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HIGHWAY 413 PRELIMINARY DESIGN AND ASSESSMENT OF ENVIRONMENTAL IMPACTS

Draft Environmental Impact Assessment Report

December 2025

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Ontario

WSP

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Appendices

Appendix A. Record of Consultation and Engagement
Appendix B. Preliminary Design Plans
Appendix C. Community Value Plan

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ABBREVIATIONS AND ACRONYMS

Acronym	Definition
407 or 407 ETR	Highway 407 Express Toll Route
AA	Archaeological Assessment
AADT	Average Annual Daily Traffic
AAQC	Ambient Air Quality Criteria
AECOM	AECOM Canada ULC
AIA	Agricultural Impact Assessment
ANSI	Area of Natural and Scientific Interest
AODA	*Accessibility for Ontarians with Disabilities Act*
AT	Active Transportation
ATMS	Advanced Traffic Management Systems
BHR	Built Heritage Resource
BMP	Best Management Practice
BRT	Bus Rapid Transit
BTR	Bluetooth Readers
CA	Conservation Authority
CAAQS	Canadian Ambient Air Quality Standards
CAG	Community Advisory Group
CANCEA	Canadian Centre for Economic Analysis
CAV	Connected and Autonomous Vehicle
CCME	Canadian Council of Ministers of the Environment
CCRA	Climate Change Resilience Assessment
CCTV	Closed-Circuit Television
CER	Canada Energy Regulator
CEW	Community Engagement Webinars
CFL	Community Field Liaison
CH	Conservation Halton
CHAR	Cultural Heritage Assessment Report
CHER	Cultural Heritage Evaluation Report
CHL	Cultural Heritage Landscape
CHVI	Cultural Heritage Value or Interest
CLI	Canada Land Inventory
cm	centimetre
CNR or CN Rail	Canadian National Railway
CNWA	*Canadian Navigable Waters Act*
CO_2e	Carbon Dioxide Equivalent
COS	Contamination Overview Study
COSSARO	Committee on the Status of Species at Risk Ontario
CPKC	Canadian Pacific Kansas City Limited (formerly CP Rail)
CPU	Certificate of Property Use
CSA	Canadian Standards Association
CTC	Credit Valley-Toronto and Region-Central Lake Ontario
CVC	Credit Valley Conservation
CVIF	Commercial Vehicle Inspection Facility
CVP	Community Value Plan
CWS	Canadian Wildlife Service
dB	Decibel
dBA	A-weighted decibel
DDI	Diverging Diamond Interchange
DFO	Fisheries and Oceans Canada
DWWP	Drinking Water Works Permit
EA	Environmental Assessment
EAA	*Environmental Assessment Act*
EASR	Environmental Activity and Sector Registry
ECA	Environmental Compliance Approval
ECCC	Environment and Climate Change Canada
EIAR	Environmental Impact Assessment Report
ELC	Ecological Land Classification

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Acronym	Definition
EPS	Emission Performance Standards
ERHD	Environmental Reference for Highway Design
ERIS	Environmental Risk Information Services
ERO	Environmental Registry of Ontario
ESA	Environmentally Significant/Sensitive Areas
EV	Electric Vehicle
FAA	Focused Analysis Area
FB	Future Build
FNB	Future No-Build
GBA+	Gender-Based Analysis Plus
GGH	Greater Golden Horseshoe
GGHM	Greater Golder Horseshoe Model
GHG	Greenhouse Gas
GTA	Greater Toronto Area
GTAG	Greenbelt Transportation Advisory Group
GTHA	Greater Toronto and Hamilton Area
Ha	Hectare
HADD	Harmful alteration, disruption or destruction
HHI	Human Health Implications
HIA	Heritage Impact Assessment
HOV	High Occupancy Vehicle
HPBATS	Halton-Peel Boundary Area Transportation Study
IAA	*Impact Assessment Act*
IAAC	Impact Assessment Agency of Canada
ICP	Indigenous Consultation Plan
IESO	Independent Electricity System Operator
IPD	Initial Project Description
IPP	Indigenous Procurement Policy
K	Vertical curve parameter

Acronym	Definition
km	kilometre
km^2	Square kilometre
km/h	Kilometres per hour
LID	Low Impact Development
LIO	Land Information Ontario
LOS	Level of Service
LRT	Light Rail Transit
LSA	Local Study Area
m	Metre
m^2	Square metres
MAG	Municipal Advisory Group
masl	Metres above sea level
mbgs	Meters below ground surface
MBR	Migratory Birds Regulations
MCM	Ministry of Citizenship and Multiculturalism
MDS	Minimum Distance Separation
MEAG	Municipal Executive Advisory Group
MECP	Ministry of the Environment, Conservation and Parks
mm	Millimetre
MLITSD	Ministry of Labour, Immigration, Training and Skills Development
MMAH	Ministry of Municipal Affairs and Housing
MNL	Mitigation Noise Level
MNO	Métis Nation of Ontario
MNR	Ministry of Natural Resources (formerly Ministry of Natural Resources and Forestry (MNRF))
MTO	Ministry of Transportation
MTOD	Ministry of Transportation Drawings
MUP	Multi-Use Path
MUT	Multi-Use Trail

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Acronym	Definition
NAPS	National Air Pollution Surveillance
n.d.	No date
NGO	Non-Governmental Organization
NIR	National Inventory Report
NRMT	Nashville Resource Management Tract
NSA	Noise Sensitive Area
NSSP	Non-Standard Special Provisions
OHSA	*Occupational Health and Safety Act*
OLA	Outdoor Living Area
OLM	Ozone Limiting Method
OMAFA	Ontario Ministry of Agriculture, Food and Agribusiness (formerly Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA))
OP	Official Plan
OPA	Official Plan Amendment
OPR	Official Plan Review
OPSD	Ontario Provincial Standard Drawing
OPSS	Ontario Provincial Standard Specification
O.Reg.	Ontario Regulation
Parclo	Partial Cloverleaf
PHPPS	Provincial Heritage Property of Provincial Significance
PIC	Public Information Centre
PPS	Provincial Planning Statement
PSA	Primary Study Area
PSN	Public Sector Network
PSW	Provincially Significant Wetland
PTE	Permission to Enter
Q&A	Question and answer
QUANTM	QUANTM Alignment Planning and Optimization software
RAAG	Regulatory Agency Advisory Group

Acronym	Definition
Reg	Regulation
ROPA	Regional Official Plan Amendment
ROPA 30	Region of Peel's Regional Official Plan Amendment for Bolton Residential Expansion Settlement
ROW	Right-of-way
RSC	Record of Site Condition
RTP	Regional Transportation Plan
SACC	Strategic Assessment of Climate Change
SAR	Species at Risk
SARA	*Species at Risk Act*
SCA	*Species Conservation Act*
SLHHRA	Screening Level Human Health Risk Assessment
SP	Special Provisions
SP 47	City of Brampton's Highway 427 Industrial Secondary Plan Area 47
SSA	Secondary Study Area
SSP	Shared Socioeconomic Pathways
STP	Snow Transport Potential
SWM	Stormwater Management
TAC	Transportation Association of Canada
TC	Transport Canada
TC Energy	TransCanada Energy
TDM	Transportation Demand Management
TDS	Transportation Development Strategy
TRCA	Toronto and Region Conservation Authority
TSM	Transportation Systems Management
UST	Underground Storage Tank
UV	Ultraviolet
v/c	Volume to capacity
VE	Value Engineering

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Acronym	Definition
WSP	WSP Canada Inc.
WWA	Water Well Assessments
WWIS	Water Well Information System

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GLOSSARY

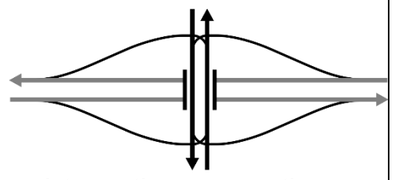
Term	Definition
***Highway 413 Act, 2024* Terminology**	
Change to the Highway 413 Project	Means, a. a change to the Highway 413 Project as the project is described in the final environmental impact assessment report published under subsection 8(4) of the *Highway 413 Act*, *2024*, as amended by any final addendum published under subsection 9(8) of the *Highway 413 Act*, *2024*, b. a change to the manner in which the Highway 413 Project is carried out, including a change to how the Ministry will mitigate negative impacts on the environment and monitor and verify the effectiveness of its mitigation, as described in the final environmental impact assessment report published under subsection 8(4) of the *Highway 413 Act*, *2024*, as amended by any final addendum published under subsection 9(8) of the *Highway 413 Act*, *2024*, and c. a prescribed type of change.
Environment	Has the same meaning as in the *Environmental Assessment Act*. Environment means, a. air, land or water, b. plant and animal life, including human life, c. the social, economic and cultural conditions that influence the life of humans or a community, d. any building, structure, machine or other device or thing made by humans, e. any solid, liquid, gas, odour, heat, sound, vibration or radiation resulting directly or indirectly from human activities, or f. any part or combination of the foregoing and the interrelationships between any two or more of them, in or of Ontario
Highway	Has the same meaning as in the *Public Transportation and Highway Improvement Act*. Includes a common and public highway, street, avenue, parkway, driveway, square, place, bridge, viaduct, trestle or any other structure incidental thereto, any part of which is intended for or used by the general public for the passage of vehicles and includes the area between the lateral property lines thereof.
Highway 413	Means a highway that connects Highway 400 in the Regional Municipality of York to Highway 401 and Highway 407 in the Regional Municipality of Halton and the Regional Municipality of Peel and includes related facilities and structures such as parking facilities, stormwater management ponds, commercial vehicle inspection facilities and maintenance yards.
Highway 413 early works projects	Means the following activities carried out by or on behalf of the Minister: a. constructing an embankment for a ramp near the existing ramp that starts at Exit 330 on westbound Highway 401 and connects westbound Highway 401 to westbound Highway 407 in the Regional Municipality of Halton; b. constructing a bridge within the Highway 413 route that is within or near the right of way for Highway 10 within the Regional Municipality of Peel, c. constructing a bridge within the Highway 413 route that is within or near the right of way for Bovaird Drive West within the Regional Municipality of Peel, d. any activities for or related to the activities described in clauses (a) to (c), e. constructing fencing for or related to any of the activities described in clauses (a) to (d) or clause (f), or otherwise constructing fencing for or related to Highway 413 or extensions of Highway 410 and Highway 427 to connect them to Highway 413, and any activities required for constructing such fencing, and f. such other activities for or related to Highway 413 or extensions of Highway 410 and Highway 427 to connect them to Highway 413 as may be prescribed.
Highway 413 Project	Means the following activities carried out by or on behalf of the Minister, other than the Highway 413 early works projects, a. constructing Highway 413, b. constructing extensions of Highway 410 and Highway 427 to connect them to Highway 413, i. changing any, ii. existing sewage works, rail lines or highways for or related to the activities set out in (a) or (b), or c. any prescribed thing related to the activities referred to in (a) or (b), and d. such other activities related to an activity referred to in (a), (b) or (c) as may be prescribed.

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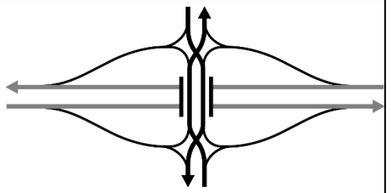
Term	Definition
Highway 413 Route	Means the area identified as the Preliminary Route Planning Study Area in Exhibit 6-20 of the GTA West Corridor Environmental Assessment Study: Transportation Development Study Report, dated November 2012, a copy of which is available on the Project website, as may be altered by the regulations.
Minister	Means the Minister of Transportation or such other member of the Executive Council to whom responsibility for the administration of the *Highway 413 Act*, *2024* is assigned or transferred under the *Executive Council Act*.
Ministry	Means the ministry of the Minister.
Person	Includes a municipality, the Crown and a Crown agency within the meaning of the *Crown Agency Act*.
Prescribed	Means prescribed by the regulations.
Project Website	Means a website maintained by or on behalf of the Minister on which information on the Highway 413 Project is publicly shared.
Regulations	In reference to the *Highway 413 Act*, *2024*, means the regulations made under the *Highway 413 Act*, *2024*.
Significant Change	Means a change to the Highway 413 Project that is, a. a change to the alignment for Highway 413 and extensions of Highway 410 and Highway 427 to connect them to Highway 413, as shown on the maps and drawings of the Ministry's preliminary design in the final environmental impact assessment report published under subsection 8(4) of the *Highway 413 Act*, *2024*, as may be amended by any final addendum published under subsection 9(8) of the *Highway 413 Act*, *2024*, b. the addition of or a change to the location of a parking facility, stormwater management pond, commercial vehicle inspection facility or maintenance yard, c. the addition of a bridge, interchange, intersection or roundabout, d. the addition of one or more lanes, e. a change to how or whether the Ministry will mitigate impacts on the environment, except, iii. where the change is required to comply with a provincial or federal Act, a regulation made under such an Act or an order, permit, approval or other instrument issued under such an Act, or iv. as prescribed; or f. a prescribed type of change.

Term	Definition
Other Terms	
400-series Highways	A network of controlled-access highways throughout the Province of Ontario, designed for high-speed, high-volume traffic. Their primary function is to transport people and goods between cities and major urban centres. 400-series highways feature full grade separation (such as bridges) at crossing roads and railway lines. Interchanges are provided along 400-series highways to connect local and municipal roads to the highways. Design speeds normally range from 100 km/h to 130 km/h, and posted speeds from 90 km/h to 110 km/h. Also referred to as Freeways.
Abutment	A retaining wall supporting the ends of a bridge, and, in general, retaining or supporting the approach embankment.
Active Transportation	Human-powered travel, including but not limited to walking, cycling, inline skating and travel with the use of mobility aids, including motorized wheelchairs and other power-assisted devices moving at a comparable speed.
Advanced Traffic Management Systems	A set of technologies used to improve the reliability, safety, and efficiency of traffic on highways and roads by collecting and analyzing real-time traffic data.
Advisory Groups	Refers to the Municipal Advisory Group, the Municipal Executive Advisory Group, the Regulatory Agency Advisory Group, the Community Advisory Group, and the Greenbelt Transportation Advisory Group established during the Highway 413 Project.
Alignment	An individual alignment alternative developed to capitalize on transportation opportunities within the Highway 413 Route and the transportation system/network, while avoiding or minimizing impacts to environmental features.
Arithmetic Evaluation Method	Quantitatively (with numbers) compares the advantages and disadvantages of the alternatives. The Arithmetic Evaluation Method was the secondary evaluation tool for Highway 413, with the primary tool being the Reasoned Argument Evaluation Method.
Arterial Road	A major roadway designed to carry large traffic volumes efficiently across urban, suburban, or rural areas. These roads link major transportation corridors (such as 400-series highways or provincial highways) to collector roads. These roads are primarily for through traffic, with limited access to properties. They may have traffic signals or roundabouts and bus or bike lanes.

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Term	Definition
Auxiliary Lane	An additional lane adjacent to a through lane intended for a specific maneuver such as turning, merging, diverging, and weaving. These are commonly used near interchanges to improve traffic flow and safety, such as merging lanes for entrance and exit ramps.
Average Annual Daily Traffic	The total volume of vehicle traffic on a road for a year, divided by the number of days in the year (365). AADT data is a key input to travel demand forecasting and predicting future traffic patterns, which informs long-term transportation planning.
Barrier Protection	A physical system or structure intended to prevent an errant vehicle from leaving the roadway or crossing into opposing lanes (for example, guiderail).
Buffer	A physical area intended to separate roadway elements, land uses, or features. Buffers can be any shape and may use empty space or a physical object to provide the separation.
Carbon Dioxide Equivalent (CO_2e)	A unit used to compare the radiative forcing of a GHG to carbon dioxide.
Carpool Lot/ Commuter Parking Lot	A designated space where users can park their vehicles and bicycles and connect to shared travel, such as public transportation, shuttles, and carpools.
Collector Road	A type of roadway that connects arterial roads to local streets, in which traffic movement and access to properties have similar importance.
Commercial Vehicle Inspection Facility	A location where MTO conducts safety and emissions inspections of commercial vehicles. CVIFs have dedicated entrance and exit ramps from the highway along with areas for large vehicle parking, weigh stations, and offices.
Community Advisory Group	An Advisory Group convened for the Highway 413 Project. A group consisting of members of the community and organizations interested in or potentially affected by the Project, who provided advice and input to MTO on community perspectives as the Project progressed.
Community Sensitive Design	A collaborative approach to transportation planning and engineering that aims to integrate the values, needs, and character of the community into infrastructure planning projects, while meeting safety and technical standards. This approach may include the early involvement of stakeholders, integration of community values, and environmental protection measures.
Constructability	The ease, efficiency, and practicality with which the Project can be built, considering aspects such as physical, property, or environmental constraints, design complexity, construction methods and timing.
Construction	The process of building the Project and achieving readiness for public use.
Contaminant	A solid, liquid or gaseous matter, microorganism, sound, vibration, ray, heat, odour, radiation or any combination thereof that is likely to somehow alter the quality of water or the environment.
Controlled Access Highway	A highway to which direct access is limited or prohibited by a public authority. 400-series highways in Ontario are controlled access highways.
Crossing Road	A road crossing the ROW via a grade-separated structure (underpass or overpass).
Cross Section	A vertical slice of a roadway taken perpendicular to its centreline that illustrates the layout of the roadway such as lanes, shoulders, sidewalks and drainage infrastructure.
Culvert	A structure that allows the passage of water, typically beneath a road, railway, or other obstruction. It typically consists of a tunnel or pipe embedded in the ground and surrounded by soil.
Design Speed	A selected speed used to determine the roadway geometry.
Desktop (Study, Review, Assessment, etc.)	A preliminary investigation that gathers and reviews existing information about a site without conducting any physical fieldwork.
Detail Design	The process of advancing the Preliminary Design to a level of detail that refines and expands the design into a comprehensive set of plans, construction specifications and material selection and quantities, providing all the necessary information for obtaining permits and approvals and constructing the Project.
Diamond Interchange	A two-level interchange, where a one-way diagonal ramp is provided in each of the four quadrants. From above, the four ramps form a diamond shape. Vehicles exit the highway via exit ramps that meet the crossing road at intersections. From these intersections, across the crossing road, vehicles enter the highway via entrance ramps. 
Direct Impacts	An impact resulting from a direct pathway between an effect of the Project and a component of the human or natural environment.

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Term	Definition
Diverging Diamond Interchange	A type of Diamond Interchange where traffic on the crossing road is temporarily shifted to the left side of the road between the ramp intersections. This shift is achieved at the intersections using crossover lanes. This design allows vehicles to turn left onto the freeway ramps without crossing opposing traffic. Beyond the ramp intersections, traffic crosses back to the right side. 
Duty to Consult	The legal obligation of Ontario, as the Crown, to consult with Aboriginal peoples where it contemplates decisions or actions that may adversely impact asserted or established Aboriginal or treaty rights.
Electric Vehicle Charging Stations	The equipment or device that supplies electricity to charge an electric vehicle. A charging station can have one or multiple charging connectors and may allow multiple vehicles to charge simultaneously
Elevation	The vertical distance measured of a point or object relative to a fixed reference surface (usually the mean sea level).
Embankment	A raised structure made of earth, rocks, or other material, built to elevate a roadway or other infrastructure above the natural ground level.
Entrance ramp	A roadway allowing traffic to enter a highway from a crossing road, with the intention of safely guiding traffic onto the highway without disrupting the flow of traffic.
Environmental Assessment	Refers to the process and requirements followed for assessing the potential environmental effects (positive or negative) for the Project. Key components of the EA process include consultation with government agencies and the public; consideration of alternatives; and the management of potential environmental effects. Starting in 2007, the Project followed the requirements of the comprehensive environmental assessment process (formerly known as an individual environmental assessment). Since 2024, the Project has followed the requirements of the *Highway 413 Act*, *2024,* building upon the considerable work completed on the Project to date, including environmental studies and ongoing consultation and engagement to advance the work since the commencement of the Project in 2007.
Environmental Constraints	Factors of the natural and human environment that are considered in the evaluation process to avoid and mitigate impacts.
Environmental Feature	Discrete components of the natural and human environment.

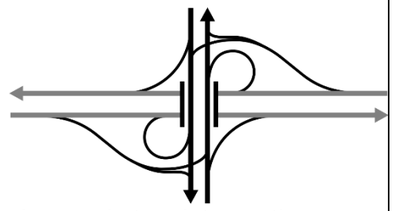
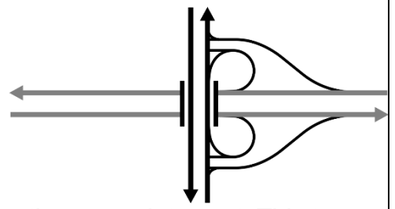
Term	Definition
Exit Ramp	A roadway allowing traffic to exit a highway and transition to a crossing road, with the intention of safely guiding traffic off the highway without disrupting the flow of through traffic.
Fieldwork (Assessment, Survey, Investigation, etc.)	Primary data collection activities used to supplement desktop reviews through physical presence at the site.
Flow Regime	The pattern of frequency and intensity of which water moves in a stream. Flow regime can be described as permanent (also referred to as perennial), intermittent, ephemeral, and seasonal. A permanent flow regime describes a stream where water flows year-round. An intermittent flow regime describes a stream where water only flows in some areas during certain times. An ephemeral flow regime describes a stream where water flows for a limited time in response to a precipitation event. A seasonal flow regime describes a stream where water only flows during specific times of the year and associated with seasonal patterns.
Fluvial Geomorphology	The study of how watercourses interact with landforms like valleys and floodplains, and how rivers change the landscape over time. It provides design input for crossing structures and channel design to support channel stability, maintain fish passage, reduce the risk of erosion and enhance the natural channel.
Focused Analysis Area	A zone surrounding the Highway 413 short list of alignments, and later the Technically Preferred Alignment and Preferred Alignment, within which refinements to the alignments could be accommodated while maintaining adequate space for the elements of Highway 413 and ancillary uses. Properties located within the FAA are subjected to limitations on modification or development, pending the completion of the Project.
Geographic Information Systems	Computer systems that are used to store, manage, analyze and visualize data that is spatially referenced to specific locations on the Earth.
Geology	The scientific study of the Earth – its materials, structure, processes, and history. It helps engineers identify suitable construction sites and materials, design infrastructure, and assess geological hazards.

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Term	Definition
Geomorphology	The scientific study of the Earth's surface features and the processes that shaped them. It helps engineers understand how the terrain is affected by natural forces such as water, wind, gravity, and tectonics to determine the suitability and stability of the land for construction or other uses, to adapt designs to the terrain, and assess hazards. This science is midway between geology and geography.
Goods Movement Priority Features	Solutions incorporated into the Highway 413 Preliminary Design to mitigate congestion related to goods movement and enhance the prioritization of goods movement within the highway corridor.
Greater Golden Horseshoe	The urban region centred around the City of Toronto, located at the western end of Lake Ontario. The geographic area extends north to Georgian Bay, south to Lake Erie, west to Wellington County and Waterloo Region, and east to the counties of Peterborough and Northumberland. The GGH was initially identified in Ontario Regulation 416/05 under the *Places to Grow Act*, 2005.
Greater Toronto Area	The geographic area including the City of Toronto and the regional municipalities of Halton, Peel, York and Durham.
Greater Toronto and Hamilton Area	The geographic area including the GTA and the City of Hamilton.
Greenbelt	A permanently protected area of land, primarily surrounding the Greater Golden Horseshoe, created under the *Greenbelt Act*, 2005. The area is identified in Schedule 1 of the Greenbelt Plan, 2017.
Greenbelt Protected Countryside	A designation of lands in Schedule 1 of the Greenbelt Plan, 2017.
Greenbelt Transportation Advisory Group	An Advisory Group convened for the Highway 413 Project. The group includes representation from environmental interest groups, environmental ministries, and other Greenbelt experts who provided advice and input to MTO on key environmental and agricultural features, potential impacts and mitigation strategies to be used within the Greenbelt.
Greenhouse Gas	Gaseous component in the atmosphere, both natural and artificial, that absorbs and re-radiates the infrared radiation of a specific wavelength emitted by the surface of the Earth, the atmosphere and the clouds.
High-Occupancy Vehicle	A vehicle that carries at least two people (including the driver) in a car, van or light truck, commercial truck less than 6.5 metres long with a gross weight of 4,500 kg or less, or a vehicle towing a trailer with a combined vehicle-trailer length of less than 6.5 metres.
High-Occupancy Vehicle Lane	A managed lane restricted primarily to high-occupancy vehicles (no tolling applied). High-Occupancy Vehicle lanes are designated lanes that can only be used by vehicles carrying two or more people or other specific types of vehicles, such as licensed taxis and motorcycles.
Highway-to-Highway Interchanges	An interchange that connects two or more highways, using ramps and flyovers. This allows for high-speed, high-volume traffic to travel from one highway to another without stopping or crossing traffic streams. Typically refers to interchanges between 400-series highways.
Horizontal Alignment	The layout of a road or as seen in plan (bird's eye view), consisting of tangents, circular curves, and transition curves. It is the path that a vehicle follows, viewed from above.
Hydrogeology	A geological discipline that studies groundwater (the underground flow of water, the search for groundwater, the evaluation of reservoirs, possible catchments and flows).
Indirect Impacts	An impact caused by the Project on a component of the natural or human environment but occurring later in time or farther removed in distance as compared to a direct impact.
Interchange	A grade-separated intersection that allows vehicles to move between two or more roads, using ramps and structures to avoid direct crossings of roadways.
Interim Lane Configuration	The elements of the Project constructed as an initial stage of implementation. In the context of Highway 413, the interim lane configuration consists of three through lanes in each direction with a grassed median. The Ultimate Lane Configuration would be constructed in the future, if warranted by transportation needs.
Intermodal	The transport of people and goods using two or more different modes of transportation.
Long List of Alignment Alternatives/Long List of Interchange Alternatives	The initial list of alignment and interchange alternatives produced within the Highway 413 Route based on principles for transportation engineering and environmental protection. The long list of alternatives was screened to determine a short list of alignments and interchanges.
Maintenance Facility	A designated area equipped for the storage and deployment of personnel, materials and equipment to enable the ongoing monitoring, maintenance and repair of highways and related infrastructure.
Major River Crossings	The Highway 413 bridge crossings of the Credit River, West Humber River, Main Humber River, and East Humber River.

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Term	Definition
Median	The physical or painted divider that separates opposing lanes of traffic. On Highway 413, a grassed median will be provided, which can be converted in future to a concrete barrier if additional lanes are constructed.
Mitigations/Mitigation Measures	A measure that is incorporated into a project to reduce, eliminate or ameliorate detrimental environmental impacts.
Modelling	The representation of a real-world structure or system, such as traffic flow on a network of roads, to simulate and analyze its behaviour. Models may be physical, mathematical, or digital.
Multi-Level Crossing	An intersection where at least one road crosses another at a different elevation.
Multi-Modal/Multi-Modal Transportation	The availability or use of more than one form of transportation, such as automobiles, walking, cycling, transit, rail (such as freight), trucks, air, and marine.
Multi-Use Path/Trail	A designated route designed to be shared by pedestrians, cyclists, and other forms of active transportation, typically separated from vehicular traffic.
Municipal Advisory Group	One of the Advisory Groups convened for the Highway 413 Project. The group includes representatives from all municipalities in the Highway 413 Route and provided input from a municipal and regional perspective.
Municipal Road	A public roadway that is owned and managed by a local government – typically a city, town, county or regional municipality. These roads are used for travelling within that municipality rather than inter-regional or highway travel.
Net Effects	The effects on the environment that remain after standard mitigation measures have been applied to reduce the extent of an effect.
Net Effects Analysis	The consideration of potential impacts and mitigation to determine the net positive or negative potential effects of an alternative.
Network Compatibility	The degree to which different components, systems, or modes within a transportation network function cohesively, both physically and operationally. Examples of this are the integration of transportation infrastructure planned by different authorities (such as municipal and regional levels), or how effectively regional transportation plans and transit initiatives are integrated to improve connectivity.

Term	Definition
Network Connectivity	The extent to which different parts of a transportation system are linked together, allowing people or goods to move efficiently from one place to another.
Overpass	A section of Highway 413 traveling over a crossing road.
Parclo-A4 Interchange	A two-level interchange having two loop ramps in diagonally-opposite quadrants for left turns from the crossing road onto the highway, two direct ramps in diagonally-opposite quadrants for right turns from the crossing road onto the highway, and two ramps from the highway to the crossing road at an intersection allowing for right or left turns. The name comes from an abbreviation for the PARtial CLOverleaf interchange. 
Parclo AB Interchange	A two-level interchange having two loop ramps and two direct ramps, configured such that two quadrants on opposite sides of the highway and on the same side of the crossing road each contain one loop ramp and one direct ramp. There are two intersections on the crossing road where the ramps intersect. This type of interchange only uses space on one side of the crossing road, but requires some vehicles to turn left to access the ramp compared to the Parclo A4 layout which has directional ramps for all crossing road traffic. 
Preferred Alignment	Refers to the collection of technically preferred alignments selected through the alignment evaluation process, with refinements applied following consultation.
Preliminary Design	The process of creating a basic layout of the highway, including its alignment, cross-section, interchange types and locations, bridge types and locations, stormwater management facilities and other key features. It facilitates property acquisition and provides a foundation for Detail Design. For Highway 413, the Preliminary Design consists of a typical six lane cross section (three lanes in each direction) with a grassed median. The ROW has been designed to accommodate up to ten lanes (five lanes in each direction) should future traffic conditions warrant additional capacity. These additional lanes would be provided by widening the highway towards the median.

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Term	Definition
Primary Source Information	Information produced by firsthand accounts or direct experience/observation.
the Proponent	MTO
Public Information Centre	A type of consultation activity where project information is shared with the public, Indigenous communities, and external agencies.
Ramp	A turning roadway that permits the movement of traffic between two or more roads.
Ramp Terminal Intersection	The point where a ramp from a highway meets a crossing road.
Rapid Transit	A form of public transportation that is designed to be high-capacity and provide fast and frequent travel. It typically operates in urban areas and is often separated from other traffic to improve safety and minimize delays.
Reasoned Argument Evaluation Method	Qualitatively (with words) compares the advantages and disadvantages of the alternatives to provide a clear rationale for the selection of a preferred alternative. The Reasoned Argument Evaluation Method was the primary evaluation tool for Highway 413, with the Arithmetic Evaluation Method employed to test and confirm the results.
Regulatory Agency Advisory Group	One of the Advisory Groups convened for the Highway 413 Project. The group includes representatives from relevant provincial ministries, agencies, and federal departments and provided input from a local planning, environmental and technical perspective.
Right-of-Way	The area of land acquired and legally designated for the provision of a transportation corridor. The Highway 413 right-of-way is typically 170 m wide, including 110 m for the highway and 60 m for the transitway, with wider areas around interchanges and to accommodate related infrastructure such as stormwater management ponds and Maintenance Facilities.
Road Network	The system of interconnected roads of all types (highway, arterial, collector, local, etc.) in a given area.
Roadway	The space that is designed and used for the movement of vehicles, cyclists and pedestrians between locations.
Secondary Source Information	Information created without direct experience or observation. Examples include reference books or articles, mapping prepared by others, or other resources that are often based on primary sources.
Section	For Highway 413, refers to the geographic divisions used in the evaluation process of the alignment and interchange alternatives.

Term	Definition
Sediment	An unconsolidated deposit of detritic, chemical or organic origin formed by the grouping of small and larger particles or precipitated matter having been transported separately.
Short List of Alignment Alternatives/Short List of Interchange Alternatives	The screened and synthesized list derived from the long list of alignment and interchange alternatives for the Highway 413 Route, developed according to transportation engineering and environmental protection principles. The short list of alternatives was evaluated using the Reasoned Argument Evaluation Method and the Arithmetic Evaluation Method to determine a Technically Preferred Alignment.
Signalized Intersection	A location where two or more roads meet, where traffic flow is regulated by traffic signals, typically using red, yellow, and green lights and pedestrian signals to assign right-of-way to vehicles and pedestrians.
Signature Bridge	A bridge designed with attention to unique architectural design.
Span	Length between bridge supports.
Speed Change Lane	A specially-designated lane that allows vehicles to adjust their speed (decelerate or accelerate) when entering or exiting a main traffic stream. These are commonly found near highway ramps, intersections, or major arterial roads.
Staging	In highway construction, the planning and sequence of construction activities, resources, and site logistics to minimize disruption to traffic and ensure road safety during construction.
Stakeholders	Individuals and organizations with interest in the Highway 413 Project.
Stormwater Management Pond	An engineered basin designed to collect, store, and treat runoff from rain and melted snow. These ponds hold excess water to prevent flooding and erosion downstream and filter out sediment and pollutants to improve water quality before releasing it into natural water bodies.
Stratigraphy	The science that studies the succession of sedimentary deposits, generally laid out in layers (or strata). The study of the order in which layers of rock that make up the Earth's crust formed over geological times.
Study Area	A geographic boundary created for analysis and reporting by specialist disciplines.
Surface or superficial deposits	Unconsolidated sediments (clay, sand, gravel, stones, etc.) of various origins, natures, morphologies and thicknesses that rest on the surface of the bedrock.
Technically Preferred Alignment	The alignment selected for each section from the short list of alignment alternatives based on the results of the evaluation process.

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Term	Definition
Terminal Intersection	The point where a ramp from a freeway or highway ramp meets a local road, forming a junction or street at its end.
Through Lane	A lane intended for through traffic movement (as compared to Turning Lane).
Traditional Land Use	All of the traditional hunting, fishing, gathering and general activities as well as land and resource use activities for livelihood, ritual and social purposes.
Traffic Management System	The technologies and strategies used to monitor, control and optimize the flow of vehicles on transportation networks. This may include components such as real-time sensors, cameras, and radar to track traffic volume, speed, and incidents, or the dynamic adjustment of traffic signals to improve traffic flow.
Transitway	Related to Highway 413, a separate proposed 60 m wide corridor running alongside the highway, dedicated for public transit, which will be subject to a separate future assessment of environmental impacts.
Transportation Corridor	A designated area that facilitates the movement of goods, services and people.
Transportation Network	A system consisting of facilities, corridors and rights-of-way for the movement of people and goods, and associated transportation facilities including roads, transit stops and stations, sidewalks, cycle lanes, bus lanes, high occupancy vehicle lanes, rail facilities, commuter parking facilities service centres, rest stops, Commercial Vehicle Inspection Facilities, inter-modal facilities, harbours, airports, marine facilities, ferries, canals and associated facilities such as Maintenance Facilities.
Tributary	A watercourse that flows into a larger watercourse or into a lake (affluent).
Turning Lane	A type of Auxiliary Lane, dedicated for turning vehicles at an intersection (as compared to Through Lane).
Ultimate Lane Configuration	The elements of the Project representing the maximum design that can be accommodated within the right-of-way. In the context of Highway 413, the ultimate lane configuration consists of five lanes in each direction, separated by a median barrier. The Ultimate Lane Configuration would be constructed in the future, if warranted by traffic needs.
Underpass	A portion of Highway 413 traveling under a crossing road.
Urban Growth Centre	Focal points for investment in public services, infrastructure and transit intended to support higher-density, mixed-use development.
Vertical Alignment	The layout that a road follows in profile (side) view, defining its elevation changes along its length. It is the path that a vehicle follows in climbing and descending a roadway.
Watercourse	A natural or artificial channel through which water flows.
Watercourse Crossing	Any structure or method that allows people, vehicles, or infrastructure to pass over or through a watercourse. Examples include bridges and culverts.
Watershed	A territory, bounded by drainage divides, over which water flows to a single point called an outflow.
Wetland	Lands that are seasonally or permanently covered by shallow water, as well as lands where the water table is close to or at the surface. In either case the presence of abundant water has caused the formation of hydric soils and has favoured the dominance of either hydrophytic plants or water tolerant plants. The four major types of wetlands are swamps, marshes, bogs and fens.
Wildlife Crossing	A structure specifically designed to allow animals to safely cross human-made barriers like roads, railways, or pipelines.

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1. Overview of the Undertaking

1.1 Project Overview

The Ontario Ministry of Transportation (MTO) retained WSP Canada Inc (WSP) and AECOM Canada ULC (AECOM) in collaboration with various sub-consultants and technical firms to undertake the Highway 413 Preliminary Design and Assessment of Environmental Impacts, hereinafter referred to as “the Project”.

The Project has followed the requirements of the *Highway 413 Act*, *2024*.

The Project includes the 52-kilometre (km) Highway 413 Corridor, a 4 km extension to Highway 410, and a 3 km extension to Highway 427 (both facilitating connections to the Highway 413 Corridor), for a total of 59 km of new infrastructure (**Section 1.2.4**). The highway will have 11 interchanges with municipal roads. Features such as stormwater management (SWM) ponds, carpool lots, Commercial Vehicle Inspection Facilities (CVIF), maintenance facilities, and the potential for electric vehicle charging stations, have been explored as part of Preliminary Design.

Highway 413 will connect Highway 401 and Highway 407 ETR (Express Toll Route) in the Regional Municipality of Halton and the Regional Municipality of Peel with Highway 400 in the Regional Municipality of York.

