2017 Annual Surface Water Quality Summary

Regional Watershed Monitoring Program

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Environmental Monitoring and Data Management
Restoration and Infrastructure Division

Toronto and Region Conservation
for The Living City

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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 2017 surface water quality sampling. It provides a general overview and description of the range of water quality conditions across the TRCA jurisdiction during 2017. 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 2017 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 2017 (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 2017

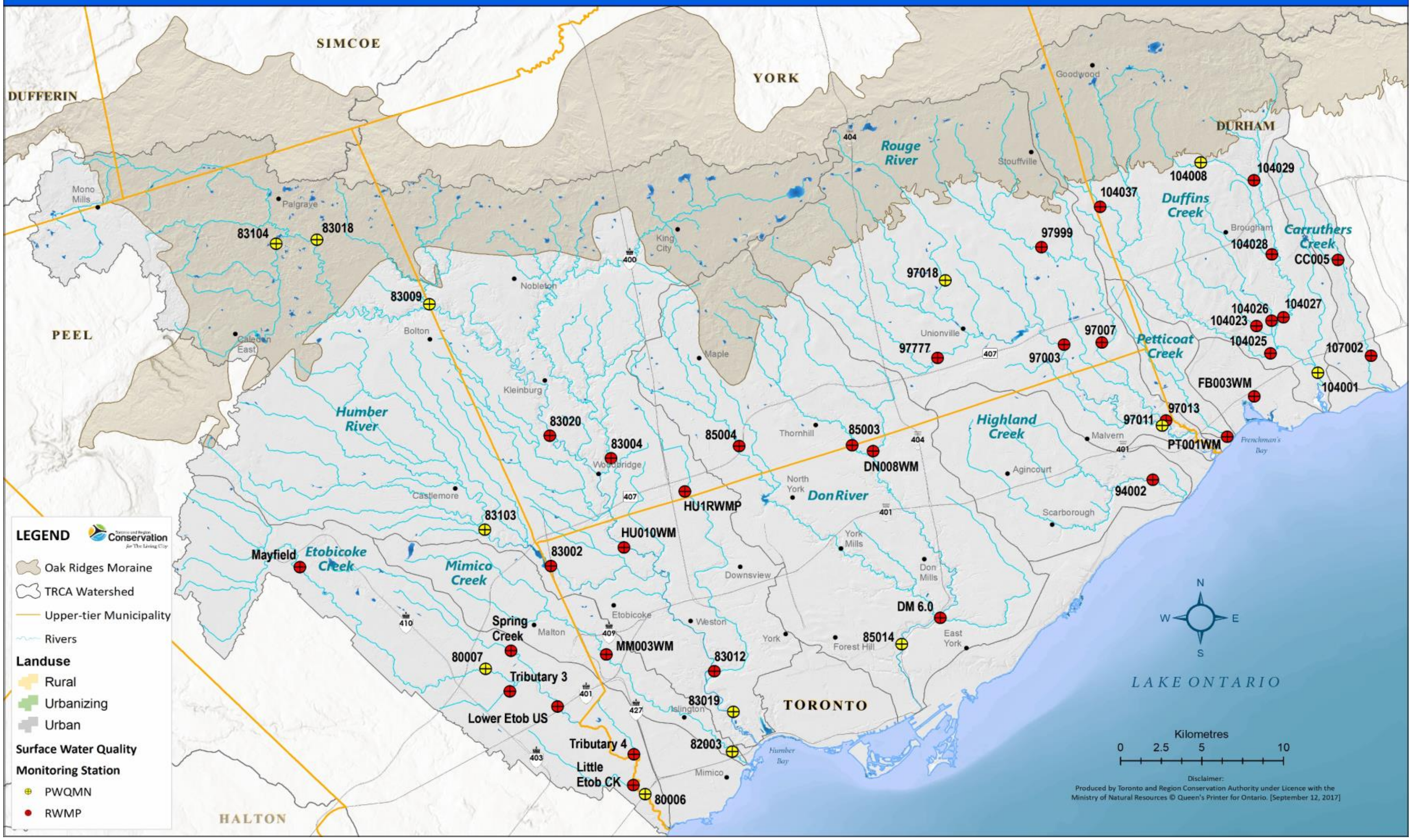

Figure 1. Current PWQMN/RWMP water quality monitoring locations 2017

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 include chloride, pH, total suspended solids 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 (OMOEE 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 between January and May 2017. Only method E3558 was used for the analysis of total phosphorus data from the OMOECC Rexdale Laboratory between June and December 2017.

Water quality laboratory results for 2017 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	Pine Creek	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	TOR	TOR	TOR
107002	Carruthers	Carruthers	4856972	660850	Buttonville	TOR	TOR	TRO

OMOE: OMOECC Rexdale Laboratory; TOR: City of Toronto Dee Avenue 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 & Microbiological	Metals
Alkalinity	**Total ammonia**	**Aluminium**
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	***E. coli* (100 CFU/100mL)**	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

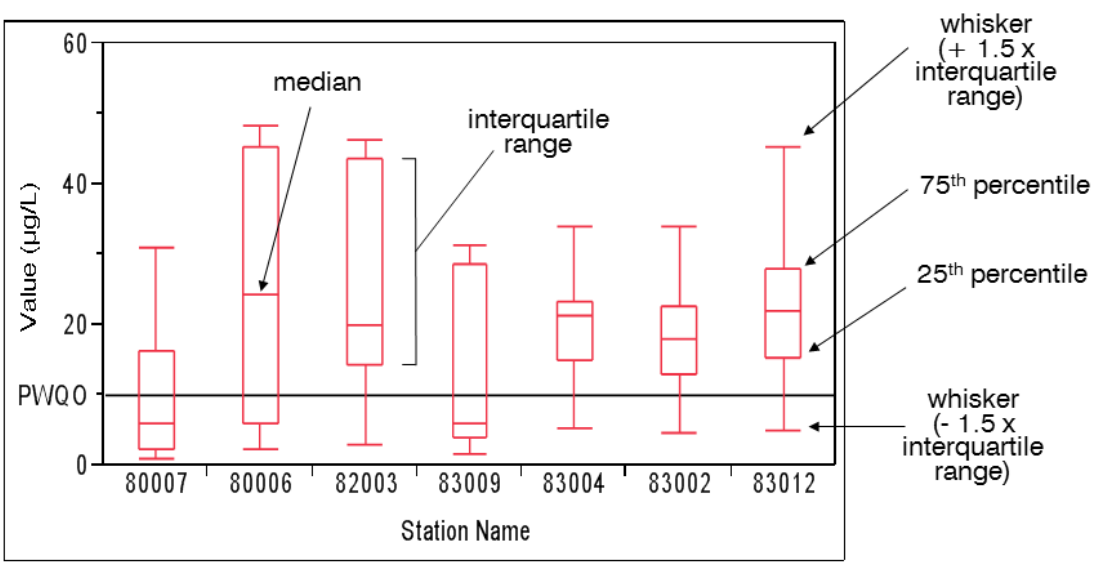

Figure 2. Box plot graphic example

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 2017 precipitation data from Pearson International and Buttonville Airports 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 (http://climate.wather.gc.ca) website. 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 2017 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 2017 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 (OMOEE 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

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 2017, rainfall was above average and was widely regarded as a wet year. The total amount of precipitation recorded in 2017 was 930 mm, which is 96 mm above the 16-year average of 834 mm (Figure 3).

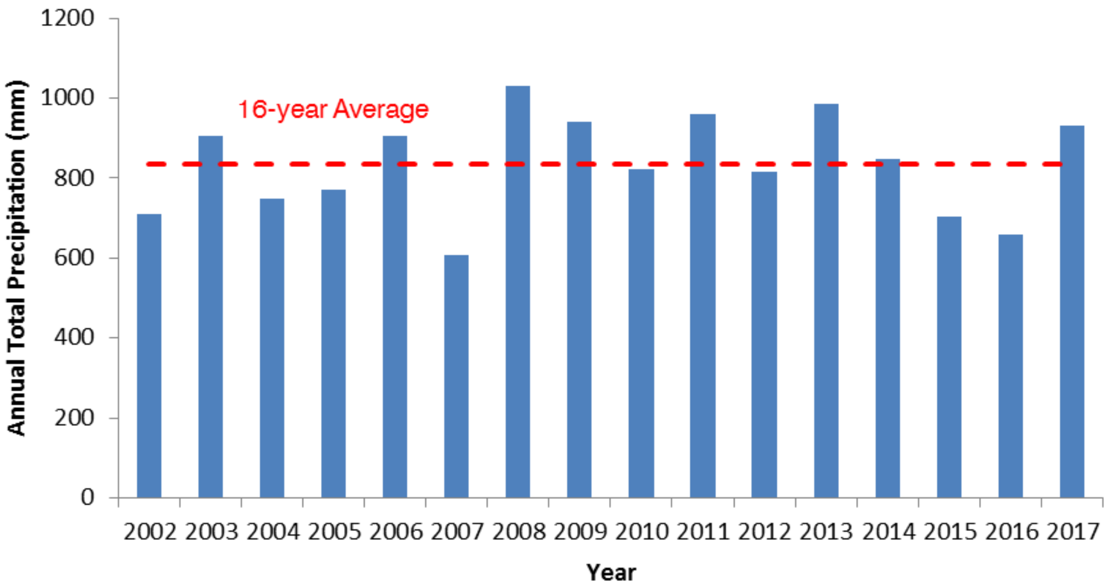

Figure 3. Annual precipitation for the TRCA jurisdiction from 2002 to 2017

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. There was a significant increasing trend in the 5-year rainfall and total precipitation moving averages (Mann-Kendall: both $p<0.01$) and no significant changes in the 5-year snowfall precipitation moving average (Mann-Kendall: $p=0.1$).

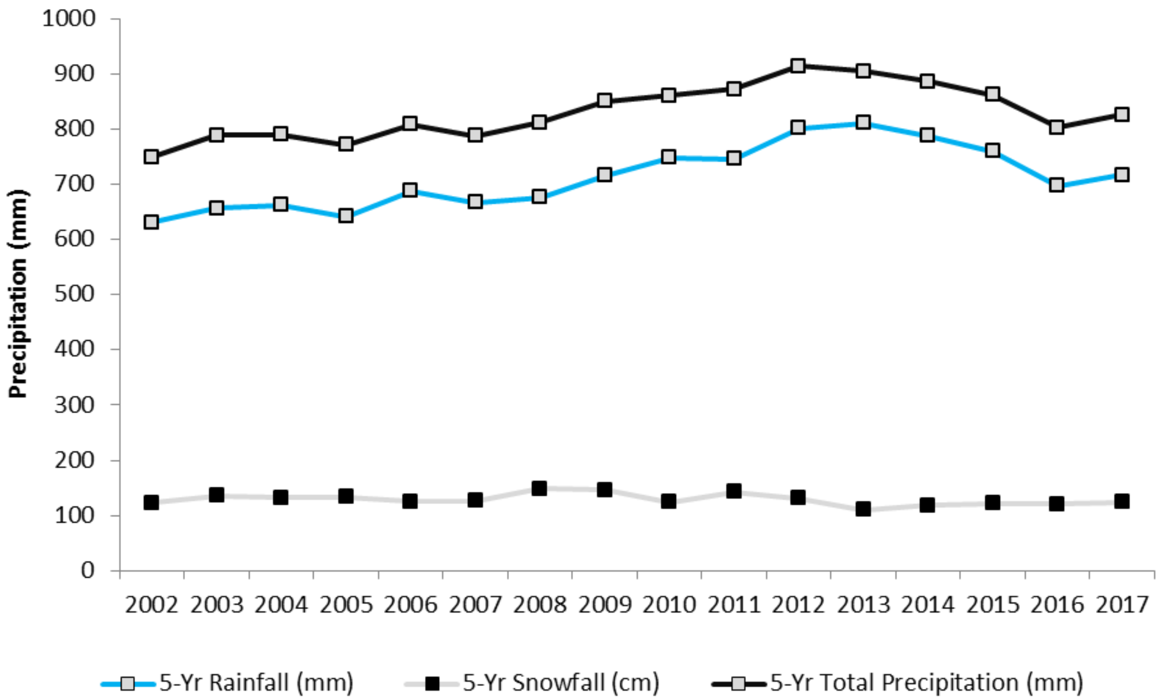

Figure 4. Five-year moving averages for rainfall, snowfall and total precipitation from 2002 to 2017

Figure 5 displays 2017 monthly precipitation and 16-year monthly precipitation averages. April, May and June had precipitation levels greatly surpassing the 16 year average for those months. These high precipitation levels were associated with flooding along the Toronto shoreline and Toronto Islands resulting in damage to the waterfront (erosion, debris accumulation) and the displacement of residents and businesses (City of Toronto 2017). By the end of June 2017, Lake Ontario water levels were recorded at their highest level in more than 100 years. Stations may exhibit elevated concentrations of water quality parameters and pollutants as a result of high precipitation. Snowfall in 2017 (95 cm) was below average (127 cm; Figure 6).

