CITY OF HAMILTON

PUBLIC WORKS DEPARTMENT

SURFACE WATER QUALITY PROGRAM

A FRAMEWORK REPORT OUTLINING THE PROGRAM DETAILS

June 2022

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Executive Summary

In 2020, the City of Hamilton (City) set out to develop a framework for monitoring surface water quality (WQ) throughout Hamilton's Watersheds. This Surface Water Quality Program (SWQP) Framework is the starting point for the City in gaining a holistic understanding of its receiving waters and the potential impacts from various City assets within the storm and wastewater collection and treatment system.

The SWQP Framework highlights the following:

- The City's major receiving water bodies and wastewater collection & treatment systems
- Internal and external partner engagement
- Three-Phase approach of program implementation

The City endeavors to study how wastewater and stormwater discharges are influencing the quality of the receiving waters. With this Framework, Hamilton's goal is to build a baseline understanding of ambient surface water conditions over time, develop open communication and transparency with various partners, and respond to and investigate any water quality anomalies that may be due to infrastructure malfunctions and standard operating conditions. The SWQP will also help to guide refinements of standard operating conditions, and pin-point non-point source contaminates throughout Hamilton's Watersheds.

1. Historical Background

Positioned at the western end of Lake Ontario, the City of Hamilton (City) has been an important corridor for transportation and settlement for people for hundreds of years. With its Harbour and a rich natural and geophysical diversity that provides an abundance of resources, the City is an important centre of activity for Canada. The Port of Hamilton is among Canada's largest and busiest inland ports on the Great Lakes, which operates on an international scale receiving and sending material to North America and overseas.

Pollution-related problems in Hamilton Harbour were first formally identified in the early 1970s, although pollution issues date back much earlier. As Canada's industrial development advanced in the 20th century, its foundation for economic growth in the Great Lakes was developed. While the City has long benefitted from its strategic location for this growth and economic development, it has also resulted in the environmental degradation of Hamilton's natural ecosystem in and near Hamilton Harbour.

> *"For more than 100 years Hamilton has been exposed to industrial, population growth and urban development. Prior to modern pollution laws, waste was dumped into the Harbour… which today, continues to threaten public health, contaminate fish and wildlife, and restrict the use of the waterfront."*[1]

This environmental legacy culminated when Hamilton Harbour was identified as a Great Lakes Area of Concern (AOC) in 1987, under the Great Lakes Water Quality Agreement (GLWQA). Practices of the past and present continue to contribute to water quality (WQ) concerns like phosphorus loadings causing algal blooms, contaminated sediments, fish consumption advisories, beach closures, and degraded waterfront aesthetics.

The Hamilton Harbour Remedial Action Plan (HHRAP) program, under the GLWQA is a partnership-driven initiative to understand and remediate water quality issues within the AOC. Many programs involving local industry and the municipality have been coordinated with the help of the HHRAP; a process established to improve Hamilton Harbour through a watershed-focused, multi-partner approach, which identifies and measures 14 beneficial use impairments (BUIs). BUIs are used to assess the status of the Harbour by describing a human or ecological use that has been lost or impaired, as the result of environmental degradation. The cumulative successes of the HHRAP community initiatives, will aid in the future delisting of the Harbour as an AOC.

The City of Hamilton's efforts to improve water quality are focused on reducing pollutant loads to the natural environment. Such efforts include improved wastewater capture and treatment, the sewer lateral cross-connections program, Windermere Basin Wetland restoration, the beach E. coli monitoring program, and investigating poor water quality and potential hazards to the natural environment through the City's Environmental, Monitoring and Enforcement (EME) unit of Hamilton Water.

[1] Bay Area Restoration Council (BARC), 'Areas of Concern and Remedial Action Plans', *About the RAP*, https://hamiltonharbour.ca/about_the_rap, (accessed 06-04-2022).

To date, the HHRAP program has had most of its success in point-source identification and control. As a result of point-source reduction plans being implemented by local industries and municipalities, the focus has shifted to non-point source contributions and watershed efforts. A watershed approach to water quality through non-point source pollutants can provide the next stages and evolution of water quality and Harbour rehabilitation.

2. Receiving Water Bodies

Various types of overflow structures exist within the City's storm and wastewater infrastructure, both within the combined sewer system, and the separated sewer system. These designed overflow structures have the potential to discharge to the natural environment and include: storm relief pumping stations, combined sewer overflow tanks (CSOs), sewer pump stations (SPSs), sewer siphons and flow regulators.

Within the overall service area for the City's storm and wastewater collection and treatment system, five (5) major receiving water bodies exist. These are:

- Hamilton Harbour
- Cootes Paradise Marsh via Spencer & Chedoke Creeks
- Red Hill Creek
- Grindstone Marsh
- Lake Ontario

Headwater tributaries of the Grand River and Niagara Peninsula catchment areas also exist with the boundaries of the City of Hamilton. These headwater tributaries flow south into the Grand River towards Lake Erie, and east outside of City boundary, discharging into Lake Ontario.

a) Hamilton Harbour

Hamilton Harbour occupies an area of approximately 21.5 km^2 at the western end of Lake Ontario. The associated watershed supplying flow to the Harbour covers an area of approximately 500 km^2. The Harbour is connected to Lake Ontario by a narrow channel that cuts through the Burlington Beach Strip. It is also connected to Cootes Paradise on its western edge via a narrow channel that was excavated as part of the construction of the Desjardins Canal.

In the early 1980's, Hamilton Harbour was designated as an Environmentally Significant Area (ESA) in the former Region of Hamilton Wentworth Official Plan (Regional OP). It was later designated as an Area of Concern (AOC) under the Great Lakes Water Quality Agreement (1987). In Ontario, the responsibilities for RAP progress and AOC remediation are shared by the federal and provincial governments, through the Canada-Ontario Agreement (COA) Respecting the Great Lakes Basin Ecosystem. The oversight and hands-on implementation of the HHRAP includes a variety of departments at all levels of government, non-governmental organizations, academia, business

and industry, and the public. The local RAP team tracks environmental conditions, activities, and outcomes relevant to the RAP.[2]

The HHRAP was developed as a multi-stage and multi-partner effort to address a standardized list of 14 potential environmental, social, and economical BUI issues within the Harbour. The City is a committed partner of the HHRAP process, and its citizens are key partners in the efforts to return beneficial uses to the Harbour and delist it as an AOC. With the Woodward Wastewater Treatment Plant (WWTP) and numerous Combined Sewer Overflow (CSO) outfalls that either discharge directly into the Harbour or contribute pollutant loadings via tributary water bodies, the City's efforts to improve water quality are focused on reducing pollutant load through improved wastewater capture and treatment. Other key City efforts are outlined above.

It should also be noted that the Halton Regions' Skyway Wastewater Treatment Plant (WWTP) effluent is discharged in the north-east corner of Hamilton Harbour (Burlington Bay). Like the City of Hamilton, Halton's WWTP is subject to an MECP Environmental Compliance Approval (ECA) that outlines monitoring and other MECP requirements, based on their system. Halton's WWTP practices or information are outside the scope of this Framework.

b) Cootes Paradise Marsh

Cootes Paradise is an important coastal marsh area in western Lake Ontario and serves as a key sanctuary and habitat for a wide variety of fauna and flora, including rare or threatened species. Owned and managed by the Royal Botanical Gardens (RBG), it spreads over 8.4 km^2 including 2.5 km^2 of coastal wetland. Because it serves important ecological functions such as being a significant natural fish nursery and key migratory bird habitat, the Government of Ontario has listed Cootes Paradise as a Provincially Significant Class 1 Wetland, and as an Area of Natural and Scientific Interest (ANSI). Cootes Paradise is also a principle environmental protection area, protected under the Royal Botanical Gardens Act 1941. Like the Hamilton Harbour, Cootes Paradise was also designated as an ESA. Its primary tributaries, Chedoke, Westdale, Spencer, Borer's and Ancaster Creeks are also identified as being environmentally significant.

The Dundas WWTP effluent and a number of CSO sites discharge directly into Cootes Paradise or indirectly via its tributary streams. In addition, Cootes Paradise may receive overflows from two (2) Storm Relief Pumping Stations, multiple sewer pump stations (SPSs) with overflow structures, and multiple sewer siphons with overflow structures. The Dundas Equalization Tank may also discharge to Cootes Paradise under emergency conditions, though this is part of the separated sewer system and historically has not overflowed in normal conditions, including no overflows between 2015-2020. In order to improve the Cootes Paradise ecosystem, the City has a goal to control all the CSO discharges to Cootes Paradise to a maximum of one CSO event in an average year. The 'average' precipitation year is determined by the City's Pollution Prevention and Control Plan.

[2] Bay Area Restoration Council (BARC), 'Areas of Concern and Remedial Action Plans', *About the RAP*, https://hamiltonharbour.ca/about_the_rap, (accessed 06-04-2022).

c) Red Hill Creek

The second largest of the numerous streams that drain into Hamilton Harbour, the Red Hill Creek watershed is largely urban and covers an area of approximately 68 km^2, entirely inside the boundaries of the City. Tributaries flowing into Red Hill Creek include Hannon, Davis and Montgomery Creeks. At 7 km in length, Red Hill Creek is a major feature of the Red Hill Valley, which represents the largest open space within the watershed. Being located within an urban environment, the valley and creek have been affected by urbanization related water quality and habitat impacts.

The effluent from the Woodward WWTP, as well as the discharge from three (3) CSO outfalls during heavy precipitation/snow melt events, discharge into the Red Hill Creek upstream of Windermere Basin and Hamilton Harbour.

d) Grindstone Marsh

Grindstone Creek drains into Grindstone Marsh. Grindstone Marsh is a smaller version of Cootes Paradise Marsh and is an important coastal marsh area in western Lake Ontario and serves as a key sanctuary and habitat for a wide variety of fauna and flora, including rare or threatened species. Its primary tributary that flow through the City of Hamilton is Grindstone Creek via the Grindstone Creek Watershed.

e) Lake Ontario

Lake Ontario provides approximately 9 million people with drinking water[3], and is the last lake in the Great Lakes before flowing to the Atlantic Ocean. Most of the Lake Ontario watershed is dominated by agricultural and rural lands, with some major urban/industrialized centers along the coasts, including Hamilton and Toronto, and Rochester, N.Y.[4]

3. Hamilton's Wastewater Collection & Treatment Systems

The City's overall wastewater collection system collects both sanitary and combined sewage and includes 1,800 km of sewers; ~3,000 km if storm sewers are included. The overall service area is approximately 11,700 ha and has a population in the order of 569,353 people.[5]

Hamilton's wastewater collection system collects and conveys flows for treatment at the Woodward Avenue WWTP (Woodward WWTP), located at 700 Woodward Avenue in the City's east end, via three primary interceptor systems, namely the Western Sanitary Interceptor, the Red Hill Creek Sanitary Interceptor and the Eastern Sanitary Interceptor.

Sanitary sewage from Dundas and a portion of flow from Waterdown are conveyed to the Dundas WWTP for treatment. The Dundas WWTP also includes an Equalization Tank to capture excess

[3] Lake Ontario Waterkeeper, *Lake Ontario,* http://www.waterkeeper.ca/lake-ontario, (accessed 07-04-2022).
[4] Great Lakes Guide, 'Urban. Fragile. Deep. Populous. Integral: Lake Ontario', *Lake Ontario*, https://greatlakes.guide/watersheds/ontario (accessed 07-04-2022).
[5] Statistics Canada. 2022. (table). *Census Profile*. 2021 Census of Population. Statistics Canada Catalogue no. 98-316-X2021001. Ottawa. Released April 27, 2022.
https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/index.cfm?Lang=E (accessed June 3, 2022)

flows. Flows captured in the Equalization Tank are pumped to the central combined sewer system for treatment at the Woodward WWTP.

Approximately half of the City of Hamilton's wastewater collection system area is serviced with over 570 km of combined sewers, representing a service area of approximately 5,180 ha that is located in the older parts of the City. It includes the lower portion of the City located between the Harbour and the Niagara Escarpment, and the upper portion of the City that extends from the Escarpment Brow to Mohawk Road. Select areas of the older parts of the City are serviced by separated sewer systems. The remaining portions of the City, including the South Mountain and Beach Boulevard, as well as Ancaster, Dundas, Glanbrook, Flamborough and Stoney Creek, are serviced by separate sanitary and storm sewer systems.

a) CSO Storage Facilities

There are nine (9) CSO storage tanks in the Combined Sewer System (CSS) network providing a total storage volume of approximately 314,000 m^3. This total storage volume is just over the daily average treatment capacity at Woodward WWTP. Storage tanks are located upstream of a CSO outfall and store combined sewage during wet weather events to reduce overflows to the natural environment, as the system was originally designed to do. The location and approximate storage volumes are provided in Table 1 below.

The combined sewer overflow tanks were added to the system as a result of the recommendations from the City of Hamilton's Pollution Prevention and Control Plan (PPCP). The original PPCP was completed in 1991 and updated in 2003 to reflect current guidelines and regulations. The process of updating the PPCP commenced again in 2020.

The purpose of the tanks is to reduce the number of CSOs to the local receiving waters. These tanks capture and store excess combined sewage during rainstorms/snowmelt events and later send it to the Woodward WWTP where it can be treated after the storm/melt event subsides.

The configuration of the CSO storage tanks is generally similar, i.e. they are divided into two cells, the first of which is designed to retain the 'first flush' and wet weather flows for most of the annual wet weather and melt events. The second cell provides additional storage capacity used during major rainfall/melt events. Some storage tanks can drain by gravity, others require pumping for dewatering the facility, while the Main/King tank utilizes both.

Table 1: Existing CSO Storage Tanks

No.	Storage Tanks	City Asset ID	Location	Year of Construction	Approximate Volume(m^3)	Gravity or Pumping Drainage
1	Original Greenhill	HCS01	East of Greenhill Avenue & West of Red Hill Creek	1988	83,500	Gravity
2	Bayfront Park	HCS02	Hamilton's Bayfront Park & Strachan Street	1993	21,000	Pumping
3	James Street	HCS03	James Street & Guise Street	1993	1,400 + 1,800 (Downstream sewer)	Gravity
4	Main King	HCS04	Cathedral Park	1997	77,100	Gravity and Pumping
5	Eastwood Park	HCS05	Eastwood Park	1997	27,000	Pumping
6	New Greenhill	HCS06	East of Greenhill Avenue & East of Red Hill Creek	2004	66,800	Gravity
7	Red Hill Superpipe	HCS07	Parallel to Red Hill Creek Sanitary Interceptor	2011	14,400	Gravity
8	Royal/Stroud	HCS08	Near Royal Avenue & Stroud Road (Stroud Park)	2007	15,000	Pumping
9	McMaster (Ewen)	HCS09	Near W Park Avenue & Sanders Blvd	2012	6,000	Pumping

b) Flow Regulators

A flow regulator is a structure that controls and/or diverts flow within the Sewer System, either through automated, manual, or static operational control. Flow regulators have the potential to divert combined sewage to the natural environmental in the event the sewer system reaches capacity as a result of infrastructure malfunction and/or wet weather events.

c) Combined Sewer and Separated Sewer Overflow Outfalls

Overflows to the City's CSO and separated sewer overflow (SSOs) outfalls are controlled by various flow regulating structures within the Sewer System. These flow regulators divert combined sewage or sanitary wastewater to the local receiving waters to prevent basement flooding and to protect the WWTP and/or pumping stations from damage during large precipitation/melt events, or infrastructure malfunction.

There is forty-one (41) priority CSO and/or SSO outfalls throughout the City. Some locations consist of two distinct but parallel pipes, which are included in the count. These 41 locations include CSO tank outfalls, CSO/SSO outfalls, three (3) blocked outfalls on Red Hill Creek, and two (2) WWTP final effluent outfalls (FEOs). These priority outfalls have the potential to discharge wastewater directly to local receiving waters. Excluded from this count is Halton Region's Skyway WWTP outfall, located at the NE corner of Hamilton Harbour. A summary of the outfalls is provided in Table 2, below. Detailed maps of the priority outfalls, along with 2020 & 2021 CSO Deposit Summaries are provided in Appendix A.

Table 2: City of Hamilton Priority Combined and/or Separated sewer Outfalls

No.	Outfall Name/Location	Outfall Type	Receiving Water Body	ASSET ID	Location of Outfall
1	Dundas WWTP Plant Final Effluent Outfall (FEO) & Bypass	FEO / Bypass	Desjardins Canal (Cootes Paradise)	DI06OF02	West end of Desjardin Canal
2	Woodward WWTP Final Effluent Outfall (FEO) & Bypass	FEO& Bypass	Red Hill Creek	HP03OF03	Mouth of Red Hill Creek on the east side of Woodward Avenue
3	Bayfront Park CSO Tank (HCS02)	CSO	Hamilton Harbour	HG06OF01	Bayfront Park at the west end of Strachan Street
4a	Eastwood Park East (Ferguson) CSO Tank (HCS05)	CSO	Hamilton Harbour	HH04OF01	North end of Ferguson Avenue, north of Dock Service Road
4b	Eastwood Park West (Catharine) CSO Tank (HCS05)	CSO	Hamilton Harbour	HH04OF02	North end of Catharine Street, north of Dock Service Road
5	Greenhill CSO Tanks (HCS01 & HCS06)	CSO	Red Hill Creek	HO13OF02	East end of Greenhill Avenue, east of Rosseau Road
6	James CSO Tank (HCS03)	CSO	Hamilton Harbour	HH05OF01	North end of James Street at Guise Street
7a	Main King CSO Tank (HCS04)	CSO	Chedoke Creek (Cootes Paradise)	HE09OF01	West side of Highway 403 beneath the King Street overpass; Glen Rd.
7b	Glen				
7c	Tope				

No.	Outfall Name/Location	Outfall Type	Receiving Water Body	ASSET ID	Location of Outfall
8	McMaster/Ewen CSO Tank (HCS09)	CSO	Coldwater Creek (Cootes Paradise)	HB11OF01	Hydro right-of-way at north end of Ewen Road
9	Red Hill Superpipe CSO Tank (HCS07)	CSO	Red Hill Creek	HQ07OF03	North of Barton Street East, east of Red Hill Valley Parkway
10	Royal/Stroud CSO Tank (HCS08)	CSO	Chedoke Creek (Cootes Paradise)	HD12OF02	East end of Royal Avenue at Stroud Road
11	Aberdeen	CSO	Chedoke Creek (Cootes Paradise)	HE10OF03	Longwood Ave.
12	Birch	CSO	Hamilton Harbour	HJ05OF01	North side of Burlington Street, just west of Birch Avenue
13	Delbrook	CSO	Chedoke Creek (Cootes Paradise)	HC12OF03	Delbrook Court at Stroud Road
14	Dunn	CSO	Red Hill Creek	HP03OF02	Mouth of Red Hill Creek on the east side of Woodward Avenue
15	Hillyard	CSO	Hamilton Harbour	HJ04OF01	North end of Hillyard Street, north of Land Street
16a	Kenilworth East	CSO	Hamilton Harbour	HN04OF02	North end of Kenilworth Avenue, north of Burlington Street
16b	Kenilworth West	CSO	Hamilton Harbour	HN04OF01	North end of Kenilworth Avenue, north of Burlington Street
17	King Street West	SSO	Battlefield Creek	SD08OF03	Multiple flow regulators upstream on King Street West
18	Lawrence	CSO	Red Hill Creek	HP11OF06	East end of Lawrence Rd. at Red Hill Creek. Currently blocked.
19	Little John Rd.	SSO	Sulphur Creek (Cootes Paradise)	DI09OF02	Flow regulator/overflow in DI09A005.
20	42 Maplevale Drive	SSO	Ancaster Creek (Cootes Paradise)	AN11OF01	Flap gate in AM11A009 that would allow for overflow to AN11OF01
21	Melvin	CSO	Red Hill Creek	HQ08OF04	East end of Melvin Ave. at Red Hill Creek. Currently blocked.
22a	Ottawa East	CSO	Hamilton Harbour	HM05OF02	North end of Ottawa Street, north of Industrial Drive
22b	Ottawa West	CSO	Hamilton Harbour	HM05OF01	North end of Ottawa Street, north of Industrial Drive
23	Parkdale	CSO	Hamilton Harbour	HP04OF01	CSO outfall, north end of Parkdale Avenue. Parkdale Storm Relief Pump Station (HC001) discharges to same outfall.
24a	Plymouth East (Gage)	CSO	Hamilton Harbour	HL03OF01	North end of Plymouth/Depew St., north of Industrial Drive

No.	Outfall Name/Location	Outfall Type	Receiving Water Body	ASSET ID	Location of Outfall
24b	Plymouth West (Gage)	CSO	Hamilton Harbour	HL03OF02	North end of Plymouth/Depew St., north of Industrial Drive
25	Queenston	CSO	Red Hill Creek	HQ10OF04	East end of Queenston Rd. at Red Hill Creek. Currently blocked.
26	Rhodes Court	SSO	Sulphur Creek (Cootes Paradise)	DG11OF01	Flow regulator/overflow in DG11A042.
27	Sleepy Hollow Court	SSO	Lake Jojo (Cootes) Paradise	DI05OF03	Flow regulator/overflow in DI05A010.
28	Sterling	CSO	Cootes Paradise	HC10OF01	North side of Sterling Street, east of Forsyth Avenue
29a	Strathearne East (HCG04)	CSO	Hamilton Harbour	HO04OF02	North end of Strathearne Avenue, north of the CNR line
29b	Strathearne West (HCG04)	CSO	Hamilton Harbour	HO04OF01	North end of Strathearne Avenue, north of the CNR line
30	The Villa Syphon (Coldwater Creek)	SSO	Spring Creek (Cootes Paradise)	DH08OF14	Flow regulator in Dundas syphon DH08A026
31	Valley Drive	SSO	Battlefield Creek	SD07OF03	Flow regulator upstream on Valley Drive in SD07A041
32a	Wellington East (HCG14)	CSO	Hamilton Harbour	HI05OF01	North end of Wellington Street, north of Burlington Street
32b	Wellington West (HCG14)	CSO	Hamilton Harbour	HI05OF02	North end of Wellington Street, north of Burlington Street
33	Wentworth (HCG03)	CSO	Hamilton Harbour	HJ04OF02	North end of Wentworth Street, north of Land Street
34	Millen Rd./ Arvin Ave.	SSO	Lake Ontario	SG04OF01	MH SH08A125 - Hilts Drive, Stoney Creek
35	Edenbridge Crt.	SSO	Spring Creek (Cootes Paradise)	DG10OF01	Critical failure SPS overflow to natural environment for DC011.

d) Pump Stations and Emergency Overflows

Sewer pump stations (SPS) are needed when wastewater cannot be conveyed by gravity. They can be required at the end of a network due to pipe depth relative to an outlet or treatment facility as well as when there is a significant physical obstacle within the network (hill, river, etc.). Pumps can also be required to dewater storage facilities as well as provide surcharge relief by controlling the hydraulic grade line below a certain level.

