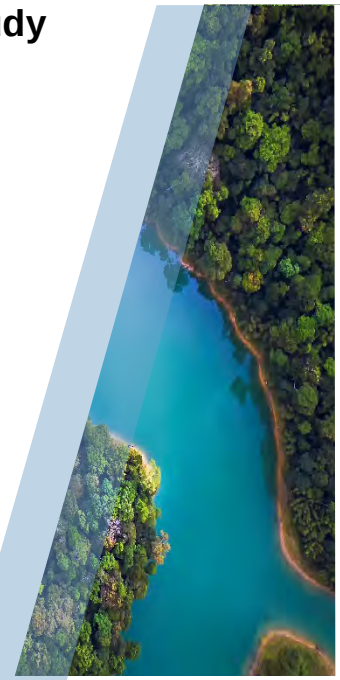
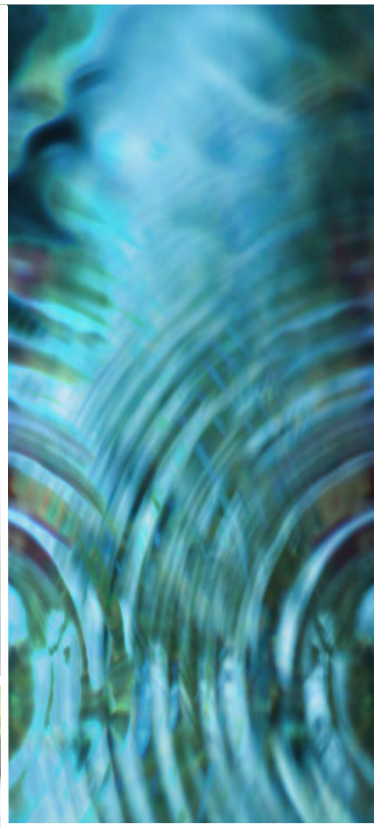
Project File Report

Municipal Class Environmental Assessment for

Joshua's Creek Flood Mitigation Study





Town of Oakville

Executive Summary

GHD Limited (GHD) was retained by the Town of Oakville (Town) to conduct a Schedule 'B' Municipal Class Environmental Assessment (MCEA) as part of the Joshua's Creek Flood Mitigation Opportunities Study. The MCEA examined the need for improvements and opportunities to address flood control issues along the studied portion of Joshua's Creek from Upper Middle Road to Lake Ontario.

Problem and Opportunity Statement

The Town conducted multiple hydraulic modeling studies to identify riverine flood risk sites along Joshua's Creek from Upper Middle Road to Lake Ontario. The Town used the studies' findings to assess areas of flood risk within the Joshua's Creek watershed and have undertaken this study to establish feasible flood mitigation options and control measures that will most effectively address the identified flood risk sites within the Study Area.

Existing Conditions

An inventory of the existing environment was completed through a desktop review and field investigations for the Study Area and is summarized below.

Hydrology and Hydraulics

A hydrologic model of the Joshua's Creek catchment area was developed and used to estimate peak flow rates along the creek, associated with the 2 to 100-year return period storm events, the climate change adjusted 100-year storm event, and the Regional (Regulatory) storm event. The climate change adjusted 100-year storm event represents rainfall parameters based on worst case scenario greenhouse gas concentrations over a time period of 2080-2100. The Regional (Regulatory) storm event refers to rainfall conditions experienced during the 1954 Hurricane Hazel storm event. Then a combination of 1-dimensional (1D) steady state and 2D unsteady state hydraulic models were developed and used to route the flow rates through the geometry of the creek to calculate corresponding channel velocities and water surface elevations. The water surface elevations were mapped over the terrain to establish the flood inundation boundaries under existing conditions. Results indicate that the majority of flood risk occurs under the highest peak flow conditions possible during the Regional storm event. Under 2 to 100-year return period storm events and under climate change conditions flood risk is significantly reduced. No residential buildings are inundated during flood events up to and including the 100-year climate change storm.

