Remediation Mitigation Report – Cootes Paradise and Western Harbour - DRAFT

Cootes Paradise Report
City of Hamilton
Project #WW20101062

Prepared for:

City of Hamilton

3/22/2021

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Prepared for:

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1.0 Introduction

1.1 Outline of Order Requirements

This report, **Remediation Mitigation Report – Cootes Paradise and Western Harbour** referred to as the "**Cootes Paradise Report**", has been prepared by Wood Environment & Infrastructure Solutions (Wood) and GM Blue Plan (GMBP) on behalf of the City of Hamilton to address the requirements outlined in the MECP Director's Order: 1- PE3L3 (the "Order", issued December 4, 2020). The content in this report is specific to the remediation and mitigation proposed for Cootes Paradise and the Western Harbour area, to off-set the impacts associated with the Chedoke Creek Spill, as detailed in the Order. The Order has numerous components (ref. Appendix A) which are addressed in the report sections which follow. Notably, Order requirements #1 and 2, have been fulfilled by the City retaining Wood and providing the MECP with confirmation of same on same on January 15, 2021 (ref. Email Girt- Burt). As such, Wood, in association with GMBP, are acting as the City's representative in the capacity of Qualified Person (QP) for the Cootes Paradise Report.

The following outlines the Order requirements (in ***bold italics***) and highlights the section in the reporting which follows, where the information has been provided to address the specific needs of MECP.

8. By March 22, 2021, submit to the Director for approval, a proposed remediation/mitigation report that is prepared by a Qualified Person(s) for the Cootes Paradise/Western Hamilton Harbor Area to offset the added nutrient loading, principally TP, identified in the Wood reports, the SLR reports and particularly the Hatch reports, and address any other potential on- going impacts (dissolved oxygen, algal blooms) as a result from the sewage spill to this area ("Cootes Paradise Report'').

The current report, "Cootes Paradise Report'', has been prepared to address this requirement of the Order; this report is a complement to the earlier report titled "Chedoke Creek Workplan", February 22, 2021, which was prepared to address the first part of the Order, related to the targeted dredging of the Chedoke Creek, specific to Order requirements #3 to 7.

9. The report in Item 8 shall, at a minimum:

i. Identify and review all potential remediation or mitigation measures, whether direct, indirect, or a combination of measures with consideration for short and long-term measures to address the remediation goal to offset added nutrient loading particularly for TP and any potential on-going impacts (dissolved oxygen, algal blooms) from the sewage spill to the Cootes Paradise/Western Hamilton Harbor Area as identified in the Wood reports, the SLR reports and the Hatch reports;

Section 2 of this report provides a summary of the outcomes from the "Chedoke Creek Water Quality Improvement Framework", GM Blue Plan and Wood, January 2021 (Draft), ("Framework Study"), which began prior to the issuance of the Order (in September 2020) and was not explicitly written to address the Order requirements. Rather, the Framework Study was commissioned by the City of Hamilton to investigate potential opportunities to improve water quality in the Chedoke Creek, and by extension Cootes Paradise and Hamilton Harbour. That said, the Framework Study has considerable content commonality with the needs expressed in the Order, and as such has been heavily relied upon for relevant information, due to the limited time availability to conduct stand-alone investigations, including stakeholder engagement, which was an important component of the Framework Study.

Section 2 of this report, outlines the options considered through the Framework Study (draft), including an assessment of their potential benefit to the receiving system (Cootes Paradise and Hamilton Harbour) along with a consideration of whether these options would be considered "short" or "long-term" undertakings, given their scope and data needs. Some of the content from the Framework Study has been slightly amended and updated from the January 2021 Draft, based on comments received from stakeholders (reference Appendix C), as well as matters arising specific to the Order. In addition, Section 3 outlines other options considered for off-setting works, beyond those outlined in the Framework Study (draft) and Section 5 provides recommendations for consideration by MECP.

Further, the Chedoke Creek Workplan contains a summary of the loading assessment for nutrients and Total Phosphorus (TP) based on earlier work by Wood, Hatch and SLR (ref. Section 2 from February 22, 2021 report). As noted in that report, it will be necessary to conduct field work in the Lower Chedoke Creek (from the outfall at Hwy 403 to the Princess Point Embayment), to determine the amount and composition of resident sediment. Once determined (through field work planned in 2021 Q2), the understanding of sediment quantity and composition, will guide the City and its partners to better identify the works required as part of the Cootes Paradise Work Plan (ref. Order requirement #10 below).

ii. Undertake consultation with and provide a summary of comments received from the Royal Botanical Gardens, Hamilton Conservation Authority, the Ministry, and any other relevant affected stakeholders for potential remediation and mitigation options as per item i. above;

The City of Hamilton has conducted stakeholder engagement as part of the Framework Study. This engagement involved two presentations; the first was on the issues and problems, and study process, while the second involved a discussion on potential solutions and opportunities to remediate the impacts to Chedoke Creek and its receivers. Furthermore, stakeholders have had a direct opportunity to comment on the draft reporting, released in January 2021.

In addition to the input provided on the Framework Study (ref. Appendix C), the City has, since the issuance of the Order on December 4, 2020, engaged the MECP on the preferred approach to address the Order requirements and associated implementation logistics. Further, the City has also contacted RBG as a central stakeholder and landowner, for insights on area resources, including Species at Risk, and background information on RBG's planned initiatives for Cootes Paradise. In addition, HCA has been contacted to determine information availability related to the design requirements for the dredging work, as well as data/information needs associated with permitting. Both RBG and HCA were part of the Framework Study, hence have also provided their input to that study which has been considered herein (ref. Section 4).

Lastly, while not considered consultation explicit to the second part of the Order, the City (through Wood) has been reaching out to regulators to determine the permitting needs for the targeted dredging works (details are outlined in the Chedoke Creek Workplan and the current status of the pre-consultation is summarized in Appendix B).

iii. Contain a cost/benefit analysis of all options to assess efficiency and effectiveness of any remediation or mitigation options;

Given the limited time availability since the issuance of the Order, the information provided in this report has relied exclusively on the cost-benefit assessments conducted for the Framework Study (draft), which has been acknowledged to be high-level and not based on detailed analytical assessments. It has been noted in both the Framework Study, as well as this report, that future studies and investigations will be required to fill information gaps on explicit cost-benefits in accordance with

Environmental Assessment (EA) rigour, using the "triple-bottom" line principles of natural, social and economic environments. Section 2 of this report outlines the high-level cost benefit approach and how it has guided the screening of alternatives and the formulation of the recommended actions.

iv. Identify the recommended options for remediation and mitigation;

The Framework Study (draft) identified numerous project opportunities for remediation and mitigation, that were then further reviewed, screened and advanced as part of that study. This report (Cootes Paradise Report) has further assessed these opportunities and others, leading to a set of recommendations for consideration by MECP. These project opportunities were then further subdivided for the purpose of the Order into those works which would be considered as normal or "Planned" by the City, to deal with infrastructure operations and capital upgrades/renewal, and those works which would be considered additive or "Unplanned" (of "Added Value"), with the express purpose of addressing the "off-set" requirements of the Order. Report Section 5 provides the details on the respective recommended options.

v. Identify the proposed offset goal to achieve remediation and/or mitigation with respect to the approximate equivalent loadings from the sewage spill;

The Chedoke Creek Workplan for the targeted dredge contains a summary of the loading assessment for nutrients and TP based on the earlier work by Wood, Hatch and SLR between 2018 and 2020 (ref. Section 2 in Chedoke Creek Workplan). As noted, field work is required in the Lower Chedoke Creek (from the outfall at Hwy 403 to the Princess Point Embayment), to determine the amount and composition of resident sediment related to the spill. Once determined (through field work planned in 2021 Q2), the field work findings will guide the extent and form of targeting dredging work required in the Chedoke Creek and thereby also establish the basis for off-set works in Cootes Paradise to satisfy the requirements of the Order and mitigate the impacts of the spill. Section 5 in this report discusses the approach and the intended process to realize the MECP's objectives related to the off-set goal.

vi. Propose a methodology for quantification with respect to the offset of the loadings for any remediation and/or mitigation measures to meet the intended goal for overall remediation and/or mitigation to address the added TP loading from the spill; and

The results from the proposed field investigations (2021 Q2) will be used to evaluate the need for additional remediation and/or mitigation efforts to address downstream TP transported from Chedoke Creek to Cootes Paradise and the Western Harbour. Potential restoration and mitigation measures include both a wide range of watershed improvements, such as treatment of non-point pollutant sources, as well as in-water restoration, such as large-scale aeration and wetland restoration. Section 5.1 provides a summary of the available restoration measures and the methodology proposed for establishing the recommended projects to address TP loading downstream of Chedoke Creek, associated with the spill.

vii. Identify and propose timelines to implement the recommended remediation or mitigation measures to offset loadings from TP, impacts to dissolved oxygen from nutrients or other measures that may improve existing or potential impairments with identification of options that can be implemented as soon as possible to start to reduce the on-going or potential impacts.

The Framework Study advanced high-level timelines associated with what it identified as "short" and "long" term undertakings. The Cootes Paradise Report has further assessed the various recommendations, specific to the "unplanned" or "added value" works, and developed associated timelines more explicitly. It is worth noting that two of the key recommendations are associated with new Master Planning Studies for the Lower Chedoke Creek Restoration and the Stormwater Retrofit

Study for the Chedoke Watershed. These studies (estimated to require 12 months each to execute – target completion in 2022) will lead to a set of recommendations for capital works and other related activities. Further, both plans are expected to be comprised of multi-year programs of works which, subject to Council approval and funding, would be able to start design in 2022 and construction in 2023, for the highest priority works. Section 7 in this report provides further details.

10. Within six (6) weeks of approval of Item 8 above or such other date approved by the Director in writing, submit to the Director for approval, a proposed workplan for the approved remediation/mitigation measures for Cootes Paradise/Western Hamilton Harbour Area ("Cootes Paradise Workplan"). The workplan shall consider and address, as necessary, Work Ordered in Item 8 and 9 above and any ministry comments upon approval of Item 8, and shall include, but not be limited to, the following:

i. A detailed workplan and timeline for carrying out the approved remediation/mitigation options within the Cootes Paradise/Western Hamilton Harbour Area; ;

ii. Calculations referred to in Item 9 iv) and v) or as otherwise approved; and;

iii. Proposed follow-up monitoring required to ensure the recovery and effectiveness of the remediation plan.

It is understood that once the MECP Director has had an opportunity to review the Cootes Paradise Report, comments will be forthcoming from MECP to potentially update and refine its content, and thereby guide follow-on effort. Once approved by MECP, this updated Cootes Paradise Report will then form the basis for establishing a more detailed work plan associated with the unplanned/"added value" recommendations. This will include information on data requirements, task descriptions and timelines, as well as engagement approaches. The subject report, referred to as the Cootes Paradise Workplan, will be submitted within six (6) weeks of the Director's approval of the Cootes Paradise Report, per the requirements of the Order. Section 6 of the Cootes Paradise Report has outlined a framework for monitoring the benefits and positive impacts associated with the recommended works, which will be further developed as part of the Cootes Paradise Workplan.

1.2 Concept of Mitigative Works (offset)

The introduction of excess nutrients from the 2014-2018 discharge of sewage into Chedoke Creek is the primary water quality concern for Cootes Paradise and the Western Harbour, however several other secondary water quality impacts are also ongoing and will require additional mitigation measures. The nutrients introduced during the discharge event have encouraged the growth of suspended algae which can lead to a cascade of additional ecological impairments, including loss of submerged vegetation, generation of additional sedimentation, loss of sediment stability, extreme changes in dissolved oxygen concentration, and loss of habitat. Once the nutrient sources have been controlled and/or better managed, measures such as revegetation and installation of other in-water works (such as floating vegetated mats) can be implemented to mitigate these secondary impairments. These mitigation measures can significantly enhance the ability of an impacted aquatic ecosystem to transition from an algal-dominated stable state to one that is dominated by aquatic macrophytes and supports a sustainable environment.

As outlined in Section 5.1, the offsetting mitigative works being considered for Cootes Paradise and the Western Harbour, largely fall into two forms, those that reduce the nutrients from the inflowing water, and those in-water works that treat the resident nutrients and other contaminants, either in a one-time reduction (such as removal) or continuously through uptake (such as specific plantings). The concept of the mitigative offsetting works considers both of these forms of work in establishing the proposed overall scope to remediate the impacts of the discharge event. As noted earlier, the work plan for the Chedoke

Creek targeted dredging will provide further data on current conditions in the creek, as well as the extent to which the targeted dredge and small-scale local remediation within the Chedoke Creek, will be able to off-set the impacts of the discharge event. Any quantifiable deficit (which is expected) will therefore guide the scope of the plan developed for the remediation of Cootes Paradise and the Western Harbour.

1.3 Chedoke Creek Workplan Context

The Chedoke Creek Workplan (February 22, 2021) was prepared by the City of Hamilton to address the first part of the Order, specific to the Targeted Dredging for the Chedoke Creek. The goal of the Chedoke Creek targeted dredge project is to restore the creek system in response to the discharge event and to provide reasonable complementary offsetting remediation projects within the creek, to account for additional environmental impacts that may not be addressed by dredging alone. Based on dialogue with MECP staff, the emphasis for these smaller scale offsetting works, relates predominantly to the Chedoke Creek system, versus the works outlined in this current report, which are more targeted towards Cootes Paradise and the Western Harbour.

Per the Chedoke Creek Workplan, the City of Hamilton is proposing to incorporate smaller scale offsetting remediation projects to augment and complement the benefits of the targeted dredging project. While not currently fully defined, (as this is part of the work yet to be completed under that plan), several water quality management technologies are available to be used as complements to dredging to improve water quality conditions in the creek by increasing dissolved oxygen and reducing nutrient concentrations. Some of the technologies which were advanced in the Chedoke Creek Workplan, and are going to be assessed over the course of that plan's execution include:

1) Floating vegetated mats
2) Small scale Aeration systems
3) Shoreline plantings
4) Beneficial sediment reuse and sediment stabilization

As noted above, these works will be spatially focused on the Lower Chedoke Creek, rather than Cootes Paradise and the Western Harbour. It is the current Cootes Paradise Report's objective to address those other offsetting works, which focus on Cootes Paradise and the Western Harbour, including those works which improve the water quality discharging to those systems.

2.0 Overview of Outcomes/Recommendations from Chedoke Creek Water Quality Framework

2.1 Introduction/Overview

The Framework Study summarized and consolidated previous and ongoing analyses conducted in the Chedoke Creek watershed, incorporated staff and stakeholder input, and undertook a broad, high level evaluation of potential improvements. Given the wide range of background information, potential solutions, and staff and stakeholder concerns, the Framework Study consolidated this information and brought forward a series of recommendations, including an implementation plan to address the water quality improvements for the Chedoke Creek system.

By way of background, urban buildout within the Chedoke Creek watershed predates modern standards for contemporary environmental and stormwater management approaches; evidence of this is demonstrated through:

- the enclosure and channelization of Chedoke Creek at several locations,
- combined sewers within the Mid and Lower Chedoke Creek watershed,
- the minimal presence of stormwater management features, and
- the placement of a landfill and other major transportation corridors adjacent to, and bisecting the natural Chedoke Creek channel and Cootes Paradise.

As a result, the Chedoke Creek experiences significant impacts such as sewage contamination, untreated urban stormwater runoff, and landfill leachate contamination. These water quality issues within Chedoke Creek watershed are of additional interest due to the Creek's location and function within the Cootes Paradise and Hamilton Harbour system.

Many recent studies and investigations have characterized the existing condition of Chedoke Creek, the performance of local infrastructure, and in some instances identified potential short and long-term management solutions to address select legacy issues. These studies and investigations have identified that water quality issues within Chedoke Creek, and the downstream receiver, Cootes Paradise, are not the result of any single source but rather are associated with both point and non-point sources throughout the watershed. Notwithstanding there are several information gaps which will need to be filled over time to better inform future remediation and restoration.

The main purpose of the Framework Study was hence to assemble the legacy work that has been completed and further examine this information as a broader system, while reviewing the various solutions that have been previously considered and/or recommended. The approach has involved assessing the watershed conditions, and specifically non-point sources, point sources of contaminants and the Creek, to identify the preferred potential solutions for the Chedoke Creek and its watershed.

2.2 Goals/Objectives

The key objectives of the Framework Study were stated as follows:

- Complete a holistic review of legacy water quality issues within the Chedoke Creek Watershed to identify the potential and likely contaminant sources, and the relative magnitude of their contributions;
- Explore and identify a range of potential *preventative* (to prevent something from occurring), *mitigative* (to make something less severe), and *restorative* (to restore to a past and more natural state) solutions to help address the identified legacy issues;

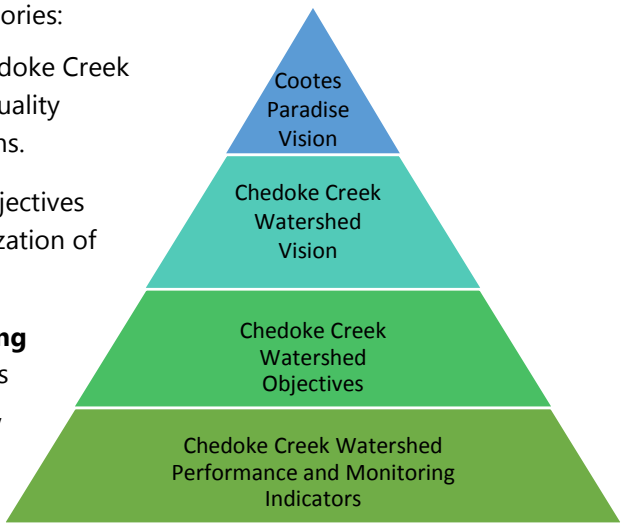
- Identify a preliminary set of management objectives to help guide future infrastructure and policy decisions;
- Engage in Stakeholder Consultation to ensure a comprehensive and common understanding of needs and set the foundation for future consultation and implementation;
- Review a range of potential solutions and provide recommendations for preferred potential solutions; and,
- Develop an Implementation Framework to support the future implementation of management solutions and associated tracking of progress.

The development and adoption of clear, achievable, and measurable objectives are essential to allow for the proper planning, design, implementation, and monitoring of Water Quality Improvements for the Chedoke Creek. These objectives, will guide the City and stakeholders to appropriately define specific needs, prioritize resources, monitor progress, and develop a common consensus related to desired outcomes.

The Framework Study has established the Chedoke Creek Watershed Management objectives based on the City's and stakeholders' Vision for the Chedoke Creek watershed and the broader Cootes Paradise system.

The Framework Study classified the objectives in three main categories:

- **Watershed Vision (Why?):** The Cootes Paradise and Chedoke Creek Watershed Vision represent the "The Goal" of the water quality improvements to the community in broad qualitative terms.
- **Chedoke Creek Watershed Objectives (What?):** The Objectives represent qualitative measures that help and lead to realization of the Watershed Vision.
- **Chedoke Creek Watershed Performance and Monitoring Indicators (How?):** The Indicators represent the measures that can be used to support the evaluation of alternatives, guide the design of infrastructure, and measure improvements over time.



The Framework Study recommended a "preliminary" Chedoke Creek Watershed Vision and Objectives, which ultimately will need to be confirmed and endorsed by the City and the respective stakeholders and public. Further, the Framework Study suggested potential Performance and Monitoring Indicators, which at this stage are qualitative (due to the study's limited technical scope), however moving forward, the City and respective stakeholders will need to establish more quantitative measures for the Performance and Monitoring Indicators.

Cootes Paradise and Hamilton Harbour Vision

The draft long-term vision for Cootes Paradise, based on the "Project Paradise", RBG and Hamilton Harbour Remedial Action Plan (HHRAP) can be described as:

Fully restored and enhanced Cootes Paradise environment

This is a long-term vision that will continue to be dynamic and adjusted over time. The Vision is expected to be refined based on further studies and consultation with the various stakeholders. It should also be noted that based on feedback from stakeholders on the draft Framework Study some amendments are likely for the Vision to better align with stakeholder interests; this will be made part of the final Framework Study reporting.

Chedoke Creek Watershed Vision

Chedoke Creek is one of the main tributaries entering Cootes Paradise, along with Spencer Creek, Ancaster Creek and Borer's Creek. Notably, Chedoke Creek is one of several sources contributing nutrient loads to Cootes Paradise. Therefore, it is important to recognize that solely addressing/managing the Chedoke Creek water quality issues will not achieve the overall Cootes Paradise Vision. **Figure 1** provides a breakdown by source for an average year for Total Phosphorus nutrient loading to Cootes Paradise (this does not consider the 2014 to 2018 discharge event). Based on stakeholder feedback on the draft Framework Study, Figure 1 may be updated, however it is presented here largely for context, to indicate that the Chedoke Creek is one of many sources of contaminants to Cootes Paradise.

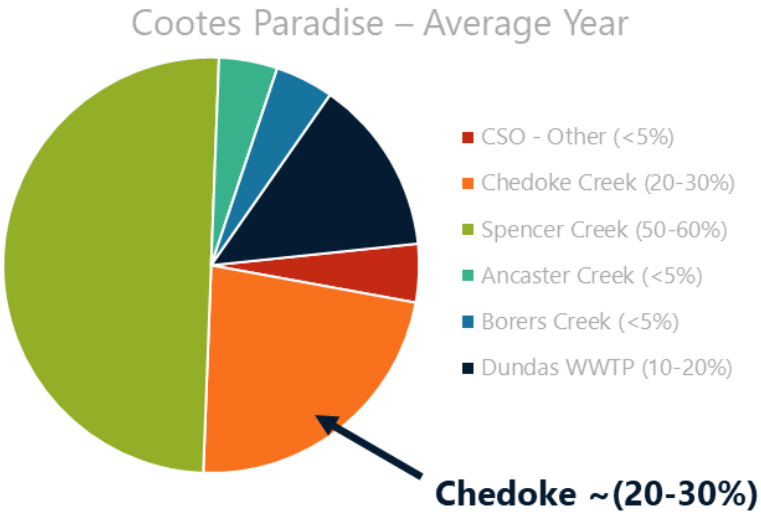


Figure 1. Cootes Paradise Average Year Total Phosphorus Loading

The Chedoke Creek Watershed Vision has been developed to support the Cootes Paradise Vision, as improvements in the Chedoke Creek Watershed will directly and indirectly benefit Cootes Paradise.

The vision for the Chedoke Creek Watershed can be described as:

Improve Chedoke Creek Watershed Water Quality to support:

- *Enhanced wildlife activity and habitat*
- *Safer Recreational Contact*

Chedoke Creek Watershed Management Objectives

Objectives are a qualitative measure intended to support and realize the project vision. These objectives are used as the basis for targets, to assess beneficial impacts, and support prioritization. The objectives need to be achievable and supported by stakeholders and by data, and should have the following characteristics:

- Technically feasible
- Align with City and Stakeholder vision
- Financially feasible
- Implementable timeline
- Complementary to other needs and priorities

The following Chedoke Creek Watershed Objectives have been identified in support of the Chedoke Creek Watershed Vision (the objectives are listed in no particular order of importance):

- Limit sources of high nutrient loads to Chedoke Creek to prevent excess nutrients and limit algae blooms
- Limit sources of contaminants to Chedoke Creek
- Eliminate sanitary sewer cross-connections to the stormwater system (in separated sewer systems)
- Minimize the risk of CSO spills to Chedoke Creek including:
    - Reducing the frequency and volume of overflow events
    - Enhance monitoring and management, to reduce the likelihood of, and reduce the response times to, spill events resulting from infrastructure failures
- Seek opportunities to enhance and naturalize Chedoke Creek

2.3 Options

As part of the Framework Study, a wide range of potential options were considered to address one or more of the identified Management Objectives. These potential options explored a range of *preventative*, *mitigative* and *restorative* solutions, and were then examined at both a local level along the creek, and also within the larger, watershed/City-wide context. The list of potential options was generated based on previously identified solutions, consideration of current industry best practices, and stakeholder engagement and input. The following outlines the potential management options which were considered through the Framework Study. The options were categorized into seven (7) main groups consisting of the following:

- Landfill
- Lower Chedoke Creek
- Wastewater
- Stormwater
- Upper Chedoke Creek
- Engagement
- Monitoring

The foregoing represented specific locations within the watershed or key targeted sources or types of systems, as well as other complementary activities to collect data or feedback. Table 2.1 provides a summary of the various sub-options considered under each group. It should be noted that some of the content in Table 2.1 and the subsequent summaries has been slightly amended from the version of the information provided in the January 2021 draft of the Framework Study, to reflect some of the input received from stakeholders and other needs and/or requirements specifically stemming from the Order requirements.

