2020 Surface Water Quality Study near the Former GM Property
285 Ontario Street, City of St. Catharines

Technical Memorandum

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1.0 Introduction

In a January 29, 2020 letter from Shelley Chemnitz, Chief Administrative Officer, City of St. Catharines to Kim Groombridge, Manager Niagara District Office, Ministry of Environment, Conservation and Parks, the City of St. Catharines (City) requested that the Ministry of Environment, Conservation and Parks (MECP) assess any potential offsite environmental impacts including surface water from the former General Motors (GM) property located at 285 Ontario Street in the City of St. Catharines. The former GM property was previously a production facility and is located directly east of Twelve Mile Creek.

To assist the MECP Niagara District Office with the City request, MECP Technical Support Surface Water completed surface water quality sampling of a former GM storm sewer outfall, a City storm sewer outfall, and various upstream and downstream locations on Twelve Mile Creek. Surface water quality sampling was completed during a snow melt event on February 13, 2020, a dry event on September 23, 2020 and a rain event on October 20, 2020.

This Technical Memorandum provides the surface water quality sampling results and an interpretation of the results regarding potential surface water quality impact.

2.0 Background Information

2.1 Twelve Mile Creek

Twelve Mile Creek has a total watershed drainage area of approximately $132km^2$. The watershed has six main subwatersheds known as Upper Twelve Mile Creek, Lake Gibson system, Richardson Creek, Francis Creek, Dicks Creek and Lower Twelve Mile Creek. The former GM property is located within the Lower Twelve Mile Creek subwatershed.

The Lower Twelve Mile Creek subwatershed has historically been totally reconstructed. It was originally modified as part of the Welland Canal and then enlarged to accommodate flow from the Ontario Power Generation DeCew Generating Station. The dominant source of flow in the Lower Twelve Mile Creek originates from the DeCew Generating Station which diverts flow from the Old Welland Canal system. The discharge from the DeCew Generating Station represents more than 98% of the flow in Twelve Mile Creek at its outlet to Lake Ontario. The DeCew Generating Station discharge can reach up to 220 m^3/s (or 220,000 L/s). (AquaResource, 2009)

2.2 Urban Stormwater Overview

Urban stormwater comprises rainfall and snowmelt that either seeps into the ground or runs off the land into storm sewers which eventually discharge to creeks and lakes. Contaminants tend to build up on urban impervious surfaces such as roadways, parking lots, etc. from various sources. As such, urban stormwater may contain elevated levels of contaminants including suspended solids, nutrients, bacteria, metals, chlorides, oil and grease, and pesticides. These contaminants can then be picked up by stormwater and transferred to creeks and lakes.

Sources of urban stormwater contaminants include:

- vehicular traffic which accounts for much of the buildup of contaminants on road surfaces (tire wear, brake pad wear, engine oil and lubricant drippings, corrosion)
- asphalt pavement deterioration
- road and driveway maintenance (asphalt repair, road salting, driveway sealant)
- lawn maintenance (fertilizers, pesticides)
- industrial and commercial activities (loading/unloading areas, storage, vehicle maintenance); and
- air pollution fallout (vehicle emissions, industrial sources, wind erosion)

(MOE, 2003a) (MOE, 2003b) (Cons. Toronto, 2001)

In general terms, older municipal areas have catchbasins and sewers for stormwater quantity control to prevent flooding and property damage similar to the area of St. Catharines sampled for this assessment. Newer municipal areas may have additional stormwater quality control measures (ie. detention ponds, etc.) to remove suspended solids and associated contaminants in stormwater.

3.0 Surface Water Quality Criteria

Surface water quality criteria provide assessment benchmarks for background water quality, end-of-pipe discharge quality, and water quality within the receiver after mixing. Various surface water quality criteria were incorporated into this assessment. The assessment will primarily focus on end-of-pipe storm sewer outfall water quality. The assessment will also discuss the upstream and downstream water quality in Twelve Mile Creek. However, the water quality in Twelve Mile Creek would be dominated by its very large flow in comparison to the much smaller flows from the storm sewer outfalls.

An overview of the surface water quality criteria is provided in the following sections.

3.1 Provincial Water Quality Objectives

The MECP Water Management document (MOEE, 1994) contains the Ontario Provincial Water Quality Objectives (PWQO). PWQO are numerical and narrative ambient surface water quality criteria that represent a desirable level of water quality that the MECP strives to maintain in the surface waters of the Province. PWQO are set at a level of water quality which is protective of all forms of aquatic life and all aspects of the aquatic life cycle during indefinite exposure to the water. PWQO provide a baseline for assessing surface water quality and act as a simple measure of ecosystem health.

3.2 Canadian Water Quality Guidelines

The MECP Water Management document (MOEE, 1994) identifies that the Canadian Water Quality Guidelines (CWQG) for the Protection of Aquatic Life (CCME, 2020) can also be used to complement or augment the PWQO since they have similar purpose and application. In the absence of a PWQO for a specific parameter or if a specific parameter PWQO has a more recently developed CWQG, the CWQG was incorporated into this assessment.

3.3 Typical Urban Stormwater Quality for Metals

In addition to the PWQO and CWQG, typical urban stormwater quality can be incorporated as criteria to identify non-typical or elevated stormwater results. The MECP Stormwater Manual (MOE, 2003a) contains a list of observed urban stormwater runoff concentrations for metals that have been included in this assessment. As well, the Twelve Mile Creek Trackdown Study (Benoit and Dove, 2010) contains metals results for typical urban neighbourhoods in St. Catharines (Walkers Creek at Lakeshore Road and Spring Garden Creek at Lakeshore Road) and an upstream reference site (Twelve Mile Creek at 1st Street Louth) for the watershed that have been incorporated into this assessment.

3.4 Typical Urban Stormwater Quality for Polycyclic Aromatic Hydrocarbons

Elevated concentrations of polycyclic aromatic hydrocarbons (PAHs) can be contained in urban stormwater. PAHs have low solubility in water and a high potential for adsorption to particulate matter in soil and in water. As such, PAHs adsorbed to particulate matter in soil and water can be picked up by stormwater runoff and transferred to creeks and lakes. Urban sources of PAHs to the aquatic environment include deposition of atmospheric PAHs (ie. vehicular emissions), deterioration of asphalt pavement and car tires, spills of petroleum products (ie. engine oil and lubricant drippings) and creosote treated railway ties. Atmospheric deposition has been estimated to be the main source of PAHs to soils and aquatic sediments. (Gov. of Can., 1994)

The Twelve Mile Creek Trackdown Study (Benoit and Dove, 2010) included PAH results within the Twelve Mile Creek watershed and concluded that those results were within typical ranges found in urban watersheds (Boyd, 1999). PAH results for Carter Creek Park Upstream from this study were incorporated into this assessment as a comparison for the watershed.

The U.S. Geological Survey studied PAHs in Urban Stormwater in Madison, Wisconsin (Selbig, 2009) to characterize PAH concentrations from urban source areas including residential feeder streets (1500 vehicles per day) and collector streets (10,000 to 15,000 vehicles per day). The study was also consistent with similar studies that measured PAH concentrations in urban stormwater in Michigan. The study results were incorporated into this assessment as another source of typical urban PAH concentrations.

3.5 Polychlorinated Biphenyls Threshold for Typical Urban Areas

Polychlorinated biphenyls (PCB) are man-made synthetic chlorinated hydrocarbon compounds that have been produced commercially since 1929. PCB refers to any one or any combination of 209 specific chemicals (known as congeners) that are similar in structure. PCBs were never manufactured in Canada, however, they were widely used in this country. They were used as ingredients in many industrial materials (ie. sealing and caulking compounds, cutting oils, inks and paint additives). PCBs were also used to make coolants and lubricants for electrical equipment (ie. transformers and capacitors) (Gov. of Can., 2020).

Generally, PCBs are relatively insoluble in water, adsorb to soil and sediment, are persistent in the environment, bioaccumulate in aquatic biota and biomagnify within the aquatic food chain. Concern about the environmental impact of PCBs led to a North American ban on manufacturing and importing by 1977. Trace levels of PCBs in the environment are found all over the world (WHO, 2003) (Gov. of Can., 2020).

Benoit et al. (2016) developed environmental triggers in five Ontario watersheds including Twelve Mile Creek to differentiate potential source areas from background PCB conditions in urban areas. Background concentrations do not represent natural conditions but rather reflect typical concentrations in urban areas in the absence of known PCB sources.

The study established a surface water PCB Threshold at greater than 10 ng/L (ie. 10x PWQO). It identified that results at most background areas did not show evidence of a PCB source at less than 10 ng/L. However, it noted that PCB results exceeding 20 ng/L may occur in urban background areas following rain events due to increased suspended solids. PCBs are typically more prevalent during runoff events in urban areas since they are hydrophobic and strongly sorb to suspended solids.

The study also included surface water quality data from the Twelve Mile Creek watershed. Specifically, Benoit et al. (2016) identified that Twelve Mile Creek non-source sites (ie. locations with a lack of evidence of a source) had PCB results for wet events that ranged from 1.5 to 22.4 ng/L with an average of 9.5 ng/L. PCB results for non-source dry events ranged from 0.8 to 3.9 ng/L with an average of 2.0 ng/L.

3.6 How are the Provincial Water Quality Objectives Set?

The scientific procedure to set a PWQO involves a review of global aquatic toxicological literature including effects such as aquatic toxicity, bioaccumulation and mutagenicity. Additional information such as odour in water, tainting of fish flesh and impacts on wildlife may also be taken into consideration. The PWQO is then set based on the lowest effect concentration with an added safety factor to be conservative (MOEE, 1994). As such, PWQO are not set at acutely or chronically lethal benchmarks.

For additional information, the following provides an example of the procedure to set a PWQO for a specific parameter and a comparison to the lab detection limit. As an example, studies for contaminant ABC have identified effect concentrations from 10 to 100 ug/L based on a lab analysis detection limit of 3 ug/L. The lowest effect concentration of 10 ug/L with a safety factor of 10 results in a PWQO of 1 ug/L. Since the setting of the PWQO is based on the scientific procedure and not the lab analysis detection limit, this PWQO would be lower than the lab analysis detection limit.

3.7 Lab Method Detection Limit for Metals

Metals results from the MECP lab are reported as a value with a specific uncertainty factor and a method detection limit. The reviewer then typically interprets the result with an understanding of the uncertainty factor. The first sampling event samples (snow event) were analysed with a single analysis method and the results were presented as the reported value in a July 16, 2020 MECP memorandum (Spencer, 2020).

After the first sampling event, the MECP lab recommended that two analysis methods be used and the metal parameter result with the lowest detection limit be used in the assessment. The MECP lab also recommended that any metal results less than the lowest method detection limit be identified as non-detect in the interpretation. Therefore, the main body of this Technical Memorandum will follow this procedure and interpret any metals results less than the lowest method detection limit as non-detect.

In addition, since the first sampling event metal results were originally presented as values and the Coalition for a Better St. Catharines provided comments (Van Meer, 2020), Appendix A will also provide an interpretation using the previously presented values.

4.0 Sampling Locations

The surface water quality sampling locations for the storm sewer outfalls and Twelve Mile Creek are illustrated in Figure 1. As well, the following table provides a description of the sampling locations:

Sampling Locations	**Description**	**Sample Id**
TMC Upstream Far	Twelve Mile Creek approximately 300m upstream of GM West Outfall and upstream of former GM property.	TMCUS
TMC Upstream	Twelve Mile Creek approximately 20m upstream of GM West Outfall and adjacent to former GM property. Across from groundwater monitoring well.	TMC1
GM West Outfall	Former GM storm sewer outfall associated with West Tilt Plate Separator.	TMCOut1
City West Outfall	Municipal storm sewer outfall in line with Carlton Street.	TMCOut2
TMC Downstream	Twelve Mile Creek approximately 40m downstream of City West Outfall and adjacent to former GM property. Across from groundwater monitoring well.	TMC2
TMC Downstream Far	Twelve Mile Creek approximately 130m downstream of City West Outfall, downstream of former GM property and just upstream of railway bridge abutment.	TMCDS

The City’s main storm sewer in line with Carlton Street captures stormwater from Ontario Street and combined sewer overflows at the intersection of Carlton Street and Ontario Street. The main storm sewer then splits into two sewer pipes and two sewer outfalls that are contained in the same concrete outfall structure. The City West Outfall is the downstream outfall in the concrete outfall structure. The upstream outfall in the concrete outfall structure is not in service (Green, personal communication 2020) and was not sampled since it was always dry during all sampling events. Previous stormwater flows from the former GM property East Plant (east side of Ontario Street) to the main storm sewer are believed to be capped (Green, personal communication 2020).

The Twelve Mile Creek samples were collected approximately 2m from the shoreline using a sampling pole. While Twelve Mile Creek has a very large flow and mixing capacity in comparison to the storm sewer outfall flows, it is anticipated that the outfalls discharge would flow along the shoreline while mixing for some distance due to the difference in flow and water quality.

A duplicate set of samples was collected at TMC Downstream Far during each sampling event for quality assurance and quality control.

Twelve Mile Creek Sampling near GM Property St. Catharines

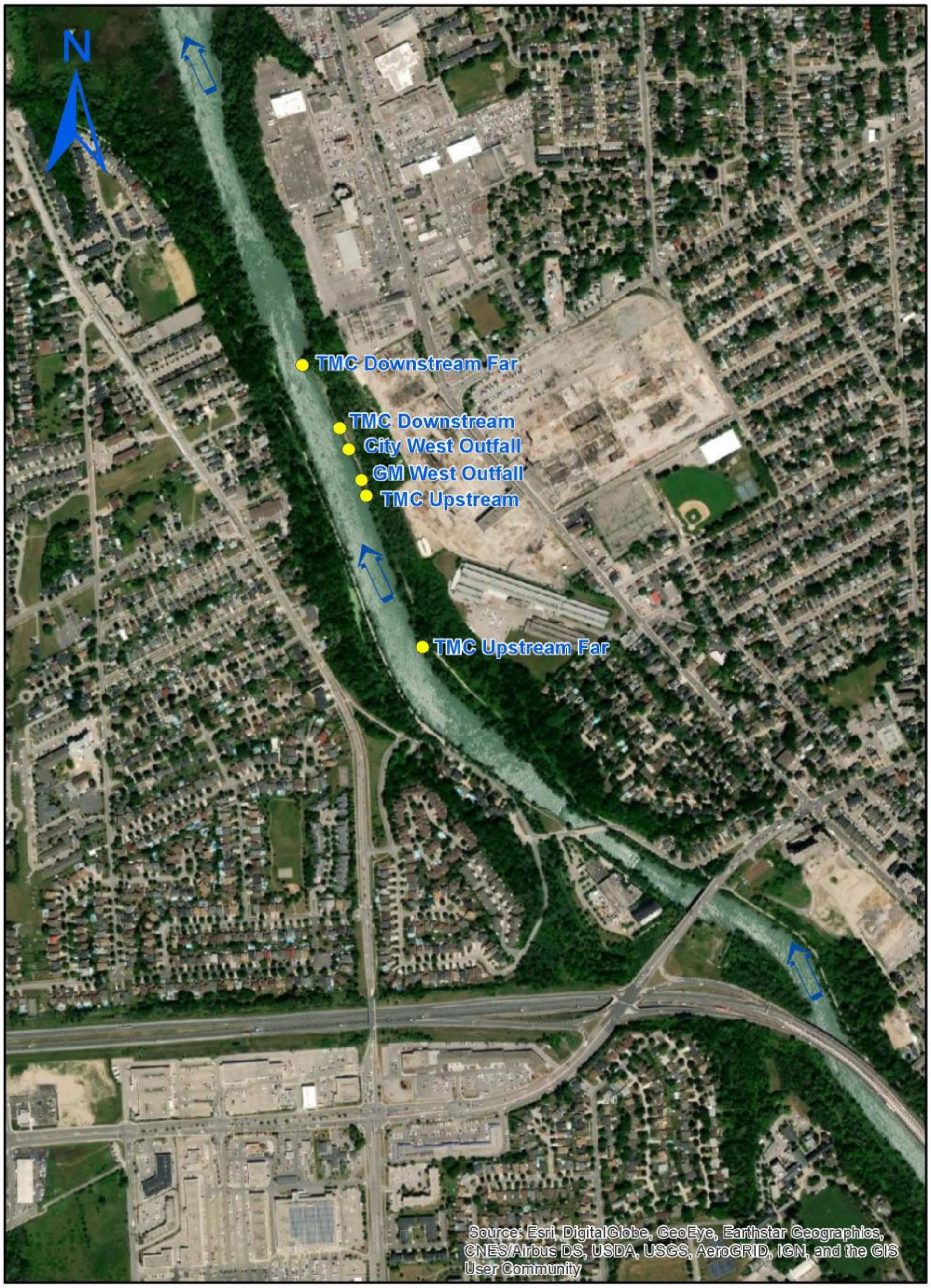

Figure 1: Twelve Mile Creek Sampling near GM Property St. Catharines

5.0 Lab Analysis

The surface water quality samples were analyzed at the MECP lab for general chemistry (including suspended solids), metals, volatile organic compounds (VOC), acid base neutrals (semi-volatiles), polycyclic aromatic hydrocarbons (PAH) and polychlorinated biphenyls (PCB). The wide range of analysis was chosen to be consistent with previous GM reports completed for the former GM Property.