The typical right-of-way (ROW) will be 170 metres (m) which includes 110 m for the typical mainline highway and 60 m for a proposed transitway (**Figure 1-6**). A multi-use trail (MUT) parallel to Highway 413 may be accommodated within the proposed transitway ROW. The ROW is expanded at interchanges and high fill areas to accommodate ramps to/from the crossing roads, as well as in locations with ancillary highway facilities as mentioned above. The Preliminary Design consists of a typical 6-lane cross-section (3 lanes in each direction) with a grassed median. The ROW has been designed to accommodate up to 10 lanes (5 lanes in each direction) should future traffic conditions warrant additional capacity. These additional lanes would be provided by widening the highway towards the median.

The proposed transitway will be a separate corridor running alongside the highway, dedicated for public transit, including stations to facilitate passenger access at key locations. The proposed transitway and stations will be subject to a separate future assessment of environmental impacts. Concept plans for the proposed transitway are shown on the Preliminary Design Plans included in **Appendix B**.

Highway 413 is a 400-series highway, which is a network of controlled-access highways throughout the Province of Ontario. Their primary function is to accommodate through traffic and provide links between urban centres. 400-series highways feature full grade separations (such as bridges) at most intersecting roads and railway lines. Interchanges are provided along the 400-series highways to connect to other highways and municipal roads. These highways have design standards to accommodate high speeds and various collision avoidance and traffic management systems. Highway 413 is proposed to have a posted speed limit of 110 km/h.

Project Timeline

The considerable work undertaken to advance the Project since 2007 (previously titled the GTA West Transportation Corridor Study), including technical studies and consultation and engagement, were carried forward to meet the requirements of the *Highway 413 Act, 2024*.

Figure 1-1 summarizes the project timeline, including the project process, key milestones, consultation and engagement process, and key fieldwork and survey investigations conducted.

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Project Timeline

	2007	2008	2009	2010	2011	2012	2013-2015	2019	2020	2021	2022	2023	2024	2025	2026 and Beyond
Project Process	**Completion of the Transportation Development Strategy (TDS)**						• Development of alignments • Commencement of assessment of alignments	**Development of Preliminary Design**						• Draft Environmental Impact Assessment Report (EIAR) generated • Comment Period on draft EIAR • Final EIAR completion	
	Development of the planning framework		• Identified transportation challenges and opportunities • Developed and evaluated transportation improvement alternatives		• Transportation Development Strategy – recommended alternatives to carry forward			• Finalization of assessment of alignments • Evaluation of alignments and selection of a Technically Preferred Alignment • Refinements following consultation and confirmation of the Preferred Alignment	• Preliminary design of the Preferred Alignment, including recommended mitigations for all anticipated impacts				*Highway 413 Act*, 2024 passed November 25th 2024		
Consultation and Engagement	1		1 x 2	1		1	1 x 2 1 x 2	1 1	1 1	1 1 1 x 2		1	1	1	
	Advisory Group Meetings / Consultation and Engagement with Stakeholder Groups							Advisory Group Meetings / Consultation and Engagement with Stakeholder Groups							
	Indigenous communities Engagement and Consultation							Indigenous communities Engagement and Consultation							
Key Fieldwork and Survey Investigations			Desktop surveys and data collection to establish baseline transportation and existing environmental conditions and constraints in the Preliminary Study Area. In order to avoid or mitigate potential negative impacts to these features, the environmental investigations identified significant natural, socio-economic and cultural features.				Fieldwork was undertaken to aid in the evaluation of the short list of planning alternatives. • Fish and Fish Habitat • Terrestrial Ecosystems • Groundwater • Potentially Contaminated Sites • Land Use • Built Heritage Resources and Cultural Heritage Landscapes	• Fisheries • Wildlife • Wetlands • Vegetation • Potentially Contaminated Sites • Built Heritage Resources and Cultural Heritage Landscapes • Fluvial Geomorphology	• Built Heritage Resources and Cultural Heritage Landscapes • Fluvial Geomorphology • Foundations Investigations	• Fisheries • Wildlife • Wetlands • Vegetation • Land Use • Agriculture • Archeology • Built Heritage Resources and Cultural Heritage Landscapes • Fluvial Geomorphology • Erosion and Sediment Control • Foundations Investigations	• Fisheries • Wildlife • Wetlands • Vegetation • Agriculture • Potentially Contaminated Sites • Archeology • Built Heritage Resources and Cultural Heritage Landscapes • Foundations Investigations	• Foundations Investigations • Fluvial Geomorphology • Built Heritage Resources and Cultural Heritage Landscapes • Pavement Engineering Investigations	• Archaeology • Foundations Investigations • Fluvial Geomorphology • Roadside Reconnaissance Surveys	

Project Paused

Subject to funding and approvals, the Project will go through a Detail Design and procurement phase. This will culminate in the initiation of project construction.

Legend

- Public Information Centre
- Community Value Plan Meeting
- Community Workshops
- Community Webinar
- Field Work and Surveys

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Figure 1-1
Highway 413 Project Timeline

1.2 Project Background and Purpose

The *Growth Plan for the Greater Golden Horseshoe* (2006) projected a substantial increase in population and employment throughout the Greater Golden Horseshoe (GGH). Without improvements to the existing transportation network, those increases would lead to unmanageable pressures on existing transportation infrastructure. In particular, it was recognized that various transportation options would be needed to improve connections between Urban Growth Centres.

In both the 2006 and 2020 Growth Plans, the Highway 413 Corridor was identified as a "Future Transportation Corridor", representing a strategic link between the Urban Growth Centres (areas subject to future intensification) in the west of the Greater Toronto Area (GTA) such as Downtown Milton, Brampton City Centre, Vaughan Metropolitan Centre and Downtown Guelph.

The Growth Plan for the GGH was consolidated into the Provincial Planning Statement (PPS) in 2024 which includes an updated reference to provincial transportation plans in relation to corridor planning and protection.

Highway 413 is identified as a new planned corridor in *Connecting the GGH: A Transportation Plan for the Greater Golden Horseshoe*, released by the Ontario Government in 2022. Highway 413 is included in both the plan's highway network and strategic goods movement network as part of its 2051 vision (**Figure 1-2**). The purpose of the Project is to adhere to Ontario's plan to expand highways and public transit across the GGH to fight congestion, create jobs and prepare for the massive population growth expected over the next 30 years.

As described in detail in the Transportation Development Strategy Report (November 2012) and its Executive Summary, despite a multi-billion-dollar commitment for additional rapid transit, highway improvements, and an overall shift to building denser, mixed-use neighbourhoods, transportation modeling results indicate that increased pressures on the transportation network, due to growth, would still result in congested roadways. From a transportation planning perspective, the forecasted growth poses a significant challenge as:

- Much of the existing road network is already operating at or near capacity during peak periods.
- The transportation network within the Preliminary Study Area, including planned road and transit improvements, will not be able to support the additional transportation demand that corresponds with the projected growth to 2031 and beyond.

This congestion affects everyone in the region, including longer commutes for workers (inclusive of those taking transit), and a less reliable logistics process for both suppliers and customers - all of which may have a general impact on quality of life.

Cost of Congestion in the Greater Toronto and Hamilton Area (GTHA)

In a 2024 study completed by the Canadian Centre for Economic Analysis (CANCEA), the annual economic impact of congestion in the GTHA was estimated at **$10.1 billion** (CANCEA, 2024) and the social value impact was estimated at **$34.6 billion** (CANCEA, 2024).

Both costs were defined and incorporated into the cost analysis of congestion impacts in the GTHA. The economic costs included the effects of congestion on business productivity, such as increased delays in the transportation of goods and services and reduced worker efficiency.

The social value impact costs accounted for the impact on commuters, including the diminished life satisfaction and increased stress due to prolonged commute times.

Additional transit and increases in transit ridership are important goals, and the transportation model used to forecast for future transportation systems assumed both would occur. As such, Ontario continues to undertake transit investments including commitments to delivering new GGH rapid transit projects.

Goods movement will continue to depend on a functional road network. Businesses and industry associations consulted early in the Project raised concerns that congestion poses a significant and costly challenge for the movement of goods, especially with a just-in-time industrial model.

Highway 413 is expected to support the overall GGH transportation system by:

- relieving traffic on local roads and parallel highways;
- accommodating travel demand;
- reducing travel times for commuters and goods movement;
- reducing the social, environmental and economic costs of congestion;
- providing greater connectivity between existing highways and Urban Growth Centres;
- providing better connections to residential and employment lands; and
- providing an alternate route in the event of an incident or road closure on local and regional roads.

Sections 1.2.1 and 1.2.2 provide a further overview of the history of the Project, including the completion of the Transportation Development Strategy (TDS) and the process for development of the Preliminary Design.

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Committed Widening

a Hwy 401 Widening (Credit River to Regional Rd 25)
b Hwy 401 Widening (Hespeler to Townline)
c Garden City Skyway Widening
d Hwy 400 Widening (Langstaff Rd to Hwy 9)
e Hwy 404 Widening (Hwy 407 to Stouffville Rd)

New Capacity Expansion

1 Hwy 8 (Sportsworld Dr to Hwy 401)
2 Hwy 9 (Hwy 10 to Hwy 400)
3 Hwy 403 (Aberdeen Ave to Paris Rd)
4 Hwy 403 (Aberdeen Ave to West of Hwy 407)
5 Hwy 401 (Townline Rd to Regional Rd 25)
6 Hwy 400 (Hwy 9 to Duckworth St)
7 Hwy 401 (Brock Rd to Hwy 35/115 Durham)
8 Hwy 6 (Upper James St to Hwy 403)
9 QEW (Hwy 406 to Guelph Line)
10 QEW (Hwy 406 to Hwy 405)
11 Hwy 7 (Donald Cousens Pkwy to York/Durham Line)
12 Hwy 403 (QEW to Hwy 407)
13 Hwy 48 (Major Mackenzie Dr to Bloomington Rd)
14 Hwy 410 (Queen St to Mayfield Rd)
15 Hwy 401 (Hwy 427 to Hwy 404)

New Planned and Conceptual Corridors

16 Hwy 6 Morriston Bypass (Realignment)
17 Hwy 7 New Freeway (Kitchener to Guelph)
18 Hanlon Expressway (Upgrade)
19 Cambridge-Brantford Corridor (conceptual project) (Hwy 401 to Hwy 403)
20 Hwy 404 Extension (Woodbine Ave to Hwy 12)
21 Highway 413
22 Bradford Bypass

Source: Connecting the GGH: A Transportation Plan for the Greater Golden Horseshoe

Figure 1-2
Current, Planned and Conceptual Future Road Infrastructure in the GGH

1.2.1 Completion of the Transportation Development Strategy

A TDS was completed to evaluate long-term inter-regional transportation problems and opportunities and consider alternative solutions to address these issues. The objective was to develop an integrated, multi-modal transportation system that enables the efficient movement of people and goods and provides better economic and transportation linkages between existing highways and Urban Growth Centres in a Preliminary Study Area (**Figure 1-3**).

The development of the TDS considered all transportation modes within a broad Preliminary Study Area, from Highway 400 in the east, to Guelph in the west. This area was intended to be large enough to accommodate the development, assessment and evaluation of a range of area transportation system alternatives to address future transportation problems and opportunities. The process for completing the TDS involved the following steps:

1. Identifying transportation problems and opportunities within the Preliminary Study Area.

   Forecasts for the Preliminary Study Area show substantial growth by 2031. Population and employment levels are expected to more than double between 2001 and 2031. The overarching problem of the inter-regional transportation system in 2031 relate to the road network. Much of the higher order road system (i.e., highways and inter-regional roads) is expected to be heavily congested during peak periods and increasingly throughout the day.

2. Developing, assessing, and evaluating a range of alternatives to address the identified transportation problems and opportunities within the Preliminary Study Area.

   a. All transportation modes (including transit, marine, air, freight rail, intermodal, and roads and highways) and their ability to address future transportation demands by 2031 [including transportation demand management (TDM) and transportation systems management (TSM)] were considered.

   b. Future anticipated conditions within the Preliminary Study Area were forecasted, and potential transportation alternatives were analysed for their ability to meet those future needs. A two-step “building block” approach was used to identify, group and assess these alternatives.

      - Step one of the “building block” approach involved a comprehensive assessment of individual modes of transportation alternatives. While each individual mode was an important component of the transportation network, the key outcome was that no single mode could meet the Preliminary Study Area’s future transportation needs.
      - During step two of the “building block” approach, single-mode alternatives were bundled into four groups of alternatives for further assessment. This approach undertook an incremental process to assessing the potential benefits of the four groups, gradually adding in more improvements as needed.

3. Recommending a strategy based on the alternatives that were carried forward from the evaluation.

The process for completing the TDS was undertaken alongside extensive consultation and engagement, including with municipal councils/committees and staff, agencies, advisory groups, Indigenous communities, and the public, and included five rounds of Public Information Centres (PICs).

Upon completion of these steps (carried out between 2009 and 2012), the TDS was released in November 2012 [Transportation Development Strategy Report (November 2012)].

The TDS recommended a multi-modal strategy to meet current and future transportation needs in the Preliminary Study Area that:

- Supports transit initiatives that are consistent with the Metrolinx Regional Transportation Plan and GO Transit Strategic Plan (GO 2020).
- Optimizes the use of existing transportation infrastructure through TDM and TSM measures in cooperation with Metrolinx.
- Initiates a region-wide Active Traffic Management Study.
- Widens selected highways to provide additional capacity including High-Occupancy Vehicles and multi-modal uses.
- Initiates a multi-modal area-wide study in the Waterloo/Wellington/Brantford area to explore the potential for inter-regional transit service improvements west of the GTA.
- **Plans a new transportation corridor from Highway 400 west to connect to Highway 401 / Highway 407 ETR at the Halton-Peel Boundary.**

Future Growth, Future Transportation Pressures

The traffic forecasts carried out as part of the TDS show that in the long-term, even with extensive investment in transit, congestion will continue to increase unless other improvements are made.

While each individual transportation mode is an important component of the transportation network, no single mode could meet the Study Area’s future transportation needs.

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The recommendation from the TDS, to "plan a new transportation corridor from Highway 400 west to connect to Highway 401 / Highway 407 ETR at the Halton-Peel Boundary" was carried forward for future study as the Project. The other recommendations from the TDS are being carried forward on a separate track outside of the Project, led by municipalities and agencies, and as part of other provincial projects and initiatives, such as MTO's Connecting the GGH: A Transportation Plan for the GGH [Connecting the GGH: A Transportation Plan for the Greater Golden Horseshoe | ontario.ca] and Metrolinx's Regional Transportation Plan [Regional Transportation Plan | Metrolinx]. Ontario Builds describes a wide range of infrastructure that has been completed or is being built around the province, including many projects at both the provincial and municipal level that were built in response to recommendations from the TDS.

1.2.2 Process for Development of the Preliminary Design

As part of the development of the Preliminary Design, alignments were generated within the Highway 413 Route. Alignment selection involved increasingly detailed assessments and evaluations of a long list of alignments, which were then refined to a short list, and culminated in the selection of the Preferred Alignment in 2020, which is identified on **Figure 1-3**. **Chapter 3** provides further details regarding the alignment selection process.

The development of the Preliminary Design for the Project was initiated in early 2014, with a focus on the recommendation from the TDS: plan a new transportation corridor located within the Preliminary Route Planning Study Area in Exhibit 6-20 of the TDS, now referred to as the Highway 413 Route (**Figure 1-3** and **Section 1.2.3**). This process focused on identifying the alignment and developing the Preliminary Design for the new transportation corridor.

MTO reviewed and considered feedback from advisory groups, municipal councils and staff, agencies, Indigenous communities, community groups and the public throughout the process (see **Chapters 7 and 8**).

The final Preliminary Design is identified in **Chapter 4** and the publication of the final Environmental Impact Assessment Report (EIAR) on the Project Website will mark the completion of the Preliminary Design phase (**Figure 1-4**).

Additional details on the next steps regarding the EIAR, including its distribution, review and finalization processes are found in **Section 1.3.3**.

Figure 1-3: Preliminary Study Area, Highway 413 Route and 2020 Preferred Alignment

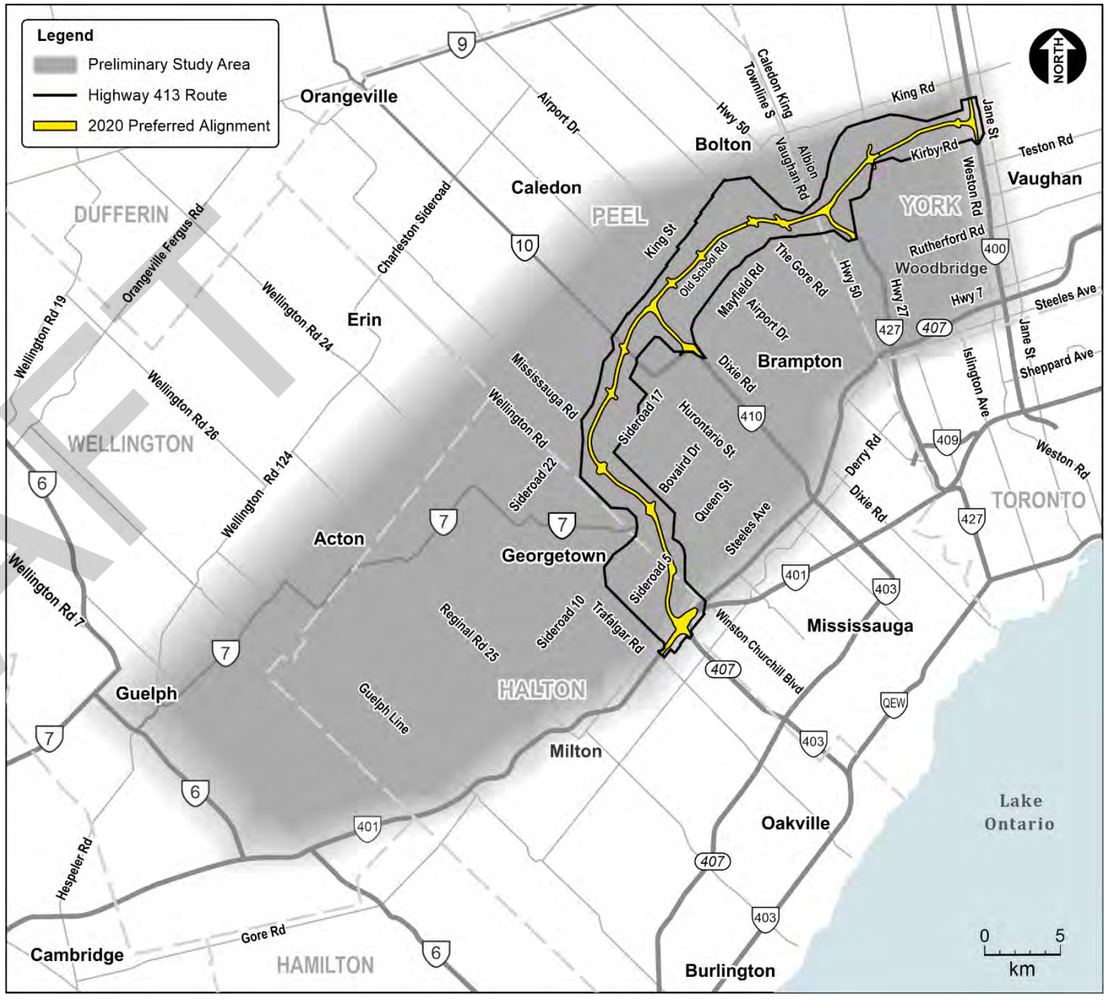
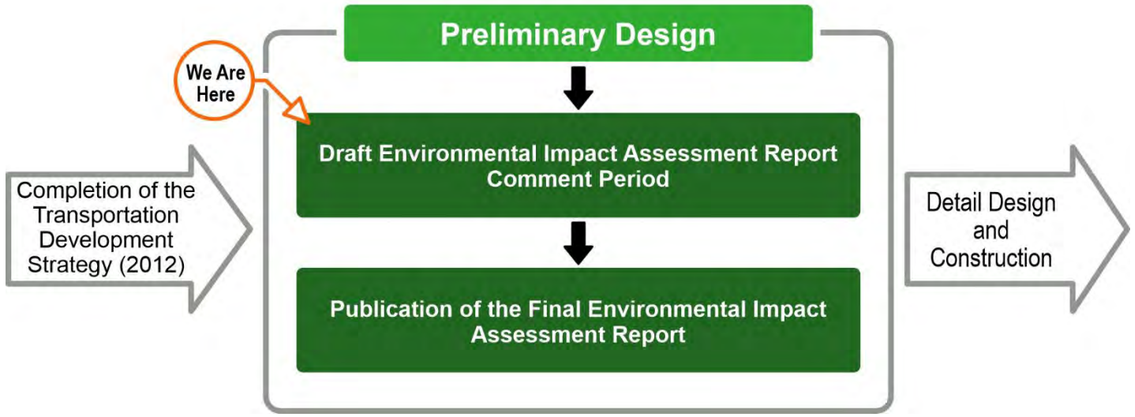


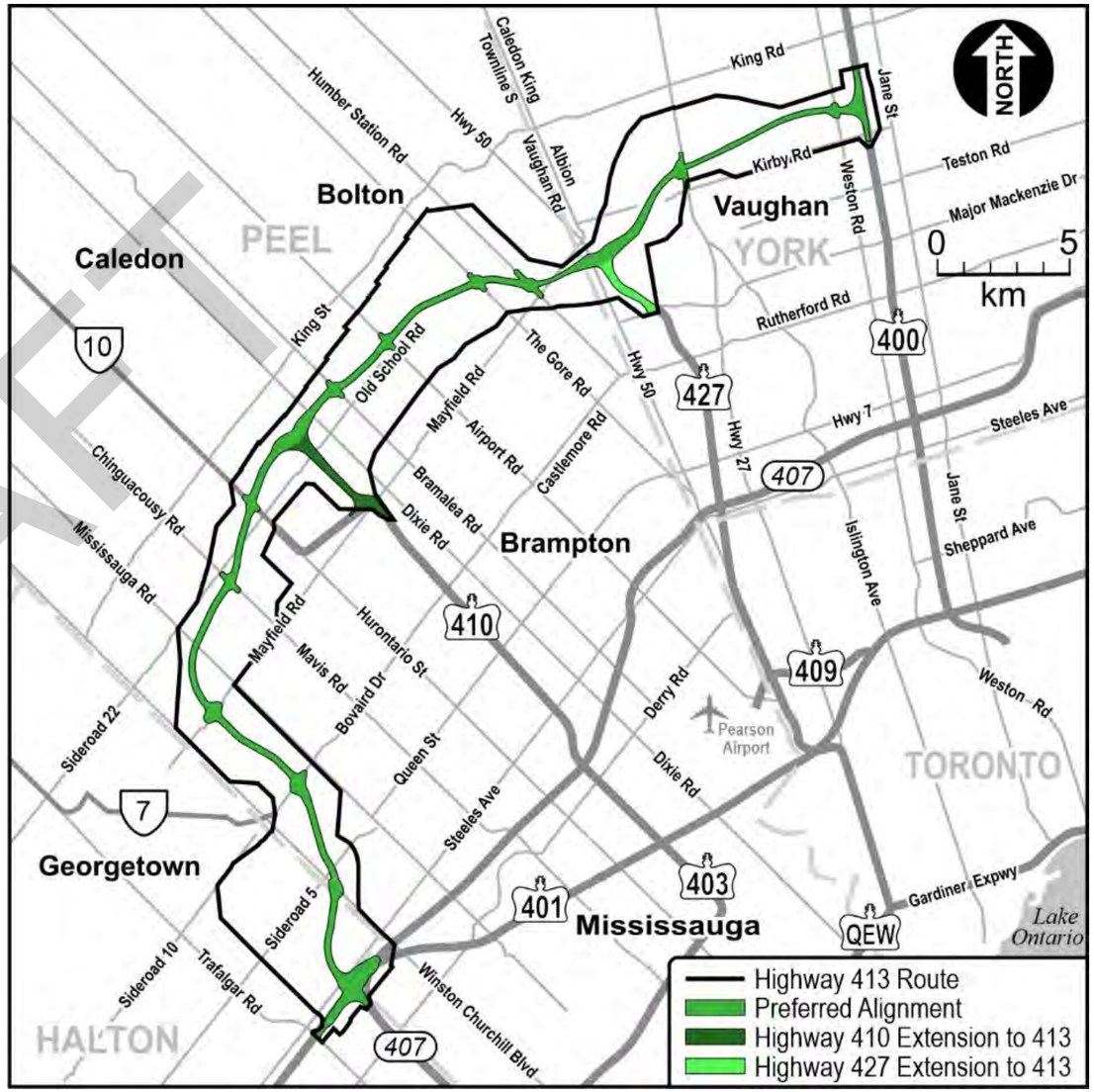
Figure 1-4: EIAR Publication Summary



1.2.3 Highway 413 Route

The Highway 413 Route (**Figure 1-5**) is a geographic area within which a reasonable range of alignments could be generated. It is large enough to accommodate several alignment alternatives for new highway/potential transitway facilities, including interchanges to connecting highways and municipal roads, sideroad realignments and new connections, transit stations and rail connections, other related facilities such as SWM ponds and transit station parking, as well as areas for environmental mitigation.

Figure 1-5: Highway 413 Route, Preferred Alignment and Extensions



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1.2.4 Preferred Alignment

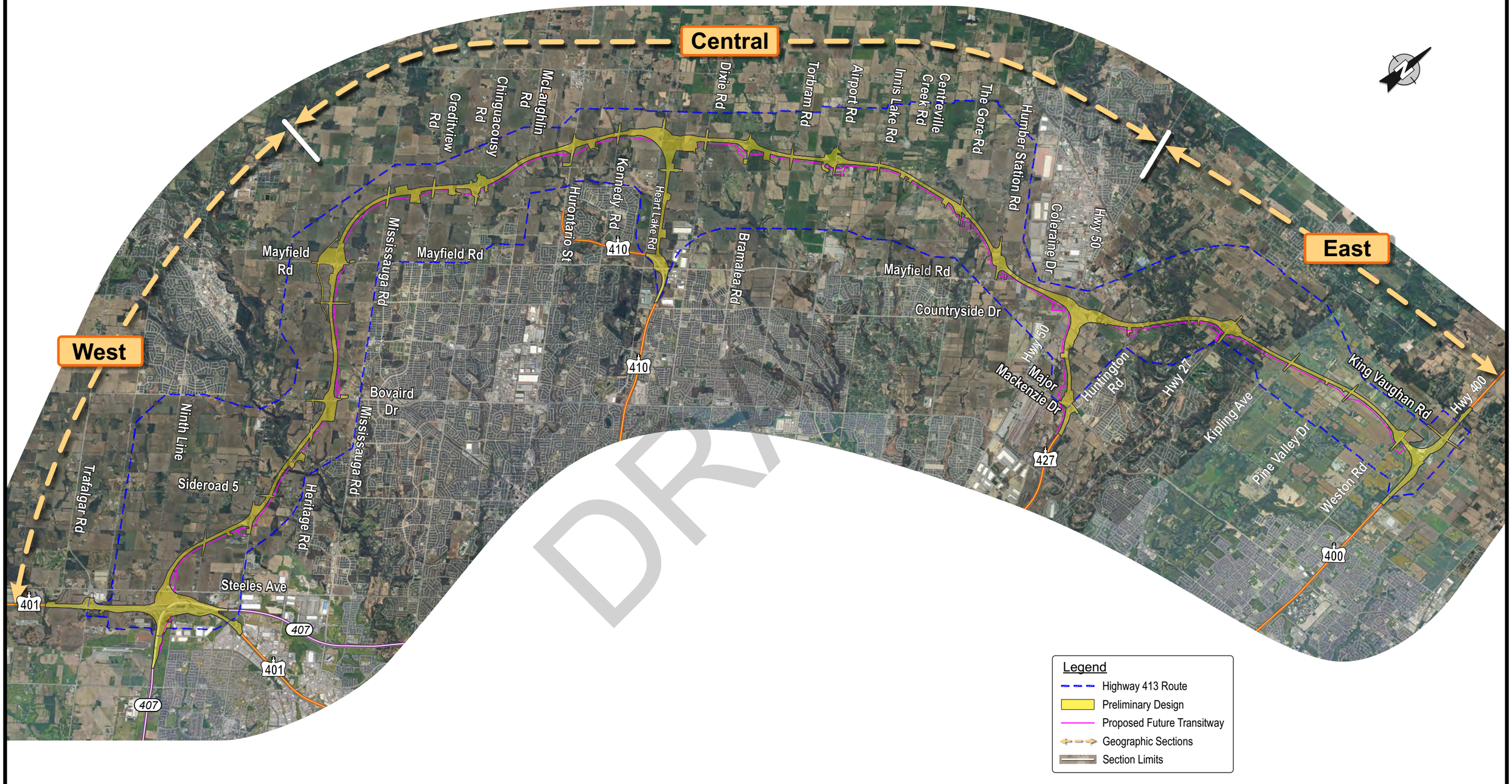
The Preferred Alignment for Highway 413, shown in **Figure 1-5** and **Figure 1-6**, was announced in 2020 and was selected based on a published set of evaluation criteria, and input from an extensive consultation and engagement process with Indigenous communities, regulatory agencies, municipalities, and members of the public (further details on alignment selection are located in **Chapter 3**). The Preferred Alignment was subsequently advanced to a preliminary design level of detail.

The Preliminary Design for Highway 413 is shown in **Figure 1-6** and detailed in preliminary engineering drawings in **Appendix B**. It reflects the alignment and ROW for the highway and interchanges, based on an iterative and multi-disciplinary process that advanced the Preferred Alignment considering opportunities to minimize environmental impacts and integrating SWM solutions to protect local ecosystems. A detailed explanation of the process to advance the Preferred Alignment to Preliminary Design is provided in **Section 3.5**.

Highway 413 will connect Highway 401 and Highway 407 ETR in the Regional Municipality of Halton and the Regional Municipality of Peel to Highway 400 in the Regional Municipality of York. Features such as SWM ponds, carpool lots, CVIF, maintenance facilities, and the potential for electric vehicle charging stations, have been explored as part of Preliminary Design.

Figure 1-7 depicts a typical cross-section for Highway 413. The Preliminary Design consists of a typical 6-lane cross section (3 lanes in each direction) with a grassed median. The ROW has been designed to accommodate up to 10 lanes (5 lanes in each direction) should future traffic conditions warrant additional capacity. These additional lanes would be provided by widening the highway towards the median. If these additional lanes are required, the requirements of the *Highway 413 Act, 2024* will be followed. The Highway 410 and 427 extensions will have similar cross-sections; however, they will initially be built with four lanes (two lanes in each direction). The proposed transitway will be a separate corridor running alongside the highway, dedicated for public transit. The proposed transitway will be subject to a separate future assessment of environmental impacts.

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Figure 1-6
Preliminary Design and ROW for Highway 413 and Interchanges

Figure 1-7: Cross Section of Highway 413



1.3 Project Process

1.3.1 Highway 413 Act

Under the *Highway 413 Act, 2024*, which received Royal Assent on November 25, 2024, the proponent (MTO) is required to:

- Prepare an Indigenous Consultation Plan (ICP) (**Section 1.3.2**) as described in Section 4 of the *Highway 413 Act*, *2024* for consulting Indigenous communities who have or may have Aboriginal or treaty rights that may be impacted by the Highway 413 Project or who are interested in the Highway 413 Project, circulate the plan to the communities (including any changes made to the plan), and implement the plan;
- Assess the impacts of the Highway 413 Project on the environment and identify how negative impacts will be mitigated, based on MTO's Preliminary Design for the Project;
- Prepare and publish a draft EIAR which will include a description of local environmental conditions and studies completed (e.g., fish and fish habitat, terrestrial ecosystems, archaeological resources, air quality, agriculture, noise, socio-economic conditions, drainage and SWM), the assessment of impacts of the Highway 413 Project on the environment based on the Preliminary Design of the Project, a description of how impacts will be mitigated and the record of consultation;
- Provide Indigenous communities, government agencies, interested persons and the public an opportunity to comment on the draft EIAR; and
- Prepare a final EIAR, considering any comments regarding the draft EIAR and publish the final EIAR on the Project Website (Highway 413).

The considerable work undertaken to advance Highway 413 since 2007 (previously titled the GTA West Transportation Corridor Study), including technical studies and consultation and engagement, were carried forward to meet the requirements of *Highway 413 Act, 2024.*

The *Highway 413 Act, 2024* also includes:

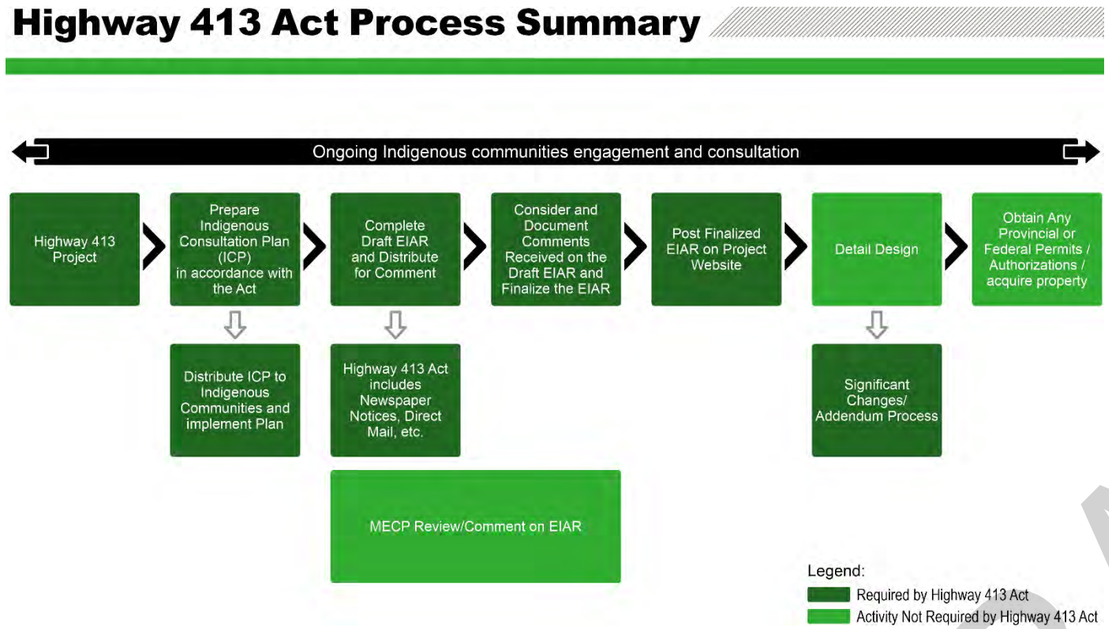
- An addendum process to deal with significant changes to the Project as defined in the *Highway 413 Act*, *2024*.That process includes requirements to assess impacts on the environment and identify mitigation, prepare a draft addendum with an opportunity for comment by Indigenous communities and the public, consider any concerns raised, and prepare and publish a final addendum. A change to the Highway 413 Project that is not a significant change can proceed without any process under the Act.
- Regulation-making authority including for:
  - prescribing additional Highway 413 early works projects;
  - prescribing the types of changes considered to be significant; and
  - governing assessment and mitigation of impacts of the Highway 413.
- A provision providing that once the draft EIAR is published on the Project Website, regulations shall not be made prescribing additional activities for the purposes of the definition of the Highway 413 Project or the Highway 413 early works.
- A provision providing that, for the purpose of any provincial plan, the Highway 413 Project and Highway 413 early works projects are deemed to be approved under the *Environmental Assessment Act* (EAA) once the final EIAR is published on the Project Website.
- A provision providing that clause 3(5)(a) and subsection 3(6) of the *Planning Act* do not apply in respect of the Project and early works.

Figure 1-8 provides an overview of the key processes outlined in the *Highway 413 Act, 2024* and its procedural framework.

The complete list of all statutory requirements for the contents of the draft and final EIAR under the *Highway 413 Act*, *2024* are outlined in Table 1-1.

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Figure 1-8: Highway 413 Act Process Summary



1.3.2 Indigenous Consultation Plan

Consultation and engagement on the Project began in 2007. Since the Project's inception, meaningful consultation and engagement with Indigenous communities has remained a critical component of the Project's process. Indigenous communities have been consulted and engaged at relevant project milestones including the alignment evaluation and preliminary design process.

The creation of an ICP as required in Section 4 of the *Highway 413 Act*, *2024*, emphasizes the need for meaningful consultation and engagement with Indigenous communities on the Project. The ICP was shared with Indigenous communities whose Aboriginal and/or treaty rights may be impacted by the Project or who have expressed an interest in the Project, and outlines MTO's plans for consulting and engaging Indigenous communities.

Further details on the ICP and the ongoing Indigenous consultation and engagement process for the Project can be found in **Chapter 7**.

1.3.3 Environmental Impact Assessment Report

1.3.3.1 Draft Environmental Impact Assessment Report

The draft EIAR has been prepared in accordance with *the Highway 413 Act, 2024* which prescribes the report's contents, and notice and distribution requirements.

The purpose of this Highway 413 draft EIAR is to document the alignments considered and the rationale for selecting the Preferred Alignment; present the Preliminary Design; outline the potential environmental impacts and proposed mitigation measures and monitoring; list provincial, federal, or other authorizations that may be required; and summarize the consultation and engagement process.

