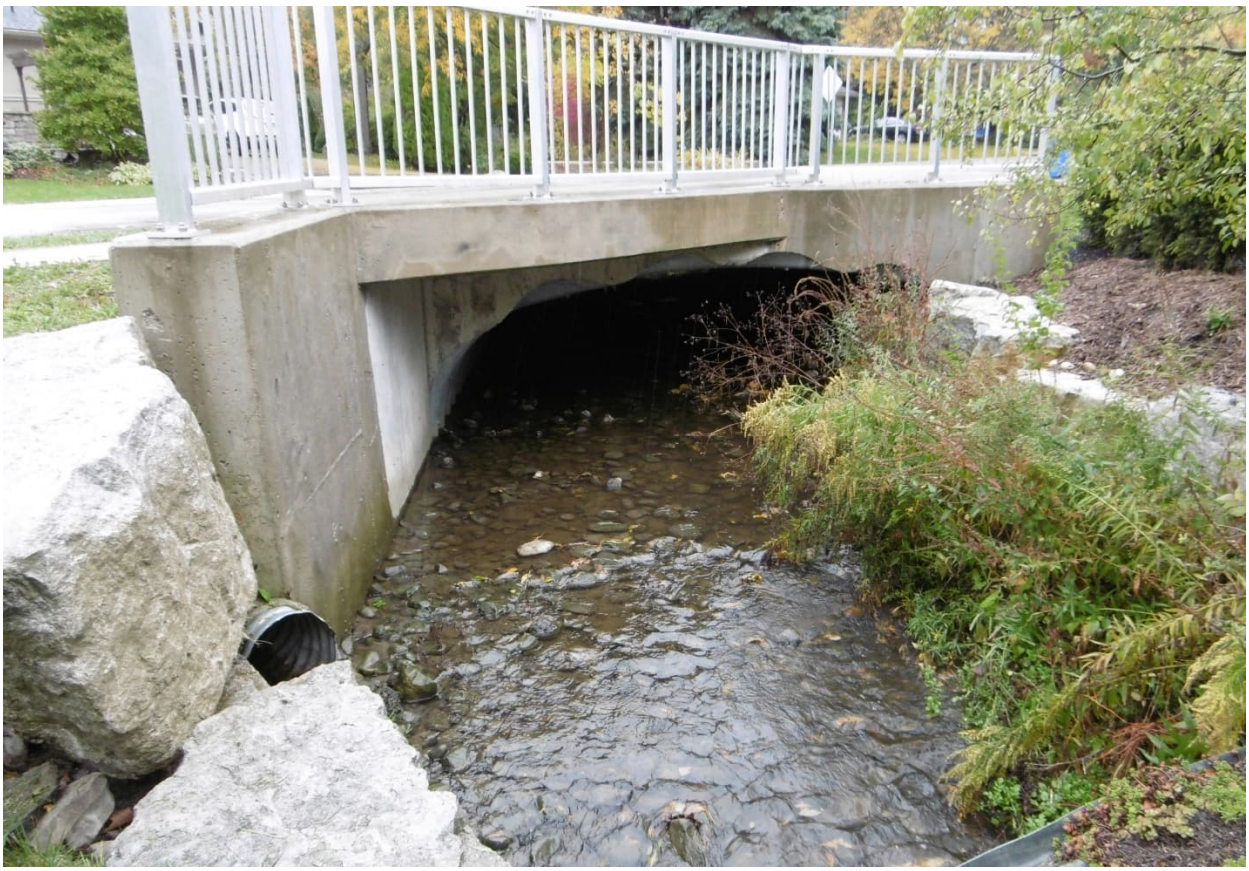
TOWN OF OAKVILLE

FLOOD MITIGATION OPPORTUNITIES STUDY LOWER MORRISON AND LOWER WEDGEWOOD CREEKS

MAY 31, 2024



FLOOD MITIGATION OPPORUNITIES STUDY LOWER MORRISON AND LOWER WEDGEWOOD CREEKS

TOWN OF OAKVILLE

PROJECT NO.: TPB168040
DATE: MAY 31, 2024

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EXECUTIVE SUMMARY

Introduction

The Town of Oakville initiated an assessment of the existing flooding conditions, within the older parts of the town, through the Town-Wide Flood Study, April 2008. The Town-wide Flood Study determined flood prone sites and a priority-based work program, including conducting Flood Mitigation Opportunities Studies to further assess flooding conditions and develop flood mitigation actions to be implemented to reduce flood risk.

