Parameter	Criteria			
	City of Hamilton's Sewer Use Bylaw No. 14-090 Schedule C: LIMITS FOR STORM SEWER DISCHARGE	Ministry Environment, Conservation and Parks - Water Management: Policies, Guidelines and Provincial Water Quality Objectives (PWQO)	Canadian Council of Ministers of the Environment; Canadian Water Quality Guidelines for the Protection of Aquatic Life (CWQG)	Guidelines for Canadian Recreational Water Quality (Health Canada, 2012)
Field Conductivity (µS/cm): Conductivity is a measure of the ability of water to pass an electrical current. Conductivity in water is affected by the presence of inorganic dissolved solids such as chloride, nitrate, sulfate, and phosphate anions (ions that carry a negative charge) and sodium, magnesium, calcium, iron, and aluminum cations (ions that carry a positive charge). Conductivity is also affected by temperature: the warmer the water, the higher the conductivity. Conductivity is useful as a general measure of stream water quality. Each stream tends to have a relatively constant range of conductivity that, once established, can be used as a baseline for comparison with regular conductivity measurements. Significant changes in conductivity could then be an indicator that a discharge or some other source of pollution has entered a stream.				
Field Dissolved Oxygen (mg/L): Dissolved Oxygen (DO) is an important water quality indicator as it directly influences the organism that live within the water body (including fish, invertebrates, bacteria and plants). DO is directly influenced by water temperature, streamflow, wind strength & direction, and the season. A dissolved oxygen level that is too high or too low can harm aquatic life and overtime, affect water quality.		≥ 5 mg/L for cold water biota ≥ 4 mg/L for warm water biota		
Field pH The pH should be maintained within the range to protect aquatic life; both alkaline and acid waters may cause irritation to anyone using the water for recreational purposes.		Within the range of: 6.5 - 8.5	Long Term range of: 6.5 - 9.0	Within the range of: 6.5 - 9.0
Field Temperature (℃): Temperature of the surface water is an important field parameter as it directly influences water chemistry and influences the dissolved oxygen (DO) content; determining the types of organisms that can survive in the water.		The temperature of the surface water is used to calculate other select field and laboratory analytical parameters.		
Ammonia + Ammonium as N (mg/L): Ammonia is an important component of the nitrogen cycle and because it is oxidized in the environment by microorganisms (i.e., nitrification), it is a large source of available nitrogen in the environment (Raven & Johnson 1989). Ammonia is the preferred nitrogen containing nutrient for plant growth, however at high concentrations it can cause algal blooms. Ammonia commonly enters the environment as a result of municipal, industrial, agricultural, and natural processes. Natural sources of ammonia include the decomposition or breakdown of organic waste matter, gas exchange with the atmosphere, forest fires, animal waste, human breath, the discharge of ammonia by biota, and nitrogen fixation processes (Environment Canada 1997; Geadah 1985).			Long Term: use Table - pH & Temperature dependent	
Unionized Ammonia as NH_3 (µg/L): Ammonia is the preferred nitrogen containing nutrient for plant growth; it can cause algal blooms and can be acutely toxic to fish in high concentrations. In water, ammonia occurs in two forms; ionized and unionized ammonia. NH_3, un-ionized ammonia, is the form more toxic to fish. Both water temperature and pH control which form of ammonia is predominant at any given time in an aquatic system.		Based on Temperature and pH: 20 µg/L	Long Term: 19 µg/L	
Carbonaceous Biochemical Oxygen Demand (cBOD) (mg/L): Carbonaceous Biochemical Oxygen Demand (CBOD) represents the Biochemical Oxygen Demand (BOD) from organic (carbon-containing) compounds, as well as the oxidation of inorganic compounds such as ferrous iron and sulfide. BOD is a measure of the potential for effluent water to deplete the oxygen in the receiving stream. Fish and other aquatic life depend on dissolved oxygen in the water for survival; contaminated wastewater can rob the receiving stream of this oxygen and have significant negative effects on the environment. For this reason, wastewater and other discharging plants are required to measure BOD in their effluent.				
Chloride (mg/L): A primary source to the environment is the application of road salt in winter months however, the chloride ion can be naturally occurring, and therefore detection of increased levels of chloride in surface waters does not necessarily imply an anthropogenic source (although chloride is often used as an indicator of increasing urbanization in a watershed). Chloride can be toxic to aquatic organisms with acute toxic effects at high concentrations and chronic effects (on growth and reproduction) at lower concentrations (OMOE 2003). The CCME has two guidelines for chloride: acute, or short-term, and chronic, or long-term. Other anthropogenic or human-derived sources of chloride include sewage, animal waste, storm and irrigation drainage, fertilizers, and industrial effluent.			Short Term: 640 mg/L Long Term: 120 mg/L	