Some SPSs within the City of Hamilton have an emergency overflow to the natural environment. In the event of an emergency, these are designed to overflow to the environment instead of backing up into homes. The City has rigorous procedures outlining roles and responsibilities in the event these emergencies were to occur.

There are seventy-three (73) SPSs throughout the City; twenty-two (22) of which have emergency overflows, three (3) of which are strictly storm relief pumping stations. The City actively inspects and maintains the existing SPSs within the system as part of the overall maintenance program. Table 3 summarizes these 22 SPSs, throughout the City.

Table 3: Pump Stations (PS) with Emergency Overflows to the Natural Environment

No.	Lift Station Name	Type	Address	Receiving Water Body	Outfall ASSET ID	Location of Outfall
1	DC001	Sanitary	29 Sleepy Hollow Court	Lake Jojo (Cootes) Paradise	DI05OF03	Flow regulator/ overflow in DI05A010. DC001 is upstream. Outfall also considered an SSO.
2	DC006	Sanitary	Little John Rd	Sulphur Creek (Cootes Paradise)	DI09OF02	Flow regulator/ overflow in DI09A005. DC006 is upstream. Outfall also considered an SSO.
3	DC009	Sanitary	2 Rhodes Court	Sulphur Creek (Cootes Paradise)	DG11OF01	Flow regulator/ overflow in DG11A042. DC009 is upstream. Outfall also considered an SSO.
4a	DC011	Sanitary	Opposite 2 Edenbridge Crt., Dundas	Spring Creek (Cootes Paradise)	DG10OF01	9 Edenbridge Crt, Dundas. Also considered an SSO as a critical failsafe overflow for Storm Relief SPS wet well.
4b	DC011	Storm Relief	Opposite 2 Edenbridge Crt., Dundas	Spring Creek (Cootes Paradise)	DG09OF03	19 Glen Crt, Dundas
5	DC012	Storm Relief	Beside 27 Pleasant Ave, Dundas	Spring Creek (Cootes Paradise)	DH09OF01	59 Pimlico Dr, Dundas
6	DC013	Sanitary	Beside 150 Mill St. S at School St, Flamborough	Grindstone Creek 222 (Grindstone Marsh)	FN19OF03	Directly behind station
7	DC014	Sanitary	372 Dundas St E	Grindstone Creek 220 (Grindstone Marsh)	FN17OF02	Directly behind station

No.	Lift Station Name	Type	Address	Receiving Water Body	Outfall ASSET ID	Location of Outfall
8	DC015	Sanitary	84 Dundas St E, Flamborough	Grindstone Creek 228 (Grindstone Marsh)	FL23OF02	Directly behind station
9	DC017	Sanitary	241 Pleasant Ave, Dundas	Spring Creek (Cootes Paradise)	DF11OF01	224 Pleasant Ave.
10	FC001	Sanitary	Adjacent to 133 Elgin St, Flamborough on the road	Grindstone Creek 218 (Grindstone Marsh)	FM17OF05	Directly behind station
11	FC003	Sanitary	30 Carl Crescent	Grindstone Creek 228 (Grindstone Marsh)	FN20OF02	Behind 28 Carl Crescent
12	HC001	Storm Relief	Parkdale	Hamilton Harbour	HP04OF01	Storm Relief SPS Overflow & Parkdale CSO Outfall
13	HC002	Sanitary	56 West 31st St	Chedoke Creek (Cootes Paradise)	HD13OF01	600 Scenic Dr, Hamilton
14	HC007	Sanitary	In front of 166 St Margaret's Road, Ancaster	Ancaster Creek (Cootes Paradise)	AK11OF02	171 St Margaret's Rd, Ancaster
15	HC010	Sanitary	111 Sulphur Springs Rd., Ancaster	Sulphur Creek (Cootes Paradise)	AK08OF02	Directly behind station
16	HC011	Sanitary	170 Calvin St, Ancaster	Ancaster Creek (Cootes Paradise)	AL12OF05	Directly behind station
17	HC015	Sanitary	Aberdeen	Chedoke Creek (Cootes Paradise)	HE10OF03	Aberdeen CSO Outfall - Longwood Ave.
18	HC018	Sanitary	1980 Upper James St	Twenty Mile Creek	GD02OF01	Directly behind station

No.	Lift Station Name	Type	Address	Receiving Water Body	Outfall ASSET ID	Location of Outfall
19	HC020	Sanitary	130 Daffodil Cres	Chedoke Creek (Cootes Paradise)	AO04OF03	Directly behind station into SWMF 21B
20	HC060	Sanitary	193 King St E, Dundas	Desjardins Canal (Cootes Paradise)	DA10OF04	193 King St E. (Dundas Equalization/Diversion Tank)
21	HC061	Sanitary	42 Maplevale Drive	Ancaster Creek (Cootes Paradise)	AN11OF01	Flap gate in AM11A009 that would allow for overflow to AN11OF01. Also considered an SSO.
22	HC062	Sanitary	Pier 8	Hamilton Harbour	HH04OF007	Pier 8 – directly behind station

4. Hamilton's Stormwater Collection & Treatment Systems

Stormwater management is a core business provided by the City of Hamilton to manage water from precipitation and snowmelt that flows across the land before it is routed into drainage systems and then on to natural areas such as creeks, lakes and wetlands. The failure to do so would negatively impact the community by increasing stream erosion, to have and/or cause negative impacts to water quality, water temperature, increase baseflow, allow flooding, and destroy fisheries habitat and aquatic life.

The implementation of watershed stormwater strategies and construction of associated infrastructure allows for community development while balancing environmental, social, and economic needs to manage human activities within a watershed. Such initiatives include roadway salt management plans, as well as inspections and maintenance of stormwater management facilities (SWMF), oil and grit separator units, and Low Impact Development (LID) stormwater features. Table 4 summarizes Hamilton's Stormwater Asset Inventory.

Table 4: Hamilton's Stormwater Asset inventory

Stormwater Asset Component	2005 Inventory	2009 Inventory	2016 Inventory	2019 Inventory	2020 Inventory	2022 Inventory
Storm Sewers	965 km	1,010 km	1,149 km	1,216 km	1,231 km	1263.49 km
Manholes	13,779	14,105	19,551	~21,000	25,503	21,408
Storm Pumping Stations	2	2	2	2	2	2

Watercourses	-	-	-	191 km	148 km	148km
Major Swales	15 km	-	190 km	-	-	-
Ditches	20 km	-	2,164 km	-	-	1,603.04km
Municipal Drains	-	-	-	57 km	57 km	57 km
Assumed SWMF (*City owned and maintained)	50	76	119	120	143	119
Un-assumed SWMF (*Contractor owned and maintained. After three years from construction date, City assumes SWMF)	-	N/A	36	39	57	63
Engineered Wetlands	-	-	-	7	Included in assumed SWMF count	9
Low Impact Development Features within the Right of Way	-	-	-	4	Included in assumed SWMF count	Included in assumed SWMF count
Inlet/Outlet Structures	1,000	845	977	~1,000	~1,000	1,432

5. Sewer Lateral Cross-Connections (known and potential)

Sanitary sewer lateral cross-connections (cross-connections) describe a condition whereby sanitary waste from homes and businesses discharge into the City's storm sewer systems and subsequently into downstream watercourses. Cross-connections are a relatively common problem for all municipalities and constitute a threat to the quality of receiving waters. The City of Hamilton first initiated a Cross-Connection Control program in 2001 within the separated sewer system and has been actively working to eliminate cross connections for the last 19 years.

The program involves a series of field investigations designed to locate and eliminate crossed sewer pipes that are discharging sewage into the City's storm sewer system. This includes the sampling of sewer outfalls, inspecting storm sewers, homeowner engagement, dye tests, engineering investigations, inspecting sewer laterals (the pipe connecting the sewer main to an individual home) and the uncrossing of a number of pipes. As the City works with homeowners

and business owners to correct a growing number of cross-connections, it will reduce the amount of untreated sewage being discharged into Hamilton's watercourses, including Hamilton Harbour, and thus help meet HHRAP water quality targets.

In addition to field investigations and repair, the City has also made changes to the building inspection program and created new bylaws to help prevent future cross-connections. By partnering with community academics, conducting a 2017 best practice industry review, and emphasizing continual improvement, Hamilton has set a high standard and established itself firmly as an industry leader throughout North America for the identification and elimination of cross-connections.

As of March 2022, the program has achieved the following:

- 352 km total of storm sewer surveyed.
- 700 sewer lateral dye tests performed.
- 435 complete cross-connections identified.
- 43 partial cross-connections identified.
- 425 cross-connection repairs; approximately 90 million litres of wastewater being diverted away from the natural environment and into the treatment system, annually.

6. Impacts of Wastewater and Stormwater Discharges

Specific to the City's wastewater and stormwater services and their impact on the quality of the receiving water bodies, the primary sources of polluted discharges include:

- Combined Sewer Overflows (CSOs)
- Separated Sewer Overflows (SSOs)
- Separated stormwater system discharges
- WWTP treated effluent discharge and bypasses
- Sanitary Sewer Cross-connections (direct and indirect)
- Sewage Pump Station (SPS) emergency overflows

As identified in the HHRAP, significant contributors to the recovery of Cootes Paradise, Red Hill Creek, and delisting Hamilton Harbour as a designated AOC, are the reduction of pollutant loadings from CSOs, and from the treated effluent discharge from both the Woodward & Dundas WWTPs.

Consequently, the City's Clean Harbour Program has many projects and programs that are related to the control and management of the CSO and WWTP discharges. These provide the greatest opportunity, in the relative short-term, to deliver water quality improvements to support the City's commitment to meeting the targets set by the HHRAP and protection of receiving natural water bodies. Other initiatives include on-going roadway salt management plans, inspections, and maintenance of stormwater management facilities (SWMF), oil and grit separator units, and Low Impact Development (LID) stormwater features.

The City of Hamilton and its Council are committed to providing our citizens with the highest quality water services that contribute to a healthy, safe, and prosperous community. We are

trusted by our customers to protect their health, the environment and our future through excellence, engagement, and innovation.

7. Surface Water Quality Program Introduction

Hamilton's City Council, at its November 27, 2019 meeting approved General Issues Committee (2020 Rate Budget) Report 19-025. Report 19-025 included a motion to add five (5) additional Full Time Equivalent Rate Supported staff to the Hamilton Water budget complement consisting of: four (4) staff to improve the routine physical inspection and preventative maintenance programs for Hamilton Water infrastructure including water and wastewater treatment plants, pumping stations, reservoirs, water towers, well systems and combined sewer overflow tanks; and, one (1) staff to sample and analyze water and wastewater quality, and equipment/process related data.

On June 22, 2020 a Water Quality Technologist (WQT) was hired to support the development of a Surface Water Quality Program (SWQP) for the watercourses within the City. The goal of this position is to implement a program to oversee the quality of receiving water bodies that receive discharges from City Infrastructure, including sampling, assessing, reporting and ongoing communication with internal and external partners. The position is based in the Environmental Monitoring and Enforcement unit (EME) of the Compliance & Regulations Section in Hamilton Water.

This SWQP Framework was developed using an all-encompassing systematic approach by collaborating with internal and external partners; avoiding duplication of efforts through communication and the transparency of various water quality program information.

The WQT identified gaps within the current water quality programs, focusing on City infrastructure that could potentially discharge wastewater into the natural environment.

The goal of this proposed long-term SWQP is to build baseline water quality data over time, develop communication strategies, ensure transparency, and respond to and investigate any water quality anomalies that may be due to infrastructure malfunctions, throughout the City of Hamilton's Watersheds.

8. Engagement

Since June 22, 2020, the WQT has reached out and introduced the proposed SWQP to internal and external partners, through email and virtual meetings, as listed in Table 5. Some of the partners listed have surface water quality programs throughout the City's Watersheds.

Table 5: Internal & External Engagement

Internal	External
Hamilton Water Division, including: Compliance & Regulations Section (C&R) Environmental Monitoring & Enforcement Unit (EME) Customer Service & Community Outreach Section (CS&CO) Water Information Systems Unit (WIS) Plant Operations Section (PO) Water Distribution & Wastewater Collection Section (WDWWC) Watershed Management Group (WM) Water/Wastewater Systems Planning Section (WWWSP) Woodward Upgrades Program (WUP) Healthy & Safe Communities Division, including: Food & Water Safety Section Indigenous Relations Section Environmental Services Division: Parks & Cemeteries Section Waste Management Division: Recycling & Waste Disposal Section	Hamilton Conservation Authority (HCA)
	Royal Botanical Gardens (RBG)
	Bay Area Restoration Council (BARC)
	Environment Hamilton
	Niagara Peninsula Conservation Authority (NPCA)
	Conservation Halton (CH)
	Grand River Conservation Authority (GRCA)
	Ministry of Environment, Conservation & Parks (MECP)
	Environment & Climate Change Canada (ECCC)
	Redeemer College
	Mohawk College
	McMaster University
	Ministry of Transportation (MTO)
	Hamilton Harbour Remedial Action Plan (HHRAP) which also includes Members from: - Cootes Paradise-Grindstone Water Quality Sub-committee - Halton Region - McMaster University -Hamilton Industrial Environmental Association (HIEA), including Stelco & ArcelorMittal Dofasco - Hamilton Oshawa Port Authority (HOPA) - Fisheries and Oceans Canada (DFO)
	Ministry of Natural Resources and Forestry (MNRF)
	Transport Canada (TC)
	Stewards of Cootes Watershed & Stewards of Red Hill
	Friends of Cootes to Escarpment EcoPark System

a) Key Partner Feedback

The feedback received from the partners is listed below:

- Interested in the City improving communications and overall WQ community involvement, including assigning a City WQ Liaison/point of contact person or group.
- Would like to be aware of and/or review any City water quality related policies or decisions, prior to going to council for approval.
- Willingness to provide their knowledge, input, and feedback during the review phase of the proposed City-wide SWQP.

- Continue in building relationships with the City of Hamilton and the WQT through aligning current WQ programs with transparency, communication, data sharing and trending.

The consensus of water quality programs throughout Hamilton is:

- sampling is generally completed mid-to down-stream within selected watersheds, or within the receiving waterbody;
- programs that do sample the headwaters of a watershed, only sample during select periods of the year: and,
- there's a lack of watershed-based studies, including achieving baseline ambient water quality data or known WQ thresholds to trigger additional inspections.
    - specifically, on the impacts of Hamilton Water Infrastructure during dry, wet or storm events.

Overall, the water quality concerns based on previous studies or known water quality 'gaps', that have been expressed are:

- large urban run-off during wet weather events causing an increase in erosion and first flush contaminants, and pollutants like:
    - rising Phosphorous levels;
    - Total Suspended Solids;
    - select Total Metals (i.e. Copper);
    - Chloride;
    - Petroleum Hydrocarbons, including Volatile Organic Compounds (VOCs); and,
    - E. coli (human and animal).
- Other pollutants of potential concern include perfluoroalkyl and polyfluoroalkyl substances (PFAS), polychlorinated biphenyls (PCBs), polychlorinated naphthalenes (PCNs), pharmaceutical residues and micro/nano plastics.

In addition to the above, both the internal and external partners have expressed their interest in an all-inclusive interactive data sharing map:

- Internal: combine all water quality features currently in separate GIS maps/layers, linking sample locations, data, reports, projects (short or long term) and contact info, etc.
- External: build onto the live Chedoke Creek Surface Water Quality Map, creating a centralized data sharing site that shows all internal and external program long-term sampling locations, with downloadable data for sharing, trending, research or reviewing purposes.
    - Many partners have openly expressed their willingness to share their data.

b) Other Water Quality Programs

The other partners that have on-going water quality sampling programs, of varying sample frequencies and parameters, within the City of Hamilton Watersheds are identified in Table 6. Refer to Appendix B for a table outlining additional Program details, and Appendix C for a PDF detailing current on-going Sampling Locations.

Table 6: Current & On-Going Water Quality Programs

Internal	Program	External	Program
Environmental Monitoring & Enforcement Unit (EME)	Chedoke Creek Program Four (4) Locations **Quarterly*	Conservation Halton (CH)	MECP PWQMN One (1) Location in Grindstone Marsh **8 months a year (Apr – Nov)*
Plant Operations Section (PO)	ECA Compliance Sampling (WWTPs, CSO Tank Effluent & Plant Bypass – various locations) Twelve (12) Locations (Five (5) of these sample locations are within the Woodward WWTP) ** Wet Weather Overflow Events*	Environment and Climate Change Canada (ECCC)	Central Station Water Quality Monitoring Hamilton Harbour Four (4) Locations **Monthly (weather permitting) January to March; bi-weekly April and May; weekly from June to September; bi-weekly October and November; Monthly (weather permitting) December*
Woodward Upgrades Program (WUP)	Red Hill Creek Monitoring Program Five (5) Locations **Six (6) times a year - two (2) wet & four (4) dry*	Fisheries and Oceans Canada (DFO)	Dissolved Oxygen and Temperature Monitoring Program for Fish Habitat Ten (10) consistent locations (5 in HH, 3 at CP and GS, 2 at Red Hill / Windermere). Loggers record at 15min intervals for the deployment period **6 months, year-round (less locations during ice on season. Additional locations are deployed based on monitoring needs* *Information is provided within Appendix B.*
Waste Management Division (Recycling & Waste Disposal Section), as per ECA agreements.	Ancaster Nine (9) Locations **1x annual* Binbrook Landfill Three (3) Locations **2x annual* Brampton Landfill Eight (8) Locations **2x annual* Edgewood Landfill Six (6) Locations **4x annual* Glanbrook Landfill	Hamilton Conservation Authority (HCA)	MECP PWQMN Six (6) Locations **8 months a year (Apr – Nov)* HHRAP Water Quality Monitoring Eleven (11) Locations **bi-weekly, year-round*

	Ten (10) Locations *3x annual* Rennie Landfill Five (5) Locations *2x annual* Stoney Creek Landfill Nine (9) Locations *3x annual* Upper Ottawa Landfill Three (3) Locations *2x annual* West Hamilton Landfill Six (6) Locations *3x annual*		
		Niagara Peninsula Conservation Authority (NPCA)	NPCA Surface Water Monitoring Eleven (11) Locations *Ice-free seasons (approx. 8-9 months a year)*
		The Ministry of the Environment, Conservation and Parks (MECP)	Great Lakes Index - Reference Station Monitoring One (1) location: Hamilton Harbour Centre Station (Station 258) *Multi-media sampling occurs 3 times a year (spring, summer, fall), every 3 years*
		Redeemer College	Chedoke Watershed Nine (9) Locations *bi-weekly in May/June and again in Oct/Nov Red Hill Creek Watershed Eleven (11) Locations *bi-weekly ~ 2 months each summer*
		Royal Botanical Gardens (RBG)	RBG Water Quality for Cootes & Grindstone Six (6) Locations *bi-weekly, May-September*

9. Surface Water Quality Program Gap Analysis

The SWQP Framework and associated recommendations have been developed based on identified gaps through internal and external engagement, and the mapping of the City's wastewater and

stormwater assets and current internal and external water quality monitoring / sampling programs.

- 62 individual outfalls associated with the wastewater system were identified throughout Hamilton's watersheds. These include pump station (PS) emergency overflows, uncontrolled and controlled CSO and SSO Outfalls (with associated regulators, back-up overflow pipes, sluice gates, etc.), CSO tank outfalls and WWTP effluent outfalls.
- 932 storm sewer outfalls associated with the stormwater system were identified throughout Hamilton's watersheds. These include stormwater management pond outfalls. *Note: this is an estimate based on an inventory count, as of April 2022. The City is continuously adding new assets to the system.*
- 149 active sample locations were identified with ongoing / regular sampling programs shared between external and internal partners, including CSO tanks and WWTP effluent discharges to natural environment. These programs vary in scope, frequency, and parameter list.