In response, the Town of Oakville has initiated this Flood Mitigation Opportunities Study to formalize the understanding of flood risks within the Lower Morrison and Lower Wedgewood Creeks systems which would help in reducing flood risks to the public, property, buildings and infrastructure. It would also provide guidance for future development areas (i.e. Midtown Area) to improve stormwater management planning practices, incorporate green infrastructure, and to build climate change resilient stormwater infrastructure.

WSP E&I Canada Limited (WSP)., formerly Wood Environment & Infrastructure Solutions Canada Limited (Wood); has been retained by the Town of Oakville (Town) to assess the Lower Morrison and Lower Wedgewood Creeks existing level of flood risk and to develop flood mitigation alternative recommendations to reduce flood risk. In addition, the study has assessed local drainage improvements within the Invicta Drive area to reduce and prevent overland flooding. The study has also assessed stormwater management requirements for future development within the Midtown Area. The study is intended to develop a comprehensive flood risk reduction plan for both creek systems.

The project limits, herein referred to as the Study Area, include 376.99 ha +/- draining to Lower Wedgwood Creek and 314.83 ha +/- draining to Lower Morrison Creek (ref. Drawing 1). The watersheds are located primarily south of the QEW, with a mixture of industrial, commercial, and residential land uses. The lower reaches of the Morrison Creek, as well as the lower reaches of the Wedgewood Creek, are conveyed through the Town of Oakville to the outlets at Lake Ontario.

Class Environmental Assessment Process

This study has been completed as a Schedule B undertaking of the Municipal Engineers Association (MEA) Class Environmental Assessment Process (ref. Municipal Engineers Association's Municipal Class Environmental Assessment October 2000, as amended in 2007, 2011, 2015 & 2023). The approved MEA Class Environmental Assessment (Class EA) document describes the process that a proponent must follow for a class or group of undertakings in order to satisfy the requirements of the Environmental Assessment Act. Additionally, it represents a method of obtaining an approval under the provincial Environmental Assessment Act and provides alternatives to carrying out individual environmental assessments for each separate undertaking or project within the class. This study has been developed, based upon the following Phased approach:

Phase 1: Problem Definition
Phase 2: Develop and Review Alternatives
Phase 3: Preferred Alternatives Selection and Preliminary Design
Phase 4: Preparation of Environmental Study Report

Consultation

Public Information Centres (PIC) have been held at planned intervals during the Flood Mitigation Opportunities Study process to inform the public of the study progress and seek input. The first PIC for the Flood Mitigation Opportunity Study was held on June 18, 2019, at the Town of Oakville Trafalgar Park Community Centre, while the second PIC was held online on December 17, 2020, due to Covid-19 restrictions. Notifications of the two (2) PICs

were sent to stakeholders, local residents, agencies and municipal staff by mail and email, as well as notices within the local newspaper.

Consultation has also been conducted with indigenous groups, namely the Six Nations of Grand River Territory, Mississaugas of the New Credit First Nation, Haudenosaunee Confederacy Council and Metis Nations of Ontario. In addition to notices being sent out to the four indigenous groups, a meeting to discuss the project was held in January 2021 with the Mississaugas of the Credit First Nation, with no further action arising out of the meeting.

The Class EA has been completed under the oversight of a Technical Steering Committee which included representatives from the Town of Oakville and Conservation Halton. Meetings have been held at key milestones throughout the study to review data needs and findings while providing input and guidance to achieve the study objectives.