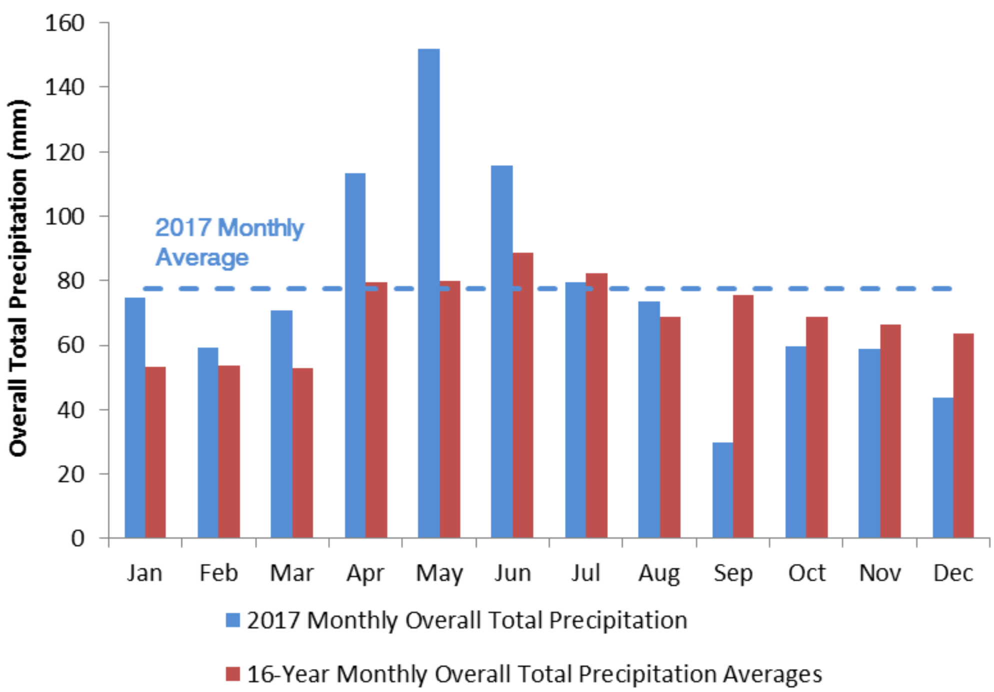

Figure 5. Monthly precipitation for 2017 compared to 16-year monthly precipitation averages

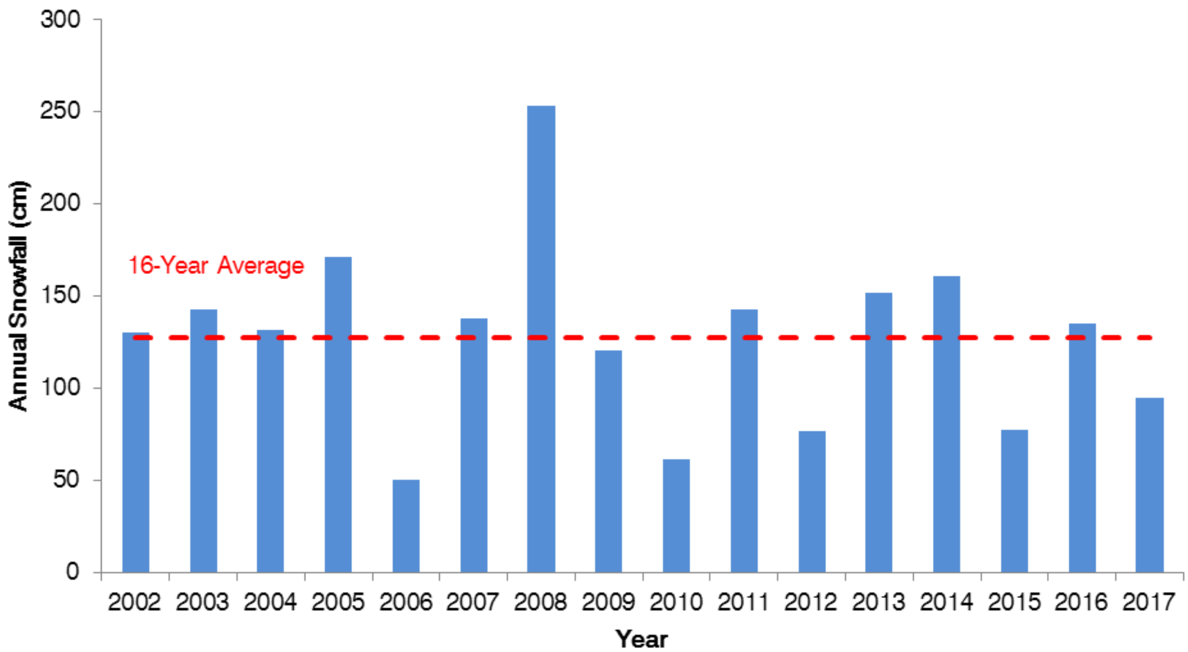

Figure 6. Annual snowfall from 2002 to 2017

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 most recent five years of 36%. Dry events ranged from 29.1% in 2011 to 89.4% in 2016 and over the most recent five years averaged 64%.

Table 3. Wet and dry sampling events based on Environment Canada's Pearson and Buttonville Airports, from 2009 to 2014 and 2016 to 2017

Year	Wet Events	Dry Events	Total Events	Wet Event Percentage	Dry Event Percentage
2017	67	497	564	11.9	88.1
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
Average	**237.1**	**280.9**	**518.0**	**47.0**	**53.0**

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 (811 mg/L) while station 83009 in the upper reaches of the Main Humber River had the lowest median chloride value (30 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).

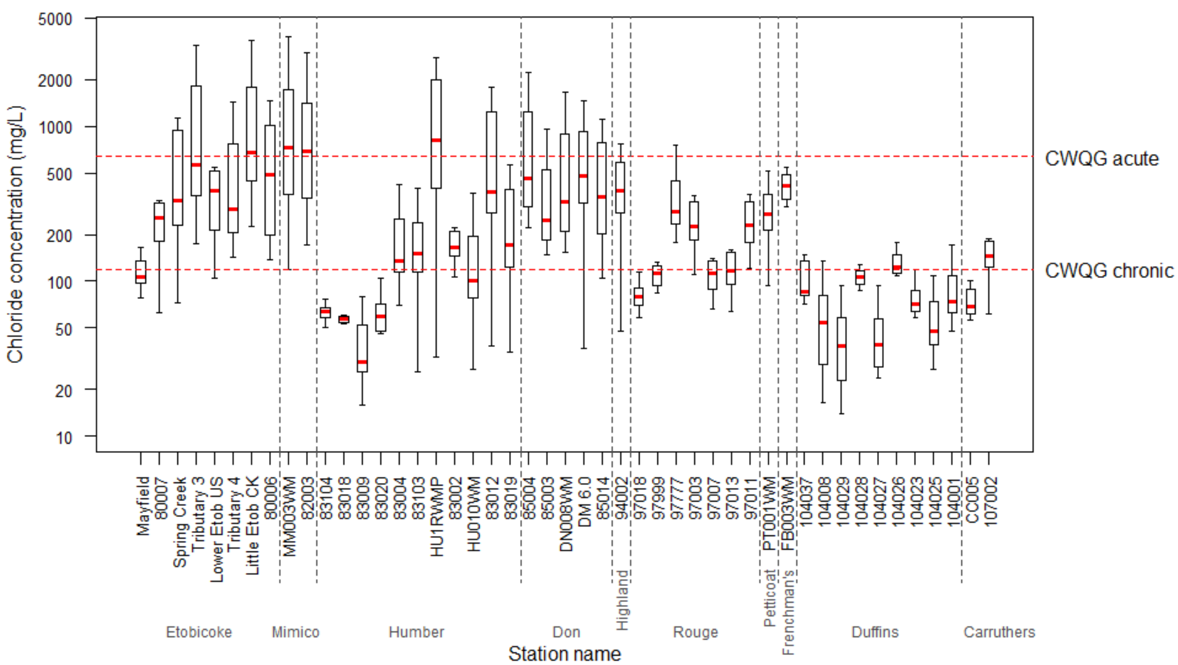

Figure 7. 2017 chloride concentrations (mg/L) at TRCA surface water quality monitoring stations (CWQG: long-term 120 mg/L (chronic) and short-term 640 mg/L (acute); CCME 2011)

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 75th percentile and/or upper whisker values at 11 stations exceeded the 30 mg/L guideline (Lower Etob US in the middle Etobicoke Creek, 83020, 83004, 83002, 83012 and 83019 in the middle to lower Humber, 85014 at the mouth of the Don, 97013 on the Little Rouge and 104027, 104025 and 104001 in the lower Duffins Creek; Figure 8). The wide range of values at those 11 stations and a few others indicate that some samples were collected during turbid conditions which could have been caused by precipitation events or an unidentified source of sediments.

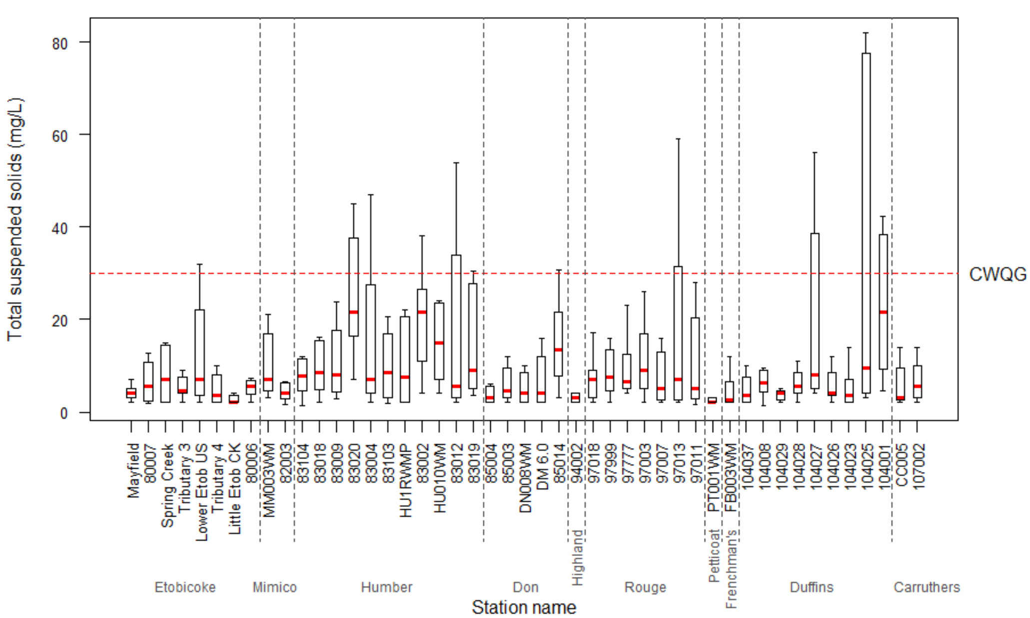

Figure 8. 2017 TSS concentrations (mg/L) at TRCA surface water quality monitoring stations (CWQG: 30 mg/L)

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 2017, 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, stations in Etobicoke Creek, Mimico Creek and the lower Humber (83019) displayed the greatest range of data values.

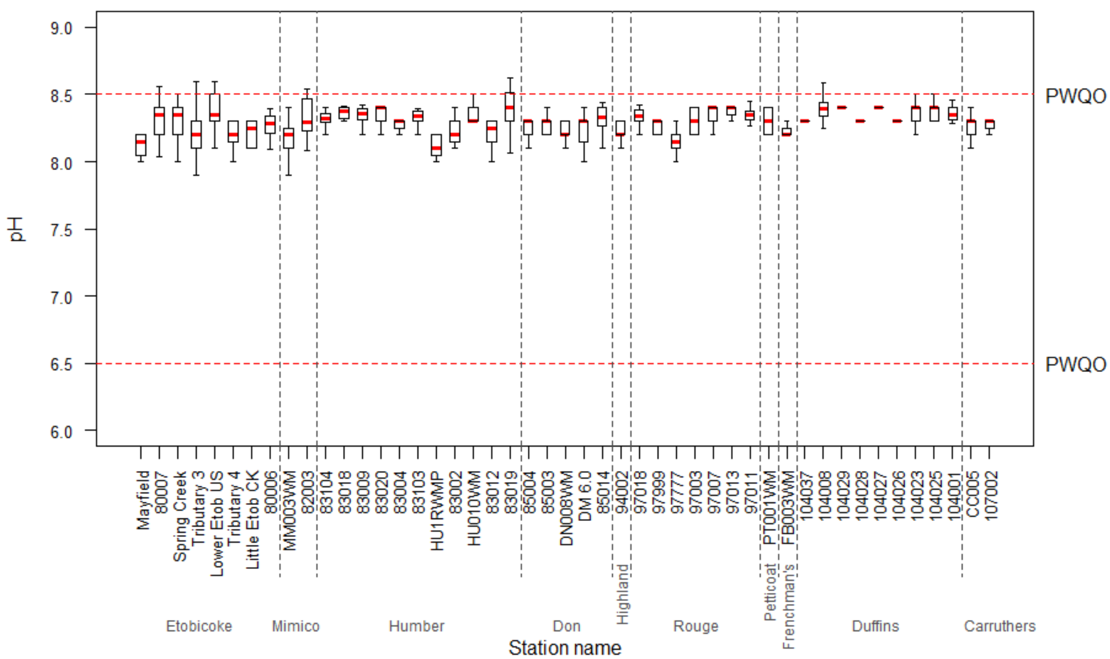

Figure 9. 2017 pH values at TRCA surface water quality monitoring stations (PWQO: 6.5-8.5)

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 2017, there was a wide degree of variation in aluminium concentrations although this is not unique to 2017 (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 (80007, Spring Creek and Lower Etob US in Etobicoke Creek, MM003WM in middle Mimico Creek, 83020 and 83004 in the middle Humber, 83002, HU010WM and 83012 in the lower Humber, 97013 on the Little Rouge River and 104027 and 104025 in the lower Duffins Creek.