In general, the following receiving water bodies / watercourses have some type of oversight as it relates to water quality monitoring:

- Hamilton Harbour
- Cootes Paradise
- Chedoke Creek
- Red Hill Creek
- Grindstone Creek & Marsh

Although the above water bodies / watercourses have some type of oversight, the review concluded there are variations in parameter lists and frequency, and there is limited visibility on how City infrastructure influences water quality within Hamilton's receiving water bodies and associated watercourses. Additional sample locations were determined to be necessary up-, mid- and down-stream respectively, especially up- and downstream to CSO related infrastructure.

10. Proposed Surface Water Quality Program Framework

Throughout the Framework development process, partners often asked, "what question(s) are you looking to answer with this Program?" Below are the primary questions driving the SWQP Framework forward.

- What is the ambient baseline water quality condition of the waterway?
- How does City Infrastructure influence water quality during seasonal fluctuations, wet/dry conditions, and wet weather events?
- Are there anomalies within the water quality data that the City should investigate (e.g. at any upstream infrastructure, or potential incoming non-point source contributions)?
- Are the right locations being sampled and for the correct parameters? Are the right questions being asked?

Based on feedback and the results of the gap analysis, along with the various projects that have been completed in support of the overall HHRAP objectives, and with limited water quality information available within the watersheds, the City is proposing a long-term multi-phased surface water quality monitoring program. This program is considered separate to other City sampling programs like the ones required under existing Environmental Compliance Approvals (ECA) and the Pollution Prevention Control Plan (PPCP), required by the MECP. Over time, as this program becomes established, further alignments with other programs may be considered.

The Hamilton Water Division (HW) will monitor and sample surface waters for a selected list of parameters, in various locations throughout the City; building consistency and baseline data, alongside the partners, beginning with Phase I.

HW will review the Framework on an annual basis to ensure the SWQP remains relevant.

11. PHASE I (1 to 2 Years)

Phase I of this multi-phase Framework focuses on establishing a surface water quality program (with monthly monitoring and sample collection) within the Watersheds that have been deemed priority.

Phase I sample location criteria used to rank priority Watersheds includes:

- CSO/SSO Outfalls and/or Sewer Pump Station (SPS) Emergency Overflows that can potentially discharge to the natural environment.
- Receiving Water Bodies classified as Sensitive Ecosystems (i.e. Cootes Paradise & Grindstone Marsh) & Hamilton Harbour (based on Area of Concern (AOC)).
    - Cootes Paradise is classified as an Environmentally Sensitive Area (ESA) as well as a Provincially Significant (Class 1) Wetland and an Area of Natural and Scientific Interest (ANSI).
- Ranking of surface water quality health based on the Conservation Authority Watershed Report Cards and Annual Reports.

The rationale used to select proposed Phase I sample locations within priority Watersheds, includes:

- up-, mid- and/or down-stream sample location(s) respectively, of known CSO/SSO Outfalls or SPS Emergency Overflow(s), with no current Internal/External WQ sample location.
- where there is a sample location already down-stream, an up- and/or mid-stream Watershed location is proposed, for water quality comparisons; the goal is to understand how infrastructure may be influencing the water quality.

a) Phase I Proposed Monitoring and Sampling Locations

The SWQP is proposing twenty-nine (29) new surface water monitoring and sampling locations to be introduced to the EME monitoring portfolio. These 29 locations do not include the current four (4) active Internal sample locations, within Chedoke Creek. The proposed 29 locations as well as the existing 4 locations, are to be monitored and sampled monthly, year-round by the WQT. The

proposed locations are outlined in **Table 8**. Refer to **Appendix D** for PDFs detailing Proposed Phase I Sampling Locations.

Table 7: Proposed Phase I Monitoring and Sampling Locations

Watershed	Sub-Watershed	Recommended Sample Location	Watershed Details
Conservation Halton			
Grindstone Creek	Grindstone Creek Subwatershed 222 CH Grade: Poor	WQ Sample: Down-stream (Mill St S @ Smokey Hollow Park); GC222 SW1	Watershed Total: 82 Storm Outfalls (OFs) & five (5) Priority Outfalls Receiving water = Grindstone Marsh
Hamilton Conservation Authority			
Spencer Creek	Spring Creek HCA Grade: Good	WQ Sample: Down-stream (Ogilvie Street); SprC SW1 WQ Sample: Up-stream (Ridgewood Blvd); SprC SW2	Watershed Total: 335 Storm OFs & 22 Priority Outfalls Receiving water = Cootes Paradise
	Ancaster Creek HCA Grade: Poor	WQ Sample: Mid-stream (Golf Links Rd); AC SW1 WQ Sample: Up-stream (Garner Rd E); AC SW4	
	Chedoke Creek HCA Grade: Insufficient Data	WQ Sample: Up/Mid-stream (Radial Rail Trail @Beddoe Drive); CC SW7 WQ Sample: Up/Mid-stream (Radial Rail Trail @Sanatorium); CC SW8 WQ Sample: Up/Mid-stream (Radial Rail Trail @Scenic Dr); CC SW9 WQ Sample: Up/Mid-stream (130 Daffodil Cres); CC SW10	
	Lower Spencer Creek HCA Grade: Fair	WQ Sample: Down-stream Dundas WWTP FEO (Desjardins Canal; east of Olympic Drive); LSC SW1 WQ Sample: Up-stream to Dundas WWTP FEO (Desjardins Canal; Centennial Park); LSC SW2 WQ Sample downstream to Sterling St CSO (Churchill Gardens/aviary); LSC SW3	
Red Hill Creek	Red Hill Valley HCA Grade: Poor	WQ Sample: Down-stream (Windemere Park); RHV SW1 WQ Sample: Mid-stream (Eastport Dr./Woodward Ave. Bridge; Down-stream to Woodward FEO); RHV SW2	Watershed Total: 161 Storm OFs and seven (7) Priority Outfalls Receiving water: Hamilton Harbour

		WQ Sample: Mid-stream (2245 Brampton Street); RHV SW3 WQ Sample: Mid-stream (Hixon Rd/Parkdale Ave S); RHV SW4	
	Upper Ottawa	WQ Sample: Up/Mid-stream (Mnt Brow Blvd @ Pedestrian Bridge at Albion Falls Park); UO SW1	
Stoney-Battlefield Creeks	Battlefield Creek HCA Grade: Poor	WQ Sample: Down-stream (Lake Ave N/Huckleberry Dr); BatC SW1 WQ Sample: Mid-stream (King Street W/Battlefield Museum); BatC SW2	Watershed Total: 49 Storm OFs & two (2) Priority Outfalls Receiving water: Hamilton Harbour
Urban Hamilton	Urban Core HCA Grade: Insufficient Data	WQ Sample: Down-stream (Bayfront Park); UC SW1 WQ Sample: Down-stream (Discovery Dr., SW corner); UC SW2 WQ Sample: Down-stream (Discovery Dr., NW corner); UC SW3 WQ Sample: Down-stream (Eastport - Catharine); UC SW4 WQ Sample: Down-stream (Wellington CSO); UC SW5 WQ Sample: Down-stream (Wentworth CSO); UC SW6 WQ Sample: Down-stream (Hillyard/Birch/ Sherman CSO); UC SW7 WQ Sample: Down-stream (Gage/Ottawa CSO); UC SW8 WQ Sample: Down-stream (Kenilworth CSO); UC SW9 WQ Sample: Down-stream (Strathearne CSO); UC SW10	Watershed Total: 20 Storm OFs and 19 Priority Outfalls Receiving water = Hamilton Harbour

b) Proposed Sampling Schedule

The City is proposing a long-term monthly SWQP. The monthly sampling event will record all field observations and parameters, and will sample for chemical parameters, as outlined below.

Once the Program is established and trends are being reviewed, the City will review the option to complete pre and post rain/wet weather event sampling and inspections, at select locations; resource dependent.

c) Surface Water Sampling Parameters Standardization

The following field and analytical parameters are being proposed as the standard list to develop baseline conditions. The list has been compiled by considering the City's current Wastewater ECA, WUP's current sampling program, existing Conservation Authority Programs, and potential contaminants of concern in our watersheds like O-Phosphate and Chloride, due to City use and aging infrastructure.

Field Parameters

Dissolved Oxygen (DO), pH, Conductivity, Temperature

Chemical Parameters

Ammonia as N, Carbonaceous Biochemical Oxygen Demand (cBOD), Chloride, Escherichia coli (E. coli) bacteria, Hardness, Nitrate, Nitrite, O-Phosphate, Total Kjeldahl Nitrogen (TKN), Total Phosphorus (TP), Total Suspended Solids (TSS), Un-ionized Ammonia, and Total Metals which include: Aluminum, Antimony, Arsenic, Barium, Beryllium, Bismuth, Boron, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Lithium, Magnesium, Manganese, Molybdenum, Nickel, Potassium, Selenium, Silicon, Silver, Sodium, Strontium, Thallium, Tin, Titanium, Tungsten, Uranium, Vanadium, Zinc, Zirconium.

Caffeine and/or Microbial Source Tracking (MST) will be added to the parameter list for sample locations, where further investigations are required.

d) Phase I Sample Method

In phase I, monthly grab samples will be taken at each location, for the parameters listed above. The main goal of this SWQP is to establish a baseline understanding of ambient surface water conditions. By sampling the ambient waterways and receiving waterbodies, the City is looking to understand the quality of water with our watersheds, up-, mid- and down-stream to any identified priority type City infrastructure.

e) Sample Characterization

The sample chain of custody and internal work orders will classify the sample as dry weather, wet weather, storm event, or snowmelt event, as well as document field parameters and observations (water colour, visible sheen, wind direction, weather, including a photo), for record keeping and trending purposes.

Classification of a dry, wet or storm event sample is determined by the amount of precipitation recorded at rain gauges throughout the City.

For Phase I, the WQT will review and record precipitation data from the two (2) ECCC precipitation gauges located at Royal Botanical Gardens and the Hamilton Airport, for trending purposes.

- A dry sample is classified as: < 4mm, of recorded precipitation within a 24-hour period, prior to sampling.

- A wet sample is classified as: ≥ 4mm, of recorded precipitation within a 24-hour period, prior to sampling.
- A storm precipitation event is classified as: ≥ 25mm, of recorded precipitation within a 24-hour period, prior to sampling.
- A snowmelt event is classified when there is a snowpack, and the temperature is above 0° Celsius.

f) Proposed Modifications to Existing City's Continuous Sampling Programs

EME's Chedoke Creek Quarterly Program

Current Program:

Four (4) sample locations; completed Quarterly. Parameters include: Field DO & Temperature, and E. coli

Proposed Modifications:

Increase sample frequency to monthly and ensure testing for the standard set of parameters, outlined above; absorb into this SWQP.

WUP's Red Hill Creek Monitoring Program

Current Program:

Sampling is completed every two (2) months (six (6) times per year).

As the SWQP evolves and as the WUP's monitoring program comes to completion in approximately 10 years, the City's SWQP will ensure monthly sampling at these locations are continued.

g) Proposed Modifications to Existing External Water Quality Programs

Phase I of the SWQP also includes suggested modifications to existing external WQ programs.

In 2022, discussions relating to the support of the Phase I proposed modifications of existing external programs, will be conducted by the City.

HCA's HHRAP WQ Monitoring Program

Current Program:

11 sample locations; completed bi-weekly, year-round. Parameters include: Ammonia, E. coli, Nitrate, Nitrite, TP, TSS, Volatile Suspended Solids (VSS) at 11/11 locations & O-phosphate at 5/11 locations

Proposed Modifications:

Hamilton Water currently supports this program by analysing the samples at the City's Environmental Laboratory. With Hamilton Water's support, the SWQP Framework is looking to increase the list of monitoring parameters to match the standard set of proposed parameters as outlined above.

Another opportunity would be to integrate HCA field data into the CHEL database (LIMS), that may allow enhanced trending and data analysis.

RBG's WQ for Cootes & Grindstone Program

Current Program:

Six (6) sample locations, completed bi-weekly, May to September; with one (1) sample location that was completed 4 times (CP-5 – West Pond) in 2020.

Hamilton Water currently supports this program by analysing the samples at the City's Environmental Laboratory. Parameters include: Ammonia (6 of 7 locations), E. coli (6 of 7 locations), nitrate/nitrite (2 of 7 locations), TP (all 7 locations), TSS (6 of 7 locations), VSS (6 of 7 locations) & Dissolved Organic Carbon (DOC) (2 of 7 locations) & Total Dissolved Phosphorus (TDP) (all 7 locations)

Proposed Modifications:

The SWQP Framework proposes the increase of the existing sampling period to bi-weekly from March 1 to November 30 (*water level, ice, weather & RBG resources dependent*) at all seven (7) locations.

Hamilton Water currently supports this program by analysing the samples at the City's Environmental Laboratory. With Hamilton Water's support, the SWQP Framework is looking to increase the list of monitoring parameters to match the standard set of proposed parameters as outlined above.

Another opportunity would be to integrate RBG field data into the CHEL database (LIMS), that may allow enhanced trending and data analysis.

h) Data Trending

Hamilton Water is in the process of building a trending dashboard technology that will integrate both internal and external data. Working with and along-side partners will be required to ensure compatibility for data storage and trending.

The data collected is reviewed against municipal, provincial, and federal regulations and guidelines for general baseline condition purposes only. The guiding documents provide water quality benchmarks, in order to monitor and measure water quality improvements, overtime.

The WQT will review water quality data, as it becomes available, against the Provincial Water Quality Objectives (PWQO), when available. In the absence of criteria of any parameter within the PWQO, the Canadian Water Quality Guidelines (CWQG) will be used. E. coli concentrations will be compared against the Canadian Health Guidelines, for primary and secondary contact recreational activities. The Hamilton's Public Health Services website will also be consulted, when required, to review E.coli data. Similar to the NPCA, the British Columbia Ambient Water Quality Guideline (BC, 2001) will also be reviewed in the absence of water quality criteria. The City of Hamilton's Sewer Use By-Law 14-090 will also be reviewed to ensure storm sewer compliance, when applicable. The

above guiding documents provide water quality benchmarks, in order to monitor and measure water quality improvements, over time.

As water quality data is collected over time, including utilizing current and historical watershed data, an average baseline, or a Water Quality Index, for select WQ parameters may be developed.

In 2022, discussions relating to developing WQ thresholds and triggers, for individual watersheds, will begin, working with our partners.

i) Spills Response Protocol

Review the EME Spills Response standard sampling list of water quality parameters to ensure it reflects the recommended SWQP standard parameter list.

Develop training material for EME's Environmental Enforcement Officers on location of standardize sampling locations to ensure data is being collected consistently.

Develop and implement standard operating procedures (SOPs) where the Surface Water Technologist will support extended sampling activities related to potential spill incidents. This includes any required additional sampling, data review, trending, and reporting.

a. Activation of City Reporting Spills Line

In the event there is an observed anomaly within the water quality (E. coli trend, abnormal field observations including floatables, low DO, etc.), and further investigation is required, the City's Spills Line will be called to report and initiate an inspection, as per the Level III SOP. If a water quality anomaly or observation cannot be determined through EME's spill investigation, the owner/operator of any suspected contributing infrastructure, will be contacted. It will be determined by the owner/operator of that infrastructure what manner of investigation (if any) would be beneficial.

Owners/operators of infrastructure could be the Water Distribution & Wastewater Collections Section, Plant Operations Section, Environmental Services Division, Waste Management Division, Transportation Operations & Maintenance Division, Energy Fleet & Facilities Division, Ministry of Transportation, Hamilton-Oshawa Port Authority, private property owners, and more.

In addition to the above, other partners with water quality programs will make visual observations and review their data with respect to long term averages, typical ranges, and trends. If water quality observations and field parameters are observed to be in poor condition, and/or the laboratory results are considered abnormally high, or abnormalities and/or significantly elevated concentrations are observed over several consecutive sampling dates, they are to report to the City Spills Line for further inspection.

In 2022, discussions relating to developing WQ thresholds and triggers, for individual watersheds, will begin, working with our partners.

j) Communications & Data Sharing

A monthly update within the Environmental Monitoring & Enforcement Unit, to discuss any completed sampling work, water quality data, and any issues identified in the field, will be established. An update to Senior Leadership will be scheduled on a 6-month interval, to discuss the status of the program and any identified trends associated with the water quality data. The Manager of C&R will communicate with the HW Leadership team as required. Any conditions that require immediate attention will be addressed via the existing Hamilton Water spill response protocol.

The City has begun the process of developing a Memorandum of Understanding (MOU) with all its partners.

Additional communications including involvement details will be developed to ensure scheduled update meetings, data transparency, communications, and long-term data sharing for both internal and external uses, such as downloadable data sharing for water quality trending purposes.

In Q1, 2021, a Surface Water Quality Webpage and Map, showing current SWQP sample locations, with associated analytical data, was launched on the City website. Looking ahead, this Water Quality Map will also include sample locations from all City partners.

k) Annual Report

Annually, the City will develop a surface water quality report outlining the successes, challenges, and other technical components of the Program. Any conditions that require immediate attention, will be addressed via the Hamilton Water spill response protocol.

As part of the annual review, the City will insure this SWQP Framework remains representative of its watershed needs and adjust as required.

Phase II (2 to 5 Years)

a) Phase II Proposed Monitoring and Sampling Locations

Phase II of the SWQP outlines additional surface water monitoring and sampling locations throughout the Watersheds. The additional locations throughout the Watersheds focus on:

- The remaining Watersheds not captured in Phase I
- Establishing an up-, mid- or down-stream water quality sampling location, respectively, to City infrastructure assets (including storm sewer outfalls) that discharge to the natural environment
    - An opportunity to gain a holistic view of how the City's assets, including road and storm run-off that discharge to the natural environment, influence water quality throughout the Watersheds.

The SWQP is proposing an additional ~46 surface water monitoring and sampling locations to be introduced to the monitoring portfolio. Refer to Appendix E for the Phase II Proposed sample locations. As the program evolves, Phase II locations may be moved, added, or removed.

b) Benthic Monitoring

Work with the partners who currently have benthic data and expand on the WUP, HCA, CH & NPCA Programs at select surface water quality monitoring and sampling locations throughout the City's watersheds.

c) Sediment sampling

Explore the opportunity to understand the sediment quality at select surface water monitoring and sampling locations throughout the City's watersheds.

d) Technology Implementation

Explore the opportunity to deploy technology to obtain real-time or in-stream water quality data, for long-term trending. This technology may enable early detection of water quality problems associated with City infrastructure (ex. pH, DO, Temperature, Flow, etc.).

e) Funding / Grants

Explore opportunities to apply for government funding or private sector grants aimed at increasing capability of the surface water monitoring program.

12. PHASE III (5 to 10 Years)

a) Decision Making / Capital Investing

The goal is to establish a robust water quality baseline that will enable decision makers to identify needed infrastructure investment to protect water quality, including a method to evaluate the impact of such investment.

As water quality data is collected over time, including utilizing current and historical WQ data, an average baseline for select WQ parameters may be developed.

Baseline variations may include:

- Seasonal, wet, dry, and storm over an:
    - Annual period;
    - 5-year period; and,
    - 10-year period.

Baseline may be developed by using the 75^{th} percentile of the sample result. This method should only be applied to background stations or stations located upstream of a City asset. By using the 75^{th} percentile, the City can then compare data from a downstream station, to see if it is elevated or not.

The City will also review the option to create a Water Quality Index (WQI), for each watershed or location. The SWQP may be modified to align with WQI objectives; customizing City urban creeks, with attainable improvement goals.

b) Strategic Sewer Use By-Law Enforcement

Prioritize areas of interest/on-going WQ areas of interest and provide input to Environmental Monitoring & Enforcement Unit to optimize areas in need of further inspection.

13. CONCLUSION

This Surface Water Quality Program Framework Report is the starting point for the City of Hamilton in gaining a holistic understanding of its receiving waters and the potential impacts from various assets within the storm and wastewater collection and treatment system. Hamilton endeavors to study how wastewater and stormwater discharges are influencing the quality of the receiving waters.

In this report, the major receiving water bodies were identified as well as the storm and wastewater collection and treatment systems. Key partners were engaged in 2020 to determine where the key gaps exist in the overall monitoring of Hamilton's surface waters. From this information, a phased approach was developed. Phase I establishes a monthly surface water monitoring plan.