Baseline Assessment

A PCSWMM hydrologic/ hydraulic model originally developed as part of the Town of Oakville Stormwater Master Plan by Amec Foster Wheeler has been used as the base model to determine peak flows for the 2 year to 100 year and Regional Storm events for both creek systems. The PCSWMM model has been refined and calibrated based on observed flows and rainfall.

Hydraulic (HEC-RAS) modelling for both the Lower Morrison Creek and Lower Wedgewood Creek has been conducted by Conservation Halton. For this study, the detailed hydraulic models for Lower Morrison Creek and Lower Wedgewood Creek, have been updated, based on field reconnaissance and topographic survey by WSP (to provide updated details of the road crossings and the associated immediate upstream and downstream creek reaches). The updated existing HEC-RAS hydraulic modelling has been used to determine flood elevations for the 2 to 100 year and Regional Storm events. Floodplain plans have been prepared for both creeks based on the foregoing modelling. Based on peak flows for all storm events, the 100 year storm would be the Regulatory Storm for both creek systems.

For Lower Morrison Creek approximately 98 properties and 43 buildings (buildings located on the flood risk properties) have been determined to be at flood risk, while for Lower Wedgewood Creek, 168 properties and 76 buildings (buildings located on the flood risk properties) are at flood risk. The identified flood risk primarily stems from inadequate flow conveyance capacity at crossings and/or historical land use encroachment into natural hazard lands

Alternative Assessment

Detailed analyses have been completed to evaluate alternative solutions to mitigate the flood risk within the subject focus area under existing and future land uses. Included in the assessment are two (2) sub areas, Invicta Drive and the Midtown Area.

For the Invicta Drive area to determine the preferred alternative, a long-list of alternatives were considered including conveyance improvements, stormwater management and drainage diversions. The preferred alternative is Alternative D2 Invicta Drive to Eighth Line Diversion. The Alternative includes a proposed diversion from Invicta Drive to a new stormwater management facility (wet pond) at Eighth Line and North Service Road. The alternative will mitigate the water quality, quantity, erosion and water budget impacts associated with the proposed North Service Road widening, while providing additional green space and benefits to the receiving Lower Wedgewood Creek.

For the Midtown Area assessment, two (2) stormwater management scenarios have been considered, one (1) with a diversion to the Sixteen Mile Creek from Lower Morrison Creek and the other without. The preferred alternative is the non-diversion scenario with the requirement that 25 mm capture, with an emphasis on green infrastructure in mind, be implemented for erosion control and stormwater quantity controls. Above the 25mm capture, further peak flow control will be required to mitigate proposed increases in peak flows resulting from development.

For the remaining Lower Morrison Creek and Lower Wedgewood Creek, a long-list of flood mitigation alternatives has been assessed through the use of evaluation criteria and scoring of the results, with the resulting short-list of alternatives undergoing a detailed assessment using the hydrologic and hydraulic modelling, and a cost/ benefit

assessment. The preferred alternatives for both creeks consist of crossing upgrades and for Lower Morrison Creek an offline storage tank to be located within the Cornwall Road Park.

Non-structural alternatives were also evaluated, including creek maintenance, emergency preparedness, flood forecasting/warning, and regulation. These programs are currently in effect and help to reduce the threat to life and property, but do not reduce existing flood conditions. Land acquisition of flood-risk properties and buildings could take place if it is determined that the benefits of purchasing the property outweigh the mitigation costs; however, there are significant social and economic considerations that reduce its viability.

The potential flood risk reduction benefits for more frequent storm events for both Lower Morrison and Lower Wedgewood Creeks for the preferred alternatives have been provided in Tables EX-1 and EX-2. The tables summarize the benefits from the combined alternative (culvert upgrades and flood storage/diversion set at an inlet based upon the 5-year WSEL) for the 10-year and 25-year events, respectively.

