course of the year (Figure 2). Box plot graphs display a range of results where the majority (50%) of results are located within the box section. The ends of the boxes represent the 25th and 75th quartiles and the difference between the quartiles is the interquartile range. The line across the middle of the box identifies the median sample value. Box plot graphs use median values because annual mean values can be skewed by one or two high values. The “whiskers” above and below the box represent the range of data plus or minus 1.5 times the interquartile range, excluding extreme values. Water quality stations are arranged along the x-axis of each graph from upstream to downstream (left to right) and grouped into watersheds which are arranged from west to east.

**Table 1. TRCA surface water quality stations, associated laboratories and Environment Canada precipitation stations**

Station	Watershed	Subwatershed	UTM Coordinates		Precipitation Station	Laboratory		
			Northing	Easting		Jan-Mar	Apr-Nov	Dec
Mayfield	Etobicoke	Upper Etobicoke	4843488	595028	Pearson	TOR	TOR	TOR
80007	Etobicoke	Upper Etobicoke	4836994	606440	Pearson	TOR	OMOE	TOR
Tributary 3	Etobicoke	Tributary 3	4835477	607825	Pearson	TOR	TOR	TOR
Spring Creek	Etobicoke	Spring Creek	4838157	607990	Pearson	TOR	TOR	TOR
Lower Etob US	Etobicoke	Etobicoke Main	4834442	610933	Pearson	TOR	TOR	TOR
Little Etob CK	Etobicoke	Little Etobicoke	4829577	615520	Pearson	TOR	TOR	TOR
Tributary 4	Etobicoke	Tributary 4	4831543	615546	Pearson	TOR	TOR	TOR
80006	Etobicoke	Lower Etobicoke	4829016	616234	Pearson	OMOE	OMOE	OMOE
MM003WM	Mimico	Lower Mimico	4837916	613849	Pearson	TOR	TOR	TOR
82003	Mimico	Lower Mimico	4831713	621585	Pearson	OMOE	OMOE	OMOE
83104	Humber	Main Humber	4864112	593560	Pearson	TOR	OMOE	TOR
83018	Humber	Main Humber	4864366	596071	Pearson	TOR	OMOE	TOR
83009	Humber	Main Humber	4860243	602980	Pearson	TOR	OMOE	TOR
83103	Humber	West Humber	4845870	606385	Pearson	TOR	OMOE	TOR
83020	Humber	Main Humber	4851861	610386	Pearson	TOR	TOR	TOR
83002	Humber	West Humber	4843562	610459	Pearson	TOR	TOR	TOR
83004	Humber	East Humber	4850423	614148	Pearson	TOR	TOR	TOR
HU010WM	Humber	Lower Main	4844739	614940	Pearson	TOR	TOR	TOR
HU1RWMP	Humber	Black Creek	4848311	618678	Pearson	TOR	TOR	TOR
83012	Humber	Black Creek	4836845	620488	Pearson	TOR	TOR	TOR
83019	Humber	Lower Main	4834265	621663	Pearson	OMOE	OMOE	OMOE
85004	Don	Upper West	4851207	622014	Buttonville	TOR	TOR	TOR
85003	Don	Upper East	4851256	628954	Buttonville	TOR	TOR	TOR
DN008WM	Don	German Mills	4850878	630252	Buttonville	TOR	TOR	TOR
85014	Don	Lower Don	4838576	632000	Buttonville	OMOE	OMOE	OMOE
DM 6.0	Don	Taylor/Massey	4840251	634378	Buttonville	TOR	TOR	TOR
94002	Highland	Main Highland	4849056	647429	Buttonville	TOR	TOR	TOR
97777	Rouge	Middle Rouge	4856823	634214	Buttonville	TOR	TOR	TOR
97018	Rouge	Bruce Creek	4861770	634680	Buttonville	TOR	OMOE	TOR
97999	Rouge	Little Rouge	4863887	640589	Buttonville	TOR	TOR	TOR
97003	Rouge	Lower Rouge	4857814	644266	Buttonville	TOR	TOR	TOR
97007	Rouge	Little Rouge	4857816	644300	Buttonville	TOR	TOR	TOR
97011	Rouge	Lower Rouge	4852511	648007	Buttonville	OMOE	OMOE	OMOE
97013	Rouge	Little Rouge	4852830	648243	Buttonville	TOR	TOR	TOR
PT001WM	Petticoat	Lower Petticoat	4851804	652005	Buttonville	TOR	TOR	TOR
FB003WM	Frenchman's	Frenchman's	4854372	653673	Buttonville	TOR	TOR	TOR
104037	Duffins	West Duffins	4866462	644191	Buttonville	TOR	TOR	TOR
104008	Duffins	East Duffins	4869299	650372	Buttonville	TOR	OMOE	TOR
104029	Duffins	East Duffins	4868158	653641	Buttonville	TOR	TOR	TOR
104028	Duffins	East Duffins	4863432	654742	Buttonville	TOR	TOR	TOR
104023	Duffins	Ganatsekiagon	4858867	653796	Buttonville	TOR	TOR	TOR
104026	Duffins	Urfe Creek	4859199	654730	Buttonville	TOR	TOR	TOR
104025	Duffins	West Duffins	4857115	654656	Buttonville	TOR	TOR	TOR
104027	Duffins	East Duffins	4859419	655458	Buttonville	TOR	TOR	TOR
104001	Duffins	Lower Main	4855880	657579	Buttonville	OMOE	OMOE	OMOE
CC005	Carruthers	Carruthers	4863072	658808	Buttonville	YD	YD	YD
107002	Carruthers	Carruthers	4856972	660850	Buttonville	YD(Jan-May);TOR(Jun-Dec)		

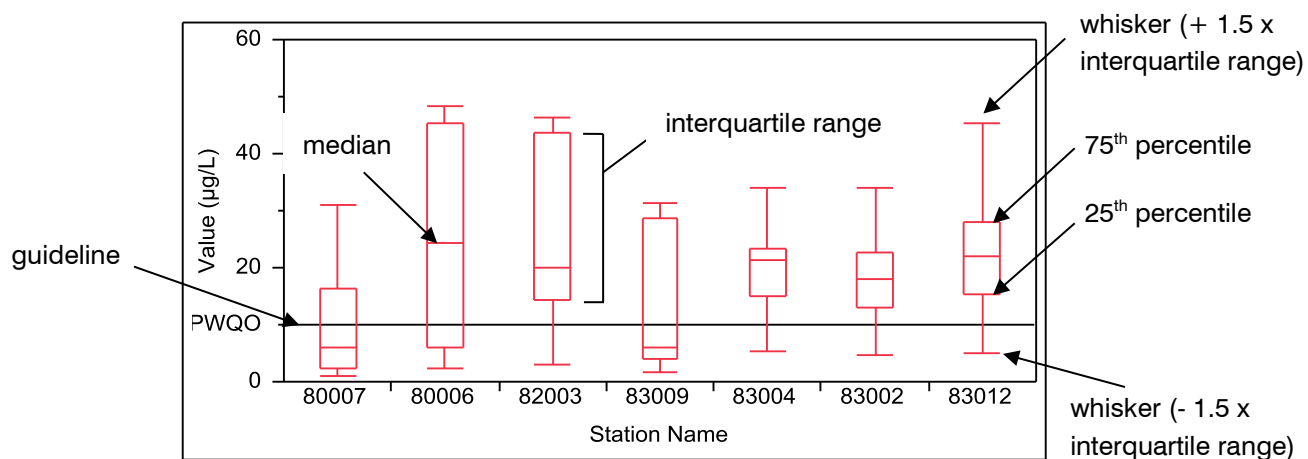
OMOE: OMOECC Rexdale Laboratory; TOR: City of Toronto Dee Avenue Laboratory; YD: York-Durham Regional Environmental Laboratory

**Table 2.** Standard suite of water quality parameters analyzed by City of Toronto and OMOE laboratories. The results of the 16 parameters in boldface are discussed in this report

General Chemistry	Nutrients	Metals	Microbiological
Alkalinity	Total ammonia	Aluminium	<i>E. coli</i> (100 CFU/100mL)
Biochemical Oxygen Demand	*Nitrate (2.93 mg/L)	Arsenic (5 µg/L)	
Calcium	*Nitrite (0.06 mg/L)	Barium	
*Chloride (120 mg/L; 640 mg/L)	Nitrogen, Total Kjeldahl	Beryllium	
Conductivity	Phosphate	Cadmium	
Dissolved Oxygen	*Total Phosphorus (0.03 mg/L)	Chromium	
Hardness		Cobalt	
Magnesium		*Copper (5 µg/L)	
pH (between 6.5 and 8.5)		Iron (300 µg/L)	
Potassium		*Lead (5 µg/L)	
Sodium		Manganese	
Total Dissolved Solids		Molybdenum	
*Total Suspended Solids (30 mg/L)		Nickel (25 µg/L)	
Turbidity		Strontium	
Water Temperature		Vanadium	
		*Zinc (20 µg/L)	

Note: additional parameters may be analyzed on a site or project specific basis.

\*PWQMN recommended indicator parameters



**Figure 2.** Box plot graphic example

Stream conditions were recorded at the time of sampling to help characterize the sample with respect to flow response to recent or occurring precipitation. These field notes (Appendix A) as well as 2016 precipitation data from Pearson International and Buttonville Airports (Subsection 3.1 Precipitation) were included in this report to provide context to assist with interpretation of results.

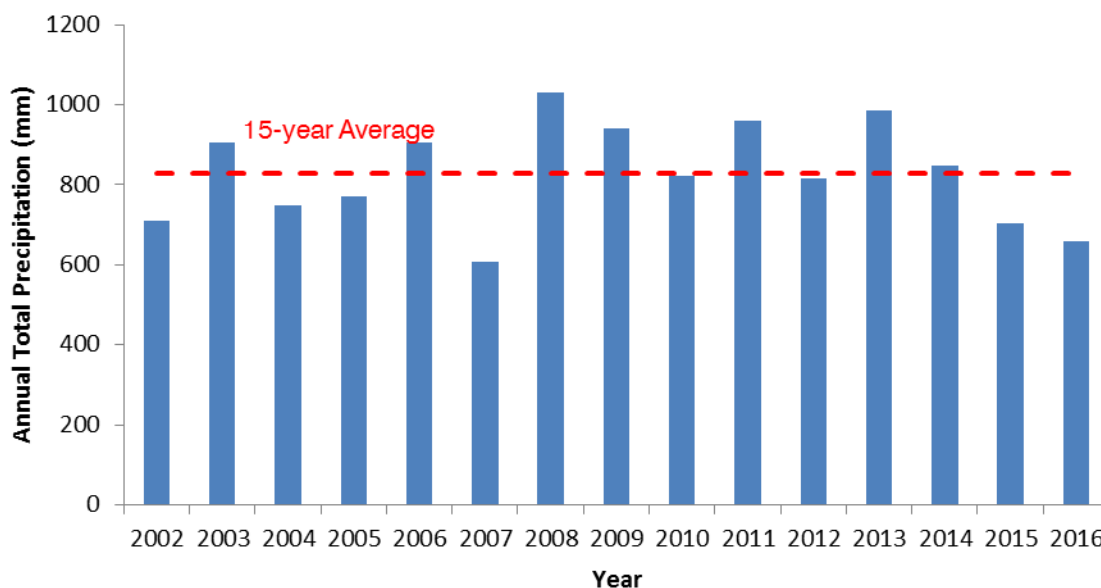
Daily precipitation data were downloaded from the Environment Canada National Climate Data and Information Archive website (<http://climate.weather.gc.ca/>). Precipitation data from meteorological stations at Pearson International and Buttonville Airports were attributed to TRCA water quality stations based on which airport was closer to the stations (Table 1). Data from Pearson were attributed to 21 water quality stations in the Etobicoke, Mimico and Humber watersheds. Buttonville precipitation data were attributed to 26 stations in the Don, Highland, Rouge, Petticoat, Duffins and Carruthers watersheds, as well as the Frenchman's Bay area. For a general overview of precipitation in the TRCA jurisdiction, the Pearson and Buttonville data were averaged. When determining whether samples were collected during precipitation events, both precipitation on the day of sampling as well as the day prior to sampling were used. Wet events were assumed if there was greater than 10 mm of rain or 10 cm of snow on the day prior to sampling and before 3 pm on the day the sample was obtained. Dry events were assumed when there was less than 10 mm of rain or 10 cm of snow on the day prior to sampling and before 3 pm on the day the sample was obtained.

The results of the 2016 data are intended to provide a general characterization of TRCA surface water quality conditions. Due to the small annual sample size ( $n=12$ ) for each station, only one or two high values (e.g. storm events) are required to skew results upwards. Therefore, one year of data cannot be assumed to represent normal conditions in the TRCA jurisdiction. The 2016 results should be considered a general overview of conditions and description of ranges of water quality parameters at stations across the jurisdiction. For more informative interpretation of results the OMOECC recommends a minimum sample size of 30 samples per station (or 2.5 years of monthly data) to reduce the influence of unusual conditions such as spills, extreme runoff events and drought (OMOECC 2003). The results of the 2011-2015 Surface Water Quality report (TRCA 2017) provides sufficient sample sizes to characterize conditions at stations, watersheds and across the jurisdiction, and can be considered the most current representation of typical conditions within the jurisdiction.

### 3. Results & Discussion

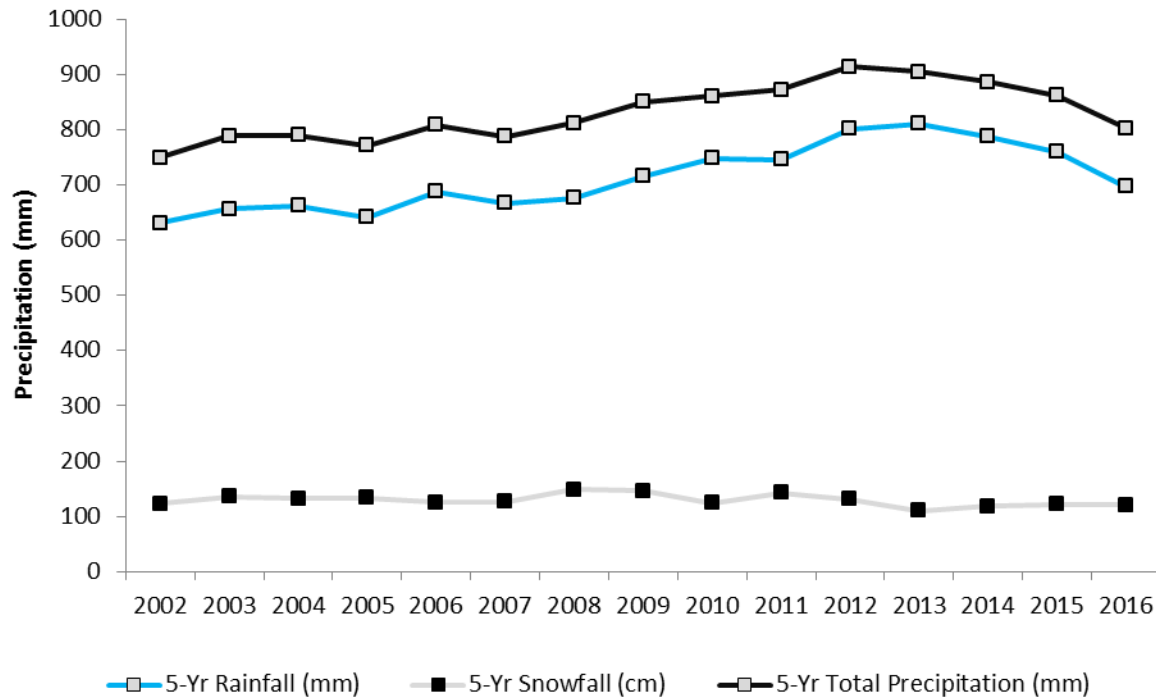
#### 3.1 Precipitation

The jurisdictional precipitation discussed in this section was an average of data from Environment Canada's Pearson and Buttonville Airport meteorological stations. In 2016, rainfall was well below average and was widely regarded as a dry year. The total amount of precipitation recorded in 2016 was 654 mm, which is 173 mm below the 15-year average of 827 mm (Figure 3).



**Figure 3.** Annual precipitation for the TRCA jurisdiction from 2002 to 2016

To reduce the influence of annual variability in order to visualize longer term trends, 5-year moving averages of rainfall, snowfall and total precipitation were plotted (Figure 4). The data point for each year was an average of the previous five years. For example, the rainfall, snowfall and total precipitation values displayed in Figure 4 for the year 2002 were an average of values from 1998-2002. The 5-year rainfall, snow and total precipitation moving averages demonstrated no significant trends using the Mann-Kendall temporal trend test (all  $p > 0.05$ ).