6.0 Surface Water Quality Sampling Results

The following sections provide the sampling results and interpretation for the snow melt, dry and rain sampling events.

6.1 Snow Melt Event February 13, 2020 Results

The snow melt event sampling was completed on February 13, 2020 for all sampling locations. The snow melt event had created runoff since the GM West Outfall and the City West Outfall were discharging. As well, the average daily temperature was above freezing (Environment Canada's St. Catharines Airport Met Station Id. 6137304).

The Lower Twelve Mile Creek flow on February 13, 2020 was approximately 165.8 m^3/s (165,800 L/s) based on the St. Lawrence Seaway Management Corporation recorded flow diversion from the Welland Canal system to the Decew Generating Station (Frick, personal communication 2020a).

The snow melt event sampling results are contained in Table 1 and discussed below.

(i) General Chemistry Results

Higher alkalinity results were recorded at the GM West Outfall (188 mg/L) and the City West Outfall (242 mg/L) in comparison to the Twelve Mile Creek upstream (102 and 103 mg/L) and downstream (101, 103 and 103 mg/L) locations. Alkalinity is a measure of a water's capacity to neutralize an acid. The PWQO states that "Alkalinity should not be decreased by more than 25% of the natural concentration." The Twelve Mile Creek downstream locations results were similar to the upstream locations results.

Higher conductivity results were recorded at the GM West Outfall (899 uS/cm) and the City West Outfall (5370 uS/cm) in comparison to the Twelve Mile Creek upstream (341 and 344 uS/cm) and downstream (348, 351 and 352 uS/cm) locations. There is no PWQO for conductivity. Conductivity serves as a control parameter and is an indicator of water quality changes since it is relatively sensitive to variations in dissolved solids concentrations. The higher conductivity results at the GM West Outfall and the City West Outfall likely reflect the higher dissolved solids concentrations. Urban runoff is expected to have elevated levels of solids from roads and construction sites (MOE, 2003a). As well, the higher dissolved solids concentrations likely reflect the snow melt containing road salt. It is estimated that 97% of road salt used in Canada is in the form of sodium chloride (CCME, 2011). The sodium results for the GM West Outfall (59.4 mg/L) and the City West Outfall (954 mg/L) were also elevated in comparison to Twelve Mile Creek (17.5 to 19.9 mg/L).

The pH results were all within the PWQO range at all the sampling locations.

Overall, the snow melt event general chemistry results are not considered a surface water concern.

(ii) <u>Metals Results</u>

The GM West Outfall cadmium and iron results exceeded the PWQO. As well, the City West Outfall aluminum, chromium, cobalt, copper, iron and zinc results exceeded the PWQO.

Aluminum - The City West Outfall aluminum result (167 ug/L) exceeded the PWQO (75 ug/L). However, the result was less than observed urban stormwater aluminum concentrations (1200 to 2500 ug/L) in the MECP Stormwater Manual (MOE, 2003a). The aluminum result was also within the range of wet event results for typical urban neighbourhoods in St. Catharines (135 to 528 ug/L at Walkers Creek at Lakeshore Road and Spring Garden Creek at Lakeshore Road) (Benoit and Dove, 2010). The result was also less than wet event results at the upstream reference site Twelve Mile Creek at 1st Street Louth (651 and 950 ug/L) (Benoit and Dove, 2010). The Twelve Mile Creek Trackdown Study (Benoit and Dove, 2010) also identified that aluminum is likely found naturally at elevated levels in the watershed due to geological features. The Twelve Mile Creek upstream and downstream locations results were all less than the PWQO.

Cadmium – The GM West Outfall cadmium result (0.817 ug/L) exceeded the PWQO. (0.2 ug/L). However, the result was less than observed urban stormwater cadmium concentrations (1 to 24 ug/L) in the MECP Stormwater Manual (MOE, 2003a). The cadmium result was only slightly higher than the range of wet event results for typical urban neighbourhoods in St. Catharines (0 to 0.732 ug/L at Walkers Creek and Spring Garden Creek at Lakeshore Road) (Benoit and Dove, 2010). The Twelve Mile Creek upstream and downstream locations results were all non-detect at the method detection limit (<0.8 ug/L).

Chromium - The City West Outfall chromium result (2.42 ug/L) exceeded the PWQO (1 ug/L). However, the result was only slightly higher than the range of wet event results for typical urban neighbourhoods in St. Catharines (0 to 2.32 ug/L at Walkers Creek and Spring Garden Creek at Lakeshores Road) (Benoit and Dove, 2010). The Twelve Mile Creek upstream and downstream locations results were all non-detect at the method detection limit (<1 ug/L).

Cobalt - The City West Outfall cobalt result (2.24 ug/L) exceeded the PWQO (0.9 ug/L). The MECP Stormwater Manual (MOE, 2003a) does not contain cobalt in the list of observed urban stormwater concentrations. The Twelve Mile Creek upstream and downstream locations results were all non-detect at the method detection limit (<1 ug/L).

Copper - The City West Outfall copper result (35.2 ug/L) exceeded the PWQO (5 ug/L). However, the result was less than observed urban stormwater copper concentrations (45 to 460 ug/L) in the MECP Stormwater Manual (MOE, 2003a). The Twelve Mile Creek upstream and downstream locations results were all less than the PWQO.

Iron - The GM West Outfall iron result (332 ug/L) slightly exceeded the PWQO (300 ug/L) and the City West Outfall iron result (391 ug/L) exceeded the PWQO. However, the results were less than observed urban stormwater iron concentrations (2700 to 7200 ug/L) in the MECP Stormwater Manual (MOE, 2003a). The GM West Outfall result was within the range of wet event results for typical urban neighbourhoods in St. Catharines (106 to 340 ug/L at Walkers Creek and Spring Garden Creek at Lakeshore Road)(Benoit and Dove, 2010), while the City West Outfall result was only slightly higher. The results were less than wet event results at the upstream reference site Twelve Mile Creek at 1st Street Louth (582 and 1070 ug/L) (Benoit and Dove, 2010). The Twelve Mile Creek upstream and downstream locations results were all less than the PWQO.

Zinc - The City West Outfall zinc result (93.3 ug/L) exceeded the PWQO (30 ug/L). However, the result was less than observed urban stormwater zinc concentrations (140 to 260 ug/L) in the MECP Stormwater Manual (MOE, 2003a). The Twelve Mile Creek upstream and downstream locations results were all less than the PWQO.

Overall, the snow melt event metals results were within typical ranges for urban stormwater.

(iii) Volatile Organic Compounds Results

The GM West Outfall VOC results for cis-1,2-dichloroethene (0.3 ug/L), tetrachloroethene (0.2 ug/L) and trichloroethene (0.7 ug/L) were all less than their PWQO (200, 50 and 20 ug/L respectively).

The City West Outfall VOC results for toluene (0.4 ug/L), bromodichloromethane (0.5 ug/L) and tetrachloroethene (0.4 ug/L) were all less than their PWQO (0.8, 200 and 50 ug/L respectively).

The Twelve Mile Creek upstream and downstream locations VOC results were all non-detect at the method detection limit.

Overall, the snow melt event VOC results are not considered a surface water concern.

(iv) Acid Base Neutral (Semi-Volatile) Results

The GM West Outfall acid base neutral results were all non-detect at the method detection limit. The Twelve Mile Creek upstream and downstream sampling locations acid base neutral results were all non-detect at the method detection limit.

The City West Outfall acid base neutral results for 4-nitrophenol (0.9 ug/L) and camphene (0.6 ug/L) were less than their PWQO (50 and 2 ug/L respectively).

Overall, the snow melt event acid base neutral results are not considered a surface water concern.

(v) Polycyclic Aromatic Hydrocarbons Results

The GM West Outfall PAH results were all non-detect at the method detection limit. As well, the Twelve Mile Creek upstream and downstream locations were all non-detect at the method detection limit.

The City West Outfall had five detections of PAHs (benzo(a)pyrene, chrysene, fluoranthene, phenanthrene and pyrene) that either exceeded the PWQO and/or CWQG.

Benzo(a)pyrene - The City West Outfall benzo(a)pyrene result (33 ng/L) exceeded the CWQG (15 ng/L). However, the result was less than the Carter Creek Park Upstream maximum result (110 ng/L) which was identified as less than the typical range found in urban watersheds for wet events (Benoit and Dove, 2010). As well, the result was less than typical urban stormwater concentrations from residential feeder streets (mean 290 ng/L) and collector streets (mean 620 ng/L) (Selbig, 2009).

Chrysene - The City West Outfall chrysene result (93 ng/L) exceeded the PWQO (0.1 ng/L). However, the result was less than the Carter Creek Park Upstream maximum result (140 ng/L) which was identified as less than the typical range found in urban watersheds for wet events (Benoit and Dove, 2010). As well, the result was less than typical urban stormwater concentrations from residential feeder streets (mean 230 ng/L) and collector streets (mean 660 ng/L) (Selbig, 2009).

Fluoranthene – The City West Outfall fluoranthene result (210 ng/L) exceeded the PWQO (0.8 ng/L) and the more recently developed CWQG (40 ng/L). However, the result was less than the Carter Creek Park Upstream maximum result (440 ng/L) which was identified as less than the typical range found in urban watersheds for wet events (Benoit and Dove, 2010). As well, the result was less than typical urban stormwater from residential feeder streets (mean 640 ng/L) and collector streets (mean 1720 ng/L) (Selbig, 2009).

Phenanthrene – The City West Outfall phenanthrene result (130 ng/L) exceeded the PWQO (30 ng/L), however, it was less than the more recently developed CWQG (400 ng/L). In addition, the result was less than the Carter Creek Park Upstream maximum result (220 ng/L) which was identified as less than the typical range found in urban watersheds for wet events (Benoit and Dove, 2010). The result was also less than typical urban stormwater from residential feeder streets (mean 310 ng/L) and collector streets (mean 780 ng/L) (Selbig, 2009).

Pyrene – The City West Outfall pyrene result (180 ng/L) exceeded the CWQG (25 ng/L). However, the result was less than the Carter Creek Park Upstream maximum result (330 ng/L) which was identified as less than the typical range found in urban watersheds for wet events (Benoit and Dove, 2010). As well, the result was less than typical urban stormwater from residential feeder streets (mean 500 ng/L) and collector streets (mean 1250 ng/L) (Selbig, 2009).

Overall, the snow melt event PAH results were within typical ranges for urban stormwater.

(vi) Polychlorinated Biphenyls Results

A discussion of the PCB results is provided in Section 7.0. It should be noted that the GM West Outfall total PCB result has been corrected in Table 1 since the previous MECP memorandum (Spencer, 2020) contained an error.

6.2 Dry Event September 23, 2020 Results

The dry event sampling was completed on September 23, 2020 at all sampling locations except the GM West Outfall. The GM West Outfall was not discharging so it was not sampled. The Niagara Peninsula Conservation Authority's Port Dalhousie Wastewater Treatment Plant precipitation gauge recorded zero precipitation from September 14 to 23.

The Lower Twelve Mile Creek flow on September 23, 2020 was approximately 187.0 m^3/s (187,000 L/s) based on the St. Lawrence Seaway Management Corporation recorded flow diversion from the Welland Canal system to the Decew Generating Station (Frick, personal communication 2020b).

The dry event sampling results are contained in Table 2 and discussed below.

(i) General Chemistry Results

The City West Outfall and Twelve Mile Creek upstream and downstream locations results for alkalinity, conductivity and solids were all relatively similar.

The pH results were within the PWQO range at all the sampling locations.

Overall, the dry event general chemistry results are not considered a surface water concern.

(ii) Metals Results

The City West Outfall metals results were all either non-detect at the method detection limit or less than the PWQO, except aluminum. The Twelve Mile Creek upstream and downstream locations results were all either non-detect at the method detection limit or less than the PWQO, except aluminum.

Aluminum - The City West Outfall aluminum result (81.3 ug/L) slightly exceeded the PWQO (75 ug/L). However, the result was less than dry event results for typical urban neighbourhoods in St. Catharines (103 ug/L at Walkers Creek and 193 ug/L at Spring Garden Creek at Lakeshore Road) (Benoit and Dove, 2010). The result was also less than the dry event results at the upstream reference site Twelve Mile Creek at 1st Street Louth (173 and 273 ug/L) (Benoit and Dove, 2010). Benoit and Dove (2010) also identified that aluminum is likely found naturally at elevated levels in the watershed due to geological features. The result was less than the upstream Twelve Mile Creek results.

The Twelve Mile Creek upstream (91.1 and 131 ug/L) and downstream (102, 127 and 133 ug/L) results also exceeded the PWQO.

Overall, the dry event metals results were within typical ranges for dry event urban surface water.

(iii) Volatile Organic Compounds Results

The City West Outfall VOC results were all non-detect at the method detection limits. As well, the Twelve Mile Creek upstream and downstream locations results were all non-detect at the method detection limits.

Overall, the dry event VOC results are not considered a surface water concern.

(iv) Acid Base Neutral (Semi-Volatile) Results

The City West Outfall acid base neutral results were all non-detect at the method detection limits. As well, the Twelve Mile Creek upstream and downstream locations results were all non-detect at the method detection limits.

Overall, the dry event acid base neutral results are not considered a surface water concern.

(v) Polycyclic Aromatic Hydrocarbons Results

The City West Outfall PAH results were all non-detect at the method detection limit. As well, the Twelve Mile Creek upstream and downstream locations results were all non-detect at the method detection limit.

Overall, the dry event PAH results are not considered a surface water concern.

(vi) Polychlorinated Biphenyls Results

A discussion of the PCB results is provided in Section 7.0.

6.3 Rain Event October 20, 2020 Results

The rain event sampling was completed on October 20, 2020 at all sampling locations. The Niagara Peninsula Conservation Authority's Port Dalhousie Wastewater Treatment Plant precipitation gauge recorded 15.25 mm of precipitation in the 24 hours prior to sampling.

The Lower Twelve Mile Creek flow on September 23, 2020 was approximately 217.3 m^3/s (217,300 L/s) based on the St. Lawrence Seaway Management Corporation recorded flow diversion from the Welland Canal system to the Decew Generating Station (Frick, personal communication 2020c).

The rain event sampling results are contained in Table 3 and discussed below.

(i) General Chemistry Results

Higher alkalinity results were recorded at the GM West Outfall (133 mg/L) and the City West Outfall (214 mg/L) in comparison to the Twelve Mile Creek upstream (97 and 98.4 mg/L) and downstream (96.7, 96.9 and 97.6 mg/L) locations. The PWQO states that "Alkalinity should not be decreased by more than 25% of the natural concentration." The Twelve Mile Creek downstream locations results were similar to the upstream locations results.

Higher conductivity results were recorded at the GM West Outfall (525 uS/cm) and the City West Outfall (1380 uS/cm) in comparison to the Twelve Mile Creek upstream (290 and 292 uS/cm) and downstream (289, 290 and 291 uS/cm) locations. Conductivity is an indicator of water quality changes since it is relatively sensitive to variations in dissolved solids concentrations. Higher dissolved solids results were recorded at the GM West Outfall (336 mg/L) and the City West Outfall (857 mg/L) in comparison to the Twelve Mile Creek upstream (168 and 172 mg/L) and downstream (164, 167 and 167 mg/L) locations. As such, the higher conductivity results at the GM West Outfall and City West Outfall reflect the higher dissolved solids concentrations in stormwater.