Escherichia coli (E. coli) bacteria (MPN/100mL): E. coli is a type of fecal coliform bacteria that is commonly found in the intestines of warm-blooded animals and humans. E coli is used as an indicator for the presence of sewage or animal waste in surface water (Tchobanoglous & Schroeder 1987).		≤ 100 counts/100 mL		Primary contact (i.e. swimming): ≤200 counts/100 mL (minimum 5 samples) OR; ≤400 counts/100 mL (single sample max. concentration) Secondary contact (i.e. canoeing, fishing, etc.): ≤ 1000 counts/100mL
Hardness (mg/L): Hard water contains high levels of dissolved minerals such as calcium and magnesium ions. Calcium and magnesium occur naturally in soils and as surface water comes into contact with these minerals, they may dissolve and enter the waterway.				
Nitrate as N (mg/L): Nitrate is the most common form of nitrogen that occurs in surface water. In aerobic or oxygen-rich water, bacteria convert ammonium and nitrite to nitrate through a process known as nitrification. In anaerobic or oxygen-depleted water, the process is reversed through denitrification. The nitrate ion is the most stable form of nitrogen in water and does not tend to combine with other ions in solution. Nitrate can be toxic to aquatic organisms and elevated concentrations contribute to excessive plant and algae growth in surface water. Anthropogenic sources of nitrate include sewage discharges, animal waste, fertilizers and pesticides.			Short Term: 550 mg/L Long Term: 13 mg/L	
Nitrite as N (mg/L): Nitrogen occurs in various forms such as nitrate, nitrite and ammonia. Nitrate is the most common form of nitrogen entering freshwater systems and is assimilated by plants. Upon the decomposition of plant matter, dissolved organic nitrogen is converted to ammonia, an energy-efficient source of nitrogen for plants (Dodson 2005). Bacteria convert ammonia into nitrate, nitrite and nitrogen. Nitrite is easily converted and rarely accumulates unless organic pollution is high (Wetzel 2001).			0.06 mg NO_2-N/L: Guideline is expressed as mg nitrite-nitrogen/L	
O-Phosphate as P (mg/L): In November 2018, the City of Hamilton began the addition of orthophosphate into the drinking water. Orthophosphate creates a protective barrier on plumbing surfaces that reduces the release of metals, such as lead and copper from plumbing. The City of Hamilton has decided to monitor this parameter as it can be directly linked to watermain leaks or breaks within the distribution system, entering the environment.				
Total Kjeldahl Nitrogen (TKN) as N (mg/L): Total Kjeldahl nitrogen (TKN) is the total concentration of organic nitrogen and ammonia.				
Total Phosphorus (TP) (mg/L): Phosphorus is a natural element found in rocks, soils and organic material and is an essential nutrient for plant growth. Phosphorus clings tightly to soil particles and is often associated with suspended sediment. Excessive phosphorus concentrations stimulate the overgrowth and decomposition of plants and algae. The decomposition of organic matter in turn depletes dissolved oxygen concentrations and stresses aquatic organisms such as fish and benthic invertebrates. Total phosphorus is a measure of all forms of phosphorus in a water sample, and includes biologically accessible phosphates. Anthropogenic sources of phosphorus include fertilizers, pesticides, and sewage discharges.		Excessive plant growth in rivers and streams should be eliminated at a total phosphorus concentration below 0.03 mg/L		
Total Suspended Solids (TSS) (mg/L) Total Suspended Solids refers to the cloudiness of water due to suspended particles; TSS detects particulate larger than 1.5 µm. The amount of total suspended solids (TSS) increases with higher precipitation, stream flow, erosion and higher agricultural or urban land uses. Higher TSS can increase the likelihood that bacteria are present (which can attach to the particles), block light from penetrating to lower depths negatively affecting species dependent upon such light, reduce the absorption of oxygen by fish gills and impair stream aesthetics. Toxic organics and metals often adhere to suspended solids.	15 mg/L		Long Term: Clear Flow: Maximum increase of 25 mg/L from background levels for any short-term exposure (e.g., 24-h period) High Flow: Maximum increase of 25 mg/L from background levels at any time when background levels are between 25 and 250 mg/L. Should not increase more than 10% of background levels when background is ≥ 250 mg/L	