**Figure 4.** Five-year moving averages for rainfall, snowfall and total precipitation from 2002 to 2016

Figure 5 displays 2016 monthly precipitation and 15-year monthly precipitation averages. March and December had higher than average precipitation; however, every other month had lower than average precipitation. Stations may exhibit elevated concentrations of water quality parameters and pollutants as a result of high precipitation. Snowfall in 2016 (135 cm) was only slightly above average (130 cm) while 2006, 2010, 2012 and 2015 showed snowfall well below average and only 2008 (1030 cm) showed snowfall amounts well above average (Figure 6).

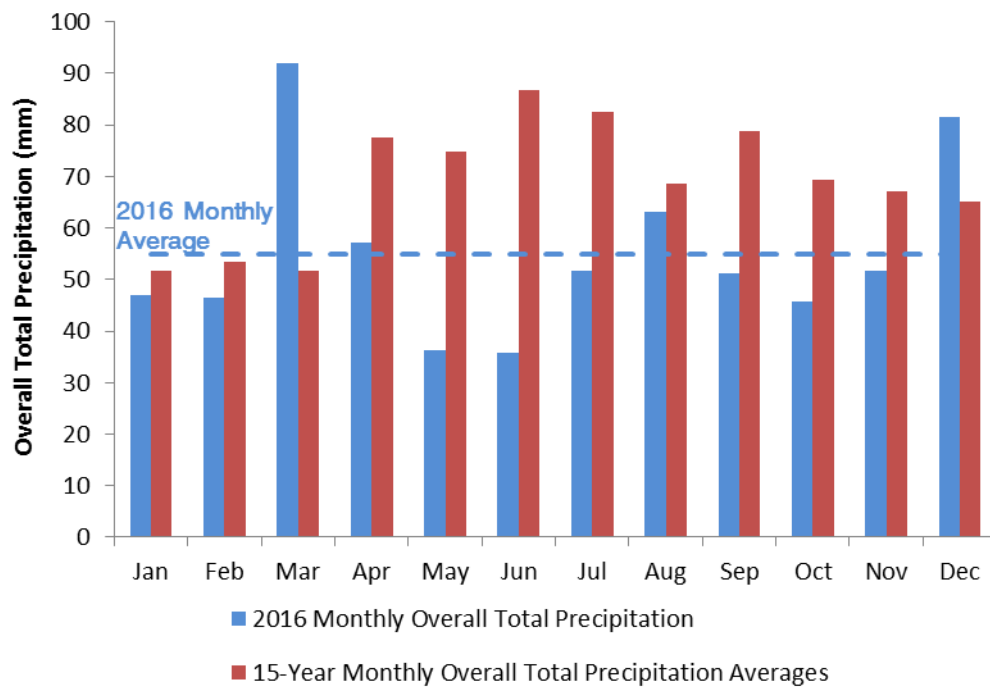


Figure 5. Monthly precipitation for 2016 compared to 15-year monthly precipitation averages

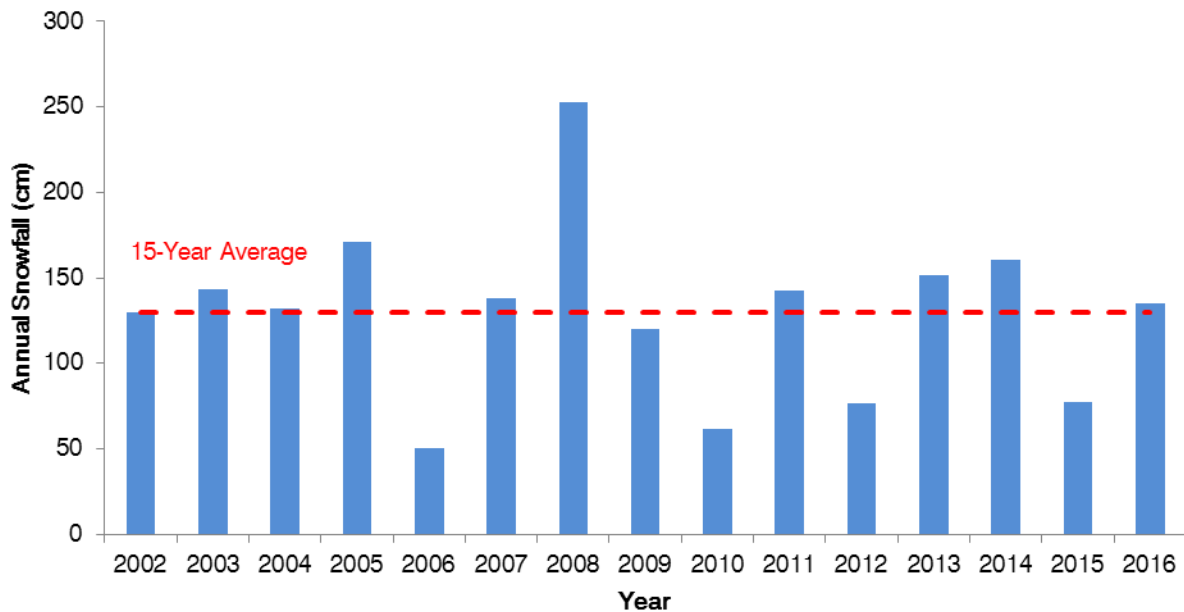


Figure 6. Annual snowfall from 2002 to 2016

Stations were sampled independent of precipitation; however, Environment Canada precipitation data from the day of and the day prior to sampling were used to calculate the percentage of wet and dry sampling events (Table 3). The annual total number of sampling events ranged from 433 in 2009 to 600 in 2013 and this is due to a general increase in the number of stations. Annual wet sampling events ranged from 10.6% in 2016 to 70.9% in 2011, with an average over the five years of 52%. Dry events ranged from 29.1% in 2011 to 89.4% in 2016 and over the five years averaged 48%.

**Table 3.** Wet and dry sampling events based on Environment Canada's Pearson and Buttonville Airports, from 2009 to 2014 and 2016

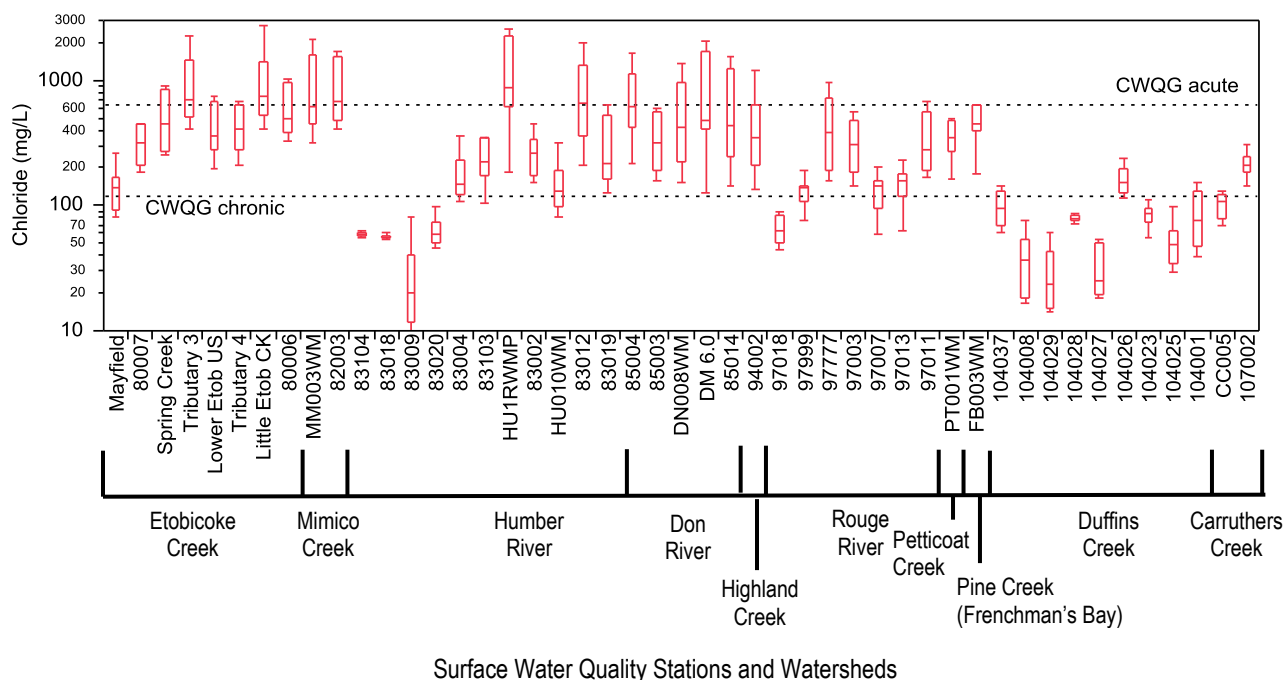
Year	Wet Events	Dry Events	Total Events	Wet Event Percentage	Dry Event Percentage
2016	60	504	564	10.6	89.4
2014	259	284	543	47.7	52.3
2013	355	245	600	59.2	40.8
2012	255	237	492	51.8	48.2
2011	349	143	492	70.9	29.1
2010	300	156	456	65.8	34.2
2009	252	181	433	58.2	41.8
<b>Average</b>	<b>261.4</b>	<b>250.0</b>	<b>511.4</b>	<b>52.0</b>	<b>48.0</b>

## 3.2 General Chemistry Parameters

### 3.2.1 Chloride

Chloride does not readily absorb onto mineral surfaces, and thus concentrations can be high in surface water and shallow aquifers, the latter releasing chloride throughout the year (CCME 2011). It can be toxic to aquatic organisms with acute toxic effects at high concentrations and chronic effects (on growth and reproduction) at lower concentrations (OMOE 2003). The CCME has two guidelines for chloride: acute, or short-term, and chronic, or long-term. The short-term guideline is 640 mg/L and the long-term guideline is 120 mg/L. A primary source of chloride is the application of road salt in winter months.

Station HU1RWMP in the Black Creek had the highest median chloride value (875 mg/L) while station 83009 in the upper reaches of the Main Humber River had the lowest median chloride value (20 mg/L; Figure 7). Most stations had concentrations above the chronic threshold except for stations in the upper Humber River, upper Rouge River and Duffins Creek watersheds. All stations in the Etobicoke Creek, Mimico Creek, Don River, Highland Creek, Petticoat Creek and Frenchman's Bay watersheds had chloride concentrations above the chronic threshold. Five stations had chloride concentrations above the acute guideline (Tributary 3, Little Etob CK, 82003 at the mouth of Mimico Creek, HU1RWMP and 83012 in the lower Black Creek).

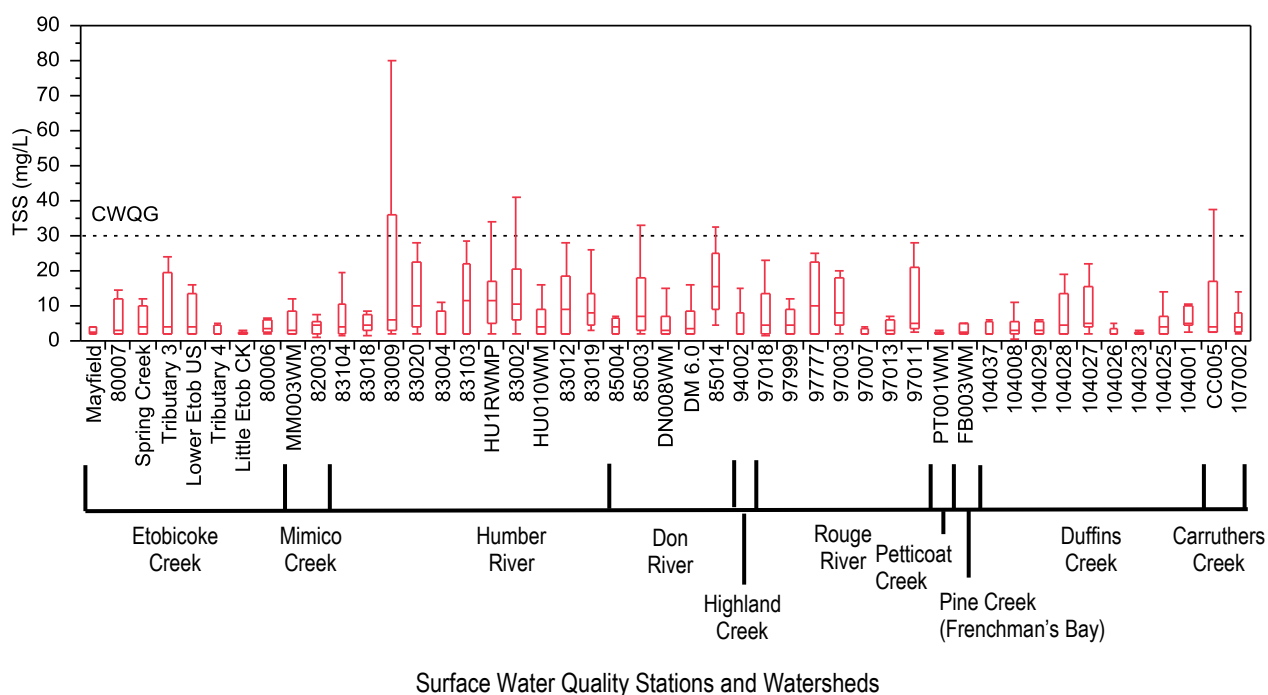


**Figure 7.** 2016 chloride concentrations (mg/L) at TRCA surface water quality monitoring stations (CWQG: long-term 120 mg/L (chronic) and short-term 640 mg/L (acute); CCME 2011)

### 3.2.2 Total Suspended Solids

Turbidity refers to the cloudiness of water due to suspended particles. Turbidity can be caused by stormwater runoff, erosion, increased stream flow, as well as by construction and agriculture. Higher turbidity can increase the likelihood that bacteria are present (which can attach to the particles), block light from penetrating to lower depths negatively affecting species dependent upon such light, reduce the absorption of oxygen by fish gills and impair stream aesthetics. Suspended particles can cause abrasion on fish gills and reduce the amount and quality of spawning habitat. Toxic organics and metals often adhere to suspended solids and may become available to benthic fauna when the solids settle (CCME 2007). The amount of total suspended solids (TSS) increases with higher precipitation, stream flow, erosion and higher agricultural or urban land uses. The Canadian Water Quality Guidelines contain a narrative guideline for TSS which the maximum increase of TSS should be no more than 25 mg/L from background concentrations (with TRCA using a background TSS concentration of 5 mg/L determined using data from the jurisdiction; CCME 2002).

Median TSS values remained below the CWQG of 30 mg/L; however, the upper whisker values at six stations exceeded the 30 mg/L guideline (83009 in the upper Humber, HU1RWMP upper Black Creek, 83002 in the West Humber, 85003 in the East Don, 85014 at the mouth of the Don and CC005 in the upper Carruthers Creek; Figure 8). The wide range of values at those five stations and a few others indicates that some samples were collected during turbid conditions which may have been caused by precipitation events.

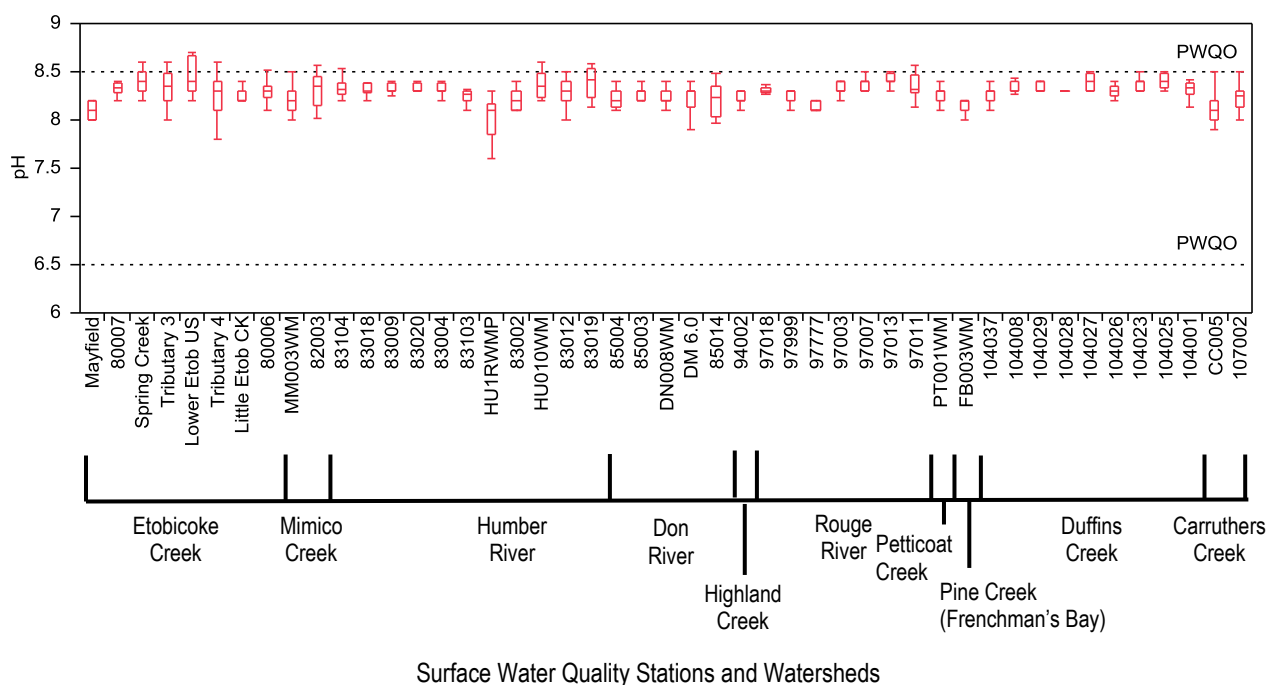


**Figure 8.** 2016 TSS concentrations (mg/L) at TRCA surface water quality monitoring stations (CWQG: 30 mg/L)

### 3.2.3 pH

pH is a measure of the acidity, neutrality or alkalinity of water. Fluctuations in pH can affect fish communities directly and indirectly by facilitating the release of organic and metal contaminants bonded to sediments. The pH of water also affects the toxicity of ammonia. Nutrient cycling, the discharge of industrial effluent and spills can result in pH fluctuations.