The pH results were all within the PWQO range at all the sampling locations.

Overall, the rain event general chemistry results are not a surface water concern.

(ii) Metals Results

The GM West Outfall and the City West outfall chromium and copper results exceeded the PWQO. The Twelve Mile Creek upstream and downstream locations aluminum results exceeded the PWQO. As previously discussed, Benoit and Dove (2010) identified that aluminum is likely found naturally at elevated levels in the watershed due to geological features.

Chromium - The GM West Outfall chromium result (1.26 ug/L) slightly exceeded the PWQO (1 ug/L) while the City West Outfall result (2.37 ug/L) exceeded the PWQO. The City West Outfall result was only slightly higher than the range of wet event results for typical urban neighbourhoods in St. Catharines (0 to 2.32 ug/L at Walkers Creek and Spring Garden Creek at Lakeshores Road) (Benoit and Dove, 2010). The Twelve Mile Creek upstream and downstream locations results were all non-detect at the method detection limit (<1 ug/L).

Copper - The GM West Outfall copper result (7.08 ug/L) and City West Outfall result (8.46 ug/L) exceeded the PWQO (5 ug/L). However, the results were less than observed urban stormwater copper concentrations (45 to 460 ug/L) in the MECP Stormwater Manual (MOE, 2003a). The GM West Outfall result was within the range of wet event results for typical urban neighbourhoods in St. Catharines (2.53 to 7.83 ug/L at Walkers Creek and Spring Garden Creek at Lakeshores Road) (Benoit and Dove, 2010), while the City West Outfall result was only slightly higher. The Twelve Mile Creek upstream and downstream locations results were all less than the PWQO.

Overall, the rain event metals results were within typical ranges for urban stormwater.

(iii) Volatile Organic Compounds Results

The GM West Outfall and the City West Outfall VOC results were all non-detect at the method detection limits. As well, the Twelve Mile Creek upstream and downstream sampling locations results were all non-detect at the method detection limits.

Overall, the rain event VOC results are not a surface water concern.

(iv) Acid Base Neutral (Semi-Volatile) Results

The GM West Outfall and City West Outfall acid base neutral results were all non-detect at the method detection limits. As well, the Twelve Mile Creek upstream and downstream sampling locations results were non-detect at the method detection limit.

Overall, the rain event acid base neutral results are not a surface water concern.

(v) Polycyclic Aromatic Hydrocarbons Results

The GM outfall results had three PAH detections. The benzo(a)pyrene result (4 ng/L) was less than the CWQG (15 ng/L). The fluoranthene result (13 ng/L) exceeded the PWQO (0.8 ng/L), however, it was less than the more recently developed CWQG (40 ng/L). The pyrene result (12 ng/L) was less than the CWQG (25 ng/L).

The City West Outfall PAH results were all non-detect at the method detection limits. As well, the Twelve Mile Creek upstream and downstream sampling locations results were all non-detect at the method detection limits.

Overall, the rain event PAH results are not a surface water concern.

(vi) Polychlorinated Biphenyls Results

A discussion of the PCB results is provided in Section 7.0.

7.0 Overall PCB Sampling Results

7.1 Twelve Mile Creek PCB Results

The Twelve Mile Creek dry event total PCB results for upstream locations (0.1 and 0.3 ng/L) and downstream locations (0.1, 0.2 and 0.2 ng/L) were all less than the PWQO.

The Twelve Mile Creek snow melt event total PCB results for upstream locations (0.1 and 0.1 ng/L) and downstream locations (non-detect) were all less than the PWQO.

The Twelve Mile Creek rain event total PCB results for upstream locations (0.4 and 0.6 ng/L) and downstream locations (0.3, 0.3 and 0.5 ng/L) were all less than the PWQO.

The Twelve Mile Creek total PCB results were all less than the PWQO and would not be considered a surface water concern. That being said, a noticeable increase in PCB concentration in Twelve Mile Creek from these storm sewer outfalls is not anticipated since the concentration in Twelve Mile Creek would likely be dominated by its very large flow in comparison to the much smaller flow from the storm sewer outfalls.

7.2 City West Outfall PCB Results

The City West Outfall dry event total PCB result (0.9 ng/L) was slightly less than the PWQO (1 ng/L), less than the PCB Threshold (10 ng/L) and within the range of Twelve Mile Creek non-source sites for dry events (0.8 to 3.9 ng/L, average 2.0 ng/L) (Benoit et al., 2016).

The snow melt and rain events total PCB results can be assessed together as a wet event. For the snow melt event, the City West Outfall result (11.0 ng/L) exceeded the PWQO (1 ng/L) and slightly exceeded the PCB Threshold (10 ng/L). For the rain event, the City West Outfall result (9.3 ng/L) exceeded the PWQO, however, it was slightly less than the PCB Threshold. Both results were within the range of Twelve Mile Creek non-source sites for wet events (1.5 to 22.4 ng/L, average 9.5 ng/L) (Benoit et al., 2016). Based on the snow melt and rain events results, the average wet event total PCB concentration is 10.1 ng/L which only very slightly exceeds the PCB Threshold.

Generally, based on the three sampling events total PCB results, the City West Outfall would be considered a non-source and reflect typical urban area concentrations.

7.3 GM West Outfall PCB Results

Generally, PCBs are typically more prevalent during runoff events in urban areas since they are hydrophobic and strongly sorb to suspended solids. The GM West Outfall was not discharging during the dry event sampling. As such, it is not considered a continuous PCB source and is considered runoff event driven.

The snow melt and rain events total PCB results can be assessed together as wet events. For the snow melt event, the GM West Outfall result (15.6 ng/L) exceeded the PWQO (1 ng/L) and exceeded the PCB Threshold (10 ng/L). However, the result was within the range of Twelve Mile Creek non-source sites for wet events (1.5 to 22.4 ng/L, average 9.5 ng/L) (Benoit et al., 2016). For the rain event, the GM West Outfall total PCB result (23.7 ng/L) exceeded the PWQO and exceeded the PCB Threshold. The result was also slightly higher than the range of Twelve Mile Creek non-source sites for wet events. Based on the snow melt and rain events results, the average wet event total PCB concentration is 19.7 ng/L which exceeds the PCB Threshold, however, it is within the range of Twelve Mile Creek non-source sites for wet events (1.5 to 22.4 ng/L) (Benoit et al., 2016).

Benoit et al. (2016) developed a water quality PCB Threshold to differentiate potential source areas from background PCB conditions in urban areas using a minimum of three rain events to confirm the consistency of the results. It identified that event-based water quality sampling is a useful component of PCB assessments if used with other lines of evidence that provide evidence of exposure (ie. exposed biota such as mussels or passive samplers). Event based water quality sampling is limited since it only represents conditions at the time of sampling and may not reflect long term conditions. However, sampling on various occasions would identify a range of conditions that may exist with some consistency. Generally, two wet event sample results are not statistically definitive. However, the GM West Outfall was also sampled on six occasions during the Twelve Mile Creek Trackdown Study (Benoit and Dove, 2010) and the average results were relatively consistent with the two collected for this study. An additional sample was collected on December 1, 2020 to confirm that current conditions at the site have not changed the average PCB concentrations observed in this discharge and the results will be provided in an addendum to this report.

From an overall Twelve Mile Creek watershed remediation perspective, the GM West Outfall total PCB results can be compared to other tributaries in various stages of remediation as follows.

(i) Significant contamination was previously identified in the Beaverdams Creek and Lake Gibson area with average concentrations up to approximately 200 ng/L at some sampling locations (Benoit, personal communication 2020). As such, remediation of two sources of contaminated sediment in Beaver Dams Creek has resulted in the removal of 23,109 metric tonnes of PCB contaminated sediment along 1750 m of creek over three cleanup phases (Benoit et al., 2016)

(ii) Clifford Creek results had an average dry event concentration of 88 ng/L (range of 15 to 167 ng/L) and average wet event concentration of 458 ng/L (range of 144 to 795 ng/L) (Benoit and Dove, 2010). These concentrations were related to the Clifford Creek Park which is a former landfill site. The City has outlined a remediation workplan to address the elevated PCB concentrations from the Clifford Creek Park (City of St. Catharines, 2019).

(iii) Carter Creek results had an average dry event concentration of 32 ng/L (range of 25 to 46 ng/L) and average wet event concentration of 93 ng/L (range of 50 to 131 ng/L) (Benoit and Dove, 2010). These concentrations were related to the Garden City Golf Course which is a former landfill site. The City has outlined a workplan to investigate potential PCB sources at the Garden City Golf Course (AECOM, 2018).

In comparison to these Twelve Mile Creek tributaries, the GM West Outfall results are considered a less significant source. The GM West Outfall is not considered a continuous source like these other tributaries. The GM West Outfall total PCB average wet event concentration is 19.7 ng/L versus 458 ng/L and 93 ng/L as noted for Clifford and Carter Creeks respectively. As well, it is anticipated that the PCB loading (kg/day) from the GM West Outfall to Twelve Mile Creek would be less as it is not a continuous discharge, is anticipated to have smaller discharge flows and the average wet event PCB concentration is less.

The PCB results can also be assessed for congener patterns. PCB congeners are any of 209 different molecules of varying degrees of chlorination that are found in PCB mixtures such as Aroclors. The water quality samples were analyzed by the MECP lab using a congener-specific PCB analysis method. From these results, congener patterns can be compared for similarities between sample events and sites. Congener-specific methods can differentiate between sources despite the degradation and weathering of the original PCB mixtures. As well, a comparison of congener profiles between sites can indicate whether the PCB originate from a common source based on data and visual "fingerprinting" (Benoit et al., 2016).

The Twelve Mile Creek Trackdown Study (Benoit and Dove, 2010) included surface water quality results in Twelve Mile Creek at the GM Outfall (Station 206) in 2003. Station 206 is the same outfall location as the GM West Outfall in this assessment, however, Station 206 discharged non-contact cooling water and stormwater at that time. In 2003, Station 206 had a total PCB average of 34 ng/L for wet events and 10 ng/L for dry events. Congener patterns at Station 206 showed a distinct pattern that resembled those of Aroclors 1242 and 1248 which suggested a distinct source from the outfall. In 2000, Station 206 showed an increase in PCB concentrations in caged mussels relative to upstream sites which suggested that PCBs were contributing to exposure at this location. However, caged mussel results at Station 206 in 2003 did not provide a meaningful assessment since most concentrations were below quantification limits. In 2004, General Motors of Canada Ltd. (Spencer, 2004) assessed the plant's storm sewer discharges as requested by the Ontario Ministry of Environment. GM identified that the plant's storm sewer discharges were similar to upstream background concentrations in Twelve Mile Creek.

A comparison of congener patterns between the sampling locations can provide an indication of similarities (ie. signatures) and whether the PCB originate from a common source. As an additional assessment, congener patterns between events were compared for locations at which total PCB concentrations exceeded background conditions; the congener patterns were assessed against typical congener profiles for common Aroclors (Figure 2) (Benoit, personal communication 2020).

The GM West Outfall patterns for the snow melt and rain events are relatively similar, however, shifts in peaks of certain congeners may suggest an influence of suspended solids, or weathering of PCBs may have influenced congener profiles between sampling events. Suspended solids concentrations were low during the rain event (2.2 mg/L) suggesting minimal association of the PCBs with suspended solids, and a congener pattern that resembled a mixture of Aroclor 1242 and 1248. Congener patterns during the snow melt event resembled a mixture that included peaks resembling Aroclor 1254, however, the lack of suspended solids collection during the snow melt event preclude any further interpretation. It should also be noted that Aroclors 1242 and 1248 were also noted in samples collected in 2003 at Twelve Mile Creek at the GM Outfall (Benoit and Dove, 2010).

The City West Outfall congener patterns are relatively consistent for both events and suggest a mixture of Aroclors 1254 and 1248 that is different from that found at the GM West Outfall (Benoit, personal communication 2020).

Overall, the congener patterns between the GM West Outfall and the City West Outfall appear different which suggests two different signatures or two different sources. (Benoit, personal communication 2020)

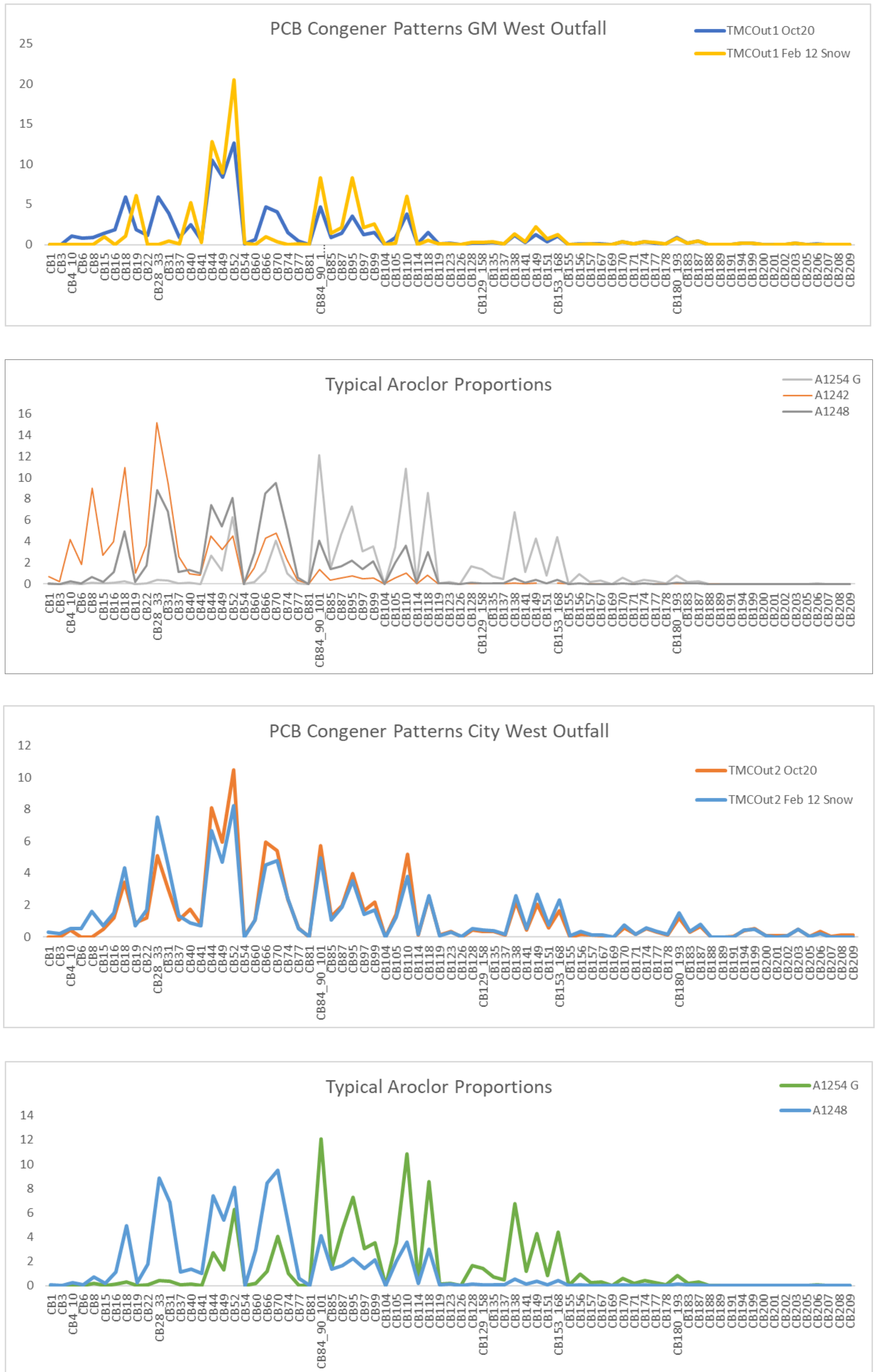

Figure 2: PCB Congener Patterns
PCB congener pattern distribution (%) during snow melt and rain events at GM West Outfall and City West Outfall. PCB congener pattern distributions (%) for Aroclors 1242, 1248 and 1254 presented for comparison purposes since they most closely resembled patterns at these locations. (Benoit, 2020)

8.0 Conclusions

The City of St. Catharines requested that the MECP assess any potential offsite environmental impacts including surface water from the former General Motors property located at 285 Ontario Street in the City of St. Catharines. As such, MECP Technical Support Surface Water completed surface water quality sampling of a former GM storm sewer outfall (GM West Outfall), a City storm sewer outfall (City West Outfall), and various upstream and downstream locations on Twelve Mile Creek. Surface water quality sampling was completed during a snow melt event on February 13, 2020, a dry event on September 23, 2020 and a rain event on October 20, 2020.