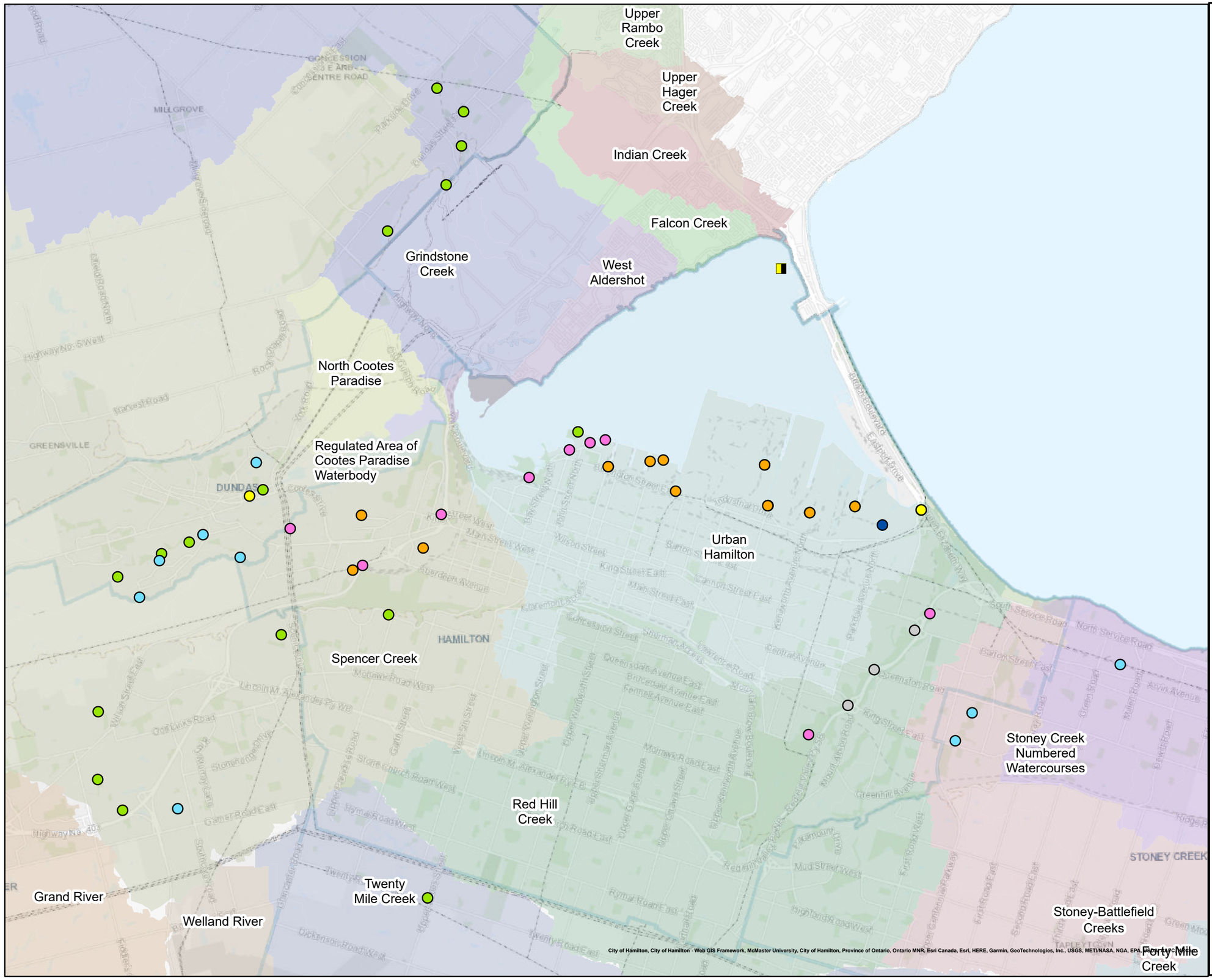
Phase II focuses on assessing the initial sampling plan and making modifications as needed and expanding the coverage of the monitoring plan. This phase will take place between years 2-5. From the baseline information captured in Phases I and II, Phase III will focus on infrastructure investment needed to better protect the receiving waters as well as prioritizing identified areas of interest/on-going WQ areas of interest for regular inspection and enforcement activities as needed.

This Framework is a living document and the road map in ensuring there is a clear oversight of Hamilton's assets and the corresponding receiving waters.

Appendix F gives a visual of the Framework's phased approach.

Appendix A: Priority Outfalls, and 2020 & 2021 CSO Deposit Summary

Hamilton Water Priority Outfalls



Priority Outfalls

- CSO OUTFALL
- CSO OUTFALL - BLOCKED
- SPS EMERGENCY OVERFLOW OUTFALL
- SPS EMERGENCY OVERFLOW & CSO OUTFALL
- CSO TANK OUTFALL
- SSO OUTFALL
- WWTP OUTFALL
- WWTP OUTFALL (HALTON)

Watersheds

- Bronte Creek
- Falcon Creek
- Forty Mile Creek
- Grand River
- Grindstone Creek
- Indian Creek
- North Cootes Paradise
- Red Hill Creek
- Regulated Area of Cootes Paradise Waterbody
- Spencer Creek
- Stoney Creek Numbered Watercourses
- Stoney-Battlefield Creeks
- Twenty Mile Creek
- Upper Hager Creek
- Upper Rambo Creek
- Urban Hamilton
- Welland River
- West Aldershot

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Kilometers

Hamilton Water All HW Storm & Priority Outfalls

Bronte Creek
Upper Rambo Creek
Upper Hager Creek
Indian Creek
Falcon Creek
West Aldershot
Grindstone Creek
Spencer Creek
North Cootes Paradise
Regulated Area of Cootes Paradise Waterbody
Urban Hamilton
Red Hill Creek
Grand River
Stoney Creek Numbered Watercourses
Stoney-Battlefield Creeks
Forty Mile Creek
Twenty Mile Creek
Welland River

Priority Outfalls

- CSO OUTFALL
- CSO OUTFALL - BLOCKED
- SPS EMERGENCY OVERFLOW OUTFALL
- SPS EMERGENCY OVERFLOW & CSO OUTFALL
- CSO TANK OUTFALL
- SSO OUTFALL
- WWTP OUTFALL
- WWTP OUTFALL (HALTON)
- All Other Outfalls
- Watercourse

Watersheds

- Bronte Creek
- Falcon Creek
- Forty Mile Creek
- Grand River
- Grindstone Creek
- Indian Creek
- North Cootes Paradise
- Red Hill Creek
- Regulated Area of Cootes Paradise Waterbody
- Spencer Creek
- Stoney Creek Numbered Watercourses
- Stoney-Battlefield Creeks
- Twenty Mile Creek
- Upper Hager Creek
- Upper Rambo Creek
- Urban Hamilton
- Welland River
- West Aldershot

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Kilometers

Hamilton Wastewater

Woodward WWTP Bypass and CSO Overflow Log
2020

SAC #	Event #	Start		Location	Stop		Duration	Volume	Disinfection	Reason	Sample Results						
											Bypass or CSO Sample					Final Effluent	
		Date	Time		Date	Time	Hours	ML	Yes / No	Code	TBOD	cBOD	TSS	TP	E.coli	pH	Total Cl
		yyyy-mm-dd			yyyy-mm-dd						mg/L	mg/L	mg/L	mg/L	CFU/100ml		mg/L
903943	**1**	2020-01-11	00:27	HCG03	2020-01-12	20:47	37.81	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
903959	**2**	2020-01-11	11:21	S	2020-01-13	04:15	40.90	637.590	No	1,7	35	n/a	75.0	1.00	996,667	7.12	n/a
	3	2020-01-11	15:01	HCS04	2020-01-13	23:37	56.60	127.121	No	1,7	n/a	21	141	0.574	770,000	n/a	n/a
	4	2020-01-11	15:21	HCS01	2020-01-13	06:49	39.47	404.695	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-01-13	13:05		2020-01-13	17:25	4.33	7.453									
	5	2020-01-11	14:01	DC011	2020-01-12	05:53	1.07	0.072	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	6	2020-01-12	1:20	HCS08	2020-01-12	06:00	4.67	5.341	No	1,7	n/a	8	220	0.287	40,000	n/a	n/a
	7	2020-01-11	10:35	HCS05	2020-01-13	02:15	39.67	50.204	No	1,7	n/a	19	57	0.916	883,333	n/a	n/a
	8	2020-01-12	02:20	DC012	2020-01-12	05:11	0.10	0.023	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	9	2020-01-11	17:21	HCS7C	2020-01-11	21:14	3.88	4.576	No	1,7	n/a	9	134	0.462	295,000	n/a	n/a
		2020-01-12	00:59		2020-01-12	07:38	6.65	10.754									
904069	**10**	2020-01-12	04:45	HCS09	2020-01-12	05:42	0.95	0.258	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904057	**11**	2020-01-12	07:19	HC060	2020-01-12	08:56	1.62	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904093	**12**	2020-01-24	17:40	HCG03	2020-01-25	13:43	19.70	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904096	**13**	2020-01-24	20:53	S	2020-01-25	22:51	25.97	206.690	No	1,7	50	n/a	70.0	1.33	1,022,500	6.98	n/a
	14	2020-01-25	02:17	HCS01	2020-01-26	10:45	32.47	180.441	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	15	2020-01-25	02:45	HCS04	2020-01-25	23:35	20.83	51.093	No	1,7	n/a	n/a*	n/a*	n/a*	340,000	n/a	n/a
	16	2020-01-25	00:00	HCS05	2020-01-25	21:05	21.08	1.394	No	1,7	n/a	25	55.0	0.92	430,000	n/a	n/a
904116	**17**	2020-01-26	18:43	HCG03	2020-01-26	23:27	2.53	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904122	**18**	2020-02-02	11:12	HCG03	2020-02-02	14:13	3.02	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904126	**19**	2020-02-10	11:45	HCG03	2020-02-10	14:07	2.37	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904129	**20**	2020-02-18	10:36	HCG03	2020-02-18	14:16	3.67	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904131	**21**	2020-02-26	12:34	HCG03	2020-02-26	12:56	0.37	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904135	**22**	2020-03-02	09:45	HCG03	2020-03-02	14:07	4.37	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904136	**23**	2020-03-02	12:51	S	2020-03-02	19:21	6.50	24.119	No	1,7	61	n/a	135	2.92	2,600,000	7.16	n/a
		2020-03-03	11:51		2020-03-03	13:03	1.20										
904141	**24**	2020-03-03	14:16	HCG03	2020-03-03	16:57	2.68	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-03-03	17:31		2020-03-03	17:54	0.38										
904142	**25**	2020-03-03	14:52	S	2020-03-04	1:50	10.97	75.387	No	1,7	59	n/a	70.0	1.65	1,470,000	7.27	n/a
	26	2020-03-03	15:10	HCS01	2020-03-04	05:44	14.57	96.861	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	27	2020-03-04	01:00	HCS04	2020-03-04	02:51	1.85	2.001	No	1,7	n/a	n/a**	n/a**	n/a**	n/a**	n/a	n/a
904159	**28**	2020-03-06	06:56	HCG03	2020-03-06	07:14	0.30	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-03-06	10:38		2020-03-06	15:54	5.27										
		2020-03-10	05:05		2020-03-10	05:37	0.53										
904163	**29**	2020-03-10	05:55	HCG03	2020-03-10	07:03	1.13	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-03-10	07:29		2020-03-10	11:05	3.60										
904187	**30**	2020-03-13	04:21	HCG03	2020-03-13	05:51	1.50	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904194	**31**	2020-03-18	21:30	HCG03	2020-03-18	23:30	2.00	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904195	**32**	2020-03-20	01:56	HCG03	2020-03-20	02:32	0.60	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904210	**33**	2020-03-23	09:31	HCG03	2020-03-23	13:09	3.63	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-03-23	14:34		2020-03-23	15:41	1.12										
	34	2020-03-25	13:12	DC012	2020-03-25	13:13	0.02	0.005	No	3	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904225	**35**	2020-03-28	10:19	HCG03	2020-03-28	11:08	0.82	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904232	**36**	2020-03-29	03:28	HCG03	2020-03-29	05:29	2.02	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-03-29	06:37		2020-03-29	10:11	3.57										
904285	**37**	2020-04-07	21:56	HCG03	2020-04-07	22:09	0.22	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Hamilton Wastewater

Woodward WWTP Bypass and CSO Overflow Log
2020

SAC #	Event #	Start Date yyyy-mm-dd	Start Time	Location	Stop Date yyyy-mm-dd	Stop Time	Duration Hours	Volume ML	Disinfection Yes / No	Reason Code	Sample Results Bypass or CSO Sample TBOD mg/L	cBOD mg/L	TSS mg/L	TP mg/L	E.coli CFU/100ml	Final Effluent pH	Final Effluent Total Cl mg/L
904293	**38**	2020-04-09	01:25	HCG03	2020-04-09	05:48	4.38	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-04-09	06:49		2020-04-09	07:55	1.10										
904298	**39**	2020-04-13	03:27	HCG03	2020-04-13	04:50	1.38	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-04-13	05:23		2020-04-13	09:15	3.87										
904312	**40**	2020-04-19	11:27	HCG03	2020-04-19	12:03	0.60	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904313	**41**	2020-04-26	10:10	HCG03	2020-04-26	11:21	1.18	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904331	**42**	2020-04-30	07:53	HCG03	2020-04-30	08:36	0.72	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-04-30	09:42		2020-04-30	10:22	0.67										
		2020-04-30	11:23		2020-04-30	12:31	1.13										
		2020-04-30	19:09		2020-04-30	19:48	0.65										
904376	**43**	2020-05-14	16:05	HCG03	2020-05-14	16:38	0.55	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-05-14	17:49		2020-05-14	18:28	0.65										
904377	**44**	2020-05-15	08:37	HCG03	2020-05-15	09:54	1.28	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904382	**45**	2020-05-17	15:51	HCG03	2020-05-17	16:37	0.77	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-05-17	17:14		2020-05-17	18:38	1.40										
		2020-05-17	21:38		2020-05-17	21:49	0.18										
		2020-05-17	22:02		2020-05-18	04:22	6.33										
		2020-05-18	06:56		2020-05-18	11:14	4.30										
		2020-05-18	14:55		2020-05-18	16:11	1.26										
		2020-05-18	20:46		2020-05-18	21:41	0.92										
904386	**46**	2020-05-18	09:28	S	2020-05-18	18:36	9.13	56.340	Yes	1,7	37	n/a	48.3	1.10	936,667	7.05	0.00
		2020-05-18	21:27		2020-05-19	00:16	2.82										
904399	**47**	2020-05-28	12:57	HCG03	2020-05-28	14:22	1.42	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-05-28	15:44		2020-05-28	16:17	0.55										
904421	**48**	2020-05-29	10:14	HCG03	2020-05-29	11:30	1.27	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-05-29	16:15		2020-05-29	16:55	0.67										
904429	**49**	2020-06-03	06:00	HCG03	2020-06-03	06:58	0.97	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904438	**50**	2020-06-10	05:17	HCG03	2020-06-10	06:10	0.88	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-06-10	13:12		2020-06-10	13:15	0.05										
		2020-06-10	22:00		2020-06-11	01:06	3.10										
904450	**51**	2020-06-10	23:47	S	2020-06-11	02:40	2.88	26.510	Yes	1,7	77	n/a	97.0	1.67	1,990,000	6.90	0.00
904463	**52**	2020-06-22	19:50	HCG03	2020-06-22	20:50	1.00	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904464	**53**	2020-06-22	20:16	HCG14	2020-06-23	05:31	9.25	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-06-23	13:40		2020-06-23	23:54	10.23										
904468	**54**	2020-06-23	13:28	HCG03	2020-06-23	14:22	0.90	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904504	**56**	2020-06-27	04:15	HCG03	2020-06-27	05:40	1.42	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904505	**57**	2020-06-27	05:09	HCG14	2020-06-27	05:19	0.17	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904531	**58**	2020-07-10	19:53	HCG03	2020-07-10	20:50	0.95	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-07-10	20:40		2020-07-11	00:06	1.43										
904532	**59**	2020-07-10	20:06	HCG14	2020-07-10	21:59	1.88	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-07-10	22:50		2020-07-11	01:17	2.45										
904540	**60**	2020-07-10	21:24	S	2020-07-11	02:25	5.02	43.010	Yes	1,7	65	n/a	88.4	1.94	540,000	7.05	0.00
904567	**61**	2020-07-16	15:20	HCG03	2020-07-16	15:30	0.17	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904578	**62**	2020-07-19	12:49	HCG03	2020-07-19	13:17	0.47	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Hamilton Wastewater

Woodward WWTP Bypass and CSO Overflow Log
2020

SAC #	Event #	Start Date yyyy-mm-dd	Start Time	Location	Stop Date yyyy-mm-dd	Stop Time	Duration Hours	Volume ML	Disinfection Yes / No	Reason Code	Sample Results Bypass or CSO Sample TBOD mg/L	cBOD mg/L	TSS mg/L	TP mg/L	E.coli CFU/100ml	Final Effluent pH	Final Effluent Total Cl mg/L
904580	63	2020-07-19	13:09	HCG14	2020-07-19	13:38	0.48	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904603	64	2020-08-02	00:35	HCG03	2020-08-02	01:01	0.43	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-08-02	02:35		2020-08-02	02:57	0.37										
		2020-08-02	04:04		2020-08-02	04:36	0.53										
		2020-08-02	06:37		2020-08-02	07:16	0.65										
		2020-08-02	08:58		2020-08-02	09:45	0.78										
904611	65	2020-08-02	07:04	HCG14	2020-08-02	07:34	0.50	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-08-02	09:06		2020-08-02	09:57	0.85										
904638	66	2020-08-03	16:47	HCG03	2020-08-03	17:45	0.97	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904639	67	2020-08-03	16:53	HCG14	2020-08-03	19:18	2.42	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-08-03	22:40		2020-08-03	22:52	0.20										
904648	68	2020-08-04	18:58	HCG03	2020-08-04	20:22	1.40	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904650	69	2020-08-04	19:15	HCG14	2020-08-05	02:04	6.82	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904657	70	2020-08-04	19:16	HC015	2020-08-04	19:45	0.07	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904653	71	2020-08-04	19:30	HC001	2020-08-04	20:00	0.50	1.080	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904647	72	2020-08-04	19:54	S	2020-08-05	02:40	6.77	54.665	Yes	1,7	54	n/a	62.0	1.72	2,600,000	7.08	0.02
	73	2020-08-04	20:03	HCS08	2020-08-04	21:56	1.88	9.848	No	1,7	n/a	6	203	0.418	100,000	n/a	n/a
	74	2020-08-04	20:49	HCS04	2020-08-05	08:57	12.13	10.998	No	1,7	n/a	11	66.9	0.507	470,000	n/a	n/a
904687	75	2020-08-17	15:05	HCG03	2020-08-17	15:43	0.63	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-08-17	21:22		2020-08-17	22:02	0.67										
904682	76	2020-08-17	15:16	HC001	2020-08-17	15:40	0.40	0.997	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904688	77	2020-08-17	15:14	HCG14	2020-08-17	16:34	1.33	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-08-17	17:46		2020-08-17	22:42	4.93										
904690	78	2020-08-17	15:56	S	2020-08-18	01:09	9.22	65.268	Yes	1,7	64	n/a	61.5	1.87	6,745,000	7.17	0.00
904700	79	2020-08-25	01:08	HCG03	2020-08-25	01:52	0.73	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904701	80	2020-08-25	01:16	HCG14	2020-08-25	02:08	0.87	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904751	81	2020-09-07	04:22	HCG03	2020-09-07	05:49	1.45	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904752	82	2020-09-07	04:31	HCG14	2020-09-07	05:36	1.08	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904766	83	2020-09-13	03:46	HCG03	2020-09-13	03:52	0.10	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-09-13	08:55		2020-09-13	10:04	1.15										
904769	84	2020-09-13	09:32	HCG14	2020-09-13	10:07	0.58	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904783	85	2020-09-28	20:07	HCG03	2020-09-28	20:17	0.17	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-09-28	20:53		2020-09-28	21:13	0.33										
		2020-09-28	22:45		2020-09-28	23:41	0.93										
		2020-09-28	23:53		2020-09-29	00:58	1.08										
904785	86	2020-09-28	23:18	HCG14	2020-09-28	23:40	0.37	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-09-29	00:14		2020-09-29	00:56	0.70										
904790	87	2020-09-30	15:56	HCG03	2020-09-30	17:00	1.07	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-09-30	18:09		2020-09-20	18:21	0.20										
904791	88	2020-09-30	16:43	HCG14	2020-09-30	16:59	0.27	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904792	89	2020-10-01	17:50	HCG03	2020-10-01	19:08	1.30	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904793	90	2020-10-01	18:03	HCG14	2020-10-01	19:00	0.95	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904794	91	2020-10-02	14:40	HCG03	2020-10-02	15:00	0.33	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904795	92	2020-10-04	16:31	HCG03	2020-10-04	17:24	0.88	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Hamilton Wastewater