In 2016, no stations had median pH values that exceeded the upper PWQO guideline of 8.5 (Figure 9). The majority of stations exhibited limited variation in pH; however, Tributary 4 and HU1RWMP in the upper Black Creek displayed the greatest range of data values.



**Figure 9.** 2016 pH values at TRCA surface water quality monitoring stations (PWQO: 6.5-8.5)

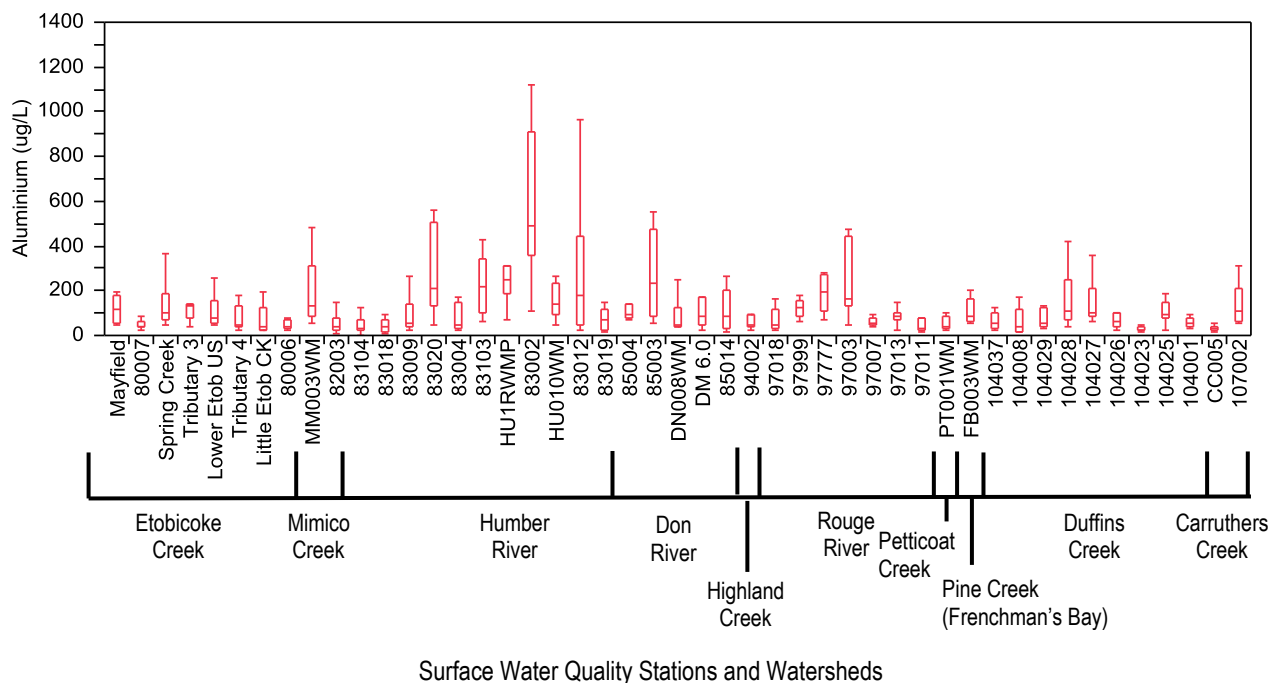
### 3.3 Metals

Metals occur naturally in the environment usually in low concentrations. Industrial processes and increased stormwater runoff in urban areas can dramatically alter the distribution of metals and increase their concentration. High concentrations of metals can be toxic, cause disruptions to aquatic ecosystems and decrease the suitability of a waterbody to support aquatic life and supply water for domestic uses.

#### 3.3.1 Aluminium

Since over 8% of the earth's crust is comprised of aluminium, the amount of aluminium in the environment from natural sources exceeds that from agriculture, industry and other anthropogenic sources. Acidic precipitation, poorly buffered soils and rapid spring snowmelts can increase concentrations of aluminium in streams (Wetzel 2001). Currently, there are no PWQO, CWQG or CESI guidelines which define the amount of allowable total aluminium for the protection of aquatic life.

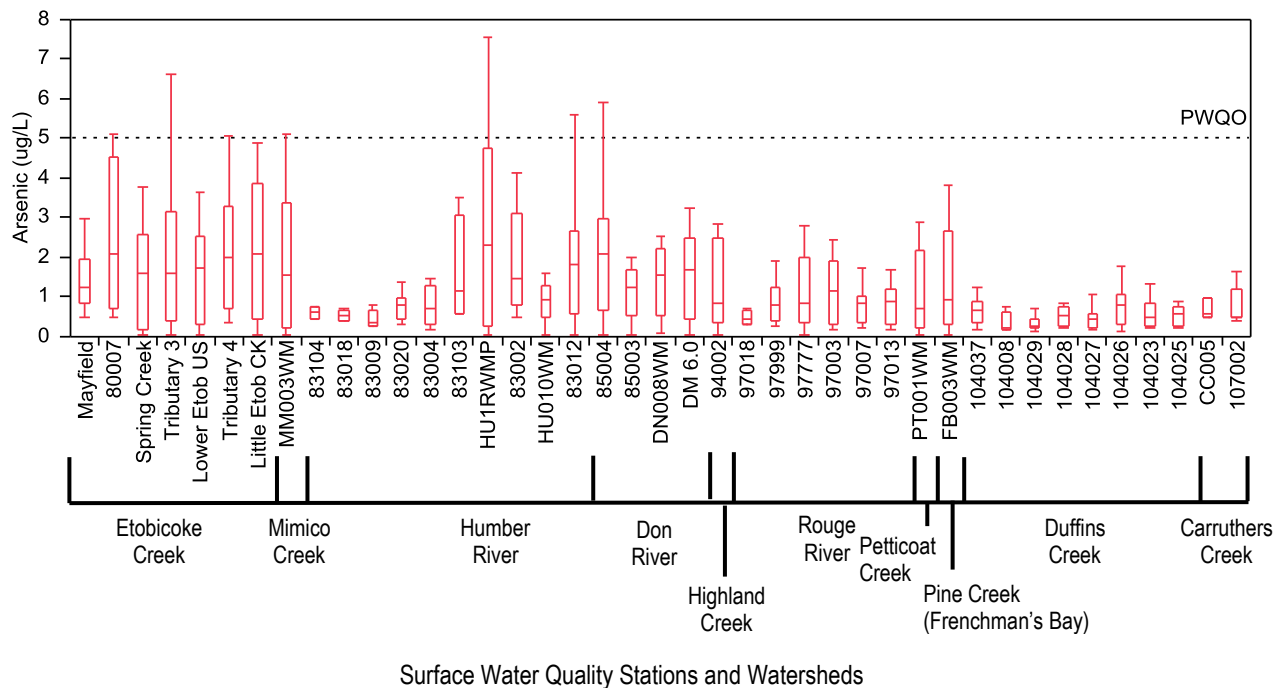
In 2016, there was a wide degree of variation in aluminium concentrations although this is not unique to 2016 (Figure 10). The highest median aluminium value was at station 83002 in the west Humber River just south of the Claireville Reservoir. Six stations had noticeably large interquartile ranges and whiskers (MM003WM in middle Mimico Creek, 83020 in the middle Humber, 83002, 83012 in lower Black Creek, 85003 in the east Don and 97003 on the Little Rouge River).



**Figure 10.** 2016 aluminium concentrations (µg/L) at TRCA surface water quality monitoring stations

### 3.3.2 Arsenic

The weathering of rocks and soils, and smelting and refining industries are sources of arsenic. Arsenic is an odourless, tasteless and toxic metal, for which the PWQO is 5 µg/L. Median arsenic concentrations at all stations in 2016 were well below the PWQO of 5 µg/L (Figure 11). HU1RWMP in the upper Black Creek had the highest median arsenic concentration of 2.33 µg/L. These arsenic values appear higher than previously reported and this is likely due to variation in laboratory services between years.

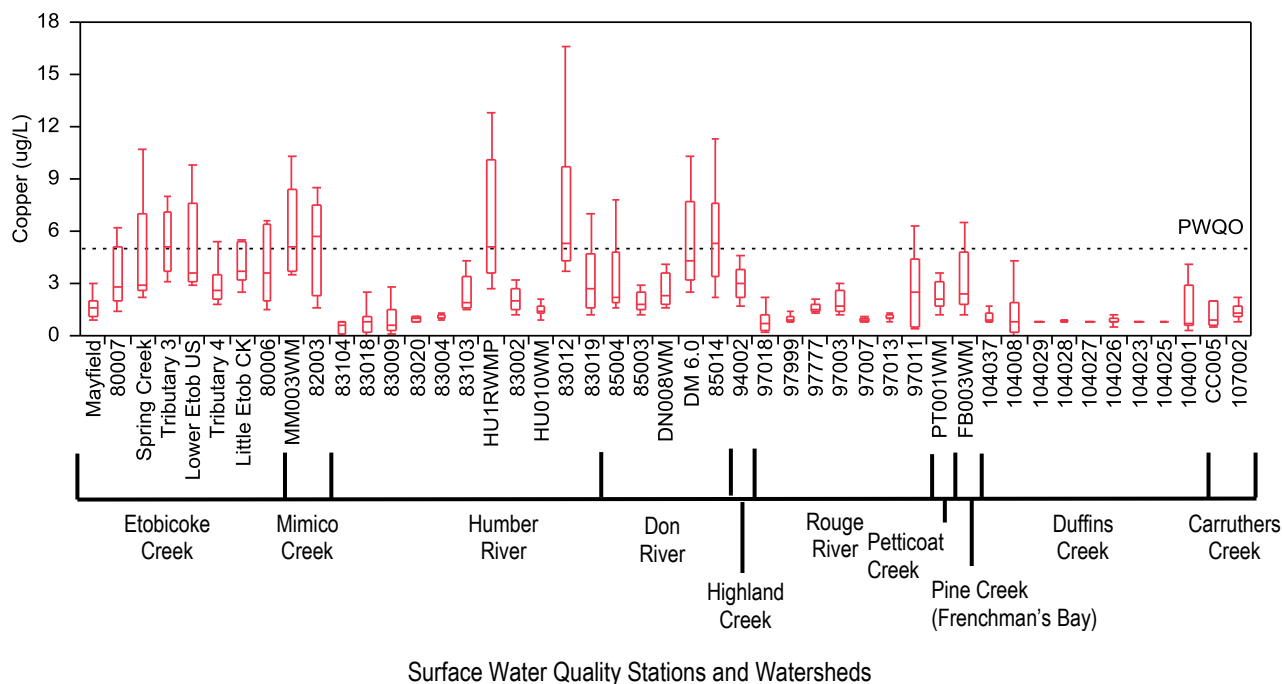


**Figure 11.** 2016 arsenic concentrations (µg/L) at TRCA surface water quality monitoring stations (PWQO: 5 µg/L)

### 3.3.3 Copper

Copper is a trace metal whose elevated concentrations are associated with urbanization. It may readily bind to soil particles (particularly organic matter) and is therefore relatively immobile. Anthropogenic sources of copper include textile manufacturing, paints, electrical conductors, plumbing fixtures and pipes, wood preservatives, pesticides, fungicides and sewage treatment plant effluent (OMOE 2003).

Copper concentrations exceeded the PWQO guideline at six stations (Tributary 3 in Etobicoke, MM003WM in the middle Mimico Creek, 82003 at the mouth of Mimico Creek, HU1RWMP, 83012 in lower Black Creek and 85014 at the mouth of the Don River). These stations are located in the urbanized middle to lower reaches of the Etobicoke Creek, Mimico Creek and Don River watersheds.

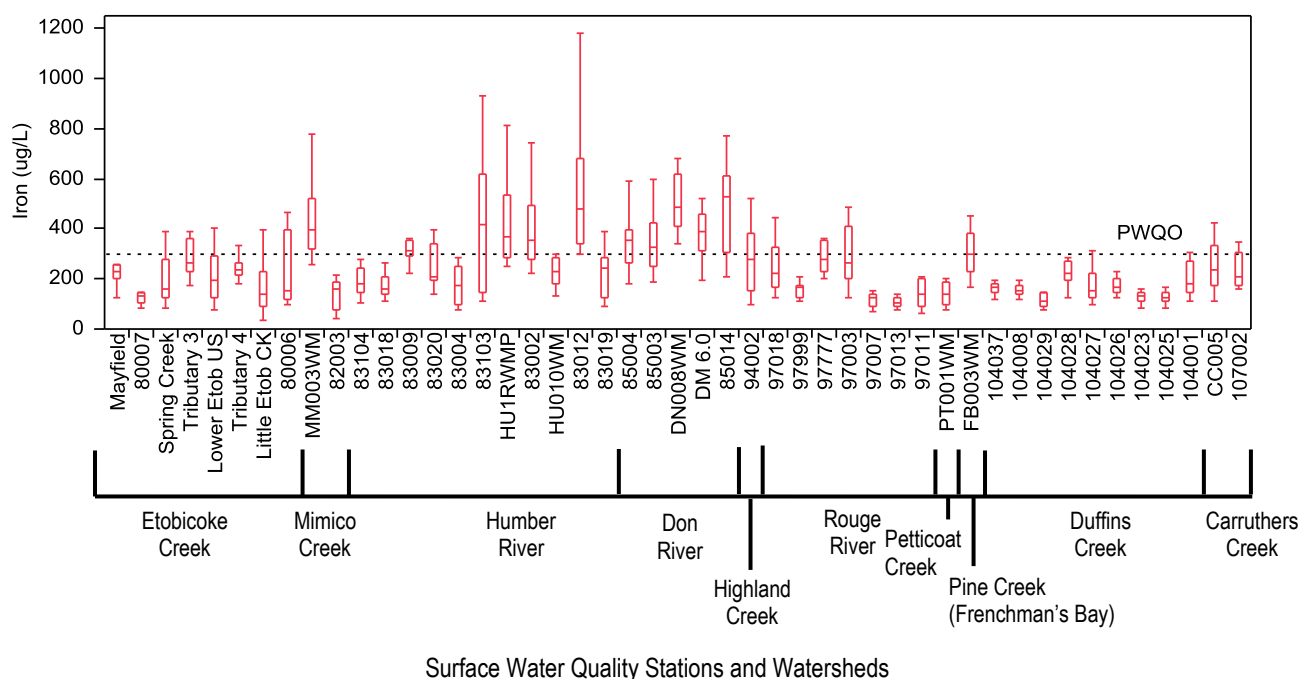


**Figure 12.** 2016 copper concentrations (µg/L) at TRCA surface water quality monitoring stations (PWQO: 5 µg/L)

### 3.3.4 Iron

Iron comes from various natural and anthropogenic sources in the environment. Natural sources include weathering of bedrock and anthropogenic sources include landfills, water purification and sewage treatment systems and pesticides and fertilizers (Dodson 2005). Iron is needed for proper ecosystem functioning as it is a necessary component of many biological processes for plants and animals; however, it can be toxic in higher concentrations (Dodson 2005).

Median iron concentrations for 11 of 43 stations in 2016 exceeded the PWQO of 300 µg/L (Figure 13). The highest median iron concentration was 531 µg/L at station 85014 at the mouth of the Don River. The lowest median iron concentration was 106 µg/L at station 97013 in the lower Rouge River watershed.