Upon completion of this draft EIAR and the associated comment period, a final EIAR will be prepared and published to the Project Website (Highway 413) per Section 8(4) of the *Highway 413 Act, 2024*.

The specific contents of this draft EIAR, including how it conforms to the requirements set out in the *Highway 413 Act*, *2024* are outlined in **Table 1-1**.

1.3.3.2 Consultation on the Draft Environmental Impact Assessment Report

The 'Notice of Draft EIAR' was distributed on December 1, 2025, in accordance with subsection 7(3) of the *Highway 413 Act, 2024* to:

- every Indigenous community that is listed in the ICP (see **Chapter 7**);
- the clerk of every municipality that is within the alignment of Highway 413 and extensions of Highway 410 and Highway 427 to connect them to Highway 413;
- every individual on any list maintained by the Ministry who has expressed interest in the Highway 413 Project; and
- any federal department or agency who, in the opinion of the Minister, may be interested in the Highway 413 Project.

Additionally, the Notice of the draft EIAR was made available on the Project Website (Highway413) and published in the following newspapers, which have general circulation within the Highway 413 Route:

- Brampton Guardian;
- Vaughan Citizen;

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- Georgetown / Acton Independent Free Press;
- Caledon Citizen;
- Caledon Enterprise;
- Mississauga Le Métropolitain;
- Mississauga News;
- Anishinabek News;
- Two Row Times; and
- The Turtle Island League.

This draft EIAR is available for comment from December 1, 2025 to January 6, 2026, which provides an opportunity for Indigenous communities, municipalities, interested persons, and federal departments or agencies who may be interested in the Project to submit written comments on the draft EIAR (as outlined in Section 7(3) of the *Highway 413 Act*, *2024*).

As outlined further in **Chapter 10**, individuals are encouraged to visit the Project Website (Highway413) or contact the MTO by phone or email as listed below to participate in the consultation for the draft EIAR as outlined in the *Highway 413 Act*, *2024*:

- Project Website: (www.highway413.ca)
- Project Email: (project_team@highway413.ca)
- Project Telephone Number: (1-877-522-6916)

In accordance with Section 6(2)(14) of the *Highway 413 Act*, *2024* this draft EIAR includes a Consultation Record (see **Appendix A**) containing a summary of consultation carried out with respect to the Highway 413 Project after November 1, 2012 (inclusive of a summary of discussions, written comments submitted and concerns raised and a description of what the Ministry did to respond to these concerns).

As required under Section 8(3)(2) of the *Highway 413 Act*, *2024* the final EIAR will include a description of the concerns regarding the draft EIAR raised by those identified under Section 7 (3)(a) and what the Ministry did to respond to these concerns.

Comprehensive details of the consultation and engagement process for the Project can be found in **Chapter 7** and **Chapter 8**.

1.3.4 Contents of the Environmental Impact Assessment Report

This draft EIAR has been prepared in accordance with Section 6(2) of the *Highway 413 Act*, *2024* and contains, at a minimum, the information outlined in **Table 1-1**.

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Table 1-1: Environmental Impact Assessment Report Conformity Table per the *Highway 413 Act, 2024*

Statute Section	*Highway 413 Act, 2024* Content Requirements	Report Section
Section 6 (2) 1.	A statement of the purpose of the Highway 413 Project.	**Section 1.2**: Project Background and Purpose
Section 6 (2) 2.	A description of the Highway 413 Project based on the Ministry's Preliminary Design for the Highway 413 Project.	**Chapter 4**: Preliminary Design
Section 6 (2) 3.	A map showing the location of Highway 413 and extensions of Highway 410 and Highway 427 to connect them to Highway 413.	**Section 1.2**: Project Background and Purpose
Section 6 (2) 4.	One or more maps and drawings showing the Ministry's Preliminary Design for the Highway 413 Project, including the alignment for Highway 413 and extensions of Highway 410 and Highway 427 to connect them to Highway 413.	**Chapter 4**: Preliminary Design **Appendix B**: Preliminary Design Plans
Section 6 (2) 5.	A description of the other alignments for Highway 413 and extensions of Highway 410 and Highway 427 to connect them to Highway 413 that were considered by the Ministry since November 1, 2012.	**Chapter 3**: Description of the Alignments Considered and Rationale for Selecting the Preferred Alignment
Section 6 (2) 6.	The rationale for selecting the alignment for Highway 413 and extensions of Highway 410 and Highway 427 to connect them to Highway 413.	**Chapter 3**: Description of the Alignments Considered and Rationale for Selecting the Preferred Alignment
Section 6 (2) 7.	A summary of the local environmental conditions of the Highway 413 route identified by the Ministry.	**Chapter 2**: Local Environmental Conditions and Engineering Studies
Section 6 (2) 8.	A description of studies of the environment completed or updated by the Ministry after November 1, 2012 in respect of the Highway 413 Project.	**Section 2.1**: Description of the Studies of the Environment Completed
Section 6 (2) 9.	The Minister's assessment under clause 5 (1) (a) of the impacts of the Highway 413 Project on the environment.	**Chapter 5**: Potential Environmental Impacts and Mitigation Measures of the Preliminary Design
Section 6 (2) 10.	The Minister's criteria for the assessment of impacts referred to in paragraph 9.	**Chapter 5**: Potential Environmental Impacts and Mitigation Measures of the Preliminary Design
Section 6 (2) 11.	A description of how the Ministry will mitigate negative impacts of the Highway 413 Project on the environment as identified under clause 5 (1) (b).	**Section 5.4**: Summary of Preliminary Design Environmental Impacts, Proposed Mitigation Measures, Monitoring Activities, and Commitments to Future Work
Section 6 (2) 12.	A description of how the Ministry will monitor and verify the effectiveness of its mitigation referred to in paragraph 11.	**Section 5.4**: Summary of Preliminary Design Environmental Impacts, Proposed Mitigation Measures, Monitoring Activities, and Commitments to Future Work
Section 6 (2) 13.	A list of any provincial, federal or other authorizations that may be required for the Highway 413 Project based on the Ministry's Preliminary Design for the Highway 413 Project.	**Chapter 6**: List of Provincial, Federal or Other Authorizations

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Statute Section	*Highway 413 Act, 2024* Content Requirements	Report Section
Section 6 (2) 14.	A consultation record, including: 1. A summary of consultation carried out with Indigenous communities in respect of the Highway 413 Project after November 1, 2012, including a summary of: a. comments submitted and concerns raised by Indigenous communities b. discussions that the Ministry had with Indigenous communities 2. A summary of consultation carried out with the public in respect of the Highway 413 Project after November 1, 2012, including a summary of written comments and concerns submitted by members of the public, and 3. A description of what the Ministry did to respond to concerns referred to in subparagraph 1. and 2.	**Chapter 7**: Indigenous Consultation and Engagement **Chapter 8**: Consultation and Engagement **Appendix A**: Record of Consultation and Engagement
Section 8 (3)	The final EIAR shall include the following: 1. A description of the concerns regarding the draft EIAR raised by the Indigenous communities referred to in paragraph 1 of subsection (1) and of what the Ministry did to respond to these concerns. 2. A description of the concerns regarding the draft EIAR raised by the persons referred to paragraph 2 of subsection (1) in written comments submitted by the date set out in the notice of draft EIAR distributed under section 7 by which written comments must be submitted, and of what the Ministry did to respond to these concerns. 3. A description of any changes to: a. the Ministry's Preliminary Design for the Highway 413 Project that was identified in the draft EIAR published under clause 7 (3) (b), and b. the manner in which the Highway 413 Project is to be carried out that was described in the draft EA report. 4. If a change described in subparagraph 3 (a) has been made and the Minister considers it appropriate, a map or drawings showing the change.	**Chapter 7**: Indigenous Consultation and Engagement **Section 8.5**: Draft EIAR Comment Period

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2. Local Environmental Conditions and Engineering Studies

In accordance with subsections 6(2)7 and 6(2)8 of the *Highway 413 Act, 2024*, this chapter provides a summary, by discipline, of the local natural, socio-economic, cultural and engineering conditions present within the Highway 413 Route and adjacent Study Areas.

Discipline-specific Study Areas are defined as necessary and outlined in **Table 2-2**.

Where applicable, detailed technical reporting and relevant field investigations have been completed and reporting will be made publicly available (under separate cover) on the Highway 413 Project Website in conjunction with the release of the final EIAR.

2.1 Description of Studies of the Environment Completed

The following subsections detail the studies completed or updated by MTO after November 1, 2012. The objective of summarizing these studies is to consolidate background information (inclusive of data collection and fieldwork) and provide an overview of the environmental and engineering conditions that define the Project's background context.

In accordance with subsections 6(2)8 and 6(3) of the *Highway 413 Act, 2024* please refer to **Table 2-1** for a comprehensive listing of the studies incorporated.

Table 2-1: Environmental and Engineering Studies and Applicable Section References

Discipline	Report Section Reference
Natural Environment	Section 2.3
Fish and Fish Habitat	Section 2.3.1
Terrestrial Ecosystems	Section 2.3.2
Groundwater and Hydrogeology	Section 2.3.3
Fluvial Geomorphology	Section 2.3.4
Erosion and Sedimentation	Section 2.3.5
Drainage and Stormwater Management	Section 2.3.6
Social and Economic Environment	Section 2.4
Land Use	Section 2.4.1
Agriculture	Section 2.4.2
Landscape	Section 2.4.3
Noise	Section 2.4.4
Air Quality	Section 2.4.5
Waste and Contaminated Property	Section 2.4.6
Climate Change	Section 2.4.7
Community Wellbeing (Part A: Socio-Economic Conditions; Part B: Human Health)	Section 2.4.8
Snowdrift	Section 2.4.9
Cultural Environment	Section 2.5
Built Heritage Resources and Cultural Heritage Landscapes	Section 2.5.1
Archaeological Resources	Section 2.5.2
Engineering Studies	Section 2.6
Existing Road Network	Section 2.6.1
Regional Transportation Network and Traffic Conditions	Section 2.6.2
Active Transportation	Section 2.6.3
Freight and Commuter Rail	Section 2.6.4
Public Transportation	Section 2.6.5
Surface Water and Drainage	Section 2.6.6
Geotechnical	Section 2.6.7
Utilities	Section 2.6.8

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2.2 Discipline Specific Study Areas

Environmental and engineering discipline-specific Study Areas were established and are described throughout this chapter to set the geographic boundaries for existing conditions, as well as potential impacts and mitigation measures (as discussed in **Chapter 5**).

The MTO has established a range of environmental guides included in its Environmental Reference for Highway Design (ERHD) (Environmental Reference for Highway Design, 2013) to support project-specific planning and design. These guides have supported the assessment of environmental impacts process by offering detailed technical information, tailored to environmental factors. Designed to address project-specific requirements, the guides cover a range of topics such as noise, contaminated property identification, and ecological impacts, ensuring that environmental considerations are effectively integrated into highway planning and design. Where relevant, these guides are referenced in the subsections below detailing the existing conditions present within the Highway 413 Route and adjacent Study Areas.

The Study Areas for each discipline are defined below in **Table 2-2** and further explained in their respective sub-sections; including graphic illustrations where applicable, to support visual and spatial context.

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Table 2-2: Study Area Definition by Discipline

Discipline	Study Area Definition
Natural Environment	
Fish and Fish Habitat	The Fish and Fish Habitat Study Area includes, at a minimum, areas within 50 m upstream and 200 m downstream of the Preliminary Design ROW.
Terrestrial Ecosystems	The Terrestrial Ecosystems Study Area generally includes the lands within 120 m on either side of the Highway 413 Preliminary Design ROW.
Groundwater and Hydrogeology	The Groundwater and Hydrogeology Study Area includes the Preliminary Design ROW, with a 500 m evaluation zone added to either side of the centreline of the Preliminary Design ROW (the Analysis Area) to characterize the local hydrogeological conditions.
Fluvial Geomorphology	The Fluvial Geomorphology Study Area includes the Preliminary Design ROW.
Erosion and Sedimentation	The Erosion and Sedimentation Study Area includes the Preliminary Design ROW.
Drainage and Stormwater Management	The Drainage and Stormwater Management Study Areas include, and are divided by, the conservation areas of Conservation Halton (CH), Credit Valley Conservation (CVC) and Toronto and Region Conservation Authority (TRCA): ■ CH: Sixteen Mile Creek watershed, including tributaries of the Sixteen Mile East Branch and the Sixteen Mile Creek East Branch Lisgar. ■ CVC: Credit River watershed, including Mullet Creek, Levi Creek, Huttonville Creek and Credit River - Norval to Port Credit subwatersheds. ■ TRCA: Humber River and Etobicoke Creek watersheds, including the East, Main, and West Humber River subwatersheds within the Humber River watershed, and the Main Etobicoke Creek, Little Etobicoke Creek, Etobicoke Creek West Branch and Spring Creek subwatersheds within the Etobicoke Creek watershed.
Social and Economic Environment	
Land Use	The Land Use Study Area includes the Highway 413 Preliminary Design ROW.
Agriculture	The Agriculture Primary Study Area includes the Preliminary Design ROW. The Agriculture Secondary Study Area includes a potential zone of impact extending a minimum of 1,000 m (1 km) beyond the boundary of the Primary Study Area.
Landscape Composition	The Landscape Study Area includes the Preliminary Design ROW.
Noise	Noise Sensitive Areas (NSAs) with a perpendicular distance of 600 m from the closest edge of pavement and 100 m from the ends of the project limits of the Preliminary Design ROW.
Air Quality	The Air Quality Study Area includes areas within 500 m on either side of the Preliminary Design ROW.
Waste and Contaminated Property	The Waste and Contaminated Property Study Area includes properties or areas within the Preliminary Design ROW with potential contamination concern and a peripheral 250 m buffer zone.
Climate Change	The Greenhouse Gas Assessment and Climate Change Resilience Assessment (CCRA) do not have designated study areas as Greenhouse Gases (GHGs) result in potential impacts that are global in nature (e.g., difficult to attribute to a single project) and physical climate risks are driven by changes at a global scale. For the CCRA, the assessment is focused on the Project itself and therefore local and regional study areas are not relevant. However, when quantifying GHG emissions associated with operations (i.e., traffic), the Air Quality Local Study Area (LSA) was used as the boundary for which traffic emissions were considered.
Socio-Economic Conditions	Defined by the boundaries of the regional municipalities surrounding the Highway 413 Route. This includes the regional municipalities of Halton, Peel, and York, and the cities of Mississauga, Brampton and Vaughan; the towns of Milton, Halton Hills and Caledon; and the Township of King.

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Discipline	Study Area Definition
Human Health	Includes the Regional Municipality of Halton, the Regional Municipality of Peel and the Regional Municipality of York.
Snowdrift	The Snowdrift Study Area includes the Preliminary Design ROW, excluding the transitway portion of the ROW.
Cultural Environment	
Built Heritage Resources and Cultural Heritage Landscapes	The Built Heritage Resource and Cultural Heritage Landscape Study Area includes the boundaries of properties within and adjacent to the Preliminary Design ROW of the Highway 413 Route that may be affected by impacts from the Project.
Archaeological Resources	■ The Archaeological Resources Stage 1 Study Area includes the Highway 413 Route, plus a 250 m buffer. ■ The Archaeological Resources Stage 2 Study Area includes the Highway 413 Preferred Alignment.
Engineering Studies	
Existing Road Network	For the development and evaluation of alternative alignments, the Study Area for the existing road network was the Highway 413 Route. For Preliminary Design, the Study Area for crossing roads and interchanges was the Preliminary Design ROW.
Regional Transportation Network	The GGH travel demand model was used in the traffic forecasting study for the project. The model extends to Lake Erie in the South, Wellington County in the West, Georgian Bay in the North, and Peterborough in the East.
Existing Traffic Conditions	Traffic modelling for the Highway 413 corridor included all crossing roads within the project study limit that cross Highway 413 and are expected to connect via interchanges to the highway. Micro-simulation modelling extends to one intersection along crossing roads adjacent to ramp terminal intersections.
Active Transportation	Existing and planned future Active Transportation plans were identified within the Preliminary Design ROW.
Freight and Commuter Rail	For the development and evaluation of alternative alignments, the Study Area for the existing Freight and Commuter Rail system was the Highway 413 Route. For Preliminary Design, the Study Area for bridge crossings of railway corridors was the Preliminary Design ROW.
Public Transportation	Existing and planned future Public Transportation plans were identified within or connecting to the Preliminary Design ROW.
Surface Water and Drainage	The Study Area includes subwatersheds within three Conservation Authorities: ■ CH: Sixteen Mile Creek watershed, including tributaries of the Sixteen Mile East Branch and the Sixteen Mile Creek East Branch Lisgar. ■ CVC: Credit River watershed, including Mullet Creek, Levi Creek, Huttonville Creek and Credit River – Norval to Port Credit subwatersheds; and ■ TRCA: Humber River and Etobicoke Creek watersheds, including the East, Main, and West Humber River subwatersheds within the Humber River watershed, and the Main Etobicoke Creek, Little Etobicoke Creek, Etobicoke Creek West Branch and Spring Creek subwatersheds within the Etobicoke Creek watershed.
Geotechnical	Geotechnical investigations were carried out: ■ To support preliminary design of bridges at the bridge locations within the Preliminary Design ROW; and ■ To support pavement design for highways, interchanges and crossing roads within the Preliminary Design ROW.
Utilities	For the development and evaluation of alternative alignments, the Study Area for existing and planned utilities was the Highway 413 Route. For Preliminary Design, the Study Area for utilities was the Preliminary Design ROW.

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2.3 Natural Environment

Natural environment studies were completed to identify, assess and document the local environmental conditions, potential impacts and mitigation measures, and applicable provincial, federal or other authorizations that may be required for the Project.

The subsections outlined below summarize the local environmental conditions for the following features of the natural environment:

- Fish and Fish Habitat;
- Terrestrial Ecosystems;
- Groundwater and Hydrogeology;
- Fluvial Geomorphology;
- Erosion and Sedimentation; and
- Drainage and Stormwater Management.

A note about provincial species at risk protections discussed in the following subsections:

The *Species Conservation Act, 2025* was enacted as part of Bill 5 (Protect Ontario by Unleashing our *Economy Act, 2025*), and should it come into force, would replace the *Endangered Species Act, 2007*. At the time of writing this draft EIAR, the *Endangered Species Act, 2007* is still in force. It is recommended that regulatory requirements be confirmed as the Project approaches implementation to verify if adjustments are required for the Project (e.g., confirmation of applicable legislation at the time permits are sought). All references to the *Endangered Species Act, 2007* throughout this document have been marked with an asterisk to illustrate this point. Additionally, "habitat", as described within this document, refers to that habitat as determined pursuant to the *Endangered Species Act, 2007* and, where applicable, Ontario Regulation 832/21, prior to June 5, 2025, when the *Protect Ontario by Unleashing our Economy Act, 2025* received Royal Assent.

2.3.1 Fish and Fish Habitat

2.3.1.1 Background

The information gathered for the existing conditions and design considerations is presented in support of a preliminary determination of the potential impacts on fish and fish habitat to determine the likelihood that the works would cause death of fish, or harmful alteration, disruption or destruction of fish habitat such that the Fisheries and Oceans Canada (DFO) will need to review those impacts from the Project.

The collection of existing conditions and preliminary impacts was conducted in accordance with the Interim MTO Environmental Guide for Fisheries, 2020 (Fish Guide) (MTO, 2020) and associated general guidance provided in the now outdated Pilot MTO/DFO/MNRF Protocol for Protecting Fish and Fish Habitat of Provincial Transportation Undertakings, Version 4, 2020 (Fisheries Protocol) (MTO, 2020), and MTO's September 2022 Memorandum regarding the dissolution of the agreement between MTO, Ministry of Natural Resources (MNR), and DFO, and how to carry out impact assessments for MTO in the interim to an updated Fish Guide.

The fish and fish habitat assessment carried out based on the Preliminary Design, documents the fish and fish habitat existing conditions components of the Project for watercourses crossed by the highway alignment that support fish and fish habitat, both directly and indirectly. The assessment also recognizes the preliminary proposed works and potential impacts to fish and fish habitat based on Preliminary Design, as well as general mitigation measures to minimize these impacts. It includes data collection from background resources, input from Indigenous communities and agency consultation, as well as field investigations conducted from 2020 to 2023.

2.3.1.2 Data Collection

2.3.1.2.1 Desktop Review

Based on review of secondary sources in 2015, a total of four major watersheds were identified within the Highway 413 Route:

- Sixteen Mile Creek;
- Credit River;
- Etobicoke Creek; and
- Humber River (for the purpose of this assessment, the Humber River watershed was separated into sub-watersheds):
  - Main Humber River;

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- East Humber River; and
- West Humber River.

Additionally, 12 subwatersheds and 20 named and mapped mainstem watercourses were identified within the Highway 413 Route prior to the determination of the Technically Preferred Alignment. Since a Technically Preferred Alignment had not been selected in 2015, the total number of potential watercourse crossings of the named watercourses and their tributaries varied between alignments.

The study was suspended between 2015 and 2018 and resumed in June 2019. Upon the Project resumption and following public consultation, the comparative evaluation of alignments was completed, and a Preferred Alignment was selected in August 2020, as described in **Chapter 3**. At that time, 95 watercourses (i.e., mainstem and tributaries to mainstem) were identified within what would become the Preferred Alignment and Study Area through secondary source data, available mapping, and the 2015 preliminary field investigations. These watercourses, plus additional watercourses identified during field investigations, were the subject of the fish habitat assessments and fish community sampling conducted in 2020, 2022 and 2023 that supported the fish and fish habitat impact assessment.

2.3.1.2.2 Fieldwork

Field investigations completed in 2020 focused on supplementing and augmenting data collected during the alignment development phase (MTO, 2015) and refining the understanding of the natural heritage features and functions within the Study Area. The 2020 Study Area was selected prior to the finalization of the Preferred Alignment in August 2020 and thus it consisted of the area around the then Technically Preferred Alignment. In cases where Permission to Enter (PTE) was not provided to access property within the Technically Preferred Alignment, investigations were carried out on adjacent properties within the Focused Analysis Area (FAA) from the roadside where access was granted.

As the Project progressed and the Preferred Alignment was further developed in Preliminary Design between 2020 and 2022, field investigations were conducted in a slightly revised and more focused 2022 Study Area. The intent of the 2022 field investigations was to capture areas where PTE was not provided for the 2020 field investigations, and to obtain additional information regarding federally listed Species at Risk (SAR), including those with mapped Critical Habitat in the Study Area. Collectively, the data gathered in 2020 and 2022 are considered one year's worth of data as both years covered a distinct set of properties.

Field investigations continued in 2023, building upon the data collected in 2020 and 2022 to provide an additional year of data collection. Further refinements to the alignment as the Preliminary Design was advanced and the ROW limits determined, resulted in some areas where the 120 m buffer extended beyond the Study Area surveyed in 2020 and 2022. Therefore, the 2023 Study Area was slightly larger and captured additional features not previously surveyed in 2020 or 2022. The 2023 natural environment field investigations were conducted where property access was permitted through PTE agreements or via notice under the *Public Transportation and Highway Improvement Act*.

The fish and fish habitat field program was developed in accordance with industry best practices and protocols provided by reviewing agencies and was shared with relevant regulatory agencies to seek feedback prior to commencement of the 2022 and 2023 field work programs. The natural environment field program also included the participation of Indigenous communities (as Community Field Liaisons [CFLs]) who attended the field investigations regularly (see **Chapter 7.1.2.1** for further details).

The comprehensive habitat assessments that were conducted generally followed Step 4 of the Fish Guide (MTO, 2020).

Species at Risk and Species of Conservation Concern

Species of Conservation Concern include provincially tracked species and SAR. The Significant Wildlife Habitat Technical Guide (MNR, 2000) defines species that can be considered Species of Conservation Concern, which include:

- Species identified as nationally endangered or threatened by the Committee on the Status of Endangered Wildlife in Canada, which are not protected in regulation under Ontario's *Endangered Species Act, 2007**;
- Species identified as provincially vulnerable based on lists of Vulnerable, Threatened, Endangered, Extirpated, or Extinct Species of Ontario that are updated periodically by the MNR;
- Species that are listed as rare or historical in Ontario based on records kept by the Natural Heritage Information Centre (MNR, 2014) in Peterborough (S1 is extremely rare, S2 is very rare, S3 is rare to uncommon);
- Species whose populations are known to be experiencing substantial declines in Ontario;
- Species that have a high percentage of their global population in Ontario and are rare or uncommon in the planning area;
- Species that are rare within the planning area, even though they may not be provincially rare;
- Species that are subjects of recovery programs (e.g., Redside Dace and American Eel); and

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- Species considered important to the municipality, based on recommendations from the Conservation Advisory Committee.

Further details on the *Endangered Species Act, 2007**, Canada's *Species at Risk Act* (SARA), and their associated approvals required for the Project are found in **Chapter 6**.

There are four aquatic SAR within the Study Area that are considered under federal and/or provincial legislation. Findings and recommendations in this report are based upon the *Endangered Species Act, 2007**, as amended on June 5, 2025.

- **Redside Dace** (*Clinostomus elongatus*) - listed as Endangered under both provincial and federal legislation, under which the species receives individual protection as well as protection of their habitat. There are 27 watercourse crossings that have been shown to support either Occupied, Recovery or Contributing Habitat for this species to which the *Endangered Species Act*, *2007** protections apply, and 14 locations identified as Critical Habitat to which SARA protections apply.
- **American Eel** (*Anguilla rostrata*) - listed as Endangered provincially, receiving species and general habitat protection. Individuals and/or their habitat have been confirmed in the Credit River watershed within the Highway 413 Route.
- **Silver Lamprey** (*Ichthyomyzon unicupis*) - listed as Special Concern both provincially and federally; they do not receive individual or habitat protection, but were considered during development of works, mitigation and impact assessment.
- **Silver Shiner** (*Notropis photogenis*) - listed as Threatened under both provincial and federal legislation, under which the species received individual protection as well as protection of their habitat. There are two watercourse crossings that are upstream of Critical Habitat mapped for this species and so consideration of potential needs under the SARA will be reviewed at Detail Design.

The field program has supported the information gathering that will be considered through the Bilateral Federal-Provincial Working Group as defined by the Memorandum of Understanding (Government of Canada, 2024) issued jointly by the Deputy Minister of Transportation (Ontario) and the President of the Impact Assessment Agency of Canada (Canada).

2.3.1.3 Summary of Environmental Conditions

Following completion of the 2023 Fish and Fish Habitat field investigations, a total of 107 watercourses were identified within the Study Area from the 2020/2022 and 2023 field programs combined. Along these 107 watercourses, 156 individual sample sites were assessed (14 of which were outside the refined 2023 Study Area). The higher number of sampling locations relative to the watercourse crossings is a result of some watercourses being crossed at more than one location along the highway corridor.

Of the 107 watercourses, 52 were assessed as direct or seasonally direct fish habitat, and 53 supported fish habitats indirectly. The remaining two watercourses could not be fully assessed due to PTE limitations during the 2023 field season and as a result the full two years of monitoring was not available for these locations. Fish community sampling was not conducted in watercourses designated as supporting aquatic SAR Occupied or Recovery Habitat under the *Endangered Species Act, 2007** or Critical Habitat for aquatic species listed as endangered or threatened under the SARA. Publicly available fish community information and data provided by regulatory agencies was deemed sufficient to categorize the fish community compositions for these crossings.

Some watercourses in the Project Study Area were occupied by Indigenous communities prior to European contact, and were a resource for harvesting, gathering, travel and trade. Throughout the consultation and engagement process, MTO has been told by some Indigenous communities that these watercourses continue to be significant to community well-being.

To inform the impact assessment and cumulative effects of the highway works on fish and fish habitat, the existing conditions information is divided by watershed and subwatershed:

- **Sixteen Mile Creek**
  - Middle Sixteen Mile Creek
    - There were two watercourses (one sampling site on each) assessed in the Middle Sixteen Mile Creek subwatershed as part of the Project.
    - Of these, one supports a coolwater fishery and the other supports a coldwater fishery.
    - Both watercourses support a permanent flow regime within the highway corridor.
  - East Sixteen Mile Creek
    - There were six watercourses encompassing six sampling sites (one per watercourse) assessed in the East Sixteen Mile Creek subwatershed as part of the Project.
    - The main branch of East Sixteen Mile Creek supports a coolwater fish community directly with a permanent flow regime.

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- Of the remaining five sites are all ephemeral/intermittent drainage features, two support a warmwater fishery directly and three are warmwater habitat that support downstream fisheries indirectly through conveyance of nutrients and organic matter inputs to their receiving watercourses.

- **Credit River**
  - Mullet Creek
    - There were two watercourses encompassing two sampling sites assessed in the Mullet Creek subwatershed as part of the Project.
    - Of these two watercourses, one supports a warmwater fishery directly and one is warmwater habitat that supports a downstream fishery indirectly through nutrient and allochthonous conveyance.
    - Both watercourses are considered to support ephemeral/intermittent flow regimes.
  - Levi Creek
    - There were nine watercourses encompassing nine sampling sites assessed in the Levi Creek subwatershed as part of the Project.
    - The main branch of Levi Creek supports a warmwater fish community directly with an intermittent flow regime.
    - All eight of the remaining sites support an ephemeral/intermittent flow regime; one watercourse supports a warmwater fishery directly and seven watercourses have warmwater habitat that support downstream fisheries indirectly through nutrient and allochthonous conveyance.
  - Main Branch of the Credit River
    - There were nine watercourses encompassing ten sampling sites assessed in the main branch of the Credit River subwatershed as part of the Project.
    - The main branch of the Credit River (CR_NP_CRR_0_E1) supports permanent flow, while the remaining eight support ephemeral/intermittent flows.
    - Two of the low order intermittent tributaries support a warmwater fish community.
    - Out of the seven remaining watercourses, one supports a warmwater fishery directly and the other six support warmwater habitat and downstream fisheries indirectly through nutrient and allochthonous conveyance.
  - Huttonville Creek
    - There were three watercourses encompassing three sampling sites assessed in the Huttonville Creek subwatershed as part of the Project.
    - All watercourses are coldwater ephemeral/intermittent agricultural drainage features that support downstream fisheries indirectly through conveyance of nutrients and allochthonous inputs.

- **Etobicoke Creek**
  - Etobicoke Creek West
    - 19 watercourses encompassing 36 sampling sites were assessed within the Etobicoke Creek West subwatershed as part of the Project.
    - Of the watercourses in this subwatershed within the Study Area, ten support a warmwater fishery directly, seven support warmwater fish habitat indirectly, and two provide support to both a warmwater fishery indirectly (upstream) and directly (downstream).
    - Five of the ten warmwater fisheries are intermittent agricultural drainage features, and five are permanent channels in well defined valleys.
    - The seven watercourse crossings supporting warmwater fisheries indirectly are ephemeral/intermittent agricultural drains.
    - The bimorphic nature of the two remaining watercourses supporting fish both directly and indirectly as a result of existing barriers to fish movement. One is considered to have permanent flows within a small but well-defined valley supplied by tile drainage and groundwater inputs, the other is an intermittent feature that dries up in the summer months.
  - Etobicoke Creek East
    - One watercourse encompassing four sites was assessed in the Etobicoke Creek East subwatershed as part of the Project.

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- This watercourse provides both permanent direct warmwater fish habitat in the downstream sites, and intermittent indirect warmwater fish habitat through the conveyance of nutrients and allochthonous inputs in the upstream sites.

- **West Humber River**
  - Campbell's Cross Creek
    - The main channel of Campbell's Cross Creek (also known as Kilmanaugh Creek) crosses through the Study Area at two sites along the watercourse.
    - Both crossings of the watercourse provide permanent direct coldwater fish habitat.
  - Salt Creek
    - The main channel and four tributaries of Salt Creek, encompassing ten sites, were assessed as part of the Project.
    - The main channel and two of the tributaries of Salt Creek provide permanent and intermittent direct warmwater fish habitat.
    - The remaining two tributaries support fish indirectly through the conveyance of nutrients and allochthonous inputs by these ephemeral/intermittent watercourses to receiving warmwater fisheries downstream.
  - West Humber River
    - The main channel and 13 unnamed tributaries of the West Humber River, encompassing 15 sampling sites, were assessed as part of the Project.
    - The main channel of the West Humber River and West Humber River Tributary 2 both support permanent flow and warmwater fisheries.
    - Two other tributaries – West Humber River Tributary 1 and West Humber River Tributary 3 – support intermittent flows and a warmwater fishery.
    - The remaining ten tributaries are intermittent flowing channels that support fish indirectly through conveyance of nutrients and allochthonous inputs to their receiving watercourses downstream.
  - The Gore Road Tributary
    - The main channel of The Gore Road Tributary and four tributaries encompassing five sampling sites were assessed as part of this Project.
    - The main channel of The Gore Road Tributary supports an intermittent warmwater fishery.
    - The four tributaries provide support indirectly to the warmwater fish habitat through conveyance of nutrient and allochthonous inputs downstream to receiving reaches that support fish directly.
  - Clarkway Drive Tributary
    - The main channel of Clarkway Drive Tributary and two tributaries encompassing three sampling sites were assessed as part of the Project.
    - The main channel of Clarkway Drive Tributary is a permanent, warmwater feature that supports fish directly.
    - Clarkway Drive Tributary 2 – is an intermittent flowing feature that also directly supports a warmwater fishery and the remaining tributary – Clarkway Drive Tributary 1 – supports intermittent flows that convey nutrients and allochthonous inputs to the main channel downstream.
- **Main Humber River**
  - Rainbow Creek
    - There were two watercourses associated with four sampling sites assessed in the Rainbow Creek subwatershed, both first order tributaries of Rainbow Creek.
    - The first branch of Rainbow Creek directly contains a permanent warmwater fishery and the second branch provides ephemeral/intermittent seasonal habitat for a warmwater fishery.
  - Robinson Creek
    - There were 11 watercourses associated with 13 sampling sites assessed in the Robinson Creek subwatershed as part of the Project.
    - The main branch of Robinson Creek supports a warmwater fishery with permanent flow.

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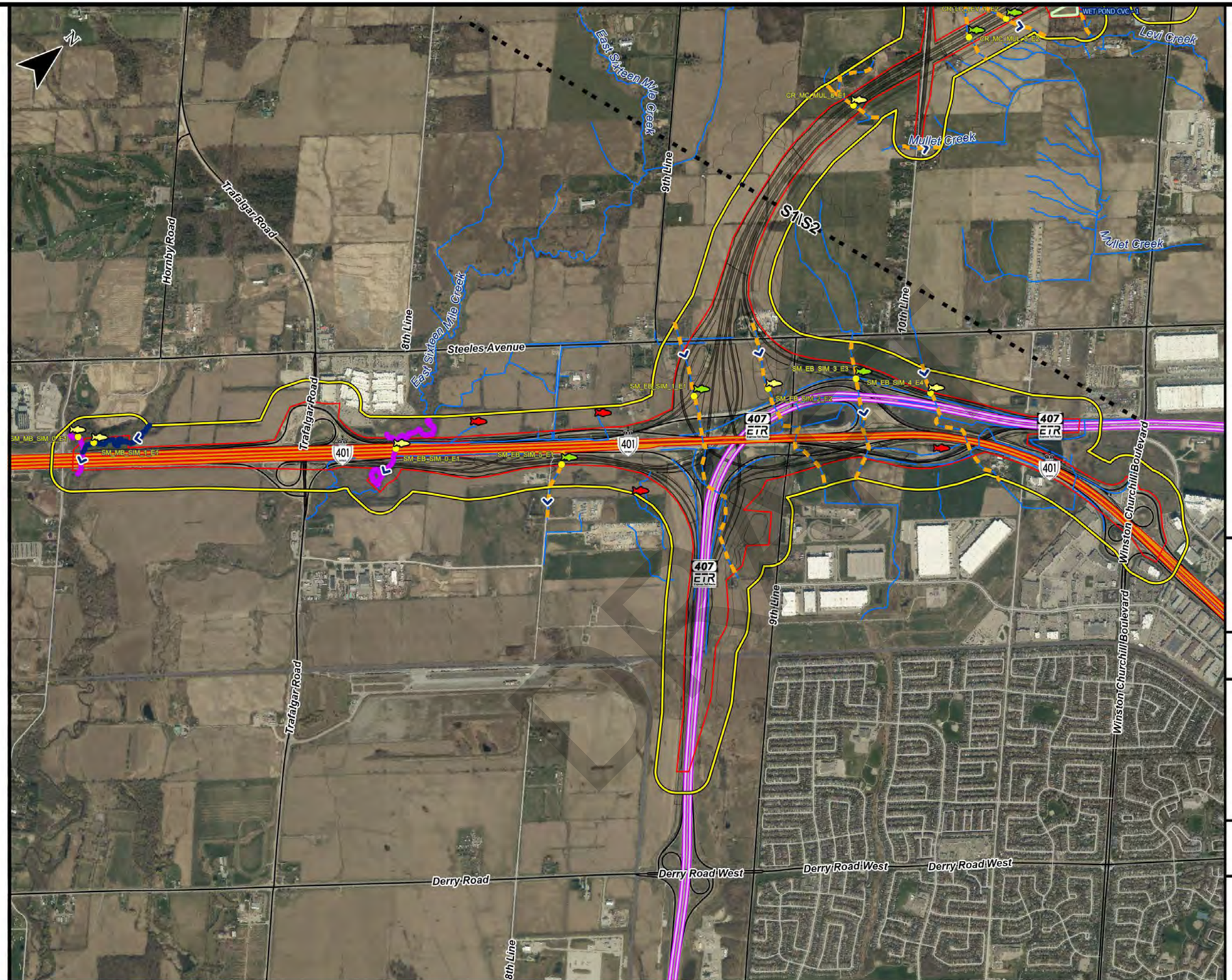
- Out of the remaining ten watercourses associated with this subwatershed, four support a warmwater fishery and four are warmwater habitat that support downstream fisheries indirectly through nutrient and allochthonous conveyance.
- Out of the remaining ten watercourses, two exhibit permanent flows and the rest support ephemeral/intermittent flow regimes.