Overall, the GM West Outfall and City West Outfall general chemistry, metals, volatile organic compounds (VOC), acid base neutral (semi-volatile) and polycyclic aromatic hydrocarbons (PAH) results are not considered a surface water concern or were within typical ranges for urban stormwater.

MECP Technical Support Groundwater (Awad, personal communication 2020) also completed a review of previous reports and identified that there were no groundwater concerns. The review identified that predicted surface water concentrations in Twelve Mile Creek from the discharge of groundwater from the former GM property and slope area were very unlikely to exceed current Aquatic Protection Values. This is consistent with MECP surface water quality sampling results.

The Twelve Mile Creek total PCB results were all less than the PWQO and would not be considered a surface water concern. As well, the City West Outfall total PCB results would be considered a non-source and reflect typical urban area concentrations.

The GM West Outfall total PCB wet event average concentration exceeded the PWQO and the PCB Threshold. However, it is within the range of Twelve Mile Creek non-source sites for wet events. In comparison to other Twelve Mile Creek tributaries in various stages of PCB remediation, the GM West Outfall is considered a less significant source. The GM West Outfall congener signature is relatively different than the City West Outfall signature which suggests different sources.

9.0 Next Steps

The MECP completed additional PCB and solids sampling at the GM West Outfall and City West Outfall on December 1, 2020. The MECP will complete an addendum to this Technical Memorandum to provide and interpret the additional sampling results.

In addition, the MECP recently became aware of a storm sewer associated with the former GM East Tilt Plate Separator that is connected to the City storm sewer on Lowell Avenue which eventually outlets to Twelve Mile Creek. The East Tilt Plate Separator storm sewer was not identified in the GM Utilities report (CH2M Hill, 2012). On November 23, 2020, the MECP completed sampling of a storm sewer manhole associated with the former East Tilt Plate Separator, a City storm sewer manhole before the outlet to Twelve Mile Creek and Twelve Mile

Creek upstream and downstream of the City outfall. The City outfall was not sampled since it was partially underwater due to the water level of Twelve Mile Creek. The samples will be analysed by the MECP lab for all the parameters discussed in this memorandum. Results and interpretation will be provided in the addendum to the Technical Memorandum.

The Niagara District Office has requested that the current owner of the former GM property update the stormwater works (ie. Tilt Plate Separator) when the development of the property resumes. I am supportive of this action as it will include a consideration to control the source of PCBs on the property to decrease the concentration discharging to Twelve Mile Creek.

10.0 Acknowledgements

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11.0 References

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Tables

Table 1: Snow Melt Event February 13, 2020 Sampling Results

General Chemistry	Units	PWQO	TMC Upstr Far	TMC Upstream	GM West Outfall	City West Outfall	TMC Downstr	TMC Downstream Far	
Alkalinity (CaCO3)	mg/L		103	102	188	242	103	103	101
Conductivity	uS/cm		344	341	899	5370	351	348	352
pH		6.5 - 8.5	8.16	8.16	8.18	7.75	8.18	8.18	8.18

Metals	Units	PWQO	TMC Upstr Far	TMC Upstream	GM West Outfall	City West Outfall	TMC Downstr	TMC Downstream Far	
Arsenic	mg/L	0.1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Antimony	mg/L	0.02	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Selenium	mg/L	0.1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Silver	ug/L	0.1	<9	<9	<9	<9	<9	<9	<9
Aluminum	ug/L	75	52.5	54.3	41.7	167	62.4	70.6	53.1
Barium	ug/L		22.5	22.5	36.2	62.7	22.7	22.7	23
Beryllium	ug/L	1100	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Bismuth	ug/L		<5	<5	<5	<5	<5	<5	<5
Calcium	mg/L		37.5	37.4	102	100	37.6	37.7	35.3
Cadmium	ug/L	0.2	<0.8	<0.8	0.817	<0.8	<0.8	<0.8	<0.8
Cobalt	ug/L	0.9	<1	<1	<1	2.24	<1	<1	<1
Chromium	ug/L	1	<1	<1	<1	2.42	<1	<1	<1
Copper	ug/L	5	2.18	2.23	4.85	35.2	2.25	2.23	1.91
Iron	ug/L	300	52.9	53.2	332	391	56.2	59.8	51.3
Hardness	mg/L		133	133	354	349	135	134	129
Potassium	mg/L		1.56	1.57	9.89	8.37	1.6	1.58	1.59
Lithium	ug/L		7.28	7.48	16.2	25.4	6.31	5.99	<5
Magnesium	mg/L		9.65	9.62	24.1	24.1	10.1	9.67	9.83
Manganese	ug/L		3.05	3.03	31.7	67.7	3.09	3.13	2.86
Molybdenum	ug/L	40	<2	<2	<2	<2	<2	<2	<2
Sodium	mg/L		17.8	17.5	59.4	954	19.9	19.1	19.5
Nickel	ug/L	25	<2	<2	3.7	11.5	<2	<2	<2
Lead	ug/L	25	<7	<7	<7	<7	<7	<7	<7
Tin	ug/L		<9	<9	<9	<9	<9	<9	<9
Strontium	ug/L		207	208	702	593	209	210	209
Titanium	ug/L		1.44	1.64	1.38	0.984	1.9	2.01	1.6
Uranium	ug/L	5	<3	<3	<3	<3	<3	<3	<3
Vanadium	ug/L	6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Zinc	ug/L	30	2.38	2.22	20.2	93.3	2.76	7.07	2.49
Zirconium	ug/L	4	<1	<1	<1	<1	<1	<1	<1

Exceeds PWQO and/or CWQG

Note: “<value>” means less than the method detection limit

Volatile Organic Compounds	Units	PWQO	TMC Upstr Far	TMC Upstream	GM West Outfall	City West Outfall	TMC Downstr	TMC Downstream Far	
1,2-diethylbenzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2,4-trimethylbenzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,3-diethylbenzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2,3-trimethylbenzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,4-diethylbenzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,3,5-trimethylbenzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Benzene	ug/L	100	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Isopropyl benzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Ethylbenzene	ug/L	8	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
2-ethyltoluene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
m- and p-xylene	ug/L	2, 30	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-xylene	ug/L	40	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Isopropyl toluene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Styrene	ug/L	4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	ug/L	0.8	<0.2	<0.2	<0.2	**0.4**	<0.2	<0.2	<0.2
3-ethyltoluene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
4-ethyltoluene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Bromofluorobenzene	ug/L		**13**	**12**	**12**	**12**	**12**	**11**	**11**
d8-toluene	ug/L		**11**	**11**	**10**	**11**	**10**	**10**	**10**
Diisopropylether	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Fluorobenzene	ug/L		**5**	**5**	**5**	**5**	**5**	**5**	**5**
Methyl isobutyl ketone	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Tert-butyl methyl ether	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Propylbenzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Tetra-amyl-methyl ether	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,1,1-trichloroethane	ug/L	10	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,1,2,2-tetrachloroethane	ug/L	70	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,1,1,2-tetrachloroethane	ug/L	20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,1,2-trichloroethane	ug/L	800	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,1-dichloroethane	ug/L	200	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,1-dichloroethene	ug/L	40	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-dichloroethane	ug/L	100	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-dichloropropane	ug/L	0.7	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
cis-1,3-dichloropropene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
trans-1,3-dichloropropene	ug/L	7	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Bromodichloromethane	ug/L	200	<0.2	<0.2	<0.2	**0.5**	<0.2	<0.2	<0.2
Bromomethane	ug/L	0.9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromoform	ug/L	60	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Dibromochloromethane	ug/L		<0.2	<0.2	<0.2	**0.2**	<0.2	<0.2	<0.2
cis-1,2-dichloroethene	ug/L	200	<0.2	<0.2	**0.3**	<0.2	<0.2	<0.2	<0.2
Chloroethane	ug/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloromethane	ug/L	700	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroform	ug/L		<0.2	<0.2	<0.2	**1.6**	<0.2	<0.2	<0.2
Carbon tetrachloride	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Dichlorodifluoromethane	ug/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichloromethane	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
trans-1,2-dichloroethene	ug/L	200	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Trichlorofluoromethane	ug/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	ug/L	50	<0.2	<0.2	**0.2**	**0.4**	<0.2	<0.2	<0.2
Trichloroethene	ug/L	20	<0.2	<0.2	**0.7**	<0.2	<0.2	<0.2	<0.2
Chloroethene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-dichlorobenzene	ug/L	2.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,3-dichlorobenzene	ug/L	2.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,4-dichlorobenzene	ug/L	4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chlorobenzene	ug/L	15	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-dibromoethane	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Trihalomethanes; total	ug/L		<0.2	<0.2	<0.2	**2.4**	<0.2	<0.2	<0.2
Xylenes; total	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

Acid Base Neutrals (Semi-Volatiles)	Units	PWQO *CWQG*	TMC Upstr Far	TMC Upstream	GM West Outfall	City West Outfall	TMC Downstr	TMC Downstream Far	
Diphenylamine	ug/L	3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-dichlorophenol	ug/L	0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-dinitrotoluene	ug/L	4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-dimethylphenol	ug/L	10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-dinitrophenol	ug/L		<10	<10	<10	<10	<10	<10	<10
2,6-dichlorophenol	ug/L	0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,6-dinitrotoluene	ug/L	6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4,6-dinitro-o-cresol	ug/L	0.2	<10	<10	<10	<10	<10	<10	<10
4-bromophenyl-phenyl ether	ug/L	0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4-chlorophenyl-phenyl ether	ug/L	0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4-nitrophenol	ug/L	50	<0.5	<0.5	<0.5	**0.9**	<0.5	<0.5	<0.5
Bis(2-chloroethyl)ether	ug/L	200	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bis(2-chloroethoxy)methane	ug/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bis(2-chloroisopropyl)ether	ug/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Butylbenzylphthalate	ug/L	0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bis-2-ethylhexylphthalate	ug/L		<10	<10	<10	<10	<10	<10	<10
Camphene	ug/L	2	<0.5	<0.5	<0.5	**0.6**	<0.5	<0.5	<0.5
Di-n-butylphthalate	ug/L	19	<10	<10	<10	<10	<10	<10	<10
Di-n-octylphthalate	ug/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Diphenyl ether	ug/L	0.03	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
m-cresol	ug/L	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
N-nitroso-di-n-propylamine	ug/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
o-cresol	ug/L	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
p-chloro-m-cresol	ug/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
p-cresol	ug/L	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phenol	ug/L	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1-chloronaphthalene	ug/L	0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1-methylnaphthalene	ug/L	2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2-chloronaphthalene	ug/L	0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2-methylnaphthalene	ug/L	2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
5-nitroacenaphthene	ug/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	ug/L	***5.8***	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	ug/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	ug/L	0.0008	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)anthracene	ug/L	0.0004	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	ug/L	***0.015***	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b)fluoranthene	ug/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Biphenyl	ug/L	0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	ug/L	0.0002	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	ug/L	0.0001	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenzo(a,h)anthracene	ug/L	0.002	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	ug/L	0.0008	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	ug/L	0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g,h,i)perylene	ug/L	0.00002	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Indole	ug/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1,2,3-c,d)pyrene	ug/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	ug/L	7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Perylene	ug/L	0.00007	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	ug/L	0.03	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	ug/L	***0.025***	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2-chlorophenol	ug/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,3,4-trichlorophenol	ug/L	18	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,3,4,5-tetrachlorophenol	ug/L	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,3,4,6-tetrachlorophenol	ug/L	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,3,5-trichlorophenol	ug/L	18	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,3,5,6-tetrachlorophenol	ug/L	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4,5-trichlorophenol	ug/L	18	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

2,4,6-trichlorophenol	ug/L	18	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pentachlorophenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Polycyclic Aromatic Hydrocarbons	**Units**	**PWQO** ***CWQG***	**TMC Upstr Far**	**TMC Upstream**	**GM West Outfall**	**City West Outfall**	**TMC Downstr**	**TMC Downstream Far**	
1-methylnaphthalene	ng/L	2000	<10	<10	<10	<50	<10	<10	<10
2-methylnaphthalene	ng/L	2000	<10	<10	<10	<50	<10	<10	<10
Acenaphthene	ng/L	***5800***	<10	<10	<10	<50	<10	<10	<10
Acenaphthylene	ng/L		<10	<10	<10	<50	<10	<10	<10
Anthracene	ng/L	0.8 / ***12***	<10	<10	<10	<50	<10	<10	<10
Benz(a)anthracene	ng/L	0.4 / ***18***	<20	<20	<20	<100	<20	<20	<20
Benzo(a)pyrene	ng/L	***15***	<1	<1	<1	**33**	<1	<1	<1
Benzo(b)fluoranthene	ng/L		<10	<10	<10	**55**	<10	<10	<10
Benzo(e)pyrene	ng/L		<10	<10	<10	<50	<10	<10	<10
Benzo(k)fluoranthene	ng/L		<10	<10	<10	<50	<10	<10	<10
Chrysene	ng/L	0.1	<10	<10	<10	**93**	<10	<10	<10
Dibenz(a,h)anthracene	ng/L	2	<20	<20	<20	<100	<20	<20	<20
Fluoranthene	ng/L	0.8 / ***40***	<10	<10	<10	**210**	<10	<10	<10
Fluorene	ng/L	200 / ***3000***	<10	<10	<10	<50	<10	<10	<10
Benzo(g,h,i)perylene	ng/L	0.02	<20	<20	<20	<100	<20	<20	<20
Indeno(1,2,3-c,d)pyrene	ng/L		<20	<20	<20	<100	<20	<20	<20
Naphthalene	ng/L	7000/***1100***	<10	<10	<10	<50	<10	<10	<10
Perylene	ng/L	0.7	<10	<10	<10	<50	<10	<10	<10
Phenanthrene	ng/L	30 / ***400***	<10	<10	<10	**130**	<10	<10	<10
Pyrene	ng/L	***25***	<10	<10	<10	**180**	<10	<10	<10

Exceeds PWQO and/or CWQG

Notes: “<value” means less than the method detection limit
“bold italic criteria” means CWQG

Polychlorinated Biphenyls	**Units**	**PWQO**	**TMC Upstr Far**	**TMC Upstream**	**GM West Outfall**	**City West Outfall**	**TMC Downstr**	**TMC Downstream Far**	
PCB congeners; total	**ng/L**	**1**	**0.111**	**0.066**	**15.627**	**11.0231**	**<mdl**	**<mdl**	**<mdl**
2-monochloroPCB(1)	pg/L		<7.6	<6.2	<5.1	**31**	<4	<3.9	<2.2
4-monochloroPCB(3)	pg/L		<4.6	<5	<3.5	**24**	<4.5	<4	<2
2,3'-dichloroPCB(6)	pg/L		<11	<9	<8.3	**57**	<9	<10	<5
2,4'-dichloroPCB(8)	pg/L		<23	<18	<17	**180**	<17	<15	<15
4,4'-dichloroPCB(15)	pg/L		<11	<17	**150**	**81**	<13	<11	<16
2,2',3-trichloroPCB(16)	pg/L		<11	<9.1	<14	**170**	<6.6	<9.3	<6.4
2,2',5-trichloroPCB(18)	pg/L		<15	<16	**170**	**490**	<14	<15	<15
2,2',6-trichloroPCB(19)	pg/L		<7	<6	**960**	**81**	<6.4	<5.9	<4
2,3,4'-trichloroPCB(22)	pg/L		<6.2	<7.8	<7.9	**190**	<6.4	<5.8	<5.9
2,4',5-trichloroPCB(31)	pg/L		<14	<17	**73**	**510**	<15	<14	<11
3,4,4'-trichloroPCB(37)	pg/L		<7	<9.8	**18**	**150**	<4.8	<5.1	<4.8
2,2',3,3'-tetrachloroPCB(40)	pg/L		<6	<3.1	**820**	**99**	<3	<3.5	<4
2,2',3,4-tetrachloroPCB(41)	pg/L		<6	<5.1	**41**	**77**	<3	<2.5	<4
2,2',3,5'-tetrachloroPCB(44)	pg/L		<14	<15	**2000**	**750**	<11	<9.4	<11
2,2',4,5'-tetrachloroPCB(49)	pg/L		<9.3	<10	**1400**	**530**	<8.5	<6.1	<6.3
2,2',5,5'-tetrachloroPCB(52)	pg/L		<18	<27	**3200**	**930**	<13	<16	<15
2,2',6,6'-tetrachloroPCB(54)	pg/L		<4	<2	**25**	<3.5	<2	<2	<2
2,3,4,4'-tetrachloroPCB(60)	pg/L		<3.8	<7.6	<5.3	**120**	<2.6	<2.3	<1.7
2,3',4,4'-tetrachloroPCB(66)	pg/L		<7.6	<19	**150**	**510**	<7.3	<6.4	<5
2,3',4',5-tetrachloroPCB(70)	pg/L		<10	<24	**56**	**540**	<7.6	<8.1	<7.8