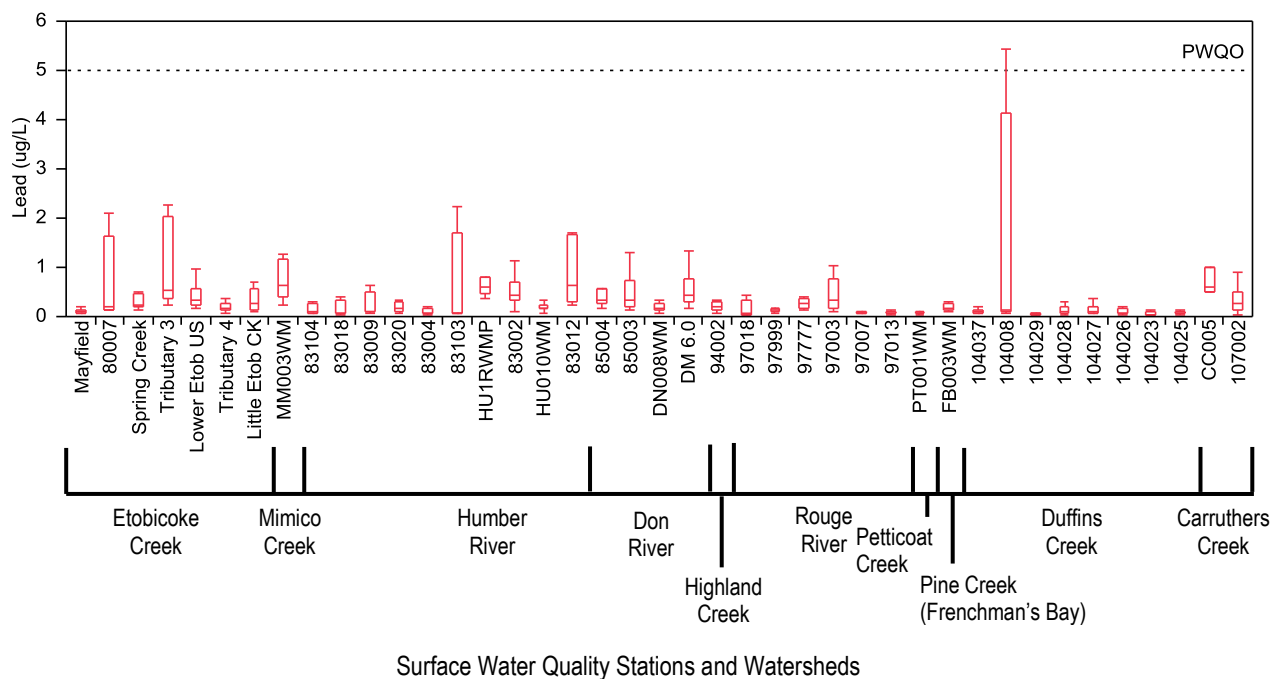


**Figure 13.** 2016 iron concentrations (µg/L) at TRCA surface water quality monitoring stations (PWQO: 300 µg/L)

### 3.3.5 Lead

Laboratory results for lead from the OMOE were excluded from analysis because the OMOE minimum detection limit (MDL) of 7 µg/L is much higher than the MDL for the City of Toronto (0.05 µg/L) and the PWQO of 5 µg/L. Lead results discussed here represent 41 stations whose samples were analyzed by the City of Toronto Dee Avenue laboratory (and January to May for station107002 at York-Durham where the MDL for lead is 0.5 µg/L).

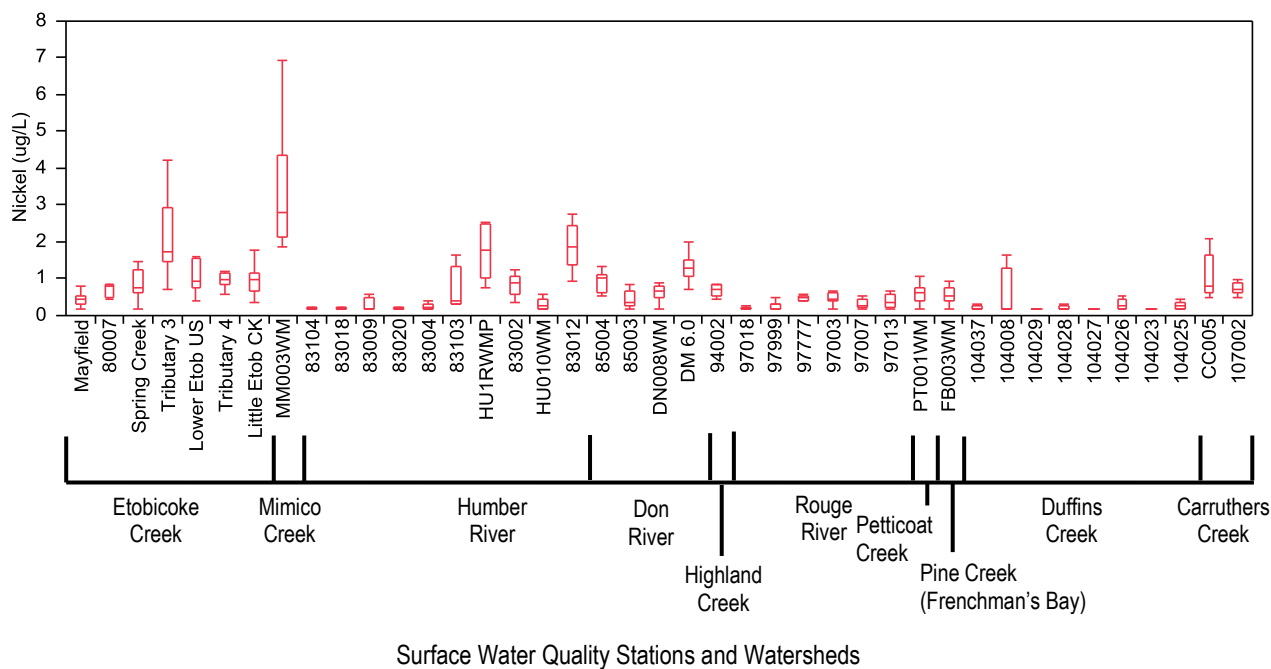
All 41 stations had median lead concentrations well below the PWQO (Figure 14), and all median values were below 1 µg/L. The very high upper value at station104008 on Mitchell Creek in the east Duffins Creek watershed was caused by a single sample on 14 March 2016 having a lead concentration of 5.4 µg/L.



**Figure 14.** 2016 lead concentrations (µg/L) at TRCA surface water quality monitoring stations (PWQO: 5 µg/L)

### 3.3.6 Nickel

Due to a higher MDL, OMOECC laboratory results for 2016 were excluded and only City of Toronto results were analysed (and York-Durham for station 107002 from January to May). All nickel results were much lower than the PWQO of 25  $\mu\text{g/L}$ , which was not included in the box plot graph so that the y-axis could be formatted to provide a clear picture of the range of nickel concentrations (Figure 15). The five highest nickel concentrations were found at MM003WM in the middle Mimico Creek, Tributary 3 in Etobicoke, HU1RWMP in upper Black Creek, 83012 in lower Black Creek and DM 6.0 in lower Taylor-Massey Creek. The most eastern watersheds (Rouge, Petticoat, Frenchman's, Duffins and Carruthers) and the upper Humber River watershed tended to have the lowest nickel concentrations.

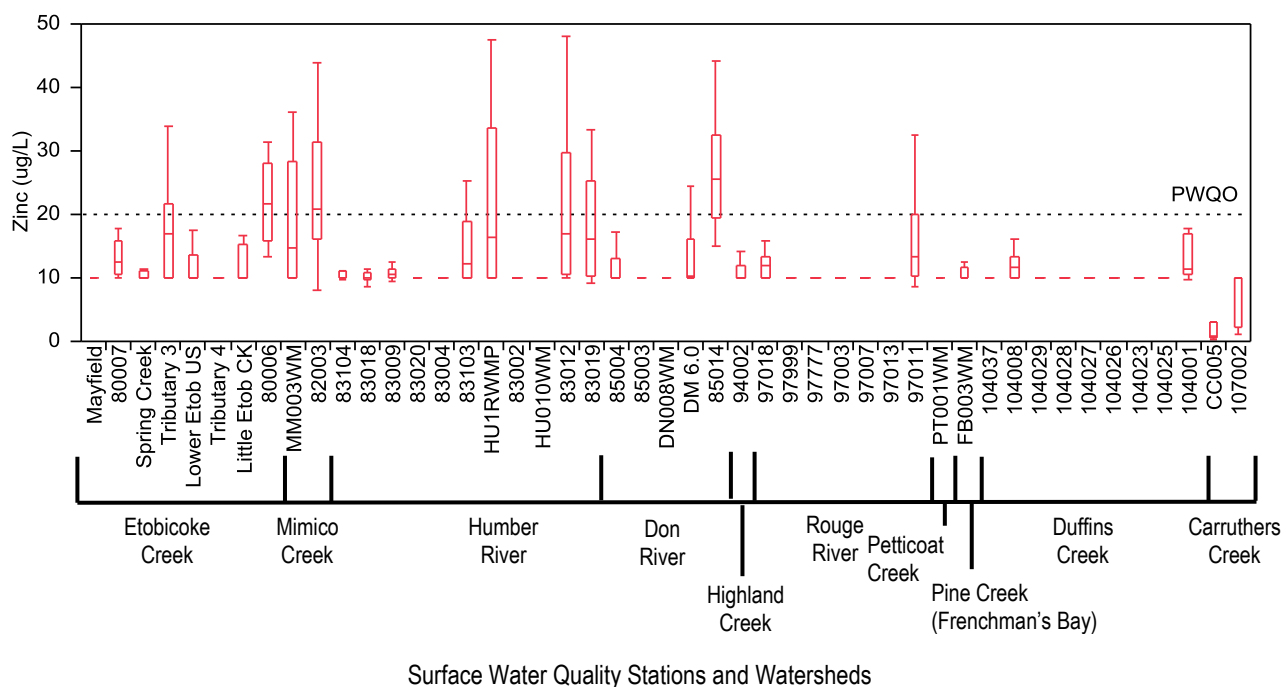


**Figure 15.** 2016 nickel concentrations ( $\mu\text{g/L}$ ) at TRCA surface water quality monitoring stations (PWQO: 25  $\mu\text{g/L}$ )

### 3.3.7 Zinc

Similar to other metals, the natural process of weathering makes zinc available in ecosystems. Anthropogenic sources include municipal wastewater, wood combustion, iron and steel production and waste incineration (OMOEE 2003).

The MDL for the City of Toronto laboratory was 10 µg/L and these appear as a straight line on the graph. It is important to note that zinc concentrations at these stations were lower than 10 µg/L. Station 107002 and CC005 appear to be the lowest because the MDL for zinc at York-Durham was 0.5 µg/L and caution should be used when comparing these stations to the rest of the region for this water quality parameter. Stations 80006, 82003 and 85014 (at the mouth of the Etobicoke Creek, Mimico Creek and Don River, respectively) had median zinc concentrations above the PWQO in 2016 (Figure 16). In addition to these three stations, Tributary 3 in Etobicoke Creek, MM003WM in middle Mimico Creek, HU1RWMP in upper Black Creek, 83012 in lower Black Creek and 83019 at the mouth of the Humber had 75<sup>th</sup> percentiles above the PWQO. The upper reaches of most watersheds and the Duffins Creek, Petticoat Creek, Frenchman's Bay and Carruthers Creek watersheds tended to have the lowest zinc concentrations.

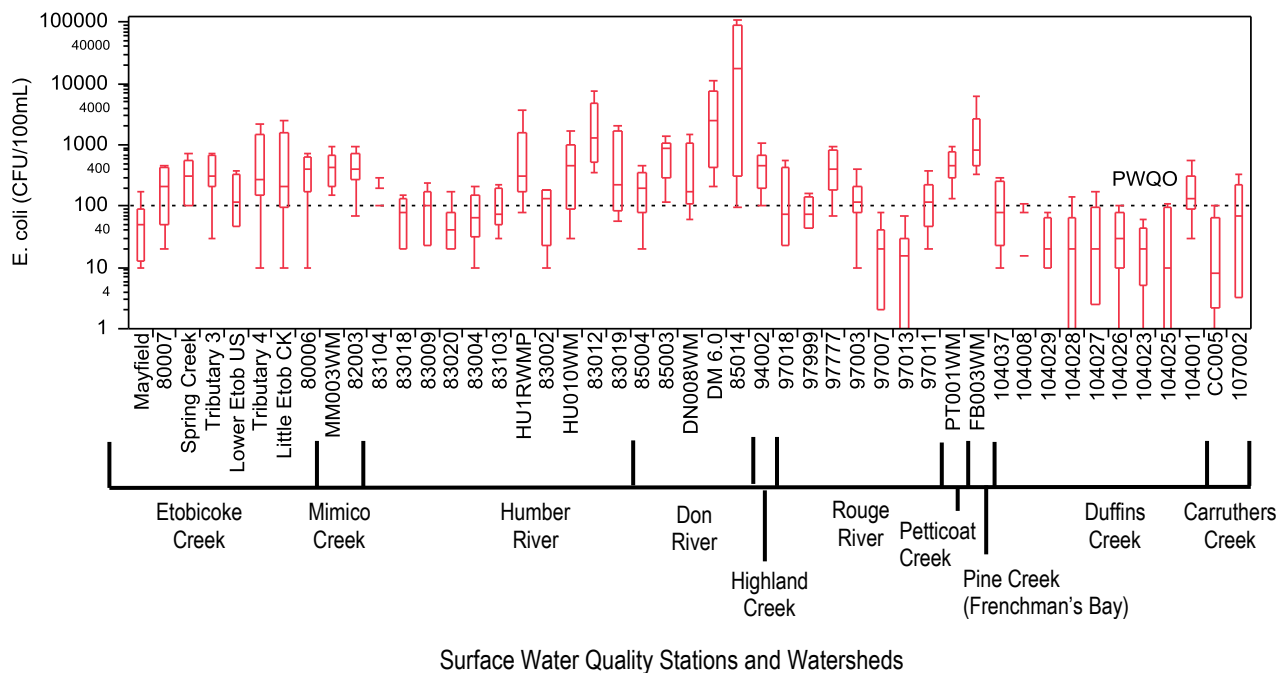


**Figure 16.** 2016 zinc concentrations (µg/L) at TRCA surface water quality monitoring stations (PWQO: 20 µg/L)

### 3.4 Bacteria

*Escherichia coli* is part of the coliform group of bacteria commonly found in the digestive systems of warm-blooded animals (Health Canada 2012). *E. coli* are used to indicate the presence of fecal contamination in water since it is not naturally found on plants or in soils and water. *E. coli* can affect human health by causing gastrointestinal illness and potentially more serious health problems (Health Canada 2012). *E. coli* levels may increase in urbanized areas due to inadequately designed combined sewer systems, illegal connections between storm and sanitary sewers and precipitation events that overflow those sewer systems (CCME 2003). Municipalities use *E. coli* as an indicator to ensure that drinking water and recreational bathing waters are safe; however, RWMP monitoring of *E. coli* levels in TRCA streams was designed to measure and track long-term watershed health.

Stations 85014 and DM 6.0 in the lower Don River watershed had the highest median values (Figure 17). The lowest *E. coli* counts were found in the Duffins Creek, middle to lower Rouge River and upper Etobicoke and Humber watersheds.