Woodward WWTP Bypass and CSO Overflow Log
2020

SAC #	Event #	Start Date yyyy-mm-dd	Start Time	Location	Stop Date yyyy-mm-dd	Stop Time	Duration Hours	Volume ML	Disinfection Yes / No	Reason Code	Sample Results Bypass or CSO Sample TBOD mg/L	cBOD mg/L	TSS mg/L	TP mg/L	E.coli CFU/100ml	Final Effluent pH	Final Effluent Total Cl mg/L
904797	**93**	2020-10-07	08:25	HCG03	2020-10-07	09:15	0.83	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904801	**94**	2020-10-13	02:51	HCG03	2020-10-13	03:36	0.75	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904802	**95**	2020-10-15	14:48	HCG03	2020-10-15	23:10	2.50	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904803	**96**	2020-10-15	22:36	HCG14	2020-10-16	11:15	12.65	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-10-16	21:03		2020-10-17	09:20	12.28										
1377-BUFP4B	**97**	2020-10-16	13:41	HCG03	2020-10-16	13:46	0.08	n/a	No		n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-10-16	18:34		2020-10-16	22:44	4.17										
904805	**98**	2020-10-19	21:55	HCG03	2020-10-20	00:10	2.25	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-10-20	01:07		2020-10-20	04:13	3.10										
904806	**99**	2020-10-21	05:14	HCG03	2020-10-21	05:57	0.72	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904809	**100**	2020-10-22	06:15	HCG03	2020-10-22	06:56	0.68	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904828	**101**	2020-10-23	20:07	HCG03	2020-10-23	21:49	1.70	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904829	**102**	2020-10-23	20:08	HCG14	2020-10-26	15:14	67.10	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-10-26	20:36		2020-10-27	10:26	13.83										
		2020-10-27	16:37		2020-10-28	06:44	14.11										
904803	**103**	2020-11-01	09:13	HCG03	2020-11-01	09:39	0.43	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904839	**104**	2020-11-15	09:07	HCG03	2020-11-15	10:26	1.32	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-11-15	14:48		2020-11-15	15:22	0.57										
904847	**105**	2020-11-22	12:54	HCG03	2020-11-22	18:47	5.88	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904852	**106**	2020-11-26	02:32	HCG03	2020-11-26	02:58	0.43	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904855	**107**	2020-11-30	08:43	HCG03	2020-11-30	14:57	6.23	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904856	**108**	2020-11-30	11:32	HCG14	2020-11-30	12:19	0.78	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904857	**109**	2020-11-30	11:50	S	2020-12-01	03:08	15.30	125.225	No	1,7	82	n/a	130	2.55	1,450,000	6.99	0.00
201212-000001	**110**	2020-12-12	13:16	HCG03	2020-12-12	15:33	2.28	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
904867	**111**	2020-12-12	13:48	HCG14	2020-12-12	14:12	0.40	n/a	No	1,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-12-12	14:24		2020-12-12	14:27	0.05										
		2020-12-12	14:28		2020-12-12	15:21	0.88										
201228-000000	**113**	2020-12-28	01:19	HCG03	2020-12-28	05:08	3.82	n/a	No	1,2,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-12-28	05:50		2020-12-28	06:58	1.12										
201228-000001	**112**	2020-12-28	04:39	S	2020-12-28	11:41	7.03	44.188	No	1,2,7	32	n/a	70	1.33	930,000	7.10	0.00
201230-000000	**115**	2020-12-30	13:10	HCG03	2020-12-30	13:38	0.45	n/a	No	1,2,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2020-12-30	14:27		2020-12-30	15:30	1.05										
		2020-12-30	16:39		2020-12-30	18:23	1.75										
		2020-12-30	18:48		2020-12-30	19:47	0.98										
201230-000001	**114**	2020-12-30	18:43	S	2020-12-30	22:34	3.85	27.947	No	1,2,7	70	n/a	93	1.79	930,000	7.18	0.00
							791.80	**2352.154**									

Hamilton Wastewater

Woodward WWTP Bypass and CSO Overflow Log
2020

SAC #	Event #	Start Date yyyy-mm-dd	Start Time	Location	Stop Date yyyy-mm-dd	Stop Time	Duration Hours	Volume ML	Disinfection Yes / No	Reason Code	Sample Results: Bypass or CSO Sample TBOD mg/L	cBOD mg/L	TSS mg/L	TP mg/L	E.coli CFU/100ml	Final Effluent pH	Final Effluent Total Cl mg/L

Legend / Notes

Bypass/Overflow Locations:

PH= Plant bypass
HW= Headworks bypass
PR= Primary bypass
S = Secondary bypass

HCS01 = Greenhill CSO
HCS02 = Strachan St CSO
HCS03 = James St CSO
HCS04 = Main/King CSO
HCS05 = Eastwood CSO
HCS7C = Red Hill CSO
HCS08 = Royal CSO
HCS09 = McMaster CSO

HCG03 = Wentworth CSO Outfall
HCG14 = Wellington CSO Outfall

Wastewater Pumping Stations: use station number

Treatment Levels:

Plant bypass (PH) - no treatment
Headworks bypass (HW) - receives preliminary treatment
Primary bypass (PR) - receives preliminary treatment
Secondary bypass (S) - receives preliminary and primary treatment
CSO tank overflows receive no treatment prior to discharge.

Notes:

* Insufficient sample collected to analyze all parameters
** Sample could not be collected due to autosampler failure

Sample Locations:

Plant: Headworks in front of the barscreens
Primary / Headworks: Inlet of the Primary Clarifiers
Secondary: Outlet of the Primary Clarifiers

Note: a Final Effluent Outfall sample must be collected for all bypass types

Volume Determination:

Bypass flow volumes at the Woodward WWTP are estimated.
CSO tank overflow volumes are measured.
Pumping stations overflow volumes are measured.

Reason Codes:

1. Heavy Precipitation
2. Snow Melt
3. Equipment Failure
4. Equipment Maintenance
5. Sewer Problems
6. Power Failure
7. Exceed Design
8. Other

Hamilton Wastewater

Woodward WWTP Bypass and CSO Overflow Log 2021

Event #	Location	Start		Stop		Duration	Volume	Disinfection	Reason
		Date yyyy-mm-dd	Time	Date yyyy-mm-dd	Time	Hours	ML	Yes / No	Code
1	HCG03	2021-01-02	00:17	2021-01-02	02:51	2.56	n/a	No	1,2,7
		2021-01-02	03:19	2021-01-02	04:37	1.30			
2	HCG14	2021-01-02	01:06	2021-01-02	02:20	1.23	n/a	No	1,2,7
3	S	2021-01-02	01:48	2021-01-02	08:36	6.80	50.877	No	1,2,7
		2021-01-02	12:17	2021-01-02	20:37	8.33			
4	HCG03	2021-02-27	06:46	2021-02-27	09:46	3.00	n/a	No	1,2,7
5	HCG14	2021-02-27	07:34	2021-02-27	08:00	0.44	n/a	No	1,2,7
		2021-02-27	08:58	2021-02-27	09:13	0.25			
6	S	2021-02-27	08:36	2021-02-27	12:52	4.25	36.996	No	1,2,7
7	HCG03	2021-02-28	12:46	2021-02-28	13:03	0.28	n/a	No	1,2,7
8	HCG03	2021-03-11	19:09	2021-03-11	19:38	0.48	n/a	No	1,2,7
9	HCG03	2021-03-26	03:14	2021-03-26	08:39	5.43	n/a	No	1,7
		2021-03-26	09:01	2021-03-26	09:59	0.98			
10	HCG14	2021-03-26	03:55	2021-03-26	05:59	2.07	n/a	No	1,7
		2021-03-26	06:41	2021-03-26	07:30	0.82			
11	S	2021-03-26	04:45	2021-03-26	11:46	7.02	41.994	No	1,7
12	HCG04	2021-03-26	07:29	2021-03-26	10:55	3.45	n/a	No	1,7
13	HCS04	2021-03-26	09:09	2021-03-26	13:48	4.65	11.934	No	1,7
14	HCS01	2021-03-26	10:32	2021-03-26	21:16	10.73	33.235	No	1,7
15	HCG03	2021-03-28	10:35	2021-03-28	11:14	0.66	n/a	No	1,7
		2021-03-28	11:30	2021-03-28	14:08	2.64			
16	HCG03	2021-04-05	17:28	2021-04-05	18:12	0.72	n/a	No	1,7
17	HCG03	2021-04-11	05:51	2021-04-11	06:20	0.48	n/a	No	1,7
		2021-04-11	06:56	2021-04-11	10:43	3.79			
18	HCG14	2021-04-11	07:49	2021-04-11	08:46	0.96	n/a	No	1,7
19	S	2021-04-11	09:03	2021-04-11	12:07	3.07	7.092	No	1,7
20	HCG03	2021-04-18	15:49	2021-04-18	16:54	1.08	n/a	No	1,7
21	HCG03	2021-04-29	18:26	2021-04-29	18:36	0.66	n/a	No	1,7
		2021-04-29	18:51	2021-04-29	19:30	0.16			
22	HCG03	2021-05-08	13:43	2021-05-08	14:07	0.40	n/a	No	1,7
23	HCG03	2021-05-26	19:01	2021-05-26	19:34	0.56	n/a	No	1,7
24	HCG14	2021-05-26	19:15	2021-05-26	19:33	0.29	n/a	No	1,7
25	HCG03	2021-05-28	12:01	2021-05-28	17:01	5.00	n/a	No	1,7

Hamilton Wastewater

Woodward WWTP Bypass and CSO Overflow Log 2021

Event #	Location	Start		Stop		Duration	Volume	Disinfection	Reason
		Date yyyy-mm-dd	Time	Date yyyy-mm-dd	Time	Hours	ML	Yes / No	Code
26	S	2021-05-28	16:20	2021-05-28	19:32	3.20	18.663	Yes	1,7
27	HCG03	2021-06-03	04:46	2021-06-03	05:20	0.56	n/a	No	1,7
28	HCG03	2021-06-08	05:17	2021-06-08	06:03	0.76	n/a	No	1,7
		2021-06-08	16:32	2021-06-08	17:33	1.01			
29	HCG14	2021-06-08	05:32	2021-06-08	06:04	0.52	n/a	No	1,7
		2021-06-08	16:38	2021-06-08	17:27	0.82			
30	HCG03	2021-06-14	09:02	2021-06-14	09:20	0.29	n/a	No	1,7
		2021-06-14	18:29	2021-06-14	19:11	0.71			
31	HCG14	2021-06-14	18:39	2021-06-14	19:03	0.40	n/a	No	1,7
32	HCG03	2021-06-18	12:55	2021-06-18	13:01	0.09	n/a	No	1,7
33	HCG03	2021-06-21	02:25	2021-06-21	03:15	0.83	n/a	No	1,7
34	HCG03	2021-06-25	22:09	2021-06-25	23:21	1.19	n/a	No	1,7
		2021-06-25	23:54	2021-06-26	01:27	1.56			
		2021-06-26	03:30	2021-06-26	05:58	2.47			
		2021-06-26	06:31	2021-06-26	07:29	0.96			
		2021-06-26	07:59	2021-06-26	08:33	0.57			
		2021-06-26	08:47	2021-06-26	09:05	0.30			
35	HCG14	2021-06-26	00:06	2021-06-26	01:28	1.36	n/a	No	1,7
		2021-06-26	03:44	2021-06-26	04:14	0.50			
		2021-06-26	04:37	2021-06-26	05:05	0.47			
		2021-06-26	05:34	2021-06-26	05:52	0.31			
		2021-06-26	06:47	2021-06-26	07:17	0.49			
36	S	2021-06-26	01:42	2021-06-26	03:07	1.42	35.636	Yes	1,7
		2021-06-26	06:01	2021-06-26	10:29	4.46			
37	HCS04	2021-06-26	08:17	2021-06-26	15:51	7.56	7.592	No	1,7
38	HCS01	2021-06-26	10:50	2021-06-26	12:50	2.00	1.945	No	1,7
39	HCG03	2021-06-29	18:06	2021-06-29	18:56	0.83	n/a	No	1,7
40	HCG14	2021-06-29	18:19	2021-06-29	19:03	0.74	n/a	No	1,7
41	HCG03	2021-07-01	17:04	2021-07-01	17:16	0.21	n/a	No	1,7
		2021-07-01	18:34	2021-07-01	19:39	1.08			
42	HCG14	2021-07-01	18:46	2021-07-01	19:37	0.86	n/a	No	1,7
43	HCG03	2021-07-02	16:05	2021-07-02	19:13	3.15	n/a	No	1,7

Hamilton Wastewater

Woodward WWTP Bypass and CSO Overflow Log 2021

Event #	Location	Start		Stop		Duration	Volume	Disinfection	Reason
		Date yyyy-mm-dd	Time	Date yyyy-mm-dd	Time	Hours	ML	Yes / No	Code
44	HCG14	2021-07-02	16:08	2021-07-02	17:06	0.97	n/a	No	1,7
		2021-07-02	17:17	2021-07-02	19:05	1.80			
46	HC001	2021-07-02	17:36	2021-07-02	18:43	1.10	1.567	No	1,7
45	S	2021-07-02	19:02	2021-07-02	20:45	1.72	15.607	Yes	1,7
46	HCG03	2021-07-07	20:39	2021-07-07	20:55	0.28	n/a	No	1,7
47	HCG03	2021-07-08	11:00	2021-07-08	13:00	2.01	n/a	No	1,7
		2021-07-08	14:12	2021-07-08	15:20	1.13			
48	HCG14	2021-07-08	12:05	2021-07-08	12:41	0.60	n/a	No	1,7
		2021-07-08	12:41	2021-07-08	12:42	0.01			
		2021-07-08	14:27	2021-07-08	14:45	0.30			
49	S	2021-07-08	12:43	2021-07-08	17:15	4.53	19.350	Yes	1,7
50	HCG03	2021-07-24	15:34	2021-07-24	15:51	0.28	n/a	No	1,7
		2021-07-24	23:35	2021-07-25	00:25	0.84			
51	HCG03	2021-07-27	11:10	2021-07-27	11:32	0.37	n/a	No	1,7
52	HCG03	2021-07-29	08:03	2021-07-29	09:53	1.83	n/a	No	1,7
53	HCG14	2021-07-29	08:23	2021-07-29	09:31	1.12	n/a	No	1,7
54	DC011	2021-08-01	17:17	2021-08-01	17:23	0.09	0.003	No	1,7
		2021-08-01	17:37	2021-08-07	17:38	0.02			
55	S	2021-08-07	16:26	2021-08-07	18:47	2.35	16.689	Yes	1,7
56	HCG03	2021-08-07	14:54	2021-08-07	16:17	1.38	n/a	No	1,7
57	DC011	2021-08-07	14:54	2021-08-07	14:55	0.01	0.006	No	1,7
		2021-08-07	14:56	2021-08-07	14:58	0.02			
		2021-08-07	14:58	2021-08-07	15:01	0.05			
58	HCG14	2021-08-07	14:57	2021-08-07	16:28	1.51	n/a	No	1,7
59	DC012	2021-08-07	14:58	2021-08-07	14:59	0.02	0.00011	No	1,7
		2021-08-07	19:35	2021-08-07	19:35	0.02			
60	HCS03	2021-08-07	15:22	2021-08-07	15:35	0.22	0.101	No	1,7
61	HCS09	2021-08-07	16:11	2021-08-07	18:30	2.31	0.053	No	1,7
62	HCG03	2021-08-11	05:13	2021-08-11	05:58	0.76	n/a	No	1,7
		2021-08-11	06:57	2021-08-11	07:21	0.40			
63	HCG14	2021-08-11	05:19	2021-08-11	06:04	0.76	n/a	No	1,7
64	HCG03	2021-08-17	13:24	2021-08-17	14:12	0.80	n/a	No	1,7
65	HCG14	2021-08-17	13:27	2021-08-17	14:08	0.68	n/a	No	1,7

Hamilton Wastewater

Woodward WWTP Bypass and CSO Overflow Log 2021

Event #	Location	Start		Stop		Duration	Volume	Disinfection	Reason
		Date yyyy-mm-dd	Time	Date yyyy-mm-dd	Time	Hours	ML	Yes / No	Code
66	HCG03	2021-08-26	19:01	2021-08-26	20:35	1.57	n/a	No	1,7
67	HCG14	2021-08-26	19:11	2021-08-26	20:44	1.54	n/a	No	1,7
68	S	2021-08-26	19:40	2021-08-26	23:51	4.18	65.926	Yes	1,7
69	HC001	2021-08-26	20:06	2021-08-26	20:29	0.38	0.940	No	1,7
70	HCS7C	2021-08-26	20:49	2021-08-26	23:42	2.88	2.695	No	1,7
71	HCG03	2021-08-29	13:56	2021-08-29	14:20	0.39	n/a	No	1,7
		2021-08-29	22:55	2021-08-29	23:42	0.79			
72	HCG14	2021-08-29	14:01	2021-08-29	14:18	0.29	n/a	No	1,7
		2021-08-29	23:09	2021-08-29	23:37	0.47			
73	HCG03	2021-09-05	00:36	2021-09-05	01:08	0.54	n/a	No	1,7
		2021-09-05	02:48	2021-09-05	03:38	0.83			
74	HCG14	2021-09-05	02:58	2021-09-05	03:37	0.65	n/a	No	1,7
75	HCG03	2021-09-07	19:38	2021-09-07	20:51	1.22	n/a	No	1,7
		2021-09-07	21:25	2021-09-08	01:01	3.60			
		2021-09-08	03:38	2021-09-08	05:09	1.51			
76	HCG14	2021-09-07	19:50	2021-09-07	20:27	0.60	n/a	No	1,7
		2021-09-07	21:35	2021-09-08	00:38	3.03			
		2021-09-08	03:45	2021-09-08	04:53	1.14			
77	S	2021-09-07	22:12	2021-09-08	16:24	18.19	213.360	Yes	1,7
78	HC001	2021-09-07	22:47	2021-09-08	00:32	1.75	3.755	No	1,7
79	HCG04	2021-09-07	23:02	2021-09-08	02:16	3.23	n/a	No	1,7
80	HCS04	2021-09-07	23:31	2021-09-08	15:53	16.36	54.750	No	1,7
81	HCS7C	2021-09-08	00:06	2021-09-08	02:35	2.49	4.211	No	1,7
82	HCS01	2021-09-08	00:17	2021-09-08	11:54	11.62	73.655	No	1,7
83	HCS08	2021-09-08	05:50	2021-09-08	09:58	4.14	0.002	No	1,7
84	HCG03	2021-09-09	14:18	2021-09-09	14:41	0.38	n/a	No	1,7
85	HCG03	2021-09-12	19:11	2021-09-12	19:49	0.64	n/a	No	1,7
		2021-09-12	23:28	2021-09-13	00:38	1.17			
86	HCG14	2021-09-12	23:38	2021-09-13	00:16	0.63	n/a	No	1,7
87	HCG03	2021-09-13	21:15	2021-09-13	21:27	0.20	n/a	No	1,7
		2021-09-13	21:59	2021-09-13	23:19	1.33			
88	HCG14	2021-09-13	22:09	2021-09-13	23:14	1.07	n/a	No	1,7
89	S	2021-09-13	23:36	2021-09-14	02:39	3.05	24.033	Yes	1,7

Hamilton Wastewater

Woodward WWTP Bypass and CSO Overflow Log 2021

Event #	Location	Start		Stop		Duration	Volume	Disinfection	Reason
		Date yyyy-mm-dd	Time	Date yyyy-mm-dd	Time	Hours	ML	Yes / No	Code
90	HCG03	2021-09-15	00:06	2021-09-15	00:56	0.84	n/a	No	1,7
91	HCG14	2021-09-15	00:18	2021-09-15	00:57	0.66	n/a	No	1,7
92	HCG03	2021-09-22	05:17	2021-09-22	07:08	1.84	n/a	No	1,7
		2021-09-22	08:52	2021-09-22	13:14	4.35			
		2021-09-22	14:18	2021-09-22	16:14	1.94			
		2021-09-22	19:22	2021-09-23	01:36	6.23			
		2021-09-23	02:59	2021-09-23	03:40	0.69			
93	HCG14	2021-09-22	09:13	2021-09-22	10:10	0.96	n/a	No	1,7
		2021-09-22	19:45	2021-09-22	22:47	3.04			
		2021-09-22	22:47	2021-09-22	22:49	0.02			
94	S	2021-09-22	10:57	2021-09-23	10:44	23.78	272.260	Yes	1,7
95	HCS04	2021-09-22	15:24	2021-09-24	07:08	39.71	164.034	No	1,7
96	DC011	2021-09-22	20:23	2021-09-23	00:15	3.87	0.265	No	1,7
97	HCS01	2021-09-22	20:37	2021-09-23	19:36	22.99	148.260	No	1,7
98	HC001	2021-09-22	20:48	2021-09-23	01:56	5.13	4.095	No	1,7
99	DC012	2021-09-22	21:16	2021-09-22	22:51	1.58	0.044	No	1,7
100	HCS05	2021-09-22	21:47	2021-09-23	18:49	21.03	82.099	No	1,7
101	HW	2021-09-22	21:53	2021-09-23	01:35	3.70	39.140	No	1,7
102	HCS08	2021-09-22	22:04	2021-09-23	12:07	14.05	2.092	No	1,7
103	HCG04	2021-09-22	22:19	2021-09-23	02:01	3.69	n/a	No	1,7
104	HCS7C	2021-09-23	00:38	2021-09-23	01:39	1.03	0.123	No	1,7
105	HCG03	2021-09-25	15:03	2021-09-25	15:23	0.33	n/a	No	1,7
106	HCG03	2021-10-03	13:28	2021-10-03	14:15	0.78	n/a	No	1,7
		2021-10-03	20:19	2021-10-04	07:18	10.99			
		2021-10-04	09:29	2021-10-04	10:12	0.71			
107	HCG14	2021-10-03	20:26	2021-10-04	00:22	3.93	n/a	No	1,7
		2021-10-04	00:45	2021-10-04	02:21	1.60			
		2021-10-04	02:50	2021-10-04	03:26	0.58			
108	S	2021-10-03	21:32	2021-10-04	20:45	23.40	265.084	Yes	1,7
109	DC011	2021-10-03	21:42	2021-10-04	04:06	0.29	0.039	No	1,7
110	HCS04	2021-10-03	22:18	2021-10-04	22:30	24.20	104.529	No	1,7
111	HCG04	2021-10-03	22:41	2021-10-04	04:32	5.85	n/a	No	1,7
112	HCS08	2021-10-03	22:41	2021-10-04	21:14	22.55	4.434	No	1,7