2,4,4',5-tetrachloroPCB(74)	pg/L		<5.7	<10	<18	**270**	<4.3	<3.8	<3.1
3,3',4,4'-tetrachloroPCB(77)	pg/L		<3	<3.8	**19**	**58**	<1.6	<1.2	<1.1
3,4,4',5-tetrachloroPCB(81)	pg/L		<1.7	<1.2	**3.9**	**4.1**	<0.9	<0.76	<0.5
PeClPCB(84)+PeCl(90)+PeCl(101)	pg/L		<17	<38	**1300**	**560**	<13	<12	<11
2,2',3,4,4'-pentachloroPCB(85)	pg/L		<2.9	<8.3	**220**	**120**	<2.9	<2.6	<1.2
2,2',3,4,5'-pentachloroPCB(87)	pg/L		<4.9	<12	**330**	**210**	<3.7	<3.5	<3.9
2,2',3,5',6-pentachloroPCB(95)	pg/L		<10	<19	**1300**	**400**	<8.7	<7.8	<8.6
2,2',3',4,5-pentachloroPCB(97)	pg/L		<4.1	<10	**330**	**160**	<2.7	<3.1	<2.9
2,2',4,4',5-pentachloroPCB(99)	pg/L		<3.9	<12	**400**	**190**	<3.7	<3.5	<2.8
2,2',4,6,6'-pentachloroPCB(104)	pg/L		<0.95	<1.3	<3	<3	<1	<0.9	<0.7
2,3,3',4,4'-pentachloroPCB(105)	pg/L		<6	<12	**29**	**140**	<2.7	<3.6	<2.8
2,3,3',4',6-pentachloroPCB(110)	pg/L		<12	<30	**940**	**430**	<8.3	<10	<8.8
2,3,4,4',5-pentachloroPCB(114)	pg/L		<2	<3.1	**5.6**	**19**	<1	<1	<0.8
2,3',4,4',5-pentachloroPCB(118)	pg/L		<8.8	**22**	**89**	**290**	<5.6	<6.3	<5.1
2,3',4,4',6-pentachloroPCB(119)	pg/L		<0.98	<0.8	**9.3**	**8.8**	<0.9	<0.7	<0.5
2',3,4,4',5-pentachloroPCB(123)	pg/L		<2.8	<4.1	**19**	**31**	<1.2	<1.4	<0.8
3,3',4,4',5-pentachloroPCB(126)	pg/L		<3.8	<2	<2	**5.2**	<1	<1	<0.9
2,2',3,3',4,4'-hexachloroPCB(128)	pg/L		<6.5	<6.1	**43**	**58**	<2.3	<1.5	<1.5
2,2',3,3',5,6'-hexachloroPCB(135)	pg/L		<4.2	<5.5	**54**	**46**	<1.9	<1.4	<1.9
2,2',3,4,4',5-hexachloroPCB(137)	pg/L		<1.7	<3.3	**11**	**16**	<2	<0.7	<0.5
2,2',3,4,4',5'-hexachloroPCB(138)	pg/L		<21	**32**	**210**	**290**	<6.8	<7.5	<6.1
2,2',3,4,5,5'-hexachloroPCB(141)	pg/L		<4.6	<6.9	**53**	**61**	<2	<1.4	<1.1
2,2',3,4',5',6-hexachloroPCB(149)	pg/L		<13	<35	**340**	**300**	<6.8	<6.4	<8.5
2,2',3,5,5',6-hexachloroPCB(151)	pg/L		<8	<12	**110**	**86**	<3	<2.6	<2.1
2,2',4,4',6,6'-hexachloroPCB(155)	pg/L		<1.1	<0.74	<0.8	**6.8**	<0.41	<0.8	<0.36
2,3,3',4,4',5-hexachloroPCB(156)	pg/L		**7.7**	<4.4	**6.5**	**37**	<2	<0.97	<1
2,3,3',4,4',5'-hexachloroPCB(157)	pg/L		<4.2	<2.7	**8.1**	**13**	<2	<0.7	<0.44
22'33'45(129)+233'44'6-HxClPCB(158)	pg/L		<6.2	<7.7	**37**	**51**	<2.4	<1.4	<1.1
2,3',4,4',5,5'-hexachloroPCB(167)	pg/L		<4.2	<2	**6.6**	**14**	<1	<0.81	<0.59
22'44'55'(153)+23'44'5'6-HxClPCB(168)	pg/L		<16	<29	**190**	**260**	<6	<5.8	<6.5
3,3',4,4',5,5'-hexachloroPCB(169)	pg/L		<2	<2	<1	<4	<2	<0.9	<0.6
2,2',3,3',4,4',5-heptachloroPCB(170)	pg/L		**27**	<8	**59**	**82**	<1.6	<1.9	<2.9
2,2',3,3',4,4',6-heptachloroPCB(171)	pg/L		<4.7	<2.8	**15**	**18**	<0.9	<0.5	<1.2
2,2',3,3',4,5,6'-heptachloroPCB(174)	pg/L		<9.9	<8.6	**60**	**63**	<2.2	<2	<2.5
2,2',3,3',4',5,6-heptachloroPCB(177)	pg/L		<6.4	<4.2	**36**	**38**	<1.5	<1.4	<1.2
2,2',3,3',5,5',6-heptachloroPCB(178)	pg/L		<3	<3.2	**13**	**19**	<0.8	<1.1	<0.52
2,2',3,4,4',5',6-heptachloroPCB(183)	pg/L		<4.4	<4.7	**33**	**36**	<1	<0.87	<1.3
2,2',3,4',5,5',6-heptachloroPCB(187)	pg/L		<7.8	**12**	**70**	**89**	<1.8	<2.2	<2
2,2',3,4',5,6,6'-heptachloroPCB(188)	pg/L		<2	<0.88	<0.52	<2	<0.5	<0.4	<0.3
2,3,3',4,4',5,5'-heptachloroPCB(189)	pg/L		<2.9	<1.6	<3	<5.1	<1.2	<0.5	<0.5
2,3,3',4,4',5',6-heptachloroPCB(191)	pg/L		<2.2	<1.2	<2.7	<4	<0.7	<0.4	<0.3
22'344'55'(180)+233'4'55'6-HpClPCB(193)	pg/L		**40**	<14	**120**	**170**	<3.5	<2.9	<4
2,2',3,3',4,4',5,5'-octachloroPCB(194)	pg/L		**16**	<4.2	**30**	**47**	<2	<2.8	<2.7
2,2',3,3',4,5,5',6'-octachloroPCB(199)	pg/L		**16**	<6	**31**	**56**	<2.1	<1.7	<2.5
2,2',3,3',4,5,6,6'-octachloroPCB(200)	pg/L		<4	<0.6	<4.4	**7.4**	<0.9	<0.6	<0.5
2,2',3,3',4,5',6,6'-octachloroPCB(201)	pg/L		<2.4	<1.9	<3.5	<6.7	<0.9	<0.6	<0.5
2,2',3,3',5,5',6,6'-octachloroPCB(202)	pg/L		<2.2	<2	<6	**9.7**	<0.94	<0.6	<0.4
2,2',3,4,4',5,5',6-octachloroPCB(203)	pg/L		**12**	<4.7	**33**	**53**	<2.5	<1.4	<1.8
2,3,3',4,4',5,5',6-octachloroPCB(205)	pg/L		<2.1	<1.1	<2	**5.1**	<1	<0.9	<0.6
22'33'44'55'6-nonachloroPCB(206)	pg/L		<6.3	<1.9	<7.5	**24**	<2	<1	<0.77
22'33'44'566'-nonachloroPCB(207)	pg/L		<1.4	<0.7	<1.3	<4.7	<1	<0.6	<0.4
22'33'455'66'-nonachloroPCB(208)	pg/L		<1.6	<2	<1.4	<6.3	<1.1	<0.7	<0.44
DecachloroPCB(209)	pg/L		<1.9	<2.9	<2.5	<7.5	<2.5	<2	<2.5
244'-triClPCB(28)+2'34-triClPCB(33)	pg/L		<26	<33	<66	**850**	<23	<21	<22
2,2'-dichloroPCB(4)+2,6-dichloroPCB(10)	pg/L		<18	<28	<26	**57**	<11	<12	<13

Exceeds PWQO and/or CWQG

Note: “<value” means less than the method detection limit

Table 2: Dry Event September 23, 2020 Sampling Results

General Chemistry	Units	PWQO	TMC Upstr Far	TMC Upstream	GM West Outfall	City West Outfall	TMC Downstr	TMC Downstream Far	
Alkalinity (CaCO3)	mg/L		94.2	96		96.3	95.8	94.2	95.2
Conductivity	uS/cm		280	277		288	282	280	281
pH		6.5 - 8.5	8.33	8.31		8.35	8.33	8.33	8.33
Suspended Solids	mg/L		6.2	6.6		6.2	5.9	5.4	7.7
Total Solids	mg/L		178	173		174	177	174	174
Dissolved Solids	mg/L		172	166		168	171	169	166

Metals	Units	PWQO	TMC Upstr Far	TMC Upstream	GM West Outfall	City West Outfall	TMC Downstr	TMC Downstream Far	
Arsenic	mg/L	0.1	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001
Antimony	mg/L	0.02	<0.0005	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005
Selenium	mg/L	0.1	<0.005	<0.005		<0.005	<0.005	<0.005	<0.005
Silver	ug/L	0.1	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Aluminum	ug/L	75	91.1	131		81.3	102	127	133
Barium	ug/L		22.2	22.2		23.1	22.1	22.5	22.4
Beryllium	ug/L	1100	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1
Bismuth	ug/L		<5	<5		<5	<5	<5	<5
Calcium	mg/L		30.5	31		33.4	31	30.5	30.7
Cadmium	ug/L	0.2	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Cobalt	ug/L	0.9	<1	<1		<1	<1	<1	<1
Chromium	ug/L	1	<1	<1		<1	<1	<1	<1
Copper	ug/L	5	2.11	2.11		2.23	2.04	2.04	2.02
Iron	ug/L	300	92.7	112		86.2	96.5	112	111
Hardness	mg/L		112	114		124	114	112	113
Potassium	mg/L		1.49	1.5		1.98	1.52	1.5	1.5
Lithium	ug/L		<5	<5		6.71	5.39	<5	<5
Magnesium	mg/L		8.73	8.78		9.74	8.82	8.77	8.75
Manganese	ug/L		5.51	5.91		5.45	5.38	5.49	5.56
Molybdenum	ug/L	40	1	1		1.1	0.9	1	0.9
Sodium	mg/L		11.3	11.1		17.8	11.6	11.1	11.1
Nickel	ug/L	25	<2	<2		<2	<2	<2	<2
Lead	ug/L	25	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Tin	ug/L		<9	<9		<9	<9	<9	<9
Strontium	ug/L		164	164		187	166	162	163
Titanium	ug/L		4.08	5.84		3.14	3.77	4.84	7.13
Uranium	ug/L	5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Vanadium	ug/L	6	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Zinc	ug/L	30	<2	<2		<2	<2	<2	<2
Zirconium	ug/L	4	<1	<1		<1	<1	<1	<1

Exceeds PWQO and/or CWQG

Note: “<value” means less than the method detection limit

Volatile Organic Compounds	Units	PWQO	TMC Upstr Far	TMC Upstream	GM West Outfall	City West Outfall	TMC Downstr	TMC Downstream Far	
1,2-diethylbenzene	ug/L		<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
1,2,4-trimethylbenzene	ug/L		<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
1,3-diethylbenzene	ug/L		<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
1,2,3-trimethylbenzene	ug/L		<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
1,4-diethylbenzene	ug/L		<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
1,3,5-trimethylbenzene	ug/L		<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
Benzene	ug/L	100	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
Isopropyl benzene	ug/L		<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
Ethylbenzene	ug/L	8	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
2-ethyltoluene	ug/L		<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
m- and p-xylene	ug/L	2, 30	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
o-xylene	ug/L	40	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
Isopropyl toluene	ug/L		<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
Styrene	ug/L	4	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
Toluene	ug/L	0.8	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
3-ethyltoluene	ug/L		<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
4-ethyltoluene	ug/L		<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
Bromofluorobenzene	ug/L		<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
d8-toluene	ug/L		<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
Diisopropylether	ug/L		<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
Fluorobenzene	ug/L		<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
Methyl isobutyl ketone	ug/L		<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
Tert-butyl methyl ether	ug/L		<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
Propylbenzene	ug/L		<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
Tetra-amyl-methyl ether	ug/L		<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
1,1,1-trichloroethane	ug/L	10	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
1,1,2,2-tetrachloroethane	ug/L	70	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
1,1,1,2-tetrachloroethane	ug/L	20	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
1,1,2-trichloroethane	ug/L	800	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
1,1-dichloroethane	ug/L	200	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
1,1-dichloroethene	ug/L	40	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
1,2-dichloroethane	ug/L	100	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
1,2-dichloropropane	ug/L	0.7	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
cis-1,3-dichloropropene	ug/L		<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
trans-1,3-dichloropropene	ug/L	7	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
Bromodichloromethane	ug/L	200	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
Bromomethane	ug/L	0.9	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Bromoform	ug/L	60	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
Dibromochloromethane	ug/L		<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
cis-1,2-dichloroethene	ug/L	200	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
Chloroethane	ug/L		<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Chloromethane	ug/L	700	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Chloroform	ug/L		<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
Carbon tetrachloride	ug/L		<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
Dichlorodifluoromethane	ug/L		<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Dichloromethane	ug/L		<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
trans-1,2-dichloroethene	ug/L	200	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
Trichlorofluoromethane	ug/L		<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	ug/L	50	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
Trichloroethene	ug/L	20	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
Chloroethene	ug/L		<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
1,2-dichlorobenzene	ug/L	2.5	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
1,3-dichlorobenzene	ug/L	2.5	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
1,4-dichlorobenzene	ug/L	4	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
Chlorobenzene	ug/L	15	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
1,2-dibromoethane	ug/L		<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
Trihalomethanes; total	ug/L		<0.2	<0.2		<0.2	<0.2	<0.2	<0.2
Xylenes; total	ug/L		<0.2	<0.2		<0.2	<0.2	<0.2	<0.2

