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**SUBJECT:** **Conservation Halton's Preliminary Analysis for the Burlington GO Major Transit Station Area and Downtown Area Flood Hazard Impacts and Mitigation Assessment**  
**CH File Number: AMPR-979**

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Conservation Halton (CH) staff completed a preliminary analysis of the Hager-Rambo Diversion Channel (HRDC) in support of the City of Burlington's preliminary Flood Hazard Impacts and Mitigation Assessment for the Burlington GO Major Transit Station Area (MTSA) and Downtown area. CH's preliminary analysis was completed in cooperation with staff from the City of Burlington and the City's consultant, WSP. The objective of the City's assessment is to complete a high-level evaluation of stormwater systems, using hydraulic modelling, to identify potential infrastructure improvement alternatives that could help mitigate or reduce flood hazard risks, build climate change resiliency, and support growth and development in the Burlington GO MTSA and Downtown area.

This memo provides findings of CH staff's preliminary analysis and includes recommendations for future studies and initiatives covering a broad range of solutions (e.g., infrastructure improvements, flood hazard modelling updates, policy) that could be employed to mitigate, reduce, and/or manage flood hazard risks in the Burlington GO MTSA and Downtown area.

CH staff understands that content from this memo will be used to inform City staff's report to present findings of the preliminary Flood Hazard Impacts and Mitigation Assessment to the City Committee of the Whole in May 2024.

### **Background**

In 2020, the City completed a Phase 1 Flood Hazard and Scoped Stormwater Management Assessment for the Burlington GO MTSA and Downtown area. Prior to the Phase 1 Study, the creeks south of the diversion channel in the Lower Rambo Creek watershed were considered part of the municipal storm drainage system; however, the Phase 1 study revealed that the extent of the flood hazard in the Lower Rambo watershed was greater than previously understood and the Lower Rambo watershed was confirmed to be regulated by CH. A notice was published on CH's website, and in the Burlington Post on November 18, 2021, to inform the public of the change in regulatory status based on the findings of the City's Phase 1 study.

WSP was retained by the City to undertake a Phase 2 study to update the Phase 1 flood hazard modelling and mapping for tributaries within the Rambo and Hager Creek watersheds, located within the Burlington GO MTSA and Downtown area. The mapping and modelling developed as part of the

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Phase 2 Study is considered the best available information for understanding the magnitude and extent of the flood hazard, assessing potential risk to life and property, and land use and regulatory decision making. Burlington Council received the final MTSA Phase 2 Flood Hazard Assessment, Burlington GO and Downtown, on July 11, 2023. The public was informed of the study and the changes to CH's Approximate Regulation Limit (ARL) mapping in summer 2023. The CH Board approved the updated flood hazard mapping for incorporation into CH's ARL mapping in October 2023.

Based on the results of the Phase 2 Study, a number of private properties and potential redevelopment sites in the Burlington GO MTSA and Downtown area are identified within a flood hazard (i.e., flood plain or spill). While Provincial policy generally directs development away from hazardous lands, municipalities are also directed to plan for development in Strategic Growth Areas to accommodate significant population and employment growth. Given competing Provincial objectives and policies related to growth and development and natural hazards in a key area of the City, there are benefits to identifying long-term solutions that can mitigate potential risk to public safety or of property damage, increase opportunities for growth and development, and build climate change resiliency. As a result, the City, in cooperation with CH, is undertaking a preliminary Flood Hazard Impacts and Mitigation Assessment to establish what options may be available to mitigate or reduce risks associated with flood hazards and specifically, spill flood hazards.