Hamilton Wastewater

Woodward WWTP Bypass and CSO Overflow Log 2021

Event #	Location	Start		Stop		Duration	Volume	Disinfection	Reason
		Date yyyy-mm-dd	Time	Date yyyy-mm-dd	Time	Hours	ML	Yes / No	Code
113	PH	2021-10-03	22:36	2021-10-04	04:25	5.81	48.434	No	1,3,7
114	HCS7C	2021-10-03	23:14	2021-10-04	04:21	5.11	8.750	No	1,7
115	HCS01	2021-10-03	23:25	2021-10-05	04:29	29.07	228.682	No	1,7
116	HW	2021-10-04	03:00	2021-10-04	07:07	4.12	40.108	No	1,7
117	HCG03	2021-10-09	03:03	2021-10-09	03:21	0.31	n/a	No	1,7
		2021-10-09	03:26	2021-10-09	03:41	0.24			
		2021-10-09	04:16	2021-10-09	08:31	4.25			
		2021-10-09	11:08	2021-10-09	12:04	0.93			
118	HCG14	2021-10-09	04:24	2021-10-09	04:48	0.40	n/a	No	1,7
		2021-10-09	05:08	2021-10-09	07:02	1.89			
119	HC001	2021-10-09	06:01	2021-10-09	10:43	4.70	3.586	No	1,7
120	S	2021-10-09	06:11	2021-10-10	00:15	18.08	156.669	Yes	1,7
121	HCS01	2021-10-09	08:30	2021-10-09	22:49	14.32	59.654	No	1,7
122	HCG03	2021-10-15	19:20	2021-10-15	19:49	0.49	n/a	No	1,7
		2021-10-15	19:53	2021-10-15	21:55	2.03			
123	HCG14	2021-10-15	20:03	2021-10-15	21:10	1.13	n/a	No	1,7
124	HC001	2021-10-15	20:20	2021-10-15	21:07	0.78	1.653	No	1,7
125	S	2021-10-15	20:45	2021-10-16	12:09	15.40	114.737	Yes	1,7
126	HCG03	2021-10-21	19:39	2021-10-21	20:10	0.50	n/a	No	1,7
127	HCG03	2021-10-25	01:42	2021-10-25	03:11	1.49	n/a	No	1,7
		2021-10-25	05:31	2021-10-25	06:19	0.79			
		2021-10-25	08:04	2021-10-25	08:31	0.45			
		2021-10-25	10:04	2021-10-25	12:08	2.07			
		2021-10-25	12:53	2021-10-25	15:07	2.24			
		2021-10-25	16:02	2021-10-25	18:49	2.79			
		2021-10-26	01:03	2021-10-26	02:12	1.14			
		2021-10-26	02:57	2021-10-26	03:38	0.69			
		2021-10-26	04:20	2021-10-26	07:06	2.76			
128	S	2021-10-25	13:50	2021-10-27	05:26	39.61	453.663	No	1,7
129	HCS01	2021-10-25	16:40	2021-10-27	05:45	37.07	279.499	No	1,7
130	HCS04	2021-10-26	05:14	2021-10-27	01:54	20.67	40.147	No	1,7
131	HCS05	2021-10-26	11:18	2021-10-27	07:15	19.95	46.132	No	1,7

Hamilton Wastewater

Woodward WWTP Bypass and CSO Overflow Log 2021

Event #	Location	Start Date yyyy-mm-dd	Start Time	Stop Date yyyy-mm-dd	Stop Time	Duration Hours	Volume ML	Disinfection Yes / No	Reason Code
132	HCG03	2021-10-29	16:18	2021-10-29	21:10	4.87	n/a	No	1,7
		2021-10-29	23:42	2021-10-30	05:43	6.02			
133	HCG14	2021-10-29	17:03	2021-10-29	18:27	1.41	n/a	No	1,7
		2021-10-29	19:09	2021-10-29	19:29	0.33			
134	S	2021-10-29	18:06	2021-10-31	01:42	31.59	346.886	No	1,7
135	HCS01	2021-10-30	00:15	2021-10-31	05:16	29.01	211.499	No	1,7
		2021-10-31	15:40	2021-10-31	15:55	0.25			
136	HCS04	2021-10-30	01:24	2021-10-31	09:43	32.32	68.835	No	1,7
137	HCS08	2021-10-30	08:53	2021-10-30	17:03	8.16	0.666	No	1,7
138	HCG03	2021-10-30	20:58	2021-10-30	21:10	0.20	n/a	No	1,7
139	HCG03	2021-11-12	20:01	2021-11-12	20:44	0.72	n/a	No	1,7
140	HCG03	2021-12-05	20:47	2021-12-06	00:28	3.67	n/a	No	1,7
		2021-12-06	08:57	2021-12-06	09:19	0.36			
141	HCG14	2021-12-05	21:16	2021-12-05	21:16	0.01	n/a	No	1,7
		2021-12-05	21:17	2021-12-05	21:35	0.29			
		2021-12-05	21:35	2021-12-05	21:36	0.01			
		2021-12-05	22:13	2021-12-05	22:39	0.43			
		2021-12-05	22:39	2021-12-05	22:40	0.00			
142	S	2021-12-05	22:38	2021-12-06	05:12	6.56	55.288	No	1,7
143	HCG03	2021-12-11	01:54	2021-12-11	02:18	0.39	n/a	No	1,7
		2021-12-11	04:07	2021-12-11	06:25	2.29			
144	HCG14	2021-12-11	04:30	2021-12-11	06:10	1.68	n/a	No	1,7
145	DC011	2021-12-11	05:17	2021-12-11	06:42	1.42	0.106	No	1,7
146	DC012	2021-12-11	05:24	2021-12-11	06:04	0.67	0.038	No	1,7
147	S	2021-12-11	05:40	2021-12-11	14:03	8.38	65.643	No	1,7
148	HCG03	2021-12-25	13:24	2021-12-25	14:14	0.83	n/a	No	1,7
		2021-12-25	15:11	2021-12-25	15:26	0.25			
						888.11	**4059.840**		

Legend / Notes

Bypass/Overflow Locations:

PH= Plant bypass
HW= Headworks bypass
PR= Primary bypass
S = Secondary bypass
HCS01 = Greenhill CSO Tank
HCS02 = Strachan St CSO Tank
HCS03 = James St CSO Tank
HCS04 = Main/King CSO Tank
HCS05 = Eastwood CSO Tank
HCS7C = Red Hill CSO Tank
HCS08 = Royal CSO Tank
HCS09 = McMaster CSO Tank
HCG03 = Wentworth CSO Outfall
HCG04 = Strathearne CSO Outfall
HCG14 = Wellington CSO Outfall
HC001 = Parkdale Pump Station
DC011 = Pleasant/Edenbridge Pump Station
DC012 = Pleasant/Sunrise Pump Station

Reason Codes:

1. Heavy Precipitation
2. Snow Melt
3. Equipment Failure
4. Equipment Maintenance
5. Sewer Problems
6. Power Failure
7. Exceed Design
8. Other

Volume Determination:

Bypass flow volumes at the Woodward WWTP are estimated.
CSO tank overflow volumes are measured.
Pumping stations overflow volumes are measured.

Bypass Treatment Levels:

Plant bypass (PH) - no treatment
Headworks bypass (HW) - receives preliminary treatment
Primary bypass (PR) - receives preliminary treatment
Secondary bypass (S) - receives preliminary and primary treatment
CSO tank overflows receive no treatment prior to discharge.

Bypass Sample Locations:

Plant: Headworks in front of the barscreens
Primary / Headworks: Inlet of the Primary Clarifiers
Secondary: Outlet of the Primary Clarifiers

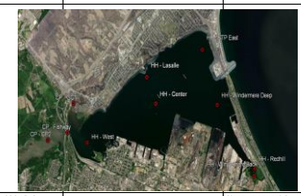
Note: a Final Effluent Outfall sample must be collected for all bypass types

Appendix B: Active/on-going Sample Program Details

Current Internal and External Water Quality Monitoring & Sampling Programs Throughout the City of Hamilton

STAKEHOLDER	Conservation Authority	Watershed	Sub-watershed	PROGRAM	PRIVATE Site ID	CITY ID (IPS)	Sample Method (Grab or Composite)	Sample Frequency	Duration	Parameters	Status (Active/Inactive)	Permission for Data Sharing through LIMS	UTM Easting (Zone 17)	UTM Northing (Zone 17)	Latitude	Longitude	Road Access	Other Description
EXTERNAL - CA SITE	Niagara Peninsula Conservation Authority	Welland River	Buckhorn Creek	NPCA Surface Water Monitoring	BU001		Grab	Monthly	Ice free seasons (approx. 8-9 months)	general chemistry, nutrients, metals and bacteria	Active	Not on LIMS; data will be sent by Stakeholder via email , when data is requested.	598136.9	4768694.7	43.064612	-79.794732	Haldibrook Road	
EXTERNAL - CA SITE	Niagara Peninsula Conservation Authority	Twenty Mile Creek	Twenty Mile Creek	NPCA Surface Water Monitoring	TN001		Grab	Monthly	Ice free seasons (approx. 8-9 months)	general chemistry, nutrients, metals and bacteria	Active		589469.125	4782649.375	43.19132	-79.898914	Twenty Road	
EXTERNAL - CA SITE	Niagara Peninsula Conservation Authority	Twenty Mile Creek	Three Mile Creek	NPCA Surface Water Monitoring	TN002		Grab	Monthly	Ice free seasons (approx. 8-9 months)	general chemistry, nutrients, metals and bacteria	Active		590516.325	4779498.675	43.162829	-79.886544	English Church Road	
EXTERNAL - CA SITE	Niagara Peninsula Conservation Authority	Twenty Mile Creek	Twenty Mile Creek	NPCA Surface Water Monitoring	TN003		Grab	Monthly	Ice free seasons (approx. 8-9 months)	general chemistry, nutrients, metals and bacteria	Active		602041.9302	4776483.683	43.134219	-79.745352	Woodburn Road	
EXTERNAL - CA SITE	Niagara Peninsula Conservation Authority	Welland River	Welland River West	NPCA Surface Water Monitoring	WR000		Grab	Monthly	Ice free seasons (approx. 8-9 months)	general chemistry, nutrients, metals and bacteria	Active		585551.9684	4780318.682	43.17079	-79.947474	Butter Road	
EXTERNAL - CA SITE	Niagara Peninsula Conservation Authority	Welland River	Welland River West	NPCA Surface Water Monitoring	WR001		Grab	Monthly	Ice free seasons (approx. 8-9 months)	general chemistry, nutrients, metals and bacteria	Active		586431.475	4779277.825	43.161319	-79.936818	Airport Road	
EXTERNAL - CA SITE	Niagara Peninsula Conservation Authority	Welland River	Welland River West	NPCA Surface Water Monitoring	WR002		Grab	Monthly	Ice free seasons (approx. 8-9 months)	general chemistry, nutrients, metals and bacteria	Active		586882.275	4779149.375	43.160111	-79.931294	Airport Road	
EXTERNAL - CA SITE	Niagara Peninsula Conservation Authority	Welland River	Welland River West	NPCA Surface Water Monitoring	WR003		Grab	Monthly	Ice free seasons (approx. 8-9 months)	general chemistry, nutrients, metals and bacteria	Active		591002.125	4773783.525	43.111317	-79.881507	Tyneside Road	
EXTERNAL - CA SITE	Niagara Peninsula Conservation Authority	Welland River	Welland River West	NPCA Surface Water Monitoring	WR00A		Grab	Monthly	Ice free seasons (approx. 8-9 months)	general chemistry, nutrients, metals and bacteria	Active		584533.72	4782159.98	43.187482	-79.959718	Book St.	
EXTERNAL - CA SITE	Niagara Peninsula Conservation Authority	Welland River	Welland River West	NPCA Surface Water Monitoring	WR004		Grab	Monthly	Ice free seasons (approx. 8-9 months)	general chemistry, nutrients, metals and bacteria	Active		595536.26	4772538.05	43.099545	-79.826005	Harrison Road	
EXTERNAL - CA SITE	Niagara Peninsula Conservation Authority	Welland River	Welland River West	NPCA Surface Water Monitoring	WR020		Grab	Monthly	Ice free seasons (approx. 8-9 months)	general chemistry, nutrients, metals and bacteria	Active		587464.93	4776185.81	43.133362	-79.924596	Highway 6	
EXTERNAL - CA SITE	Hamilton Conservation Authority	Spencer Creek	Upper Spencer Creek	PWQMN	9000800702		Grab	Monthly	8 Months/Year (April - November)	Chloride, TSS, nitrogen, phosphorus, E.coli, metals	Active	E.coli data is shared through LIMS; remaining parameters (analyses through MECP Lab) to be shared by HCA via email, when data is requested.	574723	4800433	43.353038	-80.077953	Safari Rd. & Spencer Creek	Westover
EXTERNAL - CA SITE	Hamilton Conservation Authority	Spencer Creek	Middle Spencer Creek	PWQMN	9000800602		Grab	Monthly	8 Months/Year (April - November)	Chloride, TSS, nitrogen, phosphorus, E.coli, metals	Active		576826	4792678	43.283004	-80.053092	Highway 5 & Spencer Creek	Highway 5
EXTERNAL - CA SITE	Hamilton Conservation Authority	Spencer Creek	Middle Spencer Creek	PWQMN	9000800502		Grab	Monthly	8 Months/Year (April - November)	Chloride, TSS, nitrogen, phosphorus, E.coli, metals	Active		584060	4790786	43.265198	-79.964232	Mill St. & Market St. S.	Dundas
EXTERNAL - CA SITE	Hamilton Conservation Authority	Red Hill Creek	Upper Ottawa	PWQMN	9000100402		Grab	Monthly	8 Months/Year (April - November)	Chloride, TSS, nitrogen, phosphorus, E.coli, metals	Active		595856	4783739	43.200347	-79.820138	Arbour Rd. & Albion Falls Parking Lot	Mt Albion
EXTERNAL - CA SITE	Hamilton Conservation Authority	Red Hill Creek	Red Hill Valley	PWQMN	9000100502		Grab	Monthly	8 Months/Year (April - November)	Chloride, TSS, nitrogen, phosphorus, E.coli, metals	Active		598679	4787347	43.232465	-79.784753	Queenston Rd. & Red Hill Creek	Red Hill Queenston
EXTERNAL - CA SITE	Hamilton Conservation Authority	Stoney-Battlefield Creeks	Stoney Creek	PWQMN	6005000202		Grab	Monthly	8 Months/Year (April - November)	Chloride, TSS, nitrogen, phosphorus, E.coli, metals	Active		601411	4786566	43.225071	-79.751259	Queenston Rd. & Stoney Creek	Stoney Creek
EXTERNAL - CA SITE	Conservation Halton	Grindstone Creek	Grindstone Creek Subwatershed 230	PWQMN	9000902402 / GRN-5		Grab	Monthly	8 Months/Year (April - November)	general chemistry, nutrients, metals	Active	Not on LIMS; data will be sent by Stakeholder via email , when data is requested.	591735.950	4794723.503	43.30138	-79.86883	Unsworth Avenue north of Plains Road West	~200m downstream of Unsworth Avenue within RBG lands
EXTERNAL - CA SITE	Hamilton Conservation Authority	Spencer Creek	Chedoke Creek	HHRAP	CC-3		Grab	Bi-weekly	Year Round	Ammonia, E.coli, nitrate, nitrite, o-phosphate, TP, TSS, VSS	Active	Yes, data is shared through LIMS	589391.05	4789899.19	43.2566	-79.8987	Frid St.	
EXTERNAL - CA SITE	Hamilton Conservation Authority	Spencer Creek	Chedoke Creek	HHRAP	CC-5		Grab	Bi-weekly	Year Round	Ammonia, E.coli, nitrate, nitrite, o-phosphate, TP, TSS, VSS	Active		588153.63	4789538.67	43.2535	-79.914	Stroud Rd. & Stroud Park	
EXTERNAL - CA SITE	Hamilton Conservation Authority	Spencer Creek	Chedoke Creek	HHRAP	CC-7		Grab	Bi-weekly	Year Round	Ammonia, E.coli, nitrate, nitrite, o-phosphate, TP, TSS, VSS	Active		586873.92	4788666.91	43.2458	-79.9299	Scenic Dr. & Chedoke Radial Trailhead	
EXTERNAL - CA SITE	Hamilton Conservation Authority	Spencer Creek	Chedoke Creek	HHRAP	CC-9		Grab	Bi-weekly	Year Round	Ammonia, E.coli, nitrate, nitrite, o-phosphate, TP, TSS, VSS	Active		589253.04	4788664.45	43.2455	-79.9006	Chedoke Ave. & Hillcrest Ct.	
EXTERNAL - CA SITE	Hamilton Conservation Authority	Spencer Creek	Lower Spencer Creek	HHRAP	CP-7		Grab	Bi-weekly	Year Round	Ammonia, E.coli, nitrate, nitrite, TP, TSS, VSS	Active		586988.87	4791100.88	43.2677	-79.9281	Cootes Dr. & Spencer Creek Trail	
EXTERNAL - CA SITE	Hamilton Conservation Authority	Spencer Creek	Chedoke Creek	HHRAP	CP-11		Grab	Bi-weekly	Year Round	Ammonia, E.coli, nitrate, nitrite, o-phosphate, TP, TSS, VSS	Active		589810.4	4791337.58	43.2695	-79.8933	Macklin St. N & Kay Drage Park Bridge	
EXTERNAL - CA SITE	Hamilton Conservation Authority	Spencer Creek	Borers Creek	HHRAP	CP-18		Grab	Bi-weekly	Year Round	Ammonia, E.coli, nitrate, nitrite, TP, TSS, VSS	Active		586744.43	4791808.61	43.2741	-79.931	Olympic Dr. & Olympic Ice Surface Arena	
EXTERNAL - CA SITE	Hamilton Conservation Authority	Spencer Creek	Ancaster Creek	HHRAP	AC-1		Grab	Bi-weekly	Year Round	Ammonia, E.coli, nitrate, nitrite, TP, TSS, VSS	Active		586928.64	4790733.56	43.2644	-79.9289	Westaway Rd. & McMaster Parking Lot P	
EXTERNAL - CA SITE	Hamilton Conservation Authority	Spencer Creek	Ancaster Creek	HHRAP	AC-2		Grab	Bi-weekly	Year Round	Ammonia, E.coli, nitrate, nitrite, TP, TSS, VSS	Active		585791.21	4789530.61	43.2537	-79.9431	Lynden Ave. & Little John Rd.	
EXTERNAL - CA SITE	Hamilton Conservation Authority	Spencer Creek	Ancaster Creek	HHRAP	AC-3		Grab	Bi-weekly	Year Round	Ammonia, E.coli, nitrate, nitrite, TP, TSS, VSS	Active		585799.46	4789519.61	43.2536	-79.943	Lynden Ave. & Little John Rd.	
EXTERNAL - CA SITE	Hamilton Conservation Authority	Spencer Creek	Ancaster Creek	HHRAP	AC-5		Grab	Bi-weekly	Year Round	Ammonia, E.coli, nitrate, nitrite, TP, TSS, VSS	Active		583337.98	4787000.95	43.2312	-79.9737	Rosseaux St. & Wilson St. E.	
CITY SURFACE WATER MONITORING SITE	Hamilton Conservation Authority	Spencer Creek	Chedoke Creek	EME Surface Water Monitoring Program		CC_SW1	Grab	Quarterly	Year Round	E. Coli, Field: DO, Field: Temp	Active	Yes, data is shared through LIMS			43.2735	-79.89351		
CITY SURFACE WATER MONITORING SITE	Hamilton Conservation Authority	Spencer Creek	Chedoke Creek	EME Surface Water Monitoring Program		CC_SW2	Grab	Quarterly	Year Round	E. Coli, Field: DO, Field: Temp	Active				43.26862	-79.89334		
CITY SURFACE WATER MONITORING SITE	Hamilton Conservation Authority	Spencer Creek	Chedoke Creek	EME Surface Water Monitoring Program		CC_SW3	Grab	Quarterly	Year Round	E. Coli, Field: DO, Field: Temp	Active				43.26271	-79.89408		