Acid Base Neutrals (Semi-Volatiles)	Units	PWQO *CWQG*	TMC Upstr Far	TMC Upstream	GM West Outfall	City West Outfall	TMC Downstr	TMC Downstream Far	
Diphenylamine	ug/L	3	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
2,4-dichlorophenol	ug/L	0.2	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
2,4-dinitrotoluene	ug/L	4	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
2,4-dimethylphenol	ug/L	10	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
2,4-dinitrophenol	ug/L		<10	<10		<10	<10	<10	<10
2,6-dichlorophenol	ug/L	0.2	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
2,6-dinitrotoluene	ug/L	6	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
4,6-dinitro-o-cresol	ug/L	0.2	<10	<10		<10	<10	<10	<10
4-bromophenyl-phenyl ether	ug/L	0.05	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
4-chlorophenyl-phenyl ether	ug/L	0.05	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
4-nitrophenol	ug/L	50	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Bis(2-chloroethyl)ether	ug/L	200	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Bis(2-chloroethoxy)methane	ug/L		<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Bis(2-chloroisopropyl)ether	ug/L		<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Butylbenzylphthalate	ug/L	0.2	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Bis-2-ethylhexylphthalate	ug/L		<10	<10		<10	<10	<10	<10
Camphene	ug/L	2	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Di-n-butylphthalate	ug/L	19	<10	<10		<10	<10	<10	<10
Di-n-octylphthalate	ug/L		<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Diphenyl ether	ug/L	0.03	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
m-cresol	ug/L	1	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
N-nitroso-di-n-propylamine	ug/L		<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
o-cresol	ug/L	1	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
p-chloro-m-cresol	ug/L		<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
p-cresol	ug/L	1	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Phenol	ug/L	5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
1-chloronaphthalene	ug/L	0.1	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
1-methylnaphthalene	ug/L	2	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
2-chloronaphthalene	ug/L	0.2	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
2-methylnaphthalene	ug/L	2	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
5-nitroacenaphthene	ug/L		<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Acenaphthene	ug/L	***5.8***	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Acenaphthylene	ug/L		<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Anthracene	ug/L	0.0008	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Benzo(a)anthracene	ug/L	0.0004	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	ug/L	***0.015***	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Benzo(b)fluoranthene	ug/L		<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Biphenyl	ug/L	0.2	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	ug/L	0.0002	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Chrysene	ug/L	0.0001	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Dibenzo(a,h)anthracene	ug/L	0.002	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Fluoranthene	ug/L	0.0008	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Fluorene	ug/L	0.2	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Benzo(g,h,i)perylene	ug/L	0.00002	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Indole	ug/L		<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Indeno(1,2,3-c,d)pyrene	ug/L		<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Naphthalene	ug/L	7	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Perylene	ug/L	0.00007	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Phenanthrene	ug/L	0.03	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Pyrene	ug/L	***0.025***	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
2-chlorophenol	ug/L		<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
2,3,4-trichlorophenol	ug/L	18	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
2,3,4,5-tetrachlorophenol	ug/L	1	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
2,3,4,6-tetrachlorophenol	ug/L	1	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
2,3,5-trichlorophenol	ug/L	18	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
2,3,5,6-tetrachlorophenol	ug/L	1	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
2,4,5-trichlorophenol	ug/L	18	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5

2,4,6-trichlorophenol	ug/L	18	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
Pentachlorophenol	ug/L	0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5

Polycyclic Aromatic Hydrocarbons	**Units**	**PWQO** ***CWQG***	**TMC Upstr Far**	**TMC Upstream**	**GM West Outfall**	**City West Outfall**	**TMC Downstr**	**TMC Downstream Far**	
1-methylnaphthalene	ng/L	2000	<10	<10		<10	<10	<10	<10
2-methylnaphthalene	ng/L	2000	<10	<10		<10	<10	<10	<10
Acenaphthene	ng/L	***5800***	<10	<10		<10	<10	<10	<10
Acenaphthylene	ng/L		<10	<10		<10	<10	<10	<10
Anthracene	ng/L	0.8 / ***12***	<10	<10		<10	<10	<10	<10
Benz(a)anthracene	ng/L	0.4 / ***18***	<20	<20		<20	<20	<20	<20
Benzo(a)pyrene	ng/L	***15***	<2	<2		<2	<2	<2	<2
Benzo(b)fluoranthene	ng/L		<10	<10		<10	<10	<10	<10
Benzo(e)pyrene	ng/L		<10	<10		<10	<10	<10	<10
Benzo(k)fluoranthene	ng/L		<10	<10		<10	<10	<10	<10
Chrysene	ng/L	0.1	<10	<10		<10	<10	<10	<10
Dibenz(a,h)anthracene	ng/L	2	<20	<20		<20	<20	<20	<20
Fluoranthene	ng/L	0.8 / ***40***	<10	<10		<10	<10	<10	<10
Fluorene	ng/L	200 / ***3000***	<10	<10		<10	<10	<10	<10
Benzo(g,h,i)perylene	ng/L	0.02	<20	<20		<20	<20	<20	<20
Indeno(1,2,3-c,d)pyrene	ng/L		<20	<20		<20	<20	<20	<20
Naphthalene	ng/L	7000/***1100***	<10	<10		<10	<10	<10	<10
Perylene	ng/L	0.7	<10	<10		<10	<10	<10	<10
Phenanthrene	ng/L	30 / ***400***	<10	<10		<10	<10	<10	<10
Pyrene	ng/L	***25***	<10	<10		<10	<10	<10	<10

Exceeds PWQO and/or CWQG

Notes: “<value” means less than the method detection limit
“bold italic criteria” means CWQG

Polychlorinated Biphenyls	**Units**	**PWQO**	**TMC Upstr Far**	**TMC Upstream**	**GM West Outfall**	**City West Outfall**	**TMC Downstr**	**TMC Downstream Far**	
PCB congeners; total	**ng/L**	**1**	**0.2755**	**0.08574**		**0.9152**	**0.092**	**0.2078**	**0.214**
2-monochloroPCB(1)	pg/L		<4	<3.8		**7**	<4.2	<4.4	<3.1
4-monochloroPCB(3)	pg/L		<3.1	<2.8		<2.6	<3.6	<2.4	<2
2,3'-dichloroPCB(6)	pg/L		<7.1	<5.7		<7.8	<9.1	<16	<8.9
2,4'-dichloroPCB(8)	pg/L		<23	<16		<19	<17	<19	<18
4,4'-dichloroPCB(15)	pg/L		<13	<9.4		<12	<12	<10	<9
2,2',3-trichloroPCB(16)	pg/L		<7.9	<7.7		<10	<5.9	<7.2	<7.4
2,2',5-trichloroPCB(18)	pg/L		<25	<23		**40**	<22	<28	<24
2,2',6-trichloroPCB(19)	pg/L		**6.9**	**4.6**		**9.3**	**5.5**	**6.2**	**4.8**
2,3,4'-trichloroPCB(22)	pg/L		<7.8	<6.3		<12	<7.5	<6.8	<7.7
2,4',5-trichloroPCB(31)	pg/L		<24	<22		**38**	<23	<26	<24
3,4,4'-trichloroPCB(37)	pg/L		<6.3	<5.6		**11**	<6.7	<5.4	<6
2,2',3,3'-tetrachloroPCB(40)	pg/L		<3.5	<3.7		**10**	<4.2	<3	<3.6
2,2',3,4-tetrachloroPCB(41)	pg/L		<3	<2.1		<4	<2.3	<3	<3
2,2',3,5'-tetrachloroPCB(44)	pg/L		**22**	<16		**49**	<16	<20	**23**
2,2',4,5'-tetrachloroPCB(49)	pg/L		<16	**17**		**38**	<15	<15	<22
2,2',5,5'-tetrachloroPCB(52)	pg/L		**34**	**30**		**74**	**32**	**35**	**31**
2,2',6,6'-tetrachloroPCB(54)	pg/L		<2	<1		<2	<2	<2	<1
2,3,4,4'-tetrachloroPCB(60)	pg/L		<3	<2.6		**6.6**	<2.7	<3.6	<3
2,3',4,4'-tetrachloroPCB(66)	pg/L		**14**	<12		**40**	**14**	**16**	**15**
2,3',4',5-tetrachloroPCB(70)	pg/L		**21**	<15		**44**	<16	**18**	**18**

2,4,4',5-tetrachloroPCB(74)	pg/L		**8.4**	<6.2		**18**	<6.8	**9.1**	**9**
3,3',4,4'-tetrachloroPCB(77)	pg/L		**1.7**	<1.2		**4.9**	<1	**1.4**	<1.4
3,4,4',5-tetrachloroPCB(81)	pg/L		<0.5	<0.9		<0.8	<0.9	<0.8	<1
PeClPCB(84)+PeCl(90)+PeCl(101)	pg/L		**34**	<25		**57**	<25	<31	<28
2,2',3,4,4'-pentachloroPCB(85)	pg/L		<3.4	<3.8		**11**	<3.9	<3.6	<4.1
2,2',3,4,5'-pentachloroPCB(87)	pg/L		**8.9**	<7.6		**20**	<8.2	**8.9**	**9.5**
2,2',3,5',6-pentachloroPCB(95)	pg/L		<22	<20		**40**	<21	<20	<23
2,2',3',4,5-pentachloroPCB(97)	pg/L		**7.4**	<4.6		**15**	<6.9	<6	<7.2
2,2',4,4',5-pentachloroPCB(99)	pg/L		**9.3**	<7.6		**18**	<6.8	<8.2	<8.5
2,2',4,6,6'-pentachloroPCB(104)	pg/L		<1	<0.8		<0.5	<0.7	<0.6	<0.8
2,3,3',4,4'-pentachloroPCB(105)	pg/L		**6.9**	<5.6		**16**	<5.9	**7**	**6.7**
2,3,3',4',6-pentachloroPCB(110)	pg/L		**26**	<20		**52**	**21**	**24**	**25**
2,3,4,4',5-pentachloroPCB(114)	pg/L		<0.8	<0.7		**1.7**	<1	<1.1	<1
2,3',4,4',5-pentachloroPCB(118)	pg/L		**18**	<12		**32**	<12	<16	<16
2,3',4,4',6-pentachloroPCB(119)	pg/L		<0.6	<0.6		<0.9	<1	<0.8	<1
2',3,4,4',5-pentachloroPCB(123)	pg/L		<2	<2		<3.5	<2.2	<1.8	<1.7
3,3',4,4',5-pentachloroPCB(126)	pg/L		<0.9	<0.8		<0.87	<1	<0.8	<1
2,2',3,3',4,4'-hexachloroPCB(128)	pg/L		<2.8	<2.4		**6.9**	<2.6	<3.7	<2.9
2,2',3,3',5,6'-hexachloroPCB(135)	pg/L		<3.1	<3		**4.8**	<3.3	**4.3**	<3.9
2,2',3,4,4',5-hexachloroPCB(137)	pg/L		<1.1	<0.8		**2.6**	<0.79	<1.1	<1
2,2',3,4,4',5'-hexachloroPCB(138)	pg/L		**20**	<17		**32**	<15	**18**	**19**
2,2',3,4,5,5'-hexachloroPCB(141)	pg/L		<3.8	<3.4		**7.1**	<3.1	**4.7**	<4
2,2',3,4',5',6-hexachloroPCB(149)	pg/L		<22	<18		**33**	<19	<23	<22
2,2',3,5,5',6-hexachloroPCB(151)	pg/L		<7.2	<7.8		<11	<5.5	<7.3	<6.6
2,2',4,4',6,6'-hexachloroPCB(155)	pg/L		<0.6	<0.3		<0.32	<2	<0.2	<0.4
2,3,3',4,4',5-hexachloroPCB(156)	pg/L		<2	**1.3**		**3.4**	**1.5**	**1.8**	**2**
2,3,3',4,4',5'-hexachloroPCB(157)	pg/L		<0.92	**0.87**		<1.5	<0.71	<0.98	<1
22'33'45(129)+233'44'6-HxClPCB(158)	pg/L		<4	<2.3		**6.7**	<2.2	<3.4	<4.1
2,3',4,4',5,5'-hexachloroPCB(167)	pg/L		<1	<0.86		**1.9**	<0.58	<0.6	<0.95
22'44'55'(153)+23'44'5'6-HxClPCB(168)	pg/L		**19**	<14		**31**	<14	**17**	**18**
3,3',4,4',5,5'-hexachloroPCB(169)	pg/L		<0.9	<0.8		<0.6	<0.5	<0.7	<1
2,2',3,3',4,4',5-heptachloroPCB(170)	pg/L		<3	**4.6**		**6.6**	<3.5	<3.9	<3.4
2,2',3,3',4,4',6-heptachloroPCB(171)	pg/L		<2	<0.99		<2.5	<1	<2	<1.6
2,2',3,3',4,5,6'-heptachloroPCB(174)	pg/L		<3.6	<3.9		**8.2**	<3.4	<5.9	**6**
2,2',3,3',4',5,6-heptachloroPCB(177)	pg/L		<2.5	<2.4		**4.8**	<1.4	<2.3	**3.1**
2,2',3,3',5,5',6-heptachloroPCB(178)	pg/L		<2	**0.77**		<1.4	<0.7	<1.4	<1.1
2,2',3,4,4',5',6-heptachloroPCB(183)	pg/L		<3.1	<3.1		**4.7**	<1.9	<3.2	<3.3
2,2',3,4',5,5',6-heptachloroPCB(187)	pg/L		<5.1	<5.8		**11**	<4.4	**6.6**	**6.9**
2,2',3,4',5,6,6'-heptachloroPCB(188)	pg/L		<1	<0.5		<0.6	<0.6	<0.7	<0.7
2,3,3',4,4',5,5'-heptachloroPCB(189)	pg/L		<0.7	<0.6		<0.6	<0.5	<0.5	<0.5
2,3,3',4,4',5',6-heptachloroPCB(191)	pg/L		<1	<0.4		<0.5	<0.6	<0.7	<0.8
22'344'55'(180)+233'4'55'6-HpClPCB(193)	pg/L		<7.1	**9.6**		**15**	<5.8	**11**	<8.2
2,2',3,3',4,4',5,5'-octachloroPCB(194)	pg/L		<2.5	<3.5		<4	<2	<3	<2.1
2,2',3,3',4,5,5',6'-octachloroPCB(199)	pg/L		<3.2	<2.3		<5.4	<2.4	<5.2	<3.9
2,2',3,3',4,5,6,6'-octachloroPCB(200)	pg/L		<0.82	<0.73		<0.9	<0.8	<0.95	<1
2,2',3,3',4,5',6,6'-octachloroPCB(201)	pg/L		<0.6	<0.5		<0.95	<0.8	<0.66	<1
2,2',3,3',5,5',6,6'-octachloroPCB(202)	pg/L		<1.8	<0.65		<1.1	<0.74	<0.99	<1
2,2',3,4,4',5,5',6-octachloroPCB(203)	pg/L		<1.8	<2.8		<3.7	<1.2	<3.3	<2.8
2,3,3',4,4',5,5',6-octachloroPCB(205)	pg/L		<0.7	<0.5		<0.5	<0.5	<0.9	<0.9
22'33'44'55'6-nonachloroPCB(206)	pg/L		<1	<1.1		<1.7	<0.9	**1.8**	<1
22'33'44'566'-nonachloroPCB(207)	pg/L		<0.6	<0.5		<0.6	<0.6	<0.7	<0.7
22'33'455'66'-nonachloroPCB(208)	pg/L		<0.73	<0.65		<0.65	<0.6	<0.81	<0.8
DecachloroPCB(209)	pg/L		<2	<1.8		<3.2	<2.1	<2.5	<1.6
244'-triClPCB(28)+2'34-triClPCB(33)	pg/L		<38	<34		**60**	<32	<37	<39
2,2'-dichloroPCB(4)+2,6-dichloroPCB(10)	pg/L		**18**	**17**		**23**	**18**	**17**	**17**

Exceeds PWQO

Note: "<value" means less than the method detection limit

Table 3: Rain Event October 20, 2020 Sampling Results

General Chemistry	Units	PWQO	TMC Upstr Far	TMC Upstream	GM West Outfall	City West Outfall	TMC Downstr	TMC Downstream Far	
Alkalinity (CaCO3)	mg/L		98.4	97	133	214	96.9	97.6	96.7
Conductivity	uS/cm		290	292	525	1380	290	289	291
pH		6.5 - 8.5	8.23	8.24	8.2	8.31	8.25	8.25	8.26
Suspended Solids	mg/L		12.4	10.7	2.2	2.2	11.4	11.2	11.2
Total Solids	mg/L		181	183	339	860	179	179	176
Dissolved Solids	mg/L		168	172	336	857	167	167	164