### **Preliminary Analysis and Recommendations**

The City's preliminary Flood Hazard Impacts and Mitigation Assessment separated the preliminary analyses into phases. The City and WSP carried out Phases 1a and 2 which covered an analysis of flood mitigation opportunities for the spill flood hazard identified at Rambo Creek and the QEW railway underpass and associated spill flood hazards identified downstream to Fairview Street (Phase 1a) as well as a review and assessment of the hydraulic capacity of Rambo Creek and East Rambo Creek south of Fairview Street to Lake Ontario (Phase 2). As identified in the attached figure (**Attachment One**), CH's preliminary analysis focused on:

- Reviewing the hydraulic capacity of East Rambo portion of the HRDC between the CN/Metrolinx rail culvert and Fairview Street and any potential spill flood hazard mitigation opportunities along this reach (Phase 1B), and
- Reviewing the hydraulic capacity of the Hager-Rambo Diversion Channel (HRDC) from downstream of Brant Street to its confluence with Indian Creek and any potential flood hazard mitigation opportunities along this reach (Phase 3).

A preliminary analysis of the HRDC's current performance and hydraulic capacity was advanced to assess whether it could accommodate additional flood flows and be used to mitigate some of the flood risks identified within the Burlington GO MTSA and Downtown area. The methodology, detailed analysis and associated modelling is available to City staff upon request. Preliminary results from the analysis indicates that during the Regional storm (i.e., Hurricane Hazel) the HRDC would be operating beyond its hydraulic capacity, and that extensive upgrades would be required before it could safely convey additional flood flows from upstream.

Increasing the hydraulic capacity of the HRDC would require extensive upgrades and would need to be implemented through a sequenced and systematic approach to ensure that the improvements would be effective and safe for existing populated and developed areas (i.e., would need to ensure that

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mitigating flood hazards in the Burlington GO MTSA and Downtown area would not result in new areas of increased risk). Any potential improvements would need to be examined through a Master Plan / Class EA process.

In addition to upgrades to the HRDC, opportunities exist to explore a range of alternatives or combination of approaches could be explored to address flood risk in the Burlington GO MTSA and Downtown area. Mitigating potential risk/impacts of flood hazards requires a holistic approach that could involve infrastructure improvements, updated flood hazard modelling, and new policies and will involve multiple stakeholders including the City, CH, the development community, and residents. Outlined below are CH's recommendations in this regard.

### 1. Potential Infrastructure Improvements

As outlined above, improvements to the HRDC would be required for it to safely convey additional flood flows and would need to ensure that in mitigating flood hazards in the Burlington GO MTSA and Downtown area would not result in new areas of increased risk. The potential improvements considered by CH staff's preliminary analysis are listed from downstream towards upstream; and CH staff recommends that improvements generally proceed in that order, though the final preferred alternatives and order should be established through a future comprehensive study.

#### *a. QEW Enclosure*

The HRDC is conveyed beneath the QEW via three nine (9) foot diameter concrete tunnels. The preliminary analysis suggests that these tunnels may be unable to fully convey all existing flood flows. To avoid downstream impacts, conveyance of flows beneath the QEW would need to be increased and/or inflows would need to be attenuated via increased flood storage within upstream areas. The preliminary analysis has not formally assessed potential improvements, however, the conceptual addition of a fourth tunnel beneath the QEW or provision of approximately 40 thousand additional cubic metres of flood storage volume would allow impacts to be avoided. There may be an opportunity to use upstream parklands to provide additional flood storage; however, the feasibility of this approach requires further analysis and review.

#### *b. Maple Avenue*

The HRDC is conveyed beneath Maple Avenue via two box culverts (6 m width by 2.7 m rise). The preliminary analysis suggests that the structure can generally convey most existing flood flows (some minor overtopping), however, the direction of additional flood flows would likely result in increasing flood risk on Maple Avenue and within the adjacent developed areas. The preliminary analysis has not formally assessed potential improvements, however, the conceptual replacement of the existing structure with an eighteen (18) metre span bridge, similar to the upstream Thorpe Avenue crossing structure, would likely avoid impacts.