Under the Regional flood event the following flood risk was identified:

- Flood inundation of the commercial and residential areas downstream of the Metrolinx tracks, in the right overbank area of the creek in the Regional flood event
- Inter-watershed flows (spill) to the Wedgewood Creek system near the Royal Windsor Drive and Metrolinx corridor

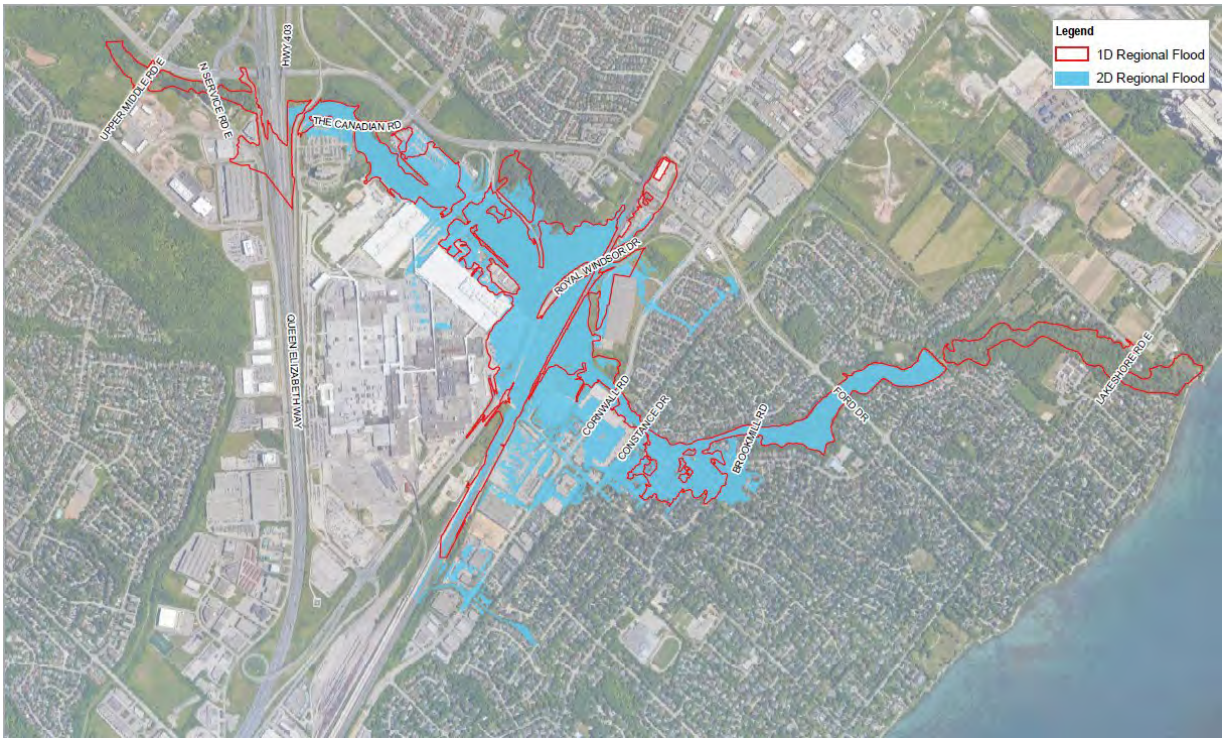


Figure 1 Regional Flood Inundation Map

Natural Environment

Joshua's Creek is a natural watercourse with moderately clear water, silty-sand sediment and large cobble stones. The majority of Joshua's Creek is located in the central and southern regions (south of Royal Windsor Drive) of the town, which are urbanized with commercial, industrial, and residential developments. There are several road and railway crossings of the creek, and portions of the channel are lined with gabion walls. In the naturalized areas of the creek corridor and surrounding areas, field investigations identified a total of 73 vascular plant species and confirmed the presence of a diverse community of predominantly cool-coldwater fish with tolerances ranging from intermediate to intolerant consisting of forage/baitfish with one salmonid sportfish species identified (rainbow trout). Furthermore, terrestrial investigations identified 22 Species at Risk with the potential to occur in the Study Area, in addition to a mix of both disturbance-tolerant species and other species (both vegetative and wildlife) associated with higher quality habitats.

Social and Economic Environment

Under the Town of Oakville's Official plan[1], the Study Area comprises of land designated as Employment Area, Parkway Belt and Residential Area.

[1] Livable Oakville, Town of Oakville Official Plan, 2009, https://www.oakville.ca/assets/2011%20planning/2018-08-28_Livable_Oakville_Office_Consolidation_schedules-E-to-K.pdf, Last updated 2018.