**Figure 17.** 2016 *E. coli* concentrations (CFU/100 mL) at TRCA surface water quality monitoring stations (PWQO: 100 CFU/100 mL)

### **3.5 Nutrients**

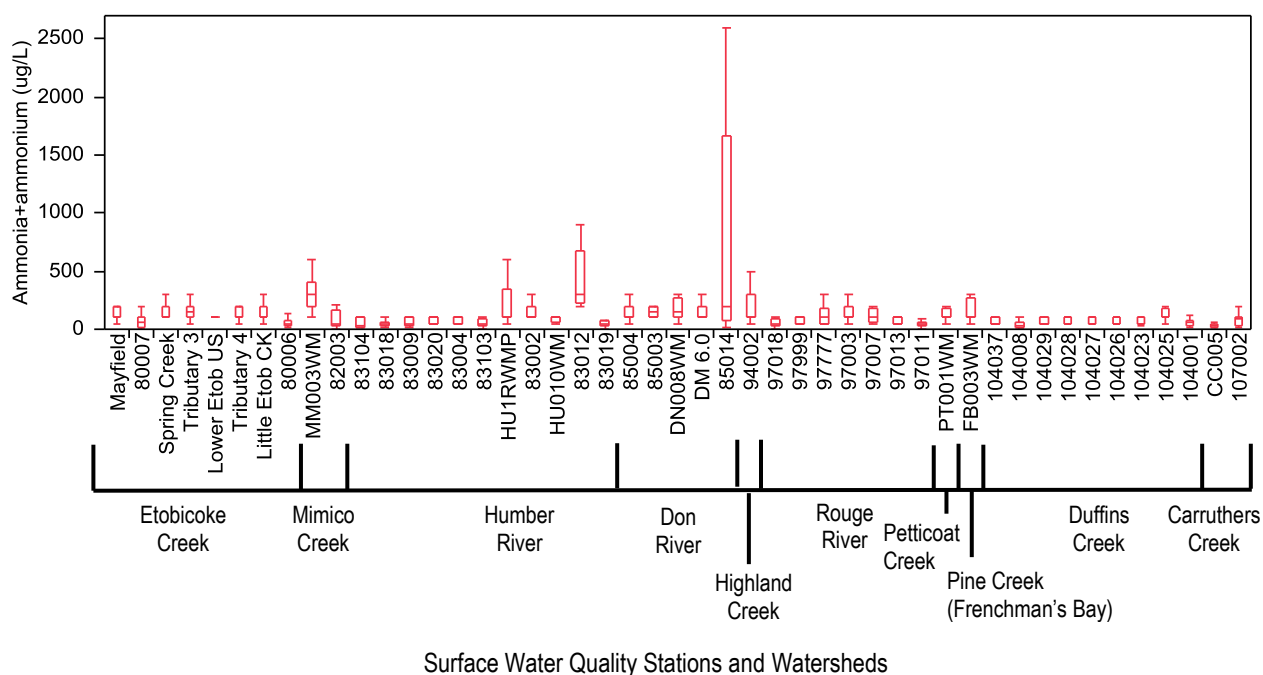
Nitrogen and phosphorus are critical to plant and animal life and their concentrations determine the productivity of aquatic systems. Phosphorus is commonly the growth limiting nutrient in aquatic systems; however, if there are substantial phosphorus loadings, nitrogen becomes the limiting nutrient.

Nitrogen occurs in various forms such as nitrate, nitrite and ammonia. Nitrate is the most common form of nitrogen entering freshwater systems and is assimilated by plants. Upon the decomposition of plant matter, dissolved organic nitrogen is converted to ammonia, an energy-efficient source of nitrogen for plants (Dodson 2005). Bacteria convert ammonia into nitrate, nitrite and nitrogen. Nitrite is easily converted and rarely accumulates unless organic pollution is high (Wetzel 2001). Total Kjeldahl nitrogen (TKN) is a quantitative determination of nitrogen and ammonia that is required in the analysis of sewage treatment plant effluent.

Anthropogenic sources of nitrogen and phosphorus (agricultural fertilizer, animal wastes and municipal sewage) that move into aquatic systems can cause unusually high concentrations of these nutrients. This over-nutrition, or eutrophication, of aquatic environments can promote excessive plant and algae growth. Eutrophic lakes can be characterized by algal blooms which reduce recreational use and deplete oxygen levels to the detriment of other biota, especially fish. Excessive growth of aquatic plants in streams can cause dissolved oxygen concentrations to decrease during the night to levels that may not sustain certain aquatic species, as well as reduce the aesthetic appeal of the stream.

### 3.5.1 Ammonia

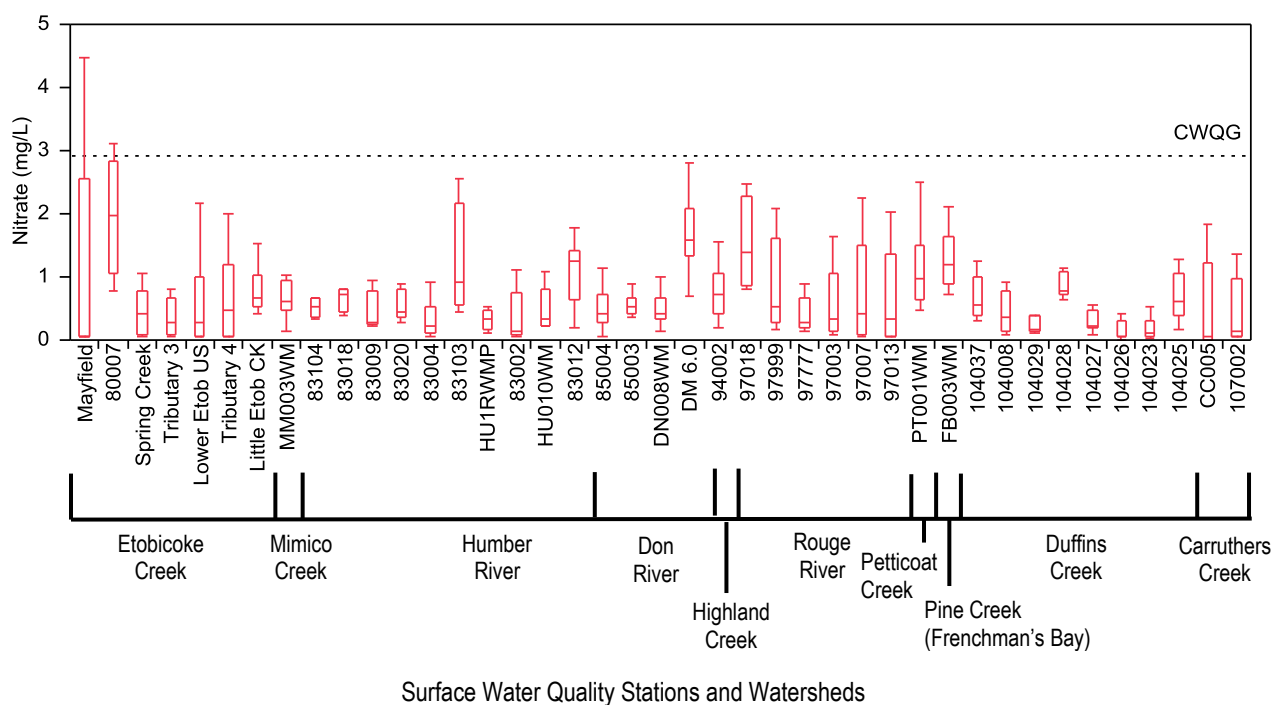
Currently, there are no PWQO, CWQG or CESI guidelines which define the amount of allowable total ammonia (ammonia + ammonium) for the protection of aquatic life. Stations MM003WM in middle Mimico Creek and 83012 in lower Black Creek had the highest median ammonia concentrations ( $300 \mu\text{g/L}$ ) while station 85014 at the mouth of the Don River had the highest 75<sup>th</sup> percentile and maximum value (Figure 18). The two stations with the lowest ammonia concentrations were 104008 and 83104. These stations are in the upper Duffins Creek and upper Humber River watersheds.



**Figure 18.** 2016 ammonia concentrations ( $\mu\text{g/L}$ ) at TRCA surface water quality monitoring stations

### 3.5.2 Nitrate

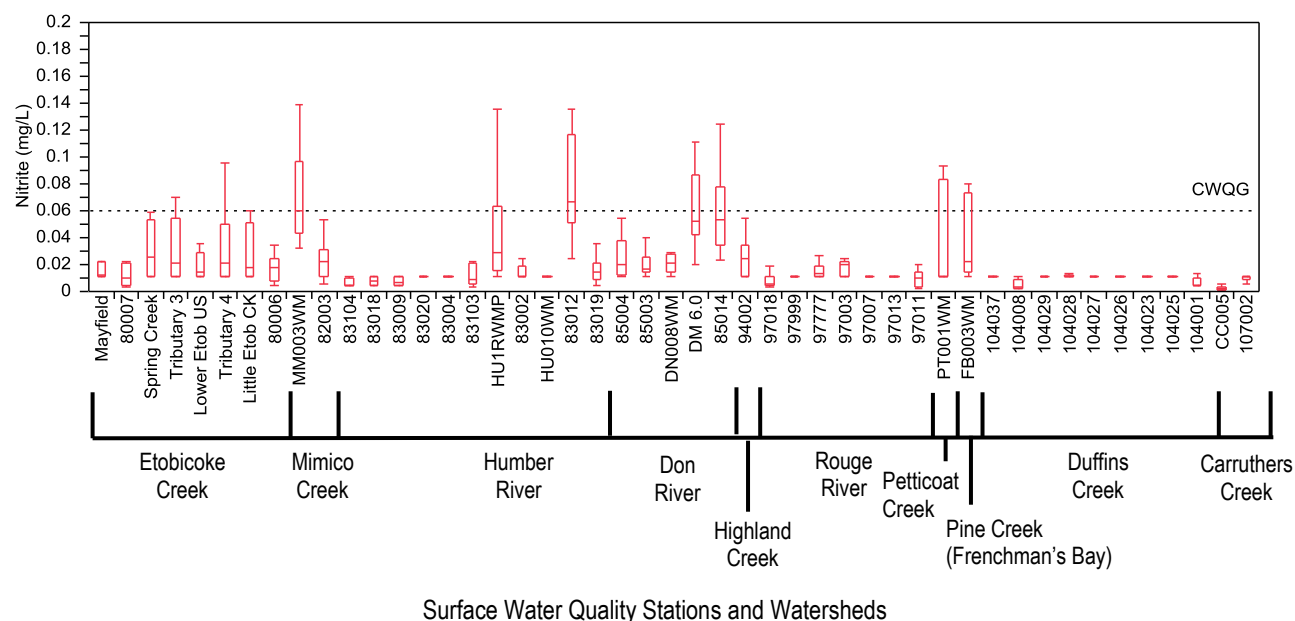
There were no stations with median nitrate concentrations above the CWQG guideline of 2.93 mg/L (Figure 19). Station 80007 on the west branch of Etobicoke Creek had the highest nitrate concentration of 1.97 mg/L followed by DM 6.0 in the Lower Don (1.58 mg/L) and 97018 in the upper portion of the Rouge River watershed (1.4 mg/L). Most stations exhibited large interquartile ranges which may be indicative of infrequent pulses of nitrate.



**Figure 19.** 2016 nitrate concentrations (mg/L) at TRCA surface water quality monitoring stations (CWQG: 2.93 mg/L)

### 3.5.3 Nitrite

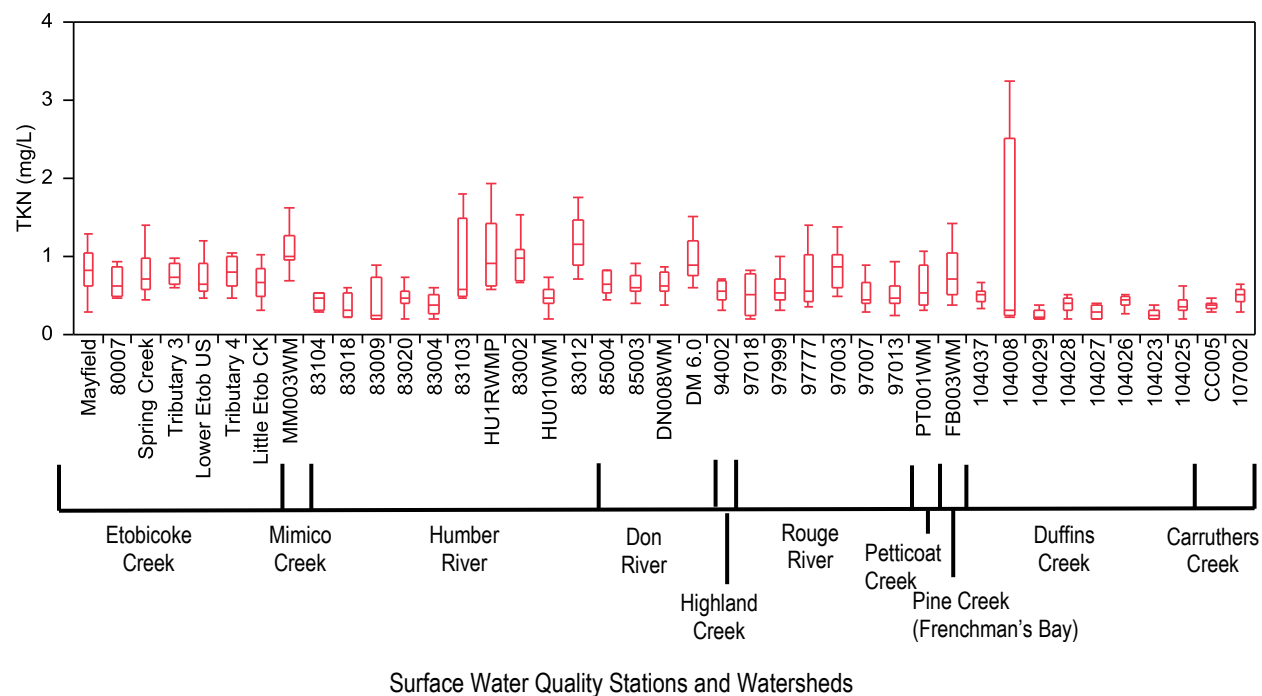
Station 83012 (lower Black Creek) and MM003WM (middle Mimico Creek) exceeded the CWQG of 0.06 mg/L (Figure 20). Several other stations had interquartile ranges suggesting higher nitrite concentrations including HU1RWMP on the upper Black Creek, DM 6.0 on the lower portion of the Taylor-Massey Creek, 85014 at the mouth of the Don, PT001WM in Petticoat and FB003WM in the Frenchman's Bay watershed. The upper Humber River, Rouge River, Duffins Creek and Carruthers Creek watersheds had the lowest nitrite levels and Etobicoke Creek, Mimico Creek, lower Humber River, Don River, Petticoat Creek and Frenchman's Bay watersheds had higher nitrite levels.



**Figure 20.** 2016 nitrite concentrations (mg/L) at TRCA surface water quality monitoring stations (CWQG: 0.06 mg/L)

### 3.5.4 Total Kjeldahl Nitrogen

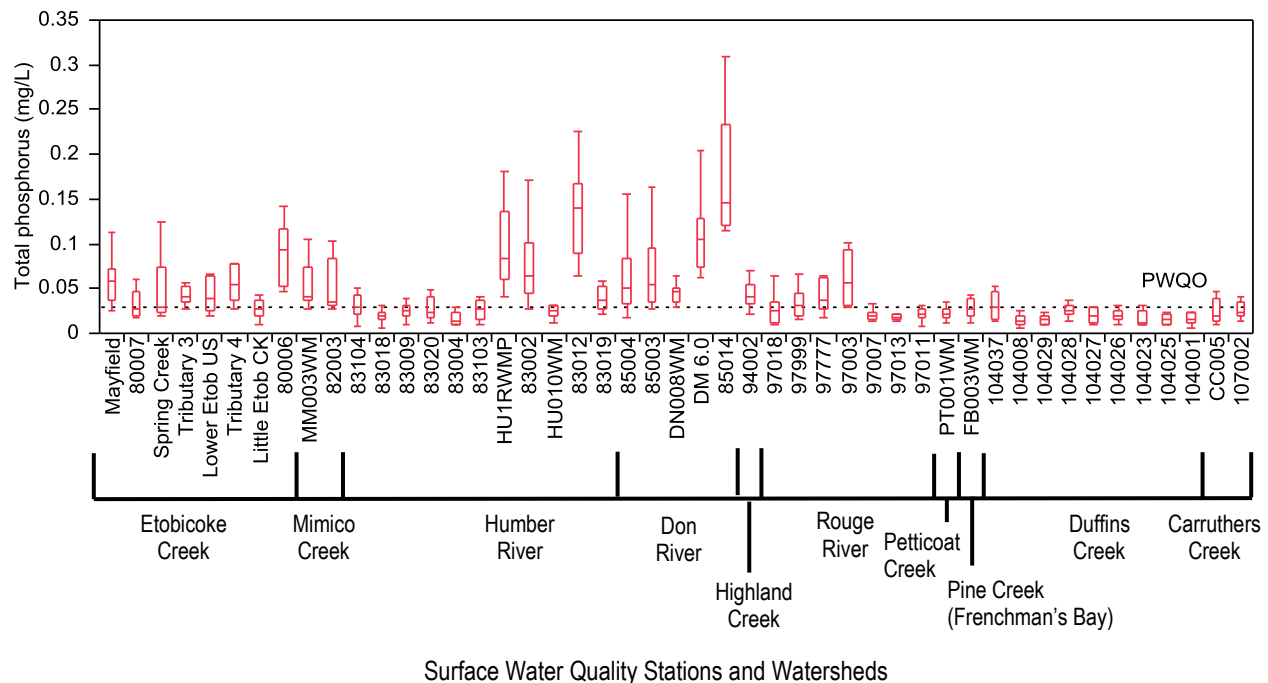
The OMOECC has stopped providing TKN values with its lab results so there is a limited site list with missing values for stations analyzed year-round by the OMOECC laboratory (80006, 82003, 83019, 85014, 97011 and 104001). The highest TKN concentrations were found at 83012 (1.16 mg/L) in the lower Humber River watershed and MM003WM (1.01 mg/L) in the Mimico Creek watershed. The lowest concentrations were found at 104029 (0.22 mg/L) in the upper Duffins Creek watershed and 83009 (0.24 mg/L) in the upper Humber River watershed.