Table 2.1. Description of Options

	Option Overview	Option Description
Landfill	Direct Clean Water Away from Landfill	• Prevent local surface water runoff from infiltrating into the landfill and entering leachate collection system (LCS) • Realign surface water pathways to allow clean water to directly flow into Chedoke Creek • Reduce total volume pumped from LCS to combined sewers due to reduced leachate generation
	Rehabilitate existing Highway 403 Culvert (Landfill)	• Prevent leachate from contaminating flows from Highway 403 entering the creek via local culvert
	Expand/Fix Leachate Collection System	• Extend and deepen perforated pipe for leachate collection pipe • Prevent leachate from seeping into creek and from contaminating runoff directly entering creek
	Landfill Capping/Barrier	• Improve landfill capping/barrier to reduce leachate leaking from boundaries • Enhance the barrier between the contaminated media and the surface
Lower Chedoke Creek	Constructed Wetland	• Construct wetland at the outlet of Chedoke Creek where it enters Cootes Paradise (Princess Point) • Capture sediments & pollutant loading from Chedoke Creek before entering Cootes Paradise • Disperse flows which will enhance natural processes and improve wildlife habitat at outlet of Chedoke Creek
	Aeration System (major/permanent)	• Install Aeration System in Lower Chedoke Creek • System intended to enhance the transfer of dissolved oxygen to Chedoke Creek/Cootes Paradise waters • Improves marine habitat along and downstream of the creek
	Stream Naturalization	• Remove concrete channel and introduce native vegetation for slope stability • Reduce stream velocity and sediment buildup downstream • Improves marine habitat along and downstream of the creek
	Restore Delta at Mouth of Chedoke Creek	• Potentially in combination with Constructed Wetland, restore the geometry of the multi-channel delta in the vicinity of Princess Point • Improve energy dissipation and sediment transport, while enhancing habitat functions

	Option Overview		Option Description
Lower Chedoke Creek	Physical Capping		• Apply a cover of clean material on top of contaminated creek bed sediment to mitigate risk of contamination • Stabilization of contaminated sediments to prevent resuspension • Prevent benthic community from interacting with and processing the contaminated sediments
	Chemical Inactivation		• Chemically treat nutrient-enriched sediment to reduce internal pollutant loading
	Hydraulic Dredging for Sediment Removal	Complete Removal	• Remove contaminated sediment via hydraulic dredging • Remediate the creek by removing all existing contaminated sediment within creek
		Targeted Removal	• Targeted removal of contaminated sediment via hydraulic dredging (Part of current MECP Order) • Remediate the creek bed by removing targeted sediment with highest potential for negative impacts
Wastewater	Sewer Separation		• Full sewer separation in Chedoke watershed (i.e., combined systems to a sanitary and storm system) • Prevents sanitary waste from overflowing into Chedoke Creek
	Increase Hydraulic Capacity Downstream of Main-King Combined Sewer Overflow (CSO) tank		• Trunk upgrades from Main-King CSO tank to Woodward Avenue WWTP to accommodate higher storm flows • Reduces volume and frequency of combined sewer overflows
	Increase Capacity of Royal CSO tank to Main-King CSO tank (Highway 403 Trunk Sewer Twinning)		• Reduces volume and frequency of combined sewer overflows • Potential elimination of overflows at Aberdeen CSO & reduction in overflows at Royal CSO
	Expand Storage at Main-King CSO tank		• Increases holding capacity to accommodate combined sewer flows during high flow events • Reduces volume and frequency of overflows
	Expand Storage Elsewhere in System		• Increases capacity to accommodate combined sewer flows during high flow events • Reduces volume and frequency of combined sewer overflows • Option would be sited upstream of Main-King CSO tank to provide additional system relief

	Option Overview		Option Description
Wastewater	Inspection and Repair	Facilities	• Prevent combined sewage from potentially infiltrating into creek due to leaks • Potential opportunity at Royal CSO • Investigation needed to confirm leaks
		Trunk Sewers	• Prevent combined sewage from potentially infiltrating into creek due to leaks • Potential opportunity within trunk sewers running parallel to creek system • Investigation needed to confirm leaks
	CSO Monitoring Improvements and Active Management		• Real Time Control (RTC) Program to optimize the performance of the collection system and CSO tanks • Improved inspection and monitoring of CSOs • Quantify overflow volume and overflow conditions
	Wet Weather Flow Management (Inflow & Infiltration) in Separated Sewers	Targeted in Chedoke Watershed	• Identify areas of high Inflow and Infiltration (I&I) in Chedoke Creek watershed • Reduce I&I into sanitary sewers thereby reducing sanitary sewer flows • Potentially reduce CSO overflows
		Targeted in broader Main-King Catchment	• Identify areas of high I&I in Main-King catchment • Reduce I&I into sanitary sewers thereby reducing sanitary sewer flows • Potentially reduce CSO overflows
		Policy/Future Infrastructure Projects	• More stringent criteria related to new development standards to ensure future construction practices better address I&I issues • Reduce I&I into sanitary sewers thereby reducing sanitary sewer flows • Potentially reduce CSO overflows
Stormwater	Cross Connection Program		• Ensure sanitary laterals are not connected to stormwater system in separated sewer system • Prioritize within Chedoke Creek catchment, south of Escarpment • Fix storm and sanitary cross-connections from homes • Reduce sanitary contaminants discharged from stormwater outfalls
	Retrofits throughout the watershed (End-of-Pipe and Source)	City	• Retrofit existing dry ponds to wet ponds and build treatment at outfalls where opportunities exist in Chedoke watershed • Introduce stormwater management practices to areas where there is currently no treatment or management
		MTO	• Retrofit existing facilities for Highway 403 drainage • Introduce stormwater management practices along Highway 403 where there is currently no treatment or management

	Option Overview		Option Description
Stormwater	Retrofits for Road Rehabilitation Projects / Low Impact Development (LID) BMP Policy		• Best Management Practices (BMPs) focussed on water quality treatment to be applied to any road rehabilitation project within the City – targeted to Chedoke Creek watershed • Advance City's stormwater management guidance to include City infrastructure
	City Street Management	Enhanced Street Sweeping	• Program to implement enhanced street sweeping within Chedoke Creek Watershed and across broader City • Clean up debris and contaminants that build up on City roads
		Improve Snow Management within Chedoke Creek Watershed	• Enhance Snow Management practices to prevent contamination (Chlorides) to Chedoke Creek during melts • Review disposal sites for snow that would reduce direct snow melt into urban streams
	Stormwater User Rate/ LID BMP Policy		• Supports sustainable funding of stormwater management program • Incentive program to encourage private property owners to manage stormwater at source on private properties and implement additional BMP's • LID BMPs will help to provide infiltration, reduce runoff volumes and support creek stability
	Enhanced Salt Management	Highway 403	• Enhance salt management plan for Highway 403
		City Roads	• Enhance City's salt management plan for City Roads
	Redevelopment Sites Stormwater Management (SWM) Policy		• Policies for BMP's including LID practices for redevelopment sites in City • Opportunity for significant stormwater reduction/treatment on redevelopment sites
	Highway 403 Water Quality Improvements		• Treat highway runoff at collection points along corridor before it enters Chedoke Creek • Install stormwater management devices at stormwater outfalls
	Inlet Controls in Combined Sewer Areas		• Install inlet control devices in combined sewer system • Restricts the amount of stormwater that enters enclosed system, reducing the potential of CSO overflows • Requires evaluation of major system (overland) capacity

	Option Overview		Option Description
Upper Chedoke Creek	Golf Course	Manage Runoff from the Golf Course	• Improve Golf course water management practices including management of fertilizers and pesticide use • Provides treatment prior to runoff entering Chedoke Creek
		Stream Naturalization	• Naturalization of channelized portions of creek and introducing native vegetation
		Retrofit and Treatment Online	• Provide location for external stormwater treatment on-site at Chedoke Golf Course (Beddoe) • Treatment to capture large portion of Upper Chedoke Creek catchments that currently flow through Golf Course • Opportunity would be part of broader water shed assessment of retrofits
Engagement	Engage Residents, Stakeholders, and City		• Educating citizens about water quality issues and benefits of proposed actions • More transparency in water quality monitoring and management • Encourages resident participation in ongoing public initiatives
Monitoring	Program Management and Monitoring		• Centralized data sharing portal to house sampling data • Apply consistent protocols to monitor and track benefits • Program will provide data to quantify water quality benefits of proposed actions • Better identify problems and effectiveness of solutions; leads to adaptive management

2.4 Screening

The screening and prioritization of options, as outlined in the Framework Study (draft), generally followed the following approach:

1. **Screening of Options**: A preliminary screening process for the options was developed and undertaken to determine which options should be *carried forward*, *screened out*, or will *require further investigations/studies*. The overall advantages and disadvantages of the options were reviewed to define which options should be *screened out* versus those that should be *carried forward*.

   The screening process considered the following:

   - Potential Cost
   - Potential Benefit
   - Technical or Implementation Challenges
   - "No-Regrets" Principles
   - Nutrient Loading Impact

   The options that were carried forward or required further investigations/studies, were then further refined through the categorization and prioritization process.

2. **Prioritization and Categorization of Options:** The Framework Study (draft) then prioritized those options carried forward, further refining their advantages and disadvantages. The approach qualitatively evaluated the relative advantages, disadvantages, and potential impacts of each option against the established criteria (ref. **Table 2.2**).

Table 2.2. Prioritization Criteria

	High	Medium	Low
Cost	<$10 M	$10-$50 M	>$50 M
Timing	Short-Term (<5 Years)	Near-Term (5-10 Years)	Long-Term (>10 Years)
Implementation	Easy	Moderate	Difficult
Visibility	High	Medium	Low

- "High" options generate comparatively beneficial impacts; these are depicted in green
- "Medium" options present a mix of positive and negative elements with some impacts; these are depicted in black
- "Low" options are considered more difficult to implement; these are depicted in red

In addition to the prioritization criteria, the following factors were also considered to aid in the screening and prioritization of options:

1. Functional Effectiveness (Nutrient Loading and Water Quality Improvements)
2. Project Benefit - Type: *Preventative, Mitigative, Restorative*
3. Project Benefit - Spatial Extent: Watershed, Upper Chedoke Creek Watershed, Lower Chedoke Creek Watershed, Cootes Paradise
4. Infrastructure Ownership

Table 2.3 provides a summary of the Screening assessment conducted for the various options as per the Framework Study.

Table 2.3. Options Screening

	Option Overview	Screening	Rationale
Landfill	Direct Clean Water Away from Landfill	Screen Out	• Low effectiveness • High cost • Difficult to implement
	Rehabilitate existing Highway 403 Culvert (Landfill)	Carry Forward	• Low cost • Highly visible • Relatively straight forward
	Expand/Fix Leachate Collection System	Future Consideration (Data Dependent)	• Need to collect more data on effectiveness of recent improvements and reassess before final recommendations
	Landfill Capping/Barrier	Screen Out	• Low effectiveness • High cost • Difficult to implement
Lower Chedoke Creek	Constructed Wetland	Future Consideration (Study Dependent)	• Highly visible • Restorative solution • Limited operations required
	Aeration System (major/permanent)	Future Consideration (Study Dependent)	• Moderately visible • Mitigative solution • Moderate implementation time

	Stream Naturalization	Future Consideration (Lower Chedoke)
		
		Screen Out (Mid Chedoke)
			• Lower Chedoke
			  ○ Moderate cost
			  ○ Highly visible
			  ○ Mitigative solution
			• Mid Chedoke
			  ○ Infrastructure constraints
			  ○ Recently re-lined by MTO

	Restore Delta at Mouth of Chedoke Creek	Future Consideration (Study Dependent)	• Highly visible • Restorative solution • Limited operations required
	Physical Capping	Screen Out	• Low effectiveness • Low visibility
	Chemical Inactivation	Screen Out	• Low effectiveness • Low visibility

	Option Overview		Screening	Rationale
Lower Chedoke Creek	Hydraulic Dredging for Sediment Removal	Complete Removal	Screen Out	• Moderate effectiveness; potentially disruptive • Medium visibility • High cost
		Targeted Removal	Carry Forward (response to Order)	• Optimized program to target most severe contaminants • Medium visibility • Moderate costs
Wastewater	Sewer Separation		Evaluate in Flooding and Drainage MSS	• Implement recommendations from City's MP study for works within Chedoke Creek
	Increase Hydraulic Capacity Downstream of Main-King Combined Sewer Overflow (CSO) tank		Evaluate in City's Water/ Wastewater/ Stormwater Master Plan	• City-wide benefits • Implement recommendations from City's MP study
	Increase Capacity of Royal CSO tank to Main-King CSO tank (Highway 403 Trunk Sewer Twinning)		In Progress	• Mitigative solution • Design already in process
	Expand Storage at Main-King CSO tank		Screen Out	• High cost • Difficult implementation • Main-King CSO tank is maximized at current site
	Expand Storage Elsewhere in System		Evaluate in City's Water/ Wastewater/ Stormwater Master Plan	• Implement recommendations from City's Master Plan study for within Chedoke Creek
	Inspection and Repair	Facilities	Carry Forward	• Low cost • "No regrets" • Ensures facilities are in good operating order
		Trunk Sewers	Carry Forward	• Low cost • "No regrets" • Ensures no major I&I in trunk sewers parallel to Chedoke Creek
	CSO Monitoring Improvements and Active Management		In Progress	• Monitoring and SCADA can better monitor and manage system • Currently implemented through other programs

	Option Overview		Screening	Rationale
Wastewater	Wet Weather Flow Management (Inflow & Infiltration) in Separated Sewers	Targeted in Chedoke Watershed	Carry Forward	• Best management practices provide benefits for local system and offer growth capacity in addition to supporting Chedoke Creek health
		Targeted in broader Main-King Catchment	Carry Forward	• Best management practices provide benefits for local system and offer growth capacity in addition to supporting Chedoke Creek health
		Policy/Future Infrastructure Projects	Carry Forward	• Policy will lead to Best management practices which will provide benefits for local system and offer growth capacity in addition to supporting Chedoke Creek health
Stormwater	Cross Connection Program		Ongoing	• Low cost • Quick implementation
	Retrofits throughout the watershed (End-of-Pipe and Source)	City	Future Consideration (Study Dependent)	• Moderate to high visibility • Short to moderate implementation timelines • Retroactive treatment
		MTO	Future Consideration (Study Dependent)	• Low to Moderate visibility • Potential for short/moderate implementation • MTO led
	Retrofits for Road Rehabilitation Projects / Low Impact Development (LID) BMP Policy		Carry Forward	• Costs incorporated with other road works • Moderate to High visibility • Ongoing best management practice
	City Street Management	Enhanced Street Sweeping	Carry Forward	• Low cost • Quick implementation for program
		Improve Snow Management within Chedoke Creek Watershed	Carry Forward	• Low cost • Visible to public • Short implementation time • "No regrets"
	Stormwater User Rate/LID BMP Policy		Ongoing	• Self-Funding • Helps define link between private practices and improvements to Chedoke Creek

	Option Overview		Screening	Rationale
Stormwater	Enhanced Salt Management	Highway 403	Carry Forward	• Low to moderate costs • Short implementation time • "No regrets"
		City Roads	Ongoing	• Low to moderate costs • Short implementation time • "No regrets"
	Redevelopment Sites Stormwater Management (SWM) Policy		Carry Forward	• Costs incorporated with other works by Others (Developers) • Moderate to High visibility • Ongoing best management practice
	Highway 403 Water Quality Improvements		Carry Forward	• Low to moderate costs • Short implementation time
	Inlet Controls in Combined Sewer Areas		Evaluate in City's Flooding and Drainage MSS	• Implement recommendations from Flooding and Drainage MSS
Upper Chedoke Creek	Golf Course	Manage Runoff from the Golf Course	Carry Forward	• Low cost • Quick implementation • Golf course can remain in operation
		Stream Naturalization	Carry Forward	• Highly visible • Golf course can remain in operation
		Retrofit and Treatment Online	Future Consideration (Study Dependent)	• Golf course can remain in operation with some potential modifications • Part of broader Retrofit Study
Engagement	Engage Residents, Stakeholders, and City		Carry Forward	• Low cost • High visibility for public • Short implementation time
Monitoring	Program Management and Monitoring		Carry Forward	• Low cost • Will help improve system understanding and support tracking benefits over time

2.5 Recommendations

The options that were not screened out in Table 2.3, were considered potential solutions that meet the project goals and objectives and were categorized and prioritized based on the methodology described in the foregoing**,** as well as stakeholder input received through study workshops. The results of the categorization and prioritization process ultimately formed the basis for the "draft" Chedoke Creek Water Quality Improvement Framework.

Solutions Categorization and Prioritization

The solutions were acknowledged to constitute actions under five (5) categories, as follows:

1. **Near-Term Capital Program**: Capital projects with a short timeline or that are already underway with a clear project scope or limited investigation / study required.
2. **Long-Term Capital Program:** Capital projects with a multi-year process and require additional studies or investigations to confirm the scope and benefit. These projects may also be triggered by other City initiatives such as the ongoing "Flooding and Drainage Master Servicing Study".
3. **Near-Term Operations and Maintenance/Program**: Operations and maintenance projects or programs with a quick start up or that are already underway which provide immediate benefit.
4. **Long-Term Operations and Maintenance/Program**: Operations and maintenance projects or programs that may require procedural/policy changes and/or new funding and staffing. Benefits are likely to be realized over the long-term.
5. **Policy and Public Engagement:** New policies and expanded public engagement to support the study framework with benefits largely realized over the long-term.

The following summarizes the various short-listed options according to these 5 categories.

Near-Term Capital Program

The Near-Term Capital Program consists of projects with a clearly defined scope, do not require extensive study and/or consultation, and that can be implemented immediately to address specific concerns. These projects are anticipated to be implemented within the next 3 years (ref. **Table 2.4)**.

Table 2.4. Near-Term Capital Program

Project	Status
Highway 403 Trunk Sewer Twinning	Under Planning and Design
Rehabilitate existing Highway 403 Culvert (Landfill)	Coordination with MTO
Chedoke Creek Targeted Removal	Underway per MECP Order

Long-Term Capital Program

The Long-Term Capital Program consists of projects that require additional studies or investigations to confirm scope and benefits before being implemented. These projects will likely not be fully implemented in the next 3 years; however, studies to support the long-term projects are either underway or are anticipated to commence within the next 2 years or less (ref. **Table 2.5**).

Table 2.5. Long-Term Capital Program

Project	Status
Aeration System	Require assessment through Lower Chedoke Combined EA Study which is Near-term
Constructed Wetland	
Stream Naturalization	
Restore Delta at Mouth of Chedoke Creek	
Other Restoration Opportunities	
Inlet Controls in Combined Sewer Areas	Dependent on Flooding and Drainage Master Servicing Study (on-going)
Sewer Separation	
Retrofits throughout watershed (End-of-Pipe and Source)	Require assessment through Chedoke Watershed Stormwater Retrofit EA Study which is Near-term
Expand Storage Elsewhere in System	Dependent on Water/ Wastewater/ Stormwater Master Plan (on-going)
Increase Capacity Downstream of Main-King CSO tank	
Expand/Fix Leachate Collection System	Dependent on Collection of more performance data before further recommendations
Golf Course – Stream Naturalization	Subject to Study
Highway 403 Water Quality Improvements	MTO Led Initiative

Near-Term Operations and Maintenance/Program

The Near-Term Operations and Maintenance/Program consists of the expansion and/or reprioritization of existing programs. There is the potential to provide immediate benefits, as these programs and investigations can be implemented within the next 2 years or less (ref. **Table 2.6**).

Table 2.6. Near-Term Operations and Maintenance/Program

Project	Status
CSO Monitoring Improvements and Active Management	Underway
Inspection and Repair – Facilities	Underway / Initiate Inspection
Inspection and Repair – Trunk Sewers	
Cross Connection Program	Prioritize in Chedoke Watershed
City Street Management – Enhanced Street Sweeping	Develop and Initiate City Program
City Street Management – Improve snow management within Chedoke Creek Watershed	Enhanced Program
Enhanced Salt Management – City Roads	Enhance Existing Program
Manage Runoff from Chedoke Golf Course	Develop and Initiate City Practices

Long-Term Operations and Maintenance/Program

The Long-Term Operations and Maintenance/Program consists of expanding existing or creating new programs either targeted to the Chedoke Creek watershed or implemented City-wide. There is the potential to provide substantial benefits, but the implementation of these programs will require more time. These programs and investigations may require upfront investigations, policy changes, and new funding and staffing, which is not anticipated to be implemented within the next 2 years (ref. **Table 2.7**).

Table 2.7. Long-Term Operations and Maintenance/Program

Project	Status
Wet Weather Flow in Separated Sewers – Targeted in Chedoke Watershed	Initiate Inflow & Infiltration Monitoring
Wet Weather Flow in Separated Sewers – Targeted in broader Main-King Catchment	
Program Management and Monitoring	Initiate Now and Continue Long Term
Enhanced Salt Management – Highway 403	Enhance Existing Program

Policy and Public Engagement

The Policy and Public Engagement programs involve expanding and creating opportunities for public engagement to monitor progress and better manage the strategy presented in the draft Framework Study. These policies and stakeholder engagement will provide long-term benefits as they strengthen over time (ref. **Table 2.8**).

Table 2.8. Policy and Public Engagement

Project	Status
Engage Residents, Stakeholders, and City	Initiate Now
Redevelopment Sites SWM Policy	Develop Policy Now, Implement through Future Projects
Retrofits for Road Rehabilitation Projects / LID BMP Policy	Develop Policy Now, Implement through Future Projects
Stormwater User Rate/ LID BMP Policy	Currently Underway
Wet Weather Flow in Separated Sewers – Policy / Future Infrastructure Projects	Develop Policy Now, Implement through Future Projects

These categories were further subdivided for the express purpose of addressing the requirements of the Order into those works which would be considered normal or planned by the City to deal with infrastructure operations and capital upgrades and those works which would be considered additive or unplanned (“Added Value”), which can more directly be considered as part of the offsetting works for Cootes Paradise and the West Harbour (ref. Section 5.2).

3.0 Other Potential Measures (Short-term/Focused)

As noted, in the Chedoke Creek Workplan, there are several smaller scale off-set works which are considered as complements to the targeted dredging of the Chedoke Creek, within the Chedoke Creek study area. These include small scale aeration, riparian planting, vegetative mats and beneficial reuse of sediment, and others. Given the focus of the Cootes Paradise Report on the remediation of spill impacts in Cootes Paradise and the Western Harbour, these works (not listed in the Framework Study) could also be considered for Cootes Paradise and the Western Harbour, as natural complements to the Chedoke Creek work. In addition, water quality and aquatic biota sampling have not been conducted within the Princess Point embayment of Cootes Paradise and beyond, to investigate the impacts of the CSO discharge event; hence further field studies in this area will likely be required to support remediation design and options assessment (see below).