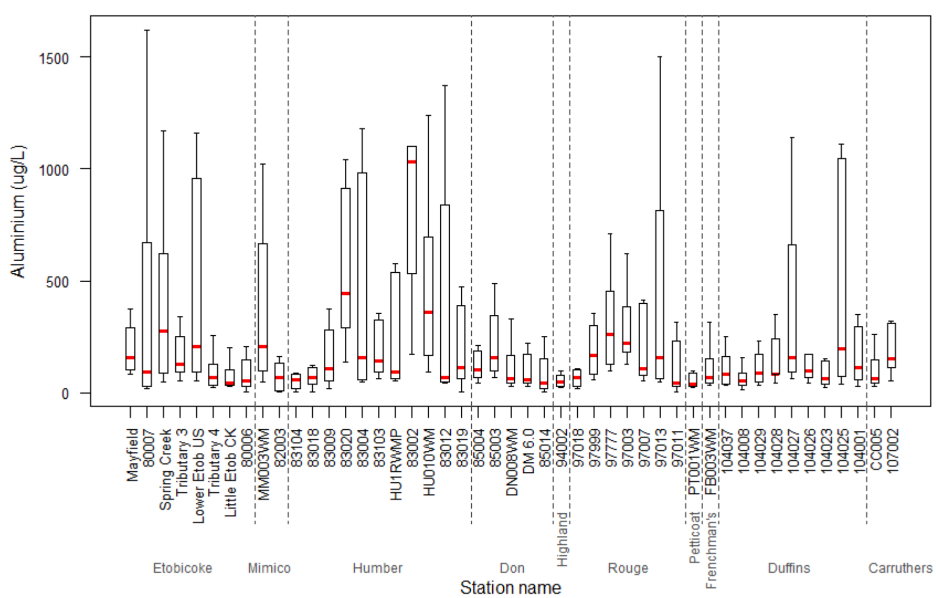

Figure 10. 2017 aluminium concentrations (μg/L) at TRCA surface water quality monitoring stations

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 2017 were well below the PWQO of 5 µg/L (Figure 11). Tributary 3 in Etobicoke Creek had the highest median arsenic concentration of 1.02 µg/L.

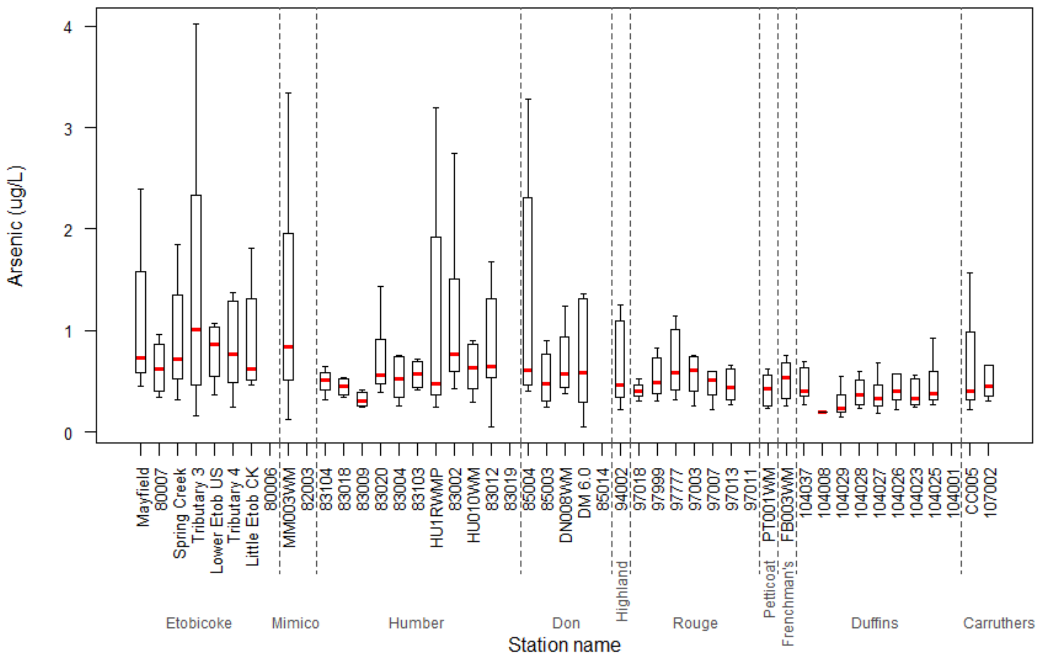

Figure 11. 2017 arsenic concentrations (µg/L) at TRCA surface water quality monitoring stations (PWQO: 5 µg/L)

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).

Median copper concentrations exceeded the PWQO guideline at two stations (80006 at the mouth of Etobicoke Creek and 85014 at the mouth of the Don River). These stations both drain heavily urbanized watersheds.

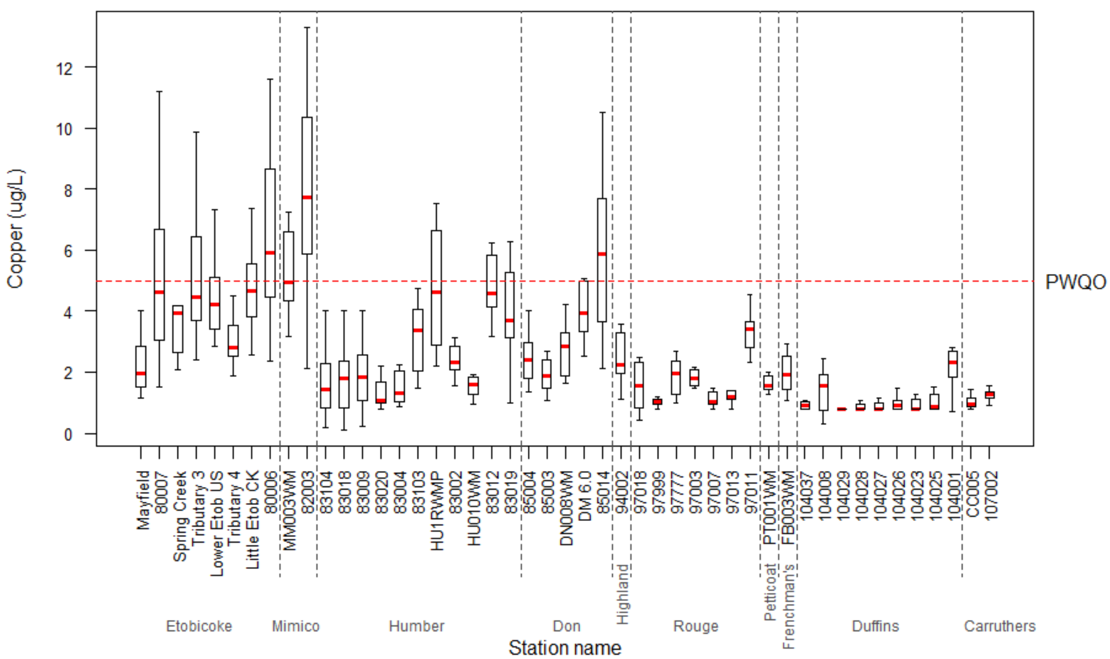

Figure 12. 2017 copper concentrations (μg/L) at TRCA surface water quality monitoring stations (PWQO: 5 μg/L)

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 15 of 47 stations in 2017 exceeded the PWQO of 300 μg/L (Figure 13). The highest median iron concentration was 520 μg/L at station 83012 in the lower Black Creek. The lowest median iron concentration was 131 μg/L at station PT001WM in the Petticoat Creek watershed.

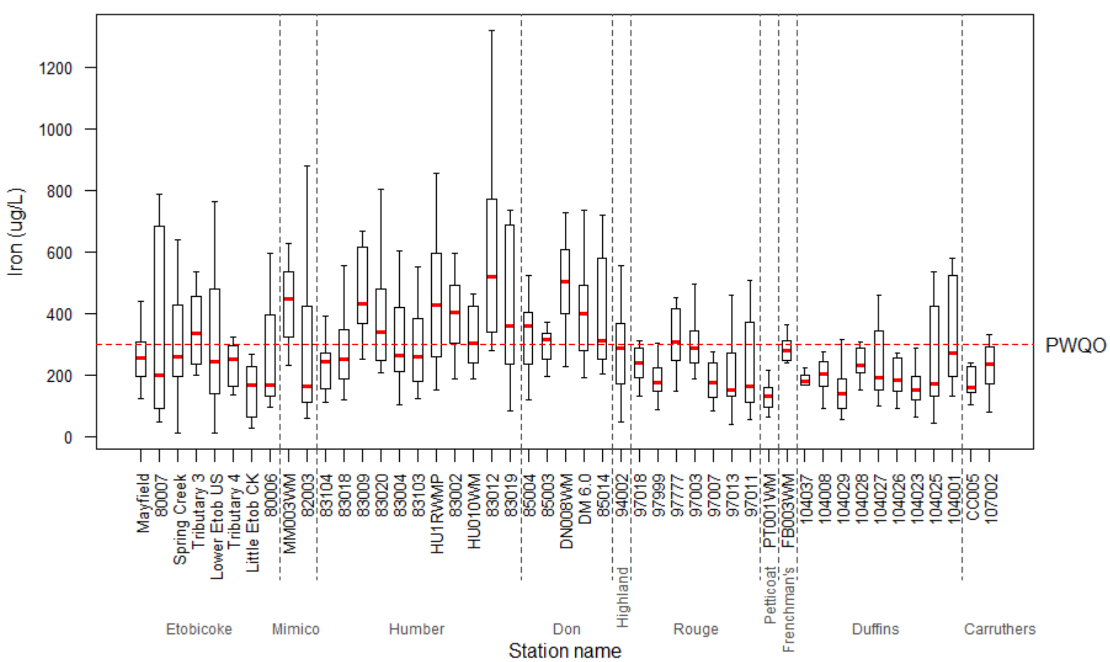

Figure 13. 2017 iron concentrations (μg/L) at TRCA surface water quality monitoring stations (PWQO: 300 μg/L)

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.

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 values at station 83012 in the lower Black Creek were caused by two very high concentrations on January 26, 2017 and July 20, 2017 having lead concentrations of 12.2 μg/L and 17.7 μg/L, respectively.

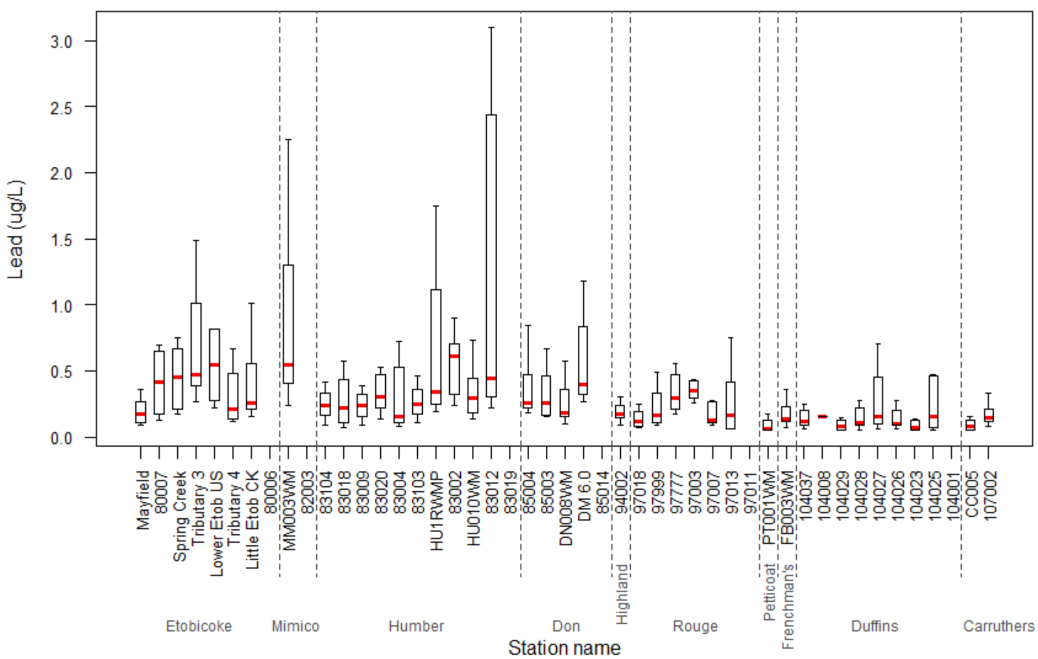

Figure 14. 2017 lead concentrations (μg/L) at TRCA surface water quality monitoring stations (PWQO: 5 μg/L)

3.3.6 Nickel

Due to a higher MDL, OMOECC laboratory results for 2017 were excluded and only City of Toronto results were analyzed. Median nickel concentrations were highest at stations Tributary 3 in Etobicoke Creek, MM003WM in Mimico Creek and 83012 in lower Black Creek. All stations were below the PWQO of 25 μg/L.