**Figure 21.** 2016 TKN concentrations (mg/L) at TRCA surface water quality monitoring stations

### 3.5.5 Phosphorus

Phosphorus readily binds to sediment particles and increases in phosphorus concentrations are typically associated with storm events and elevated levels of turbidity. The highest median phosphorus concentrations were at stations 85014 (0.146 mg/L) in the lower Don River watershed and 83012 (0.140 mg/L) in the lower Humber River watershed (Figure 22). Twenty-one stations had median phosphorus concentrations above the PWQO of 0.03 mg/L, and 26 stations were below the guideline.



**Figure 22.** 2016 phosphorus concentrations (mg/L) at TRCA surface water quality monitoring stations (PWQO: 0.03 mg/L)

## 4. Summary

This report represents a summary assessment and characterization of 47 water quality stations based on 16 water quality parameters collected throughout 2016. Annual total precipitation in 2016 was well below the 15-year average. Monthly precipitation in March and December was higher than the monthly 15-year average but all other months were lower with May and June being especially dry. Snowfall in 2016 was slightly above the 15-year average. Sampling was performed irrespective of precipitation, and it should be expected that levels of many of the parameters presented in this report would be higher when mobilized by storm events.

Chloride concentrations appear to be highest in areas of each watershed that are known to be urbanized. This observation has been supported in the literature and can also be specifically related to the Toronto region (Williams et al. 1999, Kaushal et al. 2005, Findlay and Kelly 2011). Stations with the highest chloride concentrations were in the Etobicoke, Mimico and lower Humber watersheds (Little Etob CK, Tributary 3, 82003, HU1RWMP, 83012). Stations with the lowest chloride concentrations were in the upper Humber River, upper Rouge River and Duffins Creek watersheds.

Stations with particularly high concentrations of multiple metals include MM003WM in the Mimico Creek watershed and HU1RWMP and 83012 in the middle to lower Humber River watershed. Metals did not show clear and consistent patterns among stations and this could be due to the variability in the location of point-sources and/or temporal variation in when they are discharged. For example, the lower Don also had high concentrations of several metals similar to these stations; however, the concentration of others were lower (e.g. nickel). Arsenic and lead are two metals that are not required for biological activity and are toxic to aquatic organisms (Dodson 2005). Several stations had maximum values exceeding the PWQO of 5 µg/L for both of these metals and these were Tributary 3, MM003WM and 83012 (in the Etobicoke, Mimico and Humber watersheds, respectively). Metals were consistently the lowest in the upper Humber River watershed.

Median nutrient and *E. coli* values were highest at stations DM 6.0 and 85014 in the lower Don River watershed and at station 83012 in the lower Humber River watershed. Station 85014 is downstream of the North Toronto Wastewater Treatment Plant and stations DM 6.0 and 83012 are in the lower Don River and Humber River watersheds, respectively. The highest median nitrate concentration was found at station 80007 in the middle Etobicoke Creek watershed which is inconsistent with these lower watershed trends and could reflect an unknown point source within this already industrialized and urbanized area. The upper Humber River, Duffins Creek and Carruthers Creek watersheds had the lowest median nutrient concentrations and *E. coli* counts. The upper Rouge River watershed also had low nutrients and *E. coli* in general; however, nitrate concentrations were higher and compared more closely to the Etobicoke Creek watershed with moderate concentrations.

Overall, stations in areas known to be more heavily urbanized or industrialized had poorer water quality with higher concentrations of chloride, metals, nutrients and *E. coli*. Stations in watersheds with less urbanization/industry or in more rural areas of watersheds tended to have

better water quality with lower concentrations of chloride, metals, nutrients and *E. coli*. Stream water quality varied across the Toronto region and demonstrates the diversity of land uses and point-sources affecting streams and potential opportunities for further investigation, remediation/restoration and protection.

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## Appendix A. Water quality stream conditions from field notes for 2016

Station	January	February	March	April	May	June	July	August	September	October	November	December
104001	Clear	Frozen, Clear	Turbid	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
104008	Clear, Frozen Slightly	Frozen, Clear	Turbid	Clear	Clear	Clear	Turbid Slightly	Clear	Clear	Clear	Clear	Clear
104023	Frozen, Clear	Frozen, Clear	Turbid	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
104025	Frozen, Clear	Frozen, Clear	Turbid	Clear	Clear	Clear	Turbid Slightly	Clear	Clear	Clear	Clear	Clear
104026	Clear	Partly Frozen, Clear	Turbid	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
104027	Clear	Partly Frozen, Clear	Turbid	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
104028	Clear	Partly Frozen, Clear	Turbid	Clear	Clear	Clear	Turbid Slightly	Clear	Clear	Clear	Clear	Clear
104029	Clear, Frozen Slightly	Frozen, Clear	Turbid	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
104037	Frozen, Clear	Frozen, Clear	Turbid	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
107002	Clear	Frozen, Clear	Turbid	Clear	Clear	Clear	Turbid Slightly	Clear	Clear	Clear	Clear	Clear
80006	Clear	Clear, Slightly Frozen	Slightly Turbid	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Very Turbid
80007	Clear, Slightly Frozen	Clear, Mostly Frozen	Turbid	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
82003	Clear, Slightly Frozen	Clear, Mostly Frozen	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
83002	Clear, Slightly Frozen	Clear, Slightly Frozen	Turbid	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
83004	Clear, Slightly Frozen	Partly Frozen, Clear	Turbid	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
83009	Clear, Slightly Frozen	Partly Frozen, Clear	Turbid	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
83012	Turbid	Turbid Slightly	Slightly Turbid	Clear	Clear	Clear	Clear	Turbid	Clear	Turbid	Turbid Slightly	Clear
83018	Clear, Frozen	Partly Frozen, Clear	Slightly Turbid	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
83019	Clear, Slightly Frozen	Frozen, Clear	Turbid	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
83020	Clear, Slightly Frozen	Partly Frozen, Clear	Turbid	Slightly Turbid	Clear	Clear	Clear	Turbid Slightly	Clear	Slightly Turbid	Clear	Clear
83103	Clear, Slightly Frozen	Partly Frozen, Clear	Turbid	Clear	Clear	Turbid Slightly	Turbid Slightly	Turbid Slightly	Clear	Slightly Turbid	Clear	Clear
83104	Clear, Frozen	Frozen, Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
85003	Clear, Slightly Frozen	Clear, Mostly Frozen	Slightly Turbid	Clear	Clear	Clear	Clear	Clear	Clear	Turbid	Clear	Clear
85004	Clear, Slightly Frozen	Clear, Mostly Frozen	Slightly Turbid	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
85014	Clear	Partly Frozen, Slightly Turbid	Turbid	Clear	Clear	Clear	Turbid Slightly	Turbid	Clear	Slightly Turbid	Turbid Slightly	Clear
94002	Turbid Slightly	Partly Frozen, Clear	Turbid	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
97003	Clear, Slightly Frozen	Partly Frozen, Clear	Turbid	Turbid	Clear	Clear	Turbid Slightly	Turbid	Clear	Clear	Turbid	Clear
97007	Clear, Slightly Frozen	Partly Frozen, Clear	Turbid	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
97011	Clear, Slightly Frozen	Partly Frozen, Clear	Turbid	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
97013	Clear, Slightly Frozen	Partly Frozen, Clear	Turbid	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
97018	Clear, Frozen Slightly	Partly Frozen, Clear	Slightly Turbid	Clear	Clear	Clear	Turbid Slightly	Clear	Clear	Clear	Clear	Clear
97777	Clear, Frozen Slightly	Partly Frozen, Clear	Turbid	Clear	Clear	Clear	Turbid Slightly	Turbid Slightly	Clear	Clear	Clear	Clear
97999	Clear, Frozen Slightly	Partly Frozen, Clear	Turbid	Clear	Clear	Clear	Turbid Slightly	Clear	Clear	Clear	Clear	Clear
CC005	Clear	Partly Frozen, Clear	Slightly Turbid	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
DM 6.0	Clear, Slightly Frozen	Partly Frozen, Slightly Turbid	Clear	Clear	Clear	Clear	Clear	Turbid Slightly	Turbid Slightly	Clear	Turbid Slightly	Clear
DN008WM	Clear	Clear, Frozen Slightly	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
FB003WM	Clear	Partly Frozen, Clear	Turbid	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
HU010WM	Clear, Slightly Frozen	Partly Frozen, Clear	Turbid	Turbid	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
HU1RWMP	Clear, Slightly Frozen	Partly Frozen, Clear	Turbid	Slightly Turbid	Clear	Turbid	Turbid Slightly	Turbid Slightly	Turbid Slightly	Turbid	Turbid	Clear
Little Etob CK	Clear, Slightly Frozen	Clear, Mostly Frozen	Turbid	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
Lower Etob US	Clear, Slightly Frozen	Frozen, Clear	Turbid	Clear	Clear	Clear	Clear	Clear	Clear	Slightly Turbid	Clear	Clear
Mayfield	Clear, Slightly Frozen	Frozen, Clear	Slightly Turbid	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
MM003WM	Clear, Slightly Frozen	Partly Frozen, Clear	Turbid	Clear	Slightly Turbid	Clear	Clear	Clear	Clear	Clear	Clear	Turbid Slightly
PT001WM	Clear	Partly Frozen, Clear	Turbid	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
Spring Creek	Clear, Slightly Frozen	Partly Frozen, Clear	Turbid	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
Tributary 3	Clear, Slightly Frozen	Partly Frozen, Clear, Turbid	Turbid	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
Tributary 4	Clear, Frozen	Clear, Frozen	Turbid	Clear	Clear	Clear	Clear	Clear	Turbid Slightly	Clear	Clear	Clear

### Appendix B. Stations sampled in 2016 and associated weather

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	# Wet Samples	# Dry Samples
104001	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Wet	3	9
104008	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Wet	3	9
104023	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	2	10
104025	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	2	10
104026	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	2	10
104027	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	2	10
104028	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	2	10
104029	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	2	10
104037	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	2	10
107002	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	2	10
80006	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	1	11
80007	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	1	11
82003	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	1	11
83002	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0	12
83004	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0	12
83009	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Wet	Dry	Dry	2	10
83012	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Wet	Dry	Dry	2	10
83018	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Wet	Dry	Dry	2	10
83019	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Wet	Dry	Dry	2	10
83020	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0	12
83103	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Wet	Dry	Dry	2	10
83104	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Wet	Dry	Dry	2	10
85003	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0	12
85004	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0	12
85014	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	1	11
94002	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	1	11
97003	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	1	11
97007	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	1	11
97011	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	2	10
97013	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	1	11
97018	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Wet	3	9
97777	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	2	10
97999	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	2	10
CC005	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	2	10
DM 6.0	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	1	11
DN008WM	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0	12
FB003WM	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	1	11
HU010WM	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Wet	Dry	Dry	2	10
HU1RWMP	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Wet	Dry	Dry	2	10
Little Etob CK	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0	12
Lower Etob US	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0	12
Mayfield	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0	12
MM003WM	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0	12
PT001WM	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	1	11
Spring Creek	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0	12
Tributary 3	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0	12
Tributary 4	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0	12

### Appendix C. Descriptive statistics for 2016 water quality data

		AVERAGE															
		Aluminium (ug/L)	Arsenic (ug/L)	Chloride (mg/L)	Copper (ug/L)	E. coli (CFU/100mL)	Iron (ug/L)	Lead (ug/L)	Nickel (ug/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	Ammonia (ug/L)	pH	Total phosphorus (mg/L)	TSS (mg/L)	Zinc (ug/L)
Etobicoke Creek	Mayfield	199	1.44	140	1.73	58	262	0.15	0.43	1.14	0.021	0.818	166.667	8.10	0.056	3.2	10.00
	80007	199	2.44	593	3.47	469	158	0.67	0.73	1.96	0.019	0.658	83.750	8.34	0.038	8.2	13.68
	Spring Creek	223	1.61	867	4.46	339	214	0.58	1.05	0.45	0.082	0.783	166.667	8.40	0.101	7.4	13.83
	Tributary 3	520	2.06	1383	7.17	426	332	1.79	2.61	0.35	0.037	0.927	187.500	8.33	0.060	19.8	28.16
	Lower Etob US	315	1.59	791	5.00	239	232	0.75	1.16	0.55	0.021	0.733	108.333	8.45	0.065	13.9	14.08
	Tributary 4	154	2.05	797	3.14	878	248	0.24	1.04	0.69	0.053	0.833	187.500	8.23	0.074	5.1	10.33
	Little Etob CK	95	2.60	1386	5.24	3013	197	0.41	1.39	0.81	0.031	0.662	187.500	8.22	0.027	2.3	13.63
	80006	271		1000	4.88	771	491				0.021		68.083	8.28	0.102	14.8	23.47
Mimico Creek	MM003WM	426	1.86	1225	6.44	451	432	1.12	4.29	0.65	0.070	1.081	316.667	8.21	0.061	13.3	22.52
	82003	51		1473	5.79	563	160				0.027		81.667	8.33	0.103	4.5	23.56
Humber River	83104	56	0.60	60	0.73	111	199	0.15	0.21	0.52	0.006	0.435	50.167	8.33	0.034	6.2	10.62
	83018	69	0.53	56	0.84	97	184	0.15	0.20	0.66	0.008	0.360	45.333	8.33	0.023	6.9	10.34
	83009	171	0.44	31	0.88	120	347	0.23	0.29	0.43	0.007	0.390	53.333	8.34	0.031	18.7	10.93
	83020	640	0.78	63	1.24	53	317	0.36	0.26	0.53	0.011	0.513	104.167	8.33	0.046	28.0	10.00
	83004	284	0.79	177	1.23	84	223	0.23	0.30	0.57	0.012	0.429	100.000	8.31	0.029	13.8	10.00
	83103	1115	1.61	341	2.55	212	411	0.62	0.70	1.22	0.012	0.853	60.000	8.27	0.053	22.2	16.33
	HU1RWMP	390	2.56	1671	6.69	1150	464	0.97	2.09	0.34	0.046	1.026	208.333	8.03	0.094	14.6	21.86
	83002	703	1.92	263	2.09	181	392	0.52	0.82	0.50	0.014	0.958	150.000	8.21	0.077	14.5	10.00
	HU010WM	535	0.89	158	1.60	697	286	0.35	0.39	0.48	0.011	0.535	95.833	8.36	0.041	18.3	10.00
	83012	363	1.78	919	7.57	2583	574	2.24	1.90	1.11	0.077	1.193	425.000	8.28	0.137	14.8	23.00
Don River	83019	188		378	3.35	1292	408				0.016		66.333	8.38	0.048	20.6	18.58
	85004	216	2.03	919	3.29	220	370	0.75	1.01	0.49	0.028	0.706	200.000	8.23	0.069	8.3	12.98
	85003	586	1.36	490	2.08	1278	347	0.48	0.45	0.61	0.021	0.678	191.667	8.28	0.068	16.7	10.51
	DN008WM	83	1.64	702	2.83	811	504	0.18	0.67	0.51	0.039	0.674	195.833	8.24	0.057	4.8	10.34
	DM 6.0	145	1.85	1057	5.30	3796	405	0.72	1.50	1.67	0.062	0.973	216.667	8.23	0.107	5.6	13.58
Highland Creek	85014	114		808	5.67	58195	494				0.060		1108.250	8.20	0.201	17.1	25.98
	94002	560	1.26	546	3.84	833	392	0.86	0.88	0.77	0.026	0.668	191.667	8.21	0.072	28.9	14.84
Rouge River	97018	110	0.47	66	0.85	196	246	0.15	0.21	1.52	0.008	0.508	52.500	8.32	0.027	7.5	11.92
	97999	199	0.89	130	1.00	109	171	0.17	0.29	0.85	0.011	0.592	91.667	8.25	0.037	7.7	10.00
	97777	315	1.26	455	1.98	705	327	0.46	0.48	0.39	0.015	0.774	125.000	8.13	0.057	15.6	11.14
	97003	1158	1.12	326	2.71	151	429	0.96	0.65	0.57	0.028	0.854	145.833	8.33	0.114	18.9	15.98
	97007	148	0.83	133	0.99	36	134	0.14	0.32	0.75	0.010	0.508	112.500	8.38	0.026	6.3	10.00
	97013	281	0.82	150	1.15	20	149	0.17	0.39	0.65	0.011	0.544	104.167	8.42	0.029	12.6	10.00
	97011	156		354	2.55	147	296				0.010		48.167	8.35	0.039	24.3	16.02
Petticoat Creek	PT001WM	127	1.10	501	2.40	838	153	0.20	0.61	1.14	0.131	0.773	125.000	8.27	0.026	5.3	10.46
Frenchmans Bay	FB003WM	241	1.45	696	3.03	3632	327	0.46	0.61	1.28	0.137	0.946	158.333	8.15	0.039	11.8	12.58
Duffins Creek	104037	495	0.65	99	1.21	128	247	0.46	0.29	0.67	0.013	0.593	79.167	8.28	0.057	19.5	10.42
	104008	861	0.35	37	1.12	86	295	1.45	0.56	0.43	0.005	1.023	43.583	8.36	0.065	30.8	12.08
	104029	1754	0.33	29	1.30	39	284	0.67	0.43	0.26	0.010	0.538	79.167	8.34	0.099	61.0	11.01
	104028	564	0.52	82	1.06	35	305	0.44	0.30	0.86	0.012	0.478	87.500	8.31	0.051	22.4	10.00
	104027	417	0.45	47	1.01	49	253	0.35	0.26	0.29	0.012	0.386	91.667	8.39	0.052	28.5	10.46
	104026	250	0.76	168	0.98	56	204	0.21	0.31	0.15	0.011	0.447	68.692	8.30	0.031	10.7	9.33
	104023	652	0.57	88	1.12	25	222	0.46	0.33	0.28	0.010	0.461	75.462	8.37	0.063	33.3	11.86
	104025	1232	0.52	53	1.27	52	292	0.49	0.42	0.68	0.011	0.484	116.667	8.40	0.089	85.3	10.19
Carruthers Creek	104001	294		122	2.02	199	548				0.007		58.083	8.32	0.047	47.7	15.23
	CC005	38	0.98	114	1.24	45	257	1.35	1.05	0.47	0.002	0.377	33.417	8.13	0.028	9.5	1.43
	107002	158	0.89	219	1.37	105	247	0.34	0.72	0.43	0.012	0.539	97.583	8.24	0.028	7.0	7.07