- Main Branch of the Humber River
  - There were two watercourses associated with two sampling sites assessed in the Main Humber River subwatershed as part of the Project.
  - The main branch of the Humber River supports a permanent flow regime while the other watercourse supports intermittent flow.
  - Both sampling sites of the Humber River, support a warmwater fishery directly.

- **East Humber River**
  - Main Branch of the East Humber River
    - There were eight watercourses and eight sampling sites assessed on the main branch of the East Humber River as part of the Project.
    - The main branch supports a coldwater fishery with permanent flow, including sensitive coldwater species.
    - Three of the eight sites are located along Highway 27, one supporting permanent flows and the other two support ephemeral/intermittent flows.
    - The remaining four sites support ephemeral/intermittent flows.
    - Of the seven sites excluding the main branch of the East Humber River, six sites support a coolwater fishery directly and one site supports a downstream fishery indirectly through nutrient and allochthonous conveyance.
  - Purpleville Creek
    - There were 16 watercourses and 18 sampling sites assessed in the Purpleville Creek subwatershed traversed as part of the Project.
    - The main branch of Purpleville Creek supports a coldwater fishery with permanent flow, including sensitive coldwater species.
    - Out of the remaining 15 watercourses, all are associated with ephemeral/intermittent agricultural drainage features/low order tributaries, three support a coldwater fishery directly and 12 contribute to fish habitat indirectly through conveyance of nutrient and allochthonous inputs to the receiving watercourses downstream.

Features of the existing Fish and Fish Habitat Study Area are identified in **Figure 2-1**. Potential impacts and associated mitigation measures are outlined in **Chapter 5**.

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Legend

- Preliminary Design Right-of-Way
- Study Area
- Section Boundary
- Preliminary Design
- Freeway
- 407 ETR Freeway
- Arterial Road
- Local Municipal Road
- Railway
- Aquatic Site ID

Fish Habitat

- Direct and/or Seasonal Fish Habitat
- Indirect Fish Habitat
- Not Fish Habitat

Flow and Thermal Regime

- Flow Direction
- Intermittent/Ephemeral, Warm
- Permanent, Cool
- Permanent, Cold
- Watercourse

Stormwater Management Facilities

- Wet Pond

Highway 413 Preliminary Design and Assessment of Environmental Impacts

Fish and Fish Habitat Assessment

24 Nov, 2025 (Imagery 2023)

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Meters

Figure 2-1
Fish and Fish Habitat Features



Legend

- Preliminary Design Right-of-Way
- Study Area
- Section Boundary
- Preliminary Design
- 407 ETR Freeway
- Arterial Road
- Local Municipal Road
- Aquatic Site ID

Fish Habitat

- Direct and/or Seasonal Fish Habitat
- Indirect Fish Habitat

Flow and Thermal Regime

- Flow Direction
- Intermittent/Ephemeral, Warm
- Watercourse

Stormwater Management Facilities

- Wet Pond

Highway 413 Preliminary Design and Assessment of Environmental Impacts

Fish and Fish Habitat Assessment

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Legend

- Preliminary Design Right-of-Way
- Study Area
- Section Boundary
- Preliminary Design
- Arterial Road
- Local Municipal Road
- Aquatic Site ID

Fish Habitat

- Direct, Salmonid Spawning
- Direct and/or Seasonal Fish Habitat
- Indirect Fish Habitat

Flow and Thermal Regime

- Flow Direction
- Intermittent/Ephemeral, Warm
- Permanent, Warm
- Watercourse

Stormwater Management Facilities

- Wet Pond

Highway 413 Preliminary Design and Assessment of Environmental Impacts

Fish and Fish Habitat Assessment

24 Nov, 2025 (Imagery 2023)

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Legend

- Preliminary Design Right-of-Way
- Study Area
- Section Boundary
- Preliminary Design
- Arterial Road
- Local Municipal Road
- Railway
- Aquatic Site ID

Fish Habitat

- Direct, Salmonid Spawning
- Direct and/or Seasonal Fish Habitat
- Indirect Fish Habitat
- Not Fish Habitat

Flow and Thermal Regime

- Flow Direction
- Intermittent/Ephemeral, Warm
- Permanent, Warm
- Watercourse

Stormwater Management Facilities

- Wet Pond

Highway 413 Preliminary Design and Assessment of Environmental Impacts

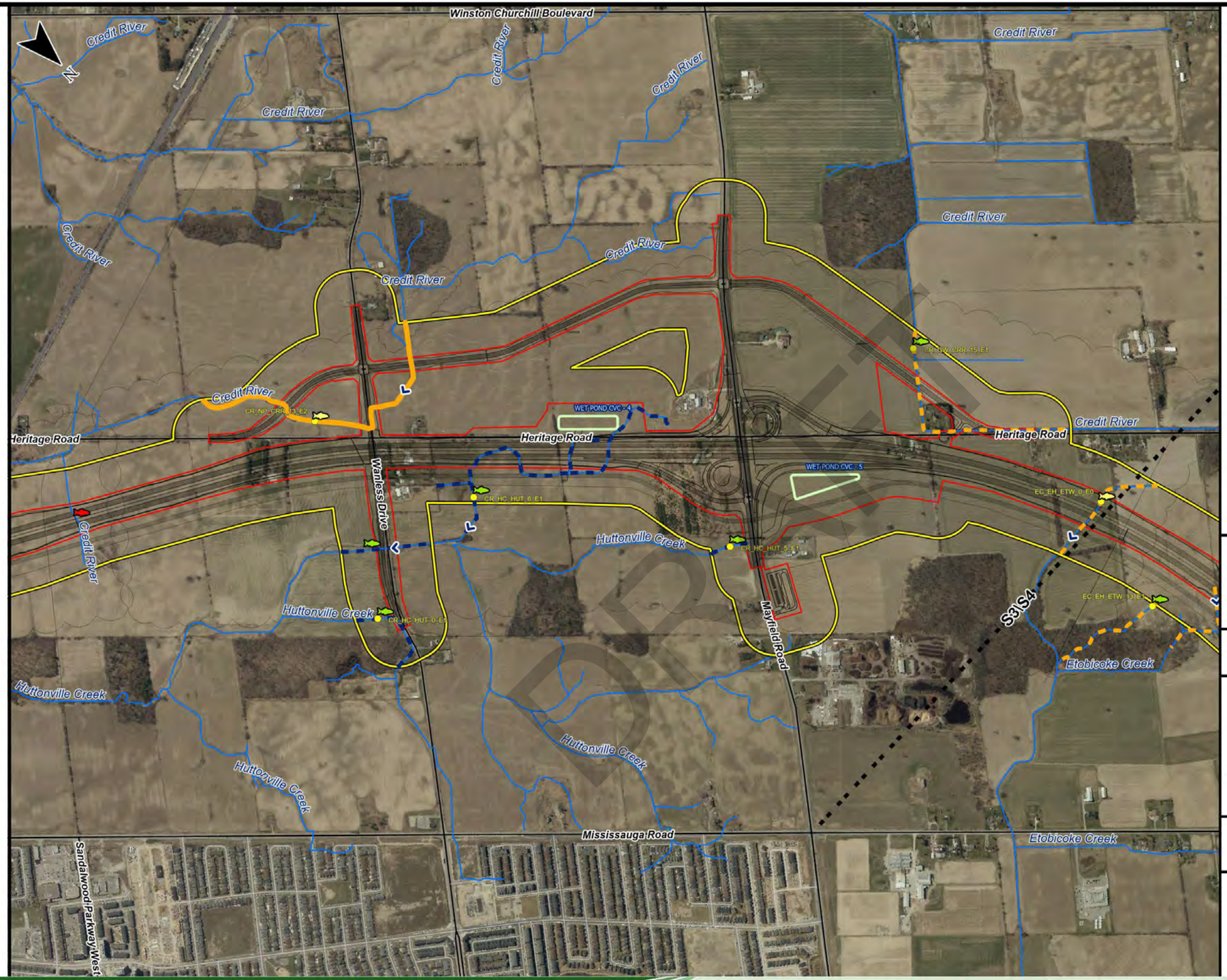
Fish and Fish Habitat Assessment

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Legend

- Preliminary Design Right-of-Way
- Study Area
- Section Boundary
- Preliminary Design
- Arterial Road
- Local Municipal Road
- Railway
- Aquatic Site ID

Fish Habitat

- Direct and/or Seasonal Fish Habitat
- Indirect Fish Habitat
- Not Fish Habitat

Flow and Thermal Regime

- Flow Direction
- Intermittent/Ephemeral, Warm
- Permanent, Warm
- Intermittent/Ephemeral, Cold
- Watercourse

Stormwater Management Facilities

- Wet Pond

Highway 413 Preliminary Design and Assessment of Environmental Impacts

Fish and Fish Habitat Assessment

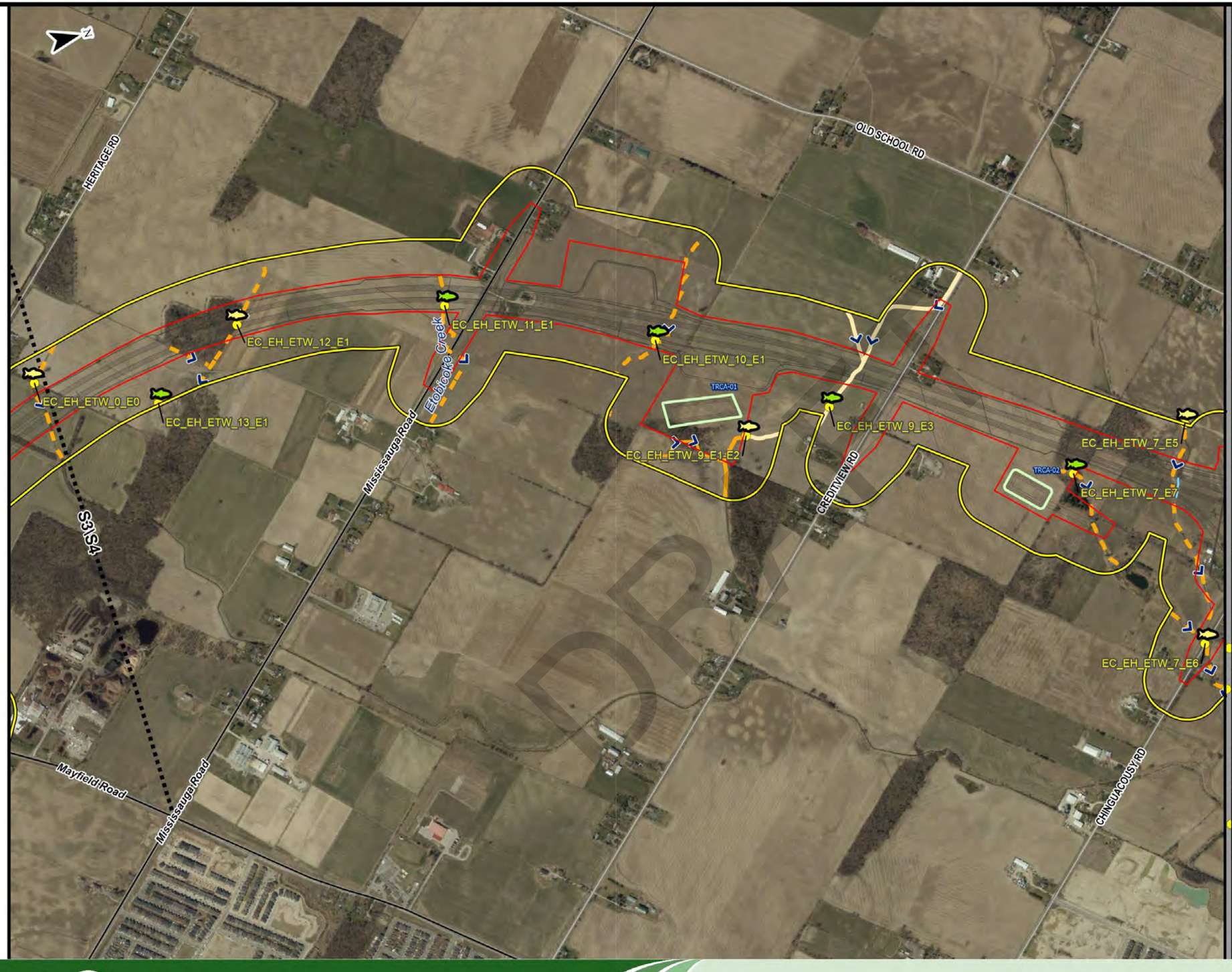
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Legend

- Preliminary Design Right-of-Way
- Study Area
- Preliminary Design
- Section Boundary
- Arterial Road
- Local Municipal Road

Stormwater Management Facilities

- Wet Pond
- Aquatic Site ID

Fish Habitat

- Direct or Seasonally Direct Fish Habitat
- Indirect Fish Habitat

Flow and Thermal Regime

- Unclassified
- Warm
- Ephemeral, Warm; Intermittent, Warm
- Permanent, Warm
- Permanent Tiled, Warm
- Watercourse
- Flow Direction

Highway 413 Preliminary Design and Assessment of Environmental Impacts

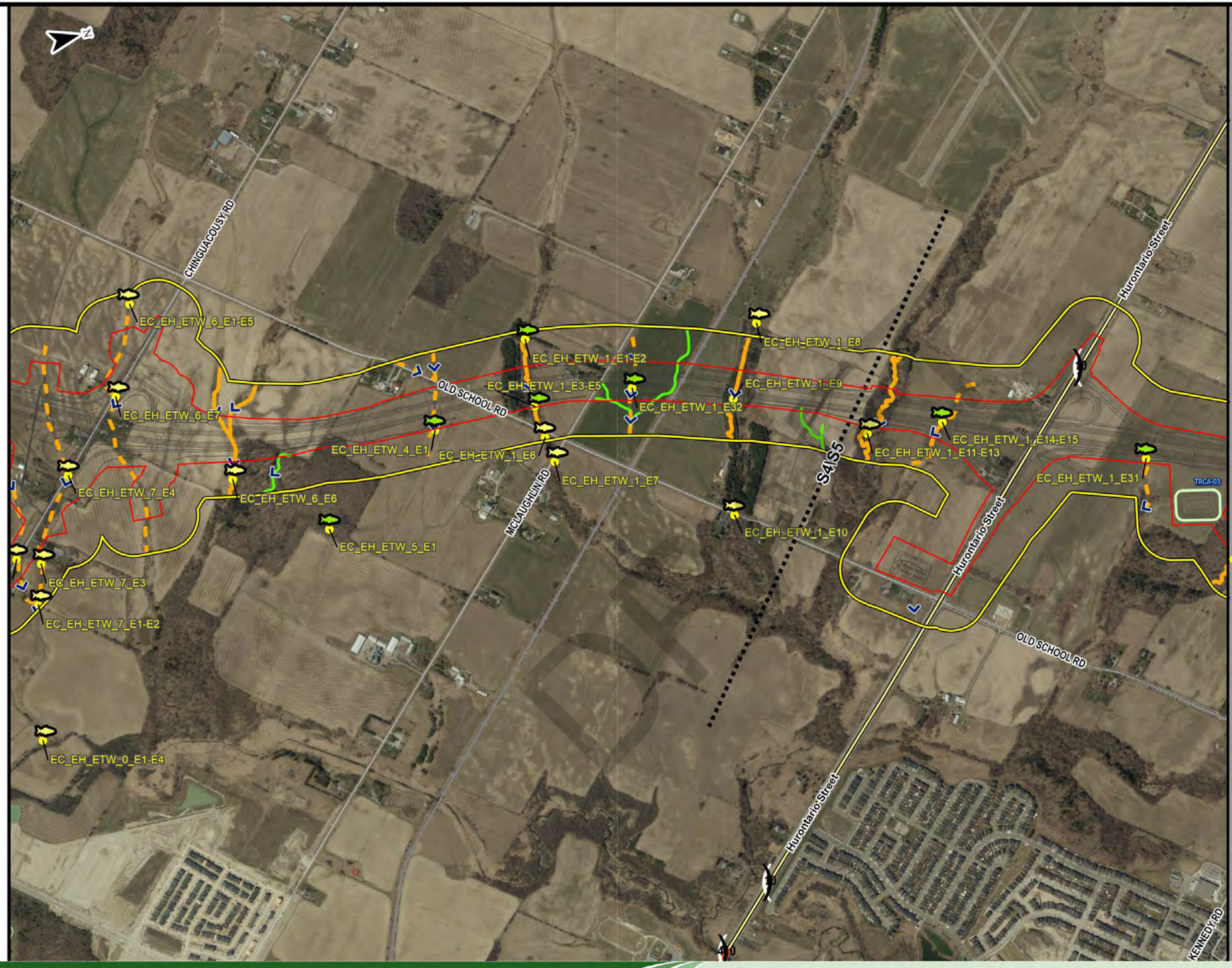
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Legend

- Preliminary Design Right-of-Way
- Study Area
- Preliminary Design
- Section Boundary
- Freeway
- Provincial Highway
- Local Municipal Road
- Railway

Stormwater Management Facilities

- Wet Pond
- Aquatic Site ID

Fish Habitat

- Direct or Seasonally Direct Fish Habitat
- Indirect Fish Habitat
- Not Fish Habitat

Flow and Thermal Regime

- Ephemeral, Warm; Intermittent, Warm
- Permanent, Warm
- No Feature Present
- Watercourse
- Flow Direction

Highway 413 Preliminary Design and Assessment of Environmental Impacts

Fish and Fish Habitat Assessment

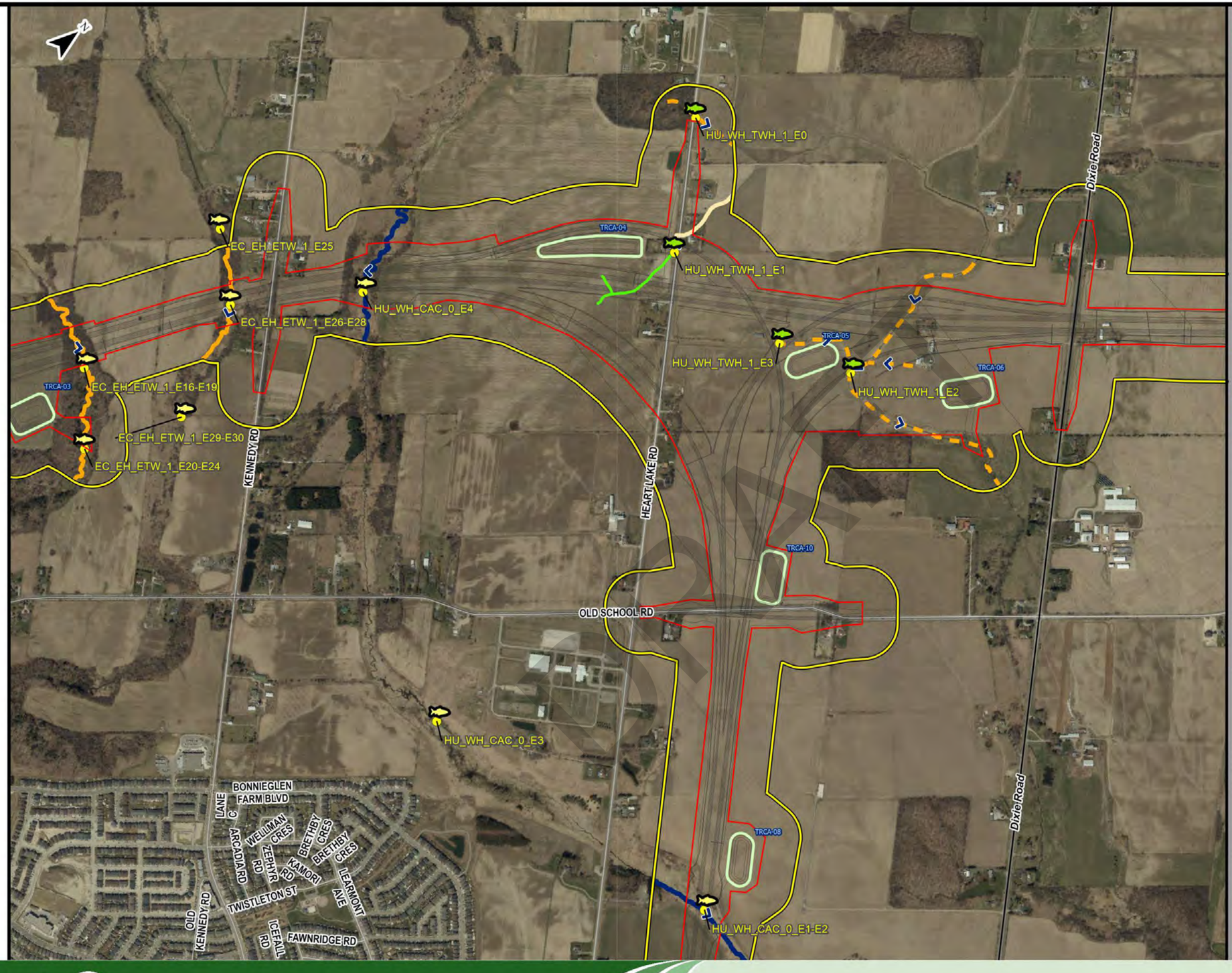
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Legend

- Preliminary Design Right-of-Way
- Study Area
- Preliminary Design
- Arterial Road
- Local Municipal Road

Stormwater Management Facilities

- Wet Pond
- Aquatic Site ID

Fish Habitat

- Direct or Seasonally Direct Fish Habitat
- Indirect Fish Habitat

Flow and Thermal Regime

- Ephemeral, Warm; Intermittent, Warm
- Permanent, Warm
- Permanent Tiled, Warm
- Permanent, Cold
- No Feature Present
- Watercourse
- Flow Direction

Highway 413 Preliminary Design and Assessment of Environmental Impacts

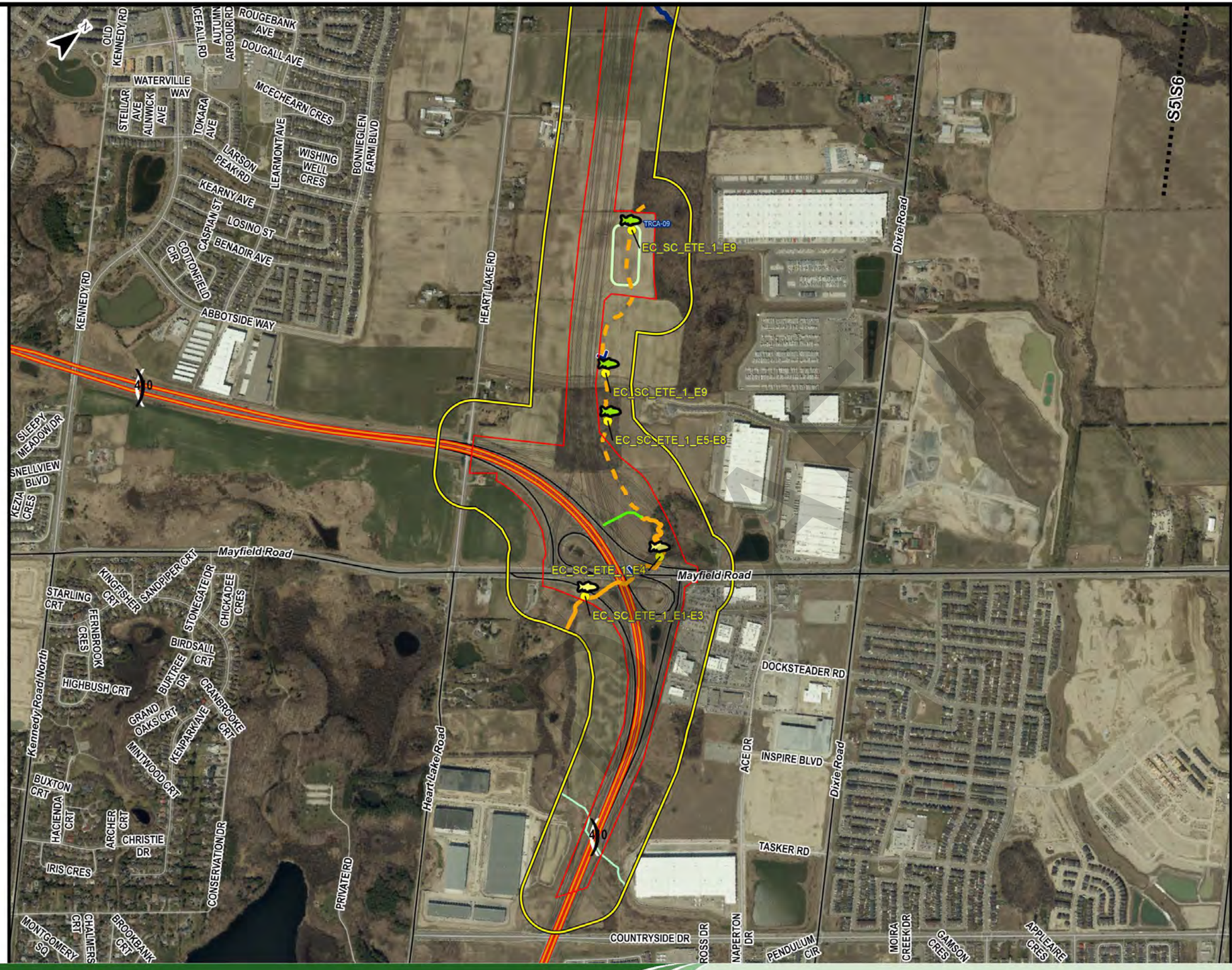
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Legend

- Preliminary Design Right-of-Way
- Study Area
- Preliminary Design
- Section Boundary
- Freeway
- Arterial Road
- Local Municipal Road

Stormwater Management Facilities

- Wet Pond
- Aquatic Site ID

Fish Habitat

- Direct or Seasonally Direct Fish Habitat
- Indirect Fish Habitat

Flow and Thermal Regime

- Ephemeral, Warm; Intermittent, Warm
- Permanent, Warm
- Permanent, Cold
- No Feature Present
- Unevaluated Watercourse
- Watercourse
- Flow Direction

Highway 413 Preliminary Design and Assessment of Environmental Impacts

Fish and Fish Habitat Assessment

24 Nov, 2025 (Imagery 2023)

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Figure 2-1
Fish and Fish Habitat Features



Legend

- Preliminary Design Right-of-Way
- Study Area
- Preliminary Design
- Section Boundary
- Arterial Road
- Local Municipal Road

Stormwater Management Facilities

- Wet Pond
- Aquatic Site ID

Fish Habitat

- Direct or Seasonally Direct Fish Habitat
- Indirect Fish Habitat

Flow and Thermal Regime

- Unclassified
- Ephemeral, Warm; Intermittent, Warm
- Permanent, Warm
- Watercourse
- Flow Direction

Highway 413 Preliminary Design and Assessment of Environmental Impacts

Fish and Fish Habitat Assessment

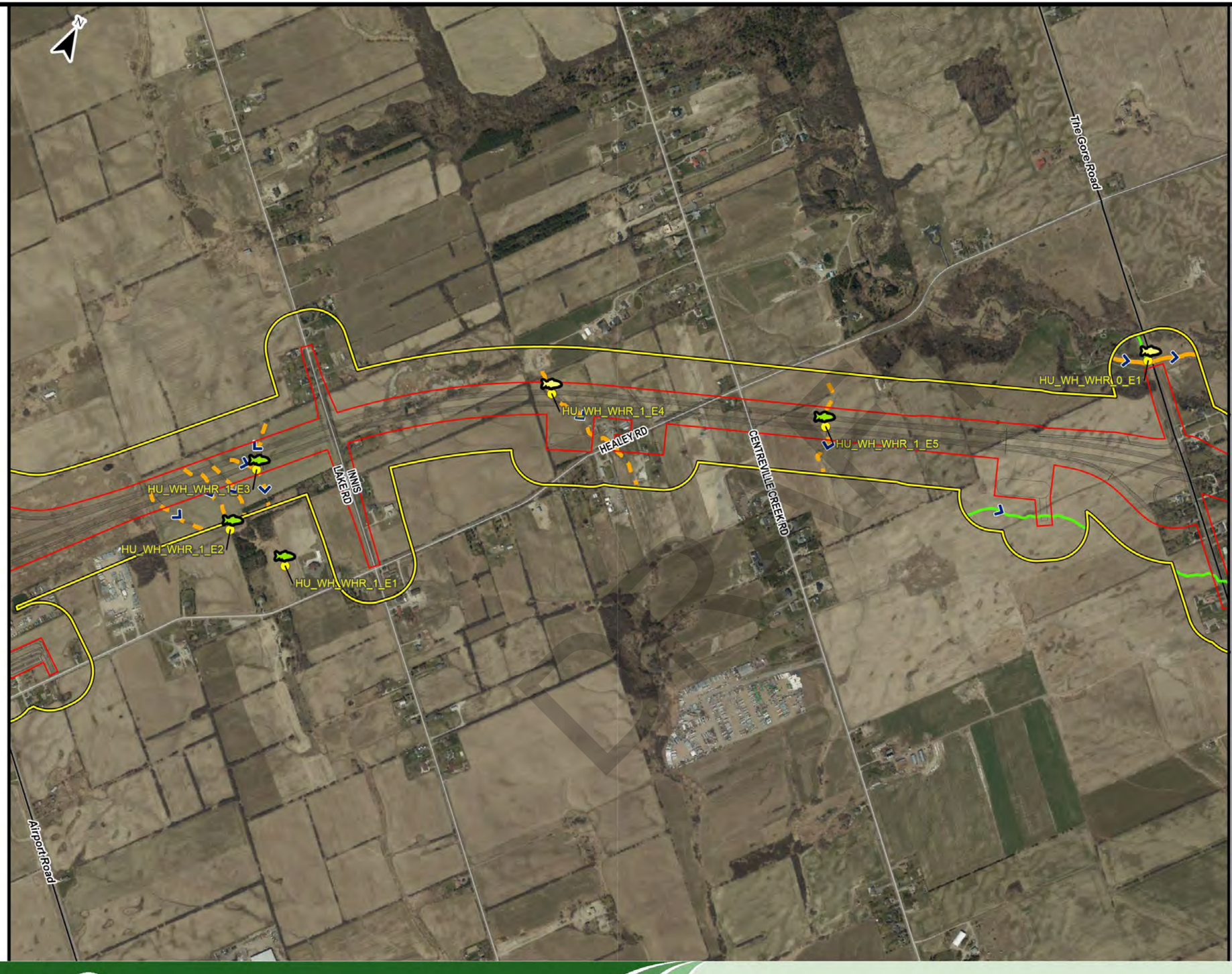
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Legend

- Preliminary Design Right-of-Way
- Study Area
- Preliminary Design
- Arterial Road
- Local Municipal Road
- Aquatic Site ID

Fish Habitat

- Direct or Seasonally Direct Fish Habitat
- Indirect Fish Habitat
- Not Fish Habitat

Flow and Thermal Regime

- Ephemeral, Warm; Intermittent, Warm
- Permanent, Warm
- No Feature Present
- Watercourse
- Flow Direction

Highway 413 Preliminary Design and Assessment of Environmental Impacts

Fish and Fish Habitat Assessment

24 Nov, 2025 (Imagery 2023)

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Legend

- Preliminary Design Right-of-Way
- Study Area
- Preliminary Design
- Section Boundary
- Arterial Road
- Local Municipal Road
- Aquatic Site ID

Fish Habitat

- Direct or Seasonally Direct Fish Habitat
- Indirect Fish Habitat
- Not Fish Habitat

Flow and Thermal Regime

- Ephemeral, Warm; Intermittent, Warm
- Permanent, Warm
- No Feature Present
- Watercourse
- Flow Direction

Highway 413 Preliminary Design and Assessment of Environmental Impacts

Fish and Fish Habitat Assessment

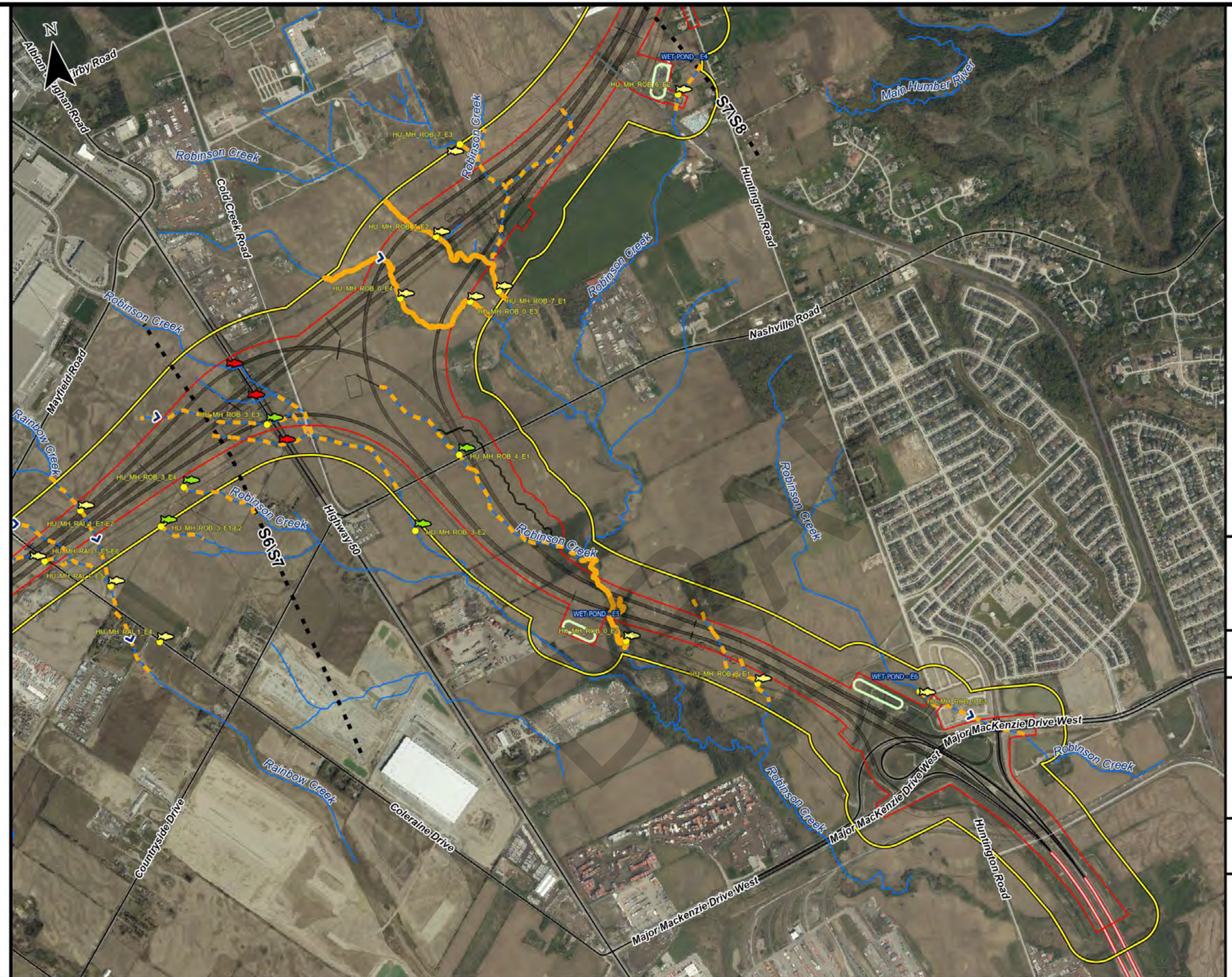
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Figure 2-1
Fish and Fish Habitat Features



Legend

- Preliminary Design Right-of-Way
- Study Area
- Section Boundary
- Preliminary Design
- Future 427 Alignment
- Arterial Road
- Local Municipal Road
- Railway
- Aquatic Site ID

