



EXECUTIVE SUMMARY

Introduction

The Town of Oakville initiated an assessment of the existing flooding conditions, 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 Fourteen Mile and McCraney Creeks systems which would help in reducing flood risks to the public, property, buildings and infrastructure.

WSP E&I Canada Limited (WSP), formerly Wood Environment & Infrastructure Solutions Canada Limited (Wood) and formerly Amec; has been retained by the Town of Oakville (Town) to assess the Fourteen Mile Creek and McCraney Creek existing level of flood risk and to develop flood mitigation alternative recommendations to reduce flood risk. 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 3183.6 ha +/- draining to Fourteen Mile Creek and 970.50 ha +/- draining to McCraney Creek (ref. Figure EX-1). The watersheds consist of a mixture of industrial, commercial, and residential land uses. The lower reaches of the Fourteen Mile Creek, as well as the lower reach of the McCraney 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 Master Plan Approach #2 Detailed Master Planning of the Municipal Engineers Association (MEA) Class Environmental Assessment (Class EA) Process (ref. Municipal Engineers Association's Municipal Class Environmental Assessment October 2000, as amended in 2007, 2011, 2015 & 2023), completing the first two phases of MEA Class process and satisfying recommended Schedule B projects. The approved MEA 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 November 14, 2013, at the Town of Oakville Town Hall, while a second PIC was held on December 2, 2014, and a third PIC was held on November 6, 2024. Notifications of the three PICs were sent to stakeholders, local residents, agencies and municipal staff by mail and email.

Consultation has also been conducted with indigenous peoples, namely the Six Nations of Grand River Territory, Mississaugas of the New Credit First Nation, Haudenosaunee Confederacy Council and Metis Nations of Ontario.

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 has been used as the base model to determine peak flows for the 2 year to 100 year and Regional Storm (Hurricane Hazel) 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 Fourteen Mile Creek and McCraney Creek has been prepared for this study. The detailed hydraulic models for Fourteen Mile Creek and McCraney Creek, have been prepared, based on topographic mapping and field reconnaissance by WSP (to confirm 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 (Hurricane Hazel) events. Floodplain mapping have been prepared for both creeks based on the foregoing modelling.

For Fourteen Mile Creek approximately 132 properties and 140 buildings (buildings located on the flood risk properties) have been determined to be at flood risk, while for McCraney Creek, 131 properties and 149 buildings (buildings located on the flood risk properties) are at flood risk during the Regional Storm event. 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 various alternatives to mitigate the flood risk within both Fourteen Mile Creek and McCraney 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. Conservation Halton and the Ministry of Natural Resources reviewed the initial preferred alternatives and rejected the proposed online flood storage located upstream of the QEW Highway, as a result, supplemental alternatives were established and assessed to determine additional ways to mitigate flood risk.

To determine the preferred alternatives, a cost benefit assessment was conducted, comparing smaller scale local improvements which offer the possibility of reducing flood risk in a targeted area (e.g.. culvert/bridge upgrades), versus, system wide improvements, which offer the potential of reducing system wide peak flows and lowering flood risk over a broader area. In comparison, the system-wide improvements offer limited additional flood risk reduction but come with a significant increase in cost compared to the local improvements. As a result, the local improvement approach to flood mitigation was selected as the preferred approach.

The preferred alternatives consist of Low Impact Development (LIDs), crossing upgrade (McCraney Creek at Lakeshore Road) and berming to be located where feasible on town owned lands and private lands where no alternative is available.

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 the 10-year, 100-year storm and Regional Storm events for both Fourteen Mile Creek and McCraney Creek for the preferred alternatives have been provided in Tables EX-1, EX-2 and EX-3. The tables summarize the benefits from the combined alternative (culvert upgrades and localized berming) for the 10-year, 100-year and Regional Storm events, respectively. Where a building floods under the existing conditions but the risk of flooding is lowered to the property parcel and the building is removed from flooding under a specific flood mitigation alternative scenario, those cases are denoted in parentheses.



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

FOURTEEN MILE 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	92	12	23	0	4	0
McCRANEY 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	97	48	5	0	7	0

Table EX-2. Summary of Flood Risk Reduction Benefits Resulting from Alternatives (100 Year)

FOURTEEN MILE 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	130	46	30	1(1)	15	1
McCRANEY 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	96	88	2	14	12	3

Table EX-3. Summary of Flood Risk Reduction Benefits Resulting from Alternatives (Regional Storm)

FOURTEEN MILE 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	132	140	27	0	21	13(15)
McCRANEY 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	131	149	5	9	14	3(3)



The results in Tables EX-1, EX-2 and EX-3, indicate the largest benefit is provided for the Regional Storm event, which has a total benefit of 110 properties and buildings with either reduced flood risk, or are removed from flood risk for both Fourteen Mile and McCraney Creeks combined.