Some of the other potential measures, beyond those summarized in the draft Framework Study, which may be considered for remediation of Cootes Paradise and the Wester Harbour, include:

- Large Scale Vegetative mats
- Sediment Nutrient Inactivation
- Dredging in Princess Point Embayment and beyond
- Bacteria / Enzymes

The first two in the above list have been described in the Chedoke Creek Workplan. Sediment nutrient inactivation and use of bacteria and/or enzymes to reduce sediment volume are discussed below.

Sediment nutrient inactivation is an additional nutrient inactivation measure which was evaluated previously by Wood in the context of application within Chedoke Creek in 2019. While the use of chemical inactivation products was not considered effective with Chedoke Creek itself, the potential for application of products such as aluminum sulfate or Phoslock® could be more efficacious within an open-water system such as Cootes Paradise, where potential sediment transport is minimal and dredging may not be practicable. One advantage of chemical sediment nutrient inactivation over other remediation measures is that a directly quantifiable mass reduction can be obtained, based on the mass of bioavailable phosphorus determined using a sequential phosphorus fractionation method (ref. Psenner et.al. 1988[1]). Potential internal pollutant load reduction from treatment areas outside of the dredge footprint could therefore be estimated using sediment data collected from within the dredge footprint.

Certain species of bacteria are capable of decomposing organic sediments and are commonly used in wastewater treatment to provide a number of beneficial functions including reduction of residual biosolids. Enzymes can be added to the process to expedite the decomposition reactions and further reduce the generation of solids. While these additives can be effective at reducing sediment volume in steady-state bioreactor systems, commonly used in wastewater treatment plants, they are less effective in natural environments where organic sediments are typically highly cellulosic and refractory; nutrient concentrations are several orders of magnitude lower; sediments are not continuously mixed; and conditions are not steady-state. Bacterial supplements could potentially be more effective on sewage-derived sediments compared to sediments originating from algae or plant material. However, even if sewage-derived sediments within Cootes Paradise could be treated effectively, the nutrients would simply be converted from one form to another (e.g., from sediment mass to bacterial mass) and would continue to move downstream through the nutrient spiraling process. For these reasons, bacterial supplements and/or enzyme addition is not recommended.

[1] "Psenner, R., Boström, B., Dinka, M., Petterson, K., Pucsko, R., Sager, M., 1988. Fractionation of phosphorus in suspended matter and sediment. Archive für Hydrobiologie: Ergebnisse der Limnologie 30, 98e103.

4.0 Summary of Consultation (to-date/planned)

4.1 General Stakeholders

Internal and external stakeholders were engaged as part of the Framework Study to provide input and help guide the development of the framework. The stakeholder consultation conducted as part of the Framework Study, is considered at this stage to represent the start of an ongoing and collaborative process which will be essential to the successful implementation of the various projects being considered to realize the identified Vision and Management Objectives.

Over the course of the Framework Study, the following external stakeholders were consulted:

- Bay Area Restoration Council (BARC)
- Conservation Halton (CH)
- Environment Hamilton (EH)
- Hamilton Conservation Authority (HCA)
- Hamilton Harbour Remedial Action Plan (HHRAP)
- Individual Indigenous Representatives
- Ontario Ministry of Transportation (MTO)
- Royal Botanical Gardens (RBG) – Cootes Paradise landowner

Further, internal City departments were also consulted throughout the project, to provide input and help guide the development of the framework.

4.2 Focused Consultation related to Order

In terms of the City's work in response to the December 4, 2020 Order, several regulatory agencies and stakeholders have been contacted to initiate early consultation to confirm permitting requirements, review and approval timelines and establish contacts for ongoing consultation throughout the targeted dredge project. A summary of these early engagements is provided in the following, with a record of consultation to-date provided in Appendix B.

4.2.1 Hamilton Conservation Authority

As per the *Conservation Authorities Act* regulation 161/06 under Ontario Regulation 97/04, a Hamilton Conservation Authority (HCA) Work Permit is required for dredging. Early consultation confirmed a 63-day review and approval period for the permit application; however, it is expected to be less than this due to ongoing engagement. The application may include project staging, an erosion and sediment control plan, flood risk assessment, discharge and material management plan, landscape/restoration plan, fisheries assessment, vegetation inventory, landowner permission (e.g., Royal Botanical Gardens), as well as a description of the ecological components including potential Species at Risk (SAR).

4.2.2 Royal Botanical Gardens

The Royal Botanical Gardens (RBG) perform monitoring studies and regulate research projects by others within Cootes Paradise, which includes the outlet of Chedoke Creek and the Princess Point embayment. As such, the proposed targeted dredging project will require an RBG research permit that includes details regarding the purpose and nature of the proposed project and allows the RBG to provide additional guidance regarding sensitive areas, best management practices and SAR observations. Since the RBG has been included in early consultation, and will continue to be included in the planning of this project, issuance of the research permit is anticipated within one month of the formal permit request submission.

4.2.3 Ministry of Transportation

An Encroachment Permit and Building and Land Use Permit are expected to be required as per the *Public Transportation Act* and *Highways Improvement Act*. A meeting with the Ministry of Transportation (MTO) Corridor Management Officers and Drainage Officer confirmed an expected review and approval timeline of one-month. These approvals are commonly processed for construction activities near-to and within the Provincial infrastructure right of ways and the proposed project does not require access from the highway. Should dredging near the piers at the Cootes Paradise Fishway be considered, further engagement with the MTO Structural team may be needed.

4.2.4 Ministry of Natural Resources and Forestry

The Guelph District MNRF has confirmed approval under the *Lakes and Rivers Improvement Act* (LRIA) will not be required for this project since the HCA Work Permit will address the dredging review and approval requirements. As such, no further permitting schedule is required for the LRIA.

4.2.5 Ministry of the Environment, Conservation and Parks

There are a number of potential SAR within the project area, some of which may have direct interactions with a dredging project. As such, early consultation with MECP (currently ongoing) and field survey data, will inform the permitting process under the *Endangered Species Act* (ESA). The ESA presents two primary options for permitting; 1) Section 17(2)(c) Overall Benefit Permit (OBP) process and 2) Section 17(2)(a) Permit regarding risk to human health and safety. Alternatively, proceeding under the Health and Safety Regulation (O.Reg 242/08) would be separate from the Section 17(2)(a) option and would be through the online Health and Safety Projects Registry, that would not require a formal permitting process. The City is evaluating these options concurrently and continues to engage MECP SAR staff to support decision making and to confirm timelines. It is assumed that permitting through the ESA will satisfy requirements of the Federal *Species at Risk Act* (SARA) and a separate SARA approval will not be required. This will be confirmed during consultation with Fisheries and Oceans Canada in the Fisheries Act Authorization project review process. Further, Indigenous engagement is likely required which will be conducted concurrently with other engagement activities.

4.2.6 Ministry of Heritage, Sport, Tourism, and Culture Industries

Potential dredging within the Princess Point embayment may require archaeological assessment of the nearshore areas; however, this will be determined once the design and targeted dredge areas are better defined. The Ministry of Heritage, Sport, Tourism, and Culture Industries will be contacted to confirm further assessment requirements; however, this scope of work and review timelines are not anticipated to be a critical path item for the permitting schedule. Depending on the scope of work and feedback from the Ministry, Indigenous engagement is likely to be required, which would be conducted concurrently with other engagement activities.

4.2.7 Transport Canada

The Navigation Protection Program (NPP) within Transport Canada (TC) reviews permit applications under the *Canadian Navigable Waters Act* (CNWA). Early engagement with TC has provided some information via email correspondence; however, further dialogue with TC Inspection Officers is anticipated to provide additional guidance on the potential permitting options. Timelines for the potential review and approval process are not well known; however, a 3 to 4 month period is anticipated. There are mandatory components of the conventional approval process that include a 30-day notice for public comment and a 45-day response and resolution period, followed by a 15-day decision period. These timelines will be discussed with TC to update the anticipated permitting schedule.

4.2.8 Fisheries and Oceans Canada

The Fisheries Protection Program (FPP) evaluates projects via the Request for Project Review (RFR) form submission that assesses whether projects are likely to cause death of fish or harmful alteration, disruption or destruction (HADD) of fish habitat, which would be in contravention of the *Fisheries Act* (FA) and require authorization to proceed. An RFR was submitted February 23, 2021 and this project was assigned File No. 21-HCAA-00211 on March 10, 2021; however, a formal response to the RFR has not been received. Further engagement with DFO is expected to occur in the near term and will confirm the required permitting path forward. The conventional FA Authorization process is shown below:

- Submit RFR – 45-day review period (maximum, can be as short as 2-weeks)
- Early consultation with DFO for FA Authorization – begin once RFR response received
- Ongoing consultation with DFO to support Draft FA Authorization application
    - Indigenous engagement likely required – to be conducted concurrently with other engagement activities.
- Draft FA Authorization application submitted July 2021 (60-day review period)
- Minister FA Authorization application decision (90-day review/approval period)

The conventional review and approval timeline above indicates approval may be available by February 2022; however, the City plans to engage DFO as soon as possible following receipt of the RFR response to expedite pre-submission review and updates as much as feasible. During this early consultation, the City will also explore an Emergency Authorization option and associated timelines for review and approval, which are site-specific and require dialogue with DFO to confirm.

4.2.9 Impact Assessment Agency of Canada

The MECP has indicated a Provincial Environmental Assessment will not be required. The Impact Assessment Agency of Canada (IAAC) has been contacted to confirm if the proposed project will require a Federal assessment under the *Impact Assessment Act* (IAA). It is understood that the proposed dredging project will not include the construction of a new facility, nor expansion of an existing facility for the treatment, incineration, disposal or recycling of hazardous waste. As such, the City is currently waiting for a response from IAAC to confirm if the IAA will apply. Timelines for review and approval will be determined following further consultation with IAAC, and are unknown at this time due to recent changes to the act and revised data requirements under the IAA.

4.3 Indigenous Nations and Peoples

Indigenous Nations and Peoples engagement is a requirement of formal permitting for the DFO *Fisheries Act* Authorization, MECP SAR Permitting and Archeological Assessments per the Ministry of Heritage, Sport, Tourism, and Culture Industries. The City will fulfill its obligations for these permits accordingly.

4.4 Planned Consultation

The City proposes further consultation as outlined in the draft Framework Study. Further, several of the recommendations include study processes which will also require formal public input. Details on the foregoing are offered in the following:

Framework:

The recommendations outlined in the Framework Study represent a diverse set of policies, projects, and programs which will require multi stakeholder input, feedback, and contributions to be successful. This stakeholder involvement will range from public input to the EA process and public interaction with the various programs and projects, multiple agency approvals, and joint project partnerships such as those with the MTO or RBG, and others.

The Framework Study has recommended that a Chedoke Creek Advisory Committee or equivalent be formed consisting of representatives from the Stakeholders listed in Section 4.1 and others as deemed appropriate, representatives of City Council, and representatives from key City departments.

It is anticipated that the Chedoke Creek Advisory Committee will be chaired by City Staff and will have a "working" mandate of:

- Confirming the Watershed Management Objectives and establishing the Performance and Monitoring Objectives
- Establishing the Monitoring Program requirements
- Reviewing and commenting on proposed Policies and Study Recommendations
- Monitoring the Chedoke Creek Water Quality Strategy progress and reporting to Council on a semi-annual basis
- Leading public outreach efforts

Further, it is anticipated that the Chedoke Creek Advisory Committee or equivalent will serve to streamline public and stakeholder engagement needed to support the implementation of the framework recommendations.

Future Studies:

Two notable recommendations of the draft Framework Study call for Master Planning studies to be conducted as Class Environmental Assessments – Lower Chedoke Master EA Study and Chedoke Watershed Stormwater Retrofit Master EA Study. As part of the execution of these studies explicitly, public stakeholders and others will have a formal opportunity to provide input at strategic points in the respective studies. The input will be able to further guide development of the problem statement, elaborate on the assessment approach and the various alternatives under consideration, leading to the recommended set of preferred solutions.

In addition, several recommendations are based on current or ongoing studies which also have public engagement, hence will be expected to provide further opportunities for the public and others to offer insights, including: Flooding and Drainage Master Servicing Study and the Water/ Wastewater/ Stormwater Master Plan.

5.0 Summary of Recommendations for Spill Off-Set

5.1 Methodology for Quantification

The following approach outlines the nutrient loading and source contribution assessment components of the investigation, highlighting the means to quantify the benefits of the unplanned works currently being considered.

The benefits from the available remediation and mitigation projects will need to be quantified and selected to meet the requirements of the Order using the methodology premised on the equation below:

$$P_R = P_S - P_D$$

Where:

P_R = Total TP mass reduction required from additional remediation or mitigation in Cootes Paradise or further downstream
P_S = Total TP mass from discharge event (2014 to 2018)
P_D= Total TP mass removal from targeted dredging and small off-set works in Chedoke Creek

The proposed potential projects providing the additional P_R TP mass are detailed in Section 5.2. As noted earlier, these projects generally come in two forms, those that address load reductions, either indirectly through in-water projects (Type A) or directly by treatment or removal (Type B), and those that improve water quality by reducing the loading of contaminants to Cootes Paradise and beyond (Type C). Projects that remove TP load to the receiving water can be calculated directly from the associated mass reduction. Other projects that prevent the release of TP can also be assigned a direct load reduction. Therefore, projects such as wetland restoration, aeration and stream naturalization will have indirect TP reduction which can be determined on a case-by-case basis. On this basis P_R TP mass will be made up of the following:

- Resident projects in Cootes Paradise (and possibly the Western Harbour) which result in an increase in TP assimilation annually (Type A)
- Projects in Cootes Paradise and the Western Harbour that inactivate or remove TP – one-time removals (Type B)
- Projects which reduce TP loading from runoff based on existing conditions in the watershed from point and non-point sources annually (Type C)

The P_R TP mass is a "to be determined estimate", premised on field work an analysis associated with the targeted dredging. Based on consultation with MECP over the Order period and likely future consultation with stakeholders, notably RBG and HHRAP, it is considered appropriate to introduce a factor which accounts for potential loss of effectiveness over time, and /or a redundancy amount to ensure that the benefits accrued to Cootes Paradise and the Western Harbour remain positive and go beyond a one-to-one off-set amount. The amount of this factor (+50%, +100%) will need to be discussed with MECP through consultation on the current document and can then be reflected in the Cootes Paradise Workplan.

An example P_R , calculated using the three types of TP removal, is included in **Table 5.1**. Project load reductions are hypothetical totals for all projects within each TP Removal Type. Additional project types discussed in this report (and others) will be included in the evaluation for the Workplan, premised on feedback from MECP on this methodology.

Table 5.1. Example of Total Phosphorus Removals

Project	TP Removal Type	Performance Unit	TP Removed per Unit	P_R by Project (kg)
Floating Vegetated Mats	A	Tonnes harvested	1 kg*	100
Sediment Nutrient Inactivation	B	kg bioavailable P treated	1 kg	500
Stormwater Treatment	C	kg P load reduction	1 kg	200
			Total	**800**

*Value from approximate dry weight percentage of TP mass from cattails (*Typha*, spp.) reported by Grossmans', et al., 2014[2].

5.2 Planned Works

As noted in the introduction (ref. Section 1), planned works (ref. **Table 5.2**) represent those normal operations and maintenance programs and infrastructure renewals, that are either already underway or scheduled/programmed to occur; these include:

Table 5.2. Planned Works per Framework Study

Type	#	Project	Lead/Process
Near-Term Capital	1	Highway 403 Trunk Sewer Twinning	City
	2	Chedoke Creek Targeted Removal (First Part of Order)	
Long-Term Capital	3	Inlet Controls in Combined Sewer Areas	City - via Flooding and Drainage Master Servicing Study
		Sewer Separation	
	4	Expand Storage Elsewhere in System	City - via Water/ Wastewater/ Stormwater Master Plan
		Increase Capacity Downstream of Main-King CSO Tank	
Near-Term O&M	5	CSO Monitoring Improvements and Active Management	City
	6	Inspection and Repair – Facilities	
		Inspection and Repair – Trunk Sewers	
	7	Cross Connection Program	
	8	Wet Weather Flow in Separated Sewers –Targeted in Chedoke Watershed and broader Main-King Catchment	City - Initiate Inflow & Infiltration Monitoring
Long-Term O&M	9	Water Quality Program Management and Monitoring	City
Policy and Engagement	10	Stormwater User Rate/ Low Impact Development Best Management Practices Policy	City

[2] Grossmans, R., Grieger, R., Ackerman, J., Gauthier, S., Swystun, K., Gass, P. , Roy D., 2014. Cattail Biomass in a Watershed-Based Bioeconomy: Commercial-scale harvesting and processing for nutrient capture, biocarbon and high-value bioproducts. Published by the International Institute for Sustainable Development.

While the foregoing projects are considered to provide positive benefits to the Chedoke Creek and its receivers, Cootes Paradise and Western Harbour, given that they are either underway or currently being planned, MECP has suggested that it is not considered appropriate to align these with required offsetting works associated with mitigation of the discharge event. Notwithstanding, it remains important to understand that these works contribute to the health of the overall ecosystem and in many cases represent a significant investment by the City of Hamilton.

5.3 Unplanned Works

Unplanned works, or those deemed to potentially provide "added value" and benefits to the ecology and health of Cootes Paradise and the Western Harbour, represent activities that are not currently planned or programmed by the City or other stakeholders (e.g.; MTO) through any current initiative; these new activities include:

Table 5.3. Unplanned Works per Framework Study

Type	#	Project		Lead
Near-Term Capital	1	Rehabilitate existing Highway 403 Culvert (Landfill)		MTO
	2	Highway 403 Water Quality Improvements		
	3	Leachate Collection System Monitoring & Data Collection		City - Additional data required before any capital works
	4	Aeration System (Major)	Based on RBG's 25yr Master Plan	City - via Lower Chedoke Master EA Study
		Constructed Wetland		
		Stream Naturalization		
		Restore Delta at Mouth of Chedoke Creek		
		Other Remediation and Mitigation Works		
	5	Retrofits Throughout Watershed		City via Chedoke Watershed Stormwater Retrofit Master EA Study
Long-Term Capital	6	Golf Course – Stream Naturalization		City
	7	Expand/Fix Leachate Collection System (dependant of findings of item 3)		
	8	Lower Chedoke Master EA Capital Works		City – Scope conditional on the outcomes of each EA
	9	Chedoke Watershed Stormwater Retrofit Master EA Capital Works		
Near-Term O&M	10	Golf Course – Runoff Management		City
Long-Term O&M	11	Enhanced Salt Management – Highway 403		MTO
	12	City Street Management – Enhanced Street Sweeping and Snow/Salt Management		City - Develop and Initiate Program
Policy and Engagement	13	Engage Residents, Stakeholders, and City		City
	14	Redevelopment Sites - Stormwater Management Policy		City - Develop Policy & Implement through Future Projects
	15	Retrofits for Road Rehabilitation Projects / Low Impact Development Best Management Practices Policy		
	16	Wet Weather Flow in Separated Sewers – Policy / Future Infrastructure Projects		

The Master Planning Environmental Assessment (EA) studies, specifically the studies supporting unplanned item numbers 4 and 5 above, will involve a detailed environmental, social and economic assessment of opportunities to improve water quality and habitat conditions, in compliance with the *Environmental Assessment Act*. The alternatives identified in the respective EA studies, will be evaluated through fieldwork, analysis (modelling) and agency/stakeholder/Indigenous engagement. This will ultimately lead to a set of preferred projects, including implementation guidance associated with timing, capital budgets, and design requirements.

Beyond those unplanned projects listed in Table 5.3, through the Order and review of various mitigation practices, the following other projects, directly focused on spill mitigation in Cootes Paradise and the Western Harbour, have been identified:

- Large Scale Vegetative mats
- Dredging in Princess Point Embayment and beyond
- Sediment Nutrient Inactivation

To further assist MECP in its review of these unplanned projects, the City has categorized them associated with the form of nutrient offset expected through their implementation based on the methodology described in Section 5.1, including:

- Resident projects in Cootes Paradise (and possibly the Western Harbour) which will result in an increase in TP assimilation annually (Type A)
- Projects in Cootes Paradise and the Western Harbour that inactivate or remove TP – one-time removals (Type B)
- Projects which reduce TP loading from runoff based on existing conditions in the watershed from point and non-point sources annually (Type C)

Using these categories, and building upon the findings from the field work and analysis outlined in the Chedoke Creek Workplan, the scope of offsetting works will be able to be defined, with due consideration of an appropriate redundancy factor. The following provides a summary of categorization of the works under consideration:

Resident Projects (annual removal) – Type A

- Large Scale Vegetative mats
- Outcomes from Lower Chedoke Master EA Study

Resident Projects (one-time removal) – Type B

- Dredging in Princess Point Embayment and beyond
- Sediment Nutrient Inactivation

Watershed Projects (point/non-point annual removals) – Type C

- Rehabilitate existing Highway 403 Culvert (Landfill)
- Highway 403 Water Quality Improvements
- Outcomes from Chedoke Watershed Stormwater Retrofit Master EA Study
- Outcomes from Leachate Collection System Monitoring & Data Collection
- Golf Course – Runoff Management
- Enhanced Salt Management – Highway 403
- City Street Management – Enhanced Street Sweeping and Snow/Salt Management
- Outcomes from application of Redevelopment Sites - Stormwater Management Policy
- Outcomes from application of Retrofits for Road Rehabilitation Projects / Low Impact Development Best Management Practices Policy
- Outcomes from application of Wet Weather Flow in Separated Sewers – Policy / Future Infrastructure Projects

6.0 Monitoring Plan

6.1 Chedoke Creek Watershed Management Objectives

The Order (ref. Item 10 iii), requires that a monitoring plan be developed to collect information on the efficacy of the proposed works to benefit Cootes Paradise and the Western Harbour. The monitoring data will offer insights into the need for any adaptive management to ensure the recovery and effectiveness of the mitigative works are realized to offset the added nutrient loading to Cootes Paradise and the Western Hamilton Harbour Area. Anthropogenic influences to Cootes Paradise are expected to continue, particularly contributions from Chedoke Creek.

The following performance and monitoring indicators from the draft Framework Study, currently submitted for consideration regarding the Chedoke Creek Watershed Management Objectives (CCWMO), have been established in accordance with the preliminary vision, to provide a method to measure progress over time and determine if the management objectives are being achieved. Quantitative targets for the CCWMO have not been established; however, a preliminary qualitative list of potential Performance and Monitoring Indicators that the City and Stakeholders may wish to consider is provided as follows:

- Water Quality concentrations in annual, peak and low flow events
- Number of annual overflow events
- Percent of contributions from CSO
- Percent of urban runoff receiving treatment
- Percent of leachate captured at the Landfill
- Percent of the creek that is naturalized

Following the adoption of the Framework's Vision and Objectives, the City and respective stakeholders will need to identify the Targets, Performance and Monitoring Indicators that will be used to track progress. Additional studies, assessment, and consultation will be needed to establish these Targets, Performance and Monitoring Indicators. This may be in the form of an annual report, where both technical and non-technical elements are highlighted.