Fish Habitat

- Direct and/or Seasonal Fish Habitat
- Indirect Fish Habitat
- Not Fish Habitat

Flow and Thermal Regime

- Flow Direction
- Intermittent/Ephemeral, Warm
- Permanent, Warm
- Watercourse

Stormwater Management Facilities

- Wet Pond

Highway 413 Preliminary Design and Assessment of Environmental Impacts

Fish and Fish Habitat Assessment

24 Nov, 2025 (Imagery 2023)

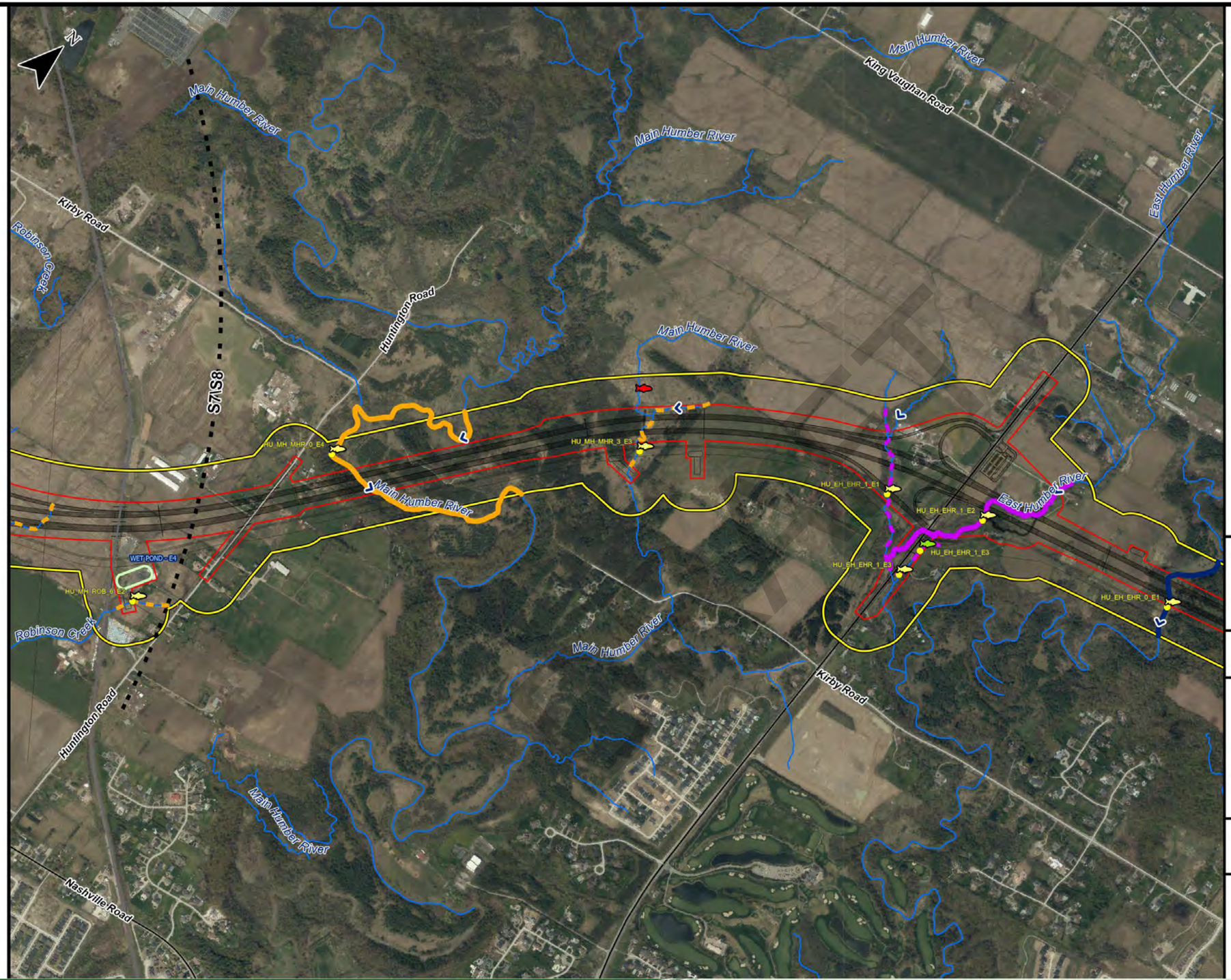
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Figure 2-1
Fish and Fish Habitat Features



Legend

- Preliminary Design Right-of-Way
- Study Area
- Section Boundary
- Preliminary Design
- Arterial Road
- Local Municipal Road
- Railway
- Aquatic Site ID

Fish Habitat

- Direct and/or Seasonal Fish Habitat
- Indirect Fish Habitat
- Not Fish Habitat

Flow and Thermal Regime

- Flow Direction
- Intermittent/Ephemeral, Warm
- Permanent, Warm
- Intermittent/Ephemeral, Cool
- Permanent, Cool
- Permanent, Cold
- Watercourse

Stormwater Management Facilities

- Wet Pond

Highway 413 Preliminary Design and Assessment of Environmental Impacts

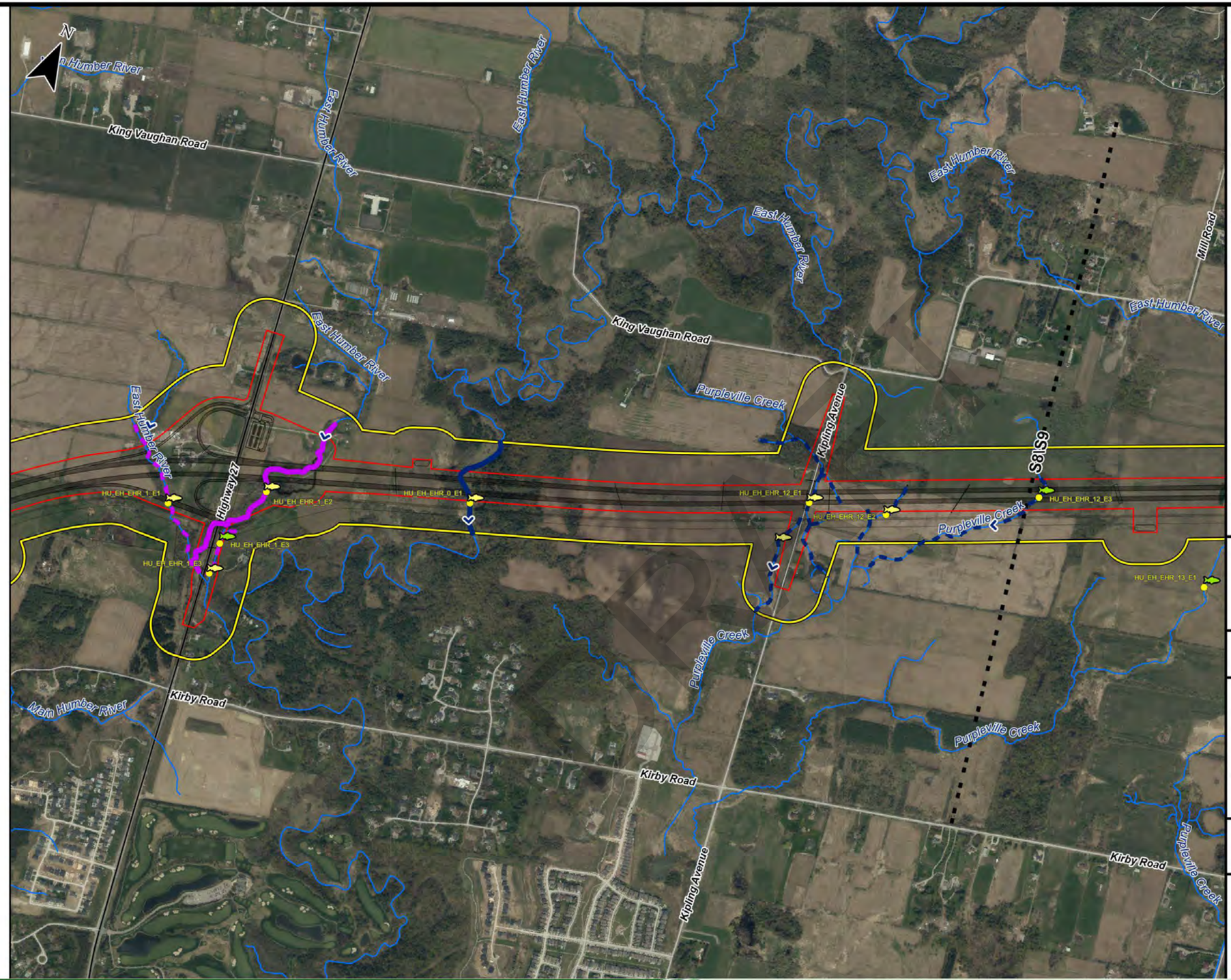
Fish and Fish Habitat Assessment

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Legend

- Preliminary Design Right-of-Way
- Study Area
- Section Boundary
- Preliminary Design
- Arterial Road
- Local Municipal Road
- Aquatic Site ID

Fish Habitat

- Direct and/or Seasonal Fish Habitat
- Indirect Fish Habitat

Flow and Thermal Regime

- Flow Direction
- Intermittent/Ephemeral, Cool
- Permanent, Cool
- Intermittent/Ephemeral, Cold
- Permanent, Cold
- Watercourse

Highway 413 Preliminary Design and Assessment of Environmental Impacts

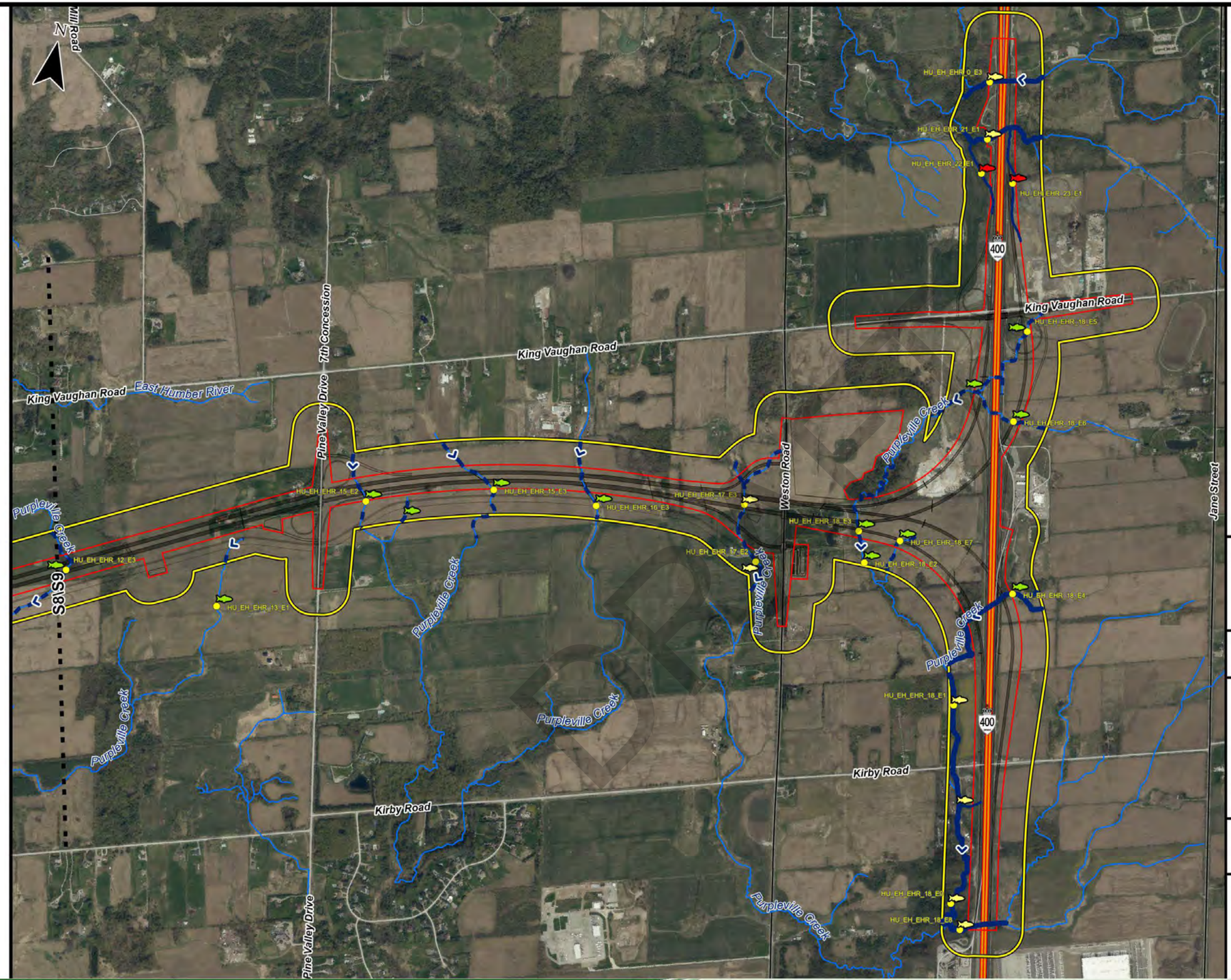
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Legend

- Preliminary Design Right-of-Way
- Study Area
- Section Boundary
- Preliminary Design
- Freeway
- Arterial Road
- Local Municipal Road
- Aquatic Site ID

Fish Habitat

- Direct and/or Seasonal Fish Habitat
- Indirect Fish Habitat
- Not Fish Habitat

Flow and Thermal Regime

- Flow Direction
- Unknown, Cold
- Intermittent/Ephemeral, Cold
- Permanent, Cold
- Watercourse

Highway 413 Preliminary Design and Assessment of Environmental Impacts

Fish and Fish Habitat Assessment

24 Nov, 2025 (Imagery 2023)

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2.3.2 Terrestrial Ecosystems

2.3.2.1 Background

Terrestrial ecosystems are land-based natural environments and play a critical role in regulating climate, soil formation and nutrient cycling. Terrestrial ecosystems include natural heritage systems, which are ecologically-based delineations of nature and natural function; a system of connected, or to-be connected, green and natural areas that provide ecological functions over a longer period of time and which enable movement of species (MNR, 2010).

Natural heritage systems are comprised of natural features, and the functions they provide including linkages (also known as corridors) between different landscapes. Throughout the consultation and engagement process, MTO has been told by Indigenous communities that areas in the Study Area have cultural significance, including for harvesting and ceremony.

In 2015, a natural heritage assessment was undertaken within the Study Area to provide information for the evaluation of alignment alternatives and the selection of a Preferred Alignment. A comprehensive review of secondary sources was completed for the Project and alignment-specific natural environment data needed to compare the alignments, including a preliminary impact assessment for each alignment, was obtained through ecological field investigations completed in 2015. Data collection focused on identifying sensitivities and constraints that could allow for alignment elimination and/or to develop recommendations for alignment modification (MTO, 2015).

In December 2015, the Highway 413 Project was temporarily suspended. Updates to the 2015 evaluation resumed in 2020 and included a review of available ecological secondary source data to reflect changes to natural heritage legislation in support of identifying the FAA.

The 2020 field program was designed to update and confirm natural environment data collected in 2015 and to develop and inform the Preliminary Design of the Preferred Alignment. This field program spanned across three years (2020, 2022, and 2023) and formed the basis for the existing conditions at that time. In 2025, roadside terrestrial field investigations were completed at targeted locations to supplement data based on refinements to the Preliminary Design. The 2025 field program included new locations not previously surveyed in 2020, 2022 and 2023.

The terrestrial ecosystems assessment summarizes the terrestrial ecosystems data collected through desktop analysis and field investigations conducted in 2020, 2022, 2023 and 2025 to establish existing conditions and assesses potential impacts of the Preliminary Design in accordance with the Environmental Reference for Highway Design (MTO, 2013).

2.3.2.2 Data Collection

2.3.2.2.1 Desktop Review

A preliminary background review was conducted in 2015 and updated in 2020, 2022, 2024 and 2025 to obtain information on known natural heritage features and species records within the Study Area. Records included those of SAR and Species of Conservation Concern. Updates to the secondary source review were conducted to account for new background data including changes to species designations under the *Species at Risk Act* and the *Endangered Species Act, 2007**. (Note that the findings and recommendations in this report are based on the *Endangered Species Act, 2007**, prior to amendments made on June 2025). Updated information and species records specific to the Study Area were also obtained in 2020 from MNR and MECP. Background information was obtained from publicly available resources, including municipal Official Plans, reference manuals, wildlife atlases, relevant technical reports and federal sources.

2.3.2.2.2 Fieldwork

Field investigations were designed to assess and characterize terrestrial features within the Study Area, address key data gaps and refine the understanding of the natural heritage features and functions affected. Terrestrial field data includes the consolidated results of field investigations completed in 2020, 2022, 2023 and 2025 to produce two years of data collection for the Study Area, noting that surveys were conducted in areas available for access and on properties with PTE; full survey coverage did not occur within the Study Area during all survey years. Field data collected included Baseline Terrestrial Surveys and Targeted SAR Surveys as summarized below.

Baseline Terrestrial Surveys

Baseline terrestrial field investigations completed in 2020, 2022, 2023, and/or 2025 included the following:

- Vegetation Community Classification and Delineation;
- Botanical Inventory for each mapped community;
- Vernal Pool Assessment;
- Nocturnal Amphibian Call Surveys;
- Breeding Bird Surveys; and
- Significant Wildlife Habitat Assessment.

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Wildlife and key wildlife habitat features encountered incidentally were also recorded, which included incidental observations of SAR, Species of Conservation Concern and birds protected under the *Migratory Birds Convention Act*, *1994* and the Migratory Birds Regulations, 2022. Incidental observations and suitable habitats of SAR listed as Threatened, Endangered or Extirpated under the provincial *Endangered Species Act, 2007** were recorded during field investigations. These species, as well as their habitat, are afforded protection under the *Endangered Species Act, 2007**. Species listed as Threatened, Endangered or Extirpated under the federal SARA that are not afforded provincial protection and their habitats were also searched for through the baseline terrestrial surveys. The field program has supported the information gathering that will be considered through the Bilateral Federal-Provincial Working Group as defined by the Memorandum of Understanding (Government of Canada, 2024) issued jointly by the Minister of Transportation (Ontario) and the President of the Impact Assessment Agency of Canada (Canada).

Locations of observed Species of Conservation Concern (MNR, 2000; MNR 2015; MNR, 2015) and their habitats were also documented during field investigations. For the purposes of the terrestrial ecosystems assessment, Species of Conservation Concern are rare species not protected under the *Endangered Species Act, 2007** and include the following:

- Species with a Subnational Rank assigned by the Natural Heritage Information Centre (MNR, 2014) as S1 (critically imperilled), S2 (imperilled) or S3 (vulnerable); and/or
- Species listed as Special Concern under the *Endangered Species Act, 2007**.

Targeted Species at Risk Surveys

The following targeted surveys were completed in 2020, 2022, 2023, and/or 2025 where PTE was afforded to confirm the presence or absence of some federally listed terrestrial SAR and their habitats within the Study Area:

- Western Chorus Frog (*Pseudacris triseriata* pop 1; Great Lakes / St. Lawrence – Canadian Shield Population) Surveys;
- Red-Headed Woodpecker (*Melanerpes erythrocephalus*) and Pileated Woodpecker (*Dryocopus pileatus*) Call-playback Surveys;
- Rapids Clubtail Surveys (*Phanogomphus quadricolor*);
- Bank Swallow (*Riparia riparia*) Critical Habitat Surveys; and
- Bat Maternity Roost Structure Surveys in Treed Habitat Assessment.

Targeted surveys for Redside Dace (*Clinostomus elongatus*) which is listed as Endangered under both the provincial *Endangered Species Act, 2007** and the federal SARA were also completed within the Study Area.

Although Pileated Woodpecker is not SAR, call-playback surveys were completed in tandem with the Red-Headed Woodpecker surveys as the species receives year-round nest protection pursuant to recent updates to the Migratory Birds Regulations, 2022 under the *Migratory Birds Convention Act*, *1994*. Characteristics of suitable habitat are the same for both Pileated Woodpecker and Red-headed Woodpecker and both species can be detected via call-playback surveys.

Indigenous Community Field Liaisons

Indigenous communities were invited to participate in the 2022 and 2023 fieldwork as CFLs during the baseline terrestrial surveys (see **Chapter 7.1.2.1** for further details). CFLs are representatives from Indigenous communities who observe fieldwork activities, provide community knowledge and expertise, and report back to the community. CFLs from Indigenous communities were also involved in targeted SAR surveys including the Western Chorus Frog, Rapids Clubtail, Red-Headed Woodpecker, Bank Swallow and Bat Maternity Roost Structure surveys.

2.3.2.3 Summary of Environmental Conditions

The Study Area falls within Ecoregion 6E, Lake Simcoe-Rideau (73%) and Ecoregion 7E, Lake Erie-Lake Ontario (27%).

Ecoregion 6E encompasses most of southern Ontario. Landcover in Ecoregion 6E is mostly agricultural (57%) and forest cover (30%, MNR, 2009). The vegetation is relatively diverse with Sugar Maple (*Acer saccharum*) dominated hardwood forests with American Beech (*Fagus grandifolia*), White Ash (*Fraxinus americana*) and Eastern Hemlock (*Tsuga canadensis*) and with lowland floodplain forests of Green Ash (*Fraxinus pennsylvanica*), Silver Maple (*Acer saccharinum*), Red Maple (*Acer rubrum*) and Eastern White Cedar (*Thuja occidentalis*).

The boundary to Ecoregion 7E to the south is separated based on temperature, elevation, geology and primary productivity.

Ecoregion 7E is also mostly agricultural and developed land (78%) and forest cover is sparser (12%). The vegetation is highly diverse including Carolinian forests of Tulip Tree (*Liriodendron tulipifera*), Black Gum (*Nyssa sylvatica*), Sycamore (*Platanus occidentalis*) and Kentucky Coffee-tree (*Gymnocarpium dioicum*) as well as the Sugar Maple dominated hardwood forests as described above.

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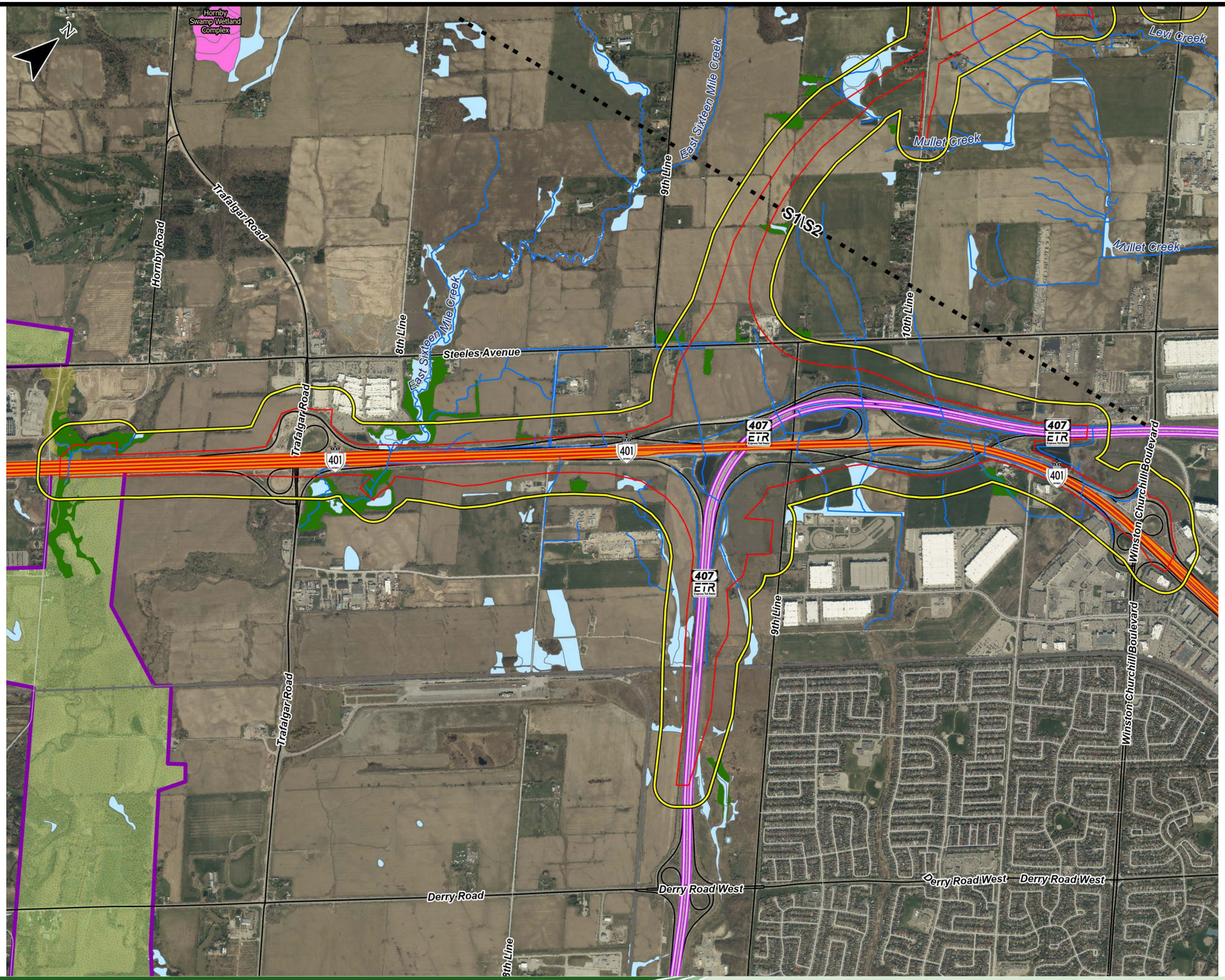
In the Study Area, the woodlands are generally more representative of Ecoregion 6E with relatively few Carolinian vegetation communities identified. However, forest cover in the local watersheds intersecting the Study Area is generally lower on average (5 to 23%) as compared to the average forest cover of Ecoregion 6E (30%). This is primarily due to human influence from an already urbanized environment. Agriculture is the dominant landcover and the remaining natural heritage features are typically fragmented patches with limited connectivity, often associated with watercourse features. Connectivity is especially limited adjacent to the existing highway corridors within the Study Area: Highway 401, Highway 410, Highway 407 ETR, Highway 427 and Highway 400.

The following is a summary of the existing terrestrial ecosystems features within the Study Area:

- The Project intersects Designated Areas including 187.36 ha of the Greenbelt, which is 11.44% of the ROW footprint or 0.02% of the Greenbelt Area, and 2.40 ha of one Environmentally Significant Area;
- The Project intersects 14.80 ha of six Provincially Significant Wetlands, 36.24 ha of 22 Significant Woodlands, and five Significant Valleylands;
- The Project intersects 388.99 ha of vegetation communities including 2.17 ha of provincially rare vegetation communities;
- 682 plant species were observed;
- 246 wildlife species were observed;
- 11 federally protected SAR were observed, and four additional federally protected SAR are potentially present;
- Eight provincially protected SAR were observed, and eight additional provincially protected SAR are potentially present;
- 12 provincial Species of Conservation Concern were observed, and two additional provincial Species of Conservation Concern are potentially present;
- 10 confirmed Significant Wildlife Habitat types and 18 candidate Significant Wildlife Habitat types are present within the Study Area; and
- Given the utilization of agricultural land and the large contiguous natural features adjacent to and intersected by the ROW, the overall functionality of the adjacent tracts of habitat for wildlife including SAR and Species of Conservation Concern is not expected to be adversely impaired or eliminated.

Features of the existing Terrestrial Ecosystem Study Area are identified in **Figure 2-2**. Potential impacts and associated mitigation measures are outlined in **Chapter 5**.

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Legend

- Watercourse
- Freeway
- 407 ETR Freeway
- Arterial Road
- Local Municipal Road
- Railway
- Section Boundary
- Preliminary Design Right-of-Way
- Study Area

Provincial Land Use and Environmental Plans Areas

- Greenbelt Plan - Protected Countryside
- Greenbelt Plan - Urban River Valley
- Greenbelt Plan - Natural Heritage System

Woodland Features

- Other Woodland

Wetland Features

- Non-Provincially Significant Wetland
- Unevaluated Wetland (MNRF and AECOM/WSP ELC 2020-2023)

Notes:
- Significant Woodlands were assessed following the size criteria described in the Natural Heritage Reference Manual (2010). Within the Study Area, Woodlands are delineated based on Ecological Land Classification, while beyond the Study Area, Woodlands are delineated based on the MNRF Woodlands (Land Information Ontario, 2024).

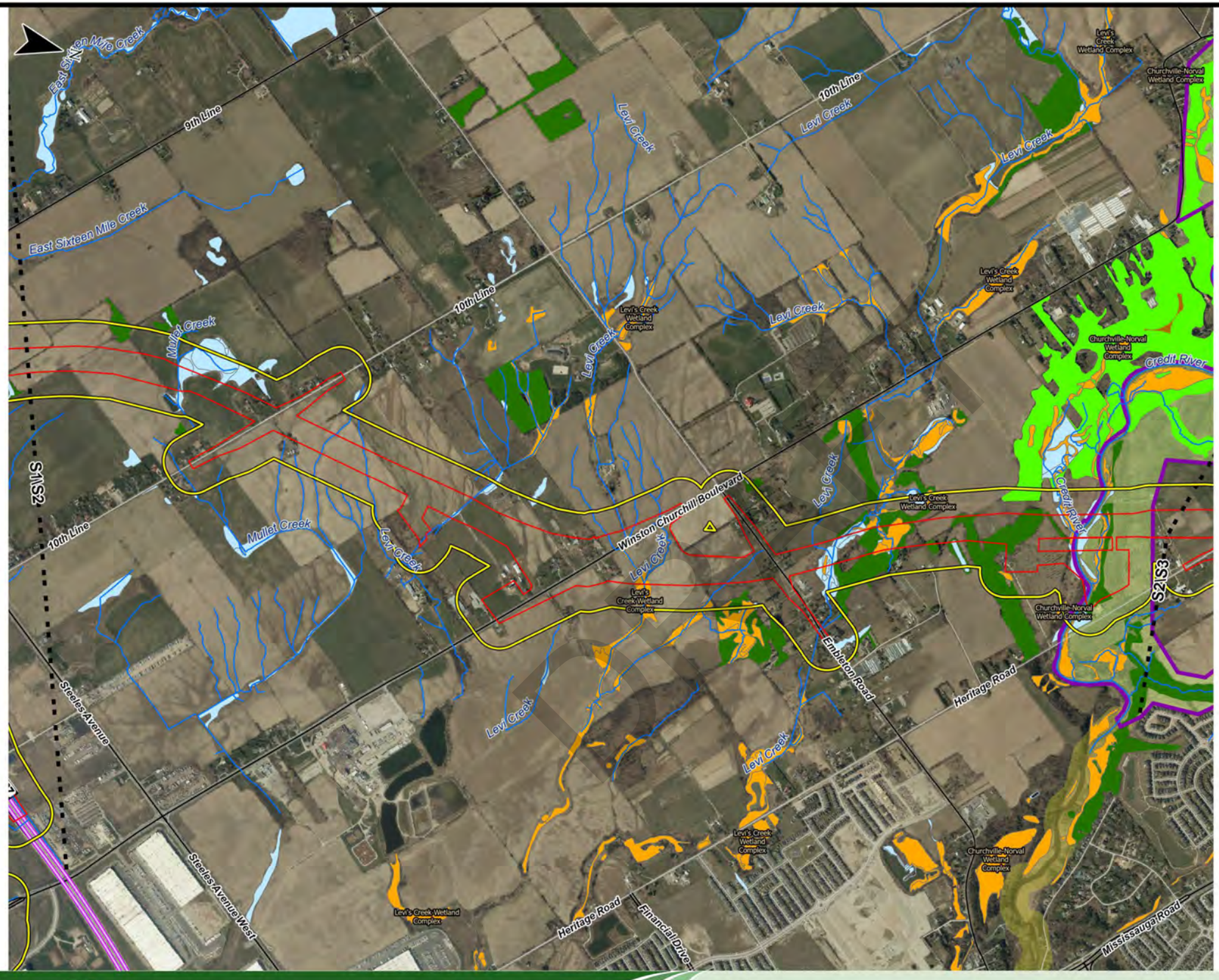
Highway 413 Preliminary Design and Assessment of Environmental Impacts

Section 1
Designated Areas, Wetlands and Woodlands

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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0 0.3 0.6 0.9 1.2 km



Legend

- Watercourse
- 407 ETR Freeway
- Arterial Road
- Local Municipal Road
- Section Boundary
- Preliminary Design Right-of-Way
- Study Area

Provincial Land Use and Environmental Plans Areas

- Greenbelt Plan - Protected Countryside
- Greenbelt Plan - Urban River Valley
- Greenbelt Plan - Natural Heritage System

Woodland Features

- Significant Woodland
- Significant Woodland Interior Habitat (100m from woodland edge)
- Other Woodland

Wetland Features

- Provincially Significant Wetland
- Unevaluated Wetland (MNRF and AECOM/WSP ELC 2020-2023)

Notes:
- Significant Woodlands were assessed following the size criteria described in the Natural Heritage Reference Manual (2010). Within the Study Area, Woodlands are delineated based on Ecological Land Classification, while beyond the Study Area, Woodlands are delineated based on the MNRF Woodlands (Land Information Ontario, 2024).

Highway 413 Preliminary Design and Assessment of Environmental Impacts

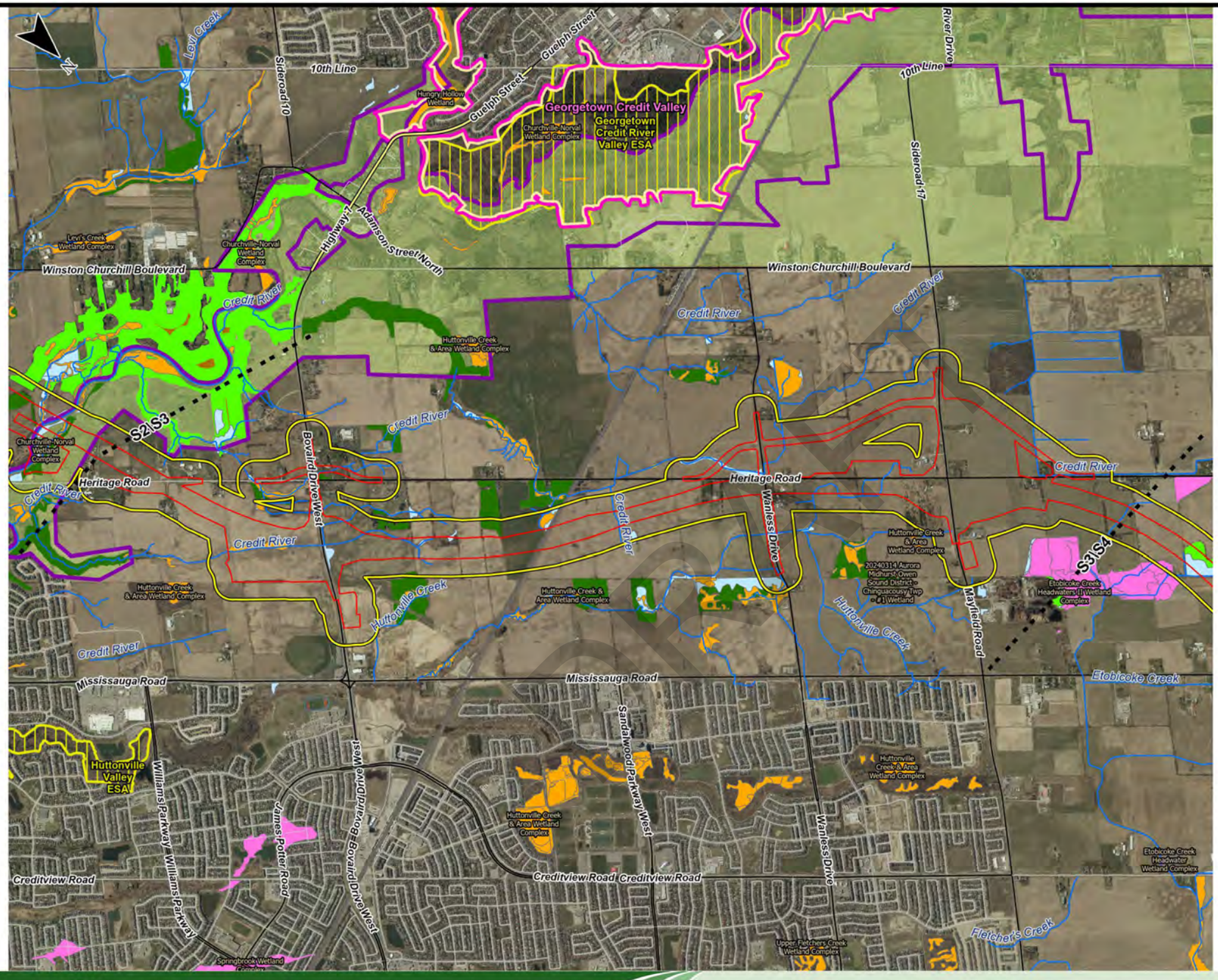
Section 2
Designated Areas, Wetlands and Woodlands

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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0 0.25 0.5 0.75 1 km

Figure 2-2
Designated Areas, Wetlands and Woodlands



Legend

- Watercourse
- Provincial Highway
- Arterial Road
- Local Municipal Road
- Railway
- Section Boundary
- Preliminary Design Right-of-Way
- Study Area

Other Designated Areas

- Environmentally Significant Area (ESA)
- Area of Natural and Scientific Interest

Provincial Land Use and Environmental Plans Areas

- Greenbelt Plan - Protected Countryside
- Greenbelt Plan - Urban River Valley
- Greenbelt Plan - Natural Heritage System

Woodland Features

- Significant Woodland
- Significant Woodland Interior Habitat (100m from woodland edge)
- Other Woodland

Wetland Features

- Provincially Significant Wetland
- Non-Provincially Significant Wetland
- Unevaluated Wetland (MNRF and AECOM/WSP ELC 2020-2023)

Notes:
- Significant Woodlands were assessed following the size criteria described in the Natural Heritage Reference Manual (2010). Within the Study Area, Woodlands are delineated based on Ecological Land Classification, while beyond the Study Area, Woodlands are delineated based on the MNRF Woodlands (Land Information Ontario, 2024).