Table EX-1. Summary of Flood Risk Reduction Benefits Resulting from Alternatives (10 Year)

LOWER MORRISON CREEK						
ALTERNATIVE	EXISTING NUMBER OF AT RISK PROPERTIES	EXISTING NUMBER OF AT RISK BUILDINGS	PROPERTIES WITH REDUCED FLOOD RISK	BUILDINGS WITH REDUCED FLOOD RISK	PROPERTIES REMOVED FROM FLOODPLAIN	BUILDINGS REMOVED FROM FLOODPLAIN
Combined	88	21	55	3	20	5
LOWER WEDGEWOOD CREEK						
Alternative	EXISTING NUMBER OF AT RISK PROPERTIES	EXISTING NUMBER OF AT RISK BUILDINGS	PROPERTIES WITH REDUCED FLOOD RISK	BUILDINGS WITH REDUCED FLOOD RISK	PROPERTIES REMOVED FROM FLOODPLAIN	BUILDINGS REMOVED FROM FLOODPLAIN
Combined	151	46	11	8	0	1

Table EX-2. Summary of Flood Risk Reduction Benefits Resulting from Alternatives (25 Year)

LOWER MORRISON CREEK						
ALTERNATIVE	EXISTING NUMBER OF AT RISK PROPERTIES	EXISTING NUMBER OF AT RISK BUILDINGS	PROPERTIES WITH REDUCED FLOOD RISK	BUILDINGS WITH REDUCED FLOOD RISK	PROPERTIES REMOVED FROM FLOODPLAIN	BUILDINGS REMOVED FROM FLOODPLAIN
Combined	118	28	50	10	13	12
LOWER WEDGEWOOD CREEK						
Alternative	EXISTING NUMBER OF AT RISK PROPERTIES	EXISTING NUMBER OF AT RISK BUILDINGS	PROPERTIES WITH REDUCED FLOOD RISK	BUILDINGS WITH REDUCED FLOOD RISK	PROPERTIES REMOVED FROM FLOODPLAIN	BUILDINGS REMOVED FROM FLOODPLAIN
Combined	161	60	11	8	1	1

The results in Tables EX-1 and EX-2, indicate the largest benefit is provided for the 25 year storm event, which has a total benefit of 106 properties and buildings with either reduced flood risk, or are removed from flood risk for both Lower Morrison and Lower Wedgewood Creeks combined. The floodlines generated for the 10-year and 25-year events are included in Appendix H (ref. Drawings 6 to 9).

Costing has been prepared for the preferred alternatives as indicated in Tables EX-3 and EX-4 for Lower Morrison and Lower Wedgewood Creeks, respectively.

Table EX-3. Summary of Preliminary Costs Associated with Proposed System Upgrades (Lower Morrison Creek)

SYSTEM	TOTAL COST ($M)	TOTAL COST WITH 15% CONTINGENCY ($M)
Culvert Upgrades	$ 2.24 M	$ 2.58 M
Flood Storage	$ 6.25 M	$ 7.19 M
2.Total	$ 8.49 M[1]	$ 9.77 M

1. Cost of Diversion has not been included as it would be either the diversion or flood storage to be implemented, not both, with flood storage providing similar benefits for reduced cost.

Table EX-4. Summary of Preliminary Costs Associated with Proposed System Upgrades (Lower Wedgewood Creek)

SYSTEM	TOTAL COST ($M)	TOTAL COST WITH 15% CONTINGENCY ($M)
Culvert Upgrades	$ 4.22 M	$ 4.85 M
Total	$ 4.22 M	$ 4.85 M

The cost benefit assessment for the alternatives proposed for both Creek Systems has been based upon the improvements that would be implemented for each alternative for the 100-year event (ref. Table 5.61). The total number of properties and buildings which benefit for each alternative (i.e. reduced flood risk based on lower flood elevations), per Creek, along with the associated cost (without contingency) is shown in Table EX-5 with the floodlines indicated on Figures EX-1 and EX-2. Alternatives would provide flood risk reduction for more frequent storm events than the 100 year storm, e.g. 10 year – 25 (ref. Tables EX-1 and EX-2).