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		MEDIAN															
		Aluminium (ug/L)	Arsenic (ug/L)	Chloride (mg/L)	Copper (ug/L)	E. coli (CFU/100mL)	Iron (ug/L)	Lead (ug/L)	Nickel (ug/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	Ammonia (ug/L)	pH	Total phosphorus (mg/L)	TSS (mg/L)	Zinc (ug/L)
Etobicoke Creek	Mayfield	115	1.27	138	1.56	50	230	0.11	0.43	0.06	0.013	0.820	100.0	8.1	0.058	2.5	10.00
	80007	43	2.09	312	2.84	215	129	0.22	0.81	1.97	0.010	0.620	63.0	8.335	0.026	3.3	12.60
	Spring Creek	103	1.62	445	2.95	315	158	0.24	0.77	0.42	0.026	0.700	100.0	8.4	0.029	4.0	10.00
	Tributary 3	130	1.61	709	5.14	315	263	0.53	1.72	0.29	0.021	0.735	150.0	8.35	0.040	4.0	16.85
	Lower Etob US	81	1.75	359	3.63	115	193	0.34	0.94	0.27	0.014	0.655	100.0	8.4	0.039	4.0	10.00
	Tributary 4	48	2.02	409	2.64	270	233	0.17	0.96	0.47	0.022	0.795	100.0	8.3	0.055	2.0	10.00
	Little Etob CK	37	2.09	745	3.67	205	136	0.27	0.97	0.67	0.018	0.675	100.0	8.2	0.027	2.0	10.00
Mimico Creek	80006	42		493	3.65	410	152				0.018		49.0	8.295	0.093	3.8	21.60
	MM003WM	136	1.58	611	5.09	440	399	0.63	2.78	0.62	0.060	1.005	300.0	8.2	0.042	3.0	14.85
	82003	35		684	5.72	395	161				0.022		44.5	8.355	0.036	4.3	20.85
Humber River	83104	32	0.62	60	0.65	100	182	0.10	0.20	0.53	0.005	0.465	29.0	8.315	0.029	4.1	10.05
	83018	38	0.53	56	0.80	80	161	0.08	0.20	0.73	0.008	0.310	47.0	8.3	0.020	4.3	10.00
	83009	54	0.36	20	0.65	100	313	0.11	0.20	0.28	0.007	0.235	43.5	8.305	0.025	6.3	10.45
	83020	208	0.82	60	1.01	40	207	0.17	0.20	0.46	0.011	0.470	100.0	8.3	0.024	10.0	10.00
	83004	49	0.72	147	1.04	65	175	0.08	0.24	0.22	0.011	0.385	100.0	8.3	0.014	2.0	10.00
	83103	220	1.17	225	1.93	75	418	0.08	0.42	0.93	0.009	0.575	39.5	8.26	0.028	11.5	12.25
	HU1RWMP	250	2.33	875	5.12	320	369	0.60	1.76	0.34	0.029	0.915	100.0	8.1	0.083	11.5	16.45
	83002	493	1.47	259	1.97	135	353	0.42	0.88	0.15	0.011	0.980	100.0	8.2	0.064	10.5	10.00
	HU010WM	138	0.92	129	1.37	445	228	0.17	0.28	0.33	0.011	0.470	100.0	8.35	0.026	4.0	10.00
	83012	180	1.81	657	5.30	1290	477	0.65	1.88	1.26	0.067	1.155	300.0	8.3	0.140	9.0	16.90
Don River	83019	73		216	2.72	225	241				0.015		48.5	8.41	0.037	7.8	16.10
	85004	94	2.09	622	2.25	195	354	0.33	1.02	0.43	0.020	0.635	100.0	8.2	0.051	4.0	10.00
	85003	235	1.24	315	1.83	870	326	0.33	0.37	0.53	0.017	0.605	150.0	8.3	0.054	7.0	10.00
	DN008WM	50	1.56	421	2.28	170	488	0.16	0.65	0.43	0.022	0.630	150.0	8.2	0.047	3.0	10.00
	DM 6.0	84	1.67	474	4.32	2440	386	0.43	1.28	1.58	0.053	0.880	100.0	8.3	0.105	3.5	10.20
Highland Creek	85014	88		429	5.26	17950	531				0.053		192.0	8.23	0.146	15.4	25.45
	94002	49	0.84	345	3.04	470	276	0.19	0.72	0.73	0.025	0.545	100.0	8.2	0.042	2.0	10.00
Rouge River	97018	51	0.43	63	0.68	74	224	0.07	0.20	1.40	0.006	0.505	39.0	8.3	0.025	4.6	11.85
	97999	127	0.81	137	0.94	75	166	0.13	0.29	0.53	0.011	0.535	100.0	8.3	0.031	4.5	10.00
	97777	193	0.86	381	1.52	405	276	0.27	0.47	0.27	0.013	0.565	100.0	8.1	0.037	10.0	10.00
	97003	167	1.15	310	1.67	120	262	0.35	0.45	0.34	0.020	0.875	100.0	8.3	0.056	8.0	10.00
	97007	56	0.86	146	0.94	20	124	0.08	0.29	0.43	0.011	0.440	100.0	8.4	0.020	2.0	10.00
	97013	82	0.88	158	1.03	15	106	0.07	0.35	0.32	0.011	0.465	100.0	8.4	0.018	3.0	10.00
	97011	32		275	2.54	115	139				0.011		45.5	8.325	0.021	5.1	13.25
Petticoat Creek	PT001WM	37	0.72	346	2.07	460	138	0.08	0.61	0.97	0.011	0.525	100.0	8.3	0.021	2.0	10.00
Frenchmans Bay	FB003WM	85	0.93	450	2.44	835	297	0.17	0.53	1.19	0.023	0.720	100.0	8.2	0.027	2.5	10.00
Duffins Creek	104037	58	0.67	95	0.88	78	167	0.12	0.20	0.56	0.011	0.520	50.0	8.3	0.030	2.0	10.00
	104008	37	0.24	33	0.74	16	158	0.14	0.20	0.36	0.003	0.305	27.5	8.325	0.014	3.6	11.90
	104029	53	0.27	24	0.80	20	114	0.05	0.20	0.17	0.011	0.220	50.0	8.3	0.016	3.0	10.00
	104028	107	0.52	78	0.80	20	223	0.11	0.20	0.78	0.011	0.395	100.0	8.3	0.026	4.5	10.00
	104027	105	0.44	25	0.80	20	151	0.11	0.20	0.23	0.011	0.280	100.0	8.4	0.020	5.0	10.00
	104026	62	0.79	151	0.84	30	169	0.08	0.27	0.06	0.011	0.440	50.0	8.3	0.019	2.0	10.00
	104023	25	0.48	87	0.80	20	130	0.05	0.20	0.12	0.011	0.250	50.0	8.4	0.013	2.0	10.00
	104025	91	0.56	49	0.80	10	126	0.07	0.25	0.61	0.011	0.365	100.0	8.4	0.015	4.0	10.00
Carruthers Creek	104001	56		76	0.69	135	181				0.005		56.0	8.34	0.015	5.2	11.35
	CC005	30	0.60	108	0.95	8	234	0.60	0.80	0.06	0.002	0.375	36.0	8.1	0.019	4.2	0.80
	107002	110	0.50	212	1.33	68	211	0.27	0.70	0.15	0.011	0.515	94.0	8.25	0.023	4.0	10.00

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		MINIMUM															
		Aluminium (ug/L)	Arsenic (ug/L)	Chloride (mg/L)	Copper (ug/L)	E. coli (CFU/100mL)	Iron (ug/L)	Lead (ug/L)	Nickel (ug/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	Ammonia (ug/L)	pH	Total phosphorus (mg/L)	TSS (mg/L)	Zinc (ug/L)
Etobicoke Creek	Mayfield	47	0.50	81	0.86	10	123	0.06	0.20	0.06	0.011	0.280	50	8.00	0.026	2.0	10.00
	80007	21	0.48	186	1.44	20	81	0.15	0.43	0.77	0.003	0.460	5	8.10	0.017	2.0	10.00
	Spring Creek	47	0.05	256	2.24	0	82	0.14	0.20	0.06	0.011	0.440	100	8.20	0.020	2.0	10.00
	Tributary 3	42	0.05	407	3.10	30	177	0.23	0.70	0.06	0.011	0.590	50	8.00	0.027	2.0	10.00
	Lower Etob US	48	0.05	199	2.86	0	75	0.16	0.38	0.06	0.011	0.460	50	8.20	0.019	2.0	10.00
	Tributary 4	25	0.34	211	1.82	10	180	0.07	0.56	0.06	0.011	0.460	50	7.80	0.027	2.0	10.00
	Little Etob CK	25	0.05	404	2.53	10	34	0.10	0.34	0.42	0.011	0.320	50	8.00	0.010	2.0	10.00
	80006	26		325	1.48	10	95				0.005		15	8.03	0.047	1.8	13.20
Mimico Creek	MM003WM	53	0.05	318	3.47	150	260	0.23	1.88	0.13	0.032	0.690	100	8.00	0.027	2.0	10.00
	82003	5		403	1.60	70	43				0.006		5	8.02	0.027	1.2	8.13
Humber River	83104	3	0.43	51	0.02	0	101	0.08	0.20	0.34	0.004	0.280	9	8.20	0.008	1.3	8.34
	83018	7	0.38	40	0.01	0	113	0.05	0.20	0.38	0.004	0.220	17	8.20	0.005	1.3	8.73
	83009	27	0.25	9	0.06	0	225	0.08	0.20	0.23	0.004	0.200	9	8.25	0.009	2.0	9.57
	83020	47	0.33	46	0.80	0	140	0.05	0.20	0.27	0.003	0.200	50	8.30	0.012	2.0	10.00
	83004	25	0.16	108	0.91	10	78	0.05	0.20	0.06	0.011	0.200	50	8.20	0.010	2.0	10.00
	83103	62	0.57	105	1.54	30	112	0.07	0.32	0.45	0.003	0.460	5	8.10	0.010	2.0	10.00
	HU1RWMP	69	0.05	183	2.75	80	250	0.35	0.74	0.11	0.011	0.570	50	7.60	0.040	2.0	10.00
	83002	106	0.50	153	1.21	10	222	0.10	0.34	0.06	0.011	0.660	100	8.10	0.027	2.0	10.00
	HU010WM	48	0.05	82	0.91	30	131	0.07	0.20	0.21	0.004	0.200	50	8.20	0.011	2.0	10.00
	83012	25	0.05	208	3.67	360	302	0.24	0.95	0.20	0.025	0.710	200	7.80	0.065	2.0	10.00
	83019	13		126	1.25	56	91				0.005		5	8.13	0.021	3.0	9.23
Don River	85004	72	0.05	215	1.57	20	184	0.18	0.51	0.06	0.011	0.440	50	8.10	0.017	2.0	10.00
	85003	57	0.05	157	1.25	120	188	0.13	0.20	0.37	0.011	0.400	100	8.20	0.027	2.0	10.00
	DN008WM	36	0.07	151	1.60	60	337	0.08	0.20	0.15	0.011	0.380	50	8.10	0.029	2.0	10.00
	DM 6.0	25	0.05	127	2.52	210	195	0.17	0.71	0.69	0.020	0.610	100	7.90	0.062	2.0	10.00
	85014	17		145	2.23	96	210				0.023		21	7.96	0.115	4.4	15.00
Highland Creek	94002	25	0.05	134	1.72	100	95	0.08	0.44	0.20	0.011	0.310	50	8.00	0.022	2.0	10.00
Rouge River	97018	23	0.29	44	0.20	0	128	0.05	0.20	0.80	0.003	0.200	6	8.27	0.010	1.3	10.00
	97999	59	0.29	75	0.80	0	111	0.06	0.20	0.16	0.005	0.320	50	8.10	0.015	2.0	10.00
	97777	70	0.05	159	1.27	70	203	0.14	0.20	0.13	0.011	0.360	50	8.10	0.018	2.0	10.00
	97003	47	0.19	144	1.25	10	125	0.09	0.20	0.07	0.011	0.490	50	8.20	0.029	2.0	10.00
	97007	40	0.22	59	0.80	0	67	0.06	0.20	0.06	0.004	0.290	50	8.30	0.014	2.0	10.00
	97013	25	0.20	63	0.84	0	76	0.05	0.20	0.06	0.006	0.250	50	8.30	0.013	2.0	10.00
	97011	16		168	0.35	20	65				0.002		5	8.13	0.008	2.6	8.62
Petticoat Creek	PT001WM	25	0.05	165	1.20	130	79	0.05	0.20	0.48	0.011	0.320	50	8.10	0.012	2.0	10.00
Frenchmans Bay	FB003WM	52	0.05	176	1.22	330	165	0.10	0.20	0.71	0.011	0.380	50	8.00	0.012	2.0	10.00
Duffins Creek	104037	27	0.20	60	0.80	10	116	0.05	0.20	0.30	0.005	0.340	50	8.10	0.013	2.0	10.00
	104008	13	0.18	17	0.00	0	121	0.08	0.20	0.09	0.002	0.230	5	8.29	0.005	0.7	9.90
	104029	29	0.12	14	0.80	0	75	0.05	0.20	0.10	0.002	0.200	50	8.30	0.010	2.0	10.00
	104028	39	0.24	72	0.80	0	126	0.05	0.20	0.65	0.011	0.200	50	8.20	0.013	2.0	10.00
	104027	62	0.19	19	0.80	0	96	0.05	0.20	0.07	0.011	0.200	50	8.30	0.010	2.0	10.00
	104026	21	0.14	113	0.50	0	126	0.05	0.20	0.01	0.001	0.180	43	8.20	0.009	2.0	1.30
	104023	13	0.21	56	0.50	0	85	0.05	0.20	0.04	0.001	0.200	31	8.30	0.010	2.0	1.90
	104025	25	0.21	29	0.80	0	86	0.05	0.20	0.16	0.004	0.200	50	8.30	0.010	2.0	10.00
	104001	32		39	0.26	30	111				0.004		17	8.10	0.005	2.4	9.80
Carruthers Creek	CC005	13	0.50	70	0.50	1	112	0.50	0.50	0.01	0.001	0.230	8	7.90	0.010	2.3	0.20
	107002	52	0.42	141	0.80	0	158	0.05	0.48	0.06	0.004	0.300	10	8.00	0.013	2.0	1.00