Highway 413 Preliminary Design and Assessment of Environmental Impacts

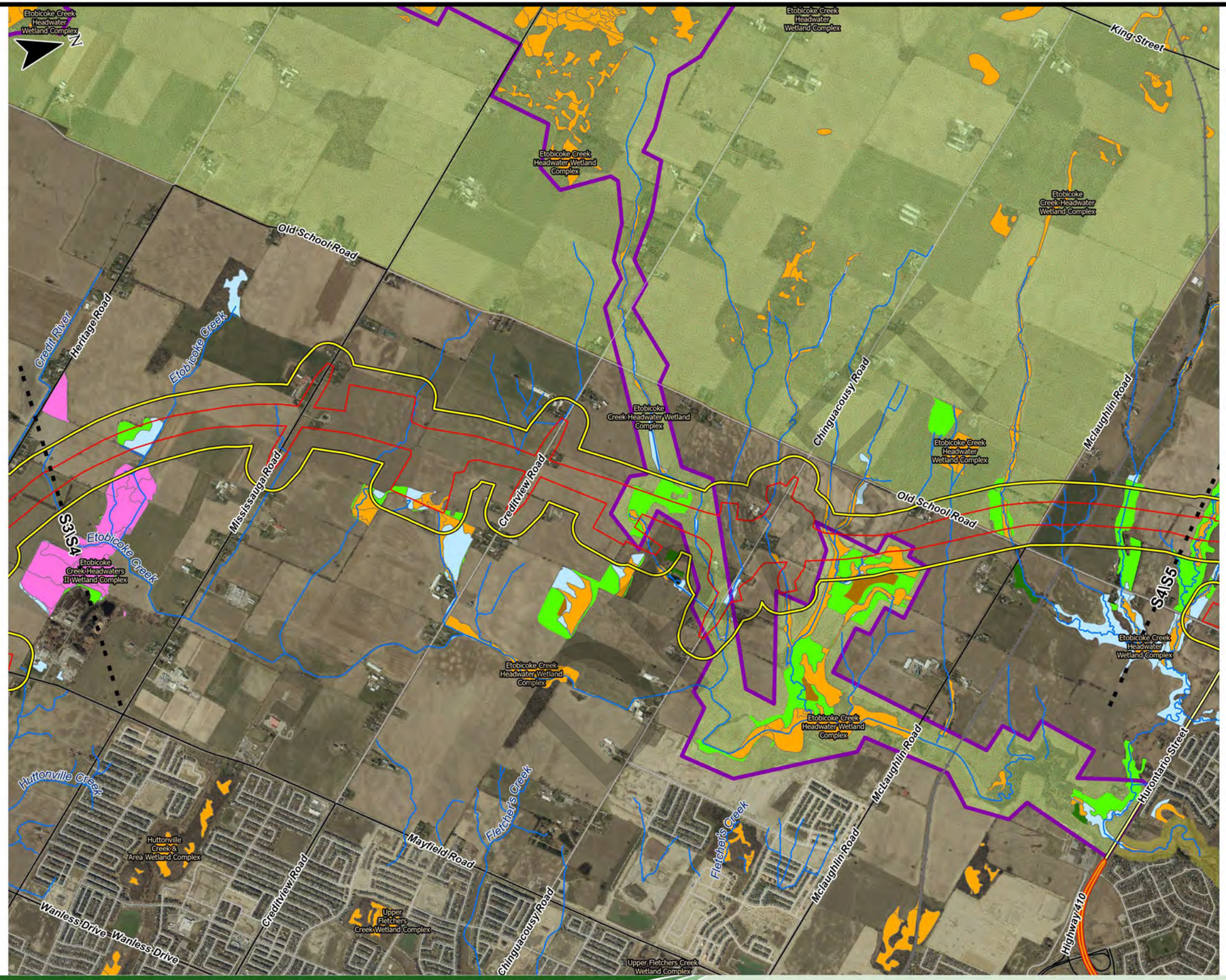
Section 3
Designated Areas, Wetlands and Woodlands

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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0 0.35 0.7 1.05 1.4 km

Figure 2-2
Designated Areas, Wetlands and Woodlands



Legend

- Watercourse
- Freeway
- Provincial Highway
- Arterial Road
- Local Municipal Road
- Railway
- Section Boundary
- Preliminary Design Right-of-Way
- Study Area

Provincial Land Use and Environmental Plans Areas

- Greenbelt Plan - Protected Countryside
- Greenbelt Plan - Urban River Valley
- Greenbelt Plan - Natural Heritage System

Woodland Features

- Significant Woodland
- Significant Woodland Interior Habitat (100m from woodland edge)
- Other Woodland

Wetland Features

- Provincially Significant Wetland
- Non-Provincially Significant Wetland
- Unevaluated Wetland (MNRF and AECOM/WSP ELC 2020-2023)

Notes:
- Significant Woodlands were assessed following the size criteria described in the Natural Heritage Reference Manual (2010). Within the Study Area, Woodlands are delineated based on Ecological Land Classification, while beyond the Study Area, Woodlands are delineated based on the MNRF Woodlands (Land Information Ontario, 2024).

Highway 413 Preliminary Design and Assessment of Environmental Impacts

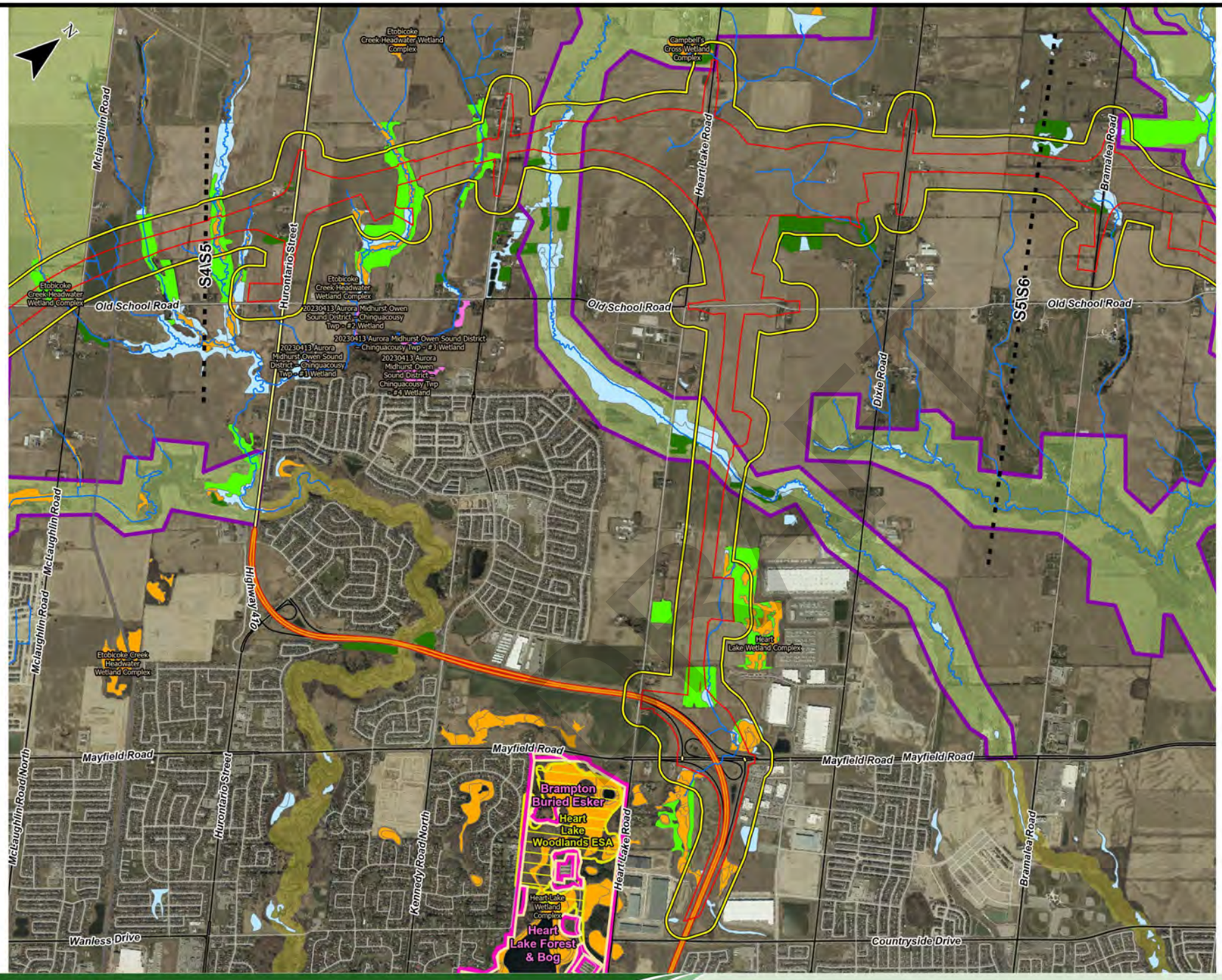
Section 4
Designated Areas, Wetlands and Woodlands

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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0 0.3 0.6 0.9 1.2 km

Figure 2-2
Designated Areas, Wetlands and Woodlands



Legend

- Watercourse
- Freeway
- Provincial Highway
- Arterial Road
- Local Municipal Road
- Railway
- Section Boundary
- Preliminary Design Right-of-Way
- Study Area

Other Designated Areas

- Environmentally Significant Area (ESA)
- Area of Natural and Scientific Interest

Provincial Land Use and Environmental Plans Areas

- Greenbelt Plan - Protected Countryside
- Greenbelt Plan - Urban River Valley
- Greenbelt Plan - Natural Heritage System

Woodland Features

- Significant Woodland
- Significant Woodland Interior Habitat (100m from woodland edge)
- Other Woodland

Wetland Features

- Provincially Significant Wetland
- Non-Provincially Significant Wetland
- Unevaluated Wetland (MNRF and AECOM/WSP ELC 2020-2023)

Notes:

- Significant Woodlands were assessed following the size criteria described in the Natural Heritage Reference Manual (2010). Within the Study Area, Woodlands are delineated based on Ecological Land Classification, while beyond the Study Area, Woodlands are delineated based on the MNRF Woodlands (Land Information Ontario, 2024).

Highway 413 Preliminary Design and Assessment of Environmental Impacts

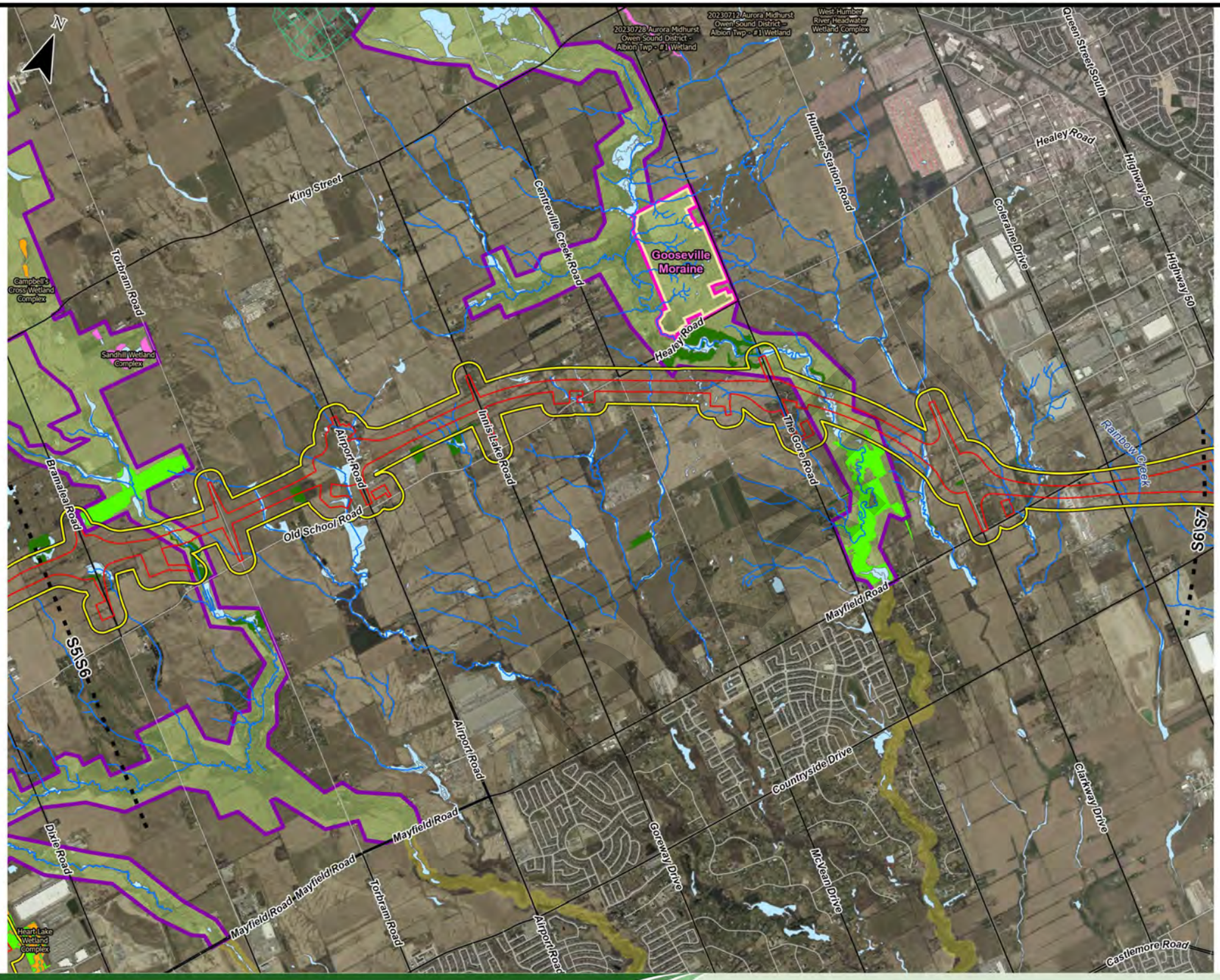
Section 5
Designated Areas, Wetlands and Woodlands

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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0 0.35 0.7 1.05 1.4 km

Figure 2-2
Designated Areas, Wetlands and Woodlands



Legend

- Watercourse
- Arterial Road
- Local Municipal Road
- Railway
- Section Boundary
- Preliminary Design Right-of-Way
- Study Area
- Area of Natural and Scientific Interest

Provincial Land Use and Environmental Plans Areas

- Oak Ridges Moraine Conservation Plan
- Greenbelt Plan - Protected Countryside
- Greenbelt Plan - Urban River Valley
- Greenbelt Plan - Natural Heritage System

Woodland Features

- Significant Woodland
- Significant Woodland Interior Habitat (100m from woodland edge)
- Other Woodland

Wetland Features

- Provincially Significant Wetland
- Non-Provincially Significant Wetland
- Unevaluated Wetland (MNRF and AECOM/WSP ELC 2020-2023)

Notes:

- Significant Woodlands were assessed following the size criteria described in the Natural Heritage Reference Manual (2010). Within the Study Area, Woodlands are delineated based on Ecological Land Classification, while beyond the Study Area, Woodlands are delineated based on the MNRF Woodlands (Land Information Ontario, 2024).

Highway 413 Preliminary Design and Assessment of Environmental Impacts

Section 6
Designated Areas, Wetlands and Woodlands

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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0 0.5 1 1.5 2 km

Figure 2-2
Designated Areas, Wetlands and Woodlands



Legend

- Watercourse
- Future 427 Alignment
- Arterial Road
- Local Municipal Road
- Railway
- Section Boundary
- Preliminary Design Right-of-Way
- Study Area

Provincial Land Use and Environmental Plans Areas

- Greenbelt Plan - Protected Countryside
- Greenbelt Plan - Urban River Valley
- Greenbelt Plan - Natural Heritage System

Woodland Features

- Significant Woodland
- Other Woodland

Wetland Features

- Non-Provincially Significant Wetland
- Unevaluated Wetland (MNRF and AECOM/WSP ELC 2020-2023)

Notes:

- Significant Woodlands were assessed following the size criteria described in the Natural Heritage Reference Manual (2010). Within the Study Area, Woodlands are delineated based on Ecological Land Classification, while beyond the Study Area, Woodlands are delineated based on the MNRF Woodlands (Land Information Ontario, 2024).

Highway 413 Preliminary Design and Assessment of Environmental Impacts

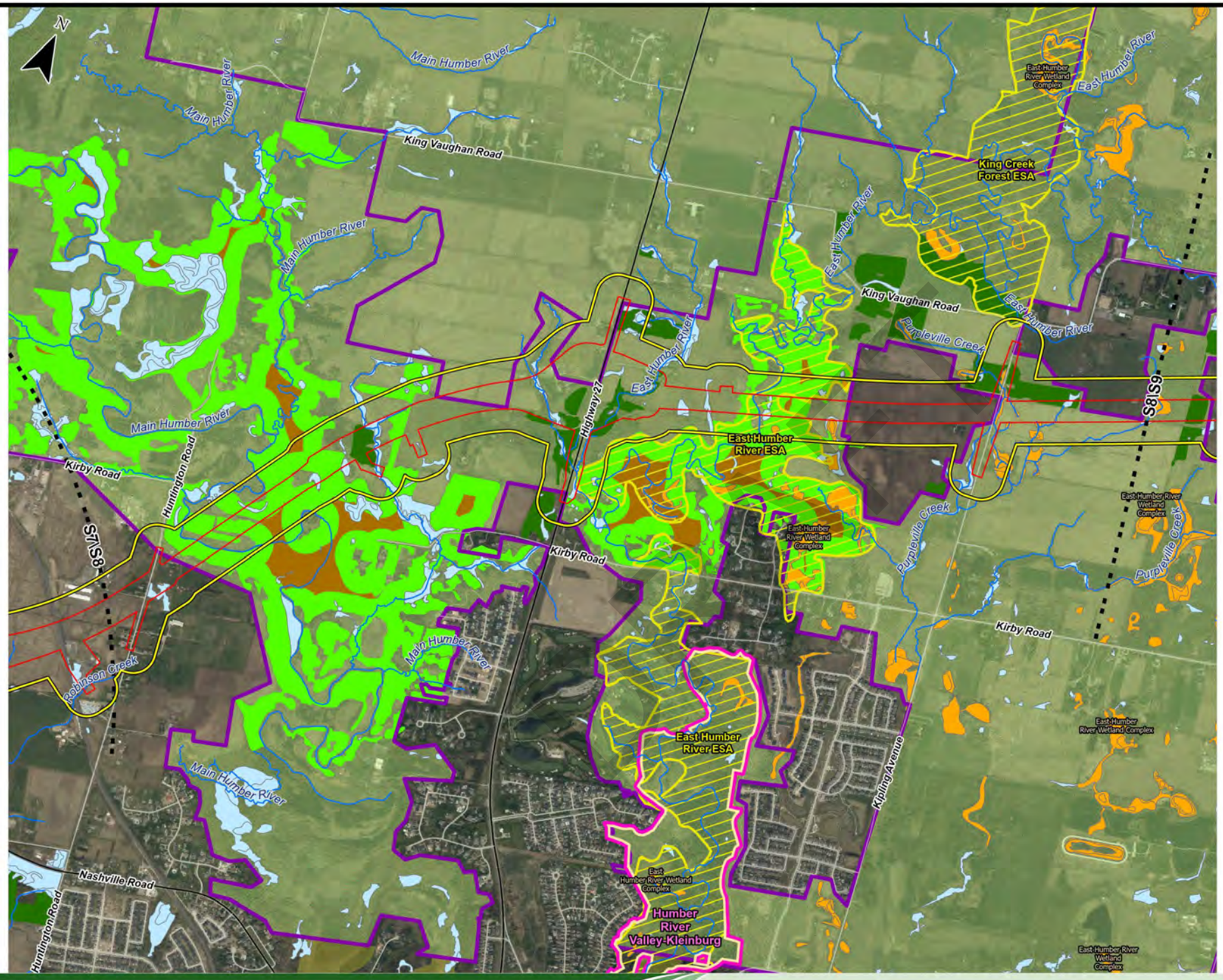
Section 7
Designated Areas, Wetlands and Woodlands

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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0 0.2 0.4 0.6 0.8 km

Figure 2-2
Designated Areas, Wetlands and Woodlands



Legend

- Watercourse
- Arterial Road
- Local Municipal Road
- Railway
- Section Boundary
- Preliminary Design Right-of-Way
- Study Area

Other Designated Areas

- Environmentally Significant Area (ESA)
- Area of Natural and Scientific Interest

Provincial Land Use and Environmental Plans Areas

- Greenbelt Plan - Protected Countryside
- Greenbelt Plan - Urban River Valley
- Greenbelt Plan - Natural Heritage System

Woodland Features

- Significant Woodland
- Significant Woodland Interior Habitat (100m from woodland edge)
- Other Woodland

Wetland Features

- Provincially Significant Wetland
- Unevaluated Wetland (MNRF and AECOM/WSP ELC 2020-2023)

Notes:

- Significant Woodlands were assessed following the size criteria described in the Natural Heritage Reference Manual (2010). Within the Study Area, Woodlands are delineated based on Ecological Land Classification, while beyond the Study Area, Woodlands are delineated based on the MNRF Woodlands (Land Information Ontario, 2024).

Highway 413 Preliminary Design and Assessment of Environmental Impacts

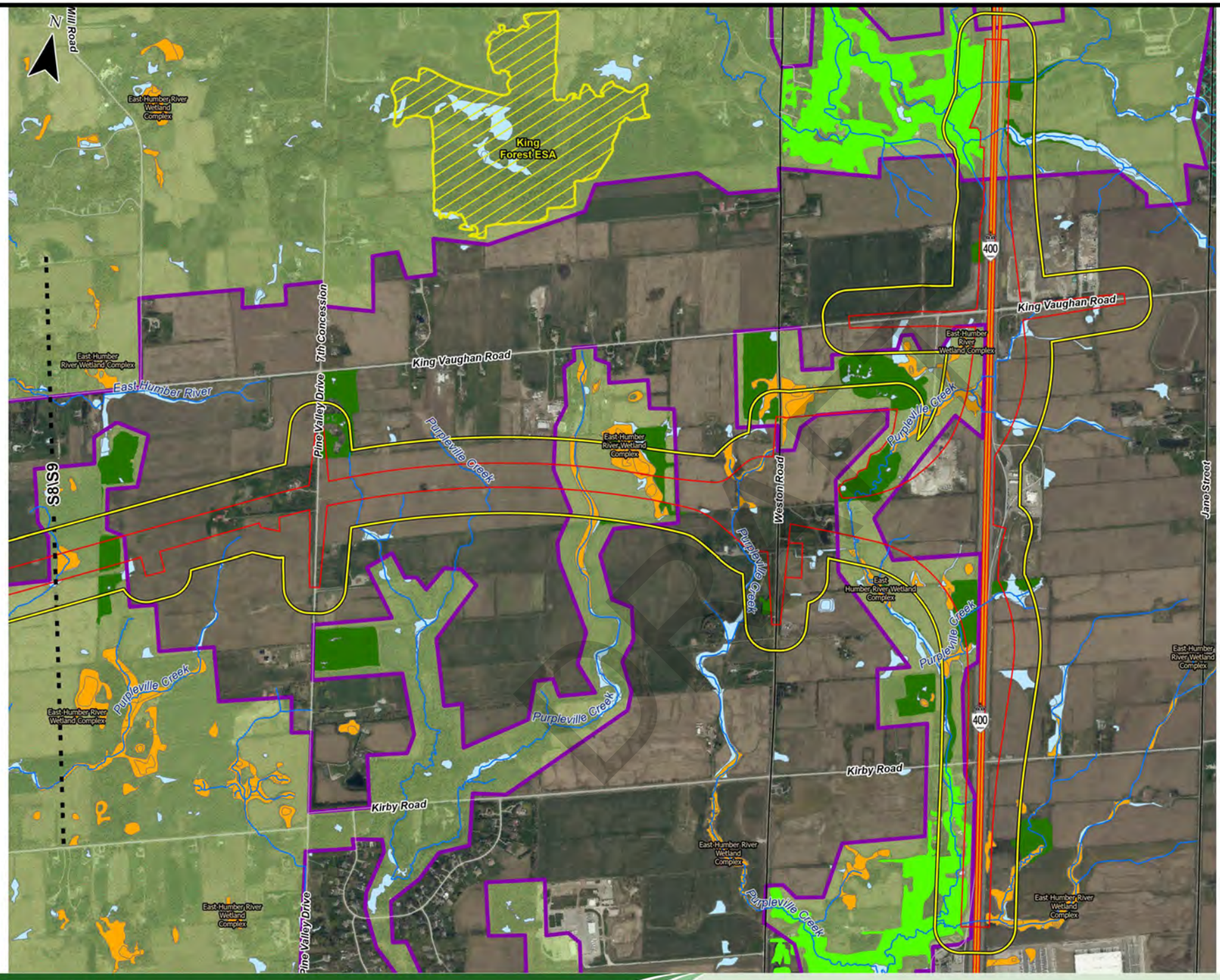
Section 8
Designated Areas, Wetlands and Woodlands

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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0 0.3 0.6 0.9 1.2 km

Figure 2-2
Designated Areas, Wetlands and Woodlands



Legend

- Watercourse
- Freeway
- Arterial Road
- Local Municipal Road
- Section Boundary
- Preliminary Design Right-of-Way
- Study Area

Other Designated Areas

- Environmentally Significant Area (ESA)

Provincial Land Use and Environmental Plans Areas

- Oak Ridges Moraine Conservation Plan
- Greenbelt Plan - Protected Countryside
- Greenbelt Plan - Natural Heritage System

Woodland Features

- Significant Woodland
- Other Woodland

Wetland Features

- Provincially Significant Wetland
- Unevaluated Wetland (MNRF and AECOM/WSP ELC 2020-2023)

Notes:

- Significant Woodlands were assessed following the size criteria described in the Natural Heritage Reference Manual (2010). Within the Study Area, Woodlands are delineated based on Ecological Land Classification, while beyond the Study Area, Woodlands are delineated based on the MNRF Woodlands (Land Information Ontario, 2024).

Highway 413 Preliminary Design and Assessment of Environmental Impacts

Section 9
Designated Areas, Wetlands and Woodlands

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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0 0.25 0.5 0.75 1 km

Figure 2-2
Designated Areas, Wetlands and Woodlands

2.3.3 Groundwater and Hydrogeology

2.3.3.1 Background

Hydrogeology and groundwater are critically important aspects of the environment due to their roots in the protection of water resources, aquifer sustainability, and significant groundwater recharge areas.

The hydrological assessment documents the hydrogeological conditions evaluation results of the Water Well Assessments (WWA), and interpretations of groundwater conditions observed during geotechnical drilling. The Analysis Area is identified as a 500 m evaluation zone added to either side of the Preliminary Design centreline to characterize the local hydrological conditions.

The following subsections provide summaries on the data collection and environmental conditions of the following components, divided by geographical location in the West, Central and East Sections:

- Groundwater Assessment;
- WWA; and
- Geotechnical Drilling Observations.

The West Section of the Project includes Highway 413 from the Highway 401 / Highway 407 ETR interchange to Mayfield Road. The Central Section includes Highway 413 from Mayfield Road to Torbram Road and the Highway 410 Extension, and the East Section includes Highway 413 from Torbram Road to Highway 400 and the Highway 427 Extension (**Figure 1-6**).

2.3.3.2 Data Collection

2.3.3.2.1 Desktop Review

Groundwater Assessment

The groundwater assessment documented the hydrological work completed during Preliminary Design including key background information, potential impacts to private water wells, existing source water protection areas, the likelihood of the release of contaminants and the potential impacts to groundwater and surface water from construction activities.

To supplement the work undertaken in the groundwater assessment, a desktop review of records was conducted. This review included geological maps and reports, Official Plans and studies from local municipalities and conservation authorities, source water protection assessment reports, MECP water well records, and MECP permit to take water records.

Water Well Assessments

The MECP Water Well Information System (WWIS) is a compilation of records for water wells drilled in the Province of Ontario for the purpose of human, agricultural, commercial, and industrial consumption. A search of the MECP WWIS was conducted for the Project in April 2020.

Geotechnical Drilling Observations

No specific desktop review was conducted for the geotechnical drilling observations.

2.3.3.2.2 Fieldwork

Groundwater Assessment

In order to complete the work undertaken in the groundwater assessment, windshield visual inspections were conducted. These inspections attempted to observe local groundwater characteristics (e.g., springs and seeps), flow in culverts and streams, serviced areas and presence of private water wells, which are readily visible from the public ROW.

Water Well Assessments

A WWA was conducted in 2023 and 2024 and consisted of soliciting water well owners to provide information relevant to the WWA work and conducting interviews with water well owners within the Analysis Area. Virtual interviews were scheduled with participating water well owners to collect information regarding the water well supply on their property, including but not limited to, the number, depth and type of private wells, well construction details, and historical water quantity and quality issues. This data enabled the evaluation of existing conditions and assessment of potential impacts to water supply as a result of the Project, in an effort to mitigate or avoid potential negative impacts. It is important to note that the information obtained from each property owner was assumed to be accurate.

Geotechnical Drilling Observations

Preliminary geotechnical investigations were performed at proposed structure locations (i.e., overpass, underpass, ramp, culvert and bridge) to support the Preliminary Design. The geotechnical investigations included the advancement of boreholes, installation of monitoring wells, and grain size distribution analyses. The investigations documented subsurface and groundwater conditions and provided construction considerations with respect to groundwater/surface water control.

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2.3.3.3 Summary of Environmental Conditions

The following environmental conditions associated with the groundwater assessment are summarized below:

- **Overburden Aquifers**
  - There are three aquifers that have been historically documented within the Analysis Area, including the Lower Chinguacousy Aquifer, the Kleinburg Aquifer, and the Woodbridge Aquifer (Singer et al., 2003).
    - The Lower Chinguacousy Aquifer is located within the Municipalities of Brampton and Caledon. The area where the aquifer occurs is covered mostly by Halton Till, with a few small areas covered by glaciofluvial and glaciolacustrine deposits.
    - The Kleinburg Aquifer is located in the vicinity of Kleinburg. This local aquifer consists of sand and gravel deposits.
    - The Woodbridge Aquifer is located in the Woodbridge area, south of Kleinburg. This confined aquifer is covered by glaciolacustrine clay deposits and consists of sand and gravel deposits.
    - According to the MECP WWIS, there are 27 overburden wells located in the West Section on and within 50 m of the Preliminary Design ROW, 32 overburden wells located in the Central Section on and within 50 m of the Preliminary Design ROW and four overburden wells located in the East Section and on within 50 m of the Preliminary Design ROW (see **Figure 1-6**).
- **Bedrock Aquifers**
  - The primary bedrock units within the Analysis Area are known as the Queenston Formation and the Georgian Bay Formation.
    - The West Analysis Area is primarily underlain by red Queenston shale (with limestone interbeds) from approximately 0 m to greater than 67 metres below ground surface (mbgs). According to Singer et al., (2003) the Queenston Formation is relatively compact and dense, and often has a low fracture density and limited porosity. These hydrogeological properties define the bedrock unit as a poor aquifer.
    - The Georgian Bay Formation consists of greenish to bluish-green shale interbedded with limestone, siltstone, and sandstone. The Georgian Bay Formation, which underlies the Queenston Formation, is not considered to be a significant source of water.
  - 112 (36%) MECP water wells are reported to be completed in bedrock in the West Section. The static groundwater levels in the bedrock wells range from approximately 3 m above ground surface to 27.4 mbgs in the West Section, indicating artesian groundwater conditions (under pressure) at some well locations (MECP, 2020).
  - 139 (32%) MECP water wells are reported to be completed in bedrock in the Central Section and range in depth between about 7.3 mbgs and 126.5 mbgs. Many of these wells are completed in the upper 10 m of the bedrock unit, which is interpreted to be ‘weathered’ bedrock.
  - According to the MECP WWIS, there are 25 wells drilled in the bedrock aquifer with depths ranging from 18 to 118.6 mbgs in the East Section. The static water levels in the 25 bedrock wells range from 11 mbgs to 61 mbgs (MECP, 2020).
  - According to the MECP WWIS, there are 15 bedrock wells located in the West Section on and within 50 m of the Preliminary Design ROW, 10 bedrock wells located in the Central Section on and within 50 m of the preliminary Design ROW and there are no bedrock wells located in the East Section on and within 50 m of the Preliminary Design ROW.
- **Wellhead Protection Area**
  - There are two separate areas that represent Wellhead Protection Areas within the Analysis Area in the East Section. There is a single set of Wellhead Protection Areas overlapping with the Analysis Area at Kleinburg.
- **Groundwater Flow**
  - Groundwater flow within the three primary aquifer complexes, the Oak Ridges Aquifer Complex, the Thorncliffe Formation, and the Scarborough Formation is generally south and southeast towards Lake Ontario and flow is controlled on a regional scale by changes in bedrock topography, changes in stratigraphy and differences in groundwater elevation expressed as a potentiometric surface (TRCA, 2015).
  - The groundwater flow of the Thorncliffe formation shows local deviation toward the major river systems and then flows to Lake Ontario.

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- There are deep channels cut within the Newmarket Till (where it is present) that cause some level of hydrogeological connectivity between shallow and deep overburden aquifers.

- **Surface Water Intake**
  - According to the Source Protection Assessment Reports (CTC [Credit Valley-Toronto and Region-Central Lake Ontario] Source Protection Committee, 2012; Credit Valley Conservation Authority, 2015; Hamilton-Halton Source Protection Region, 2012; TRCA, 2015), there are no Intake Protection Zones located within the Analysis Area. The Intake Protection Zone is an area around a surface water intake that is identified for protection.

The following environmental conditions associated with the WWA are summarized below:

A search of the MECP WWIS (April 2020) identified a total of 311 water well records (including 285 water supply wells) in the West Section, 438 water well records (including 405 water supply wells) in the Central Section, and 253 water well records present within the East Section of the Analysis Area.

- **West and Central Sections**
  - Requests to participate in a virtual well survey were sent to 790 commercial/residential properties and 79 properties owned by provincial and municipal government agencies/entities with potential groundwater wells in use within the Analysis Area.
    - A virtual well survey was conducted at 51 commercial/residential properties and 27 properties owned by provincial and municipal government agencies/entities. A total of 46 water wells were identified by the property owners.
    - A majority of property owners (72%) had dug wells, that were primarily used for residential water use, and secondary use was livestock/irrigation.
    - Four property owners had historical issues with water quantity or quality. Those owners had issues due to drought or nearby infrastructure construction. Water quality issues were identified by public health testing and wells were shocked or additional treatment systems installed.

- **East Section**
  - Requests to participate in a virtual well survey were sent to 354 commercial/residential properties and 48 properties owned by provincial and municipal government agencies/entities with potential groundwater wells in use within the Analysis Area.
    - A virtual well survey was conducted at nine commercial/residential properties and 23 properties owned by provincial and municipal government agencies/entities. A total of five water wells were identified by the property owners.
    - Most property owners had drilled wells that were primarily used for residential water use, and the secondary use was irrigation.

The following environmental conditions associated with the geotechnical investigations are summarized below:

- **West Section**
  - Geotechnical investigations have been conducted at 12 structure locations within the West Section of the Analysis Area.
    - During borehole advancement, groundwater elevations were inferred from the soil conditions. According to the borehole logs, groundwater elevations ranged from 200.9 masl and 260.4 masl. Groundwater monitoring wells were installed at two structures (W-18 and W-23) locations in the West Section of the Analysis Area. The groundwater elevations in the monitoring wells ranged from 190.3 masl and 260.4 masl.

- **Central Section**
  - Geotechnical investigations have been conducted at 21 structure locations within the Central Section of the Analysis Area
    - During borehole advancement, groundwater elevations were inferred from the soil conditions. According to the borehole logs, groundwater elevations ranged from 225.8 masl and 277.9 masl. Groundwater monitoring wells were installed at various structure locations throughout the Central Section of the Analysis Area. Artesian conditions were encountered near the Healey Road Bridge.

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- **East Section**
  - Geotechnical investigations have been conducted at 27 structure locations within the East Section of the Analysis Area.
    - During borehole advancement, groundwater elevations were inferred from the soil conditions. According to the borehole logs, groundwater elevations ranged from 208.8 masl and 323.7 masl. Groundwater monitoring wells were installed at various structure locations throughout the East Section of the Analysis Area. The groundwater elevations in the monitoring wells ranged from 193.4 masl and 262.2 masl.

Potential impacts and associated mitigation measures pertaining to groundwater and hydrogeology are outlined in **Chapter 5.**

2.3.4 Fluvial Geomorphology

2.3.4.1 Background

Fluvial geomorphology focuses on the creation of landforms by river processes, largely defined by physiography, surficial geology, topography and land use.