Table EX-5. Summary of Flood Risk Reduction Benefits Resulting from Alternatives (100 Year)

LOWER MORRISON CREEK (98 PROPERTIES AND 28 EXISTING BUILDINGS AT FLOOD RISK)					
ALTERNATIVE	TOTAL COST ($M)	PROPERTIES WITH REDUCED RISK	PROPERTIES REMOVED FROM FLOODPLAIN	BUILDINGS WITH REDUCED FLOOD RISK	BUILDINGS REMOVED FROM FLOODPLAIN
Culvert Upgrades	$ 2.58 M	0	0	6	0
Flood Storage	$ 7.19 M	59	13	16	18
Combined	$ 9.77 M	59	13	16	18
LOWER WEDGEWOOD CREEK (151 PROPERTIES AND 46 EXISTING BUILDINGS AT FLOOD RISK)					
ALTERNATIVE	TOTAL COST ($M)	PROPERTIES WITH REDUCED RISK	PROPERTIES REMOVED FROM FLOODPLAIN	BUILDINGS WITH REDUCED FLOOD RISK	BUILDINGS REMOVED FROM FLOODPLAIN
Culvert Upgrades	$ 4.85 M	1	0	3	0
Combined	$ 4.85 M	1	0	3	0

The flood risk reduction benefits resulting from the preferred alternatives, indicates that alternatives recommended for Lower Morrison Creek would be more effective in lowering flood risk, than the alternatives for Lower Wedgewood Creek, with the main reason for the difference being the Flood Storage that could be implemented for Lower Morrison Creek and the reduced flows. Flood Storage was determined not be a feasible alternative for Lower Wedgewood Creek.

Implementation

Subject to town and Council approval, the preferred alternatives for mitigating the flood risk at various identified sites on Lower Morrison and Lower Wedgewood Creeks, as presented herein, can be advanced to the next stages of planning and design. Prioritization of the alternatives would be established by the Town as part of overall flood risk mitigation works being considered for the Town.

Implementation of each of the alternatives has been considered based on the Municipal Class EA process and associated project schedules (ref. Table EX-5) and whether each alternative will or will not require a more detailed Class Environmental Assessment. For the recommended culvert upgrades and the Lower Morrison offline flood storage tank, this Class EA has fulfilled the Municipal Class EA process and associated assessment requirements. For the Invicta Drive drainage improvements, future study requirements are to be determined through the North Service Road Improvements Project. Municipal Class EA project requirements for the Midtown Area stormwater management measures will be dependent upon the scope of work, public versus private ownership and any property purchase requirements for the Town.

Table EX-5. Summary of Preferred Alternatives and Implementation Considerations

LOCATION	MUNCIPAL CLASS EA SCHEDULE	EA STATUS	OTHER CONSIDERATIONS
• Invicta Drive Alternative D2	• Schedule B for stormwater management pond (fulfilled by this Class EA)	• *A Schedule B EA based on Project Classification 40b: Establish new or replace or expand existing stormwater detention/retention ponds or tanks and appurtenances including outfall to receiving water body where all such facilities are not located in an existing utility corridor, or an existing road allowance or where property acquisition is required.*	• To be integrated with the North Service Road reconstruction project with the understanding that the Town will own lands for the proposed Stormwater management facility. • Consultation with MTO required throughout the project regarding all project aspects including stormwater management. • - design requirements to be finalized through the North Service Road Improvements Project.
• Midtown Area	• Depends on type of stormwater management project and associated road works. Refer to Town of Oakville Commitment Letter to Conservation Halton (May 24, 2024) regarding additional assessment requirements for stormwater	• For consideration, projects are exempt based on: o *Project Classification 37: Roadside ditches, culverts and other such incidental stormwater works constructed solely for the purpose of servicing municipal road works.* o *Project Classification 40a: Establish new or replace or expand existing stormwater detention/retention ponds or tanks and appurtenances including outfall to receiving water body provided all such facilities are in either an existing utility corridor or an existing road allowance where no additional property is required.*	• Stormwater management works to be determined for each project within the Midtown Area. • Consultation required with MTO with its' jurisdiction along the highway corridor. • Design requirements will vary depending on each project scope. • Consultation with Conservation Halton within regulated areas. • Stormwater management works to consider Stormwater Master Plan recommendations.