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Total Metals (mg/L): Metals occur naturally in the environment usually in low concentrations. Industrial processes and increased stormwater runoff in urban areas can dramatically alter the distribution of metals and increase their concentration. High concentrations of metals can be toxic, cause disruptions to aquatic ecosystems and decrease the suitability of a waterbody to support aquatic life and supply water for domestic uses.				
Aluminum:		pH 6.5 to 9: 0.075 mg/L - clay free sample pH 5.5 to 6.5: not more than 10% above natural background concentration pH 4.5 to 5.5: 0.015 mg/L- clay free sample	Variable = 0.005 mg/L if pH < 6.5 = 0.1 mg/L if pH ≥ 6.5	
Antimony:		0.02 mg/L		
Arsenic:		0.005 mg/L	Long Term: 0.05 mg/L	
Barium:			Long Term: 1.0 mg/L	
Beryllium:		<75 mg/L hardness: 0.011 mg/L >75 mg/L hardness: 1.1 mg/L		
Bismuth:				
Boron:		0.2 mg/L	Short Term: 29 mg/L Long Term: 1.5 mg/L	
Cadmium:	1 mg/L	0 - 100 mg/L hardness: 0.0001 mg/L >100 mg/L hardness: 0.0005 mg/L	Use equation to determine guideline; hardness dependent	
Calcium:				
Chromium (Total):	1 mg/L	Valence dependent Cr3: 0.0089 mg/L Cr6: 0.001 mg/L		
Cobalt:		0.0009 mg/L		
Copper:	1 mg/L	0 - 20 mg/L hardness: 0.001 mg/L >20 mg/L hardness: 0.005 mg/L	Use equation to determine guideline; hardness dependent	
Iron:		0.3 mg/L	Long Term: 0.3 mg/L	
Lead:	1 mg/L	<30 mg/L hardness: 0.001 mg/L 30 to 80 mg/L hardness: 0.003 mg/L >80 mg/L hardness: 0.005 mg/L	Use equation to determine guideline; hardness dependent	
Lithium:				
Magnesium:				
Manganese:			Use equation to determine guideline; hardness dependent	
Molybdenum:		0.04 mg/L	Long Term: 0.073 mg/L	
Nickel:	1 mg/L	0.025 mg/L	When the water hardness is 0 to ≤ 60 mg/L, the CWQG is 0.025 mg/L. At hardness > 60 to ≤ 180 mg/L the CWQG is calculated using this equation: CWQG (μg/L) = e{0.76[ln(hardness)]+1.06} (see CCME website) At hardness >180 mg/L, the CWQG is 0.15 mg/L	
Potassium:				
Selenium:		0.100 mg/L	Long Term: 0.001 mg/L	
Silicon:				
Silver:		0.0001 mg/L	Long Term: 0.00025 mg/L	
Sodium:				
Strontium:				
Thallium:		0.0003 mg/L	Long Term: 0.0008 mg/L	
Tin:				
Titanium:				
Tungsten:		0.03 mg/L		
Uranium:		0.005 mg/L	Short Term: 0.033 mg/L Long Term: 0.015 mg/L	
Vanadium:		0.006 mg/L		
Zinc:	3 mg/L	0.03 mg/L		
Zirconium		0.004 mg/L		

Source:

Ministry Environment, Conservation and Parks - Water Management: Policies, Guidelines and Provincial Water Quality Objectives (PWQO) - https://www.ontario.ca/page/water-management-policies-guidelines-provincial-water-quality-objectives

Canadian Council of Ministers of the Environment - Canadian Water Quality Guidelines (CWQG): https://ccme.ca/en/current-activities/canadian-environmental-quality-guidelines & https://ccme.ca/en/summary-table

City of Hamilton's Sewer Use Bylaw No. 14-090 Schedule C: LIMITS FOR STORM SEWER DISCHARGE - http://www2.hamilton.ca/NR/rdonlyres/C297E982-46C5-492E-8941-C1BB39AA3CA2/0/14090.pdf

Guidelines for Canadian Recreational Water Quality (Health Canada, 2012) - https://www.canada.ca/en/health-canada/services/publications/healthy-living/guidelines-canadian-recreational-water-quality-third-edition.html

Hamilton Conservation Authority - https://conservationhamilton.ca/

Niagara Peninsula Conservation Authority - https://npca.ca/watershed-health#water-quality-monitoring

Toronto and Region Conservation Authority - https://trca.ca/conservation/environmental-monitoring/environmental-monitoring-resource-library/#waterquality