When road or highway crossings are placed over a watercourse without due consideration for the geomorphological processes that are occurring within the watercourse and their upstream sub-catchment, risks to the crossing structure and/or channel form and function may occur. Such risks could lead to the need for continual or emergency maintenance of the crossing, impede fish passage through the structure, and adversely affect channel stability/aquatic habitat conditions both up and downstream of the crossing.

A fluvial geomorphological assessment was conducted to help inform the development of future mitigation measures related to erosion risk. It served two main functions: (1) it provided a multi-criteria evaluation to determine the proper crossing size for watercourses affected by the highway work, and (2) it identified the preferred alignment concepts for watercourses that presently (a) cross the proposed highway obliquely, and (b) identified locations where installing a crossing is not feasible (e.g., complex highway interchanges).

Numerous factors have been considered to provide appropriate crossing size and alignment recommendations. The assessment specifically focused on the following key factors:

1. Reviewing available background documentation (previous studies, surficial physiography, and surficial geology) to provide a general understanding of the natural, historical, and cultural conditions that influence channel morphology and watercourse stability in a broad sense.
2. Reviewing the provincial and federal protocols and guidelines to ensure crossings are designed with due consideration of relevant policies and legislation.
3. Assessing the pre-construction existing conditions through a desktop assessment.
4. Assessing the pre-construction existing conditions through a field assessment of each watercourse reach as close to the proposed crossing location as possible.
5. Based on the existing conditions, completing a preliminary crossing assessment by determining the meander belt width and erosion rate for all defined watercourses that cross the Preliminary Design ROW based on channel form, function, future erosion risk and site-specific features such as current erosion or sedimentation issues, identified through desktop and field assessments.
6. Providing crossing recommendations that are appropriate from a fluvial geomorphic perspective, including input regarding the location, size and orientation of the crossing design.
7. Preliminary channel designs will also be provided where the orientation of the existing watercourse crossings are either severely misaligned with respect to the Preliminary Design ROW, or where it is not feasible to construct crossing structures, such as at complex highway interchanges.

2.3.4.2 Data Collection

2.3.4.2.1 Desktop Review

A background review of the Study Area was conducted to provide a general understanding of the natural, historical and cultural conditions that influence channel morphology and watercourse stability. Crossing size and alignment recommendations have all been provided in accordance with relevant governing Conservation Authority published guidelines and procedures. The sources that guided this review include previous inspections and assessments, online documentation, topographic maps, aerial imagery and other sources of natural heritage information falling within and adjacent to the Preliminary Design ROW. The most pertinent references guiding the fluvial geomorphic, meander belt width assessments and final crossing recommendations include previous fluvial geomorphology studies, guidelines, data sources and additional reference materials.

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2.3.4.2.2 Fieldwork

Fluvial geomorphological site investigations were conducted throughout the 2020 to 2025 fieldwork seasons. In addition to confirming the findings of the historical and desktop analysis, the purpose of these field assessments was to characterize the dominant geomorphic processes occurring in the reaches that will be affected by the Project thereby defining the existing conditions for each watercourse reach. The accessible portions of each reach were walked during the assessment and, when possible, the site of the proposed crossing location was visited. For properties where PTE was not possible, assessments were completed from the public ROW and based on aerial imagery. The fluvial geomorphological assessment included evaluation of the following:

1. Watercourses that will be crossed by the Project or will be within the grading limits of the Preliminary Design ROW;
2. Watercourses that may need to be realigned or relocated to accommodate the Project and its related elements (maintenance yards, carpool lots, SWM ponds); and
3. Watercourses that will accept drainage from planned SWM ponds.

The geomorphological reach characterization fieldwork conducted included the following:

- Hydraulic Flow Regime;
- Channel Definition;
- Bankfull Characterization;
- Rapid Cross Sections;
- Floodplain Connectivity;
- Rapid Geomorphic Assessment;
- Documentation of erosion or aggradation issues;
- Existing Crossing Assessment; and
- Collection of characteristic reach photographs.

2.3.4.3 Summary of Environmental Conditions

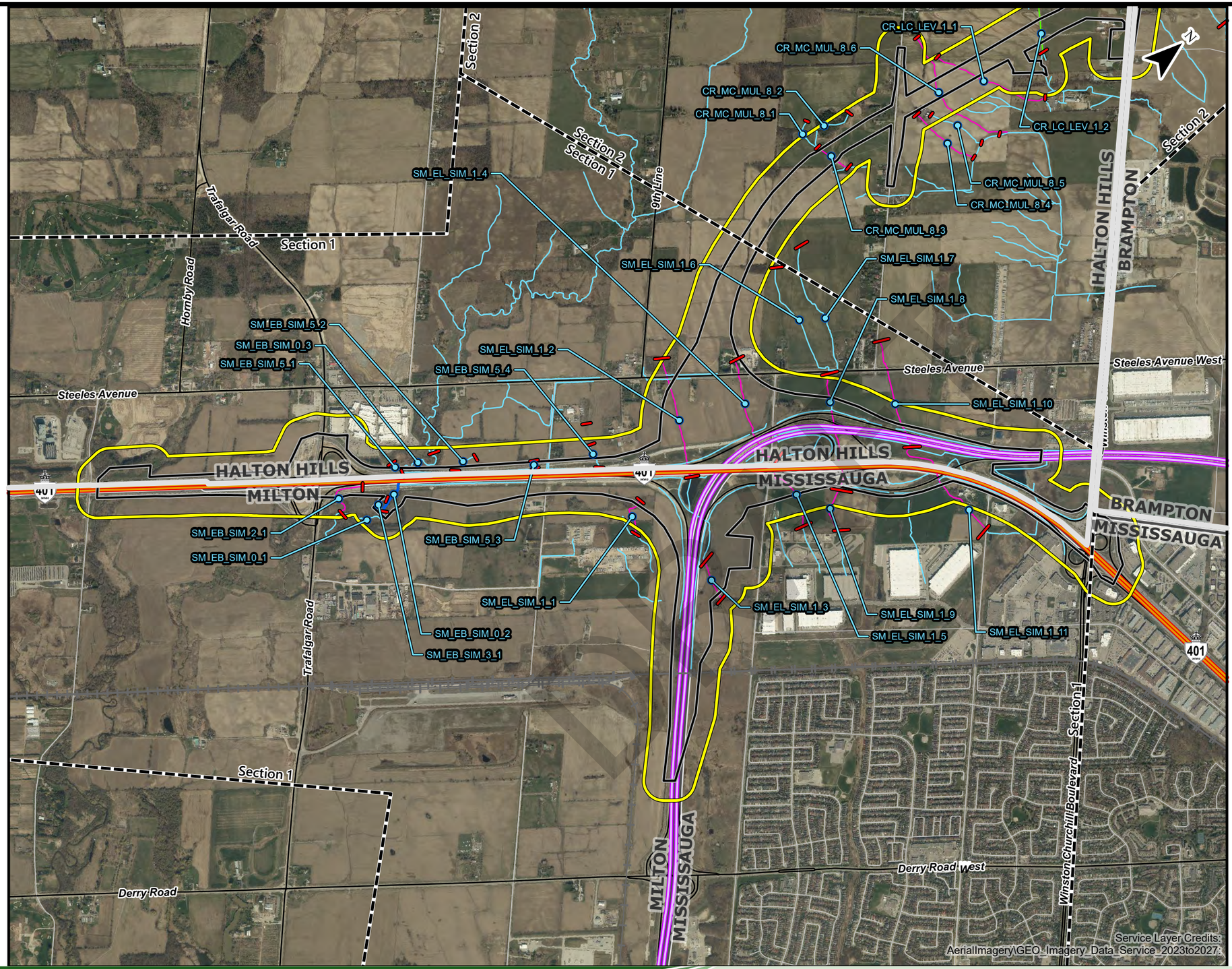
The Preliminary Design ROW spans four different watersheds: Sixteen Mile Creek Watershed, Credit River Watershed, Etobicoke Creek Watershed and Humber River Watershed. It contains land regulated by three separate Conservation Authorities' jurisdictions: CH, CVC, and TRCA.

Desktop and field assessments were completed for all reaches that cross the Preliminary Design ROW. The results of these investigations were used to determine the erosion rate and meander belt width of each proposed defined watercourse crossing that contains perennial (permanent) or intermittent flows with downstream connectivity, to define a baseline preliminary crossing recommendation. Watercourse reaches were classified according to a high-level flow regime assessment, encompassing the categorizations of permanent watercourse, intermittent watercourse, or ephemeral watercourse.

Preliminary crossing recommendations were refined based on an understanding of channel form, function, and future risk using (1) a risk matrix that was developed for the purposes of the assessment, (2) an assessment of future flow conditions, (3) a review of federal (i.e., species at risk, channel design, erosion and sediment control, and hazard delineation) and provincial crossing design recommendations, and (4) consideration for any site-specific conditions noted during fieldwork. Preliminary crossing assessments included a 100-year erosion rate and meander belt width assessment. Preliminary channel designs were also provided where the orientation of the existing watercourse crossing structure is either severely misaligned with respect to the preferred highway alignment, or where it is not feasible to construct a crossing structure, such as at complex highway interchanges.

Features of the existing fluvial geomorphological Study Area are identified in **Figure 2-3** below. Potential impacts and associated mitigation measures are outlined in **Chapter 5**.

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Legend

- Project Sections
- 120m Environmental Study Area
- Impacted Area
- Reach Break
- Railway
- Freeway
- 407 ETR Freeway
- Arterial Road
- Local Municipal Road
- Municipal Boundary

Flow Regime

- Permanent
- Intermittent
- Ephemeral
- Unclassified

Highway 413 Transportation Corridor Route Planning, Preliminary Design and Environmental Assessment Project, Stage 2

Section 1
Fluvial Geomorphological Assessment Reach Locations

15 Oct, 2025 (Imagery 2024)

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Meters



Legend

- Project Sections
- 120m Environmental Study Area
- Impacted Area
- Reach Break
- Freeway
- 407 ETR Freeway
- Provincial Highway
- Arterial Road
- Local Municipal Road
- Municipal Boundary

Flow Regime

- Permanent
- Intermittent
- Ephemeral
- Unclassified

Highway 413 Transportation Corridor Route Planning, Preliminary Design and Environmental Assessment Project, Stage 2

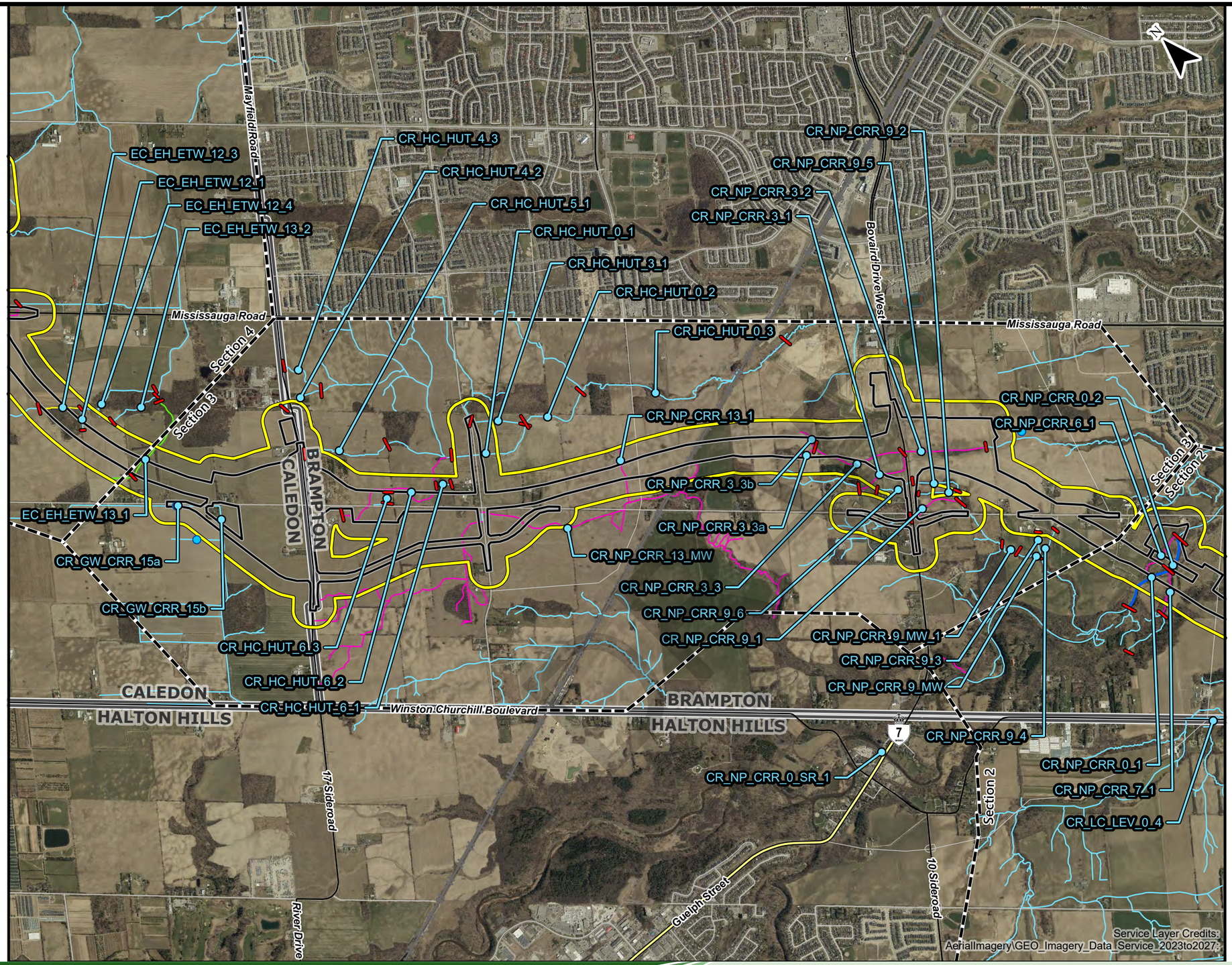
Section 2
Fluvial Geomorphological Assessment Reach Locations

15 Oct, 2025 (Imagery 2024)

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Meters



Legend

- Project Sections
- 120m Environmental Study Area
- Impacted Area
- Reach Break
- Railway
- Provincial Highway
- Arterial Road
- Local Municipal Road
- Municipal Boundary

Flow Regime

- Permanent
- Intermittent
- Ephemeral to Intermittent
- Ephemeral
- Unclassified

Highway 413 Transportation Corridor Route Planning, Preliminary Design and Environmental Assessment Project, Stage 2

Section 3
Fluvial Geomorphological Assessment Reach Locations

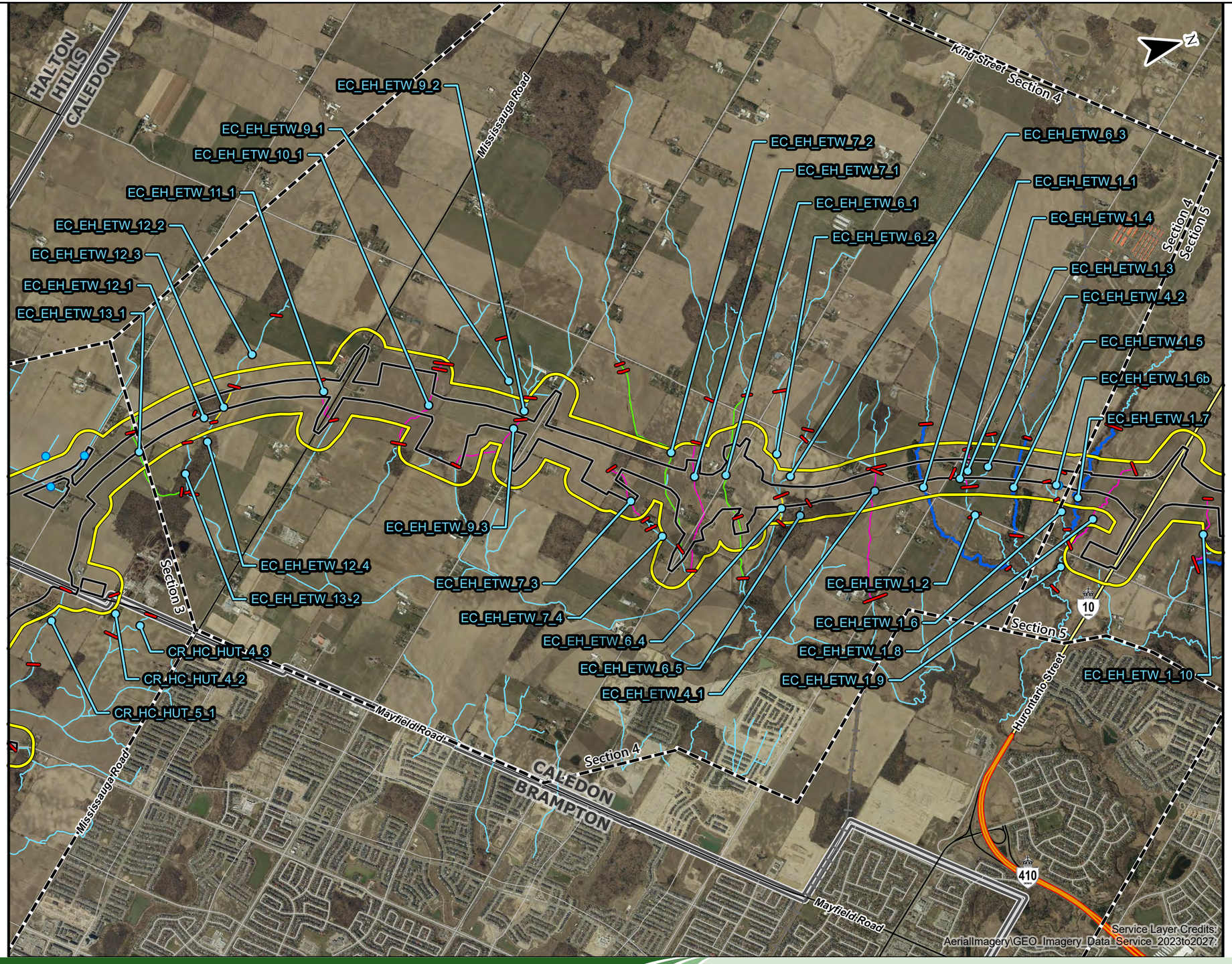
15 Oct, 2025 (Imagery 2024)

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Legend

- Project Sections
- 120m Environmental Study Area
- Impacted Area
- Reach Break
- Railway
- Freeway
- Provincial Highway
- Arterial Road
- Local Municipal Road
- Municipal Boundary

Flow Regime

- Permanent
- Intermittent
- Ephemeral to Intermittent
- Ephemeral
- Unclassified

Highway 413 Transportation Corridor Route Planning, Preliminary Design and Environmental Assessment Project, Stage 2

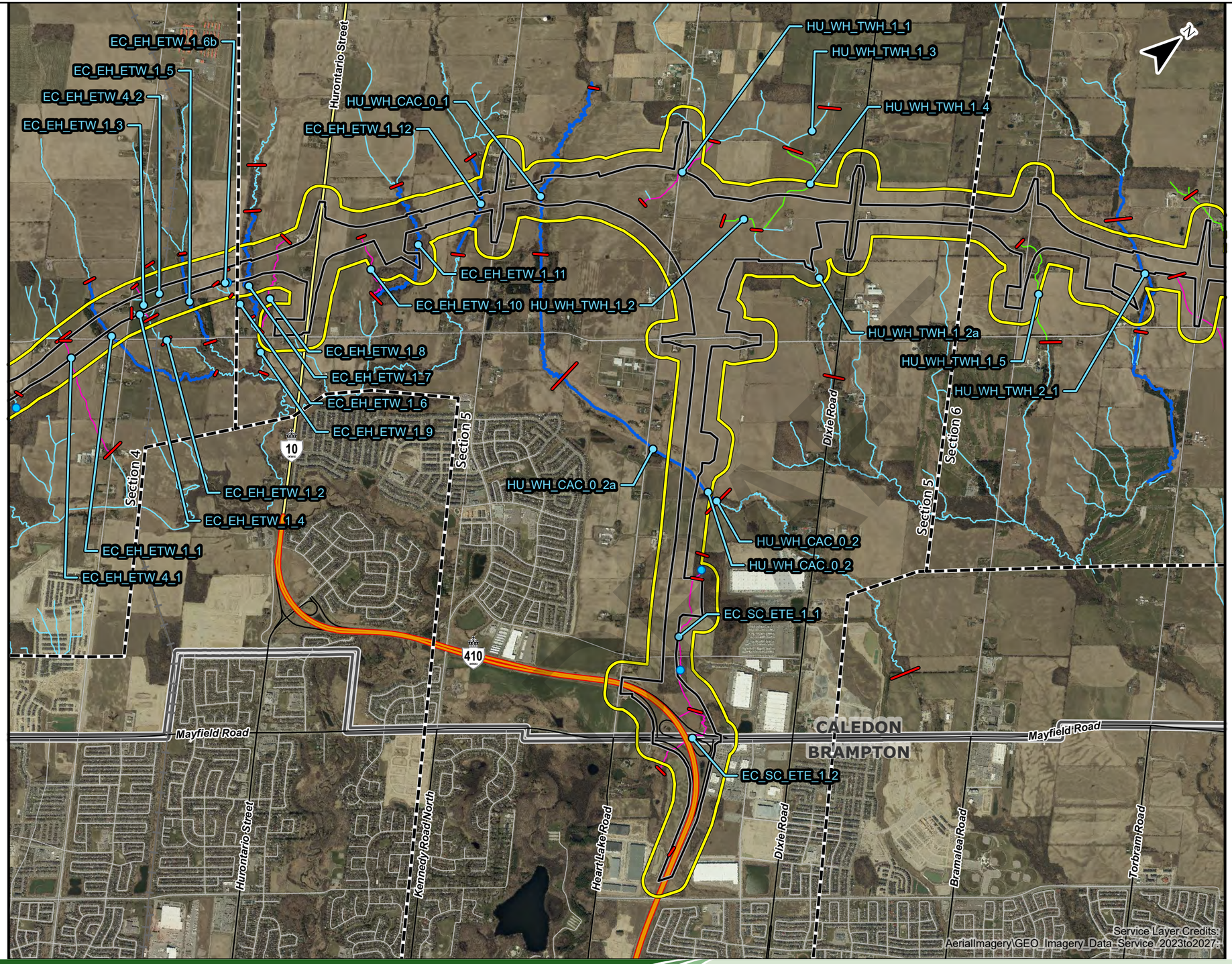
Section 4
Fluvial Geomorphological Assessment Reach Locations

15 Oct, 2025 (Imagery 2024)

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Meters



Legend

- Project Sections
- 120m Environmental Study Area
- Impacted Area
- Reach Break
- Railway
- Freeway
- Provincial Highway
- Arterial Road
- Local Municipal Road
- Municipal Boundary

Flow Regime

- Permanent
- Intermittent
- Ephemeral
- Unclassified

Highway 413 Transportation Corridor Route Planning, Preliminary Design and Environmental Assessment Project, Stage 2

Section 5
Fluvial Geomorphological Assessment Reach Locations

15 Oct, 2025 (Imagery 2024)

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Legend

- Project Sections
- 120m Environmental Study Area
- Impacted Area
- Reach Break
- Railway
- Freeway
- Arterial Road
- Local Municipal Road
- Municipal Boundary

Flow Regime

- Permanent
- Intermittent
- Ephemeral
- Unclassified

Highway 413 Transportation Corridor Route Planning, Preliminary Design and Environmental Assessment Project, Stage 2

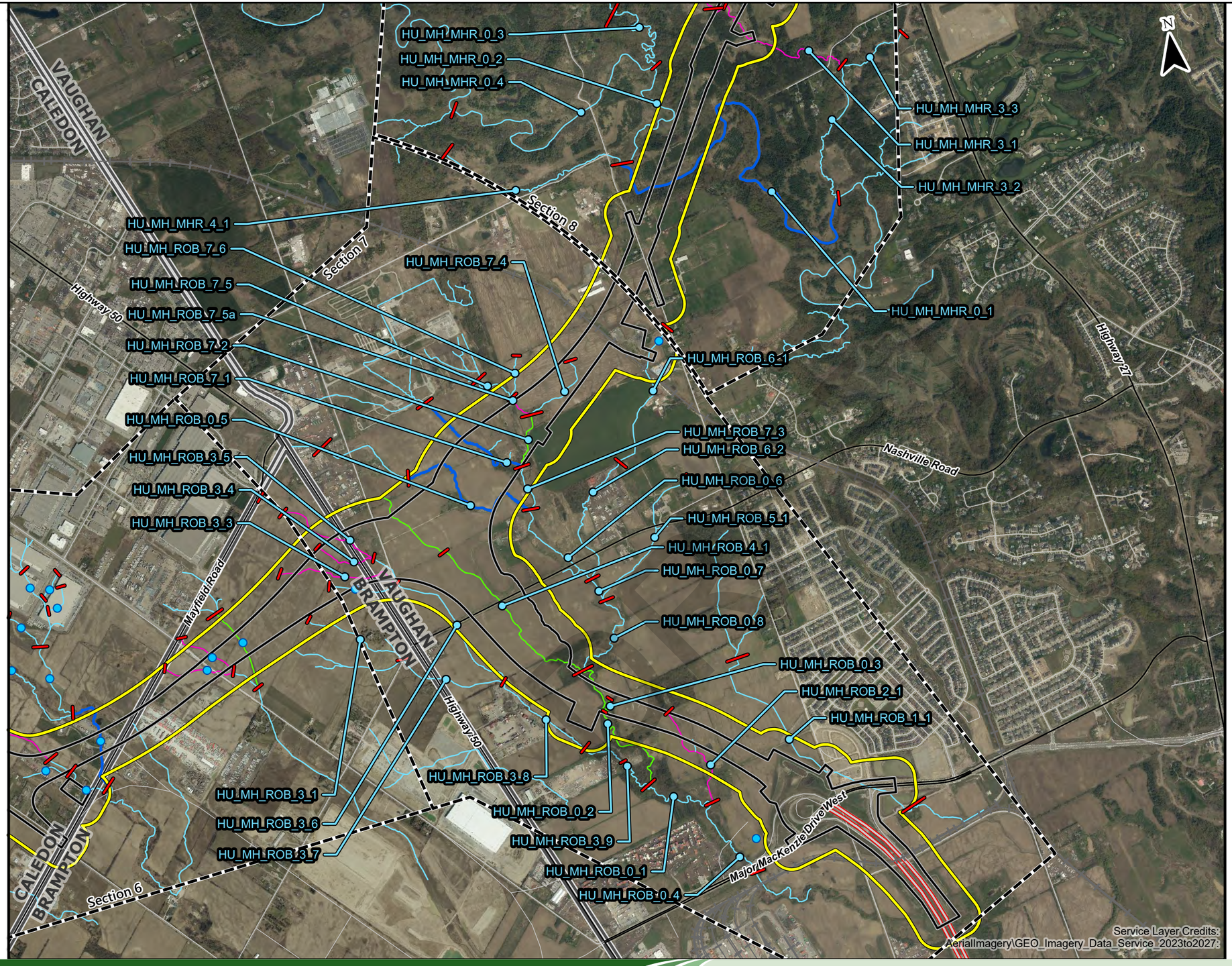
Section 6
Fluvial Geomorphological Assessment Reach Locations

15 Oct, 2025 (Imagery 2024)

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Legend

- Project Sections
- 120m Environmental Study Area
- Impacted Area
- Reach Break
- Railway
- Future 427 Alignment
- Arterial Road
- Local Municipal Road
- Municipal Boundary

Flow Regime

- Permanent
- Intermittent
- Ephemeral
- Unclassified

Highway 413 Transportation Corridor Route Planning, Preliminary Design and Environmental Assessment Project, Stage 2

Section 7
Fluvial Geomorphological Assessment Reach Locations

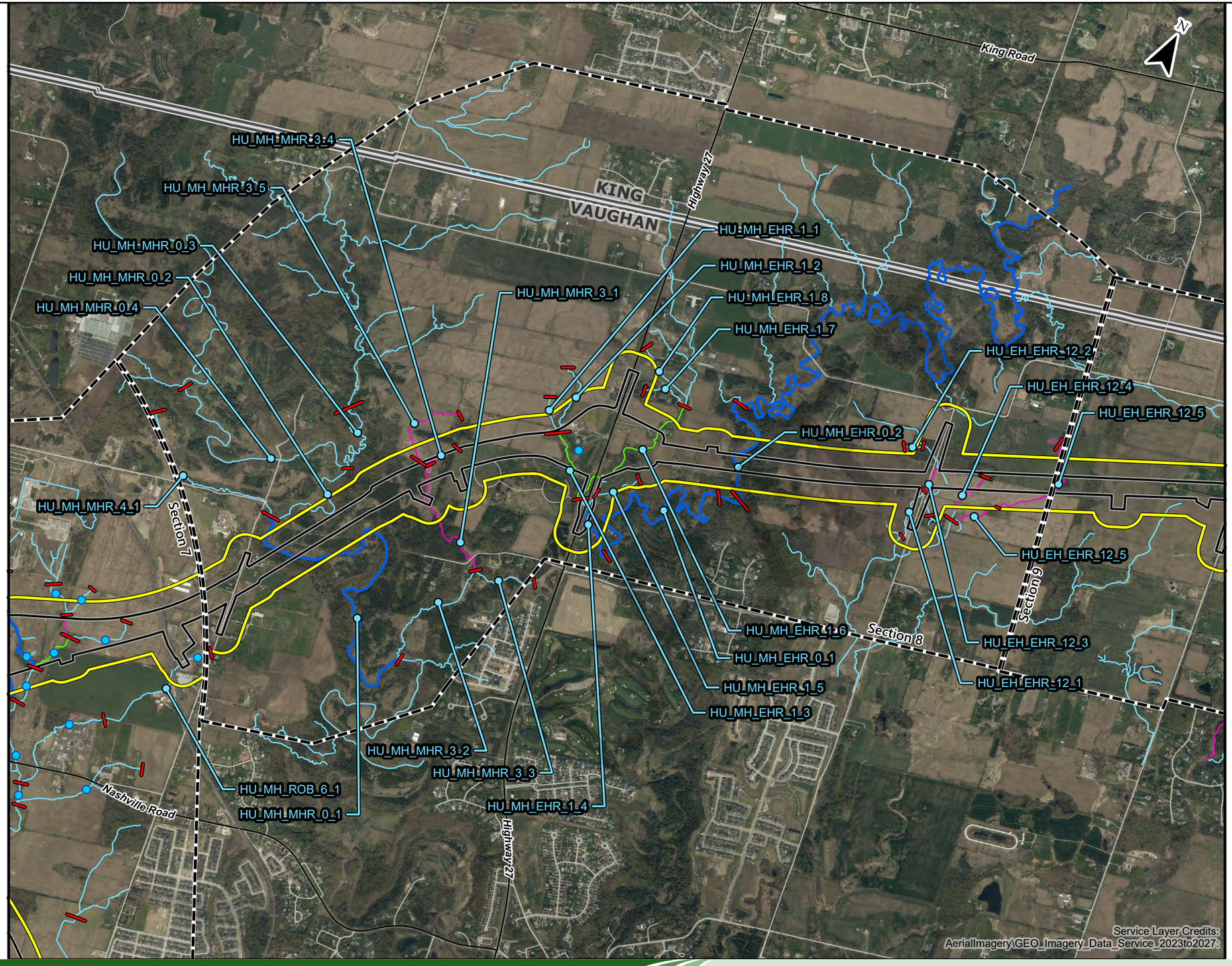
15 Oct, 2025 (Imagery 2024)

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Legend

- Project Sections
- 120m Environmental Study Area
- Impacted Area
- Reach Break
- Railway
- Arterial Road
- Local Municipal Road
- Municipal Boundary

Flow Regime

- Permanent
- Intermittent
- Ephemeral
- Unclassified

Highway 413 Transportation Corridor Route Planning, Preliminary Design and Environmental Assessment Project, Stage 2

Section 8
Fluvial Geomorphological Assessment Reach Locations

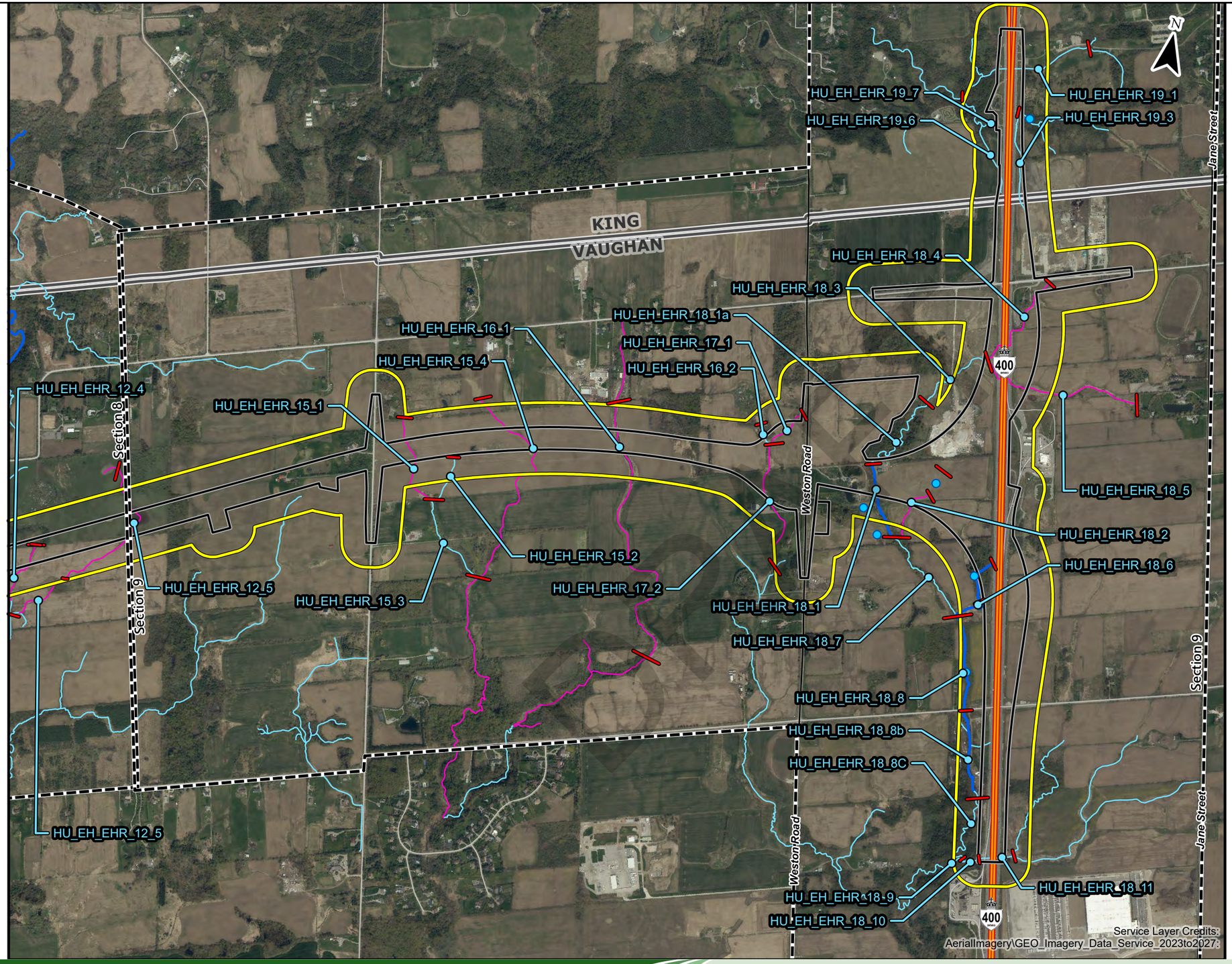
15 Oct, 2025 (Imagery 2024)

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Meters



Legend

- Project Sections
- 120m Environmental Study Area
- Impacted Area
- Reach Break
- Freeway
- Arterial Road
- Local Municipal Road
- Municipal Boundary

Flow Regime

- Permanent
- Ephemeral
- Unclassified

Highway 413 Transportation Corridor Route Planning, Preliminary Design and Environmental Assessment Project, Stage 2

Section 9
Fluvial Geomorphological Assessment Reach Locations

15 Oct, 2025 (Imagery 2024)

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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Meters

Figure 2-3
Fluvial Geomorphology Reach Locations

2.3.5 Erosion and Sedimentation

2.3.5.1 Background

Erosion and sedimentation are natural processes involving removal of surface materials and the deposition of those eroded materials.

An erosion and sedimentation risk assessment was completed for the Project to support the development of the Preliminary Design. This process involved reviewing the Preliminary Design plans and selected key sites and conducting multiple site visits. Utilizing this data, existing conditions were documented at areas considered higher risk, particularly along watercourse ravine areas with steeper slopes and erodible silty soils. The information gathered during these investigations has been documented to support the preparation of the Erosion and Sediment Control Plan, to be completed in Detail Design prior to construction.

MTO is currently undergoing the process of updating its Erosion and Sediment Control Guide (2015). As part of this revision, procedural requirements and terminology may evolve. Any references to Erosion and Sedimentation documentation within the draft EIAR are intended to reflect the current framework, and may be updated to align with the Guide (MTO, 2015), once finalized.