## 2016 Surface Water Quality Summary

August 2017

		MAXIMUM																
		Aluminium (ug/L)	Arsenic (ug/L)	Chloride (mg/L)	Copper (ug/L)	E. coli (CFU/100mL)	Iron (ug/L)	Lead (ug/L)	Nickel (ug/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	Ammonia (ug/L)	pH	Total phosphorus (mg/L)	TSS (mg/L)	Zinc (ug/L)	
Etobicoke Creek	Mayfield	1200	2.99	264	3.30	170	668	0.58	0.78	4.46	0.073	1.300	400	8.20	0.113	8.0	10.00	
	80007	1870	5.10	2770	6.25	3400	513	2.10	0.87	3.11	0.079	0.930	300	8.62	0.127	42.0	23.80	
	Spring Creek	1290	3.76	3850	10.70	730	555	3.18	4.11	1.05	0.376	1.400	400	8.60	0.752	33.0	36.70	
	Tributary 3	3390	6.63	6470	29.10	1460	1010	9.88	10.20	0.81	0.152	2.910	600	8.60	0.236	116.0	152.00	
	Lower Etob US	2640	3.66	3390	9.83	880	698	4.87	3.14	2.18	0.062	1.200	200	8.70	0.248	87.0	45.60	
	Tributary 4	1100	5.05	3730	6.24	4000	412	0.88	2.07	1.99	0.325	1.640	600	8.60	0.210	24.0	14.00	
	Little Etob CK	470	9.49	6160	15.40	30000	698	1.61	6.68	1.52	0.116	1.030	700	8.40	0.043	4.0	36.20	
	80006	2070		4780	16.40	5300	3320				0.070		208	8.52	0.276	112.0	48.50	
Mimico Creek	MM003WM	3140	5.11	5470	16.30	930	780	6.17	16.30	1.03	0.139	1.620	600	8.50	0.178	108.0	78.50	
	82003	144		7090	16.50	2000	428				0.094		215	8.56	0.705	12.1	43.90	
Humber River	83104	227	0.75	73	2.12	300	402	0.32	0.23	0.67	0.011	0.530	100	8.54	0.090	19.3	13.90	
	83018	385	0.69	63	2.49	370	351	0.40	0.21	0.80	0.011	0.600	100	8.55	0.067	26.0	13.60	
	83009	1160	0.79	87	2.80	410	669	0.62	0.57	0.94	0.011	0.890	100	8.53	0.113	79.9	14.40	
	83020	4900	1.37	97	3.63	170	1220	2.33	0.90	0.88	0.022	1.160	300	8.40	0.276	208.0	10.00	
	83004	2640	1.46	363	3.16	210	846	1.71	0.75	3.57	0.022	0.920	200	8.40	0.181	124.0	10.00	
	83103	11100	3.52	1090	6.26	1100	928	2.24	1.64	2.56	0.022	1.800	200	8.54	0.361	138.0	45.40	
	HU1RWMP	1270	7.56	5610	12.80	5650	1170	3.52	4.76	0.54	0.135	1.930	600	8.30	0.180	48.0	47.50	
	83002	2540	4.15	454	3.20	640	743	1.14	1.25	2.58	0.025	1.530	300	8.40	0.171	41.0	10.00	
	HU010WM	4800	1.61	319	3.70	2750	1050	2.25	1.33	1.08	0.022	1.230	200	8.60	0.234	158.0	10.00	
	83012	1670	5.60	2980	16.60	7800	1180	14.90	2.76	1.78	0.135	1.760	900	8.50	0.226	72.0	62.00	
		83019	1490		1530	7.05	7400	2520				0.036		210	8.58	0.174	146.0	33.30
	Don River	85004	1140	5.91	3380	7.84	460	745	4.03	2.26	1.13	0.094	1.490	1000	8.40	0.193	50.0	34.30
85003		4390	4.45	1530	4.20	7500	595	1.30	0.86	1.46	0.040	1.220	500	8.40	0.164	96.0	16.10	
DN008WM		252	5.14	2920	6.28	5320	684	0.32	1.59	1.01	0.220	1.230	600	8.40	0.198	15.0	14.10	
DM 6.0		451	6.74	4570	10.30	11000	841	2.91	4.33	2.80	0.111	1.520	1000	8.40	0.204	16.0	26.10	
85014		265		3520	11.30	360000	773				0.125		6310	8.48	0.615	32.6	44.20	
Highland Creek	94002	5730	2.86	1970	13.90	5000	1810	7.31	2.56	1.56	0.055	1.390	500	8.30	0.408	304.0	61.30	
Rouge River	97018	561	0.72	88	2.23	560	441	0.42	0.25	2.46	0.019	0.820	100	8.55	0.065	23.0	15.80	
	97999	1090	1.89	189	1.67	420	358	0.73	0.48	2.09	0.014	1.010	200	8.30	0.090	35.0	10.00	
	97777	1480	4.47	955	6.20	3400	667	2.32	0.97	0.88	0.027	2.000	300	8.20	0.183	72.0	23.70	
	97003	11000	2.45	568	12.30	400	2090	7.11	2.32	1.65	0.144	1.380	300	8.40	0.735	121.0	81.80	
	97007	1120	1.75	201	1.82	180	380	0.77	0.53	2.24	0.011	0.900	200	8.50	0.091	40.0	10.00	
	97013	2480	1.68	231	2.47	70	637	1.25	0.67	2.02	0.017	1.120	300	8.60	0.144	113.0	10.00	
	97011	1310		669	6.29	370	1900				0.020		122	8.56	0.246	199.0	32.50	
Petticoat Creek	PT001WM	1000	2.87	1540	5.40	4900	361	1.55	1.08	2.50	1.080	2.770	300	8.40	0.078	39.0	15.50	
Frenchmans Bay	FB003WM	1830	3.84	2360	6.52	27000	738	3.39	1.45	2.10	0.931	3.190	300	8.20	0.175	92.0	36.50	
Duffins Creek		104037	5270	1.24	142	3.79	300	1200	4.33	1.02	1.26	0.026	1.760	200	8.40	0.357	196.0	15.00
		104008	9720	0.75	76	4.30	690	1860	5.44	1.63	0.93	0.011	3.250	148	8.57	0.627	328.0	16.00
		104029	20100	0.73	62	6.83	170	2050	7.25	3.01	0.77	0.011	3.760	200	8.40	1.020	696.0	22.10
		104028	5230	0.85	114	3.13	140	1250	3.91	1.17	1.14	0.017	1.650	200	8.40	0.339	202.0	10.00
		104027	3500	1.06	241	3.13	170	1250	2.82	0.93	0.55	0.022	1.110	200	8.50	0.311	252.0	15.50
		104026	2230	1.79	330	2.42	300	584	1.36	0.54	0.42	0.022	0.750	100	8.40	0.177	105.0	10.00
		104023	8000	1.33	149	5.27	60	1370	4.81	1.56	1.72	0.011	2.930	200	8.50	0.621	404.0	36.60
		104025	13700	0.88	98	6.34	250	2130	5.11	2.10	1.29	0.015	1.720	200	8.50	0.903	972.0	12.30
		104001	2910		590	8.40	560	4490				0.013		122	8.56	0.395	497.0	45.20
Carruthers Creek	CC005	139	3.00	249	2.00	260	426	7.70	2.10	1.84	0.006	0.550	57	8.50	0.085	37.4	3.00	
	107002	461	2.59	336	2.20	330	539	0.90	1.00	1.35	0.023	1.070	300	8.50	0.066	29.3	10.00	

## 2016 Surface Water Quality Summary

August 2017

		STANDARD DEVIATION															
		Aluminium (ug/L)	Arsenic (ug/L)	Chloride (mg/L)	Copper (ug/L)	E. coli (CFU/100mL)	Iron (ug/L)	Lead (ug/L)	Nickel (ug/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (ug/L)	Ammonia (ug/L)	pH	Total phosphorus (mg/L)	TSS (mg/L)	Zinc (ug/L)
Etobicoke Creek	Mayfield	319	0.72	55	0.75	50	139	0.14	0.17	1.63	0.019	0.296	121.23	0.09	0.025	1.7	0.00
	80007	527	2.03	758	1.71	937	117	0.96	0.21	0.96	0.024	0.201	86.64	0.13	0.031	11.5	4.06
	Spring Creek	347	1.34	1075	2.96	233	138	0.86	1.03	0.36	0.137	0.278	98.47	0.13	0.207	8.8	8.82
	Tributary 3	1028	2.01	1692	7.10	395	223	2.84	2.57	0.28	0.041	0.636	147.90	0.18	0.059	35.5	39.61
	Lower Etob US	735	1.27	996	2.72	303	175	1.32	0.75	0.69	0.015	0.244	46.87	0.19	0.069	24.7	10.19
	Tributary 4	302	1.48	1042	1.38	1200	64	0.22	0.38	0.73	0.089	0.315	175.97	0.22	0.055	6.7	1.15
	Little Etob CK	129	2.70	1632	3.79	8535	184	0.43	1.71	0.33	0.032	0.212	175.97	0.13	0.010	0.7	7.53
	80006	603		1270	4.11	1444	919				0.018		55.05	0.13	0.063	31.6	9.74
Mimico Creek	MM003WM	864	1.65	1449	3.80	243	144	1.62	4.06	0.28	0.036	0.239	152.75	0.13	0.043	30.0	19.75
	82003	44		1937	4.12	516	101				0.025		72.74	0.17	0.191	3.0	10.71
Humber River	83104	63	0.17	5	0.71	115	82	0.11	0.01	0.15	0.003	0.120	38.51	0.09	0.021	5.6	1.49
	83018	103	0.14	6	0.79	104	68	0.17	0.00	0.20	0.003	0.169	22.83	0.09	0.015	7.1	1.27
	83009	319	0.24	27	0.83	119	117	0.26	0.19	0.34	0.003	0.335	35.32	0.08	0.027	23.8	1.36
	83020	1352	0.35	16	0.79	52	294	0.63	0.20	0.23	0.004	0.240	75.25	0.05	0.073	57.3	0.00
	83004	744	0.49	78	0.62	65	208	0.47	0.16	0.98	0.003	0.198	52.22	0.07	0.048	34.8	0.00
	83103	3147	1.39	286	1.47	321	269	1.08	0.63	0.92	0.007	0.634	52.02	0.11	0.097	37.6	10.34
	HU1RWMP	416	2.42	1830	3.64	1767	272	0.96	1.35	0.16	0.044	0.431	186.88	0.20	0.045	13.5	14.36
	83002	644	1.27	93	0.65	206	151	0.29	0.28	0.74	0.005	0.260	67.42	0.11	0.042	12.1	0.00
	HU010WM	1345	0.48	76	0.73	817	246	0.60	0.32	0.31	0.004	0.256	39.65	0.13	0.061	44.2	0.00
	83012	494	1.55	835	4.66	2761	311	4.19	0.60	0.46	0.037	0.369	237.89	0.21	0.053	19.8	16.67
	83019	412		400	1.91	2283	671				0.009		58.24	0.16	0.041	40.0	8.45
Don River	85004	313	1.65	873	2.13	155	157	1.11	0.47	0.29	0.025	0.281	261.99	0.10	0.054	13.6	7.10
	85003	1209	1.15	442	0.84	1998	119	0.42	0.23	0.31	0.010	0.216	131.14	0.06	0.043	26.5	1.76
	DN008WM	66	1.37	793	1.36	1498	117	0.08	0.36	0.26	0.058	0.225	151.45	0.08	0.046	4.0	1.18
	DM 6.0	151	1.83	1269	2.75	3681	165	0.76	0.95	0.60	0.028	0.295	255.25	0.15	0.040	4.4	5.86
	85014	92		973	2.77	102693	175				0.033		1840.81	0.17	0.143	9.6	8.63
Highland Creek	94002	1633	1.08	538	3.27	1345	464	2.05	0.59	0.41	0.015	0.341	148.99	0.09	0.107	86.7	14.69
Rouge River	97018	149	0.19	17	0.71	214	101	0.18	0.02	0.74	0.005	0.267	35.09	0.08	0.017	7.0	1.99
	97999	283	0.52	32	0.27	111	65	0.18	0.09	0.71	0.002	0.187	41.74	0.07	0.023	9.2	0.00
	97777	396	1.31	273	1.35	902	142	0.61	0.19	0.25	0.005	0.502	91.70	0.05	0.050	19.6	3.95
	97003	3110	0.80	151	3.07	112	535	1.96	0.57	0.54	0.037	0.262	72.17	0.06	0.197	32.7	20.73
	97007	307	0.52	42	0.28	51	82	0.20	0.12	0.80	0.002	0.181	56.91	0.07	0.021	11.0	0.00
	97013	693	0.53	47	0.43	22	155	0.34	0.16	0.74	0.002	0.251	75.25	0.08	0.037	31.7	0.00
	97011	367		188	2.07	114	513				0.006		31.71	0.13	0.065	55.7	7.12
Petticoat Creek	PT001WM	276	1.02	422	1.19	1300	77	0.43	0.26	0.60	0.307	0.675	72.30	0.09	0.017	10.6	1.59
Frenchmans Bay	FB003WM	503	1.29	659	1.83	7548	153	0.93	0.34	0.47	0.277	0.766	97.31	0.07	0.044	25.8	7.58
Duffins Creek	104037	1504	0.34	29	0.86	115	301	1.22	0.23	0.34	0.005	0.378	45.02	0.09	0.096	55.6	1.44
	104008	2790	0.27	22	1.29	194	493	2.66	0.72	0.35	0.004	1.485	43.12	0.08	0.177	93.6	2.01
	104029	5778	0.17	18	1.74	49	559	2.07	0.81	0.19	0.003	1.016	45.02	0.05	0.290	200.0	3.49
	104028	1474	0.24	11	0.68	42	301	1.10	0.28	0.18	0.002	0.379	43.30	0.05	0.091	56.8	0.00
	104027	974	0.26	62	0.67	61	320	0.78	0.21	0.17	0.003	0.311	41.74	0.08	0.088	70.7	1.59
	104026	603	0.51	61	0.46	80	118	0.37	0.13	0.16	0.004	0.146	25.83	0.07	0.044	28.4	2.41
	104023	2208	0.35	23	1.25	23	346	1.31	0.38	0.46	0.004	0.744	45.12	0.08	0.168	111.4	7.96
	104025	3927	0.25	22	1.60	75	579	1.45	0.53	0.38	0.002	0.404	53.65	0.07	0.256	279.3	0.66
	104001	824		152	2.37	162	1243				0.003		29.92	0.12	0.110	141.6	9.84
Carruthers Creek	CC005	34	0.77	47	0.68	75	98	2.05	0.55	0.71	0.002	0.080	16.90	0.16	0.021	10.7	1.19
	107002	122	0.66	56	0.40	116	110	0.25	0.16	0.49	0.006	0.191	82.29	0.14	0.015	7.8	4.02

Appendix D. Mean monthly parameter values for 2016

Mean Monthly Analyte Values																
Month	Aluminium (ug/L)	Arsenic (ug/L)	Chloride (mg/L)	Copper (ug/L)	E. coli (CFU/100mL)	Iron (ug/L)	Lead (ug/L)	Nickel (ug/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	Ammonia (mg/L)	pH	Total phosphorus (mg/L)	TSS (mg/L)	Zinc (ug/L)
January	168	0.26	471	2.47	7861	241	0.56	0.57	1.27	0.017	0.562	278.2	8.26	0.044	5.99	13.53
February	177	1.73	1724	4.12	2732	278	0.52	1.72	1.10	0.046	0.656	262.2	8.21	0.046	7.70	17.10
March	2850	1.17	320	4.84	1440	866	2.28	1.08	1.33	0.020	1.152	158.6	8.27	0.201	127.23	20.52
April	109	1.71	381	1.98	2745	252	0.25	0.48	0.70	0.019	0.614	119.2	8.34	0.036	5.41	11.91
May	136	0.25	260	2.64	1603	259	0.34	0.62	0.47	0.018	0.845	122.9	8.39	0.035	6.92	11.09
June	117	2.46	314	1.62	765	256	0.29	0.75	0.37	0.020	0.712	169.9	8.35	0.052	7.39	11.74
July	127	0.95	261	1.72	227	242	0.34	0.81	0.38	0.016	0.577	93.2	8.35	0.073	6.89	11.28
August	348	1.92	182	2.37	1352	244	0.57	0.85	0.27	0.013	0.527	82.0	8.27	0.058	8.67	12.91
September	110	1.39	185	1.83	368	194	0.23	0.75	0.37	0.058	0.746	104.8	8.30	0.051	10.25	10.61
October	216	0.58	179	2.87	1498	239	0.55	0.76	0.34	0.056	0.665	88.0	8.23	0.061	8.99	11.22
November	140	0.80	506	2.32	792	304	0.58	0.87	0.38	0.020	0.568	115.3	8.23	0.038	7.40	15.46
December	139	1.76	874	4.20	576	307	0.22	0.71	0.66	0.029	0.548	144.0	8.23	0.039	6.52	13.55