6.2 Natural Environment and Effectiveness for Cootes Paradise and Western Harbour

Implementation and effectiveness of the remediation activities specifically for Cootes Paradise and the Western Harbour will be determined by confirming that the remediation measures have been constructed as per the approved plans and are functioning as intended, using the criteria and guidance developed in associated with the MECP, through the response to the Order. In general, the monitoring and evaluation of conditions compared to these criteria will demonstrate overall habitat quality improvement based on improved water quality, reduced sediment contamination concentrations and an improved benthic fauna community. These components will realize improvement at different temporal scales, with the sediment contamination expected to be nearly immediate, concurrent with the dredging and potential chemical inactivation activities. Changes to the sediment quality will support changes to the benthic invertebrate community that will require several years to establish. As such, a series of post-remediation monitoring studies are likely to be required for measurement and confirmation of the remediation activities' effectiveness. The following provides a conceptual monitoring framework for some of the candidate off-set works within the Princess Point embayment of Cootes Paradise, that are ultimately intended to improve water quality flowing downstream to Cootes Paradise and the Western Harbour. A more fulsome and comprehensive monitoring strategy will be provided as part of the workplan for Cootes Paradise and the Western Harbour, once MECP has reviewed this report, and the scope of remediation and mitigation is better defined; the monitoring approach outlined in the following is hence illustrative only at this stage.

6.2.1 Large Scale Vegetative Mats

Floating vegetative mats, also known as floating treatment wetlands (FTWs), have been used to manage and remove excess nutrients and metals from surface waters under a variety of conditions. The plants used for FTWs accumulate and store nutrients within their tissues, which can be mechanically removed from the area thereby improving surface water quality. The amount of uptake and storage of nutrients and metals is dependent on the plant species, and species selection for the Cootes Paradise application can be determined during detailed design. Studies show the shoots accumulate more nutrients and metals than the roots, as such, the target harvest material may be the shoots growing 5 centimeters (cm) above the surface of water. Monitoring implementation and effectiveness of the FTWs can be completed on a thrice annual basis using the periodicity and success criteria as provided in **Table 6.1**.

Table 6.1. Vegetative Mats Monitoring, Success Criteria and Contingency Summary

Monitoring Period	Success Criteria	Action / Contingency
Immediately post-construction (assume Spring installation)	Vegetative mats have been constructed and placed as per the approved design drawings: • Appropriate size • Correct plant species • Anchors and placement within specified location and total water depth(s).	As-constructed survey results provided in a report to document existing conditions and identify non-conformance relative to approved design. Corrective actions to be completed as per discussion with MECP.
Summer post-construction	Inspection of vegetative mats to confirm performance: • 80% or greater of planted species are showing new growth and increased biomass • Constructed mats are remaining in-place, anchors are performing as expected and structural maintenance is not required.	Assessment report to document existing conditions and non-conformance with success criteria including photos of each mat from consistent vantage points taken during the as-constructed surveys. Corrective actions to be completed as per discussion with MECP.
Fall post-construction (end of growing season)	Inspection of vegetative mats and removal of plant tissue for analysis: • Constructed mats are remaining in-place, anchors are performing as expected and structural maintenance is not required. • Removal of shoots for laboratory analysis of nutrients and metals to help quantify total removal quantities.	Assessment report to document existing conditions and non-conformance with success criteria including photos of each mat from consistent vantage points taken during the as-constructed surveys. The report will also document total vegetation mass removed and laboratory analysis results. Corrective actions to be completed as per discussion with MECP.

6.2.2 Dredging in Princess Point Embayment and beyond

Targeted dredging will remove contaminated sediment from the Princess Point embayment and areas potentially beyond (within selected portions of Cootes Paradise). These removals will improve sediment quality and are likely to improve the benthic invertebrate community. Benthic invertebrate community surveys can facilitate assessment of the biological response to dredging, with colonization of the dredged areas to occur during several years post-remediation. The following conceptual monitoring and success criteria may be used to assess implementation and effectiveness of this off-set measure (ref. **Table 6.2.**)

Table 6.2. Targeted Dredging Monitoring, Success Criteria and Contingency Summary

Monitoring Period	Success Criteria	Action / Contingency
Immediately post-construction (sediment removal)	Bathymetric and/or topographic surveys conducted to demonstrate physical remediation was completed appropriately and total removal volume align with the approved design drawings: • Correct locations dredged. • Expected total water depth(s) achieved.	As-constructed survey results provided in a report to document existing conditions and identify non-conformance relative to approved design. Corrective actions to be completed as per discussion with MECP.
Years 1, 3 and 5 post-construction	Inspection of dredge areas: • Bathymetric and/or topographic surveys conducted for comparison to as-constructed and previous monitoring event(s) measurements. • Sediment quality sampling of the bioactive layer (top 10 cm) for chemical laboratory analysis confirming contaminants of concern are less than pre-construction values. • Benthic invertebrate community surveys within the targeted dredge areas show increased taxa richness, density and diversity relative to pre-construction values.	Assessment report to document existing conditions and non-conformance with success criteria. Corrective actions to be completed as per discussion with MECP.

6.2.3 Sediment Nutrient Inactivation

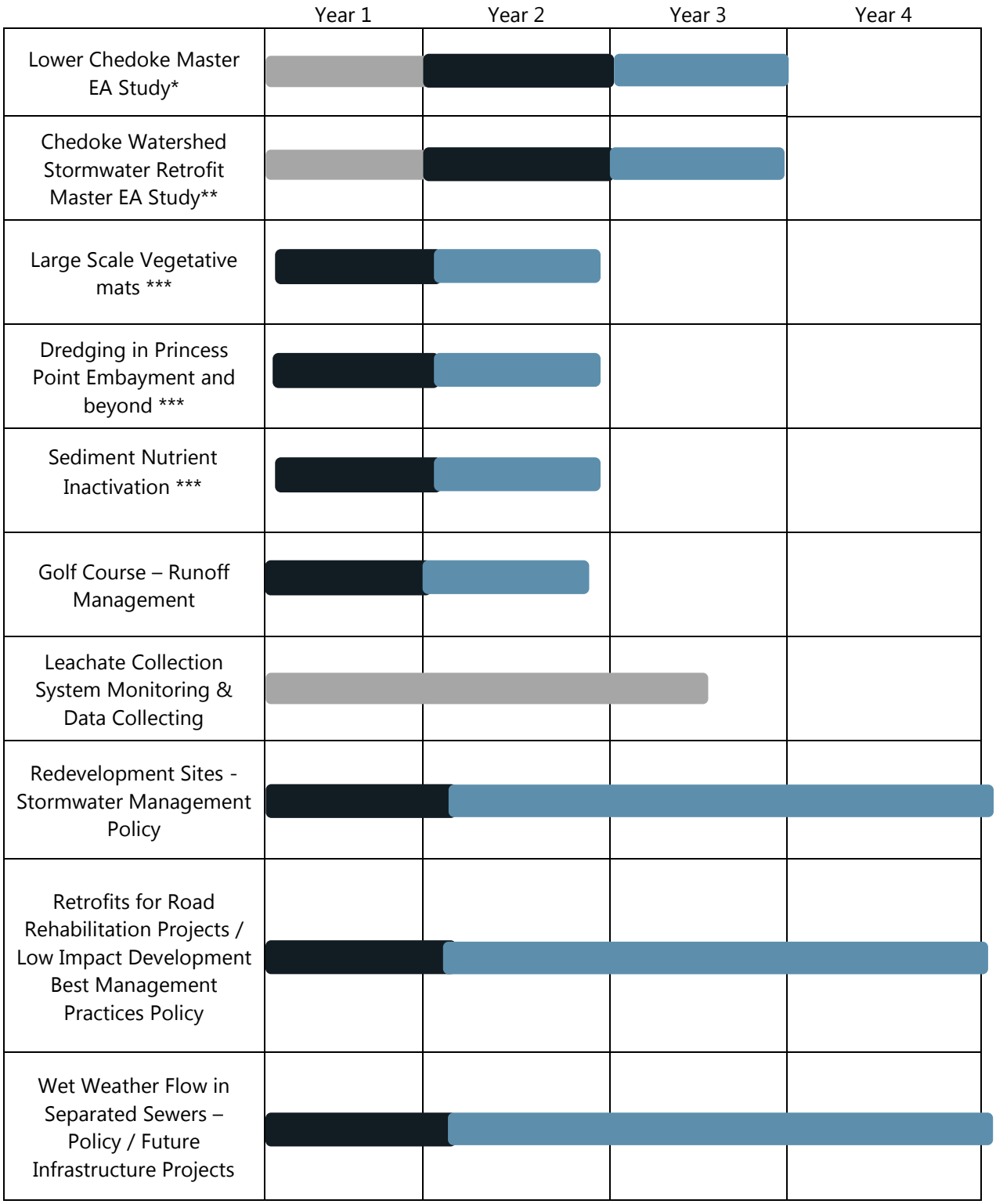
Sediment nutrient inactivation may be used to remove contaminated sediment from within the Princess Point embayment and areas potentially beyond (within Cootes Paradise). The nutrient inactivation would improve sediment quality and is likely to improve the benthic invertebrate community. Benthic invertebrate community surveys can facilitate assessment of the biological response to nutrient inactivation, with colonization of the treatment areas to occur during several years post-remediation. The following conceptual monitoring and success criteria may be used to assess implementation and effectiveness of this offset measure (ref. **Table 6.3**).

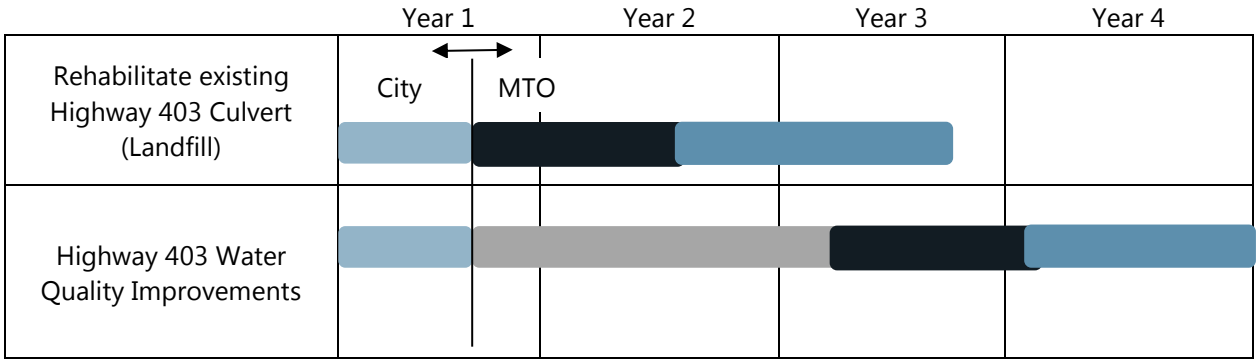
Table 6.3. Sediment Nutrient Inactivation Monitoring, Success Criteria and Contingency Summary

Monitoring Period	Success Criteria	Action / Contingency
Years 1, 3 and 5 post-construction	Inspection of nutrient inactivation treatment areas: • Sediment quality sampling of the bioactive layer (top 10 cm) for chemical laboratory analysis confirming nutrient concentrations are less than pre-construction values. • Benthic invertebrate community surveys within the treatment areas show increased taxa richness, density and diversity relative to pre-construction values.	Assessment report to document existing conditions and non-conformance with success criteria. Corrective actions to be completed as per discussion with MECP.

7.0 Schedule

The estimated timelines to implement the unplanned near-term remediation and mitigation measures, as well as others currently under consideration, is shown in the schedule below. The selected initiatives are those that are considered to have direct applicability toward satisfying the second part of the Order.





* Implementation of first recommendations – will be a medium-term ~5-year plan
** Implementation of first recommendations – will be a long-term ~20-year plan
*** Dependent on findings and analysis related to Chedoke Creek Workplan

City endorsement to MTO

EA Study / Monitoring

Design/ Approvals

Construction / O&M (dependant on scope)

8.0 Next Steps

Following the review of the Cootes Paradise Report by MECP, the City will update the report and use the input and early findings from the Chedoke Creek Workplan, to prepare the Cootes Paradise Workplan, per Order requirement #10. This work plan will be issued to the MECP no later than 6 weeks following the approval of the Cootes Paradise Report by MECP and will contain the following:

i. A detailed workplan and timeline for carrying out the approved remediation/mitigation options within the Cootes Paradise/Western Hamilton Harbour Area; ;

ii. Calculations referred to in Item 9 iv) and v) of the Order (offset calculation) or as otherwise approved; and;

iii. Proposed follow-up monitoring required to ensure the recovery and effectiveness of the remediation plan.

APPENDIX A: Director's Order #1 - PE3L3

Director's Order

Section 157.3 Environmental Protection Act, R.S.O. 1990
Section 16.4 Ontario Water Resources Act, R.S.O. 1990
Section 26.3 Pesticides Act, R.S.O. 1990
Section 107 Safe Drinking Water Act, S.O. 2002, c.32 (SDWA)
Section 32 Nutrient Management Act, 2002, S.O. 2002

Order Number
1-PE3L3

To:

HAMILTON, CITY OF
700 WOODWARD Ave N
HAMILTON ON L8H 6P4
Canada

HAMILTON, CITY OF
71 MAIN STREET WEST, 1st Floor
HAMILTON, ONTARIO L8P 4Y5
Canada

Site: Chedoke Creek, downstream of the Main/King Combined Sewer Overflow discharge pipe, the eastern end of Cootes Paradise and western end of Hamilton Harbour, and as further described in the Provincial Officer Report # 1-OW6SS under section entitled "Description of the Site and the Orderees".

Response to Request

Attention: City Clerk

I have reviewed Provincial Officer Order 1-OW6SS ("Order") dated 20/11/2020 (dd/mm/yyyy) in response to your request for the review dated November 27, 2020, submitted by your lawyer, Ms. Rosalind Cooper on behalf of the City of Hamilton. I have considered your submissions and met with the issuing Provincial Officer, Shelley Yeudall and technical support staff in the Ministry of the Environment Conservation and Parks (Ministry) to discuss the Order and the above noted request. I have also considered the submissions made at a meeting held on December 3, 2020 between City officials Andrew Grice, Cari Vanderperk and Mark Bainbridge and Ministry officials including myself, Shelley Yeudall, Lindsey Burzese, Zafar Bhatti and Sarah Day.

Pursuant to my authority under s. 157.3 of the Environmental Protection Act, R.S.O. 1990, c. E.19 (EPA) and s. 16.4 of the Ontario Water Resources Act, R.S.O. 1990, c. O.40 (OWRA) I hereby confirm and alter portions of the Order as set out below.

Item No. 1of the Order was altered to extend the compliance date as specified below.

Item No. 2, No. 3, No. 8 and No. 10 of the Order were altered to extend the compliance dates as specified below, and to refer to the Director as opposed to Provincial Officer for the submission of required documents.

Item No. 6, No. 7, No. 12, No. 13, No. 15, No. 17, No. 18, No. 19 and No. 20 of the Order were altered to refer to the Director as opposed to the Provincial Officer.

Item No. 16 of the Order was revoked.

Item No. 4, No. 5, No. 9, No. 11 and No. 14 of the Order are confirmed.

For ease of reference this order uses the definitions used in the Provincial Officer's Report.

Also, for ease of reference, the Director's Order now reads as follows:

1. By January 15, 2021, retain the services of a Qualified Person that has the experience and qualifications to carry out the work specified in this order.

2. By January 15, 2021, submit to the Director written confirmation that the Qualified Person has been retained to carry out the work specified in this order, that a copy of the order has been given to the Qualified Person; and that the Qualified Person has the experience and qualifications to carry out the work.

Chedoke Creek Downstream of the Main/King CSO Discharge Pipe

3. By February 22, 2021, submit to the Director, for approval, a remediation workplan for Chedoke Creek that is developed by the Qualified person to undertake the targeted dredging of Chedoke Creek based on the recommendation identified in section 5.2.5 of the Wood report entitled "MECP Order # 1-J25YB Item 1b – Chedoke Creek Natural Environment and Sediment Quality Assessment and Remediation Report" dated January 24, 2019 ("Chedoke Creek Workplan"). The Chedoke Creek Workplan shall be prepared in accordance with the requirements set out in Items 4 and 5 below.

4. The Chedoke Creek Workplan shall, at a minimum:

i. Consider technical reports, Ministry comments and affected stakeholders' comments, to determine an acceptable plan to implement the recommendation in the Wood report to restore the Chedoke Creek, while mitigating impacts of implementing the plan on the natural environment, including water;

ii. Contain a detailed timeline setting out critical milestones and checkpoints with the Ministry for carrying out the Chedoke Creek Workplan;

iii. Contain a Species at Risk assessment plan and associated timelines for Chedoke Creek downstream of the spill and including potential impacted areas downstream of Chedoke Creek that may be impacted by targeted dredging;

iv. Undertake consultation with the Species at Risk Branch within the Ministry in respect of any identified items pursuant to 4 iii) and incorporate this feedback and outcome into the workplan for any species at risk;

v. Provide a description of any anticipated approvals needed to implement the Chedoke Creek Workplan, initial consultation and proposed timelines to obtain such approvals, if required, for the Workplan to be implemented;

vi. The consultation in iv) and v) shall include the Regional Technical Support Section of the Ministry;

vii. Contain a description of the identified areas and the extent (depth, location) of the targeted dredging with a description of how the items outlined in Item 5 below were addressed and a description of any methods for refining identified areas in Item 5 including the impacted areas identified in the Wood reports and SLR reports and timing as needed, in the Chedoke Creek Workplan;

viii. Contain a description of the approximate volume of material to be removed;

ix. Identify and contain a description of proposed mitigation measures for any short-term impact(s) that may arise from implementing the Chedoke Creek Workplan for Chedoke Creek, its shoreline and connected waterways/natural environment, on any species at risk and other potentially impacted uses. Mitigation measures may include, but are not limited to: exclusion measures for local aquatic uses; limit recreational uses in the area; total suspended solids control as required for carrying out the targeted dredging; and proposed monitoring during any remediation to monitor effectiveness of mitigation measures during dredging identified in iv); and

x. Contain a proposed monitoring plan to monitor the recovery of the natural environment and effectiveness of the Chedoke Creek Workplan once dredging is complete.

5. With respect to the area from the Main/King CSO outfall to the mouth of Chedoke Creek, the Chedoke Creek Workplan shall take into consideration the scope of targeted dredging work necessary to restore the natural environment to pre-spill conditions, as to be agreed upon by the Ministry, and to mitigate any impairments or potential impairments from the spill, in relation to the following, but not limited to:

i. Sediment areas identified as impacted, in consultation with the Ministry, by the sewage spill;

ii. Sediment areas identified as containing elevated organic material consistent with sewage sludge;

iii. Sediment areas identified as elevated nutrients (particularly TP, TAN, and TKN);

iv. Sediment areas identified as had, may have, or continuing to have reduced dissolved oxygen levels in the water column from historical levels;

v. Sediment areas identified as having elevated parameters as identified by the ERA carried out by SLR ("Ecological Risk Assessment (ERA), Chedoke Creek, Hamilton, Ontario" dated February 12, 2020) to have moderate or high risk for impacts, or otherwise identified by the reports or in comments by the Ministry; and

vi. Addressing any ecological flow path requirements and connectivity within the creek in any remedial action plan that may impact low flow path and connectivity.

6. By October 31, 2021 or such other date approved by the Director in writing, complete the approved Chedoke Creek Workplan.

7. Within one (1) month of the completion of the of the work undertaken pursuant to the approved Chedoke Creek Workplan, submit to the Director, a report prepared by the Qualified Person confirming that the natural environment has been restored to pre-spill conditions and that further impairment to the natural environment will not occur as a result of the spill to the Chedoke Creek as detailed in the attached Provincial Officer's report, and at a minimum contain the following:

i. The details of the work undertaken to complete the Chedoke Creek Workplan;

ii. Any monitoring results completed before, during and after the work undertaken in accordance with the Chedoke Creek Workplan;

iii. Analysis of the results in Item 7(ii) above for the purposes of the intended monitoring; and

iv. Determination if any requirement for on-going monitoring is required to verify the effectiveness or maintenance of the remedial actions undertaken is necessary.

Cootes Paradise/Western Hamilton Harbour Area

8. By March 22, 2021, submit to the Director for approval, a proposed remediation/mitigation report that is prepared by a Qualified Person(s) for the Cootes Paradise/Western Hamilton Harbor Area to offset the added nutrient loading, principally TP, identified in the Wood reports, the SLR reports and particularly the Hatch reports, and address any other potential on- going impacts (dissolved oxygen, algal blooms) as a result from the sewage spill to this area ("Cootes Paradise Report").

9. The report in Item 8 shall, at a minimum:

i. Identify and review all potential remediation or mitigation measures, whether direct, indirect, or a combination of measures with consideration for short and long-term measures to address the remediation goal to offset added nutrient loading particularly for TP and any potential on-going impacts (dissolved oxygen, algal blooms) from the sewage spill to the Cootes Paradise/Western Hamilton Harbor Area as identified in the Wood reports, the SLR reports and the Hatch reports;

ii. Undertake consultation with and provide a summary of comments received from the Royal Botanical Gardens, Hamilton Conservation Authority, the Ministry, and any other relevant affected stakeholders for potential remediation and mitigation options as per item i. above;

iii. Contain a cost/benefit analysis of all options to assess efficiency and effectiveness of any remediation or mitigation options;

iv. Identify the recommended options for remediation and mitigation;

v. Identify the proposed offset goal to achieve remediation and/or mitigation with respect to the approximate equivalent loadings from the sewage spill;

vi. Propose a methodology for quantification with respect to the offset of the loadings for any remediation and/or mitigation measures to meet the intended goal for overall remediation and/or mitigation to address the added TP loading from the spill; and

vii. Identify and propose timelines to implement the recommended remediation or mitigation measures to offset loadings from TP, impacts to dissolved oxygen from nutrients or other measures that may improve existing or potential impairments with identification of options that can be implemented as soon as possible to start to reduce the on-going or potential impacts.

10. Within six (6) weeks of approval of Item 8 above or such other date approved by the Director in writing, submit to the Director for approval, a proposed workplan for the approved remediation/mitigation measures for Cootes Paradise/Western Hamilton Harbour Area ("Cootes Paradise Workplan"). The workplan shall consider and address, as necessary, Work Ordered in Item 8 and 9 above and any ministry comments upon approval of Item 8, and shall include, but not be limited to, the following:

i. A detailed workplan and timeline for carrying out the approved remediation/mitigation options within the Cootes Paradise/Western Hamilton Harbour Area;

ii. Calculations referred to in Item 9 iv) and v) or as otherwise approved; and

iii. Proposed follow-up monitoring required to ensure the recovery and effectiveness of the remediation plan.

11. Within two (2) weeks of the approval obtained pursuant to item 10 above, commence implementation of the approved Cootes Paradise Workplan within the timelines set out in the approval.

12. Submit a report prepared by the Qualified Person within one (1) month of the completion of the work undertaken pursuant to the approved Cootes Paradise Workplan to the Director confirming that the natural environment has been restored and outlining the completed items and the work undertaken to restore the natural environment, including, but not limited to, the following:

i. Any monitoring results completed before, during and after the work undertaken in accordance with Cootes Paradise Workplan;

ii. Analysis of the results in Item 12 (i) above for the purpose of the intended monitoring; and

iii. Determination if any requirement for on-going monitoring is needed to verify the effectiveness or maintenance of the remedial actions undertaken as necessary.

13. Provide notice to any impacted landowner(s) of the following items:

i. within 7 days of submission of any proposed workplan(s) submitted to the Director for approval; and

ii. within 7 days of the approval of any workplan(s) by the Director.

14. Provide notice to any impacted landowner(s) at least seven (7) days before the implementation of any work on the approved Chedoke Creek Workplan or the approved Cootes Paradise Workplan;

15. Within seven (7) days of any work on the Chedoke Creek Workplan and the Cootes Paradise Workplan, provide written confirmation to Director, that implementation of the approved workplan(s) has commenced.