Metals	Units	PWQO	TMC Upstr Far	TMC Upstream	GM West Outfall	City West Outfall	TMC Downstr	TMC Downstream Far	
Arsenic	mg/L	0.1	<0.001	<0.001	<0.001	0.0011	<0.001	<0.001	<0.001
Antimony	mg/L	0.02	<0.0005	<0.0005	0.002	0.0019	<0.0005	<0.0005	<0.0005
Selenium	mg/L	0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	ug/L	0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Aluminum	ug/L	75	145	174	33.2	65.6	165	180	180
Barium	ug/L		22.4	22.7	34.2	42.9	23	22.9	22.8
Beryllium	ug/L	1100	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Bismuth	ug/L		<5	<5	<5	<5	<5	<5	<5
Calcium	mg/L		33.2	33	53.3	83	31.5	31.6	32
Cadmium	ug/L	0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cobalt	ug/L	0.9	<1	<1	<1	<1	<1	<1	<1
Chromium	ug/L	1	<1	<1	1.26	2.37	<1	<1	<1
Copper	ug/L	5	2.63	2.53	7.08	8.46	2.25	2.31	2.41
Iron	ug/L	300	126	142	55.1	74.7	130	148	145
Hardness	mg/L		120	119	193	320	115	115	117
Potassium	mg/L		1.59	1.61	7.12	13.9	1.61	1.63	1.61
Lithium	ug/L		6.49	<5	15.9	42.5	<5	<5	5.67
Magnesium	mg/L		8.93	8.95	14.6	27.3	8.85	8.85	8.9
Manganese	ug/L		8.7	8.44	8.99	4.49	8.32	8.67	8.72
Molybdenum	ug/L	40	0.9	0.9	3	5.2	0.9	0.9	0.9
Sodium	mg/L		11.3	11.3	30.6	157	11.2	11.5	11
Nickel	ug/L	25	<2	<2	<2	2.4	<2	<2	<2
Lead	ug/L	25	<0.5	<0.5	0.5	<0.5	<0.5	<0.5	<0.5
Tin	ug/L		<9	<9	<9	<9	<9	<9	<9
Strontium	ug/L		165	163	358	612	163	166	164
Titanium	ug/L		4.95	6.4	1.54	2.41	6.47	6.34	6.59
Uranium	ug/L	5	<0.5	<0.5	0.6	1.4	<0.5	<0.5	<0.5
Vanadium	ug/L	6	<0.5	<0.5	0.5	1.3	<0.5	<0.5	<0.5
Zinc	ug/L	30	4.8	3.1	17.6	15	2.43	<2	3.2
Zirconium	ug/L	4	<1	<1	<1	<1	<1	<1	<1

(shaded) Exceeds PWQO and/or CWQG

Note: “<value” means less than the method detection limit

Volatile Organic Compounds	Units	PWQO	TMC Upstr Far	TMC Upstream	GM West Outfall	City West Outfall	TMC Downstr	TMC Downstream Far	
1,2-diethylbenzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2,4-trimethylbenzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,3-diethylbenzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2,3-trimethylbenzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,4-diethylbenzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,3,5-trimethylbenzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Benzene	ug/L	100	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Isopropyl benzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Ethylbenzene	ug/L	8	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
2-ethyltoluene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
m- and p-xylene	ug/L	2, 30	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-xylene	ug/L	40	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Isopropyl toluene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Styrene	ug/L	4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	ug/L	0.8	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
3-ethyltoluene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
4-ethyltoluene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Bromofluorobenzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
d8-toluene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Diisopropylether	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Fluorobenzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Methyl isobutyl ketone	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Tert-butyl methyl ether	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Propylbenzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Tetra-amyl-methyl ether	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,1,1-trichloroethane	ug/L	10	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,1,2,2-tetrachloroethane	ug/L	70	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,1,1,2-tetrachloroethane	ug/L	20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,1,2-trichloroethane	ug/L	800	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,1-dichloroethane	ug/L	200	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,1-dichloroethene	ug/L	40	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-dichloroethane	ug/L	100	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-dichloropropane	ug/L	0.7	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
cis-1,3-dichloropropene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
trans-1,3-dichloropropene	ug/L	7	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Bromodichloromethane	ug/L	200	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Bromomethane	ug/L	0.9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromoform	ug/L	60	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Dibromochloromethane	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
cis-1,2-dichloroethene	ug/L	200	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chloroethane	ug/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloromethane	ug/L	700	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroform	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Carbon tetrachloride	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Dichlorodifluoromethane	ug/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichloromethane	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
trans-1,2-dichloroethene	ug/L	200	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Trichlorofluoromethane	ug/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	ug/L	50	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Trichloroethene	ug/L	20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chloroethene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-dichlorobenzene	ug/L	2.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,3-dichlorobenzene	ug/L	2.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,4-dichlorobenzene	ug/L	4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chlorobenzene	ug/L	15	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-dibromoethane	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Trihalomethanes; total	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Xylenes; total	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

Acid Base Neutrals (Semi-Volatiles)	Units	PWQO *CWQG*	TMC Upstr Far	TMC Upstream	GM West Outfall	City West Outfall	TMC Downstr	TMC Downstream Far	
Diphenylamine	ug/L	3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-dichlorophenol	ug/L	0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-dinitrotoluene	ug/L	4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-dimethylphenol	ug/L	10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-dinitrophenol	ug/L		<10	<10	<10	<10	<10	<10	<10
2,6-dichlorophenol	ug/L	0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,6-dinitrotoluene	ug/L	6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4,6-dinitro-o-cresol	ug/L	0.2	<10	<10	<10	<10	<10	<10	<10
4-bromophenyl-phenyl ether	ug/L	0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4-chlorophenyl-phenyl ether	ug/L	0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4-nitrophenol	ug/L	50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bis(2-chloroethyl)ether	ug/L	200	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bis(2-chloroethoxy)methane	ug/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bis(2-chloroisopropyl)ether	ug/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Butylbenzylphthalate	ug/L	0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bis-2-ethylhexylphthalate	ug/L		<10	<10	<10	<10	<10	<10	<10
Camphene	ug/L	2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Di-n-butylphthalate	ug/L	19	<10	<10	<10	<10	<10	<10	<10
Di-n-octylphthalate	ug/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Diphenyl ether	ug/L	0.03	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
m-cresol	ug/L	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
N-nitroso-di-n-propylamine	ug/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
o-cresol	ug/L	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
p-chloro-m-cresol	ug/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
p-cresol	ug/L	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phenol	ug/L	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1-chloronaphthalene	ug/L	0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1-methylnaphthalene	ug/L	2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2-chloronaphthalene	ug/L	0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2-methylnaphthalene	ug/L	2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
5-nitroacenaphthene	ug/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	ug/L	***5.8***	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	ug/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	ug/L	0.0008	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)anthracene	ug/L	0.0004	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	ug/L	***0.015***	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b)fluoranthene	ug/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Biphenyl	ug/L	0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	ug/L	0.0002	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	ug/L	0.0001	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenzo(a,h)anthracene	ug/L	0.002	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	ug/L	0.0008	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	ug/L	0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g,h,i)perylene	ug/L	0.00002	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Indole	ug/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1,2,3-c,d)pyrene	ug/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	ug/L	7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Perylene	ug/L	0.00007	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	ug/L	0.03	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	ug/L	***0.025***	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2-chlorophenol	ug/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,3,4-trichlorophenol	ug/L	18	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,3,4,5-tetrachlorophenol	ug/L	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,3,4,6-tetrachlorophenol	ug/L	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,3,5-trichlorophenol	ug/L	18	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,3,5,6-tetrachlorophenol	ug/L	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4,5-trichlorophenol	ug/L	18	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

2,4,6-trichlorophenol	ug/L	18	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pentachlorophenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Polycyclic Aromatic Hydrocarbons	**Units**	**PWQO** ***CWQG***	**TMC Upstr Far**	**TMC Upstream**	**GM West Outfall**	**City West Outfall**	**TMC Downstr**	**TMC Downstream Far**	
1-methylnaphthalene	ng/L	2000	<10	<10	<10	<10	<10	<10	<10
2-methylnaphthalene	ng/L	2000	<10	<10	<10	<10	<10	<10	<10
Acenaphthene	ng/L	***5800***	<10	<10	<10	<10	<10	<10	<10
Acenaphthylene	ng/L		<10	<10	<10	<10	<10	<10	<10
Anthracene	ng/L	0.8 / ***12***	<10	<10	<10	<10	<10	<10	<10
Benz(a)anthracene	ng/L	0.4 / ***18***	<20	<20	<20	<20	<20	<20	<20
Benzo(a)pyrene	ng/L	***15***	<2	<2	**4**	<2	<2	<2	<2
Benzo(b)fluoranthene	ng/L		<10	<10	<10	<10	<10	<10	<10
Benzo(e)pyrene	ng/L		<10	<10	<10	<10	<10	<10	<10
Benzo(k)fluoranthene	ng/L		<10	<10	<10	<10	<10	<10	<10
Chrysene	ng/L	0.1	<10	<10	<10	<10	<10	<10	<10
Dibenz(a,h)anthracene	ng/L	2	<20	<20	<20	<20	<20	<20	<20
Fluoranthene	ng/L	0.8 / ***40***	<10	<10	**13**	<10	<10	<10	<10
Fluorene	ng/L	200 / ***3000***	<10	<10	<10	<10	<10	<10	<10
Benzo(g,h,i)perylene	ng/L	0.02	<20	<20	<20	<20	<20	<20	<20
Indeno(1,2,3-c,d)pyrene	ng/L		<20	<20	<20	<20	<20	<20	<20
Naphthalene	ng/L	7000/***1100***	<10	<10	<10	<10	<10	<10	<10
Perylene	ng/L	0.7	<10	<10	<10	<10	<10	<10	<10
Phenanthrene	ng/L	30 / ***400***	<10	<10	<10	<10	<10	<10	<10
Pyrene	ng/L	***25***	<10	<10	**12**	<10	<10	<10	<10

Exceeds PWQO and/or CWQG

Notes: "<value" means less than the method detection limit
"bold italic criteria" means CWQG

Polychlorinated Biphenyls	**Units**	**PWQO**	**TMC Upstr Far**	**TMC Upstream**	**GM West Outfall**	**City West Outfall**	**TMC Downstr**	**TMC Downstream Far**	
PCB congeners; total	**ng/L**	**1**	**0.3545**	**0.6017**	**23.694**	**9.2618**	**0.2892**	**0.547**	**0.3449**
2-monochloroPCB(1)	pg/L		<5	<4.3	<15	<4.7	<4.3	<6.2	<3.4
4-monochloroPCB(3)	pg/L		<3.7	<2.4	<4.3	<4.1	<3.1	<5.2	<2.7
2,3'-dichloroPCB(6)	pg/L		**17**	<6.3	**180**	<14	<7.1	<8.7	<7.2
2,4'-dichloroPCB(8)	pg/L		<21	<18	**210**	<29	<19	<19	<15
4,4'-dichloroPCB(15)	pg/L		<17	<13	**330**	**45**	<9	<9.2	<12
2,2',3-trichloroPCB(16)	pg/L		<9.1	<8.2	**430**	**110**	<7.7	<7.9	<6.8
2,2',5-trichloroPCB(18)	pg/L		<25	<23	**1400**	**320**	<26	<22	<22
2,2',6-trichloroPCB(19)	pg/L		**7.3**	<6.3	**440**	**81**	<6.7	**7.4**	<6.9
2,3,4'-trichloroPCB(22)	pg/L		<8.3	<8.9	**280**	**110**	<8.3	<9.2	<8
2,4',5-trichloroPCB(31)	pg/L		<27	<26	**930**	**280**	<25	<25	<24
3,4,4'-trichloroPCB(37)	pg/L		<7.6	<7.1	**220**	**100**	<7.6	**8.5**	<5.6
2,2',3,3'-tetrachloroPCB(40)	pg/L		<4.7	**4.5**	**580**	**160**	<6	<7.4	**6.5**
2,2',3,4-tetrachloroPCB(41)	pg/L		<3.2	<5.2	**130**	**72**	**4.6**	<6.1	<4
2,2',3,5'-tetrachloroPCB(44)	pg/L		**32**	**30**	**2500**	**750**	**26**	**30**	**32**
2,2',4,5'-tetrachloroPCB(49)	pg/L		**27**	**28**	**2000**	**550**	**22**	**25**	**26**
2,2',5,5'-tetrachloroPCB(52)	pg/L		**46**	**51**	**3000**	**970**	<45	<43	**46**
2,2',6,6'-tetrachloroPCB(54)	pg/L		<0.7	<3	**19**	**3.5**	<1	<4.2	<2
2,3,4,4'-tetrachloroPCB(60)	pg/L		**5.6**	**6.1**	**140**	**98**	<3.2	**6.3**	**3.9**
2,3',4,4'-tetrachloroPCB(66)	pg/L		**22**	**26**	**1100**	**550**	**18**	**19**	**20**
2,3',4',5-tetrachloroPCB(70)	pg/L		**27**	**30**	**970**	**500**	**23**	**25**	**28**
2,4,4',5-tetrachloroPCB(74)	pg/L		**10**	**13**	**360**	**220**	**10**	**13**	**14**