LOCATION	MUNCIPAL CLASS EA SCHEDULE	EA STATUS	OTHER CONSIDERATIONS
	management within the Midtown Area.	o *Project Classification 44: Construction of stormwater management facilities which are required as a condition of approval on a consent, site plan, plan of subdivision or condominium which will come into effect under the Planning Act prior to the construction of the facility. This includes LID features.* • For consideration, projects require a Schedule B based on: o *Project Classification 38a: Establish new or modify, retrofit or improve LID features within an existing road allowance or an existing utility corridor.* o *Project Classification 38b: Establish new or modify, retrofit or improve LID features where property acquisition is required.* o *Project Classification 40b: Establish new or replace or expand existing stormwater detention/retention ponds or tanks and appurtenances including outfall to receiving water body where all such facilities are not located in an existing utility corridor, or an existing road allowance or where property acquisition is required.*	

LOCATION	MUNCIPAL CLASS EA SCHEDULE	EA STATUS	OTHER CONSIDERATIONS
• Culvert Crossings (Various Crossings on both Lower Morrison Creek and Lower Wedgewood Creek.	• Exempt	• Culvert Crossings upgrades are exempt under the 2023 Municipal Class EA Guidelines, based on Table C – Municipal Transit Projects: o Project Classification 8b: *Culvert repair or replacement where the capacity of the culvert or drainage area is changed.* • Should culverts be replaced solely for the purpose of flood control, then under Table B Municipal Water and Wastewater Projects (Shoreline/ In Water Works): o Project *Classification 50: Modify existing water crossings for the purposes of flood control* a Schedule B is required.	• Conservation Halton to be consulted for each culvert crossing. May require Department of Fisheries and Oceans (DFO) consultation. • Design to consider: o property o construction access o road design, o structural design o utilities, o geotechnical conditions, o excess soils o hydraulics, including Lower Morrison Lower Wedgewood Channel spill conditions o erosion conditions o stream morphology o fisheries passage and habitat o terrestrial vegetation assessment o wildlife and species at risk. o construction timing restrictions
• Lower Morrison Creek Offline Flood Storage Tank	• Schedule B (fulfilled by this Class EA)	• *As per Table B Municipal Water and Wastewater Projects (Shoreline/ In Water Works) stormwater tanks are Exempt based on:* o *Project Classification 40a : Establish new or replace or expand existing stormwater detention/retention ponds or tanks and appurtenances including outfall to receiving water body provided all such facilities are in either an existing utility corridor or an existing road*	• Conservation Halton, DFO and Ministry of Environment Conservation and Parks (MECP) to be consulted. • Stage 1 Archaeological Assessment in area of the tank. • Town of Oakville Parks, Recreation & Culture to be consulted prior to project. • Design to consider: o park features and usage o construction access for creek inlet and outlet o tank configuration o structural design o utilities, o geotechnical and hydrogeological conditions,

LOCATION	MUNCIPAL CLASS EA SCHEDULE	EA STATUS	OTHER CONSIDERATIONS
		allowance where no additional property is required • *A Schedule B Class EA is required for:* o *Project Classification 5*1*: Works undertaken in a watercourse for the purposes of flood control or erosion control, which may include:* o *bank or slope regrading, • deepening the watercourse, relocation,* o *realignment or channelization of watercourse* o *revetment including soil bio-engineering techniques* o *reconstruction of a weir or dam*	o excess soils o hydraulics, including Lower Morrison Lower Wedgewood Channel spill conditions o erosion conditions o stream morphology o fisheries habitat protection o terrestrial vegetation assessment o wildlife and species at risk o construction timing restrictions o post construction monitoring and adaptive measures o long-term maintenance