16. Within (2) days of any limitations or changes being identified to the approved workplans, notify the Director and within two (2) weeks, submit, in writing for review and acceptance, any proposed changes to an approved workplan with the relevant information to support any proposed changes. Written acceptance by the Director of the proposed changes is required prior to implementation of any proposed changes.

17. Prior to the first of each month, provide to the Director written, monthly progress updates on the progress made to comply with this order.

18. In conjunction with the written monthly progress updates, the City shall meet with the Director within 7 days of the submission of the monthly report to discuss the progress reports.

19. Post this order on the web site of the City for public viewing within 24 hours of it being served and it shall remain posted unless otherwise directed by the Director.

A. While this order is in effect, a copy or copies of this order shall be posted in a conspicuous place.

B. While the order is in effect, report in writing, to the District or Area Office, any significant changes of operation, emission, ownership, tenancy or other legal status of the facility or operation.

Request for Hearing

You may require a hearing before the Environmental Review Tribunal if, within 15 days of service of this order, you serve written notice of your appeal on the Environmental Review Tribunal and the Director. Your notice must state the portions of the order for which a hearing is required and the grounds on which you intend to rely at the hearing. Except by leave of the Environmental Review Tribunal, you are not entitled to appeal a portion of the order or to rely on grounds of appeal that are not stated in the notice requiring the hearing. Unless stayed by the Environmental Review Tribunal, the order is effective from the date of service.

Written notice requiring a hearing must be served personally or by mail upon:

The Secretary Environmental Review Tribunal 655 Bay Street, 15th Floor Toronto, ON M5G 1E5	and	Director Ministry of the Environment, Conservation and Parks 119 King St. W., 9th floor Hamilton, ON, L8P 4Y7 Fax: (905) 521-7806

Where service is made by mail, the service shall be deemed to be made on the fifth day after the date of mailing and the time for requiring a hearing is not extended by choosing service by mail.

For your Information

The procedures to request a hearing and other information provided above are intended as a guide. The legislation should be consulted for additional details and accurate references.

Reasons for Response

I altered work ordered item Items No. 1, No. 2, No. 3 and No.8 of the Order allow the City of Hamilton more time to follow their internal procurement and funding process to retain the Qualified Person within a reasonable period of time. Additional time was granted, at the City's request, to allow the City more time to work with the Qualified Person to complete the Chedoke Creek Workplan and the Cootes Paradise Report.

I altered work ordered Item No. 10 of the Order to allow at least six (6) weeks, or such other date approved by the Director, for the submission of the Cootes Paradise Workplan in relation to the approved remediation/mitigation measures for Cootes Paradise/Western Hamilton Harbour Area. The additional time will allow the City more time to develop the Cootes Paradise Workplan in consultation with the Qualified person and accommodate their internal approval processes.

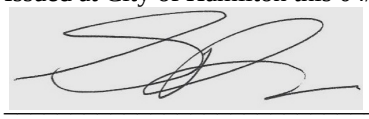
Item No. 16 of the order was revoked as I agree with the City that the requirements were duplicative, and that the monthly update meetings required by Item No. 17 (formerly No. 18 of the Order) will provide the necessary updates to me and the Ministry on the City's progress in complying with the order. Item No. 17, No. 18, No. 19 and No. 20 of the Order were renumbered accordingly.

I am confirming work ordered Items No. 4, No. 5, No. 6, No. 7, No. 9, No. 11, No. 12, No. 13, No. 14, No. 15, No. 17, No. 18, No. 19 and No. 20 of the Order.

A meeting was held on December 3, 2020 between City officials Andrew Grice, Cari Vanderperk and Mark Bainbridge, and me along with Ministry staff, in response to the request for review of the Order. I discussed the requirements of the Order in detail, including in relation to the clarifications sought by the City in its request for review, with support from Ministry officials in attendance. The City was given opportunity to ask questions of me and Ministry officials regarding the work ordered, and I discussed expectations of the Order moving forward. I am of the view that given the nature of the discussions, and the City's understanding of the work that is required of them, I did not see a need to alter any other terms of the order.

I note that Item No. 2, No. 3, No. 6, No. 7, No.8, No. 10, No. 12, No. 13, No. 15, No. 17, No. 18, No. 19 and No. 20 were altered to refer to the Director, as opposed to the Provincial Officer, for the purposes of administering the requirements of the order, and so I am apprised of progress made to comply with the Order.

Issued at City of Hamilton this 04/12/2020 (dd/mm/yyyy).



Stephen Burt

Badge # 1504

Hamilton District

Provincial Officer's Report

Order Number
1-OW6SS

To:
HAMILTON, CITY OF
700 WOODWARD Ave N
HAMILTON ON L8H 6P4
Canada

HAMILTON, CITY OF
71 MAIN STREET WEST, 1st Floor
HAMILTON, ONTARIO L8P 4Y5
Canada

Site:
Chedoke Creek, downstream of the Main/King Combined Sewer Overflow discharge pipe, the eastern end of Cootes Paradise and western end of Hamilton Harbour, and as further described in the Provincial Officer Report under section entitled “Description of the Site and the Orderees”.

Observations

1. Authority to Issue Order

This Order is being issued pursuant to my authority under sections 157, 157.1 and 196 of the Environmental Protection Act and under sections 16, 16.1, and 104 of the Ontario Water Resources Act.

2. Definitions

For the purpose of this Order, the following terms shall have the meanings described below:

"adverse effect" means one or more of:
(a) impairment of the quality of the natural environment for any use that can be made of it,
(b) injury or damage to property or to plant or animal life,
(c) harm or material discomfort to any person,
(d) an adverse effect on the health of any person,
(e) impairment of the safety of any person,
(f) rendering any property or plant or animal life unfit for human use,
(g) loss of enjoyment of normal use of property, and
(h) interference with the normal conduct of business.

"cBOD" means Carbonaceous Biochemical Oxygen Demand

"City" means the City of Hamilton.

"Combined Sewers" means pipes that collect and convey both wastewater from residential, commercial, institutional and industrial buildings and facilities (including infiltration and inflow) and stormwater runoff through a single-pipe system;

"Combined Sewer Overflow (CSO)" means a discharge to the environment from a Combined Sewer system that usually occurs as a result of precipitation when the capacity of the combined sewer is exceeded.

"combined sewer system" is a wastewater collection system which conveys sanitary wastewaters (domestic, commercial and industrial wastewaters) and stormwater runoff through a single pipe system to a Sewage Treatment Plant (STP) or treatment works. Combined sewer systems which have been partially separated and in which roof leaders or foundation drains contribute stormwater inflow to the sewer system conveying sanitary flows are still defined as combined sewer systems in Procedure F-5-5.

"discharge", when used as a verb, includes add, deposit, emit or leak and, when used as a noun, includes addition, deposit, emission or leak; ("rejet", "rejeter")

"DO" means Dissolved Oxygen

"Dry weather flow" is sewage flow resulting from both: 1) Sanitary wastewater (combined input of industrial, domestic and commercial flows); and 2) Infiltration and inflows from foundation drains or other drains occurring during periods with an absence of rainfall or snowmelt.

"EPA" means the Environmental Protection Act, R.S.O. 1990, c. E.19.

"ERA" means Ecological Risk Assessment.

"HATCH" means HATCH Limited.

"HATCH reports" means the following reports:
- Report entitled "Quantification of Volume and Contaminant Loadings" dated September 28, 2018 by HATCH Limited;
- Report entitled "Main-King CSO Tank Overflow Volume Estimates" by HATCH Limited dated April 14th, 2020.

Ministry" or "MECP" means the Ontario Ministry of Environment, Conservation and Parks.

"municipality" means the City of Hamilton

"operator" means a person who adjusts, inspects or evaluates a process that controls the effectiveness or efficiency of a facility, and includes a person who adjusts or directs the flow, pressure or quality of the wastewater within a wastewater collection facility;

"Order" means this Provincial Officer's Order 1-OW6SS, as it may be amended.

"overflow event" occurs when there is one or more CSOs from a combined sewer system, resulting from a precipitation event. An intervening time of twelve hours or greater separating a CSO from the last prior CSO at the same location is considered to separate one overflow event from another.

"owner" means a municipality or person having authority to construct, maintain, operate, repair, improve or extend water works or sewage works; ("propriétaire")

"owner of the pollutant" means the owner of the pollutant immediately before the first discharge of the pollutant, whether into the natural environment or not, in a quantity or with a quality abnormal at the location where the discharge occurs, and "owner of a pollutant" has a corresponding meaning; ("propriétaire du polluant", "propriétaire d'un polluant")

"OWRA" means the Ontario Water Resources Act, R.S.O. 1990, c. O.40.

"Partially Separated Sewer Systems" means wastewater collection systems that originally had Combined Sewers and where either only a portion of a system was retrofitted to separate sewers, or in which roof leaders or foundation drains still contribute stormwater inflow to the separated sewer conveying sanitary sewage, and/or a new development area served by separate sewers was added to an area served by Combined Sewers;

"person having control of a pollutant" means the person and the person's employee or agent, if any, having the charge, management or control of a pollutant immediately before the first discharge of the pollutant, whether into the natural environment or not, in a quantity or with a quality abnormal at the location where the discharge occurs, and "person having control of the pollutant" has a corresponding meaning;

"pollutant" means a contaminant other than heat, sound, vibration or radiation, and includes any substance from which a pollutant is derived;

"practicable" means capable of being effected or accomplished;

"Provincial Officer" means the undersigned provincial officer or, in the event that the undersigned is unable to act, any other provincial officer authorized to act pursuant to the EPA and OWRA.

"Provincial Officer's Report" means this 18-page report which comprises part of the Order.

"restore the natural environment", when used with reference to a spill of a pollutant, means restore all forms of life, physical conditions, the natural environment and things existing immediately before the spill of the pollutant that are affected or that may reasonably be expected to be affected by the pollutant, and "restoration of the natural environment", when used with reference to a spill of a pollutant, has a corresponding meaning;

"Sanitary Sewers" means pipes that collect and convey wastewater from residential, commercial, institutional and industrial buildings, and some infiltration and inflow from extraneous sources such as groundwater and surface runoff through means other than stormwater catch basins;

"Separate Sewer Systems" means wastewater collection systems that comprised of Sanitary Sewers while runoff from precipitation and snowmelt are separately collected in Storm Sewers;

"sewage" includes drainage, storm water, commercial wastes and industrial wastes and such other matter or substance as is specified by the regulations; ("eaux d'égout")

"sewage works" means any works for the collection, transmission, treatment and disposal of sewage or any part of such works, but does not include plumbing to which the Building Code Act, 1992 applies; ("station d'épuration des eaux d'égout")

"Site" means the site described as: Chedoke Creek, downstream of the Main/King Combined Sewer Overflow discharge pipe, the eastern end of Cootes Paradise and western end of Hamilton Harbour and as further described in the Provincial Officer Report under section entitled

"Description of the Site and the Orderees".

"SLR" means SLR Consulting (Canada) Ltd.

"SLR reports" means the following reports:
- Letter report entitled "Peer Review Report - Chedoke Creek Natural Environment and Sediment Quality Assessment and Remediation Report" dated May 15, 2019 by SLR Consulting (Canada) Ltd.;
- Report entitled "Ecological Risk Assessment (ERA), Chedoke Creek, Hamilton, Ontario" by SLR Consulting (Canada) Ltd. dated February 12, 2020 (including "APPENDIX A Previous Environmental Investigations Sampling Locations");
- Report entitled "Cootes Paradise: Environmental Cootes Evaluation Hamilton, Ontario" by SLR Consulting (Canada) Ltd. dated April 22, 2020; and
- Letter report entitled "Response to Ministry of Environment, Conservation and Parks May 28, 2020 letter entitled Chedoke Creek Spill Response – District Comments" by SLR Consulting
(Canada) Ltd. dated June 12, 2020.

"spill", when used with reference to a pollutant, means a discharge,
(a) into the natural environment,
(b) from or out of a structure, vehicle or other container, and
(c) that is abnormal in quality or quantity in light of all the circumstances of the discharge,
and when used as a verb has a corresponding meaning; ("déversement", "déverser")

"Storm Sewers" means pipes that collect and convey runoff resulting from precipitation and snowmelt (including infiltration and inflow);

"substance" means any solid, liquid or gas, or any combination of any of them.

"TAN" means Total Ammonia Nitrogen

"TKN" means Total Kjeldahl Nitrogen

"TP" means Total Phosphorous

"Tribunal" means the Environmental Review Tribunal

"TSS" means Total Suspended Solids

"Wet weather flow" is the combined sewage flow resulting from:
1. Sanitary wastewater; and
2. Infiltration and inflows from foundation drains or other drains resulting from rainfall or snowmelt; and
3. Stormwater runoff generated by either rainfall or snowmelt that enters the combined sewer system.

"Wood" means Wood Environmental & Infrastructure Solutions a division of Wood Canada Limited.

"Wood reports" means the following reports:
- Report entitled "MECP Order # 1-J25YB Item 1b – Chedoke Creek Natural Environment and Sediment Quality Assessment and Remediation Report" dated January 24, 2019 by Wood Environmental & Infrastructure Solutions;
- Report entitled "MECP Order # 1-J25YB Item 1c – Implementation and Costing Report" dated January 24, 2019 by Wood Environmental & Infrastructure Solutions; and
- Memo entitled "Chedoke Creek Project, Wood Commentary on SLR Peer Review Comments, City of Hamilton" dated May 23, 2019 by Wood Environmental & Infrastructure Solutions.

3. Description of the Site and the Orderees

The City of Hamilton is the owner and operator of two (2) wastewater treatment plants (WWTP) called Dundas WWTP and Woodward WWTP located at 135 King Street West and 700 Woodward Avenue, respectively. Sewage is collected via the wastewater collection system made up of both Separate Sewer Systems and Combined Sewer Systems and Partially Separated Sewer Systems serving the former towns of Stoney Creek, Hamilton, Dundas, Ancaster and Waterdown and other hamlets surrounding the City.

The City of Hamilton is also the owner and operator of the wastewater collection system which includes approximately nine (9) Combined Sewer Overflow (CSO) tanks. CSO tanks are engineered structures designed to hold a portion of combined sewage (sewage and stormwater) during rain events that is in excess of the WWTP capacity. The purpose of providing storage capacity at the CSO tanks is to prevent untreated sewage from discharging to the natural environment. When the rain stops, the sewage is gradually pumped to the WWTP for treatment. Under heavy rain conditions, a CSO tank storage capacity may be exceeded, which may result in combined sewer overflow into the receiving water although at a more diluted concentration than raw sewage. The Main/King CSO Tank and Pumping Station (HCS04) located at 707 King Street West, Hamilton has a combined sewage storage capacity of 75,000 m3.

As detailed later in this Provincial Officer's Report, from January 28, 2014 until July 18, 2018, sewage from the Main/King CSO pumping station was discharged to Chedoke Creek on multiple occasions in the absence of rain and when the capacity of the CSO tank was not exceeded. The sewage flowed from the pumping station into the overflow chamber and out via a 2400 mm discharge pipe traveling west/northwest discharging into Chedoke Creek just north of Glen Road, Hamilton. The spill flowed north in Chedoke Creek discharging into the south-eastern portion of Cootes Paradise with the usual currents going out the Desjardins Canal into the western end of Hamilton Harbour.

The Site is described as: Chedoke Creek, downstream of the Main/King Combined Sewer Overflow discharge pipe, the eastern end of Cootes Paradise and western end of Hamilton Harbour, and as detailed in Appendix A.

Appendix A shows a map of the Site entitled "Chedoke Creek, downstream of the Main/King Combined Sewer Overflow discharge pipe, the eastern end of Cootes Paradise and western end of Hamilton Harbour".

The following are property uses of land surrounding Chedoke Creek:
Neighbouring land uses to the east include Hwy 403 with park land further east (Kay Drage Park/former Landfill);
To the south and west is a mix of residential homes and apartments, institutional properties (long term care facility and former school), and Royal Botanical Garden's park land extending north to Princess Point; and
To the north of Chedoke Creek is Cootes Paradise and additional Royal Botanical Garden (RBG) park land.

4. Events Leading to the Provincial Officer's Order

An estimated volume of 24 billion litres of sewage spilled from the Main/King CSO Tank and associated Pumping Station into Chedoke Creek during the period of January 28, 2014 until July 18, 2018 as a result of the incorrect operation of a valve, and the malfunction of a second gate valve without detection. The purpose of a CSO tank is to collect and retain sewage and storm flows during rain events that would otherwise overwhelm a waste water collection system and thereby prevent untreated sewage from discharging to the natural environment. The associated pumping station then pumps the sewage to the pant when the rain stops, and capacities allow for more flow. Discharges from a CSO tank should not occur during dry weather conditions or during rain events for which the tank capacity has been designed. Because the discharge was abnormal in quality and quantity and unapproved under the OWRA it was determined a spill.

The following chronology is a description of this Provincial Officer's dealings with this spill event since first being assigned to it on July 6, 2018:

Prior to July 6, 2018 the District Office received Annual Reports from the City about the Main/King CSO tank which reported no recent combined sewer overflows. The City also did not report any operating problems encountered and corrective actions taken with respect to the CSO tank as required under condition 4 (c) of the Certificate of Approval (CofA)/Environmental Compliance Approval (ECA) # 3-1455-94-956.

On July 6, 2018, the Spills Action Centre received a public complaint regarding the City discharging sewage into Chedoke Creek and Cootes Paradise. The complaint was forwarded to the Hamilton District Office. The caller reported the presence of sewage odours, worse than he had ever experienced, and raw sewage related plastic debris within Chedoke Creek. Caller reported that the problem had been ongoing since the City installed the CSO tank. The caller indicated that they had also reported the same observations to the City.

On July 9, 2018, Hamilton District Manager, Paul Widmeyer received an email from the Hamilton Health Unit, regarding the health hazard of extremely high E. coli results meeting the criteria of "suspected sewage contamination" in Chedoke Creek with results reported of 3.4 million CFU/100 mL and a trend of historical high results from approximately the end of May 2018.

On July 10, 2018 the Hamilton Health Unit required the City of Hamilton to post warning signs for the public at potential water access points along Chedoke Creek, Princess Point Park, Cootes Paradise Waterfront Trail, Desjardin Canal (which allows flow between Cootes Paradise and Hamilton Harbour) and to remove the canoe/kayak dock at Princess Point Park.

On July 11, 2018 the Hamilton Conservation Authority took samples in the Chedoke Creek watershed at several locations for E. coli and human/bovine bacteria markers in order to isolate the section of Chedoke Creek where the discharge was occurring and determine the source of contamination. Sample results showed high concentrations of E. coli and bacteria readings consistent with human source. Resampling was conducted on July 18, 2018 by the Hamilton Conservation Authority with results also showing high concentrations of E. coli and bacteria readings consistent with human source.

On July 13, 2018, I received a presentation from the Hamilton Harbour Remedial Action Program (HHRAP) committee where the Royal Botanical Gardens (RBG) presented photos of the Chedoke Creek on July 4, 2018 showing a significant amount of sewage solids floating on the surface.

On July 16, 2018, I visited the site at Kay Drage Park bridge with Water Compliance Supervisor, Zafar Bhatti and detected sewage odours and observed sewage debris in Chedoke Creek.

On July 17, 2018, the undersigned Provincial Officer met with City staff at Chedoke Creek outfall and detected strong sewage odours downwind of the outfall and observed significant sewage debris in the creek. City staff identified the sewage as algae. At the Kay Drage Park bridge a slight increase in sewage debris was observed in the creek.

The City had been checking their system and providing update reports from staff suggesting natural organics, algae or sediment reflux all-natural sources and not sewage coming from the sewage system up to July 18th, 2018 but my inspections were on-going to determine the source.

On the morning of July 18, 2018, I visited the upstream portion of the Chedoke Creek outfall at the MTO work site on the east side of the 403 and observed that the water was running clear with no odour.
On July 18, 2018, Calder Engineering Ltd conducted a confined space inspection and sampling of the twin box culvert and connecting and storm sewer pipe from overflow chamber of Main/King CSO tank and Pumping Station located at 707 King Street West. The twin box culvert channels Chedoke Creek under Main Street West to where Chedoke Creek emerges north of Glen Road and receives flow from several different areas. It was this inspection that found sewage flowing into the box sewer from King/Main

CSO tank at an estimated rate of 150 L/sec, while clear water was coming from Chedoke Creek. Further investigation at the Main /King Pump Station found sewage in the CSO tank overflow chamber discharging to a 2400 mm storm discharge culvert. Sewage was entering the overflow chamber through a reported 4.7% open 3000 mm x 3000 mm maintenance gate valve between the overflow chamber and the influent 1950 mm combined sewer entering the pumping station wet well. Once identified the City closed the gate and reported the spill to the Spills Action Centre due to the discharge being of abnormal quality and quantity.

Water Compliance Supervisor Zafar Bhatti and I attended the King/Main CSO tank location on July 18, 2018 to confirm that the discharge had stopped and to conduct a visual inspection of the Chedoke Creek outfall which showed no flow from the east side of the box culvert which had been observed the previous day by the undersigned Provincial Officer. Sewage debris was still observed with sewage odours. Preliminary reports from the City indicated that the gate valve had been open since January 29, 2014. The initial estimated volume of sewage discharged to the creek from January 29, 2014 until the gate valve was fully closed was initially reported as 15.9 billion litres (and more accurately determined to be 24 billion litres later).

The undersigned Provincial Officer also conducted a site visit on July 20, 2018 and found strong sewage odours on Glen Road, downwind of the creek and observed a boom installed by City contractors between Kay Drage Park bridge and the Chedoke Creek Outfall to collect floating materials.

On July 27, 2018, the City confirmed that a gate valve between the sewage pumping station wet well and overflow chamber had been open since January 28, 2014 allowing dry weather flow out of the station. In January 2018 a second gate valve malfunctioned which directed added (wet and dry weather) flow from a large combined sewer into the wet well where the first gate valve was open which allowed the added flow to spill into the overflow chamber and discharging to Chedoke Creek.

A Provincial Officer Order (POO) Number 1-J25YB was issued on August 2, 2018 requiring the City, among other things, to evaluate impacts of the sewage spill to Chedoke Creek from the Main/King CSO tank facility between January 28, 2014 and July 18, 2018. This evaluation required evaluation of impacts to Chedoke Creek from the spill and anticipation/risk of on-going impacts, recommendations for remediation and/or mitigation, if necessary, and regarding the most effective way to complete the remediation and/or mitigation; and associated implementation timeline for any necessary remedial and/or mitigation work by November 30, 2018.

In October 2018, the City submitted a report entitled "Quantification of Volume and Contaminate Loadings" by HATCH dated September 28, 2018 which stated that an estimated 24 billion litres (24 million cubic metres) of raw sanitary sewage and combined sewage was discharged to Chedoke Creek from January 28, 2014 to July 18, 2018. The Total Contaminant Loadings (in Tonnes) for the period from January 28, 2014 to July 18, 2018 were estimated to be 2375 Tonnes of TSS, 47 Tonnes of TP, 159 Tonnes of TAN, 312 Tonnes of TKN and 1373 Tonnes of cBOD.

On January 31, 2019, the City submitted a consultant's (Wood) report (report entitled "MECP Order # 1-J25YB Item 1b – Chedoke Creek Natural Environment and Sediment Quality Assessment and Remediation Report" dated January 24, 2019 by Wood Environmental & Infrastructure Solutions) as a fulfilment of the above Order #1-J25YB, which recommended Direct Removal (section 5.2.5) of settled material by hydraulic dredging. The report stated, "Physical removal of the organic sediment will directly address the three primary sources of potential impairment including nutrient contamination, bacteriological contamination and habitat loss". Options considered in the order of most to least effective were: Direct Removal, Chemical Inactivation, Physical Capping and No Action.