Costing has been prepared for the preferred alternatives as indicated in Table EX-3 for both creek systems.

Table EX-3. Summary of Preliminary Costs Associated with Proposed System Upgrades

SYSTEM	TOTAL COST (\$M)	TOTAL COST WITH 15% CONTINGENCY (\$M)
Culvert Upgrade (McCraney Creek at Lakeshore Road)	\$ 5.34 M	\$ 6.15 M
Berming	\$ 1.61 M	\$ 1.85 M
Total	\$ 6.95 M	\$ 8.0 M

The total number of properties and buildings which benefit from the alternatives by being removed from the Regional Storm floodplain is provided in Table EX-4. Figures EX-2 and EX-3 indicate the existing and proposed Regional Storm floodlines with the preferred alternatives implemented.

Table EX-4. Summary of Flood Risk Reduction Benefits Resulting from Alternatives (Regional Storm)

FOURTEEN MILE CREEK AND McCraney Creek (263 PROPERTIES AND 289 EXISTING BUILDINGS AT FLOOD RISK)		
ALTERNATIVES	TOTAL COST (\$M)	REDUCED FLOOD RISK (REDUCED OR REMOVED)
Culvert Upgrade (McCraney Creek at Lakeshore Road) and Berming	\$ 8M	110

Implementation

Subject to town and Council approval, the preferred alternatives for mitigating the flood risk at various identified sites on Fourteen Mile and McCraney 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 and stormwater network works being considered through the lens of the Rainwater Management Financial Plan (RWMP). The Rainwater Management Financial Plan (RWMP) takes a comprehensive approach to integrate the state of good repair and increase resiliency of the town’s stormwater network based on various studies and assessments completed to date. The multi-phase RWMP will deliver a financing plan that provides an all-inclusive approach to planning and implementing stormwater-related infrastructure renewal and improvement projects into the future.

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 upgrade and the proposed flood protection berming, this Class EA has fulfilled the Municipal Class EA process and associated assessment requirements.

The Town will implement LIDs within the Fourteen Mile Creek and McCraney Creek Subwatershed areas, as town projects occur with the appropriate conditions (e.g. groundwater depths, soil conditions, availability of space, etc.) and in accordance with the Town of Oakville’s Stormwater Management Master Plan and Town of Oakville Climate Action Plan



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

LOCATION	MUNICIPAL CLASS EA SCHEDULE	EA STATUS	OTHER CONSIDERATIONS
<ul style="list-style-type: none"> Crossing Upgrade at Lakeshore Road, McCraney Creek 	<ul style="list-style-type: none"> Exempt McCraney Creek Bridge Replacement Class EA (Completed) 	<ul style="list-style-type: none"> Culvert Crossings upgrades are exempt under the 2023 Municipal Class EA Guidelines, based on Table C – Municipal Transit Projects: <ul style="list-style-type: none"> Project Classification 8b: <i>Culvert repair or replacement where the capacity of the culvert or drainage area is changed.</i> Should culverts be replaced solely for the purpose of flood control, then under Table B Municipal Water and Wastewater Projects (Shoreline/ In Water Works): <ul style="list-style-type: none"> Project Classification 50: <i>Modify existing water crossings for the purposes of flood control</i> a Schedule B is required. 	<ul style="list-style-type: none"> Conservation Halton to be consulted May require Department of Fisheries and Oceans (DFO) consultation. Design to consider: <ul style="list-style-type: none"> property construction access road design structural design utilities geotechnical conditions, excess soils hydraulics, including McCraney Creek spill conditions at the CNR erosion conditions stream morphology fisheries passage and habitat terrestrial vegetation assessment wildlife and species at risk construction timing restrictions
<ul style="list-style-type: none"> Flood Protection Berms 	<ul style="list-style-type: none"> Schedule B (fulfilled by this Class EA) 	<ul style="list-style-type: none"> As per Table B Municipal Water and Wastewater Projects (Shoreline/ In Water Works) flood protection berms are a Schedule B activity based on: <ul style="list-style-type: none"> Project Classification 49: <i>Construct berms along a watercourse for the purposes of flood control in areas subject to damage by flooding</i> Project Classification 50: <i>Modify existing watercourses for the purpose of flood control</i> Project Classification 51: Works undertaken in a watercourse for the purposes of flood control or erosion control, which may include: <ul style="list-style-type: none"> Bank or slope regrading Deepening the watercourse Relocation, realignment or channelization of watercourse Revetment including soil bio-engineering techniques Reconstruction of a weir or dam Based on this Flood Mitigation Opportunities Study fulfilling Schedule B requirements, a subsequent Schedule B Class EA for the proposed berm works would not be required. 	<ul style="list-style-type: none"> Conservation Halton, DFO and Ministry of Environment Conservation and Parks (MECP) to be consulted (for species at risk). To be located on town-owned lands to the full extent possible. For berms entirely on private property and berms adjacent to private property as grading may extend into private property, property owners to meet with Town to understand what is entailed in constructing a localized flood protection berm and provide permission for works to proceed. Depending on location, multiple property owners will need to agree to a flood protection berm to allow berm design and construction Town to coordinate design and construction of berms with other creek improvements (erosion mitigation) whenever possible. Design to consider: <ul style="list-style-type: none"> construction access for berm and creek works creek overbank grading to offset flood storage lost by berm works utilities, existing land use and amenities (i.e. decks, pools, sheds, etc.) geotechnical and hydrogeological conditions, excess soils hydraulics erosion conditions stream morphology fisheries habitat protection terrestrial vegetation assessment wildlife and species at risk construction timing restrictions post construction monitoring and adaptive measures maintenance of creek works – town and private landowner agreement