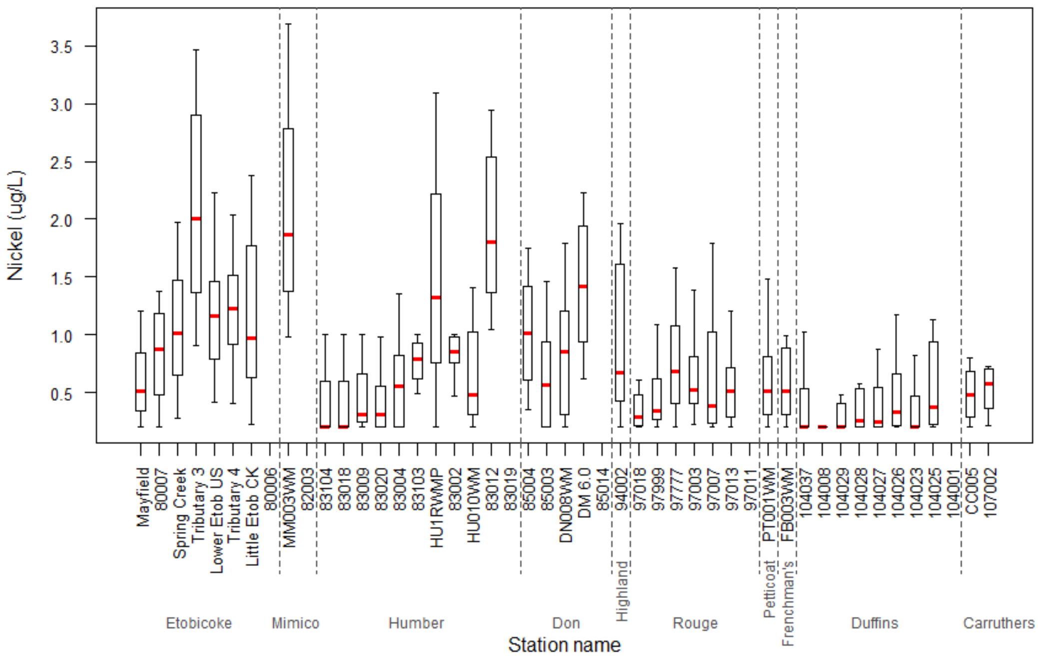

Figure 15. 2017 nickel concentrations (μg/L) at TRCA surface water quality monitoring stations (PWQO: 25 μg/L)

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. Tributary 3 in Etobicoke Creek, MM003WM and 82003 in Mimico Creek and 85014 at the mouth of the Don River all had median zinc concentrations above the PWQO in 2017 (Figure 16).

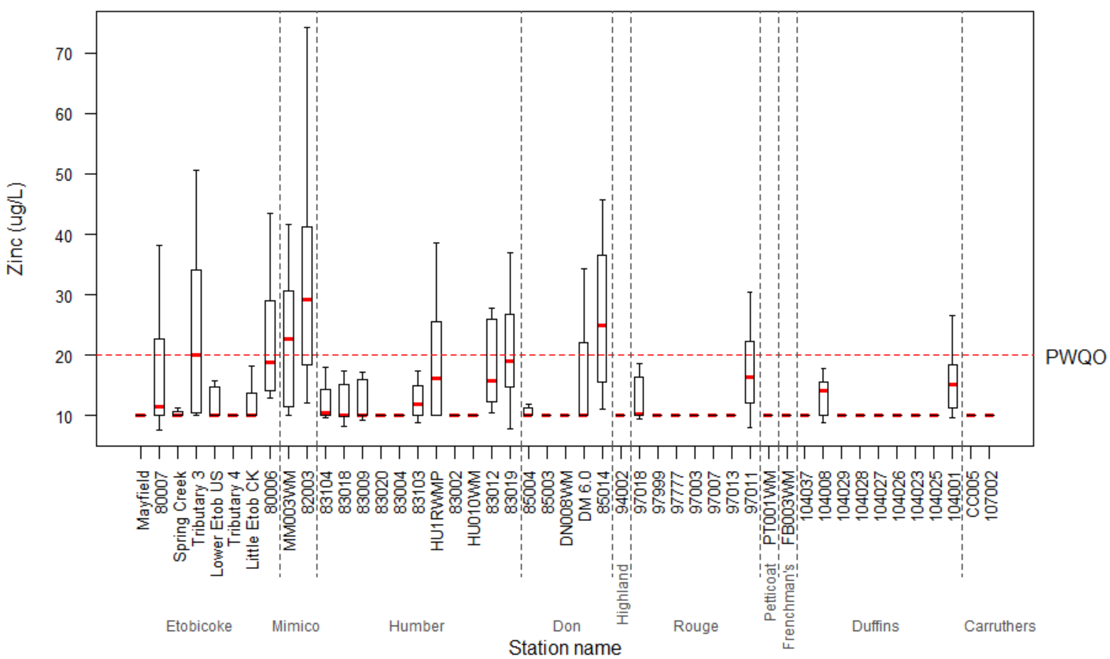

Figure 16. 2017 zinc concentrations (μg/L) at TRCA surface water quality monitoring stations (PWQO: 20 μg/L)

3.4 Bacteria

Escherichia coli are 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.

Tributary 4 in Etobicoke Creek, 83012 in the lower Black Creek and FB003WM in Frenchman's Bay had the highest median *E. coli* values (Figure 17). The lowest *E. coli* counts were found in the Duffins Creek, upper and lower Rouge River and upper Etobicoke and Humber watersheds.

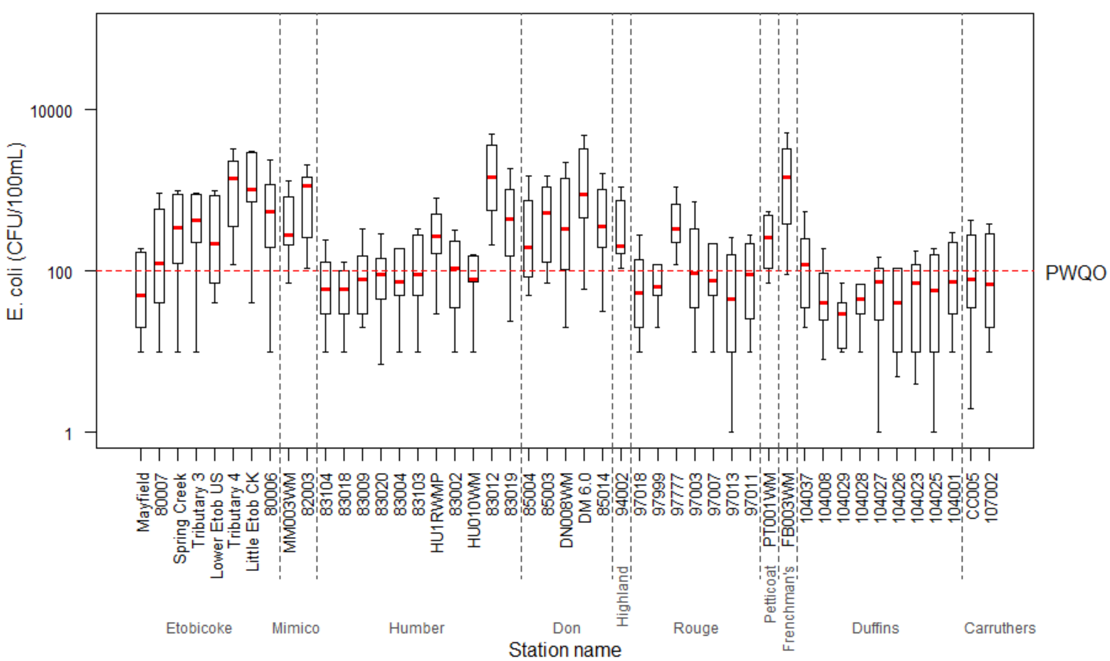

Figure 17. 2017 *E. coli* concentrations (CFU/100 mL) at TRCA surface water quality monitoring stations (PWQO: 100 CFU/100 mL)

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. Ammonia concentrations were the highest at station MM003WM in Mimico Creek and 83012 in the lower Black Creek.

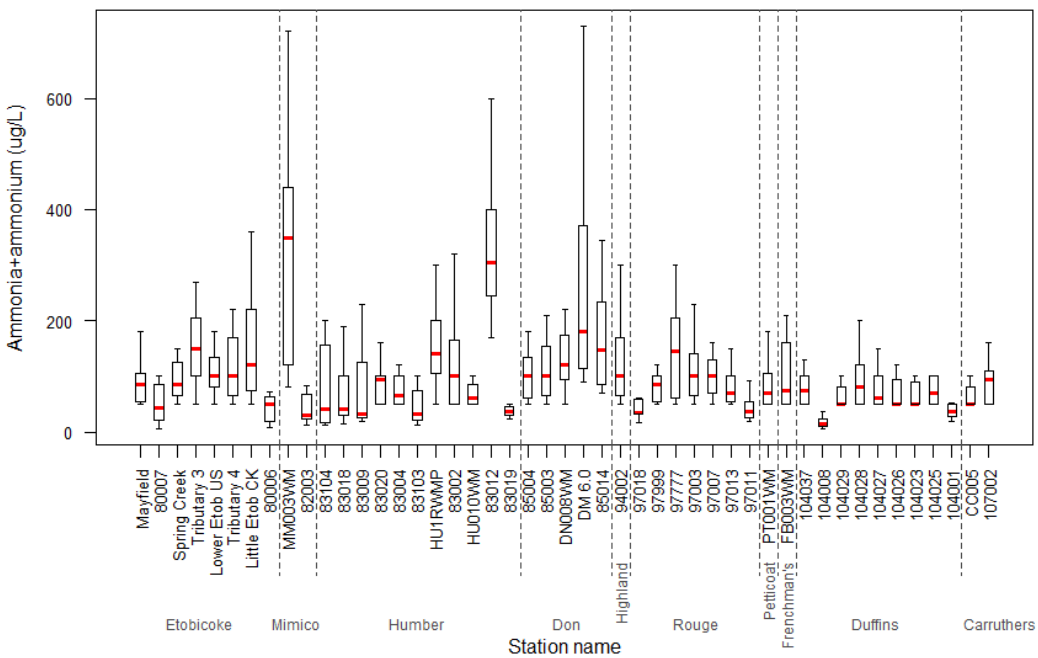

Figure 18. 2017 ammonia concentrations (µg/L) at TRCA surface water quality monitoring stations

3.5.2 Nitrate

There were no stations with median nitrate concentrations above the CWQG guideline of 2.93 mg/L; however, 3 stations had 75th percentiles and/or upper whiskers above this guideline (Figure 19). Median nitrate concentrations were the highest at stations DM 6.0 and 85014 in the lower Don and stations PT001WM and FB003WM in the Petticoat Creek and Frenchman's Bay watersheds.

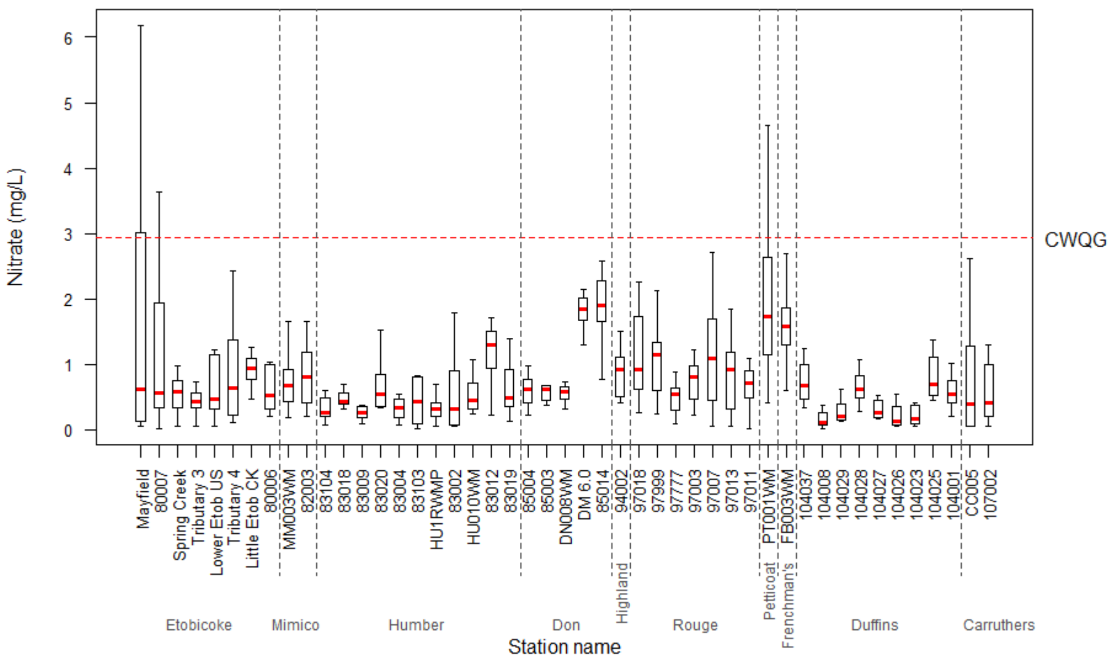

Figure 19. 2017 nitrate concentrations (mg/L) at TRCA surface water quality monitoring stations (CWQG: 2.93 mg/L)

3.5.3 Nitrite

Median nitrite concentrations were within the CWQG of 0.06 mg/L; however, 6 stations had 75th percentiles and/or upper whiskers exceeding this guideline (Figure 20). These stations included Tributary 3 in Etobicoke Creek, MM003WM in the middle Mimico Creek, HU1RWMP on the upper Black Creek, 83012 on the lower Black Creek, DM 6.0 on the lower portion of the Taylor-Massey Creek and 85014 at the mouth of the Don River. 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 and Don River had higher nitrite levels.