3,3',4,4'-tetrachloroPCB(77)	pg/L		<4	**2.8**	**110**	**51**	**1.8**	**4.6**	**2.1**
3,4,4',5-tetrachloroPCB(81)	pg/L		<4	<0.7	<5	<3	<1	**3.6**	<1
PeClPCB(84)+PeCl(90)+PeCl(101)	pg/L		<41	**60**	**1100**	**530**	<44	<51	<44
2,2',3,4,4'-pentachloroPCB(85)	pg/L		<4.6	**11**	**220**	**120**	**5.5**	**9.2**	**6.6**
2,2',3,4,5'-pentachloroPCB(87)	pg/L		**13**	**21**	**330**	**180**	**15**	**17**	**14**
2,2',3,5',6-pentachloroPCB(95)	pg/L		<28	<35	**840**	**370**	<24	<27	<27
2,2',3',4,5-pentachloroPCB(97)	pg/L		**11**	**15**	**290**	**150**	**9.2**	**13**	**9.4**
2,2',4,4',5-pentachloroPCB(99)	pg/L		**13**	**18**	**360**	**200**	**12**	**15**	**11**
2,2',4,6,6'-pentachloroPCB(104)	pg/L		<0.9	<0.7	<0.6	<0.83	<1	**3.9**	<0.9
2,3,3',4,4'-pentachloroPCB(105)	pg/L		**11**	**15**	**200**	**130**	**11**	**14**	**11**
2,3,3',4',6-pentachloroPCB(110)	pg/L		**36**	**53**	**900**	**480**	**35**	**40**	**37**
2,3,4,4',5-pentachloroPCB(114)	pg/L		<5	<4	**17**	**12**	<5	<5	<7
2,3',4,4',5-pentachloroPCB(118)	pg/L		**24**	**37**	**360**	**230**	**27**	**30**	**24**
2,3',4,4',6-pentachloroPCB(119)	pg/L		<0.8	<0.86	**16**	**9.2**	<0.76	**3.7**	<2
2',3,4,4',5-pentachloroPCB(123)	pg/L		<5	**3.8**	**51**	**31**	<7	**6**	<7
3,3',4,4',5-pentachloroPCB(126)	pg/L		<6	<5	**9.8**	<2	<7	<6	<7
2,2',3,3',4,4'-hexachloroPCB(128)	pg/L		**4**	**7.3**	**51**	**41**	**5.8**	**7.6**	**4**
2,2',3,3',5,6'-hexachloroPCB(135)	pg/L		<4	<6.9	**54**	**30**	<4.3	**8.1**	<4.6
2,2',3,4,4',5-hexachloroPCB(137)	pg/L		<1.5	<2.2	**14**	**12**	<1.9	**5**	<1.5
2,2',3,4,4',5'-hexachloroPCB(138)	pg/L		**27**	**40**	**280**	**200**	**27**	**33**	**25**
2,2',3,4,5,5'-hexachloroPCB(141)	pg/L		<5.2	**8.4**	**59**	**38**	<4.5	<7.5	<4.9
2,2',3,4',5',6-hexachloroPCB(149)	pg/L		<24	<38	**290**	**190**	<24	<31	<23
2,2',3,5,5',6-hexachloroPCB(151)	pg/L		<6.7	<13	**88**	**54**	<7.7	<13	<6.7
2,2',4,4',6,6'-hexachloroPCB(155)	pg/L		<0.4	<0.4	<0.31	<0.85	<0.6	**3.5**	<0.4
2,3,3',4,4',5-hexachloroPCB(156)	pg/L		**3.3**	**3.6**	**22**	**14**	**3.1**	**5.9**	**2.8**
2,3,3',4,4',5'-hexachloroPCB(157)	pg/L		**1.2**	**1.9**	**14**	**9.2**	**1.8**	**4.6**	**1.3**
22'33'45(129)+233'44'6-HxClPCB(158)	pg/L		**4.9**	**8**	**50**	**33**	**5**	**13**	**6.2**
2,3',4,4',5,5'-hexachloroPCB(167)	pg/L		<1.4	**1.6**	**14**	**8.6**	**1.5**	**5**	<1.6
22'44'55'(153)+23'44'5'6-HxClPCB(168)	pg/L		<19	**35**	**250**	**150**	<23	**31**	<20
3,3',4,4',5,5'-hexachloroPCB(169)	pg/L		<1	<0.8	<2	<1	<0.8	**4.4**	<0.9
2,2',3,3',4,4',5-heptachloroPCB(170)	pg/L		<5	**6.5**	**90**	**53**	**5.5**	**9**	<4.5
2,2',3,3',4,4',6-heptachloroPCB(171)	pg/L		<1.9	**2.8**	**24**	**16**	**1.4**	**5**	<1.9
2,2',3,3',4,5,6'-heptachloroPCB(174)	pg/L		<4.1	**10**	**85**	**50**	**5.3**	**8.4**	**5.4**
2,2',3,3',4',5,6-heptachloroPCB(177)	pg/L		<2	**5**	**50**	**29**	<3.3	**6.2**	<2.1
2,2',3,3',5,5',6-heptachloroPCB(178)	pg/L		<1.3	**2.9**	**21**	**11**	<1.4	**4.7**	<1
2,2',3,4,4',5',6-heptachloroPCB(183)	pg/L		**3.1**	**5.2**	**44**	**27**	**3.5**	**6.4**	<1.9
2,2',3,4',5,5',6-heptachloroPCB(187)	pg/L		<7.3	**11**	**100**	**59**	<7	**8.6**	<5.2
2,2',3,4',5,6,6'-heptachloroPCB(188)	pg/L		<0.7	<0.9	**1**	<0.61	<0.9	**4**	<0.8
2,3,3',4,4',5,5'-heptachloroPCB(189)	pg/L		<0.5	<0.5	**3.2**	<3.1	<0.6	<3.5	<0.5
2,3,3',4,4',5',6-heptachloroPCB(191)	pg/L		<0.8	<1	**4.7**	**2.8**	<1	<4	<0.8
22'344'55'(180)+233'4'55'6-HpClPCB(193)	pg/L		**9.1**	**17**	**210**	**110**	**9.2**	**19**	**8.7**
2,2',3,3',4,4',5,5'-octachloroPCB(194)	pg/L		<4	<3.5	**46**	**35**	<2.6	**6.6**	<3.5
2,2',3,3',4,5,5',6'-octachloroPCB(199)	pg/L		<2.8	**4.6**	**52**	**49**	<3.1	**7.9**	<3.6
2,2',3,3',4,5,6,6'-octachloroPCB(200)	pg/L		<0.64	<1.4	**5.7**	**4.8**	<0.9	**4.3**	<1
2,2',3,3',4,5',6,6'-octachloroPCB(201)	pg/L		<0.6	<1.1	**5.9**	**4.9**	<0.8	**5.1**	<1
2,2',3,3',5,5',6,6'-octachloroPCB(202)	pg/L		<2.3	<1.5	**9.2**	**8.5**	<1.3	**4.6**	<1
2,2',3,4,4',5,5',6-octachloroPCB(203)	pg/L		<1.8	**5.7**	**50**	**44**	<2.3	**7.6**	<2.5
2,3,3',4,4',5,5',6-octachloroPCB(205)	pg/L		<0.5	<0.5	**2.6**	**2.5**	<0.7	**4.6**	<0.5
22'33'44'55'6-nonachloroPCB(206)	pg/L		<2.2	<1.8	**15**	**30**	<1.9	**4.8**	<1.8
22'33'44'566'-nonachloroPCB(207)	pg/L		<0.7	<0.7	**2**	**3.8**	<0.8	**3.9**	<0.6
22'33'455'66'-nonachloroPCB(208)	pg/L		<0.8	<1.1	**3.9**	**10**	<0.9	**4.7**	<0.77
DecachloroPCB(209)	pg/L		<1.8	<2.7	<3.5	**10**	<2	**6.3**	<3
244'-triClPCB(28)+2'34-triClPCB(33)	pg/L		<42	<40	**1400**	**470**	<40	<39	<38
2,2'-dichloroPCB(4)+2,6-dichloroPCB(10)	pg/L		<20	<20	**260**	**39**	<15	<22	<21

	Exceeds PWQO

Note: “<value” means less than the method detection limit

Appendices

Appendix A: Review of Coalition for a Better St. Catharines September 14, 2020 Letter

Introduction

On February 13, 2020 MECP Technical Support Surface Water completed surface water sampling of Twelve Mile Creek and storm sewer outfalls during a snow melt event near the former General Motors (GM) Property at 285 Ontario Street in the City of St. Catharines. The surface water quality results were briefly presented in a July 16, 2020 MECP memorandum from Michael Spencer, Technical Support Section.

In a September 14, 2020 letter to Phil Hull, MECP Niagara District Office from Dennis Van Meer, Coalition for a Better St. Catharines, the Coalition for a Better St. Catharines provided comments on the surface water quality results and sampling program contained in the July 16, 2020 MECP memorandum.

As such, the following discussion and interpretation was completed to address these comments.

Review of Coalition for a Better St. Catharines September 14, 2020 Letter

1. The September 14, 2020 letter from Coalition for a Better St. Catharines stated:

    Taking surface runoff samples at a time when ambient temperatures were above freezing and the ground still frozen represent possibly a 'best case' dilution of contaminants leaving the site. A more rigorous inspection sampling needs to take into account the migration of contaminants in groundwater and soil especially in the spring when groundwater comes to the surface and runs downslope into Twelve Mile Creek and perhaps also migrates to the surrounding residential community.

    As identified in the July 16, 2020 MECP memorandum, the February 13, 2020 sampling occurred during a snow melt event with runoff and discharge from the storm sewers since the average daily temperature was above freezing (St. Catharines Met Station Id. 6137304). During sampling, the top layer of the ground adjacent to Twelve Mile Creek was not frozen. As well, the majority of the former GM property is impervious (concrete, asphalt, building) so the snow melt created runoff to carry potential contaminants to the storm sewer and storm sewer outfall that was sampled.

    A surface water sampling program has now been completed for snow melt, dry and rain events. Overall, the storm sewer outfall snow melt event results had more detections of metals and PAH that exceeded the PWQO and/or CWQG; and more detections of volatile organic compounds and acid base neutral than the October 20, 2020 rain event results.

    MECP Technical Support Groundwater completed a review of previous reports and identified that there were no groundwater concerns since there is no groundwater receptor to the west of the site except Twelve Mile Creek. Based on the modelling results, the predicted surface water concentrations in Twelve Mile Creek from the discharge of groundwater from the former GM property and slope area were very unlikely to exceed current Aquatic Protection Values ("Rationale for the Development of Soil and Ground Water Standards for Use at Contaminated Sites in Ontario, Ministry of Environment, April 15, 2011"). This is consistent with MECP surface water quality sampling results.

2. The September 14, 2020 letter from Coalition for a Better St. Catharines overall identified human health concerns (ingestion, inhalation, dermal contact) in regards to the metals and polycyclic aromatic hydrocarbons surface water quality results. This Technical Memorandum interpreted the results with various surface water quality criteria including typical urban stormwater quality. The storm sewer outfalls are not a typical or easily accessible point of human contact, however, the surface water quality results have been provided to the Niagara Region Public Health.

3. The following comments are contained under the specific metal headings from the September 14, 2020 letter from Coalition for a Better St. Catharines.

Aluminium: PWQO guidelines: ug/L 75 sample 167 = 223% over PWQO guidelines

	PWQO	TMC1	TMCOut1	TMCOut2	TMC2
Aluminum (ug/L)	75	54.3	41.7	167	62.4

The aluminum PWQO is 75 ug/L. The GM West Outfall (TMCOut1) result of 41.7 ug/L was less than the PWQO. The City West Outfall (TMCOut2) result of 167 ug/L exceeded the PWQO. These aluminum results are discussed in Section 6.1(ii) of this Technical Memorandum from a surface water quality perspective.

Cadmium PWQO guidelines: ug/L = .2 sample: 817 = 409% over the PWQO guidelines

	PWQO	TMC1	TMCOut1	TMCOut2	TMC2
Cadmium (ug/L)	0.2	0.474	0.817	0.574	0.52

The cadmium PWQO is 0.2 ug/L. The GM West Outfall (TMCOut1) result of 0.817 ug/L and the City West Outfall (TMCOut2) result of 0.574 ug/L both exceeded the PWQO. As well, Twelve Mile Creek immediately upstream (0.474 ug/L) and immediately downstream (0.52 ug/L) exceeded the PWQO.

The GM West Outfall and City West Outfall cadmium results were less than observed urban stormwater cadmium concentrations (1 to 24 ug/L) in the MECP document "Stormwater Management Planning and Design Manual, March 2003". The City West Outfall result was within the range of wet event results for typical urban neighbourhoods in St. Catharines (0 to 0.732 ug/L at Walkers Creek at Lakeshore Road and Spring Garden Creek at Lakeshore Road) contained in the Ministry of Environment and Climate Change/Environment Canada report "Twelve Mile Creek – Old Welland Canal Trackdown Study (2003 – 2006), Technical Memorandum, March 2010", while the GM West Outfall result was only slightly higher.

Twelve Mile Creek downstream of the outfalls was similar to upstream. The immediately upstream Twelve Mile Creek location (TMC1) result was 0.474 ug/L and the immediately downstream (TMC2) result was 0.52 ug/L which was still less than the PWQO.

Chromium PWQO guidelines ug/l =1 sample = 2.42 = 242% over PWQO guidelines

	PWQO	TMC1	TMCOut1	TMCOut2	TMC2
Chromium (ug/L)	1	0.148	0.707	2.42	0.348

The chromium PWQO is 1 ug/L. The GM West Outfall (TMCOut1) result of 0.707 ug/L was less than the PWQO. The City West Outfall (TMCOut2) result of 2.42 ug/L exceeded the PWQO.

The MECP document "Stormwater Management Planning and Design Manual, March 2003" does not contain chromium in the list of observed urban stormwater concentrations. However, the City West Outfall chromium result (2.42 ug/L) was only slightly higher than the range of wet event results for typical urban neighbourhoods in St. Catharines (0 to 2.32 ug/L at Walkers Creek at Lakeshore Road and Spring Garden Creek at Lakeshores Road).

The immediately upstream Twelve Mile Creek location (TMC1) result was 0.148 ug/L and the immediately downstream (TMC2) result was 0.348 ug/L. While the Twelve Mile Creek result downstream of the outfalls was higher than upstream, the downstream result was still less than the PWQO.

Cobalt PWQO guidelines ug/l = .9 sample = 2.24 = 250% over PWQO guidelines

	PWQO	TMC1	TMCOut1	TMCOut2	TMC2
Cobalt (ug/L)	0.9	0.53	0.528	2.24	0.534

The cobalt PWQO is 0.9 ug/l. The GM West Outfall (TMCOut1) result of 0.528 ug/L was less than the PWQO. The City West Outfall (TMCOut2) result of 2.24 ug/L exceeded the PWQO.

The MECP document "Stormwater Management Planning and Design Manual, March 2003" does not contain cobalt in the list of observed urban stormwater concentrations. However, Twelve Mile Creek downstream of the outfalls was similar to upstream. The immediately upstream Twelve Mile Creek location (TMC1) result was 0.53 ug/L and the immediately downstream (TMC2) result was 0.534 ug/L which was still less than the PWQO.

Copper PWQO guidelines ug/l = 5, sample = 35 = 700% over PWQO guidelines

	PWQO	TMC1	TMCOut1	TMCOut2	TMC2
Copper (ug/L)	5	2.23	4.85	35.2	2.25

The copper PWQO is 5 ug/l. The GM West Outfall (TMCOut1) result of 4.85 ug/L was less than the PWQO. The City West Outfall (TMCOut2) result of 35.2 ug/L exceeded the PWQO. These copper results are discussed in Section 6.1(ii) of this Technical Memorandum from a surface water quality perspective.

Zinc: PWQO guidelines ug/l =30, sample = 93 = 311% over PWQO guidelines

	PWQO	TMC1	TMCOut1	TMCOut2	TMC2
Zinc (ug/L)	30	2.22	20.2	93.3	2.76

The zinc PWQO is 30 ug/L. The GM West Outfall (TMCOut1) result of 20.2 ug/L was less than the PWQO. The City West Outfall (TMCOut2) result of 93.3 ug/L exceeded the PWQO. These zinc results are discussed in Section 6.1(ii) of this Technical Memorandum from a surface water quality perspective.

4. The September 14, 2020 letter contained comments on the City West Outfall polycyclic aromatic hydrocarbons (PAH) results that exceeded the PWQO and/or CWQG for benzo(a)pyrene, chrysene, fluoranthene, phenanthrene and pyrene. These PAH results are discussed in Section 6.1(v) of this Technical Memorandum from a surface water quality perspective.

February 13, 2020 Metals Results as Presented in July 16, 2020 MECP Memorandum

Metals	Units	PWQO	TMC Upstr Far	TMC Upstream	GM West Outfall	City West Outfall	TMC Downstr	TMC Downstream Far	
Arsenic	mg/L	0.1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Antimony	mg/L	0.02	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005
Selenium	mg/L	0.1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Silver	ug/L	0.1	0	0	0	0	0	0	0
Aluminum	ug/L	75	52.5	54.3	41.7	167	62.4	70.6	53.1
Barium	ug/L		22.5	22.5	36.2	62.7	22.7	22.7	23
Beryllium	ug/L	1100	0.0254	0.0318	0.0303	0	0.0417	0.0258	0.0265
Bismuth	ug/L		0	0	0	0	0	0	0
Calcium	mg/L		37.5	37.4	102	100	37.6	37.7	35.3
Cadmium	ug/L	0.2	0.238	0.474	0.817	0.574	0.52	0.551	0.624
Cobalt	ug/L	0.9	0.44	0.53	0.528	2.24	0.534	0.565	0.38
Chromium	ug/L	1	0.153	0.148	0.707	2.42	0.348	0.336	0
Copper	ug/L	5	2.18	2.23	4.85	35.2	2.25	2.23	1.91
Iron	ug/L	300	52.9	53.2	332	391	56.2	59.8	51.3
Hardness	mg/L		133	133	354	349	135	134	129
Potassium	mg/L		1.56	1.57	9.89	8.37	1.6	1.58	1.59
Lithium	ug/L		7.28	7.48	16.2	25.4	6.31	5.99	4.04
Magnesium	mg/L		9.65	9.62	24.1	24.1	10.1	9.67	9.83
Manganese	ug/L		3.05	3.03	31.7	67.7	3.09	3.13	2.86
Molybdenum	ug/L	40	0	0.276	1.92	0	0.0833	0.216	0.953
Sodium	mg/L		17.8	17.5	59.4	954	19.9	19.1	19.5
Nickel	ug/L	25	0.879	0.416	3.7	11.5	0.854	0.795	0.504
Lead	ug/L	25	0	0	0	0	0	0	0
Tin	ug/L		0	0	0	0	0	0	0
Strontium	ug/L		207	208	702	593	209	210	209
Titanium	ug/L		1.44	1.64	1.38	0.984	1.9	2.01	1.6
Uranium	ug/L	5	0.893	1.38	0.642	2.41	0.0885	1.05	0.586
Vanadium	ug/L	6	0.14	0.184	0.0255	0	0.192	0.219	0.32
Zinc	ug/L	30	2.38	2.22	20.2	93.3	2.76	7.07	2.49
Zirconium	ug/L	4	0	0	0	0	0	0	0

Exceeds PWQO

Appendix B: Certificates of Analysis

MECP lab certificates of analysis for the February 13 (C263915), September 23 (C266658) and October 20, 2020 (C267160) surface water quality sampling available upon request.