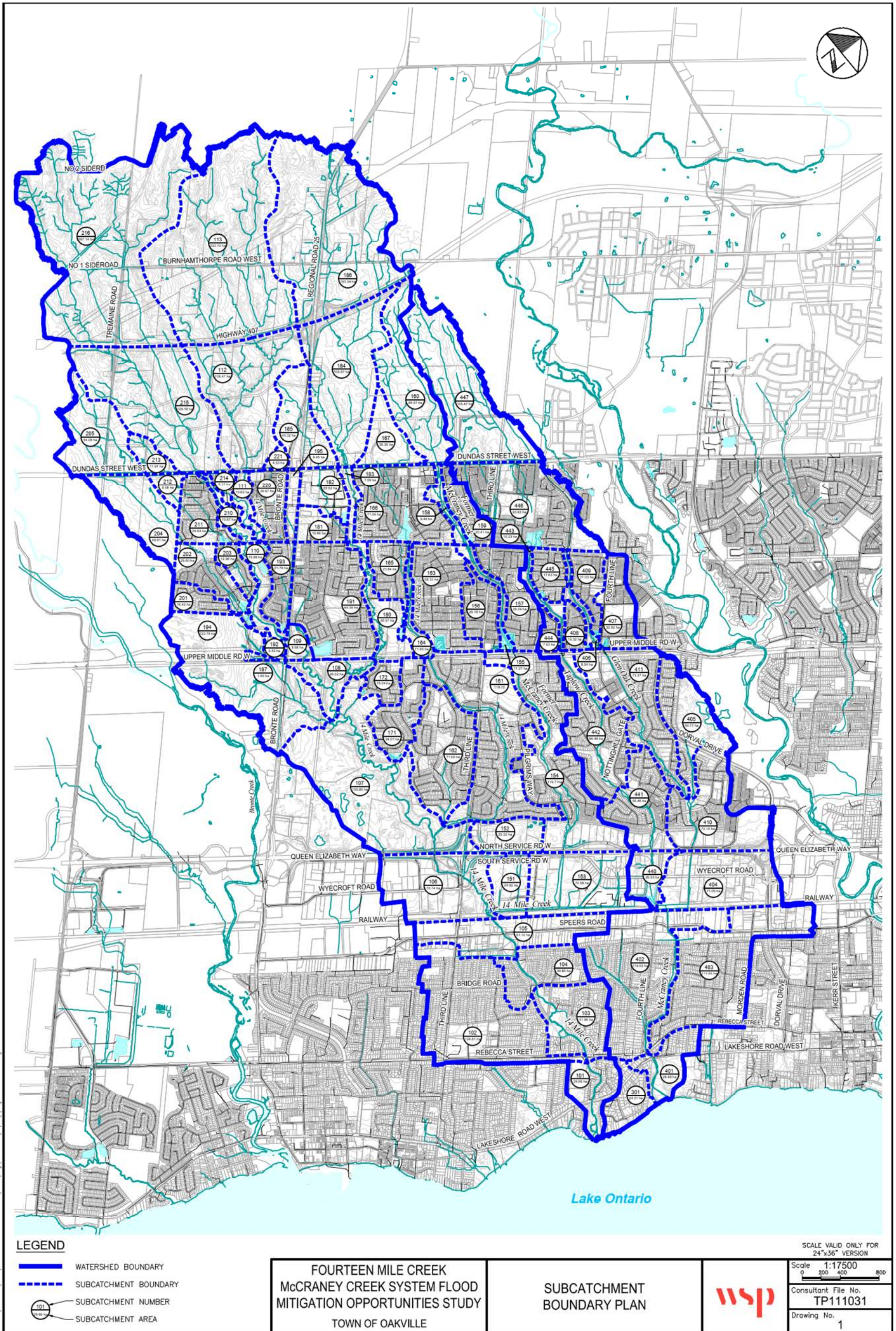


Figure EX-1. Fourteen Mile Creek and McCraney Creek Drainage Area Plan