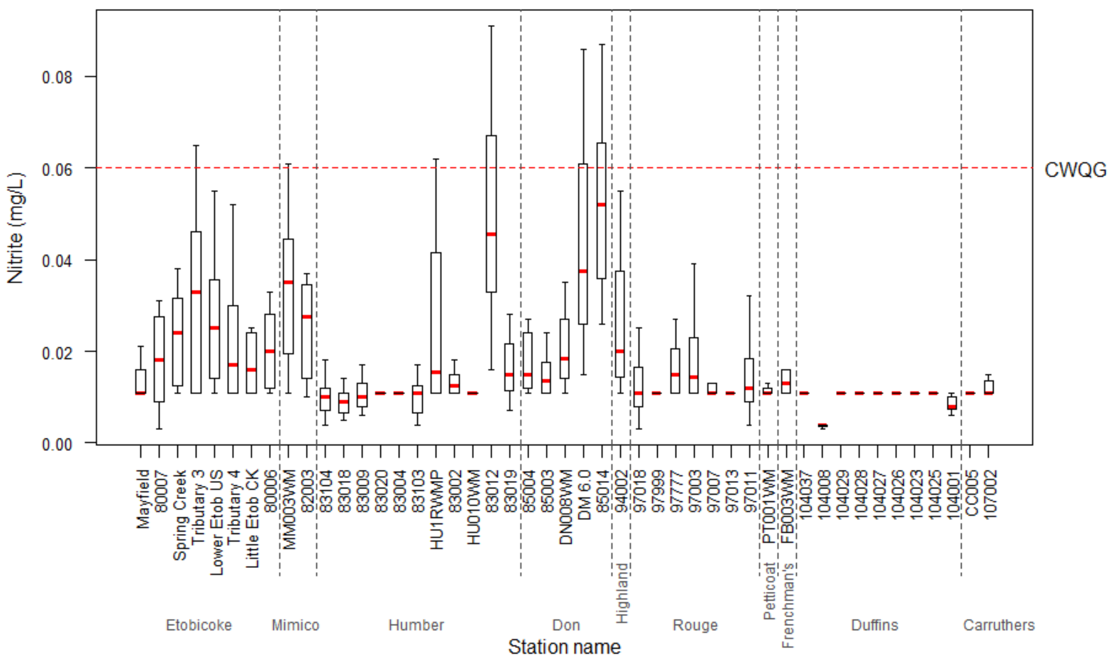

Figure 20. 2017 nitrite concentrations (mg/L) at TRCA surface water quality monitoring stations (CWQG: 0.06 mg/L)

3.5.4 Total Kjeldahl Nitrogen

The OMOECC has stopped providing TKN values with its lab results in 2015 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 median TKN concentrations were found at Tributary 3 in Etobicoke Creek (1.14 mg/L), MM003WM (1.33 mg/L) in the Mimico Creek watershed and 83012 (1.16 mg/L) in the lower Humber River watershed. The lowest median concentrations were found at in the upper Duffins Creek watershed.

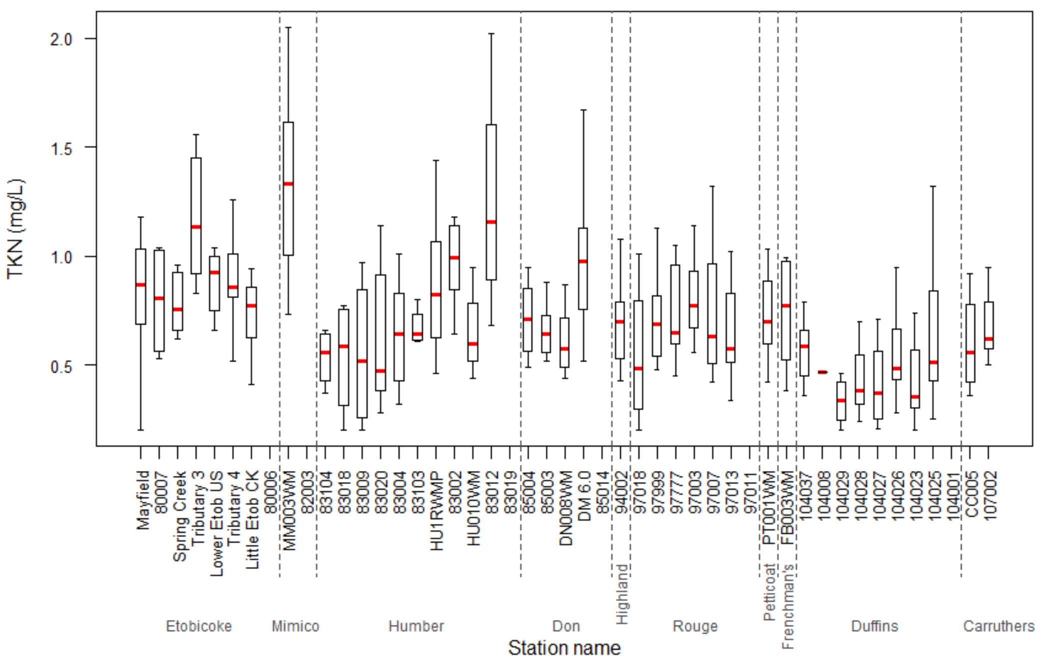

Figure 21. 2017 TKN concentrations (mg/L) at TRCA surface water quality monitoring stations

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 DM 6.0 (0.087 mg/L) and 85014 (0.104 mg/L) in the lower Don River watershed. Twenty-nine stations had median phosphorus concentrations above the PWQO of 0.03 mg/L.

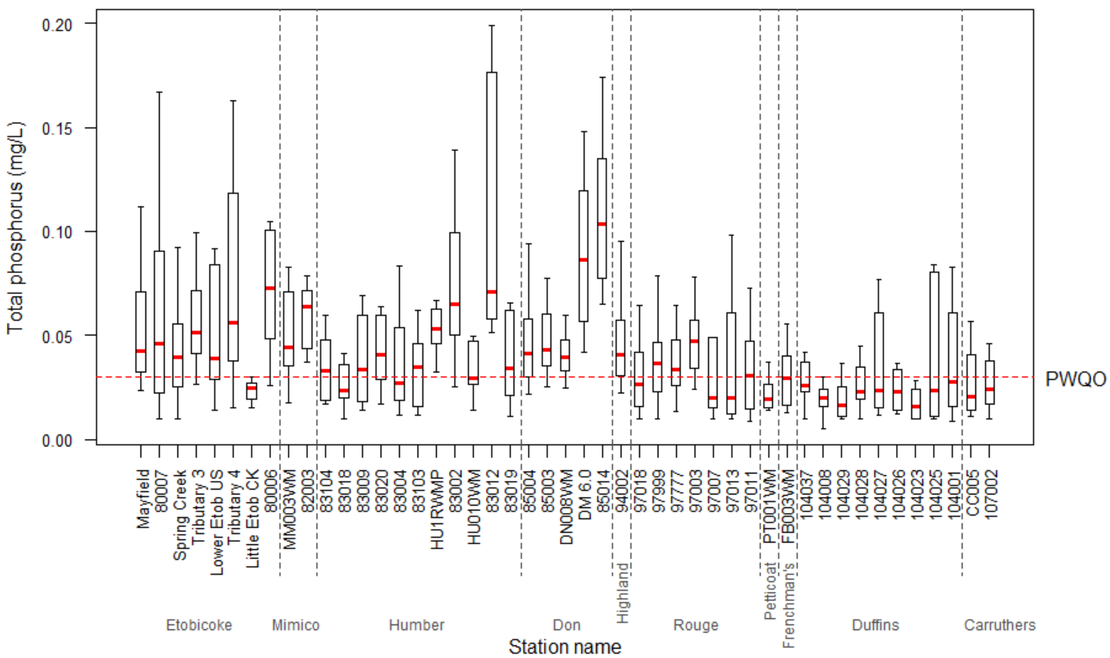

Figure 22. 2017 phosphorus concentrations (mg/L) at TRCA surface water quality monitoring stations (PWQO: 0.03 mg/L)

4. Summary

This report represents a summary assessment and characterization of 47 water quality stations based on 16 water quality parameters collected throughout 2017. Annual total precipitation in 2017 was above the 16-year average. Monthly precipitation in April, May and June in particular was higher than the monthly 16-year average coinciding with flooding of the Toronto shoreline and Toronto Islands. Snowfall in 2017 was below the 16-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 median chloride concentrations were in the Etobicoke, Mimico and lower Humber watersheds (Little Etob CK, Tributary 3, MM003WM, 82003, HU1RWMP). 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 Tributary 3 in the Etobicoke Creek watershed, MM003WM in the Mimico Creek watershed, 83012 in the lower Black Creek and stations DM 6.0 and 85014 on the lower Don River. 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 Lower Etob US, 83012 and DM 6.0 (in the Etobicoke, lower Black Creek and lower Taylor-Massey Creek, respectively). Metals were consistently the lowest in the Duffins, Rouge and upper Humber River watersheds.

Median nutrient and *E. coli* values were highest at station 83012 in the lower Humber River watershed. Stations DM 6.0 and 85014 in the lower Don River watershed also had high median nutrient concentrations but *E. coli* counts were not as high as the lower Humber (or several other stations in the jurisdiction). 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. High nutrient concentrations (specifically nitrogen-based compounds) were also found in the lower Etobicoke Creek, middle Mimico Creek, Petticoat Creek and Pine Creek in the Frenchman's Bay watershed. 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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6. Appendix

Appendix A. Water quality stream conditions from field notes for 2017

Station	January	February	March	April	May	June	July	August	September	October	November	December
104001	Turbid	Turbid	Slightly turbid	Clear	Turbid/green	Turbid, road construction	Turbid	Clear	Clear	Clear	Slightly turbid	Clear, partly frozen
104008	Clear	Clear	Clear, partly frozen	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear, partly frozen
104023	Clear	Slightly turbid, partially frozen	Clear, partly frozen	Clear	Clear	Clear	Turbid	Clear	Clear	Clear	Clear	Clear, partly frozen
104025	Turbid	Turbid, partially frozen	Slightly turbid	Clear	Clear	Turbid	Turbid	Clear	Clear	Clear	Clear	Clear, partly frozen
104026	Turbid	Clear	Clear, partly frozen	Clear	Clear	Clear, road construction	Turbid	Clear	Clear	Clear	Clear	Clear, partly frozen
104027	Turbid	Slightly turbid	Slightly turbid, partially frozen	Clear	Clear	Clear, road construction	Turbid	Clear	Clear	Clear	Clear	Clear, partly frozen
104028	Slightly turbid	Clear	Clear, partly frozen	Clear	Clear	Clear	Slightly high, turbid	Clear	Clear	Clear	Clear	Clear
104029	Slightly turbid	Clear	Clear, partly frozen	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear, partly frozen
104037	Clear	Clear, partially frozen	Clear, partly frozen	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear, partly frozen
107002	Turbid	High, turbid	Clear	Clear	Clear	Clear	Turbid	Clear	Clear	Clear	Clear	Clear, partly frozen
80006	Turbid	Slightly turbid	Clear	Slightly turbid	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear, partly frozen
80007	Turbid	Slightly turbid	Clear, partly frozen	Slightly high, slightly turbid	Clear	Clear	Clear	Turbid	Clear	Clear	Clear	Clear, partly frozen
82003	Clear	Slightly turbid	Clear	Slightly turbid	Clear	Clear	Clear	Slightly turbid	Clear	Slightly turbid	Clear	Clear, partly frozen
83002	Slightly turbid	Slightly turbid	Slightly turbid	Slightly turbid	Clear	Slightly turbid	Slightly turbid	Slightly turbid	Clear	Slightly turbid	Slightly turbid	Clear, partly frozen
83004	Turbid	Slightly turbid	Clear, partly frozen	Clear	Clear	Turbid		Clear	Clear	Clear	Clear	Clear, partly frozen
83009	Slightly turbid	Clear	Clear	Clear	Clear	Turbid	Slightly turbid	Clear	Clear	Clear	Clear	Clear
83012	Turbid	Clear	Clear	Slightly turbid	Slightly turbid	Slightly turbid, high	High, turbid	Clear	Clear (Constant Debris Flowing)	Clear	Clear	Frozen slightly
83018	Clear	Clear	Clear, partly frozen	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Frozen slightly
83019	Slightly turbid	Slightly turbid	Clear	Clear	Slightly turbid	Slightly turbid	High, turbid	Slightly turbid	Clear	Clear	Clear	Frozen slightly
83020	Turbid	Clear	Slightly turbid, partially frozen	Slightly high, slightly turbid	Slightly turbid	Turbid		Clear	Clear	Slightly turbid	Clear	Slightly turbid, partially frozen
83103	Slightly turbid	Slightly turbid	Clear	Clear	Clear	Clear	Slightly turbid	Clear	Clear	Clear	Clear	Frozen slightly
83104	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Frozen slightly
85003	Clear	Clear	Clear	Clear	Clear	Turbid	Clear	Slightly turbid	Clear	Clear	Clear	Clear, partly frozen
85004	Clear	Clear	Clear, partly frozen	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear, partly frozen
85014	Turbid	Clear	Clear	Clear	Clear	Slightly turbid	Slightly turbid, high	Clear	Clear	Clear	Clear	Frozen slightly
94002	Clear	Clear	Clear	Clear	Clear	Slightly turbid		Clear	Clear	Slightly turbid	Clear	Clear, partly frozen
97003	Slightly turbid	Clear	Clear	Slightly turbid	Slightly turbid	Turbid		Slightly turbid	Clear	Slightly turbid	Clear	Slightly turbid, partially frozen
97007	Turbid	Clear	Clear, partly frozen	Clear	Clear	Very Turbid		Clear	Clear	Clear	Clear	Clear, partly frozen
97011	Slightly turbid	Slightly turbid	Clear	Clear	Clear	Turbid		Clear	Clear	Clear	Clear	Clear, partly frozen
97013	Turbid	Slightly turbid	Slightly turbid, partially frozen	High, clear	Clear	Turbid		Clear	Clear	Clear	Clear	Clear, partly frozen
97018	Slightly turbid	Clear	Clear, partly frozen	Clear	Clear	Slightly turbid	Slightly high, clear	Clear	Clear	Clear	Clear	Clear, partly frozen
97777	Slightly turbid	Slightly turbid	Clear	Clear	Clear	Slightly turbid	High, turbid	Clear	Clear	Clear	Clear	Clear, partly frozen
97999	Slightly turbid	Clear	Clear, partly frozen	Clear	Clear	Clear	Slightly turbid	Clear	Clear	Clear	Clear	Clear, partly frozen
CC005	Clear	Clear	Clear, partly frozen	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear, partly frozen
DM 6.0	Slightly turbid	Clear	Clear	Clear	Clear	Slightly turbid	High, turbid	Clear	Clear	Clear	Clear	Frozen
DN008WM	Clear	Clear	Clear	Slightly turbid	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear, partly frozen
FB003WM	Clear	Clear	Clear	Clear	Clear	Slightly turbid		Clear	Clear	Clear	Clear	Clear, partly frozen
HU010WM	Turbid	Clear	Slightly turbid	Clear	Clear	Turbid	High, turbid	Slightly turbid	Clear	Slightly turbid	Clear	Slightly turbid, partially frozen
HU1RWMP	Slightly turbid	Clear	Clear, partly frozen	Turbid	Clear	Turbid	High, turbid	Clear	Clear	Clear	Clear	Frozen
Little Etob CK	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear, partly frozen
Lower Etob US	Turbid	Slightly turbid	Clear	Slightly turbid	Clear	Clear	Clear	Turbid	Clear	Slightly turbid	Clear	Clear, partly frozen
Mayfield	Slightly turbid	Slightly turbid	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Slightly turbid, partially frozen
MM003WM	Clear	Clear	Clear	Slightly high	Clear	Clear	Clear	Turbid	Clear	Slightly turbid	Clear	Clear, partly frozen
PT001WM	Clear	Clear	Clear, partly frozen	Clear	Clear	Slightly turbid	High	Clear	Clear	Slightly turbid	Clear	Clear, partly frozen
Spring Creek	Clear	Slightly turbid	Clear	Slightly high, slightly turbid	Clear	Clear	Clear	Turbid	Clear	Clear	Clear	Slightly turbid
Tributary 3	Clear	Clear	Clear	Slightly turbid	Clear	Clear	Clear, slight oil sheen	Slightly turbid	Clear	Clear, high	Clear	Clear, partly frozen
Tributary 4	Clear	Clear	Clear, partly frozen	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Frozen