Cultural Environment

A review of the Oakville Heritage Database[2] resulted in the identification of three heritage properties located within the Study Area. After completing the Criteria for Evaluating Archaeological Potential checklist, in addition to consulting the Ministry of Heritage, Sport, Tourism and Culture Industries, it was determined that an archaeological assessment would be needed in response to any project activities resulting in ground disturbance within previously undisturbed areas (pre-1960). The majority of the Study Area is largely disturbed due do previous watercourse alterations, as well as the residential, industrial, and commercial developments.

Alternative Solutions

The following eight alternative solutions were established to address flood risks identified:

- **Alternative 1 - Do Nothing:** The Do Nothing alternative involves maintenance of existing conditions of the creek system, with no implementation of, or improvements to flood mitigation infrastructure. It is to be included within the Municipal Class EA to provide a benchmark for the other alternatives.
- **Alternative 2 – Increase the Hydraulic Capacity of the Metrolinx Crossing:** This alternative involves the installation of a second bridge on private property, adjacent to the existing structure to increase the effective flow area of the crossing. It also includes the construction of a floodwall along the right creek bank between Constance Drive and Brookmill Road, adjacent to an existing municipal trail.
- **Alternative 3 – Construct Flood Control Infrastructure:** This alternative involves the construction of a flood control berm on private property to direct floodwater away from the commercial and residential areas, and toward the creek. It also includes the construction of a floodwall along the right creek bank between Constance Drive and Brookmill Road.
- **Alternative 4 - Install a Relief Culvert under Royal Windsor Drive:** This alternative involves the installation of a relief culvert under Royal Windsor Drive to prevent overtopping of the road during a flood event.
- **Alternative 5 - Construct an Offline Storage Facility:** This alternative involves the diversion of creek flows to an offline flood storage facility to attenuate peak flow rates and discharge any remaining water back into Joshua's Creek.
- **Alternative 6 - Implement LID Measures:** This alternative involves the installation of low impact development (LID) measures to promote infiltration, evaporation, harvesting, filtration, and detention of stormwater by mimicking natural hydrologic processes in urbanized areas throughout the Joshua's Creek watershed.
- **Alternative 7 - Construct a Flow Diversion Channel:** This alternative involves the diversion of creek flows into an adjacent drainage system, or downstream location within the same system, to by-pass the identified flood risk sites.

[2] Oakville Heritage Planning - https://www.oakville.ca/business/heritage-planning.html

- **Alternative 8 - Implement Non-Structural Flood Mitigation Measures:** This alternative involves the development and implementation of an emergency preparedness plan that includes measures to help reduce the extent and severity of flooding at flood risk sites.

Evaluation of Alternatives and the Preferred Alternative

A comparative evaluation of the eight alternative solutions was completed using a quantitative ranking system that looks at the technical feasibility and effectiveness of each alternative in meeting the project objectives and assesses impacts with respect to the natural environment, social/cultural environment, and economic considerations. The preferred flood mitigation alternatives recommended for implementation in the Joshua's Creek watershed are a combination of Alternative 8 in the short-term, with future consideration for implementation of Alternative 2. Alternative 8 calls for the implementation of non-structural flood mitigation measures, specifically an emergency preparedness plan, while Alternative 2 calls for the replacement of the Metrolinx bridge crossing with a higher capacity hydraulic structure, and the construction of a floodwall along the right creek bank between Constance Drive and Brookmill Road. Alternative 2 is contingent on acceptance from Metrolinx.

Alternative 2 is presented in the figure below and is the most effective alternative in terms of mitigating riverine flood risk during the Regional storm event; however, several drawbacks reduced its score in the evaluation process including ownership and high capital cost. The bridge is owned by Metrolinx; therefore, any upgrades, improvements, or replacements to the structure would be outside of the Town's jurisdiction to implement. In the long-term, when the bridge is scheduled for replacement, the Town could consider partnering with Metrolinx to ensure adequate capacity. At this time, various cost sharing and/or government funding opportunities could be explored to plan and execute the work, which could make Alternative 2 a more viable option.