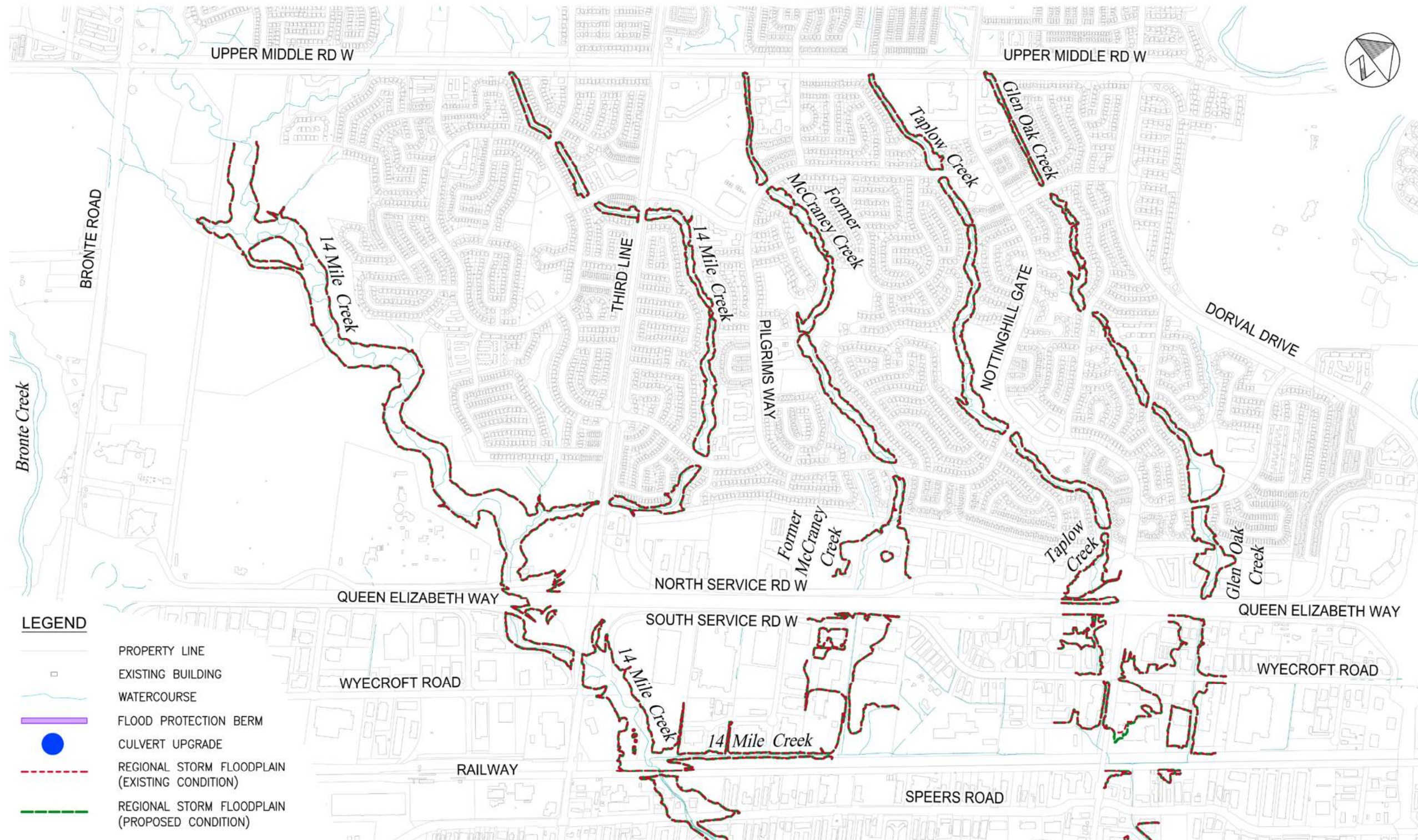


Figure EX-2. Fourteen Mile Creek and McCraney Creek Regional Storm Floodlines North of the QEW Highway