Appendix B. Stations sampled in 2017 and associated weather

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	# Wet Samples	# Dry Samples
104001	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	1	11
104008	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	1	11
104023	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	1	11
104025	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	1	11
104026	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	1	11
104027	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	1	11
104028	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	1	11
104029	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	1	11
104037	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	1	11
107002	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	1	11
80006	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0	12
80007	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Wet	2	10
82003	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0	12
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	Wet	Dry	Wet	2	10
83009	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	1	11
83012	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	1	11
83018	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	1	11
83019	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	1	11
83020	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Wet	2	10
83103	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	1	11
83104	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	1	11
85003	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Wet	Dry	Dry	Dry	Dry	2	10
85004	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Wet	Dry	Dry	Dry	Dry	2	10
85014	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	1	11
94002	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	4	8
97003	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	4	8
97007	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	4	8
97011	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	4	8
97013	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	4	8
97018	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	1	11
97777	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	1	11
97999	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	1	11
CC005	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	1	11
DM 6.0	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	1	11
DN008WM	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Wet	Dry	Dry	Dry	Dry	2	10
FB003WM	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	4	8
HU010WM	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	1	11
HU1RWMP	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	Dry	Dry	Dry	1	11
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	Wet	Dry	Dry	1	11
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	Dry	Dry	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	4	8
Spring Creek	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	1	11
Tributary 3	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	1	11
Tributary 4	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0	12

Appendix C. Descriptive statistics for 2017 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	344	1.06	115	2.20	302	261	0.19	0.70	2.02	0.013	0.835	90.833	8.08	0.054	6.5	10.00
	80007	407	0.64	287	5.17	766	432	0.41	0.83	1.51	0.018	0.795	50.083	8.31	0.059	22.9	19.24
	Spring Creek	451	1.28	617	4.57	908	307	0.86	1.05	0.58	0.026	0.851	130.000	8.32	0.051	16.3	16.40
	Tributary 3	194	1.82	1079	5.20	930	346	0.73	2.12	0.50	0.031	1.350	154.167	8.22	0.057	6.6	30.88
	Lower Etob US	548	1.41	656	5.16	842	336	1.12	1.23	1.08	0.027	1.003	112.500	8.36	0.065	26.8	17.10
	Tributary 4	117	1.20	596	3.00	1418	236	0.30	1.27	0.87	0.025	0.878	116.667	8.21	0.077	8.0	10.08
	Little Etob CK	110	1.51	1157	4.68	2343	179	0.48	1.19	0.96	0.023	0.725	158.333	8.22	0.026	4.2	12.95
	80006	111		708	6.54	694	260			1.02	0.025		57.583	8.29	0.081	8.6	24.02
Mimico Creek	MM003WM	363	1.74	1198	5.92	1048	434	1.01	2.10	0.72	0.038	1.456	356.667	8.18	0.056	14.5	24.48
	82003	118		982	8.65	980	275			0.82	0.031		41.250	8.40	0.059	6.8	32.11
Humber River	83104	88	0.50	63	1.60	108	233	0.25	0.40	0.33	0.011	0.535	131.250	8.33	0.034	14.1	12.29
	83018	129	0.45	56	1.77	69	276	0.27	0.40	0.50	0.009	0.535	65.417	8.37	0.030	16.1	12.10
	83009	202	0.32	39	1.92	268	463	0.24	0.45	0.53	0.011	0.553	76.250	8.35	0.039	10.7	12.43
	83020	866	0.75	65	1.31	110	390	0.48	0.42	0.67	0.011	0.618	90.000	8.35	0.058	39.0	10.00
	83004	562	0.73	182	1.47	275	307	0.35	0.58	0.43	0.011	0.642	74.167	8.29	0.043	21.5	10.00
	83103	369	0.57	184	3.12	131	294	0.27	0.77	0.90	0.010	0.675	71.333	8.34	0.037	11.7	12.43
	HU1RWMP	802	1.65	1129	4.71	615	441	0.92	1.48	0.36	0.025	0.863	154.167	8.11	0.079	33.5	21.24
	83002	1022	1.13	214	2.50	851	400	0.56	0.90	0.75	0.013	0.974	121.667	8.21	0.074	20.1	10.00
	HU010WM	993	0.84	141	2.34	708	378	0.69	0.62	0.58	0.011	0.736	85.833	8.33	0.079	52.3	14.88
	83012	1173	1.41	680	6.67	4777	625	3.13	1.94	1.17	0.067	1.253	336.667	8.24	0.140	47.1	27.98
	83019	828		240	6.55	1438	1738			0.68	0.016		44.750	8.42	0.107	70.0	36.25
Don River	85004	155	1.44	778	2.45	884	332	0.38	1.03	0.65	0.021	0.713	110.833	8.24	0.048	5.7	11.83
	85003	248	0.84	410	2.02	1003	308	0.35	0.65	0.63	0.020	0.632	111.667	8.28	0.050	9.0	10.00
	DN008WM	117	1.02	536	2.73	1188	498	0.26	0.86	0.61	0.023	0.615	130.000	8.23	0.043	5.1	10.27
	DM 6.0	1388	1.46	598	5.53	6021	566	3.22	1.57	1.78	0.044	1.223	261.667	8.21	0.179	77.4	26.28
	85014	150		474	5.78	749	479			1.90	0.071		166.417	8.39	0.111	17.7	26.44
Highland Creek	94002	104	1.36	482	2.64	1167	286	0.31	0.96	0.89	0.025	0.681	126.667	8.23	0.052	6.8	10.82
Rouge River	97018	101	0.41	87	1.54	119	235	0.14	0.35	1.31	0.013	0.545	48.833	8.34	0.034	7.4	12.91
	97999	230	0.73	128	1.09	150	187	0.22	0.49	1.20	0.012	0.718	88.333	8.26	0.036	11.0	10.00
	97777	342	0.88	406	1.85	459	318	0.36	0.75	0.53	0.016	0.742	141.667	8.15	0.040	9.3	10.00
	97003	304	1.04	286	1.80	295	298	0.42	0.68	0.86	0.018	0.800	120.833	8.29	0.048	12.8	10.00
	97007	1954	0.78	124	1.37	225	226	0.65	0.62	1.28	0.013	0.946	100.833	8.35	0.101	51.2	10.53
	97013	430	0.81	137	1.29	73	206	0.25	0.56	1.00	0.011	0.647	80.000	8.39	0.036	17.5	10.00
	97011	113		293	3.16	189	226			0.77	0.015		42.750	8.40	0.034	10.8	17.26
Petticoat Creek	PT001WM	70	1.18	285	1.74	688	132	0.09	0.64	2.06	0.012	0.718	84.167	8.30	0.023	2.8	10.00
Frenchmans Bay	FB003WM	109	1.42	400	2.10	1947	280	0.19	0.70	1.61	0.018	1.118	104.167	8.20	0.030	5.3	10.66
Duffins Creek	104037	101	0.58	119	0.96	146	179	0.14	0.40	0.80	0.011	0.557	76.667	8.28	0.028	4.9	10.53
	104008	62	0.20	61	1.39	59	195	0.15	0.20	0.29	0.004	0.470	18.833	8.40	0.022	7.8	13.37
	104029	134	0.31	42	0.84	34	150	0.12	0.34	0.35	0.011	0.333	64.167	8.38	0.019	5.3	10.00
	104028	242	0.52	109	0.93	112	254	0.20	0.44	0.64	0.012	0.430	95.000	8.28	0.031	9.3	10.00
	104027	380	0.41	46	0.90	128	240	0.28	0.38	0.36	0.011	0.408	92.500	8.38	0.035	19.5	10.00
	104026	296	0.60	131	1.03	113	224	0.22	0.48	0.26	0.011	0.556	76.667	8.31	0.031	9.8	11.88
	104023	273	0.50	78	0.96	90	187	0.18	0.37	0.33	0.011	0.418	96.667	8.37	0.028	11.5	10.00
	104025	1252	0.51	59	1.20	99	280	0.42	0.54	0.89	0.011	0.652	95.000	8.38	0.082	75.8	10.00
	104001	265		89	2.27	185	527			0.64	0.009		36.917	8.36	0.048	37.5	15.57
Carruthers Creek	CC005	118	0.72	77	1.03	278	190	0.10	0.57	0.75	0.011	0.693	105.833	8.26	0.030	5.8	10.00
	107002	283	0.78	164	1.28	176	228	0.21	0.64	0.67	0.012	0.642	87.500	8.28	0.031	9.2	10.00