On March 20, 2019, the City reported that a peer review of the original reports was being conducted. On May 30, 2019 I received both: a Peer Review Report by SLR, dated May 15th, 2019; and a memo from Wood, dated May 23, 2019.

On September 19, 2019 as part of the review of the above reports, the Surface Water Specialist of the Technical Support Section and I requested clarification from the City on the identification of a clear conclusion or recommendation for remediation and/or mitigation option the City was proposing. The City had submitted both the Wood report with one recommendation for dredging and the peer review, which recommended no action. No clear indication was provided by the City on which recommendation it was proposing. With no response from the City by September 30th, 2019 I requested a response by October 4th. The City reported on October 1, 2019 that additional sampling work was completed at the site during the last week of September 2019 as a result of the peer review to identify the need for any remedial work.

On October 10, 2019 in a meeting the City informed the Director, me and other Ministry staff that an ERA had been started. I requested a final report and recommendations by November 15th, 2019. The City then informed us that an ERA final report could not be provided until the end of January 2020 as lab analysis and data interpretation/report would take additional time. The Surface Water Specialist of the Technical Support Section in consultation with the Director and I, informed the City that the contaminated sites environmental risk assessment process cannot be used for the determination of spill clean-up requirements as this process does not have the same requirements as a spill to undertake practicable clean-up to restore the natural environment under Section 93 of the EPA. The legal duty to restore the natural environment in section 93 of the EPA helps to prevent a spill site from becoming a

contaminated site and to ensure the owner deals with the spill and its impacts. Some of the analyses undertaken in an ERA can be used to identify areas and extent of impact of a spill, which may be incorporated into the full evaluation of impact and remediation/mitigation options for the spill, but it does not identify level of clean-up required for spills or the practicable measures available to address the impacts of the spill.

In order to ensure appropriate timelines were followed, a Provincial Officer Order (POO) was issued and the City submitted a Request for Review resulting in the Directors decision to issue Director's Order #1-MRRCX on November 28th, 2019 clarifying the work to be conducted with revised time lines of submission of the ERA in Chedoke Creek by February 14, 2020 and Cootes Paradise Environmental Impact Evaluation (EIE) report by May 1, 2020. Work required was:

1. A Chedoke Creek ERA and evaluation of the environmental impact, an identification and evaluation of sewage remaining in the creek, identification of any anticipated on-going environmental impacts to the creek, and a review of options designed to remediate the creek and monitor the environmental condition of the creek, written proposed actions with justification in respect to the remediation and the monitoring of the creek including selected option(s) for environmental remediation and monitoring with supporting documentation/justification and an implementation timeline including significant milestones and any approvals required; and

2. An environmental impact evaluation to Cootes Paradise from the sewage discharged including a written assessment of any anticipated on-going environmental impacts with identification of contaminants related to the sewage spill, any known environmental impacts and an assessment of anticipated on-going environmental impacts from the identified contaminants including a spatial and environmental evaluation of the contaminants remaining (floatables and non floatables) in Cootes Paradise, and any proposed remedial actions and recommendations with justification including timelines with surface water monitoring program.

On February 14, 2020 the City submitted its Chedoke Creek ERA report and letter of position recommending that no further actions or additional remedial work was required to address the effects from the sewage spill or previous effects from the sewage discharge because of the alleged likelihood of recontamination, presence of historical contamination, and potential presence of a species at risk.

On May 28, 2020, the Director provided preliminary comments from the Ministry technical experts to the City and asked the City to provide additional information and clarification in order to complete its review of the Chedoke Creek ERA and better understand the City's methodology used to conclude that no further action or remediation was needed in Chedoke Creek. The request included, but was not limited to:
o Clarification on the assessment of the creek sediment;
o Additional work to verify the presence of a species at risk (Lilliput mussel);
o Additional evidence to support the no-dredging conclusion to address organic material related to the spill; and
o an assessment of any other remedial options considered.

The City and its consultant provided additional information to the Director, me and Ministry staff on June 15, 2020 and maintained that no further action was required.

In a letter dated February 13th, 2020 and in a meeting on March 13, 2020 the Royal Botanical Gardens (RBG), expressed concerns regarding ecological damage, potential extent of contamination to the bed of the marsh, which is owned by RBG, and requested a robust analysis of the spill impact and future remediation efforts. RBG plays a critical role in administering marsh restoration programs, ecological remediation plans and are responsible for the health and safety of visitors, program participants and staff of Cootes Paradise.

On April 30, 2020, the City submitted the required Cootes Paradise EIE and letter of position. It did not recommend any action or additional remedial work to address the effects from the sewage spill because the City believed either impact was short-lived or no adverse impact was sustained on water quality, sediment, aquatic vegetation or fish in Cootes Paradise.

I provided the materials for technical review by Technical Support Section, and as a result of their review comments they advised me that more work is needed to address the impacts of the spill on Chedoke Creek and Cootes Paradise as outlined in section entitled 4.2 Workplan below.

4.1 Environmental Site Investigations and Related Information

To date, the following reports detailing environmental site investigations and related information regarding the Site have been received, reviewed by Ministry Staff, provided for technical review and are listed below:

Documents submitted under Order No. 1-J25YB, dated August 2, 2018
• Report entitled "Quantification of Volume and Contaminant Loadings" dated September 28, 2018 by HATCH Limited;

• Report entitled "MECP Order # 1-J25YB Item 1b – Chedoke Creek Natural Environment and Sediment Quality Assessment and Remediation Report" dated January 24, 2019 by Wood Environmental & Infrastructure Solutions;
• Report entitled "MECP Order # 1-J25YB Item 1c – Implementation and Costing Report" dated January 24, 2019 by Wood Environmental & Infrastructure Solutions;

Additional Letter Reports/Peer Review submitted
• Letter report entitled "Peer Review Report - Chedoke Creek Natural Environment and Sediment Quality Assessment and Remediation Report" dated May 15, 2019 by SLR Consulting (Canada) Ltd.;
• Memo entitled "Chedoke Creek Project, Wood Commentary on SLR Peer Review Comments, City of Hamilton" dated May 23, 2019 by Wood Environmental & Infrastructure Solutions.

Documents submitted under Directors Order No. 1-MRRCX dated November 28, 2019
• Letter from the City entitled "Response to Director's Order 1-MRRCX" Items 1 & 2 submitted on February 14th, 2020 with the following report attachment:
- "Ecological Risk Assessment (ERA), Chedoke Creek, Hamilton, Ontario" by SLR Consulting (Canada) Ltd. dated February 12, 2020 (including "APPENDIX A Previous Environmental Investigations Sampling Locations").
• Report entitled "Main-King CSO Tank Overflow Volume Estimates" by HATCH Limited dated April 14th, 2020.
• Letter from the City entitled "Response to Order No.1-MRRCX, Items 3 and 4" submitted on April 30, 2020 with the following attachments:
- Letter from the City of Hamilton entitled "Director Order Number; Item No. 4, Surface Water Monitoring Program" dated April 30, 2020; and
- Report entitled "Cootes Paradise: Environmental Cootes Evaluation Hamilton, Ontario" by SLR Consulting (Canada) Ltd. dated April 22, 2020.

Confirmation of Position and Methodology Clarification
• Letter from the Ministry to the City entitled "Chedoke Creek Spill Response – District Comments" dated May 28, 2020
• Letter of response from the City entitled "Response to District Comments – Chedoke Creek Spill Response" dated June 15, 2020 with the following attachment:
- Letter entitled "Response to Ministry of Environment, Conservation and Parks May 28, 2020 letter entitled Chedoke Creek Spill Response – District Comments" by SLR Consulting (Canada) Ltd. dated June 12, 2020.

4.2 Work Plan

As previously discussed, I provided the materials for technical review by Technical Support Section, and as a result of their review comments they advised me that more work is needed to address the impacts of the spill on Chedoke Creek and Cootes Paradise as outlined in this section.

Chedoke Creek

The City and its consultants (Wood and SLR) have identified dredging in Chedoke Creek as the only effective option, of the options assessed, to address the increased sewage parameter concentrations in the sediment from the spill. SLR reported that hydraulic dredging could improve sediment quality but identified several items potentially limiting the effectiveness or feasibility of hydraulic dredging and therefore did not recommend dredging, namely: 1) a potential species at risk presence in Chedoke Creek due to its identification in nearby Cootes Paradise; 2) an inability to differentiate sediment contaminated by the spill versus historical contamination; and 3) the likelihood of recontamination from other on-going sources of contamination to the creek.

I asked Ministry technical experts to assess the above potential limitations and was advised that the limitations noted can be addressed with the refinement of targeted dredging locations and mitigation measures or limitations and were not supported as outlined below and based on the information provided. They advised further work is required to assess and address the potential presence of any species at risk in Chedoke Creek that may be subject to dredging. This could include the development of mitigatable measures to protect any species at risk during dredging or avoidance of specific areas for dredging. Consideration on the impact of dredging on species at risk is also given for: if the potential impact from dredging is deemed to be a long-term negative impact; if current conditions are degraded due to historical or spill impacts and already potentially negatively impacting the species; and if there would be a long-term impact improvement despite a short-term negative impact from dredging, in order to determine what and where it is appropriate to dredge. The City is required to address the impacts of the spill and restore the natural environment even if historical contamination (even similar contamination) is present and does not absolve the owner of cleaning up a spill. It is also felt that any recontamination from on-going sources, such as: the closed landfill, combined sewer overflows; potential sanitary sewer cross-connections; and stormwater, are within the City's range of scope and responsibility. Significant improvements have been made to most of these sources (in quantity and quality) in the last 10-15 years, as shown by the improved conditions in the creek and sediment

before the spill. Any on-going sources of contamination are not anticipated to re-contaminate any remediated area to the same level historically seen or to the level seen from the 24 billion litres of sewage seen in this spill and is generally minor in comparison to the loadings seen from the spill.

Some of the key items from the Ministry's technical staff review of the Chedoke Creek ERA and impact assessment are as follows:

• The data interpretation and aggregate data analysis used in assessing pre spill conditions, spill period conditions and post spill conditions did not look at specific year differences (2018 vs 2014-2017) but used mean data analysis over the spill period potentially masking the extent of the impact of the spill seen, particularly in 2018, for some parameters and didn't determine if the pre-spill period used was representative of conditions at the time of the spill.

• Information supported the sediment being impacted by the sewage spill by some of the nutrients;

• Impacted sediment was found to be a moderate to high risk with bacteria, PAH's and copper;

• The contaminant loading of nutrients, cBOD and other sewage related parameters showed ongoing impact on DO levels;

• Elevated TAN levels in Chedoke Creek above pre-spill conditions were on-going.

Cootes Paradise

The consultant's report (SLR) concluded that no further action was required based on some limited monitoring data indicating that Cootes Paradise had returned to pre-spill conditions. Despite a request from the Director, myself and ministry technical staff the report did not consider, a loadings assessment from the spill to understand the magnitude of the loadings added to the system and to have a long-term impact on the system e.g. algal blooms. The additional loadings will undo and delay the improvements from several projects that are being/have been undertaken to improve the conditions in Cootes Paradise to meet HHRAP goals, such as improvements to TP treatment at the Dundas sewage treatment plant. The added loadings may also increase the likelihood and extent of algal blooms for several years. Based on advice received from ministry technical experts, it is not as feasible, for a number of reasons, to undertake a direct restoration of the added loadings to Cootes Paradise and the western Hamilton Harbour area both from the extent and type of the dispersion of TP, and the cost, effectiveness and potential to cause more harm than good in these areas using a direct removal method like dredging. In order to address the impacts of the increased loadings caused by the spill, based on advice received from Ministry experts, other remedial options must be considered and utilized to offset and/or improve the conditions in these systems in an effort to mitigate the added loading and associated impact as a result of the spill, and thus restore the natural environment.

I have considered some of the key items from the Ministry's technical staff review of the Cootes Paradise EIE and are as follows:

• As previously discussed, the data interpretation and aggregate data analysis used in assessing pre spill conditions, spill period conditions and post spill conditions did not look at specific year differences (2018 vs 2014-2017) but used mean data analysis over the spill period potentially masking the extent of the impact of the spill seen.

• Total Phosphorous (TP) and E. coli also showed similar patterns during the spill with TP double the concentration seen during pre and post spill periods for the east end of Cootes Paradise (CP11, CP11.2 and CP1).

• Rough loadings analysis for Total Phosphorous to Cootes Paradise from the spill in the:

o The last 6 months of the spill (January-July 2018) added about 94 kg/d of TP which is approximately double the average annual daily TP loadings (39 kg/day) on top of the normal TP loadings to the system during that time, which may be retained in various forms and recirculated within providing an additional source of nutrients.

o The previous four years of the spill (2014-2017) added approximately half, at about 21 kg/d, of the annual average daily TP loading of 39 kg/d on top of the normal TP loadings to the system during that time; and

o The total spill loading of 47,750 kg, compared to the annual average modelled loading of 14,100 kg/yr, indicated that the loadings from the spill over 4.5 years were equivalent to approximately three (3) years of additional loadings to Cootes Paradise from the point sources (e.g. Dundas sewage treatment plant, combined sewer overflows and the non-point sources (urban and rural stormwater runoff in the tributaries) combined.

• The report did not assess total ammonia nitrogen (TAN) as a contaminant of potential concern for Cootes Paradise. TAN can have other impacts including eutrophication, elevated nutrients supporting greater algal blooms, and can also cause a nitrogenous oxygen demand impacting dissolved oxygen. Data showed levels at CP11 much higher during the spill, e.g. 13.1 mg/L TAN compared to 1.95 mg/L of TAN during pre and post spill with similar trends at CP11.2 and CP1, although to a lesser extent.

• TKN, Ammonia and cBOD would show high input levels to the systems compared to average annual loadings

• The report did not assess the potential for added loadings to the system to impact algal blooms.

• Although diluted throughout a larger area (Chedoke Creek, the eastern portion of Cootes and into Hamilton Harbour to some extent), potential long-term impacts from the additional loadings, particularly for Total Phosphorous were not evaluated.

• The assessment on Chedoke Creek identified that the bulk of the loadings of some parameters, particularly TP, moved beyond Chedoke Creek into Cootes Paradise. Understanding of the currents and water exchange between Cootes Paradise and Hamilton

Harbour indicates that some of the loading also would have moved into Hamilton Harbour.

Considering the above, I am of the view that more work is needed. The work ordered under section 157, in respect of section 93 and section 14 of the EPA, is needed to restore the natural environment as a result of the spill, and to prevent further impairment to the natural environment, and to prevent adverse effects.

The EPA imposes a duty to mitigate and restore the natural environment on the owner of a pollutant and the person having control of a pollutant that is spilled as per section 93 of the EPA which states:

93 (1) The owner of a pollutant and the person having control of a pollutant that is spilled and that causes or is likely to cause an adverse effect shall forthwith do everything practicable to prevent, eliminate and ameliorate the adverse effect and to restore the natural environment.

When duty effective
(2) The duty imposed by subsection (1) comes into force in respect of each of the owner of the pollutant and the person having control of the pollutant immediately when the owner or person, as the case may be, knows or ought to know that the pollutant is spilled and is causing or is likely to cause an adverse effect.

The City is owner of the pollutant and the City's employees and operators were the person(s) having control of the pollutants, namely raw sewage contaminants (including TSS, TP, TAN, TKN and cBOD), that were discharged into the natural environment over approximately 4.5 years (January 28, 2014 and July 18, 2018) from its sewage works. The discharge of 24 billion litres of sewage was not authorized under the OWRA. As previously discussed, the discharges were occurring at all times, during both dry weather and wet weather conditions regardless of the CSO tank's operating level. The discharged volume of the dry weather flow alone, raw sanitary sewage, was 2.9 billion litres which is abnormal to be discharged to the natural environment considering this volume under normal operating conditions would have received full treatment at the wastewater treatment plant. The estimated normal CSO operation volume during the spill period (2014-2018), for the Main-King CSO if it was operating properly, was modelled by HATCH to be about 0.321 billion litres in total for those five years. Sanitary sewage flow of approximately 2.9 billion litres alone added approximately a loading of 771 tonnes of TSS, 502 tonnes of cBOD, 13 tonnes of TP, and 101 tonnes of TKN into Chedoke Creek. This discharge was further augmented by wet weather flow making a total volume of the spill 24 billion litres with total loadings of 2375 tonnes of TSS, 1373 tonnes of cBOD, 47 tonnes of TP, and 312 tonnes of TKN with no treatment by the WWTP or CSO tank. I consider these volumes and loadings excessive and abnormal in quality and quantity. As a result of the discharge, sewage was spilled into the Chedoke Creek causing adverse effects, including impairment to the quality of the natural environment, including waters (e.g. Chedoke Creek and Cootes Paradise), for any use that can be made of it, impairment to the safety of any person, and loss of enjoyment of normal use of property. Examples include odour complaints from RBG and the public due to raw sewage debris floating in the water and on the shore. As a result of the discharge, technical review by ministry experts have determined an adverse effect was observed as a result of the spill and if the natural environment is not restored the remaining spilled contaminants may cause further adverse effect.

As previously discussed, in July 2018, the City began remediation efforts along the surface of Chedoke Creek which included the installation of booms and removal of floating sewage by boat and hydrovac trucks. A seasonal boom was put in place to capture any further associated sewage floatables discharged. The operator station inspection program has been revised and assessments on critical valves have been completed in the system and maintenance prioritized. I am advised by the Ministry's technical experts that these efforts have not restored the natural environment to the pre-spill conditions as required under Section 93 of the EPA due to ongoing evidence of sewage parameter concentrations present above pre-spill conditions for some parameters and on-going low DO conditions.

Accordingly, the City was requested on several occasions, in writing and during meetings to assess and make recommendations to remediate the impacts of the spill (Order No. 1-J25YB dated August 2, 2018, Order No. 1-J3XAY dated November 21, 2019, Directors Order No. 1-MRRCX dated November 28, 2019 and letter dated May 28, 2020 entitled "Chedoke Creek Spill Response – District Comments".)

In addition, the City was in contravention of s.14 of the EPA in relation to the spill, which has caused and may cause an adverse effect as discussed above.

Pursuant to section 30(1) of the OWRA every person that discharges or causes or permits the discharge of any material of any kind into or in any waters or on any shore or bank thereof or into or in any place that may impair the quality of the water of any waters is guilty of an offence.

The discharge of sewage from the Main/King CSO described above constituted a contravention of section 30 of the OWRA. The City as the owner and operator discharged or caused or permitted the discharge of a material/sewage into or in any waters, Chedoke

Creek and Cootes Paradise/Hamilton Harbour, has impaired and may continue to impair the quality of the water further if work is not done.

For the purposes of the OWRA, the quality of water is deemed impaired by the discharge of material, where certain conditions are met as set out in section 1(3) of the OWRA. In the circumstances of this spill, the quality of water is deemed impaired for Chedoke Creek and its connected waterways/natural environment for the following: there was a degradation in the appearance and odour of the water; and the quality of the water was impaired by the discharge of 24 billion litres of sewage that entered the water directly and caused or may cause injury to or interference with any living organism that lives in or comes in contact with or as a result of it using or consuming the water or sediment that is in contact with the water.

For the purposes of section 30 of the OWRA, I am of the view, after having consulted with ministry experts, that the spill caused or may cause impairment to the system and therefore the items identified in the Order are required and more work is needed. Some of the identified impairments or potential impairments also include: 1) The sediment has been identified as having moderate to high risk for effects to some organisms from PAHs. Elevated levels of bacteria have or may have impacted uses or continue to do so; 2) Elevated TAN and nitrite levels in the water and added TKN levels in the sediment will continue to have an added nutrient source, impact DO levels, and add to the eutrophication of the system, all of which may continue to impact organisms in the water and sediment; and 3) the added nutrient loadings, particularly TP, at the significance of the loading to the entire system, will continue to increase the risk in the frequency and size of algal blooms which may impair the water for its use or cause injury as a result of algal blooms.

Considering the above noted on-going impacts and continuing potential impairment, I am of the opinion, after consultation with Ministry staff and technical experts, that a "no action" recommendation by the City does not discharge its obligation to restore the natural environment nor does it address or prevent potential adverse effects, or may impair or continued impairment of the natural environment, including waters.

Thus, further action is necessary to restore the natural environment in relation to Chedoke Creek and that further action is needed to offset the impacts of the spill to Cootes Paradise. Accordingly, I require the City to undertake remedial measures outlined in the accompanied Provincial Officer's Order to restore the natural environment in Chedoke Creek as a result of the spill and take steps to determine what is required in relation to Cootes Paradise and implement those steps once an appropriate course of action is determined.

Based on previous significant public interest, and the need to keep the public informed, the Order also requires posting on the City's website with progress reports, as needed. Progress reports and meetings with the Ministry are outlined to improve collaborative communication and information sharing during spill response workplan development, remediation and ensure timely progress towards restoring the natural environment. Landowner notifications are also required to improve communications with stakeholders.

5. Legal Basis for the Order and Provincial Officer's Opinion

I reasonably believe that the City of Hamilton has contravened or is contravening those provisions of the EPA as outlined in the Offences, Suspected Violation(s)/Offences section of this report.
And
I further reasonably believe that the City of Hamilton has contravened or is contravening those provisions of the OWRA as outlined in the Offences, Suspected Violation(s)/Offences section of this report.
And
I further reasonably believe that the requirements in this Order are in the public interest in order to prevent any further discharge of material into Chedoke Creek, Cootes Paradise and Hamilton Harbour, that may impair the quality of any water;
And
I further reasonably believe the requirements specified in this Order are necessary:

i) to prevent, or reduce the risk of any adverse effect on the natural environment from contaminated sediment which sediment was the direct result of the spill or spills to the Chedoke Creek from the Main/King CSO and which will continue to discharge compounds into the natural environment from the Site; and/or

ii) to prevent, decrease or eliminate an adverse effect that may result from the presence of such contaminants in, on or under the Site.

6.0 Attachments
The attachments listed below form part of the Order:
Appendix A – Site Map "Chedoke Creek, downstream of the Main/King Combined Sewer Overflow discharge pipe, the eastern end of Cootes Paradise and western end of Hamilton Harbour"

Offence(s)
Suspected Violation(s)/Offence(s)
Act – Regulation – Section
Description

Environmental Protection Act, 93 (1) The owner of a pollutant and the person having control of a pollutant that is spilled and that causes or is likely to cause an adverse effect shall forthwith do everything practicable to prevent, eliminate and ameliorate the adverse effect and to restore the natural environment.
(2) The duty imposed by subsection (1) comes into force in respect of each of the owner of the pollutant and the person having control of the pollutant immediately when the owner or person, as the case may be, knows or ought to know that the pollutant is spilled and is causing or is likely to cause an adverse effect. R.S.O. 1990, c. E.19, s. 93.

Environmental Protection Act, Section 14 (1) Subject to subsection (2) but despite any other provision of this Act or the regulations, a person shall not discharge a contaminant or cause or permit the discharge of a contaminant into the natural environment, if the discharge causes or may cause an adverse effect. 2005, c. 12, s. 1 (5).

Ontario Water Resources Act, Section 30 (1) Every person that discharges or causes or permits the discharge of any material of any kind into or in any waters or on any shore or bank thereof or into or in any place that may impair the quality of the water of any waters is guilty of an offence. R.S.O. 1990, c. O.40, s. 30 (1).