#### *c. CNR Rail Crossing*

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Downstream of Brant Street, the HRDC is conveyed beneath a railway spur via two culverts [fourteen (14) foot diameter, asphalt lined structural plate]. The preliminary analysis suggests that the structure can generally convey most existing flood flows (potential for some minor spill), however, the direction of additional flood flows would increase the spill and similar flood risks would continue (via an alternate pathway) to effect the Burlington GO MTSA and Downtown area. Replacement of the existing crossing structure with a ten (10) metre wide by 3.5 metre rise box, or installation of a third barrel, would likely avoid impacts.

### *d. Edinburgh Drive*

Upstream of where the East Rambo portion of the HRDC enters the enclosure beneath Fairview Street, a small spill may occur resulting in inundation of several adjacent properties off of Edinburgh Drive. The preliminary analysis suggests that this potential spill is very small under existing conditions, however, it can be expected to increase if additional flows are directed into this reach of the HRDC. Use of grading to contain flows within the HRDC may be one potential strategy to prevent/mitigate this potential spill. Though not formally assessed, conceptually raising grades between 0.3 to 0.5 metres would likely suffice. Use of a flood wall may also be an option; however, this may present challenges from a regulatory perspective if seeking its inclusion within flood hazard mapping.

### *e. East Rambo Spill Flood Hazard*

Between the CNR/Metrolinx rail culvert and Fairview Street, on the East Rambo portion of the HRDC, potential for spill eastward to the existing properties and Fairview Street has been identified. CH's preliminary analysis suggests that this spill may actually be smaller than was suggested by modelling from the City's Phase 2 Study. Use of grading to contain the spill within the HRDC may be one potential strategy to prevent/mitigate this potential spill. Though not formally assessed, conceptually raising grades between 0.3 to 0.5 metres would likely suffice. Use of a flood wall may also be an option; however, this may present challenges from a regulatory perspective if seeking its inclusion within flood hazard mapping.

### *f. Argon Court*

It is understood that the storm sewer (1200 mm diameter RCP at 0.20 percent slope) which drains the sag on Fairview Street, near Argon Court, may not have the capacity to convey the magnitude of flow/spill conveyed toward this area under a regulatory flood and that flows in excess of its capacity would generally accumulate within the sag and eventually spill toward the Downtown area via Argon Court and/or other spill pathways. CH's preliminary analysis suggests that this spill may be smaller than was suggested by modelling from the City's Phase 2 Study, generally due to the upstream spill from the channel being smaller (East Rambo Spill Flood Hazard). If full elimination of the Argon Court Spill is ultimately sought, twinning or installation of a relief storm sewer is a potential approach which could be used to eliminate this spill and/or to reduce potential ponding within the sag on Fairview Street. Use of a flap gate/backflow valve may also need to be considered as part of any future upgrade. Sizing of

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the relief sewer would depend upon if the upstream spill (East Rambo Spill Flood Hazard) is mitigated or not, as it is a direct contributor to the Argon Court spill.

### **2. Modelling Updates**

A key component of informing and supporting decision making for potential infrastructure improvements is a comprehensive update to the watershed's hydrologic and hydraulic models. A hydrologic model update was recommended by the City's Phase 1 and Phase 2 studies, as well as previously by CH staff. CH's preliminary analysis continues to support this recommendation. This comprehensive update would improve our understanding of flood flow rate estimates to better inform infrastructure assessments and sizing recommendations. There may also be an opportunity to calibrate and/or validate the hydrologic model(s) as part of a comprehensive update using data from CH's HRDC flow gauge. This would support the model's primary objective of understanding and predicting the watershed's runoff response.

In addition to supporting potential infrastructure improvements, the updated modelling may inform flood hazard mapping refinements in the Burlington GO MTSA and Downtown area. This may be particularly beneficial along the East Rambo portion of the HRDC between the CN/Metrolinx rail culvert and Fairview Street where CH's preliminary analysis suggests that the spill flood hazard may be smaller than what was defined by the City's Phase 2 Study.