		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	158	0.73	106	1.94	45	256	0.17	0.51	0.62	0.011	0.870	85.0	8.15	0.043	4.0	10.00
	80007	94	0.62	257	4.61	125	198	0.41	0.87	0.57	0.018	0.805	44.0	8.345	0.046	5.6	11.45
	Spring Creek	275	0.72	332	3.93	345	261	0.45	1.01	0.59	0.024	0.755	85.0	8.35	0.039	7.0	10.00
	Tributary 3	128	1.02	566	4.48	425	337	0.47	2.00	0.43	0.033	1.135	150.0	8.2	0.051	4.5	20.15
	Lower Etob US	208	0.87	386	4.24	155	244	0.55	1.16	0.47	0.025	0.925	100.0	8.35	0.039	7.0	10.00
	Tributary 4	69	0.77	292	2.81	1400	251	0.21	1.23	0.64	0.017	0.855	100.0	8.2	0.056	3.5	10.00
	Little Etob CK	44	0.63	671	4.66	1025	166	0.26	0.97	0.94	0.016	0.770	120.0	8.25	0.025	2.0	10.00
	80006	54		485	5.91	415	167			0.53	0.020		49.5	8.28	0.073	5.5	18.75
Mimico Creek	MM003WM	206	0.84	728	4.94	285	447	0.55	1.87	0.67	0.035	1.330	350.0	8.2	0.044	7.0	22.80
	82003	68		696	7.71	1150	164			0.81	0.028		31.0	8.295	0.064	4.2	29.20
Humber River	83104	57	0.52	64	1.45	55	243	0.24	0.20	0.27	0.010	0.555	40.5	8.32	0.033	7.7	10.55
	83018	69	0.46	57	1.81	50	251	0.22	0.20	0.44	0.009	0.585	40.5	8.375	0.023	8.4	10.05
	83009	109	0.31	30	1.83	80	431	0.24	0.31	0.26	0.010	0.520	33.0	8.355	0.034	8.1	10.00
	83020	445	0.56	59	1.09	70	339	0.31	0.30	0.56	0.011	0.475	95.0	8.4	0.041	21.5	10.00
	83004	156	0.52	134	1.31	55	265	0.15	0.56	0.34	0.011	0.645	65.0	8.3	0.027	7.0	10.00
	83103	144	0.57	152	3.36	75	259	0.25	0.79	0.43	0.011	0.645	33.0	8.34	0.035	8.6	11.85
	HU1RWMP	91	0.48	811	4.61	260	426	0.34	1.32	0.32	0.016	0.825	140.0	8.1	0.053	7.5	16.25
	83002	1030	0.77	164	2.33	105	404	0.61	0.85	0.33	0.013	0.995	100.0	8.2	0.065	21.5	10.00
	HU010WM	360	0.63	101	1.60	80	303	0.29	0.48	0.45	0.011	0.600	60.0	8.3	0.029	15.0	10.00
	83012	67	0.65	374	4.58	1455	520	0.44	1.81	1.31	0.046	1.155	305.0	8.25	0.071	5.5	15.70
	83019	114		172	3.69	440	358			0.48	0.015		36.0	8.405	0.034	8.9	19.05
Don River	85004	104	0.62	462	2.41	170	361	0.26	1.02	0.63	0.015	0.710	100.0	8.3	0.041	3.0	10.00
	85003	156	0.48	249	1.89	525	316	0.25	0.56	0.62	0.014	0.640	100.0	8.3	0.043	4.5	10.00
	DN008WM	63	0.57	327	2.86	330	503	0.18	0.85	0.58	0.019	0.575	120.0	8.2	0.039	4.0	10.00
	DM 6.0	59	0.58	481	3.94	880	401	0.40	1.42	1.86	0.038	0.975	180.0	8.3	0.087	4.0	10.00
	85014	42		349	5.88	360	311			1.91	0.052		148.0	8.33	0.104	13.4	25.05
Highland Creek	94002	47	0.46	386	2.24	205	288	0.18	0.68	0.93	0.020	0.700	100.0	8.2	0.041	3.0	10.00
Rouge River	97018	70	0.40	80	1.55	54	240	0.12	0.29	0.92	0.011	0.485	35.5	8.34	0.026	7.1	10.30
	97999	168	0.49	112	1.03	63	175	0.17	0.34	1.15	0.011	0.690	85.0	8.3	0.037	7.5	10.00
	97777	263	0.59	280	1.95	335	306	0.29	0.68	0.55	0.015	0.650	145.0	8.15	0.034	6.5	10.00
	97003	223	0.61	226	1.79	95	289	0.35	0.52	0.82	0.015	0.775	100.0	8.3	0.047	9.0	10.00
	97007	108	0.51	113	1.03	62	174	0.13	0.39	1.10	0.011	0.630	100.0	8.4	0.020	5.0	10.00
	97013	158	0.45	118	1.19	35	152	0.17	0.51	0.92	0.011	0.575	70.0	8.4	0.020	7.0	10.00
	97011	45		228	3.41	90	162			0.71	0.012		36.0	8.35	0.030	5.1	16.40
Petticoat Creek	PT001WM	39	0.42	269	1.58	265	131	0.06	0.51	1.73	0.011	0.700	70.0	8.3	0.019	2.0	10.00
Frenchmans Bay	FB003WM	69	0.54	411	1.92	1450	278	0.14	0.52	1.58	0.013	0.770	75.0	8.2	0.030	2.5	10.00
Duffins Creek	104037	80	0.41	86	0.92	85	181	0.12	0.21	0.67	0.011	0.585	75.0	8.3	0.026	3.5	10.00
	104008	52	0.20	54	1.58	35	202	0.15	0.20	0.12	0.004	0.470	14.5	8.395	0.020	6.3	14.15
	104029	85	0.24	38	0.80	22	140	0.08	0.20	0.20	0.011	0.340	50.0	8.4	0.017	4.0	10.00
	104028	82	0.37	106	0.80	40	233	0.11	0.26	0.62	0.011	0.380	80.0	8.3	0.023	5.5	10.00
	104027	157	0.34	39	0.80	73	193	0.16	0.24	0.26	0.011	0.370	60.0	8.4	0.024	8.0	10.00
	104026	98	0.40	124	0.90	15	183	0.10	0.33	0.14	0.011	0.485	50.0	8.3	0.023	4.0	10.00
	104023	64	0.33	71	0.80	35	151	0.08	0.21	0.17	0.011	0.355	50.0	8.4	0.016	3.5	10.00
	104025	199	0.38	47	0.86	45	173	0.16	0.37	0.71	0.011	0.510	70.0	8.4	0.023	9.5	10.00
	104001	114		74	2.34	75	270			0.55	0.008		36.5	8.345	0.028	21.7	15.20
Carruthers Creek	CC005	64	0.40	69	0.97	70	159	0.08	0.48	0.40	0.011	0.560	50.0	8.3	0.021	3.0	10.00
	107002	153	0.46	146	1.27	65	235	0.15	0.57	0.42	0.011	0.620	95.0	8.3	0.024	5.5	10.00

		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	83	0.45	78	1.17	0	124	0.09	0.20	0.06	0.011	0.200	50	7.50	0.024	2.0	10.00
	80007	16	0.35	63	1.53	10	48	0.13	0.20	0.01	0.003	0.530	5	8.04	0.010	1.9	7.60
	Spring Creek	47	0.33	73	2.09	10	10	0.18	0.27	0.06	0.011	0.620	50	8.00	0.010	2.0	10.00
	Tributary 3	52	0.17	174	2.42	10	200	0.27	0.91	0.06	0.011	0.830	50	7.90	0.027	2.0	10.00
	Lower Etob US	53	0.36	104	2.84	0	10	0.22	0.42	0.06	0.011	0.660	50	8.00	0.014	2.0	10.00
	Tributary 4	25	0.25	144	1.86	120	136	0.11	0.40	0.11	0.011	0.520	50	8.00	0.015	2.0	10.00
	Little Etob CK	28	0.47	224	2.58	40	28	0.15	0.23	0.47	0.011	0.410	50	8.10	0.015	2.0	10.00
	80006	2		138	2.38	0	95			0.21	0.011		8	8.09	0.026	2.0	13.00
Mimico Creek	MM003WM	48	0.13	120	3.16	70	230	0.24	0.98	0.19	0.011	0.730	80	7.90	0.018	3.0	10.00
	82003	2		170	2.12	110	58			0.21	0.010		12	8.08	0.037	1.6	12.10
Humber River	83104	2	0.32	50	0.18	0	111	0.09	0.20	0.07	0.004	0.370	12	8.20	0.017	1.3	9.79
	83018	2	0.35	40	0.09	0	119	0.07	0.20	0.33	0.005	0.200	15	8.30	0.010	2.0	8.24
	83009	19	0.25	16	0.21	20	252	0.09	0.20	0.10	0.006	0.200	18	8.20	0.014	2.9	9.23
	83020	138	0.40	46	0.80	0	207	0.14	0.20	0.33	0.011	0.280	50	8.20	0.017	7.0	10.00
	83004	47	0.26	70	0.89	0	103	0.08	0.20	0.07	0.011	0.320	50	8.20	0.012	2.0	10.00
	83103	64	0.41	26	1.46	0	122	0.11	0.49	0.02	0.004	0.610	13	8.20	0.012	1.9	8.95
	HU1RWMP	52	0.24	33	2.22	0	151	0.20	0.20	0.06	0.011	0.460	50	8.00	0.033	2.0	10.00
	83002	170	0.43	106	1.56	0	189	0.24	0.47	0.06	0.011	0.640	50	7.90	0.025	4.0	10.00
	HU010WM	94	0.29	27	0.95	0	188	0.14	0.20	0.25	0.003	0.440	50	8.10	0.014	4.0	10.00
	83012	42	0.05	38	3.18	210	278	0.22	1.04	0.23	0.016	0.680	170	8.00	0.052	2.0	10.50
	83019	4		35	0.97	24	82			0.13	0.007		23	8.06	0.011	3.5	7.88
Don River	85004	41	0.41	222	1.36	0	120	0.18	0.35	0.22	0.011	0.490	50	8.10	0.022	2.0	10.00
	85003	67	0.25	149	1.06	70	196	0.16	0.20	0.38	0.011	0.280	50	8.20	0.025	2.0	10.00
	DN008WM	28	0.38	153	1.62	20	227	0.10	0.20	0.32	0.011	0.440	50	8.10	0.025	2.0	10.00
	DM 6.0	27	0.05	37	2.52	60	191	0.26	0.62	0.24	0.015	0.520	90	7.80	0.042	2.0	10.00
	85014	2		105	2.11	32	204			0.77	0.026		70	8.10	0.065	3.1	11.10
Highland Creek	94002	25	0.22	48	1.12	110	49	0.09	0.20	0.42	0.011	0.430	50	8.10	0.023	2.0	10.00
Rouge River	97018	17	0.31	59	0.43	10	130	0.08	0.20	0.26	0.003	0.200	17	8.20	0.010	2.0	9.55
	97999	60	0.31	84	0.80	20	87	0.09	0.20	0.25	0.011	0.480	50	8.20	0.010	2.0	10.00
	97777	96	0.32	178	1.01	120	146	0.17	0.20	0.10	0.011	0.450	50	8.00	0.013	4.0	10.00
	97003	128	0.26	110	1.49	10	186	0.25	0.23	0.22	0.011	0.560	50	8.20	0.024	2.0	10.00
	97007	55	0.23	66	0.80	0	84	0.09	0.20	0.06	0.011	0.420	50	8.20	0.010	2.0	10.00
	97013	46	0.27	64	0.80	0	40	0.06	0.20	0.06	0.011	0.340	50	8.30	0.010	2.0	10.00
	97011	2		122	1.11	10	56			0.02	0.004		18	8.27	0.009	1.6	8.03
Petticoat Creek	PT001WM	25	0.23	94	1.26	70	62	0.05	0.20	0.42	0.011	0.420	50	8.20	0.014	2.0	10.00
Frenchmans Bay	FB003WM	33	0.26	110	1.09	90	107	0.07	0.20	0.61	0.011	0.380	50	8.00	0.013	2.0	10.00
Duffins Creek	104037	31	0.27	71	0.80	0	96	0.06	0.20	0.34	0.011	0.360	50	8.20	0.010	2.0	10.00
	104008	15	0.20	17	0.30	0	90	0.15	0.20	0.02	0.002	0.470	5	8.25	0.005	1.3	8.88
	104029	35	0.15	14	0.80	0	54	0.05	0.20	0.13	0.011	0.200	50	8.30	0.010	2.0	10.00
	104028	43	0.23	60	0.80	0	150	0.05	0.20	0.28	0.011	0.240	50	8.20	0.010	2.0	10.00
	104027	63	0.19	24	0.80	0	99	0.07	0.20	0.17	0.011	0.210	50	8.30	0.012	4.0	10.00
	104026	45	0.23	42	0.80	0	89	0.06	0.20	0.06	0.011	0.280	50	8.20	0.012	2.0	10.00
	104023	25	0.25	24	0.80	0	65	0.05	0.20	0.06	0.011	0.200	50	8.20	0.010	2.0	10.00
	104025	40	0.27	27	0.80	0	43	0.05	0.20	0.46	0.011	0.250	50	8.30	0.010	3.0	10.00
	104001	27		48	0.69	10	131			0.22	0.006		20	8.28	0.009	4.5	9.69
Carruthers Creek	CC005	29	0.22	57	0.80	0	104	0.05	0.20	0.06	0.011	0.360	50	8.10	0.011	2.0	10.00
	107002	55	0.31	61	0.89	0	81	0.08	0.22	0.06	0.011	0.230	50	8.20	0.010	2.0	10.00