S. Yeudall

Shelley Yeudall
Provincial Officer
Badge Number: 881

Ministry of the Environment, Conservation and Parks

Ministère de l'Environnement, de la Protection de la nature et des Parcs

Ontario

Provincial Officer's Order

Order Number
1-OW6SS

Environmental Protection Act, R.S.O. 1990, c.E 19 (EPA)
Nutrient Management Act, R.S.O. 2002, c.4 (NMA)
Ontario Water Resources Act, R.S.O. 1990, c.O. 40 (OWRA)
Pesticides Act, R.S.O. 1990, c. P11 (PA)
Safe Drinking Water Act, S.O. 2002, c.32 (SDWA)

To: HAMILTON, CITY OF
700 WOODWARD Ave N
HAMILTON ON L8H 6P4
Canada

HAMILTON, CITY OF
71 MAIN STREET WEST, 1st Floor HAMILTON, ONTARIO L8P 4Y5
Canada

Site: Chedoke Creek, downstream of the Main/King Combined Sewer Overflow discharge pipe, the eastern end of Cootes Paradise and western end of Hamilton Harbour, and as further described in the Provincial Officer Report under section entitled “Description of the Site and the Ordeees”.

Work Ordered

Pursuant to my authority under sections 157, 157.1, 196 of the Environmental Protection Act and under sections 16, 16.1, and 104 of the Ontario Water Resources Act I hereby order you, the City of Hamilton, to do the following:

1. By December 11, 2020, retain the services of a Qualified Person that has the experience and qualifications to carry out the work specified in this Order.

2. By December 11, 2020, submit to the undersigned Provincial Officer written confirmation that the Qualified Person has been retained to carry out the work specified in this Order, that a copy of the Order has been given to the Qualified Person; and that the Qualified Person has the experience and qualifications to carry out the work.

Chedoke Creek Downstream of the Main/King CSO Discharge Pipe

3. By January 22, 2021, submit to the undersigned Provincial Officer, for approval, a remediation workplan for Chedoke Creek that is developed by the Qualified person to undertake the targeted dredging of Chedoke Creek based on the recommendation identified in section 5.2.5 of the Wood report entitled "MECP Order # 1-J25YB Item 1b – Chedoke Creek Natural Environment and Sediment Quality Assessment and Remediation Report" dated January 24, 2019 ("Chedoke Creek Workplan"). The Chedoke Creek Workplan shall be prepared in accordance with the requirements set out in Items 4 and 5 below.

4. The Chedoke Creek Workplan shall, at a minimum:

i) Consider technical reports, Ministry comments and affected stakeholders' comments, to determine an acceptable plan to implement the recommendation in the Wood report to restore the Chedoke Creek, while mitigating impacts of implementing the plan on the natural environment, including water;

ii) Contain a detailed timeline setting out critical milestones and checkpoints with the Ministry for carrying out the Chedoke Creek Workplan;

iii) Contain a Species at Risk assessment plan and associated timelines for Chedoke Creek downstream of the spill and including potential impacted areas downstream of Chedoke Creek that may be impacted by targeted dredging;

iv) Undertake consultation with the Species at Risk Branch within the Ministry in respect of any identified items pursuant to 4 iii) and incorporate this feedback and outcome into the workplan for any species at risk;

v) Provide a description of any anticipated approvals needed to implement the Chedoke Creek Workplan, initial consultation and proposed timelines to obtain such approvals, if required, for the Workplan to be implemented;

vi) The consultation in iv) and v) shall include the Regional Technical Support Section of the Ministry;

vii) Contain a description of the identified areas and the extent (depth, location) of the targeted dredging with a description of how the items outlined in Item 5 below were addressed and a description of any methods for refining identified areas in Item 5 including the impacted areas identified in the Wood reports and SLR reports and timing as needed, in the Chedoke Creek Workplan;

viii) Contain a description of the approximate volume of material to be removed;

ix) Identify and contain a description of proposed mitigation measures for any short-term impact(s) that may arise from implementing the Chedoke Creek Workplan for Chedoke Creek, its shoreline and connected waterways/natural environment, on any species at risk and other potentially impacted uses. Mitigation measures may include, but are not limited to: exclusion measures for local aquatic uses; limit recreational uses in the area; total suspended solids control as required for carrying out the targeted dredging; and proposed monitoring during any remediation to monitor effectiveness of mitigation measures during dredging identified in iv); and

x) Contain a proposed monitoring plan to monitor the recovery of the natural environment and effectiveness of the Chedoke Creek Workplan once dredging is complete.

5. With respect to the area from the Main/King CSO outfall to the mouth of Chedoke Creek, the Chedoke Creek Workplan shall take into consideration the scope of targeted dredging work necessary to restore the natural environment to pre-spill conditions, as to be agreed upon by the Ministry, and to mitigate any impairments or potential impairments from the spill, in relation to the following, but not limited to:

i) Sediment areas identified as impacted, in consultation with the Ministry, by the sewage spill;

ii) Sediment areas identified as containing elevated organic material consistent with sewage sludge;

iii) Sediment areas identified as elevated nutrients (particularly TP, TAN, and TKN);

iv) Sediment areas identified as had, may have, or continuing to have reduced dissolved oxygen levels in the water column from historical levels;

v) Sediment areas identified as having elevated parameters as identified by the ERA carried out by SLR ("Ecological Risk Assessment (ERA), Chedoke Creek, Hamilton, Ontario" dated February 12, 2020) to have moderate or high risk for impacts, or otherwise identified by the reports or in comments by the Ministry; and

vi) Addressing any ecological flow path requirements and connectivity within the creek in any remedial action plan that may impact low flow path and connectivity.

6. By October 31, 2021, or such other date approved by the Provincial Officer in writing, complete the approved Chedoke Creek Workplan.

7. Within one (1) month of the completion of the of the work undertaken pursuant to the approved Chedoke Creek Workplan, submit to the undersigned Provincial Officer, a report prepared by the Qualified Person confirming that the natural environment has been restored to pre-spill conditions and that further impairment to the natural environment will not occur as a result of the spill to the Chedoke Creek as detailed in the attached provincial officer's report, and at a minimum contain the following:

i) The details of the work undertaken to complete the Chedoke Creek Workplan;

ii) Any monitoring results completed before, during and after the work undertaken in accordance with the Chedoke Creek Workplan;

iii) Analysis of the results in Item 7(ii) above for the purposes of the intended monitoring; and

iv) Determination if any requirement for on-going monitoring is required to verify the effectiveness or maintenance of the remedial actions undertaken is necessary.

Cootes Paradise/Western Hamilton Harbour Area

8. By January 22, 2021, submit to the undersigned Provincial Officer for approval, a proposed remediation/mitigation report that is prepared by a Qualified Person(s) for the Cootes Paradise/Western Hamilton Harbor Area to offset the added nutrient loading, principally TP, identified in the Wood reports, the SLR reports and particularly the Hatch reports, and address any other potential on-going impacts (dissolved oxygen, algal blooms) as a result from the sewage spill to this area ("Cootes Paradise Report").

9. The report in Item 8 shall, at a minimum:

i. Identify and review all potential remediation or mitigation measures, whether direct, indirect, or a combination of measures with consideration for short and long-term measures to address the remediation goal to offset added nutrient loading particularly for TP and any potential on-going impacts (dissolved oxygen, algal blooms) from the sewage spill to the Cootes Paradise/Western Hamilton Harbor Area as identified in the Wood reports, the SLR reports and the Hatch reports;

ii. Undertake consultation with and provide a summary of comments received from the Royal Botanical Gardens, Hamilton Conservation Authority, the Ministry, and any other relevant affected stakeholders for potential remediation and mitigation options as per item i. above;

iii. Contain a cost/benefit analysis of all options to assess efficiency and effectiveness of any remediation or mitigation options;

iv. Identify the recommended options for remediation and mitigation;

v. Identify the proposed offset goal to achieve remediation and/or mitigation with respect to the approximate equivalent loadings from the sewage spill;

vi. Propose a methodology for quantification with respect to the offset of the loadings for any remediation and/or mitigation measures to meet the intended goal for overall remediation and/or mitigation to address the added TP loading from the spill; and

vii. Identify and propose timelines to implement the recommended remediation or mitigation measures to offset loadings from TP, impacts to dissolved oxygen from nutrients or other measures that may improve existing or potential impairments with identification of options that can be implemented as soon as possible to start to reduce the on-going or potential impacts.

10. Within three (3) weeks of approval of Item 8 above, submit to the undersigned Provincial Officer for approval, a proposed workplan for the approved remediation/mitigation measures for Cootes Paradise/Western Hamilton Harbour Area ("Cootes Paradise Workplan"). The workplan shall consider and address, as necessary, Work Ordered in Item 8 and 9 above and any ministry comments upon approval of Item 8, and shall include, but not be limited to, the following:

i) A detailed workplan and timeline for carrying out the approved remediation/mitigation options within the Cootes Paradise/Western Hamilton Harbour Area;

ii) Calculations referred to in Item 9 iv) and v) or as otherwise approved; and

iii) Proposed follow-up monitoring required to ensure the recovery and effectiveness of the remediation plan.

11. Within two (2) weeks of the approval obtained pursuant to item 10 above, commence implementation of the approved Cootes Paradise Workplan within the timelines set out in the approval.

12. Submit a report prepared by the Qualified Person within one (1) month of the completion of the work undertaken pursuant to the approved Cootes Paradise Workplan to the undersigned Provincial Officer confirming that the natural environment has been restored and outlining the completed items and the work undertaken to restore the natural environment, including, but not limited to, the following:

i) Any monitoring results completed before, during and after the work undertaken in accordance with Cootes Paradise Workplan;

ii) Analysis of the results in Item 12 (i) above for the purpose of the intended monitoring; and

iii) Determination if any requirement for on-going monitoring is needed to verify the effectiveness or maintenance of the remedial actions undertaken as necessary.

Communication

13. Provide notice to any impacted landowner(s) of the following items:

i) within 7 days of submission of any proposed workplan(s) submitted to the undersigned Provincial Officer for approval; and

ii) within 7 days of the approval of any workplan(s) by the undersigned Provincial Officer.

14. Provide notice to any impacted landowner(s) at least seven (7) days before the implementation of any work on the approved Chedoke Creek Workplan or the approved Cootes Paradise Workplan;

15. Within seven (7) days of any work on the Chedoke Creek Workplan and the Cootes Paradise Workplan, provide written confirmation to undersigned Provincial Officer, that implementation of the approved workplan(s) has commenced.

16. Commencing March 1, 2021 and on the first day of the month, until the completion report for each workplan is submitted, submit a three (3) month summary report, prepared by the Qualified Person(s), to the undersigned Provincial Officer, detailing all of the actions taken in implementing the approved workplan in the preceding three months.

17. Within (2) days of any limitations or changes being identified to the approved workplans, notify the undersigned Provincial Officer and within two (2) weeks, submit, in writing for review and acceptance, any proposed changes to an approved workplan with the relevant information to support any proposed changes. Written acceptance by the undersigned Provincial Officer of the proposed changes is required prior to implementation of any proposed changes.

18. Prior to the first of each month, provide to the undersigned Provincial Officer written, monthly progress updates on the progress made to comply with this Order.

19. In conjunction with the written monthly progress updates, the City shall meet with the undersigned Provincial Officer within 7 days of the submission of the monthly report to discuss the progress reports.

20. Post this Order on the web site of the City for public viewing within 24 hours of it being served and it shall remain posted unless otherwise directed by the undersigned Provincial Officer.

A. While this Order is in effect, a copy or copies of this order shall be posted in a conspicuous place.

B. While the Order is in effect, report in writing, to the District or Area Office, any significant changes of operation, emission, ownership, tenancy or other legal status of the facility or operation.

This Order is being issued for the reasons set out in the annexed Provincial Officer's Report which forms part of the Order.

Issued at City of Hamilton this 20/11/2020 (dd/mm/yyyy)

S. Yeudall

Shelley Yeudall
Badge Number: 881
Hamilton District

APPEAL/REVIEW INFORMATION

REQUEST FOR REVIEW

You may request that this order be reviewed by the Director. Your request must be made in writing (or orally with written confirmation) within seven days of service of this order and sent by mail or fax to the Director at the address below. In the written request or written confirmation you must,

- specify the portions of this order that you wish to be reviewed;
- include any submissions to be considered by the Director with respect to issuance of the order to you or any other person and within respect to the contents of the order;
- apply for a stay of this order, if necessary; and provide an address for service by one of the following means:
  1. Mail
  2. Fax

The Director may confirm, alter or revoke this order. If this order is revoked by the Director, you will be notified in writing. If this order is confirmed or amended by order of the Director, the Director's order will be served upon you. The Director's order will include instructions for requiring a hearing before the Environmental Review Tribunal.

DEEMED CONFIRMATION OF THIS ORDER

If you do not receive oral or written notice of the Director's decision within seven days of receipt of your request, this order is deemed to be confirmed by order of the Director and deemed to be served upon you.

You may require a hearing before the Environmental Review Tribunal if, within 15 days of service of the confirming order deemed to have been made by the Director, you serve written notice of your appeal on the Environmental Review Tribunal and the Director. Your notice must state the portions of the order for which a hearing is required and the grounds on which you intend to rely at the hearing. Except by leave of the Environmental Review Tribunal, you are not entitled to appeal a portion of the order or to rely on grounds of appeal that are not stated in the notice requiring the hearing. Unless stayed by the Environmental Review Tribunal, the order is effective from the date of service.

Written notice requiring a hearing must be served personally or by mail upon:

The Secretary Environmental Review Tribunal 655 Bay Street, 15th Floor Toronto, ON M5G 1E5	and	Director (Provincial Officer Orders) Ministry of the Environment, Conservation and Parks 119 King St. W., 9th floor Hamilton, ON, L8P 4Y7 Fax: (905) 521-7806

Where service is made by mail, it is deemed to be made on the fifth day after the date of mailing and the time for requiring a hearing is not extended by choosing service by mail.

Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal by

Tel: (416) 212-6349 Fax: (416) 326-5370 www.ert.gov.on.ca

FOR YOUR INFORMATION

- Unless stayed by the Director of the Environmental Review Tribunal, this order is effective from the date of service. Non-compliance with the requirements of this order constitutes an offence.
- The requirements of this order are minimum requirements only and do not relieve you from complying with the following:
  - Any applicable federal legislation;
  - Any applicable provincial requirements that are not addressed in the order; and
  - Any applicable municipal law.
- The requirements of this order are severable. If any requirement of this order or the application of any requirement to any circumstances is held invalid, the application of such requirement to other circumstances and the remainder of the order are not affected.
- Further orders may be issued in accordance with the legislation as circumstances require.
- The procedures to request a review by the Director and other information provided above are intended as a guide. The legislation should be consulted for additional details and accurate reference.

Ministry of the Environment Conservation and Parks

Ontario

Appendix A -Site Map
Chedoke Creek, downstream of the Main/King Combined Sewer Overflow discharge pipe, the eastern end of Cootes Paradise and western end of Hamilton

Drinking Water and Environmental Compliance Division
Central Region Technical Support Section

Legend

- Chedoke Creek Outfall
- Point of Interest
- Main/King Combined Sewer Overflow Tank and Pumping Station (HCSO4)
- Combined Sewer Overflow Tank Overflow Pipe
- Glen Road, Hamilton

Land Use

- Vacant (no colour)
- Agricultural
- Residential
- Commercial
- Industrial
- Institutional
- Special/Exempt
- Government

N

Data Sources, Uses and Constraints

1. Parcel boundary and basemap provided by the Ministry of Natural Resources and Forestry
2. Land Use information provided by the Municipal Property Assessment Corporation

Disclaimer

The map shown here is for illustration purposes only. Ministry of the Environment, Conservation and Parks provides this information with the understanding that it is not guaranteed to be accurate, correct or complete and conclusions drawn from such information are the responsibility of the user. While every effort has been made to use data believed to be accurate; a degree of error is inherent in all maps. Map products are intended for reference purposes only, and the Ministry of the Environment, Conservation and Parks will accept no liability for consequential and indirect damages arising from the use of this map. This map is distributed 'as-is' without warranties of any kind, either expressed or implied, including but not limited to warranties of suitability to a particular purpose or use.

0 125 250 500 750 1,000 Metres

APPENDIX B: Order Consultation Summary

Date	Event Type	Regulatory Agency / Stakeholder Organization	Agency Acronym	Stakeholder Participants	Team Participants	Event Summary	Questions	Response	Actions / Commitments	File Reference
YYYY-MM-DD	*Call / Email / In-person Meeting*	*Agency / Company / Organization Name*	*Acronym*	*Name; email address*	*Company: Name*	*Brief summary of engagement, items discussed*	*Specific questions asked*	*Response(s) if provided*	*Action item(s) or post-engagement task(s)*	*Please save record of engagement as PDF in following format: YYYYMMDD_StakeholderName_CommType.pdf (emails, meeting minutes, etc.)*
2021/01/15	Email	Ministry of Heritage, Sport, Tourism and Culture Industries	MHSTCI	Malcolm Horne, Archaeology Review Officer; Malcolm.Horne@ontario.ca	Wood: Peter P.	Confirming archaeology survey requirements.	Will the City need to conduct a new archaeology assessment for the proposed project?	**No new assessment required** for Chedoke Creek area - see file.	None	20210115_MHSTCI_MHorne_Archaeology.pdf
2021/01/15	Email	Ministry of the Environment, Conservation and Parks	MECP	Stephen Burt	COH: Susan G.	Written submission confirming the City has retained a QP as per Items 1 & 2 of the Order.	Confirmation request	Confirmation received: Items 1 & 2 – City of Hamilton has met the requirements of this item. (see file)	N/A	20210115_MECP-COH_email_Respone to Directors Order No.1-PE3L3 Items 1 and 2.pdf
2021/01/29	Call	Royal Botanical Gardens	RBG	Tys Theysmeyer, Head of Natural Areas ttheysmeyer@rbg.ca	Wood: Ron S.	Access request to RBG information relevant to enhancing Chedoke Creek and Cootes Paradise.	N/A	N/A	Confirm if HHRAP update from 2012 is available. Tys to provide RBG reports/data.	20210129_RBG_TTheysmeyer_EcologicalData.pdf
2021/02/02	Call	Hamilton Conservation Authority	HCA	Scott Peck and Jonathan Bastien, Hamilton Conservation Authority; scott.peck@conservationhamilton.ca	Wood: Ron S.	Discuss - Information Availability; permitting needs and timing	What information does HCA have for the Chedoke and Cootes study areas? What information is required for a permit application and how long will it take to secure a permit?	Information: 2014-2019 sampling; no H&H modelling; flow monitor set up in 2020; regulation mapping covers all of Chedoke and Cootes - based on flood and erosion hazard; 1992 report on physical modelling of lower Chedoke is available; Permitting: will need to provide Staging, E&S, Flood risk assessment, Discharge and material management plan; land owner permission (RBG); SAR and ecological information	JB to provide 1992 report on physical modelling of outlet; **HCA can provide permit within 63 days**	
2021/02/02	Email	Transport Canada	TC	Navigation Protection Program NPPONT-PPNONT@tc.gc.ca	Wood: Dale K.	Provided summary of POO and requested meeting to discuss targeted dredging and to confirm if the project can be considered an emergency situation under the Canadian Navigable Waters Act.	N/A	N/A	Schedule a teleconference/ meeting	20210203_TC_NPP_MtgRequest.pdf 20210203_TC_NPP_MtgRequest-Response.pdf
2021/02/02	Email	Ministry of the Environment, Conservation and Parks	MECP	Brianne Brothers, Management Biologist (A) brianne.brothers@ontario.ca 905-321-5736 Paul Heeney, Manager Permissions and Compliance 613-202-1889 Paul.Heeney@ontario.ca	Wood: Dale K.	Request meeting with MECP SAR group to discuss timelines on permits, assessments and any processes that can be streamlined.	N/A	N/A	Schedule a teleconference/ meeting	20210202_MECP_SARgroup_MtgRequest.pdf 20210202_MECP_SARgroup_MtgRequest-Response.pdf
2021/02/02	Call & Email	Ministry of Natural Resources and Forestry	MNRF	Jennifer Harvard, Lands & Waters Technical Specialist jennifer.harvard@ontario.ca	Wood: Dale K.	Brief discussion and requested review of email summary and subsequent meeting to discuss targeted dredging and to confirm if the project will require an LRIA application and if so, whether this can be considered an emergency situation under the Act.	N/A	N/A	DK - sent email summary to JH DK - follow-up call 20210203w/ JH JH - email received confirming the project is considered channelization and is located within the jurisdiction of HCA. As a result, it falls under the LRIA O.Reg 454/96, and an **approval is not required through MNRF**. (see email to file)	20210202_MNRF_JHarvard_LRIA.pdf 20210203_MNRF_JHarvard_LRIA-Response.pdf
2021/02/04	Email	Fisheries and Oceans Canada	DFO	Andrea Doherty, SARA/Science Coordinator - Fisheries Protection Program andrea.doherty@dfo-mpo.gc.ca	Wood: Mark R., Dale K.	Requested meeting to discuss targeted dredging and to confirm if the project can be considered an emergency situation under the Fisheries Act.	N/A	N/A	Schedule a teleconference/ meeting	20210204_DFO_Adoherty_MtgRequest.pdf
2021/02/08	Call	Ministry of Transportation	MTO	Central Region Downsview Highway Corridor Management 416-235-5385	Wood: Dale K.	Contact for pre-consultation	Requested contact name for pre-consultation	Kevin Kelly, Corridor Management Officer kevin.kelly@ontario.ca 437-833-9479	send email K.Kelly	N/A
2021/02/08	Email	Ministry of Transportation	MTO	Kevin Kelly, Corridor Management Officer; kevin.kelly@ontario.ca 437-833-9479	Wood: Dale K.	Request pre-consultation meeting.	N/A	N/A	DK - email K.Kelly KK - reply cc internal MTO staff	20210208_MTO_KKelly_PreConsultationRequest.pdf 20210208_MTO_KKelly_PreConsultationRequest-Response.pdf
2021/02/08	Call	Impact Assessment Agency of Canada	IAAC	General information hotline	Wood: Bob F.	Left voicemail requesting return call.	N/A	N/A	Schedule a teleconference/ meeting	Note to file.
2021/02/10	Email	Royal Botanical Gardens	RBG	Tys Theysmeyer, Head of Natural Areas ttheysmeyer@rbg.ca	Wood: Dale K.	Request meeting	N/A	N/A	Schedule a teleconference/ meeting	20210210_RBG_TTheysmeyer_MtgRequest.pdf