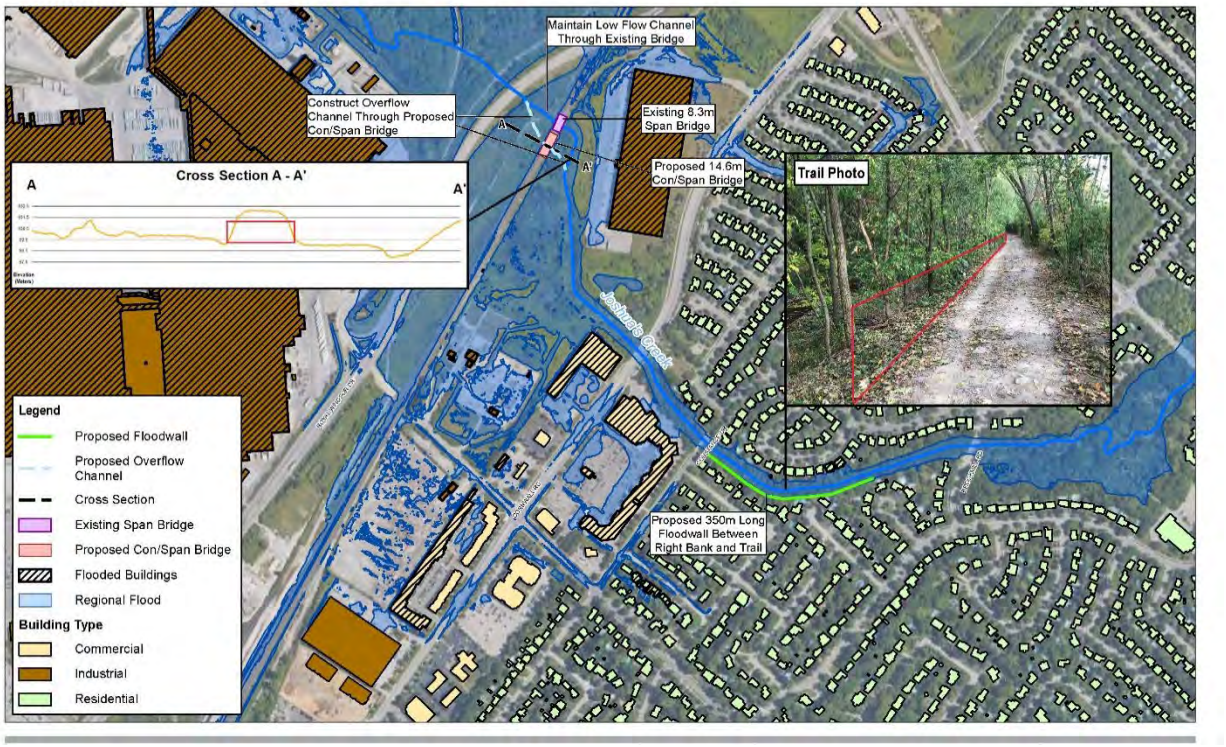


Figure 2 Alternative 2 Schematic

The results presented in the table below demonstrate the effectiveness of Alternative 2 in terms of removing properties and buildings from the Regional flood boundary. The results show that 114 of the 170 residential properties, and 124 of the 134 residential buildings will be removed from the Regional flood boundary.

Table 1.1 Reduction of Properties/Buildings in the Regional Floodplain Boundary After Implementation of Alternative 2

Land Use Type	Number of Properties within the Regional Flood Boundary	Number of Buildings within the Regional Flood Boundary
	Existing / After Alternative 2 Implemented	
Residential	170/56	134/10
Industrial/ Commercial	21/17	29/24

Next Steps/Project Implementation

A prioritization of flood mitigation works will be carried out and implemented with consideration of level of risk, return on investment and funding availability. The timing for the implementation of the Joshua Creek flood mitigation solutions will depend on the prioritization given to the Joshua's Creek watershed and the available funding.

Consultation

Public consultation is an integral component of the MCEA process. Although only two mandatory points of contact are required for Schedule B activities, four were included as part of the project to increase the opportunities for review agencies, Indigenous communities, and the public to be involved. Consultation activities completed as part of the Joshua's Creek Flood Mitigation Opportunities Study include the following:

- Notice of Study Commencement
- Review of the alternative flood mitigation solutions as part of Phase 2 of the MCEA through a Public Information Centre
- Confirmation of the preferred solution through a second Public Information Centre
- Review of the Draft Project File Report by Conservation Halton and filing of the Final Project File Report for review