		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	1480	2.40	165	4.00	2300	441	0.36	2.26	8.64	0.021	1.180	180	8.20	0.112	35.0	10.00
	80007	1620	0.96	881	11.20	5120	1830	0.70	1.38	6.89	0.031	1.040	100	8.56	0.167	190.0	61.90
	Spring Creek	1620	5.96	2260	11.00	4180	641	3.82	1.97	1.39	0.069	1.380	410	8.50	0.172	83.0	52.10
	Tributary 3	665	7.67	3330	9.85	3720	536	1.96	3.47	1.57	0.065	3.750	270	8.60	0.100	19.0	132.00
	Lower Etob US	2290	6.17	3220	14.90	5500	1000	6.55	2.63	5.16	0.055	1.990	230	8.60	0.251	180.0	71.60
	Tributary 4	496	4.14	2200	4.49	3300	323	0.67	2.52	2.43	0.076	1.260	220	8.30	0.163	33.0	10.90
	Little Etob CK	611	5.69	3590	7.35	8000	564	1.75	2.38	1.62	0.090	0.940	360	8.30	0.061	20.0	29.50
	80006	367		2340	11.60	2400	594			4.64	0.091		257	8.61	0.203	28.8	55.80
Mimico Creek	MM003WM	1020	9.02	3750	11.50	5640	628	3.49	3.69	1.65	0.103	3.270	960	8.40	0.150	57.0	62.00
	82003	532		2980	18.90	2100	881			1.65	0.076		83	9.24	0.079	27.1	74.20
Humber River	83104	415	0.65	77	4.00	600	391	0.42	1.00	0.61	0.023	0.660	790	8.53	0.060	73.4	18.00
	83018	651	0.54	61	4.00	240	555	0.58	1.00	0.86	0.014	0.770	190	8.54	0.078	66.0	17.40
	83009	794	0.42	79	4.00	2160	669	0.39	1.00	2.26	0.017	0.970	230	8.55	0.069	23.7	17.30
	83020	3190	1.77	112	2.22	380	802	1.42	0.98	1.52	0.013	1.140	160	8.40	0.163	130.0	10.00
	83004	2740	2.08	423	2.24	1900	605	1.40	1.35	1.38	0.015	1.010	120	8.40	0.156	115.0	10.00
	83103	2120	0.72	397	4.76	340	553	0.47	1.00	3.87	0.017	0.800	300	8.56	0.098	42.0	17.40
	HU1RWMP	6190	6.54	2780	7.51	4230	857	4.62	3.09	1.04	0.062	1.440	300	8.20	0.298	273.0	62.60
	83002	2460	2.75	562	4.00	8600	594	0.90	1.46	3.69	0.018	1.180	320	8.40	0.139	38.0	10.00
	HU010WM	7240	2.53	371	9.44	7280	1090	4.86	1.41	1.40	0.014	1.880	320	8.50	0.542	437.0	68.50
	83012	8520	6.17	1780	19.50	34000	1320	17.70	2.94	1.71	0.291	2.020	600	8.60	0.587	367.0	95.50
	83019	7890		568	37.30	11000	16400			1.94	0.028		106	8.84	0.882	686.0	221.00
Don River	85004	425	5.24	2210	4.00	6600	524	0.97	1.75	1.42	0.055	0.950	290	8.30	0.094	20.0	22.20
	85003	865	3.29	1210	4.00	5900	480	1.02	1.46	1.07	0.085	0.880	210	8.40	0.102	35.0	10.00
	DN008WM	330	3.82	1650	4.20	7300	726	0.58	1.79	1.14	0.058	0.870	220	8.30	0.078	10.0	13.20
	DM 6.0	14800	7.17	1470	20.50	51000	2560	30.00	3.73	2.80	0.086	4.180	730	8.40	1.220	843.0	155.00
	85014	1010		1110	10.50	3100	1640			2.57	0.300		344	9.06	0.174	62.9	45.70
Highland Creek	94002	717	6.04	1460	5.40	9100	554	1.70	1.96	1.50	0.055	1.080	300	8.30	0.140	28.0	19.40
Rouge River	97018	408	0.52	172	2.47	560	310	0.25	0.61	4.49	0.025	1.010	100	8.52	0.094	17.2	18.70
	97999	809	2.09	268	1.79	660	302	0.49	1.21	3.48	0.015	1.130	200	8.30	0.079	30.0	10.00
	97777	1060	2.41	1200	2.68	1100	451	0.92	1.58	1.16	0.027	1.050	300	8.30	0.097	23.0	10.00
	97003	728	4.02	660	2.16	1600	496	0.86	1.61	2.53	0.039	1.140	300	8.40	0.078	42.0	10.00
	97007	20100	2.80	233	3.65	1400	644	5.33	1.79	3.69	0.032	3.740	160	8.40	0.846	468.0	16.30
	97013	1500	3.27	272	2.07	260	458	0.75	1.21	3.47	0.014	1.020	150	8.50	0.098	59.0	10.00
	97011	317		697	4.55	750	507			2.35	0.038		92	9.01	0.073	27.9	30.40
Petticoat Creek	PT001WM	323	5.74	518	3.20	5200	214	0.25	1.48	4.66	0.015	1.030	180	8.40	0.050	8.0	10.00
Frenchmans Bay	FB003WM	316	6.19	543	4.20	5200	412	0.51	1.84	2.69	0.048	5.610	210	8.30	0.056	19.0	14.60
Duffins Creek	104037	252	1.38	251	1.49	550	272	0.25	1.11	2.00	0.011	0.790	130	8.30	0.042	10.0	16.30
	104008	158	0.20	134	2.43	190	276	0.15	0.20	1.49	0.011	0.470	50	8.59	0.063	20.9	17.90
	104029	404	0.64	94	1.24	130	314	0.34	0.91	1.44	0.011	0.460	100	8.40	0.037	18.0	10.00
	104028	1450	1.45	188	1.45	750	455	0.97	1.16	1.07	0.022	0.700	200	8.30	0.089	48.0	10.00
	104027	1140	0.91	93	1.17	880	458	0.71	0.88	1.06	0.012	0.710	320	8.40	0.077	56.0	10.00
	104026	2120	1.71	210	1.96	790	676	1.21	1.17	1.03	0.011	0.950	170	8.40	0.125	53.0	32.60
	104023	2280	1.48	145	1.67	530	555	1.21	0.95	1.37	0.011	0.740	480	8.50	0.139	88.0	10.00
	104025	7890	1.15	128	2.70	560	882	1.83	1.13	2.16	0.016	1.320	260	8.50	0.481	463.0	10.00
	104001	1160		173	4.39	810	1790			1.69	0.015		52	8.53	0.147	144.0	26.50
Carruthers Creek	CC005	440	2.42	131	1.43	1900	437	0.33	1.28	2.61	0.011	2.060	550	8.40	0.093	14.0	10.00
	107002	1110	2.43	307	1.69	740	332	0.69	1.39	2.47	0.018	0.950	160	8.40	0.087	36.0	10.00

		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 (mg/L)	Ammonia (ug/L)	pH	Total phosphorus (mg/L)	TSS (mg/L)	Zinc (ug/L)
Etobicoke Creek	Mayfield	450	0.65	26	0.90	657	92	0.09	0.57	2.79	0.004	0.285	43.37	0.20	0.030	9.1	0.00
	80007	595	0.28	204	3.02	1521	516	0.28	0.49	2.00	0.010	0.267	35.09	0.14	0.048	53.3	16.13
	Spring Creek	499	1.55	626	3.10	1314	197	1.16	0.52	0.38	0.016	0.265	114.81	0.15	0.044	24.2	14.73
	Tributary 3	172	2.15	1015	2.55	1220	120	0.54	0.89	0.39	0.020	0.799	71.15	0.17	0.021	4.9	34.25
	Lower Etob US	684	1.69	876	3.30	1589	295	1.79	0.65	1.48	0.014	0.392	52.42	0.18	0.064	50.8	17.67
	Tributary 4	136	1.16	632	0.77	1077	69	0.21	0.59	0.74	0.020	0.189	58.83	0.10	0.052	10.0	0.26
	Little Etob CK	166	1.90	1074	1.31	2771	144	0.47	0.73	0.30	0.022	0.174	105.90	0.09	0.012	5.2	5.99
	80006	130		676	3.08	762	183			1.25	0.022		66.47	0.13	0.046	9.3	13.50
Mimico Creek	MM003WM	349	2.47	1169	2.49	1736	132	0.97	0.86	0.40	0.026	0.680	271.27	0.13	0.035	16.6	15.65
	82003	159		876	4.35	688	245			0.45	0.022		24.77	0.30	0.015	7.3	17.55
Humber River	83104	116	0.14	7	1.13	169	88	0.13	0.40	0.18	0.005	0.135	217.80	0.09	0.016	20.0	2.88
	83018	179	0.09	6	1.13	67	120	0.22	0.40	0.15	0.003	0.271	52.40	0.07	0.018	19.9	3.26
	83009	220	0.08	21	1.13	602	138	0.12	0.37	0.69	0.003	0.356	75.81	0.09	0.021	7.3	3.34
	83020	968	0.44	22	0.48	118	177	0.44	0.27	0.37	0.001	0.309	35.93	0.07	0.048	42.3	0.00
	83004	808	0.60	106	0.50	556	161	0.39	0.40	0.39	0.001	0.234	26.78	0.07	0.041	32.6	0.00
	83103	584	0.15	109	1.16	133	144	0.15	0.22	1.26	0.004	0.087	89.04	0.09	0.025	11.6	2.87
	HU1RWMP	1753	2.21	939	1.92	1162	214	1.26	0.93	0.27	0.018	0.299	81.85	0.08	0.075	76.8	15.81
	83002	692	0.79	131	0.64	2448	124	0.23	0.28	1.06	0.003	0.175	80.66	0.13	0.033	10.3	0.00
	HU010WM	1997	0.67	95	2.37	2073	244	1.32	0.41	0.35	0.003	0.392	75.85	0.10	0.147	122.1	16.89
	83012	2514	1.80	584	5.04	9549	365	5.71	0.64	0.43	0.074	0.456	133.58	0.15	0.151	104.8	28.06
	83019	2230		179	9.79	3061	4623			0.54	0.007		25.97	0.20	0.245	194.3	58.75
Don River	85004	133	1.57	673	0.80	1855	127	0.26	0.49	0.32	0.015	0.161	69.73	0.08	0.024	5.8	3.83
	85003	242	0.95	345	0.78	1615	76	0.27	0.45	0.22	0.021	0.156	58.59	0.06	0.022	10.1	0.00
	DN008WM	102	1.08	463	0.90	2056	138	0.17	0.56	0.24	0.013	0.142	57.05	0.08	0.015	3.1	0.92
	DM 6.0	4235	2.14	407	4.93	14419	645	8.50	0.85	0.60	0.024	0.976	197.43	0.17	0.329	241.3	41.39
	85014	281		349	2.54	882	404			0.52	0.074		92.26	0.25	0.038	16.4	12.00
Highland Creek	94002	194	1.97	365	1.14	2554	140	0.44	0.67	0.35	0.015	0.189	78.78	0.07	0.034	9.5	2.71
Rouge River	97018	113	0.09	31	0.74	160	60	0.08	0.18	1.19	0.007	0.347	26.79	0.09	0.025	4.8	3.77
	97999	209	0.58	56	0.29	203	61	0.14	0.34	0.89	0.001	0.204	42.60	0.05	0.019	9.4	0.00
	97777	292	0.74	297	0.61	319	97	0.22	0.48	0.30	0.006	0.210	81.56	0.08	0.023	5.9	0.00
	97003	192	1.22	170	0.26	459	88	0.19	0.43	0.61	0.009	0.181	75.97	0.09	0.016	11.5	0.00
	97007	5736	0.80	55	0.84	407	164	1.50	0.52	1.08	0.006	0.922	39.19	0.07	0.237	133.7	1.82
	97013	488	0.94	65	0.37	89	127	0.23	0.34	0.95	0.001	0.220	31.62	0.07	0.030	20.3	0.00
	97011	123		188	0.87	254	160			0.59	0.010		24.28	0.20	0.021	9.8	7.07
Petticoat Creek	PT001WM	84	1.90	123	0.51	1431	48	0.06	0.44	1.29	0.001	0.203	42.31	0.09	0.011	1.7	0.00
Frenchmans Bay	FB003WM	91	2.23	120	0.87	1873	75	0.13	0.57	0.52	0.013	1.432	67.08	0.09	0.015	5.3	1.56
Duffins Creek	104037	74	0.38	62	0.19	162	46	0.07	0.33	0.47	0.000	0.136	28.07	0.04	0.010	3.1	1.82
	104008	42		37	0.69	62	61			0.42	0.002		13.00	0.09	0.014	5.8	3.09
	104029	128	0.16	25	0.13	36	77	0.09	0.25	0.38	0.000	0.097	20.21	0.04	0.009	4.8	0.00
	104028	392	0.41	30	0.25	216	79	0.25	0.34	0.23	0.003	0.139	52.48	0.04	0.021	12.4	0.00
	104027	404	0.21	23	0.15	242	121	0.23	0.25	0.25	0.000	0.177	78.06	0.04	0.025	19.3	0.00
	104026	583	0.51	41	0.35	228	153	0.32	0.34	0.29	0.000	0.210	38.69	0.05	0.031	14.5	6.52
	104023	638	0.40	30	0.29	150	129	0.33	0.26	0.39	0.000	0.193	122.35	0.08	0.037	24.3	0.00
	104025	2352	0.28	31	0.68	159	243	0.60	0.37	0.49	0.001	0.366	66.95	0.07	0.137	139.7	0.00
	104001	353		38	0.92	250	571			0.40	0.002		11.64	0.07	0.049	45.8	4.92
Carruthers Creek	CC005	122	0.68	22	0.21	530	89	0.08	0.37	0.83	0.000	0.467	143.75	0.08	0.024	4.4	0.00
	107002	302	0.77	74	0.21	225	75	0.17	0.37	0.70	0.002	0.182	35.71	0.06	0.021	10.2	0.00

Appendix D. Mean monthly parameter values for 2017

	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	675	0.94	497	3.56	712	438	0.80	1.11	2.34	0.023	0.700	126.1	8.25	0.064	25.25	16.40
February	510	0.58	690	3.22	295	425	0.40	0.77	1.50	0.029	0.835	101.6	8.24	0.055	16.55	15.69
March	173	0.39	767	2.95	79	337	0.20	0.90	1.07	0.018	0.551	128.1	8.36	0.031	9.27	14.02
April	200	0.38	273	3.17	230	284	0.49	1.58	0.81	0.016	0.674	144.7	8.30	0.033	8.97	15.68
May	69	0.44	289	2.35	326	229	0.16	1.58	0.69	0.017	0.676	102.6	8.35	0.026	4.45	13.60
June	799	0.73	167	2.38	678	301	0.74	0.67	0.62	0.021	0.923	110.7	8.32	0.079	27.04	12.38
July	1641	0.81	172	4.16	3631	771	2.18	0.71	0.51	0.013	1.011	99.4	8.30	0.149	87.62	24.02
August	286	2.68	153	3.16	944	314	0.69	0.70	0.39	0.016	0.819	98.8	8.21	0.060	20.85	16.88
September	110	3.72	229	2.22	220	248	0.26	0.59	0.36	0.018	0.556	82.3	8.29	0.038	8.52	12.91
October	152	0.50	131	2.69	1334	218	0.31	0.46	0.39	0.015	0.872	59.9	8.31	0.043	7.06	11.05
November	144	0.42	170	1.54	363	219	0.26	0.37	0.75	0.017	0.893	103.2	8.35	0.036	8.77	11.23
December	98	0.43	747	3.03	418	262	0.24	0.67	0.79	0.027	0.738	140.7	8.26	0.037	6.21	13.64