CITY SURFACE WATER MONITORING SITE	Hamilton Conservation Authority	Spencer Creek	Chedoke Creek	EME Surface Water Monitoring Program		CC_SW5	Grab	Quarterly	Year Round	E. Coli, Field: DO, Field: Temp	Active				43.25647	-79.89878		
EXTERNAL - RBG SITE	Hamilton Conservation Authority	Cootes Paradise	Cootes Paradise	RBG Water Quality Cootes Paradise	CP1		Grab	Bi-weekly	May 13 - Sept 30	Ammonia, E.coli, TDP., TP. TSS. VSS	Active		589465.5763	4792411.434	43.279209	-79.897374		East End
EXTERNAL - RBG SITE	Hamilton Conservation Authority	Spencer Creek	Lower Spencer Creek	RBG Water Quality Cootes Paradise	CP16		Grab	Bi-weekly	May 13 - Sept 30	Ammonia, E.coli, TDP., TP. TSS. VSS	Active		588904.7709	4791447.326	43.270595	-79.90444		Westdale Inlet
EXTERNAL - RBG SITE	Hamilton Conservation Authority	Cootes Paradise	Cootes Paradise	RBG Water Quality Cootes Paradise	CP2		Grab	Bi-weekly	May 13- Sept 30	Ammonia, DOC, Nitrite/Nitrate, E.coli, TDP. TP. TSS. VSS	Active		588711.0898	4791911.194	43.274795	-79.906751		Mid Marsh
EXTERNAL - RBG SITE	Hamilton Conservation Authority	Cootes Paradise	Cootes Paradise	RBG Water Quality Cootes Paradise	CP5		Grab	Bi-weekly	August- Sept 30	Ammonia, E.coli, Nitrate/Nitrite, TDP, TP, TSS. VSS	Active		586805.3287	4791414.472	43.270545	-79.930312		West Pond
EXTERNAL - RBG SITE	Halton Region Conservation Authority	Hamilton Harbour	Grindstone Creek Watershed	RBG Water Quality Grindstone Marsh	GC1		Grab	Bi-weekly	May 13- Sept 30	Ammonia, DOC, Nitrite/Nitrate, E.coli, TDP. TP. TSS. VSS	Active		590280.3252	4793468.216	43.288626	-79.887161		Carolls Bay
EXTERNAL - RBG SITE	Halton Region Conservation Authority	Grindstone Creek	Grindstone Creek Subwatershed 232	RBG Water Quality Grindstone Marsh	GC5		Grab	Bi-weekly	May 13 - Sept 30	Ammonia, E.coli, TDP, TP, TSS. VSS	Active		590235.1509	4793853.098	43.292096	-79.887654		Long Pond
CITY CSO TANK EFFLUENT SITE	Hamilton Conservation Authority	Hamilton Harbour	Urban Hamilton	ECA Compliance Sampling Program		RSO0001 EFFLUENT	Auto Sampler - Composite	Wet Weather Overflow Event	Year Round	as per ECA, BOD, Suspended Solids, Free Ammonia as Nitrogen, TKN, Total Phosphorus, E.coli, Zinc, Lead, Copper	Active	Yes, data is shared through LIMS			43.27367	-79.85505		EASTWOOD PARK CSO TANK
CITY CSO TANK EFFLUENT SITE	Hamilton Conservation Authority	Spencer Creek	Ancaster Creek	ECA Compliance Sampling Program		RSO0002 EFFLUENT	Auto Sampler - Composite	Wet Weather Overflow Event	Year Round		Active				43.26028	-79.93202		MCMASTER CSO TANK
CITY CSO TANK EFFLUENT SITE	Hamilton Conservation Authority	Red Hill Creek	Red Hill Valley	ECA Compliance Sampling Program		RSO0003 EFFLUENT	Auto Sampler - Composite	Wet Weather Overflow Event	Year Round		Active				43.24316	-79.77061		RED HILL VALLEY CSO TANK
CITY CSO TANK EFFLUENT SITE	Hamilton Conservation Authority	Spencer Creek	Chedoke Creek	ECA Compliance Sampling Program		RSO0004 EFFLUENT	Auto Sampler - Composite	Wet Weather Overflow Event	Year Round		Active				43.25299	-79.91528		ROYAL CSO TANK
CITY CSO TANK EFFLUENT SITE	Hamilton Conservation Authority	Hamilton Harbour	Urban Hamilton	ECA Compliance Sampling Program		RSO0005 EFFLUENT	Auto Sampler - Composite	Wet Weather Overflow Event	Year Round		Active				43.26927	-79.86882		STRACHAN CSO TANK
CITY CSO TANK EFFLUENT SITE	Hamilton Conservation Authority	Spencer Creek	Chedoke Creek	ECA Compliance Sampling Program		RSO0006 EFFLUENT	Auto Sampler - Composite	Wet Weather Overflow Event	Year Round		Active				43.26104	-79.89152		MAIN KING CSO TANK
CITY WWTP DISCHARGE	Hamilton Conservation Authority	Cootes Paradise	Cootes Paradise	ECA Compliance Sampling Program		RSZ0001 EFFLUENT	Auto Sampler - Composite	Wet Weather Overflow Event	Year Round		Active				43.26775	-79.94264		DUNDAS WWTP
CITY WWTP DISCHARGE	Hamilton Conservation Authority	Red Hill Creek	Red Hill Valley	ECA Compliance Sampling Program		WWTP WOODWARD FEO	Auto Sampler - Composite	Wet Weather Overflow Event	Year Round		Active				43.25589	-79.77255		WOODWARD WWTP
CITY WWTP DISCHARGE	Hamilton Conservation Authority	Red Hill Creek	Red Hill Valley	ECA Compliance Sampling Program		Secondary Bypass	Grab	Bypass Event	Year Round	as per ECA, BOD, Suspended Solids, Free Ammonia as Nitrogen, TKN, Total Phosphorus, E.coli, Zinc, Lead, Copper	Active	Yes, data is shared through LIMS			43.252216	-79.77228		outlet of the primary clarifiers, just upstream of the Secondary Bypass Gate
CITY WWTP DISCHARGE	Hamilton Conservation Authority	Red Hill Creek	Red Hill Valley	ECA Compliance Sampling Program		Primary Bypass	Grab				Active				43.252444	-79.77335		inlet to the primary clarifiers, just upstream of the Primary Bypass Gate
CITY WWTP DISCHARGE	Hamilton Conservation Authority	Red Hill Creek	Red Hill Valley	ECA Compliance Sampling Program		Headworks Bypass	Grab				Active				43.252097	-79.774186		inlet to the primary clarifiers, just upstream of the Primary Bypass Gate
CITY WWTP DISCHARGE	Hamilton Conservation Authority	Red Hill Creek	Red Hill Valley	ECA Compliance Sampling Program		Plant Bypass	Grab				Active				43.252396	-79.773633		east influent channel, from hatch upstream of the East Influent Gate
Consultant - CITY WUP WWTP EXPANSION PROGRAM	Hamilton Conservation Authority	Red Hill Creek	Red Hill Valley	CITY WUP WWTP EXPANSION PROGRAM	WQ1		Grab	Six (6) times a year (2 wet/4 dry weather events)	March - December	Inorganics & Metals	Active	Yes, data is shared through LIMS			43.251977	-79.764867		
Consultant - CITY WUP WWTP EXPANSION PROGRAM	Hamilton Conservation Authority	Red Hill Creek	Red Hill Valley	CITY WUP WWTP EXPANSION PROGRAM	WQ2		Grab	Six (6) times a year (2 wet/4 dry weather events)	March - December		Active				43.254556	-79.76664		
Consultant - CITY WUP WWTP EXPANSION PROGRAM	Hamilton Conservation Authority	Red Hill Creek	Red Hill Valley	CITY WUP WWTP EXPANSION PROGRAM	WQ3		Grab	Six (6) times a year (2 wet/4 dry weather events)	March - December		Active				43.257836	-79.769725		
Consultant - CITY WUP WWTP EXPANSION PROGRAM	Hamilton Conservation Authority	Red Hill Creek	Red Hill Valley	CITY WUP WWTP EXPANSION PROGRAM	WQ4		Grab	Six (6) times a year (2 wet/4 dry weather events)	March - December		Active				43.261441	-79.771637		
Consultant - CITY WUP WWTP EXPANSION PROGRAM	Hamilton Conservation Authority	Red Hill Creek	Red Hill Valley	CITY WUP WWTP EXPANSION PROGRAM	WQ5		Grab	Six (6) times a year (2 wet/4 dry weather events)	March - December		Active				43.263622	-79.773826		
EXTERNAL - ECCC SITE	Conservation Halton & Hamilton Conservation Authority	Hamilton Harbour	Hamilton Harbour	Central Station Monitoring	9031			Monthly (weather permitting) January to March; bi-weekly April and May; weekly from June to September; bi-weekly October and November; Monthly (weather permitting) December	Year Round	Phosphorus, oxygen, ammonia, nitrate+nitrite, chlorophyll, Secchi transparency, particulate organic carbon and nitrogen, dissolved organic and inorganic carbon, temperature/oxygen/conductivity profiles	Active	On Federal Open Portal website; D Depew has also indicated can send most recent sample results via email, if requested. ECCC open to discussing/ establishing an open data sharing agreement between the lab for trending and City Interactive Map.						
EXTERNAL - ECCC SITE	Conservation Halton & Hamilton Conservation Authority	Hamilton Harbour	Hamilton Harbour	Central Station Monitoring	1001			Monthly (weather permitting) January to March; bi-weekly April and May; weekly from June to September; bi-weekly October and November; Monthly (weather permitting) December	Year Round	Phosphorus, oxygen, ammonia, nitrate+nitrite, chlorophyll, Secchi transparency, particulate organic carbon and nitrogen, dissolved organic and inorganic carbon, temperature/oxygen/conductivity profiles	Active							
EXTERNAL - ECCC SITE	Conservation Halton & Hamilton Conservation Authority	Hamilton Harbour	Hamilton Harbour	Central Station Monitoring	9030			Monthly (weather permitting) January to March; bi-weekly April and May; weekly from June to September; bi-weekly October and November; Monthly (weather permitting) December	Year Round	Phosphorus, oxygen, ammonia, nitrate+nitrite, chlorophyll, Secchi transparency, particulate organic carbon and nitrogen, dissolved organic and inorganic carbon, temperature/oxygen/conductivity profiles	Active							
EXTERNAL - ECCC SITE	Conservation Halton & Hamilton Conservation Authority	Hamilton Harbour	Hamilton Harbour	Central Station Monitoring	9033			Monthly (weather permitting) January to March; bi-weekly April and May; weekly from June to September; bi-weekly October and November; Monthly (weather permitting) December	Year Round	Phosphorus, oxygen, ammonia, nitrate+nitrite, chlorophyll, Secchi transparency, particulate organic carbon and nitrogen, dissolved organic and inorganic carbon, temperature/oxygen/conductivity profiles	Active							

EXTERNAL - REDEEMER UNIVERSITY	Hamilton Conservation Authority			Water Monitoring Project	Scenic Waterfall		Triplicate grab	every two weeks in May and June plus weekly for a 5-6 week stretch in Oct/Nov	Spring & Fall Semesters	nitrate, phosphate, TP, BOD5, chloride, E. coli and total coliform, (and with less frequency, microbial source tracking)	Active	Yes			43.2440075	-79.9346734		
EXTERNAL - REDEEMER UNIVERSITY	Hamilton Conservation Authority			Water Monitoring Project	Princess Falls		Triplicate grab				Active				43.2458048	-79.9298878		
EXTERNAL - REDEEMER UNIVERSITY	Hamilton Conservation Authority			Water Monitoring Project	Mountview Waterfall		Triplicate grab				Active				43.245625	-79.9214833		
EXTERNAL - REDEEMER UNIVERSITY	Hamilton Conservation Authority			Water Monitoring Project	Cliffview Falls		Triplicate grab				Active				43.245585	-79.9083939		
EXTERNAL - REDEEMER UNIVERSITY	Hamilton Conservation Authority			Water Monitoring Project	Westcliffe Falls		Triplicate grab				Active				43.2452308	-79.9087555		
EXTERNAL - REDEEMER UNIVERSITY	Hamilton Conservation Authority			Water Monitoring Project	Chedoke Falls		Triplicate grab				Active				43.2436553	-79.9000839		
EXTERNAL - REDEEMER UNIVERSITY	Hamilton Conservation Authority			Water Monitoring Project	Creek in Chedoke Golf Course		Triplicate grab				Active				43.2515745	-79.9104464		
EXTERNAL - REDEEMER UNIVERSITY	Hamilton Conservation Authority			Water Monitoring Project	Creek in Stroud Park		Triplicate grab				Active				43.2527987	-79.9161277		
EXTERNAL - REDEEMER UNIVERSITY	Hamilton Conservation Authority			Water Monitoring Project	Princess Point		Triplicate grab				Active				43.2732701	-79.8935819		
EXTERNAL - REDEEMER UNIVERSITY	Hamilton Conservation Authority			Water Monitoring Project	Upper Ottawa Creek		Triplicate grab	sample every two weeks in May-June			Active				43.2033045	-79.8364841		
EXTERNAL - REDEEMER UNIVERSITY	Hamilton Conservation Authority			Water Monitoring Project	Hannon Creek		Triplicate grab				Active				43.1955958	-79.8265171		
EXTERNAL - REDEEMER UNIVERSITY	Hamilton Conservation Authority			Water Monitoring Project	Upper Davis Creek (Felker's Creek)		Triplicate grab				Active				43.1963805	-79.7896142		
EXTERNAL - REDEEMER UNIVERSITY	Hamilton Conservation Authority			Water Monitoring Project	Upper Glendale Falls		Triplicate grab				Active				43.2021442	-79.8097958		
EXTERNAL - REDEEMER UNIVERSITY	Hamilton Conservation Authority			Water Monitoring Project	Lower Davis Creek (King and Quigley)		Triplicate grab				Active				43.222365	-79.7831875		
EXTERNAL - REDEEMER UNIVERSITY	Hamilton Conservation Authority			Water Monitoring Project	Red Hill Trail		Triplicate grab				Active				43.2257966	-79.79299		
EXTERNAL - REDEEMER UNIVERSITY	Hamilton Conservation Authority			Water Monitoring Project	Globe Park		Triplicate grab				Active				43.2484465	-79.7675357		
EXTERNAL - REDEEMER UNIVERSITY	Hamilton Conservation Authority			Water Monitoring Project	Buttermilk Falls		Triplicate grab				Active				43.2053967	-79.8198383		
EXTERNAL - REDEEMER UNIVERSITY	Hamilton Conservation Authority			Water Monitoring Project	Greenhill Park		Triplicate grab				Active				43.2110226	-79.7887561		
EXTERNAL - REDEEMER UNIVERSITY	Hamilton Conservation Authority			Water Monitoring Project	Red Hill at Woodward		Triplicate grab				Active				43.26241	-79.7723479		
EXTERNAL - REDEEMER UNIVERSITY	Hamilton Conservation Authority			Water Monitoring Project	Albion Falls		Triplicate grab				Active				43.2005	-79.8224		
EXTERNAL - MECP	Conservation Halton & Hamilton Conservation Authority	Hamilton Harbour	Hamilton Harbour	MECP GL Index and Reference Centre Station Monitoring	Station 258		Multi-media sampling	Water Qulaity sampling occurs approx. every 3 years . Sediment sampling, every 6 years.	spring, summer, fall	Major ions, nutrient status, metals, PCB/OCs, PAHs, physical parameters Surface Water Samples: Turbidity, Chloride, Cations (Ca, Mg, Na, K), Chlorophyll, DOC and Silicate, Nitrates and Ammonium, Mercury, Suspended Solids, Total P and Kjeldahl-nitrogen, Alkalinity, Conductivity, Lab pH, Sulphate, Metals scan by ICP Sediment Samples: chlorobenzenes, OC pesticides, PAHs, PCB-total, Chlorinated dioxins and furans, Dioxin-like PCB congers, mercury, arsenic, metals scan, Particle size, TOC, Total P & N	Active				43.288806,	-79.83625		Position: Lat. 43 17 19.7 Long. 79 50 10.5
EXTERNAL - DFO	Fisheries and Oceans Canada (DFO)	Hamilton Harbour & Red Hill Creek		Dissovled Oxygen and Temperature Monitoring Program for Fish Habitat			10 consistent locations (5 in HH, 3 at CP and GS, 2 at Redhill/Winderemer), loggers record at 15min intervals for the deployment period (6 months per season, or year-round. Additional locations are deployed based on monitoring needs. Contcat DFO is you would like addional detials on their DO monitoring.											
CITY LANDFILL SITES				Ancaster		SW4	Grab	1x annual		General Chemistry Phenol Metal Turbidity	Active				43.2114552	-80.0204612		Close to Laurel Ct
CITY LANDFILL SITES				Ancaster		SW5	Grab	1x annual		General Chemistry Phenol Metal Turbidity	Active				43.2080888	-80.0234485		Close to the 403; on the side of the soccer fields
CITY LANDFILL SITES				Ancaster		SW6	Grab	1x annual		General Chemistry Phenol Metal Turbidity	Active				43.2118677	-80.0251463		Pond backing onto Griffiths property (PW1)

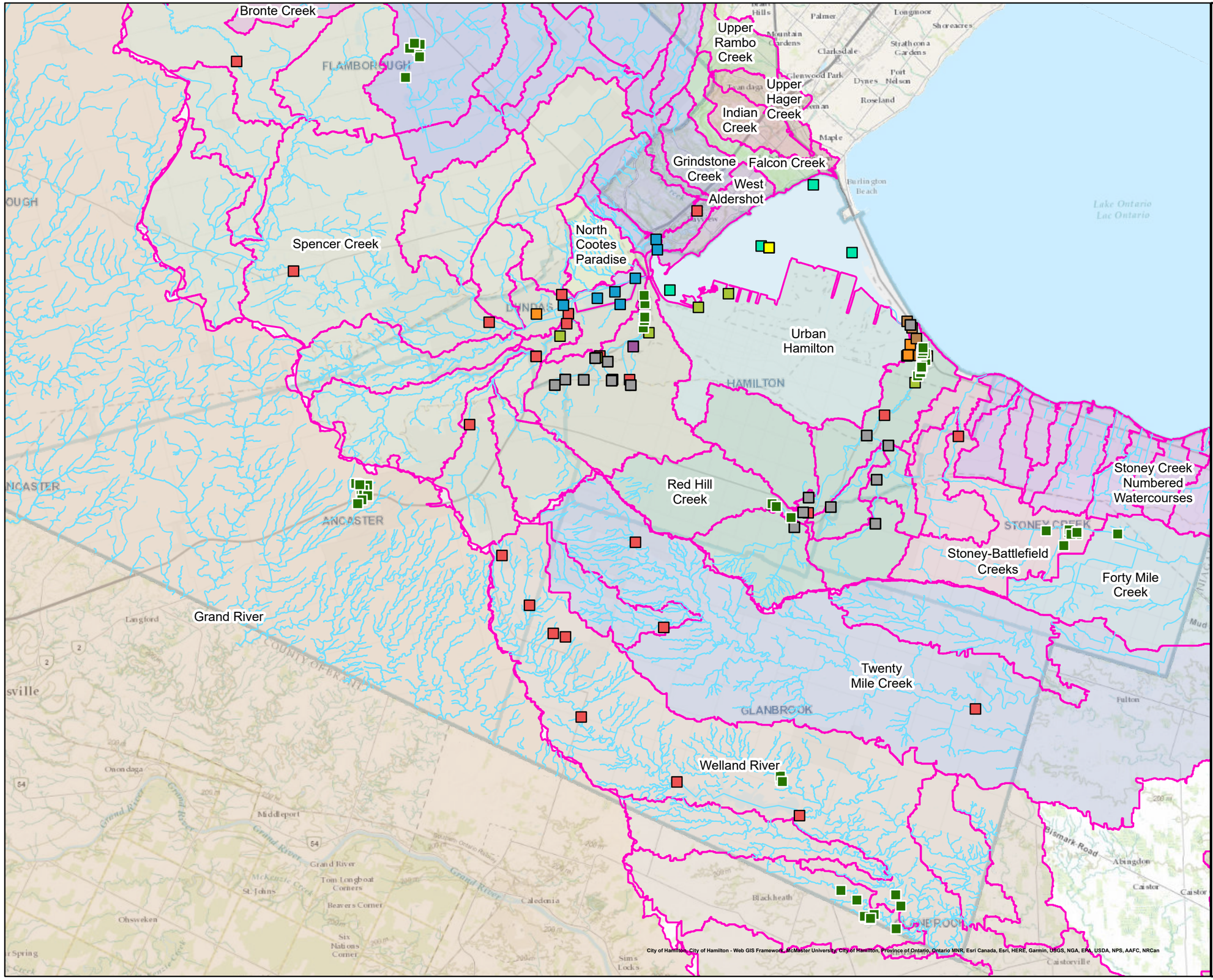
CITY LANDFILL SITES				Ancaster		SW7	Grab	1x annual		General Chemistry Phenol Metal Turbidity	Active				43.2099636	-80.0223354		Along the path past the second set of gates, at the other end of the soccer fields
CITY LANDFILL SITES				Ancaster		PW1	Grab	1x annual		General Chemistry Phenol Metal Turbidity VOCs PAHs	Active				43.2120495	-80.0258625		856 jerseyville road; Griffiths property
CITY LANDFILL SITES				Ancaster		MH1	Grab	1x annual		General Chemistry Phenol Metal Turbidity VOCs PAHs	Active				43.2116194	-80.0240332		next to panel; along driving path beside soccer fields
CITY LANDFILL SITES				Ancaster		SW11	Grab	1x annual		General Chemistry Phenol Metal Turbidity	Active				43.2079363	-80.0204766		in the ditch off of 403 on the opposite side of soccer fields
CITY LANDFILL SITES				Ancaster		SW14	Grab	1x annual		General Chemistry Phenol Metal Turbidity	Active				43.2065835	-80.0231588		on the east side of the driving path
CITY LANDFILL SITES				Ancaster		SW16	Grab	1x annual		General Chemistry Phenol Metal Turbidity	Active				43.2053049	-80.0251007		East of the driving path, furthest location out
CITY LANDFILL SITES				Binbrook		SW1	Grab	2x annual		General Chemistry Metals Phenols Turbidity	Active				43.1115104	-79.8342776		Closest to MW3 on outer boundary of landfill
CITY LANDFILL SITES				Binbrook		SW2	Grab	2x annual		General Chemistry Metals Phenols Turbidity	Active				43.112789	-79.8344707		Off of fletcher Road south of the landfill
CITY LANDFILL SITES				Binbrook		SW3	Grab	2x annual		General Chemistry Metals Phenols Turbidity	Active				43.1109602	-79.8335829		in the stream cutting through farm field
CITY LANDFILL SITES				Brampton		SW1	Grab	2X annual Reduced sampling in the fall (Gen chem and Phenol only)		General Chemistry Metals Phenols PCBs PAHs	Active				43.2484679	-79.7675718		Closest to Rennie Landfill
CITY LANDFILL SITES				Brampton		SSE	Grab	2X annual Reduced sampling in the fall (Gen chem and Phenol only)		General Chemistry Metals Phenols PCBs PAHs	Active				43.2483541	-79.7672573		A culvert directly across from SW1; across the river
CITY LANDFILL SITES				Brampton		SW2	Grab	2X annual Reduced sampling in the fall (Gen chem and Phenol only)		General Chemistry Metals Phenols PCBs PAHs	Active				43.2505241	-79.7655822		in the stream in between N4 and N5
CITY LANDFILL SITES				Brampton		SW3	Grab	2X annual Reduced sampling in the fall (Gen chem and Phenol only)		General Chemistry Metals Phenols PCBs PAHs	Active				43.252781	-79.7657539		past the redhill bridge past N7
CITY LANDFILL SITES				Brampton		SSN	Grab	2X annual Reduced sampling in the fall (Gen chem and Phenol only)		General Chemistry Metals Phenols PCBs PAHs	Active				43.2523864	-79.7674102		under construction currently
CITY LANDFILL SITES				Brampton		SSN-B	Grab	2X annual Reduced sampling in the fall (Gen chem and Phenol only)		General Chemistry Metals Phenols PCBs PAHs	Active				43.2528025	-79.7672251		under construction currently
CITY LANDFILL SITES				Brampton		SW4	Grab	2X annual Reduced sampling in the fall (Gen chem and Phenol only)		General Chemistry Metals Phenols PCBs PAHs	Active				43.253709	-79.7668107		unnaccesible due to construction
CITY LANDFILL SITES				Brampton		SW5	Grab	2X annual Reduced sampling in the fall (Gen chem and Phenol only)		General Chemistry Metals Phenols PCBs PAHs	Active				43.2547443	-79.7667664		unnaccesible due to construction
CITY LANDFILL SITES				Edgewood		SW1	Grab	4x annual		General Chemistry Metals	Active				43.3561426	-79.9952531		along edgewood road in the culvert close to BH3 and BH3A
CITY LANDFILL SITES				Edgewood		SW2	Grab	4x annual		General Chemistry Metals	Active				43.3538832	-79.9944967		along edgewood road in a culvert
CITY LANDFILL SITES				Edgewood		SW3	Grab	4x annual		General Chemistry Metals	Active				43.3580363	-79.9941668		across from the corn field in the phragmites
CITY LANDFILL SITES				Edgewood		SW4	Grab	4x annual		General Chemistry Metals	Active				43.3567735	-79.9989438		along the outside boundary of the landfill close to MW7
CITY LANDFILL SITES				Edgewood		SW5	Grab	4x annual		General Chemistry Metals	Active				43.3470607	-80.0010064		off of concession road 6 West in a culvert
CITY LANDFILL SITES				Edgewood		SW6	Grab	4x annual		General Chemistry Metals	Active				43.3584156	-79.996727		across from BH5 in a ditch on edgewood road; typically dry