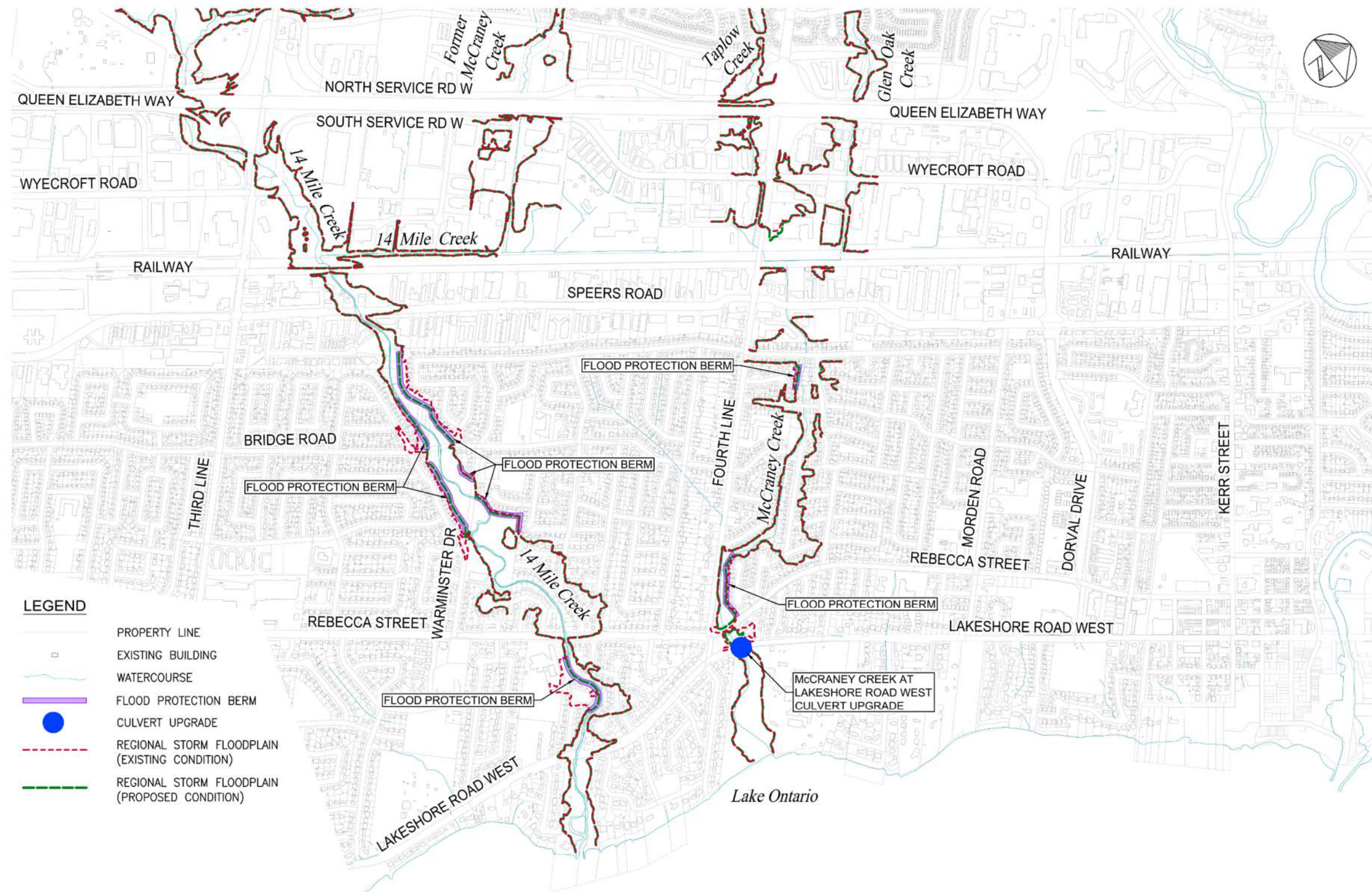


Figure EX-3. Fourteen Mile Creek and McCraney Creek Regional Storm Floodlines South of the QEW Highway