Date	Event Type	Regulatory Agency / Stakeholder Organization	Agency Acronym	Stakeholder Participants	Team Participants	Event Summary	Questions	Response	Actions / Commitments	File Reference
2021/02/11	Conf. Call	Ministry of the Environment, Conservation and Parks	MECP	Paul Heeney, Brianne Brothers	Wood: Dale K. CoH: Tim C.	SAR discussion	Asked MECP for their input on permitting and potential options/guidance for consideration.	Three permitting options exist; 1) conventional OBP, 2) expedited OBP, and 3) Human Health & Safety under the ESA. Brianne provided a slide deck regarding pros/cons of these options and additional guidance for consideration.	Continue to review data and assess options.	Note to file.
2021/02/16	Email	Royal Botanical Gardens	RBG	Tys Theysmeyer, Head of Natural Areas ttheysmeyer@rbg.ca	COH: Cari V.	Chedoke Creek Targeted Dredge Work Plan	Tys noted an RBG permit would be required.	N/A	Follow-up with Tys re: permit requirements and timeline.	20210216_RBG-COH_TTheysmeyer_RBGPermit.pdf
2021/02/17	Conf. Call	Royal Botanical Gardens	RBG	Tys Theysmeyer, Head of Natural Areas ttheysmeyer@rbg.ca	Wood: Dale K.	Ecological data / SAR discussion and RBG permitting requirements.	Discussed SAR species in area, historical surveys and permitting. Requested additional data as available.	Tys will provide fishway catch data specific to American Eel observations. RBG will require submission of a research permit application via online portal to allow RBG an opportunity to provide comment and guidance regarding mitigation measures, construction considerations and SAR guidance.	Continue to engage RBG during workplan development.	Note to file.
2021/02/19	Email	Royal Botanical Gardens	RBG	Tys Theysmeyer, Head of Natural Areas ttheysmeyer@rbg.ca	Wood: Dale K.	Fishway catch records for American Eel from past five years.	N/A	N/A	N/A	20210219_RBG_TTheysmeyer_AmericanEelObsv.pdf
2021/02/23	Email	Fisheries and Oceans Canada	DFO	General Fisheries Protection Program email.	Wood: Dale K., Ron S. CoH: Tim C.	Submission of the Request for Project Review from.	N/A	N/A	Schedule a teleconference/ meeting once a biologist from the Regulatory Review Unit responds.	20210223_DFO_RFR-Submission.pdf
2021/02/25	Conf. Call	Ministry of Transportation	MTO	Neave Constantine, Corridor Management Officer; Shahbaz Asif, Drainage Officer; Kevin Kelly, Corridor Management Officer	Wood: Ron S., Dale K. CoH: Tim C.	Ron provided overview of the project and intended Permitting Compliance Report to summarize all stakeholder permits and approvals. Requested guidance regarding the required MTO permits.	Which permits will be required and what is the review timeline for MTO?	Encroachment Permit and Building and Land Use Permit required, also need to provide trucking routes for MTO consideration. Additional consultation will likely be required with MTO structural team if dredging is recommended near any piers at the fishway. **Typically 1-month review period for the above noted permits.**	Continue to engage MTO as plans develop.	Note to file.
2021/03/04	Email	Ministry of the Environment, Conservation and Parks	MECP	Brianne Brothers, Management Biologist (A) brianne.brothers@ontario.ca 905-321-5736	COH: Susan G.	MECP SAR Group review comments regarding the Chedoke Creek Remediation Work Plan	N/A	N/A	Update Work Plan as per the comments.	20210304_MECP-SAR_ChedokeCreekWorkPlan-Comments.pdf
2021/03/10	Email	Impact Assessment Agency of Canada	IAAC	Jeff Balsdon, Project Manager, Ontario Region	Wood: Bob F., Dale K., Ron S.	Email acknowledging request.	N/A	N/A	Provide additional information to IAAC regarding Hazardous Waste sections 56 and 57 of the IAA.	20210227_IAAC_JBalsdon_Response-MtgRequest.pdf
2021/03/10	Email	Impact Assessment Agency of Canada	IAAC	Jeff Balsdon, Project Manager, Ontario Region	Wood: Bob F., Dale K., Ron S.	Provided IAAC confirmation that the proposed project scope does not include the construction of a new facility, nor expansion of an existing facility for the treatment, incineration, disposal or recycling of hazardous waste	N/A	N/A	Acknowledgement from IAAC confirming whether the proposed project will be regulated under the IAA.	20210310_IAAC_BFelker-JBalsdon_FurtherInfo.pdf
2021/03/10	Email	Fisheries and Oceans Canada	DFO	General Fisheries Protection Program email response.	Wood: Dale K., Ron S. CoH: Tim C.	Acknowledgement the project submission has been sent to the Fish and Fish Habitat Protection Program Regulatory Review unit File No.21-HCAA-00211	N/A	N/A	Schedule a teleconference/ meeting once a biologist from the Regulatory Review Unit responds.	20210310_DFO_FPP_RFR-Received.pdf
2021/03/11	Email	Impact Assessment Agency of Canada	IAAC	General email address, Ontario Region, iaac.ontarioregion-regiondontario.aeic@canada.ca	Wood: Bob F.	Requested meeting to discuss targeted dredging and to confirm if the project will be regulated under the Impact Assessment Act.	N/A	N/A	Schedule a teleconference/ meeting	20210211_IAAC_GeneralMail_MtgRequest.pdf

APPENDIX C: Framework Consultation Summary

Date Received	From	Section	Page	Comments	GMBP Response
01-Mar	MECP	1.2	3	1. Page 3 – 4th paragraph references to Chedoke Creek running through 'sewers'. Chedoke Creek doesn't run through any sewers and this may cause confusion and unnecessary concern. The references to a closed piped system noted further down are more accurate to use here.	
01-Mar	MECP	3.2	11	2. Page 11 – Figure 3 and Appendix C – same comment as provided previously on the methodology and outcome of TP loadings contribution from certain sources. This does not appear to be reflective of other studies and the support is lacking. If the loadings are based on data in 2015-2019, it is overestimating the normal loading from Chedoke Creek as it includes the loadings added from the spill. While it may make sense with some caution to use the method in Appendix C for assessing loadings to Chedoke Creek if other information is not available for the loadings assessments to Cootes Paradise, there are more advanced assessments that have been completed and should be used here to better assess cost benefits on a holistic approach.	
01-Mar	MECP	3.2	12	3. Page 12 – Vision for Chedoke Creek looks good but should it include something about reduced anthropogenic impact on Cootes Paradise from the Chedoke Creek watershed as a vision? The stated goals should achieve this as well ultimately but it does guide the focus on what is within the City's control to some extent.	
01-Mar	MECP	3.4	13	4. Page 13 – Given that this is an initial high level screening of options and it includes longer-term projects, a mechanism or regular review process should be included to consider new options or revisit options considered here if further work or changes current knowledge or provides new opportunities or ideas.	
01-Mar	MECP	4.1	14	5. Page 14 Table 1 – Clarification of 'visibility' is required in this context. The other item that may also play into the timing of the larger or longer term projects should be the planning vision and timeline of needs to ensure that there are no increases in CSOs or the degradation of stormwater quality occurs over time. This should be tied in with this project and a process for assessing options that may change how an option is assessed and what it will address due to another process such as a flooding and drainage study, masterplan, development direction or some forward thinking reviews and may raise its priority as a result or be recognized that other factors may drive those projects a priority such as requirements under F-5-5. For example, a $15 million stormwater project with a >5 yr timeline may be elevated in priority if it may improve existing impacts along with permitting development in a connected area that may start occurring within 5 years allowing an overall benefit to the system and development to occur.	
01-Mar	MECP	4.1	14	6. Page 13 – Should the definition of "Low" say 'present negative impacts' instead of 'prevent negative impacts'? Otherwise it is confusing with this description and its use for evaluation.	
01-Mar	MECP	4.3	16	7. Page 16 - Figures 4 and 5 regarding average year and peak day loadings to Chedoke Creek – the rough estimate of this calculation should be noted here in the report and caution given on the accuracy in considering the use of this data for decisions.	
01-Mar	MECP	4.4	18	8. Page 18 – Aeration in Lower Chedoke Creek – clarification is needed on what this project is. Based on previous conversations, there should be two aeration projects for consideration here. Localized temporary aeration in Lower Chedoke Creek into Princess Point area should be considered for on-going low dissolved oxygen as a mitigative measure. It may also reduce the low flow, stagnant water conditions that occur in lower Chedoke Creek to reduce the potential for algal growth some while higher nutrient availability exists. If this is considered in other reports, then clarity in this report should be provided.	
01-Mar	MECP	4.4	18	9. Option table – for the most part it contains projects that are part of processes that should be considered or would need to be addressed at some time as part of maintenance and infrastructure upgrades. Were there other projects around habitat restoration, naturalization, or flow improvements considered for the Lower Chedoke Creek that were brought up by stakeholders? Where stakeholders involved in brainstorming sessions on potential projects outside of these possibilities?	
01-Mar	MECP	5.3.2	24	10. Page 24 – 5.3.2 Drainage and Masterplan – this report and any further process should identify thinking outside of the standard options and consider other more innovative options to separate or quasi separate combined and sanitary sewers during higher flows through twinning connections in between these areas or having connections solely for CSO areas to overflow keeping more higher strength separate sewage in the system to improve cost benefit options and to reduce impacts to receiving waters.	
01-Mar	MECP	5.3.3	24	11. Page 24 – Golf Course – Retrofit and Treatment Online – generally online stormwater treatment ponds are not supported by the ministry. Offline ponds are supported for the ability to reduce contaminants and maintenance without direct impact to a creek along with habitat and temperature considerations due to structures in creek. Clarification of this and how truly online this pond is should be discussed with the ministry before design is considered.	

Date Received	From	Section	Page	Comments	GMBP Response
01-Mar	MECP	5.4.1	26	12. Page 26 – Priority 1 – CSO Monitoring – This should include monitoring/understanding of unmonitored CSOs contribution to CSO volumes and flows.	
01-Mar	MECP	5.6.5	29	13. Page 29 – 5.6.5 – Wet weather flow in separated sewers – this should consider methods such as minimum construction standards or processes to add new connections to minimize and prevent I/I in new systems with verification upon construction.	
01-Mar	MECP	6.1	32	14. Page 31 – Table 8. Other priorities and drivers such as development, approvals and F-5-5 requirements, etc. may change this timeline and the City must consider this now and whether a 5+ yr timeline is soon enough to start addressing more of these needs and impacts for some of these pressures specifically with added new or significant infill development flows.	
01-Mar	MECP	6.1.1	32	15. Page 32 –near term improvements in Chedoke Creek - It is agreed that for some of this, it is a process and a priority driven goal that will take time. However, the dredging, improvements to nutrients for offsets from the spill and the need to address on-going low DO in areas from the spill are near term items. It is not clear how continued low DO in parts of Chedoke and into Princess Point are addressed in the near term where this is noted and part of the spill and whether some of these items are better addressed in the coming reports.	
01-Mar	MECP	6.2	35	16. Page 34 – Chedoke Creek Advisory Committee – The role in establishing watershed objectives, performance monitoring, monitoring programs and interpreting results in conjunction with other stakeholders through this committee is not advised. All of this already falls under the RAP mandate and cannot be separated from this forum as it is not solely a City led initiative. It is suggested that the role be considered to review, suggest, comment and provide a forum to streamline some of the public and stakeholder interaction as suggested and provide the City with objectives but be limited to that role in some manner. However, specific city purposed based monitoring programs could be within their preview and efficiencies with other programs incorporated for the benefit of all. Further discussions on the role integration with the Ministry, EC, and DFO RAP leads should be undertaken to ensure that clarity exists in this process.	
01-Mar	MECP	Appendix C	N/A	17. Appendix C – It is unclear how the spill was addressed in the loadings impacts for Chedoke creek as the CSOs would have been under reported in this time and the instream data was impacted at times by spill as well. As noted at the end of this Appendix, this is a rough calculation and should not be considered actual loadings. This should be noted in the report as stated above.	
01-Mar	MECP	General	N/A	18. It is unclear how this report ties into the overall picture to address the intent of the order in Chedoke Creek. This should be addressed on some level in this report. What are the specific objectives that are to be achieved? All objectives may not be clearly set out here at this time, but some goals on monitoring in the interim, during and after for spill related items and other work can be included. The City should identify these objectives as soon as possible. The Ministry has already identified some of the concerns relating to the spill that provides some focus from our perspective but also some of the legacy on-going impacts that are a part of this as well that need to be considered as the City moves forward.	Will be addressed separately by the City/others in continuing to address the requirements of the order
01-Mar	MECP	General	N/A	19. While the focus of this report is on the Chedoke Creek itself, it does tie into the full picture with Cootes Paradise. The focus and priority of specific projects may be brought forward or changed when looking at the full scope of the projects and area. This remains somewhat flexible and difficult for the Ministry to see the full picture until the Cootes Paradise report is also created. At this time, what has been provided for Chedoke is a great start at looking at the full picture and putting together potential steps forward in this process. There should be some clear commitment and approximate timelines to undertaking some of these projects in a reasonable time for both improvements to the current impacts that are seen and to ensure that further impact from on-going sources and development is reduced.	Will be addressed separately by the City/others in continuing to address the requirements of the order
25-Feb	City Operations	General	N/A	Just wanted to clarify the comment from Ops regarding the trunk inspection recommendation (near-term, priority 2). I talked to Don yesterday and we looked at the example of the combined trunk just upstream of the Royal CSO tank. The last inspection for that leg seems to have been in 2014/16. There isn't a set frequency for trunk inspection – it's more so dictated by its last condition assessment grade. Per Don's suggestion, if an inspection is being proposed for the sewers in this sewershed, can you provide a bit more detail – what do you recommend the inspection should be looking for? (i.e. how propose to identify extraneous 'inflow' for a combined sewer?) Are there key segments/areas? With some additional clarification, this recommendation will be OK.	
23-Feb	Conservation Hamilton	General	N/A	First and foremost, any improvements to Chedoke Creek water quality are a good thing, and the report does present some great opportunities that HCA staff would support.	

Date Received	From	Section	Page	Comments	GMBP Response
23-Feb	Conservation Hamilton	1.2	3	Figure 1 and 2 seem to be reversed. The text refers to Figure 1 as the overall watershed yet the Figure 1 shows the lower urbanized area of the watershed. I think that Figure 1 should be Figure 2 and Figure 2 should be Figure 1.	
23-Feb	Conservation Hamilton	General	N/A	The report does acknowledge that the high-level estimations of loadings need further assessment to more accurately define them. These assessments would dove-tail with HCA flow monitoring efforts in Chedoke Creek and Lower Spencer Creek to better determine loadings.	
23-Feb	Conservation Hamilton	General	N/A	The report seems to focus on enhancement options to aspects that have quite small contributions to an average year nutrient loading (CSO, landfill, Highway 403), while the biggest contributor (Stormwater) is typically a lower priority.	
23-Feb	Conservation Hamilton	General	N/A	We continue to think there is a chance that baseflow is a more significant contributor to overall nutrient loading than the report estimates, but we still need more flow data (currently being collected) to confirm this. If baseflow is a more key contributor, then enhancement options such as Removing cross-connections, CSO monitoring to ensure that dry event spills to the creek are not occurring, and Retrofits throughout Watershed (online options that can capture baseflow total phosphorus in Chedoke Creek should be considered for increased priority.	
23-Feb	Conservation Hamilton	3.4	12	The monitoring section does leave the opportunity for the City to commence their own WQ monitoring program. HCA staff are available to discuss our water quality monitoring program and how this can be expanded to meet City, HCA and watershed needs.	
23-Feb	Conservation Hamilton	3.2	11	We would be interested to review how the contribution breakdown was calculated to Cootes Paradise from the various watercourses / aspects, as this information is not included in Appendix C. We are not aware of any flow data on these watercourses which would allow for properly estimating loadings. If the City has such flow data, this information would be very helpful in our HHRAP WQ monitoring program.	
23-Feb	Conservation Hamilton	1.4	7	We acknowledge that the details of the spill are not the focus of this study. That said, in Section 1.4 on page 7, the report states "Prior to the second gate failure, based on a review of historical rainfall data, discharge to the creek occurred only during wet weather flow (WWF) conditions, mainly due to rainfall events, or in some cases (in late winter/early spring), due to snowmelt and/or elevated groundwater infiltration entering the contributing sewage collection system. After the second gate failure, discharges to the creek began to also occur during dry weather flow (DWF) conditions."	
23-Feb	Conservation Hamilton	General	N/A	It would be really helpful to our Chedoke Creek WQ understanding if we could get copies of the Hatch annual CSO reports on which this information is based. Our water quality sampling at Princess Point suggests a different situation, with considerably elevated concentrations of TP & E coli during dry events in 2014 -18, compared to prior and 2019-2020 values. This suggests that the CSO may have been contributing elevated TP / E coli loads to the creek more than just during storm events from 2014 to 2018.	
23-Feb	Conservation Hamilton	Appendix C	C-8, D-1, 16	While not critical to the findings, Appendix C contribution breakdown (page C-8) did not equal the Appendix D (page D-1) or main report (page 16) contribution break down. Can this be clarified?	
25-Feb	RBG	Overall	N/A	Specifically regarding CSOs, please include the policy objectives in the document for the current CSO tanks, as well as the addition CSOs (Tope, Glen, Delbrook, and Aberdeen), and clarify if downspout disconnection is a policy and/or educational outreach program. In addition, the Main-King CSO tank has a policy objective not reflective of its location of discharge, and as such is a policy change is needed. We also see there is still a misunderstanding of water in the buried channels system which is significantly affecting context and data calculations.	
25-Feb	RBG	Overall	N/A	Further, a key ultimate question is this. At what point would the Royal Botanical Gardens Desjardin Trail adjacent to Chedoke Creek delta be suitable for recreational contact, based on potential implementation timelines? Currently, our impression is that optimistically this could occur by 2023/24. In addition, is there a place within this framework to link into the LRT? This supports the proposed LRT central station, that sits on the confluence of tributaries that includes the main Chedoke tributary. This central tributary is also the only section of natural channel potentially supporting accessible Lake Ontario fish habitat in the nearer term.	
25-Feb	RBG	3	10	Update/replace the Cootes Paradise vision - recommend removing Cootes Paradise vision, use RBG Vision in the context section - For the pyramid feature rename Cootes Vision to Cootes Paradise Nature Sanctuary (i.e.. What it is as a place as identified by RBG and supporting by the RBG Act - see further below for specifics). It is inappropriate for the framework document to create new vision statements for the Royal Botanical Gardens property.	

Date Received	From	Section	Page	Comments	GMBP Response
25-Feb	RBG	Maps	N/A	Mapping refinements - the base map is a valuable communication tool and thus refinements and missing CSOs to be added to support communications.	
25-Feb	RBG	Overall	N/A	Review and update the Main-King Policy objective. Highlight/include in the text, the Royal Tank CSO Policy Objective, which is appropriate for this location's receiving body of water and different from the Main-King Tank.	
25-Feb	RBG	Overall	N/A	Dry weather baseline condition of the creek needs communication as it is reflective of several of the framework needed improvement options pertaining to sewage capture, as well as miscommunication of the issues in the upper watershed.	
25-Feb	RBG	1.2	3	Clarify the use of terms associated with upper and lower Chedoke. Upper Chedoke would be best to represent above the escarpment, which aligns with 3 features, the physical topography, the combined vs. separated sewers, and fisheries objectives of Lake Ontario (note there is also a Hamilton Harbour Fisheries Management Plan created by OMNRF).	
25-Feb	RBG	Overall	N/A	Data Clarification of stormwater vs. loadings. These clarifications then connect to various graphs, implications, and project impact summaries in Appendix C (pie chart below).	
25-Feb	RBG	5	21	Refinement of presentation of section 5.0 the layout provides some confusion due to the inconsistent timelines approach between sections and capital vs. program.	
25-Feb	RBG	5.3.2	24	Project addition/separation from sewer separation as a distinct project. Please identify the separation of the creek that flows from Iroquois Heights and is direct sent to the Woodward WWTP via the Royal CSO tank 24/hrs. a day as a separate project. This is substantially different than catch basin/sanitary sewer separation (project 11). This could also be done for the east side tributary which follows a similar pattern, but using the Main-King lift station pumps.	
25-Feb	RBG	6	N/A	Education programming support for downspout disconnection and rain garden programs, or are these policy establishment items? By the regulations for wastewater systems these seem to be policy items in support of CSO system management. This simple element is a fundamental communication item.	
25-Feb	RBG	6	N/A	Educational - is there an opportunity to include improvements to trail connectivity between the waterfront (Princess Pt and the rail trails with Chedoke Golf Course)	
25-Feb	RBG	5	N/A	Projects - stream habitat projects needed further refinement in organization in section 5 as there is a mix of the way it is being treated.	
25-Feb	RBG	Overall	N/A	Appendix's as an approach - much appreciated and helps clarify a complicated situation.	
25-Feb	RBG	1.2	3	A Statistic of watershed % imperviousness for combined and separated systems would be helpful for understanding and communications.	
25-Feb	RBG	1.2	3	Highlight statistic of % buried channel - an attempt on this statistic was made in the HCA stewardship action plan - connects to habitat and daylighting as well as instream ecological process that naturally improve water quality.	
25-Feb	RBG	1.2	3	Highlight the % watershed in green spaces (i.e.. Parks/hydro corridor/golf course/HCA property)	
25-Feb	RBG	1.2	3	Maps add Iroquois Heights, and other CSOs (Aberdeen, Tope, Glen, Delbrook)	
25-Feb	RBG	2.4	9	Put Royal Botanical Gardens first, and include in brackets (Cootes Paradise landowner)	
25-Feb	RBG	3	10	Pyramid - "Cootes Paradise Vision" - Update to Cootes Paradise Nature Sanctuary	
25-Feb	RBG	3	10	Watershed Vision (Why): The Cootes Paradise and Chedoke Creek Watershed Vision represent the "The Goal" of the water quality improvement to the community in broad qualitative description objectives that can be easily interpreted. Updated to - Watershed Vision (Why): The Chedoke Creek Watershed Vision represent the "The Goal" of the water quality improvement in support of the Royal Botanical Gardens mandate and the community in broad qualitative description objectives that can be easily interpreted.	
25-Feb	RBG	3	10	RBG Vision - A world in which everyone is awake to the beauty, diversity, and necessity of plants, and from that consciousness more activity works together to protect and preserve plants species and habitats, and by extension our plant	
25-Feb	RBG	3.1	10	include Cootes Paradise represents ~90% of the fish and wildlife habitat of the HHRAP	
25-Feb	RBG	3.2	11	replace chart - see concentrations diagram below	
25-Feb	RBG	3.3	12	align with Royal Botanical Gardens	
25-Feb	RBG	5	21	this is a challenging section to communicate and align with section 4 prioritization and category timelines, so further refinement is needed.	
25-Feb	RBG	Policy item projects	29	Recognize/correct Royal Botanical Gardens (act and mandate) in city policy and planning appropriately	

Date Received	From	Section	Page	Comments	GMBP Response
25-Feb	RBG	Policy item projects	29	Recognize Cootes Paradise as a place designated for environmental protection and education and waterfront access	
25-Feb	RBG	Policy item projects	29	Reflect the leaky drinking water pipes, leaking water and enriched with phosphorus to the surface water flow and thus nutrient enrichment challenge	
25-Feb	RBG	Policy item projects	29	Review and update the Main-King objective. Highlight the Royal Policy Objective for CSOs	
25-Feb	RBG	Mapping	N/A	Highlight the main green space areas - i.e. areas that aren't stormwater or sewer impacting the streams and providing cleaner water	
25-Feb	RBG	Mapping	N/A	Include all the CSOs (add Glen, Tope, Aberdeen, and Delbrook) on the map	
25-Feb	RBG	Data Calculations	N/A	Fully support the measures being used, however a review of the actual calculations is perhaps needed as they do not look at all reflective of the HCA data and the watershed (stormwater appears as highly overstated - see map below, and search out the other CSOs of Chedoke, and HCA data on dry weather flows)	
25-Feb	RBG	Data Calculations	N/A	Assumption that 30% of the flow reaches Cootes is incorrect. Tributaries of Chedoke West, Lands, and Lower Chedoke East don't reach Cootes Paradise - i.e.. Are fully taken into the CSO system (hence the CSO overflow issues) - see map below.	
25-Feb	RBG	Data Calculations	N/A	Stormwater - includes sewage thus a total loadings needs refinement as the sewage is significantly biasing stormwater loading calculations. And assumption is required to undertake reasonably accurate calculations. A review of HCA data to determine this is needed. See attached 2020 HCA data and dry weather conditions - HCA station CP 9 is the main upper tributary that reaches Cootes Paradise and is the poorest dry weather water	
25-Feb	RBG	Data Calculations	N/A	Baseline flow conditions needed in a graph or image/map the illustrates the various tributaries and their status. I.e. the underlying day to day conditions in the summer	
25-Feb	RBG	Data Calculations	N/A	The use of lower Chedoke relative to other tributaries would need to use data post July 2018 (post spill). By review it currently does not appear that station CP11 is part of any of the calculations so this may not be an issue.	