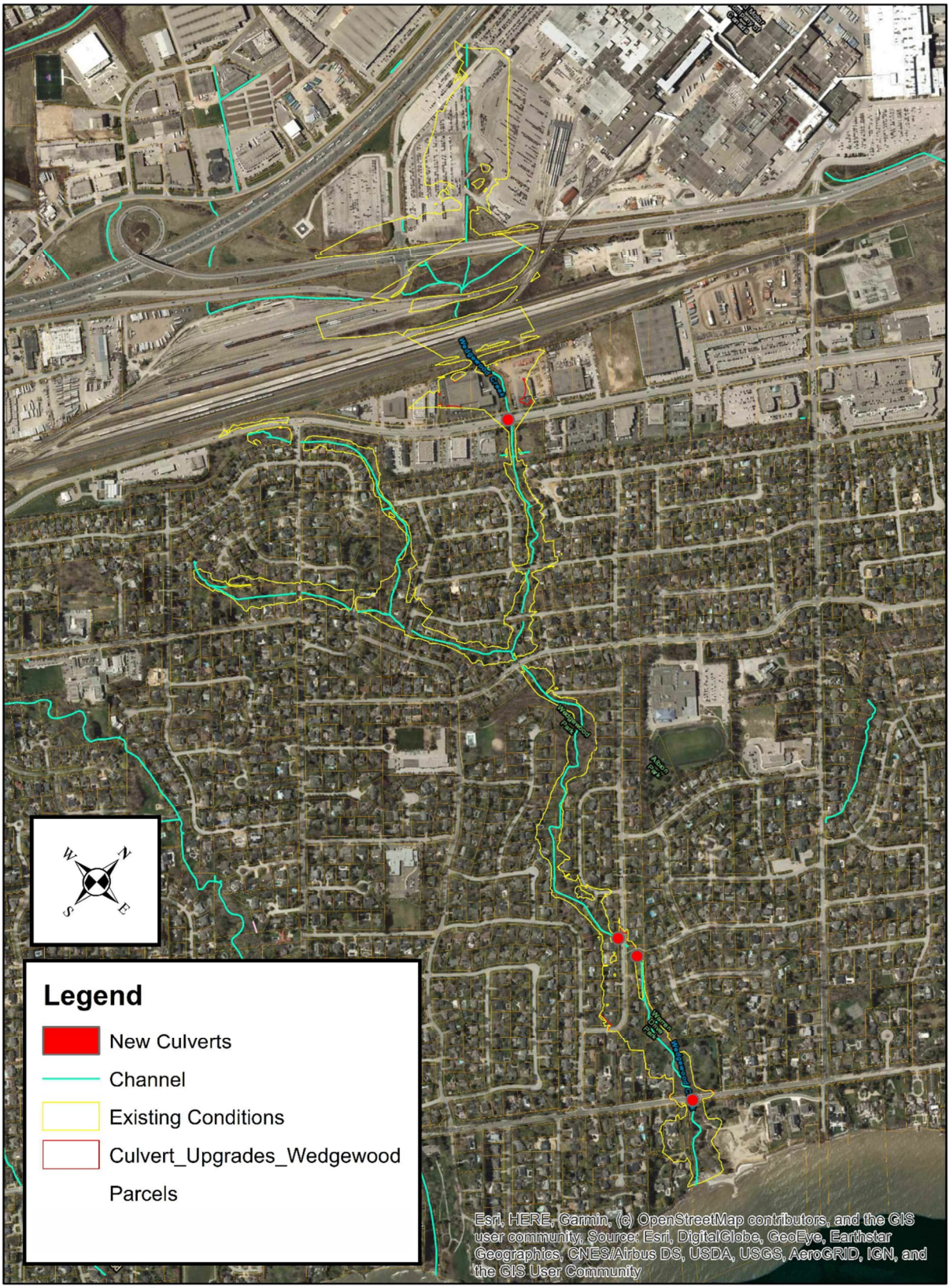

Figure EX-1. Lower Wedgewood Creek (100 Year Floodlines) with Culvert Upgrades