### **3. Spill Flood Hazard Policy**

In addition to the potential infrastructure and modelling solutions, a review and update of CH and City policies for development within spill flood hazards may provide further opportunities for landowners to mitigate flood risks. CH staff is currently undertaking a Spill Flood Hazard Policy Review and Update. In November 2022, CH's Board endorsed a risk-based, flexible policy approach be taken to address development in spill flood hazards. This has enabled CH staff to begin developing general, jurisdiction-wide spill flood hazard policy with the opportunity for area specific policies where a comprehensive study is undertaken by a municipality or CH. Staff anticipates that draft spill flood hazard policies will be available for review and feedback in 2024 and will work closely with City staff and other municipal partners in this regard. Detailed spill flood hazard policies will provide the City, development community and public with greater certainty and transparency on CH's requirements for developing in spill flood hazards and enable consistent and efficient review of development proposals by staff. Opportunities may also exist for the City and CH to work together to develop area specific policies, as necessary.

### **4. Provincial Advocacy**

As part of exploring all options to address flood risk in the Burlington GO MTSA and Downtown area, the City and CH could request that the Province (Minister of Municipal Affairs and Housing and Minister of Natural Resources) work with City and CH staff to discuss competing Provincial objectives and policies related to growth and development and natural hazards. This could include exploring policy solutions to address the challenge of competing Provincial objectives and policies related to growth and development and natural hazards in a key area of the City and advocating for updates to the Technical

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Guide, River & Stream Systems: Flooding Hazard Limit (Ministry of Natural Resources) last updated in 2002 to provide direction for the assessment of development in spill flood hazards

### **Next Steps**

A preliminary analysis of the HRDC's current performance and hydraulic capacity was advanced to assess whether it could accommodate additional flood flows and be used to mitigate some of the flood risks identified within the Burlington GO MTSA and Downtown area. Preliminary results from the analysis indicates that during the Regional storm (i.e., Hurricane Hazel) the HRDC would be operating beyond its hydraulic capacity, and that extensive upgrades would be required before it could safely convey additional flood flows from upstream. This would need to be implemented through a sequenced and systematic approach to ensure that the improvements would be effective and safe for existing populated and developed areas (i.e., would need to ensure that mitigating flood hazards in the Burlington GO MTSA and Downtown area would not result in new areas of increased risk).

CH staff recommends advancing the preliminary Flood Hazard Impacts and Mitigation Assessment work to consider a broad range of potential solutions for addressing flood risk within the Burlington GO MTSA and Downtown area. A comprehensive study (e.g., Master Plan / Class EA) may help assess, analyze and prioritize the broad range of potential solutions. As part of this process a range of options should be explored, including the following:



- assessment of all infrastructure (e.g., Municipal, Provincial, CH & CN) and mitigation improvement options (e.g., additional flood storage areas)
- undertaking flood hazard and flood risk modelling updates and mapping refinements
- participating in CH's spill flood hazard policy review and update and developing area specific policies, where appropriate
- working with the Province (Minister of Municipal Affairs and Housing and Minister of Natural Resources) to discuss competing Provincial objectives and policies related to growth and development and natural hazards, exploring policy solutions and advocating for technical guidance updates regarding the assessment of development in spill flood hazards

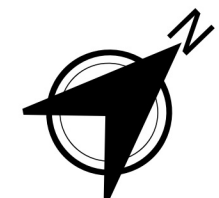
CH staff look forward to continuing to work with City staff, the development community, and residents to help advance solutions to mitigate potential risk to public health or safety or of property damage from flood hazards.

### **Attachment One: CH Preliminary Analysis Study Area**


**Figure 1: Study Area Map  
Preliminary Analysis of the  
Hager-Rambo Diversion  
Channel's Performance and  
Hydraulic Capacity**

### Legend

-  Study Area
-  Study Watercourse



0 200 400 600 m



Scale 1 : 10 000  
(11" x 17")