CITY LANDFILL SITES				Glanbrook		SW1	Grab	3x annual		General Chemistry Metals Phenols Turbidity	Active				43.0744367	-79.8076916		off of trimble road next to bridge
CITY LANDFILL SITES				Glanbrook		SW2	Grab	3x annual		General Chemistry Metals Phenols Turbidity	Active				43.0652568	-79.7965953		Off of haldibrook road near the culvert
CITY LANDFILL SITES				Glanbrook		SW3	Grab	3x annual		General Chemistry Metals Phenols Turbidity	Active				43.0646435	-79.7947365		off the bridge near the landfill entrance
CITY LANDFILL SITES				Glanbrook		SW4	Grab	3x annual		General Chemistry Metals Phenols Turbidity	Active				43.0614101	-79.7828436		Off of short road near the bridge, past BH102
CITY LANDFILL SITES				Glanbrook		SW5	Grab	3x annual		General Chemistry Metals Phenols Turbidity	Active				43.0711607	-79.8004979		past the gate near the compost pond, in the phragmites
CITY LANDFILL SITES				Glanbrook		SW6	Grab	3x annual		General Chemistry Metals Phenols Turbidity	Active				43.0727125	-79.7828436		Off the bridge off on Hall road just past GM 10A
CITY LANDFILL SITES				Glanbrook		SW7	Grab	3x annual		General Chemistry Metals Phenols Turbidity	Active				43.0689505	-79.7805691		Off the bridge on Woodburn Road
CITY LANDFILL SITES				Glanbrook		SW8	Grab	3x annual		General Chemistry Metals Phenols Turbidity	Active				43.0657056	-79.797188		In a ditch off of haldibrook road, across from SW2
CITY LANDFILL SITES				Glanbrook		SW10	Grab	3x annual		General Chemistry Metals Phenols Turbidity	Active				43.0662856	-79.792757		off the entrance road to glanbrook
CITY LANDFILL SITES				Glanbrook		FW99	Grab	3x annual		General Chemistry Metals Phenols Turbidity	Active				43.0649923	-79.7944307		Just past SW3 near the entrance
CITY LANDFILL SITES				Rennie		SW1	Grab	2x annual (Metals not sampled in spring)		General Chemistry Phenols Metals O&G Turbidity	Active				43.2482066	-79.7675912		in between SW5 and SW4
CITY LANDFILL SITES				Rennie		SW2	Grab	2x annual (Metals not sampled in spring)		General Chemistry Phenols Metals O&G Turbidity	Active				43.2454059	-79.7694111		Underneath the Redhill Nearest CP3
CITY LANDFILL SITES				Rennie		SW3	Grab	2x annual (Metals not sampled in spring)		General Chemistry Phenols Metals O&G Turbidity	Active				43.246543	-79.7680378		Underneath the Redhill across from MW6 52A/B
CITY LANDFILL SITES				Rennie		SW4	Grab	2x annual (Metals not sampled in spring)		General Chemistry Phenols Metals O&G Turbidity	Active				43.2479243	-79.7676972		In between SW1 and MW6-53A/B
CITY LANDFILL SITES				Rennie		SW5	Grab	2x annual (Metals not sampled in spring)		General Chemistry Phenols Metals O&G Turbidity	Active				43.2483033	-797675711		Closest to Brampton Landfill
CITY LANDFILL SITES				Stoney Creek		SW1	Grab	3x annual		General Chemistry Metals	Active				43.1918446	-79.6979061		West side of the landfill, near BH12 outside the boundary of the landfill
CITY LANDFILL SITES				Stoney Creek		SW2	Grab	3x annual		General Chemistry Metals	Active				43.1925095	-79.7016585		Closest to east entrance of landfill; outside the boundary of the landfill
CITY LANDFILL SITES				Stoney Creek		SW3	Grab	3x annual		General Chemistry Metals	Active				43.1933777	-79.7014815		in a ditch off the dofasco 2000 trail; outside the boundary of the landfill
CITY LANDFILL SITES				Stoney Creek		SW4	Grab	3x annual		General Chemistry Metals	Active				43.1926327	-79.6977371		In swampy area off the dofasco 2000 trail, near BH8; outside the boundary of the landfill
CITY LANDFILL SITES				Stoney Creek		SW10	Grab	3x annual		General Chemistry Metals	Active				43.1918818	-79.7006822		North side of the landfill, near BH19; outside the boundary of the landfill
CITY LANDFILL SITES				Stoney Creek		SW15	Grab	3x annual		General Chemistry Metals	Active				43.1924978	-79.697949		southwest corner of the landfill near BH7; outside the boundary of the landfill
CITY LANDFILL SITES				Stoney Creek		SW19	Grab	3x annual		General Chemistry Metals	Active				43.1881564	-79.7040564		In a ditch just off of 6th Road east
CITY LANDFILL SITES				Stoney Creek		SW30	Grab	3x annual		General Chemistry Metals	Active				43.1931783	-79.711926		in a culvert off of fifth road E
CITY LANDFILL SITES				Stoney Creek		SW31	Grab	3x annual		General Chemistry Metals	Active				43.1917547	-79.6794605		in a culvert off of 8th road E
CITY LANDFILL SITES				Upper Ottawa		SW1	Grab	2x annual		General Chemistry Metals Phenols	Active				43.2035413	-79.8364985		Near the dam
CITY LANDFILL SITES				Upper Ottawa		SW2	Grab	2x annual		General Chemistry Metals Phenols	Active				43.2025599	-79.8345888		Along the stream in between MH10 and MH11

CITY LANDFILL SITES				Upper Ottawa		SW3	Grab	2x annual		General Chemistry Metals Phenols	Active				43.1988488	-79.8279503		In bridge underneath the off ramp of dartnall road
CITY LANDFILL SITES				West Hamilton		STN1	Grab	3 x annual		General Chemistry Metals Phenols PAHs	Active				43.2626906	-79.8940587		Near the Dam closest to Glen Road
CITY LANDFILL SITES				West Hamilton		STN3	Grab	3 x annual		General Chemistry Metals Phenols PAHs	Active				43.2651087	-79.8935008		Along the stream next to the Chedoke Expwy/403; in between STN1 and SWC2
CITY LANDFILL SITES				West Hamilton		STN4	Grab	3 x annual		General Chemistry Metals Phenols PAHs	Active				43.2666712	-79.8932916		Along the stream next to the chedoke expwy/403; in between SWC2 and HCL08
CITY LANDFILL SITES				West Hamilton		STN7	Grab	3 x annual		General Chemistry Metals Phenols PAHs	Active				43.2707296	-79.8931575		Off of Macklin St N. along the stream
CITY LANDFILL SITES				West Hamilton		STN9	Grab	3 x annual		General Chemistry Metals Phenols PAHs	Active				43.2734871	-79.8934874		Off of the bridge on desjardin recreation trail
CITY LANDFILL SITES				West Hamilton		SWC2	Grab	3 x annual		General Chemistry Metals Phenols PAHs	Active				43.2662473	-79.8933372		the stream next to chedoke expwy/403; in between STN4 and STN3

Appendix C: Active/on-going Sample Locations

Hamilton Water
Active Sample Locations



Active Sample Locations

- EXTERNAL - CA SITE
- EXTERNAL - RBG SITE
- CITY CSO TANK EFFLUENT SITE
- CITY SURFACE WATER MONITORING SITE
- CITY WWTP DISCHARGE
- CONSULTANT - CITY WUP WWTP EXPANSION PROGRAM
- EXTERNAL ECCC
- EXTERNAL - REDEEMER UNIVERSITY
- EXTERNAL - MECP
- CITY LANDFILL SITES
- Watercourse

Watersheds

- Bronte Creek
- Falcon Creek
- Forty Mile Creek
- Grand River
- Grindstone Creek
- Indian Creek
- North Cootes Paradise
- Red Hill Creek
- Regulated Area of Cootes Paradise Waterbody
- Spencer Creek
- Stoney Creek Numbered Watercourses
- Stoney-Battlefield Creeks
- Twenty Mile Creek
- Upper Hager Creek
- Upper Rambo Creek
- Urban Hamilton
- Welland River
- West Aldershot

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Appendix D: City of Hamilton's Phase I Sample Locations

Hamilton Water Priority Outfalls & Phase 1 Sample Locations

Upper Rambo Creek
Upper Hager Creek
Indian Creek
Falcon Creek
Grindstone Creek
West Aldershot
North Cootes Paradise
Regulated Area of Cootes Paradise Waterbody
Urban Hamilton
Spencer Creek
Red Hill Creek
Stoney Creek Numbered Watercourses
Twenty Mile Creek
Grand River
Welland River
Stoney-Battlefield Creeks
Forty Mile Creek

GC222_SW1
UC_SW1
UC_SW2
UC_SW3
UC_SW4
UC_SW5
UC_SW6
UC_SW7
UC_SW8
UC_SW9
UC_SW10
CC_SW1
CC_SW2
CC_SW3
CC_SW5
CC_SW7
CC_SW8
CC_SW9
CC_SW10
LSC_SW1
LSC_SW2
LSC_SW3
SprC_SW1
SprC_SW2
AC_SW1
AC_SW4
UO_SW1
RHV_SW1
RHV_SW2
RHV_SW3
RHV_SW4
BatC_SW1
BatC_SW2

Chedoke Creek Active Sample Locations

Sample Locations

Phase 1

Priority Outfalls

- CSO OUTFALL
- CSO OUTFALL - BLOCKED
- SPS EMERGENCY OVERFLOW OUTFALL
- SPS EMERGENCY OVERFLOW & CSO OUTFALL
- CSO TANK OUTFALL
- SSO OUTFALL
- WWTP OUTFALL
- WWTP OUTFALL (HALTON)
- Watercourse

Watersheds

- Bronte Creek
- Falcon Creek
- Forty Mile Creek
- Grand River
- Grindstone Creek
- Indian Creek
- North Cootes Paradise
- Red Hill Creek
- Regulated Area of Cootes Paradise Waterbody
- Spencer Creek
- Stoney Creek Numbered Watercourses
- Stoney-Battlefield Creeks
- Twenty Mile Creek
- Upper Hager Creek
- Upper Rambo Creek
- Urban Hamilton
- Welland River
- West Aldershot

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Hamilton Water Priority Outfalls, Active Sample Locations & Phase 1 Sample Locations

Bronte Creek
Upper Rambo Creek
Upper Hager Creek
Indian Creek
Grindstone Creek
Falcon Creek
West Aldershot
North Cootes Paradise
Spencer Creek
Urban Hamilton
Red Hill Creek
Stoney Creek Numbered Watercourses
Stoney-Battlefield Creeks
Forty Mile Creek
Grand River
Twenty Mile Creek
Welland River
FLAMBOROUGH
HAMILTON
ANCASTER
STONEY CREEK
GLANBROOK
Lake Ontario
Lac Ontario

Sample Locations
- Phase 1

Active Sample Locations
- EXTERNAL - CA SITE
- EXTERNAL - RBG SITE
- CITY CSO TANK EFFLUENT SITE
- CITY SURFACE WATER MONITORING SITE
- CITY WWTP DISCHARGE
- CONSULTANT - CITY WUP WWTP EXPANSION PROGRAM
- EXTERNAL ECCC
- EXTERNAL - REDEEMER UNIVERSITY
- EXTERNAL - MECP
- CITY LANDFILL SITES

Priority Outfalls
- CSO OUTFALL
- CSO OUTFALL - BLOCKED
- SPS EMERGENCY OVERFLOW OUTFALL
- SPS EMERGENCY OVERFLOW & CSO OUTFALL
- CSO TANK OUTFALL
- SSO OUTFALL
- WWTP OUTFALL
- WWTP OUTFALL (HALTON)
- Watercourse

Watersheds
- Bronte Creek
- Falcon Creek
- Forty Mile Creek
- Grand River
- Grindstone Creek
- Indian Creek
- North Cootes Paradise
- Red Hill Creek
- Regulated Area of Cootes Paradise Waterbody
- Spencer Creek
- Stoney Creek Numbered Watercourses
- Stoney-Battlefield Creeks
- Twenty Mile Creek
- Upper Hager Creek
- Upper Rambo Creek
- Urban Hamilton
- Welland River
- West Aldershot

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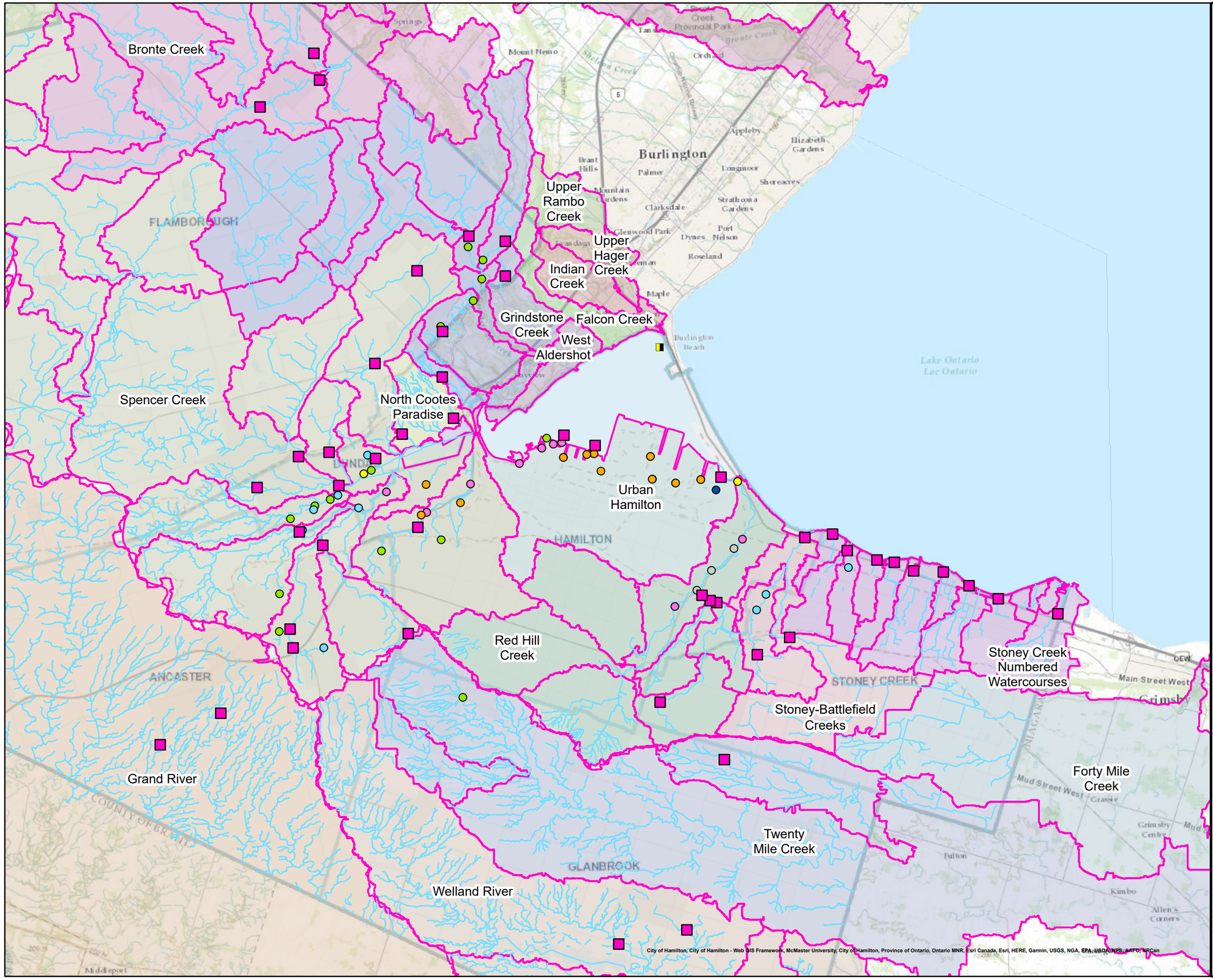
Appendix E: City of Hamilton Proposed Phase II Sample Locations

Hamilton Water Proposed Phase 2 Sample Locations



Proposed Sample Locations

Priority Outfalls

- CSO OUTFALL
- CSO OUTFALL - BLOCKED
- SPS EMERGENCY OVERFLOW OUTFALL
- SPS EMERGENCY OVERFLOW & CSO OUTFALL
- CSO TANK OUTFALL
- SSO OUTFALL
- WWTP OUTFALL
- WWTP OUTFALL (HALTON)
- Watercourse

Watersheds

- Bronte Creek
- Falcon Creek
- Forty Mile Creek
- Grand River
- Grindstone Creek
- Indian Creek
- North Cootes Paradise
- Red Hill Creek
- Regulated Area of Cootes Paradise Waterbody
- Spencer Creek
- Stoney Creek Numbered Watercourses
- Stoney-Battlefield Creeks
- Twenty Mile Creek
- Upper Hager Creek
- Upper Rambo Creek
- Urban Hamilton
- Welland River
- West Aldershot

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Appendix F: Visual – Framework's Phased Approach

Surface Water Quality Program Framework

Preparation

- Hiring WQT
- Background information review
- Stakeholder Engagement
- Sample Point Inventory
- Gap Analysis
- Sample name standardization
- EME Chedoke Creek sample conversion
- LIMS data standardization
- Mapping
- WQT Training
- Field equipment

Phase I (1-2 yrs)

- Sampling parameter standardization
- Proposed modification existing internal WQ programs
- New internal WQ monitoring locations
- Proposed modification external WQ programs
- Data trending
- Spills response protocol
- Stakeholder communications
- Annual report

Phase II (2-5 yrs)

- Additional enhancements to sample inventory
- Technology – real time monitoring
- Data sharing / Webpage
- Funding / Grants

Phase III (5-10 yrs)

- Decision making / Capital investing
- Benthic monitoring
- Strategic sewer use by-law enforcement