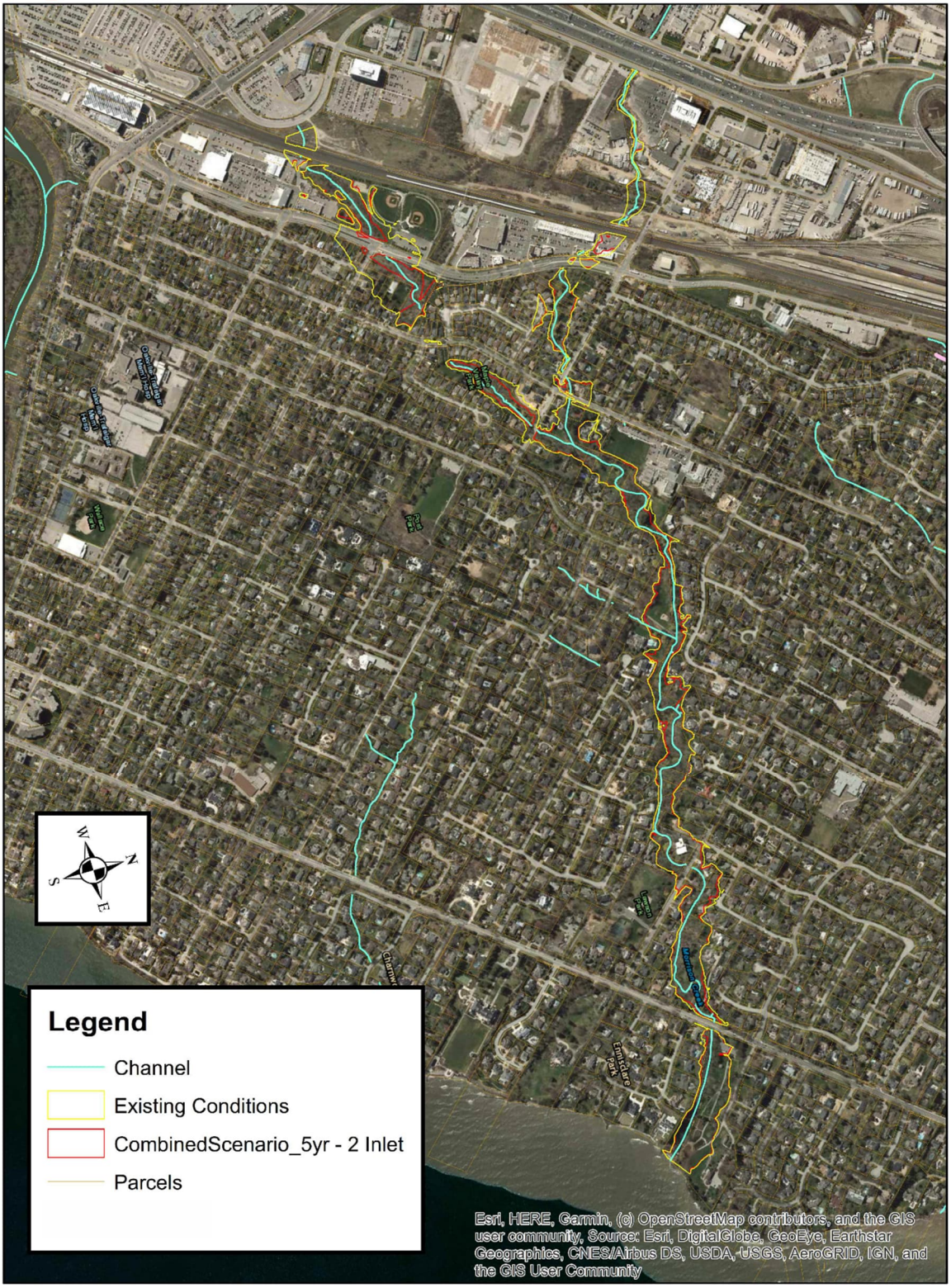

Figure EX-2. Lower Morrison (100 Year Floodlines) Combined Scenario with Culvert Upgrades, 5 Year 2-Inlet WSELs