2.3.5.2 Data Collection

2.3.5.2.1 Desktop Review

To complete the erosion and sedimentation risk assessment, mapping was prepared to illustrate surficial geology, topographic contours and natural features. This mapping was supported by a desktop review of information such as recent aerial imagery and historical climate normal for the Study Area. The MTO Environmental Guide for Erosion and Sediment Control During Construction of Highway Projects (2015) (the Guide) was used to assess erodibility.

The Study Area was divided into five polygons (A through E, from west to east) of similar characteristics including geology, topography and natural features.

- Polygon A is west of the Credit River;
- Polygon B is at the Credit River;
- Polygon C is between the Credit River and Humber River;
- Polygon D is at the Humber River; and
- Polygon E is east of the Humber River.

Each polygon was assessed based on the Guide's (2015) Hierarchy of Soil Erodibility, which classifies various soil types (surficial geology mapping) as low, medium or high soil erodibility and the Guide's (2015) Erosion Potential Associated with Slope Length, Slope Gradient and Slope Erodibility Rating, which defines the erosion potential associated with the various polygons based on the soil erodibility and the slope gradient and length (approximated based on the topography of the polygons).

2.3.5.2.2 Fieldwork

In support of the erosion assessment for the Project, a number of site visits were conducted along the alignment. Existing conditions were documented in areas considered higher risk, particularly along watercourse ravine areas with steeper slopes and erodible silty soils. The topographic mapping was reviewed and watercourses that showed significant topographic contour changes were selected for assessment.

Information gathered during erosion field investigations is summarized below:

- **Credit River**
  - There were various areas along the bank of the Credit River on the property accessed that have exposed soil. These areas of exposed soil are no more than 1 m in height.
- **Tributary to Levi's Creek**
  - The tributary to Levi's Creek was viewed approximately 200 m north of the alignment due to restrictions in PTE access. The reach to the northeast of an existing culvert was observed to be partially dammed by debris, and the banks on either side to be highly vegetated. No exposed overburden or signs of erosion were observed.
- **West Humber River**
  - The West Humber River was viewed from the road adjacent to 12830 The Gore Road, Bolton due to restrictions in PTE access. Stone-mesh flood barriers and erosion control were observed to be installed around a large existing culvert conveying the watercourse, with no exposed overburden or obvious signs of erosion noted.
- **Tributary to the West Humber River**
  - The watercourse approximately 250 m northeast and perpendicular to 13305 Kennedy Road, Caledon was observed to be interspersed with small pools of water, approximately 30-50 centimetres (cm) deep and 1 m wide. The bed sediment was comprised of organics and silt with no exposed overburden or clear signs of erosion along the banks.

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- **Humber River**
  - Active areas of erosion were seen along the south bank of the Humber River. Exposed soil revealed the roots of various vegetation types, including large trees. Some trees were seen leaning over the Humber River due to erosion in this section.
- **East Humber River**
  - The banks of the East Humber River accessed during fieldwork exhibited portions of exposed soil with tree roots visible.
- **Tributary to the East Humber River**
  - The area around the watercourse visited during fieldwork, including the property at 11881 Highway 27, situated between the two houses closest to Highway 27 and the valley area south of the driveway on 11701 Highway 27, displayed heavy vegetation including trees, shrubs, and tall grass. The watercourse had some sections of exposed soil.

2.3.5.3 Summary of Environmental Conditions

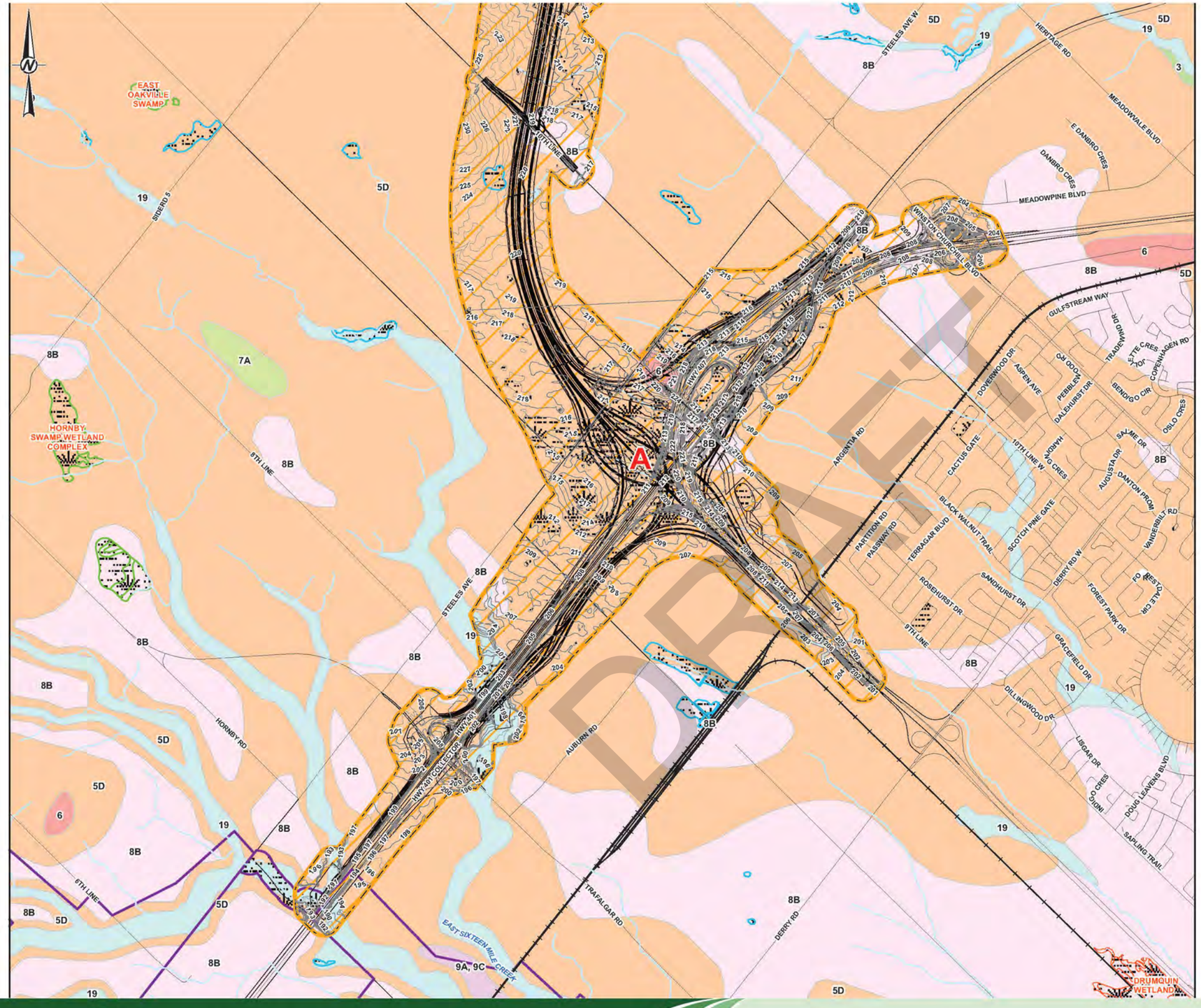
Mapping was prepared to illustrate surficial geology, topographic contours and natural features and is provided in **Figure 2-4**. The site was divided into five polygons (A through E, from west to east). Below is a summary of the environmental conditions assessed at each polygon:

- **Polygon A** is west of the Credit River and is interpreted to have moderate erosion potential and moderate rate/consequence. This area is predominantly silt clay till with some ground surface slopes. East Sixteen Mile Creek is located on the east edge of the polygon and some provincially significant wetlands are located on the northern side of the polygon.
- **Polygon B** is at the Credit River and is interpreted to have high erosion potential and high rate/consequence. The area is a mix of sand and gravel and alluvium (silt, clay, sand and gravel) and has a steep slope down to the Credit River. Provincially significant wetlands are located along the river and adjacent lands.
- **Polygon C** is between the Credit River and Humber River and is interpreted to have moderate erosion potential and moderate rate/consequence. This area is predominantly silt clay till with some ground surface slopes. A number of watercourses cross this polygon, some with steep valley slopes and provincially significant wetlands are located throughout the polygon.
- **Polygon D** is at the Humber River and is interpreted to have high erosion potential and high rate/consequence. The area is predominately silt and clay and has a steep slope down to the West Humber River, Main Humber River and East Humber River. Some provincially significant wetlands are located along the East Humber River.
- **Polygon E** is east of the Humber River and is interpreted to have moderate erosion potential and moderate rate/consequence. This area is predominantly silt clay till with some ground surface slopes. Provincially significant wetlands are located throughout the polygon.

Erosion and sediment control is a critical consideration throughout the entire Highway 413 Route and is not limited to areas identified as high risk. Mitigation measures will be evaluated and applied into Detail Design to ensure environmental protection and regulatory compliance.

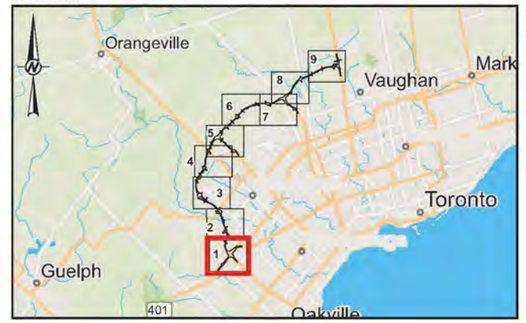
Potential impacts and associated mitigation measures pertaining to erosion and sedimentation are outlined in **Chapter 5**.

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KEY MAP



LEGEND

- ROADWAY
- 1 M TOPOGRAPHIC CONTOURS
- PRELIMINARY DESIGN
- WATERCOURSE
- RAILWAY
- FOCUSED STUDY AREA
- GREENBELT
- UNEVALUATED WETLAND
- EVALUATED WETLAND (NO SIGNIFICANCE)
- PROVINCIALLY SIGNIFICANT WETLAND (PSW)
- WATERBODY

EROSION PONTENTIAL AND CONSEQUENCE

- MODERATE

SURFICIAL GEOLOGY

- 3: PALEOZOIC BEDROCK
- 5D: GLACIOLACUSTRINE-DERIVED SILTY TO CLAYEY TILL
- 6: ICE-CONTACT STRATIFIED DEPOSITS (SAND AND GRAVEL)
- 7A: SANDY DEPOSITS
- 8B: INTERBEDDED FLOW TILL, RAINOUT DEPOSITS AND SILT AND CLAY
- 9C: FORESHORE-BASINAL DEPOSITS (SAND AND GRAVEL)
- 19: MODERN ALLUVIAL DEPOSITS (CLAY, SILT, SAND, GRAVEL AND ORGANICS)

0 250 500 1,000

METRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. IMAGERY CREDITS: COMMUNITY: SOURCES: ESRI, TOMTOM, GARMIN, FAO, NOAA, USGS, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
3. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N

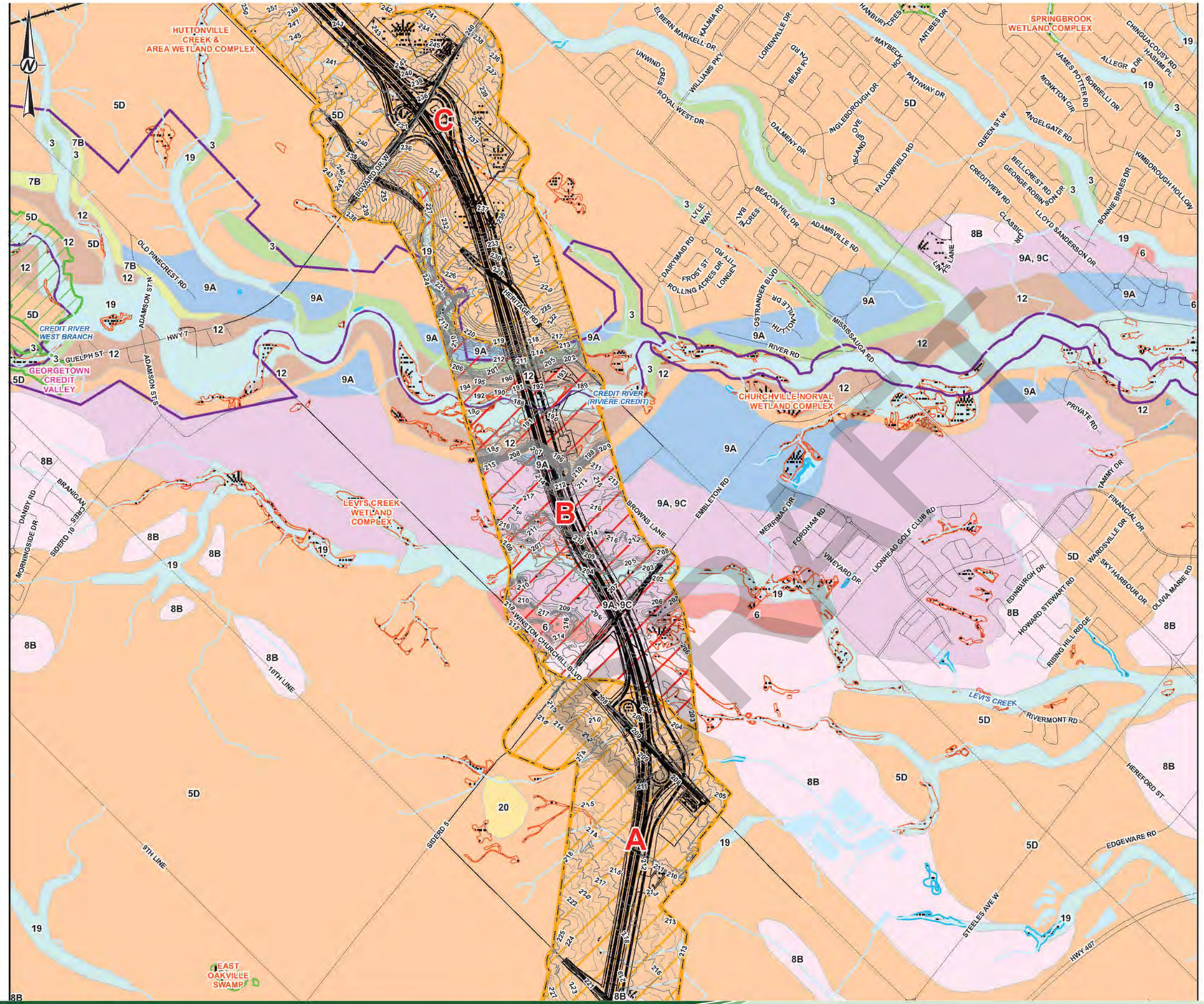
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WSP AECOM

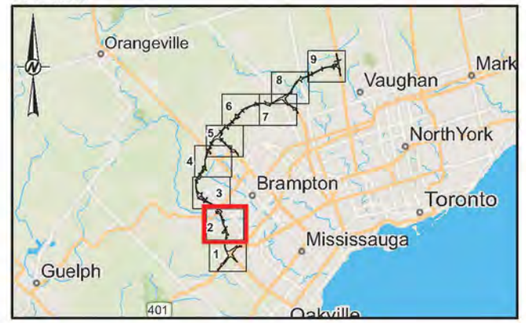
Highway 413 Environmental Impact Assessment Report

Figure 2-4

Erosion and Sedimentation Environmental Conditions - Assessment by Corresponding Polygon



KEY MAP



LEGEND

- ROADWAY
- 1 M TOPOGRAPHIC CONTOURS
- PRELIMINARY DESIGN
- WATERCOURSE
- RAILWAY
- ANSI
- FOCUSED STUDY AREA
- GREENBELT
- UNEVALUATED WETLAND
- EVALUATED WETLAND (NO SIGNIFICANCE)
- PROVINCIALLY SIGNIFICANT WETLAND (PSW)
- WATERBODY

EROSION PONTENTIAL AND CONSEQUENCE

- MODERATE
- HIGH

SURFICIAL GEOLOGY

- 3: PALEOZOIC BEDROCK
- 5D: GLACIOLACUSTRINE-DERIVED SILTY TO CLAYEY TILL
- 6: ICE-CONTACT STRATIFIED DEPOSITS (SAND AND GRAVEL)
- 7B: GRAVELLY DEPOSITS
- 8B: INTERBEDDED FLOW TILL, RAINOUT DEPOSITS AND SILT AND CLAY
- 9A: DELTAIC DEPOSITS (SAND AND GRAVEL)
- 9C: FORESHORE-BASINAL DEPOSITS (SAND AND GRAVEL)
- 12: OLDER ALLUVIAL DEPOSITS (CLAY, SILT, SAND, GRAVEL AND ORGANICS)
- 19: MODERN ALLUVIAL DEPOSITS (CLAY, SILT, SAND, GRAVEL AND ORGANICS)

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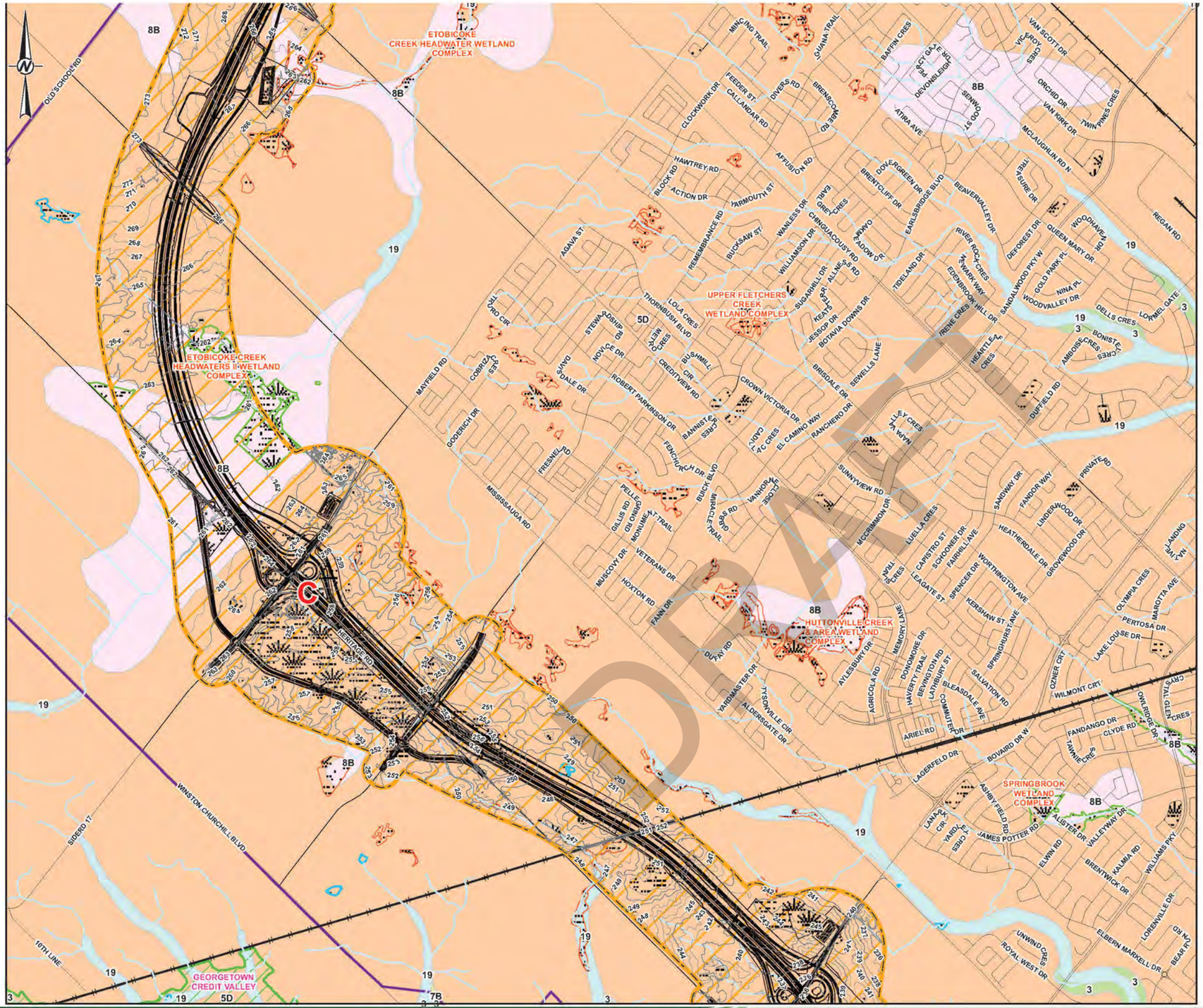
METRES

NOTE(S)
1. ALL LOCATIONS ARE APPROXIMATE

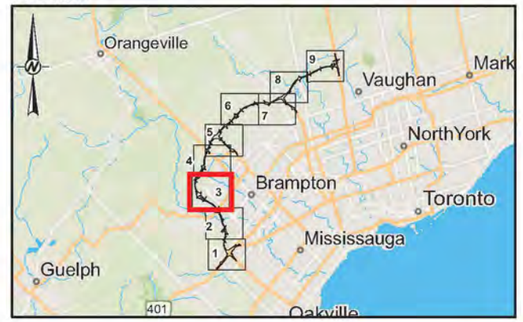
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3. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N

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Figure 2-4
Erosion and Sedimentation Environmental Conditions - Assessment by Corresponding Polygon



KEY MAP



LEGEND

- ROADWAY
- 1 M TOPOGRAPHIC CONTOURS
- PRELIMINARY DESIGN
- WATERCOURSE
- RAILWAY
- ANSI
- FOCUSED STUDY AREA
- GREENBELT
- UNEVALUATED WETLAND
- EVALUATED WETLAND (NO SIGNIFICANCE)
- PROVINCIALLY SIGNIFICANT WETLAND (PSW)
- WATERBODY

EROSION PONTENTIAL AND CONSEQUENCE

- MODERATE

SURFICIAL GEOLOGY

- 3: PALEOZOIC BEDROCK
- 5D: GLACIOLACUSTRINE-DERIVED SILTY TO CLAYEY TILL
- 7B: GRAVELLY DEPOSITS
- 8B: INTERBEDDED FLOW TILL, RAINOUT DEPOSITS AND SILT AND CLAY
- 19: MODERN ALLUVIAL DEPOSITS (CLAY, SILT, SAND, GRAVEL AND ORGANICS)

0 250 500 1,000

METRES

NOTE(S)
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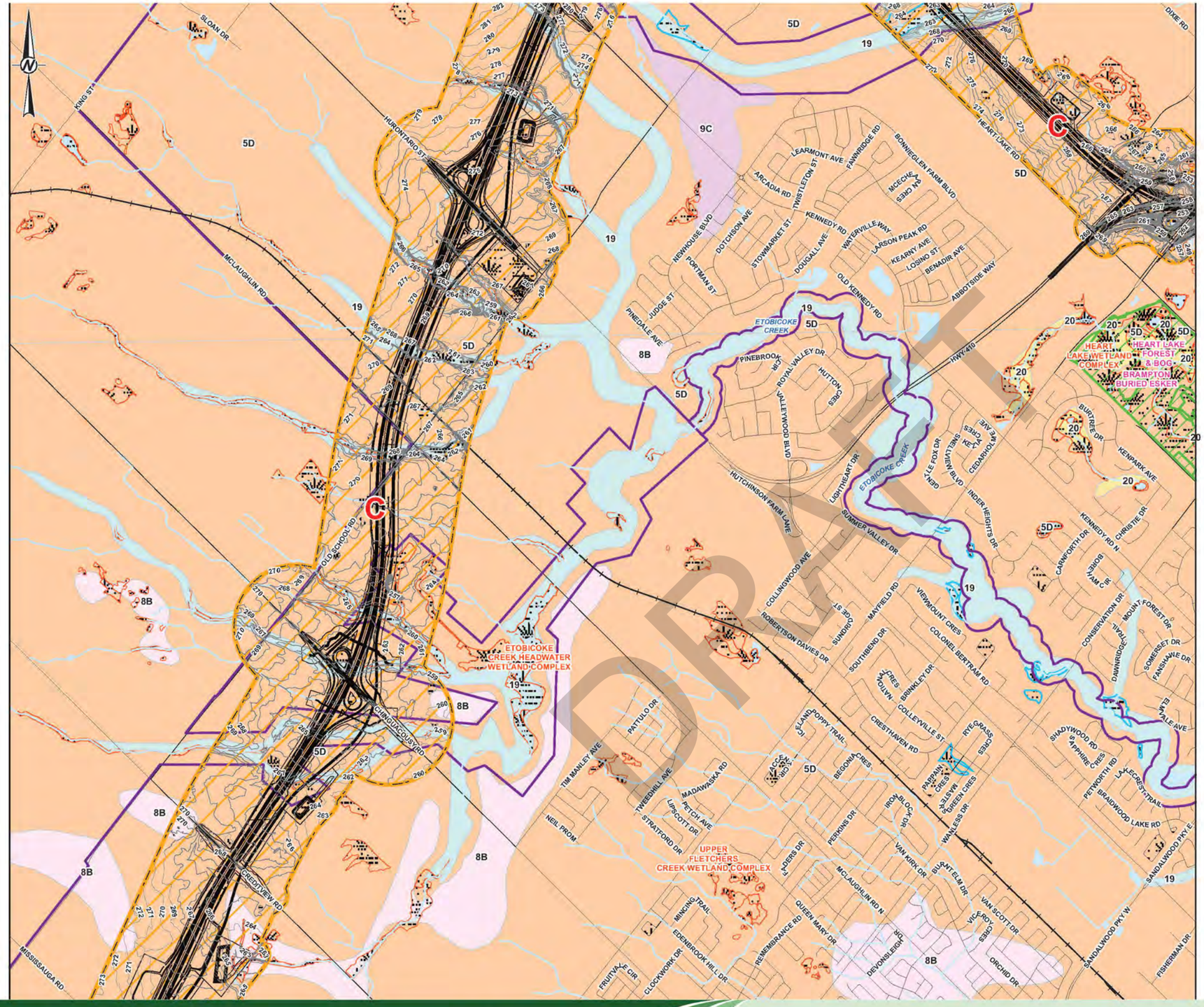
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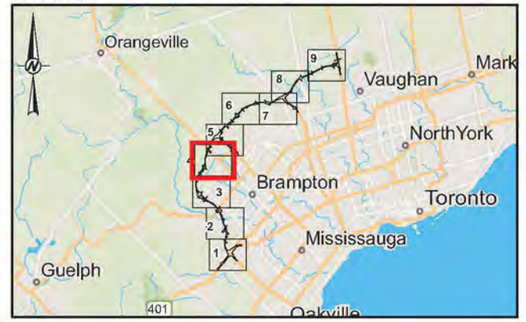
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Highway 413 Environmental Impact Assessment Report

Figure 2-4
Erosion and Sedimentation Environmental Conditions - Assessment by Corresponding Polygon



KEY MAP



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EROSION PONTENTIAL AND CONSEQUENCE

- MODERATE

SURFICIAL GEOLOGY

- 5D: GLACIOLACUSTRINE-DERIVED SILTY TO CLAYEY TILL
- 8B: INTERBEDDED FLOW TILL, RAINOUT DEPOSITS AND SILT AND CLAY
- 9C: FORESHORE-BASINAL DEPOSITS (SAND AND GRAVEL)
- 19: MODERN ALLUVIAL DEPOSITS (CLAY, SILT, SAND, GRAVEL AND ORGANICS)
- 20: ORGANIC DEPOSITS (PEAT, MUCK, MARL)

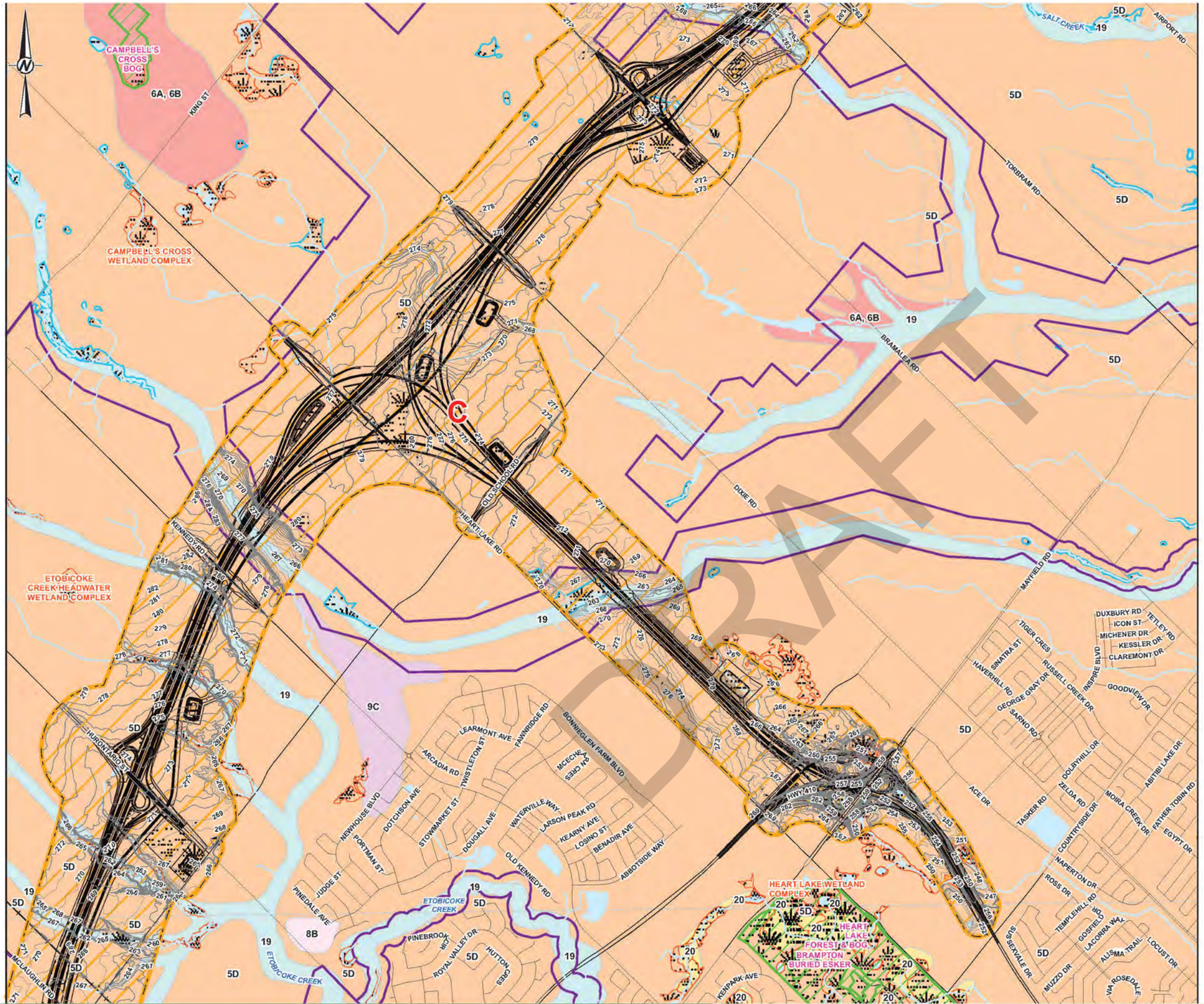
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METRES

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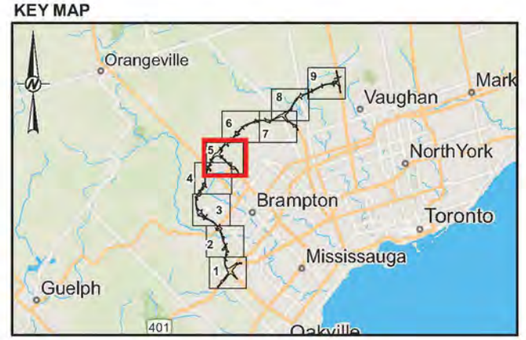
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Figure 2-4
Erosion and Sedimentation Environmental Conditions - Assessment by Corresponding Polygon



KEY MAP



LEGEND

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EROSION PONTENTIAL AND CONSEQUENCE

- MODERATE

SURFICIAL GEOLOGY

- 5D: GLACIOLACUSTRINE-DERIVED SILTY TO CLAYEY TILL
- 6: ICE-CONTACT STRATIFIED DEPOSITS (SAND AND GRAVEL)
- 8B: INTERBEDDED FLOW TILL, RAINOUT DEPOSITS AND SILT AND CLAY
- 9C: FORESHORE-BASINAL DEPOSITS (SAND AND GRAVEL)
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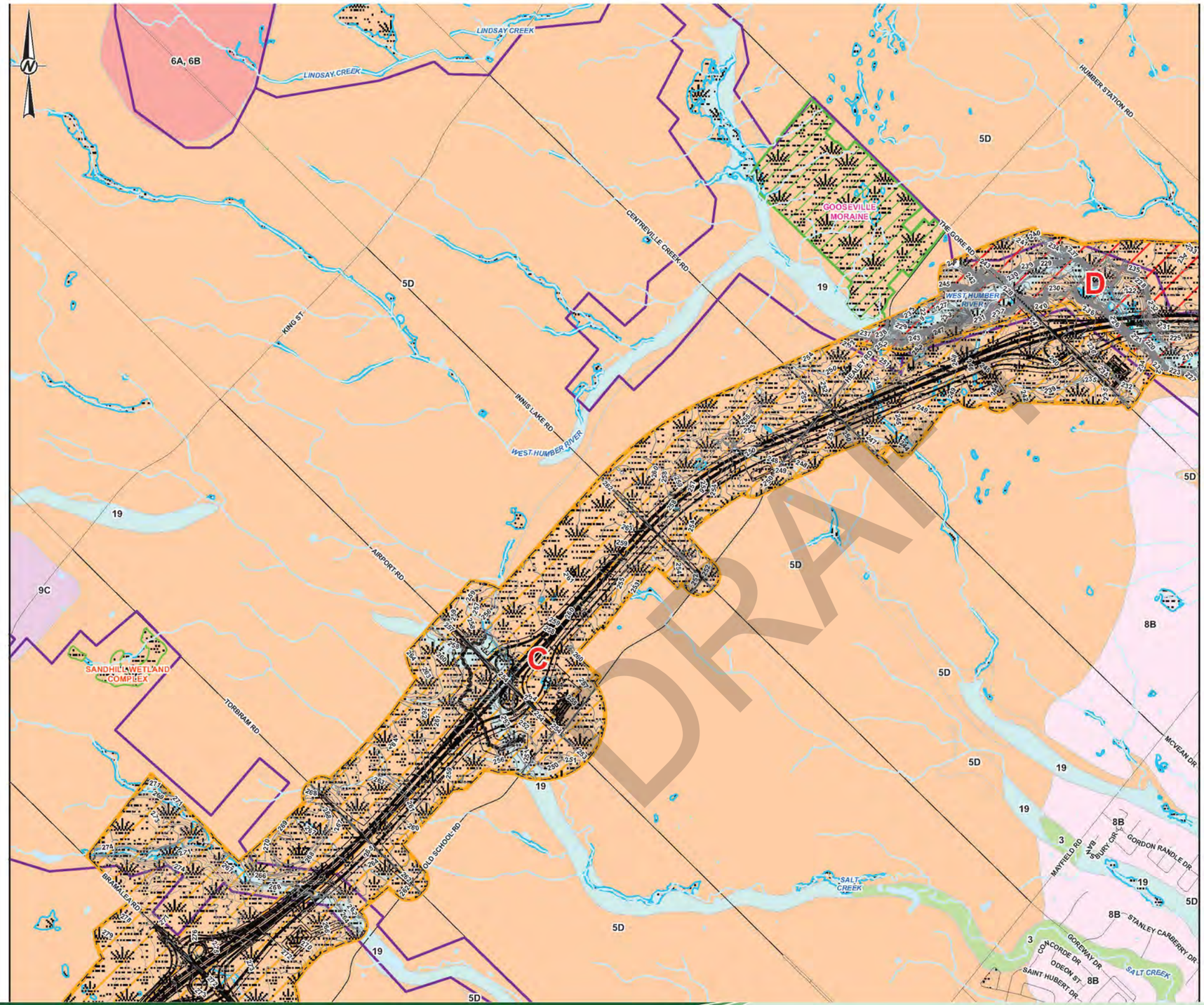
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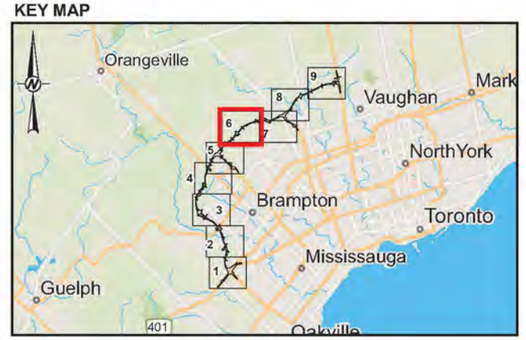
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Figure 2-4
Erosion and Sedimentation Environmental Conditions - Assessment by Corresponding Polygon



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KEY MAP



LEGEND

- ROADWAY
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- ANSI
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- GREENBELT
- UNEVALUATED WETLAND
- EVALUATED WETLAND (NO SIGNIFICANCE)
- WATERBODY

EROSION PONTENTIAL AND CONSEQUENCE

- MODERATE
- HIGH

SURFICIAL GEOLOGY

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- 6: ICE-CONTACT STRATIFIED DEPOSITS (SAND AND GRAVEL)
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METRES

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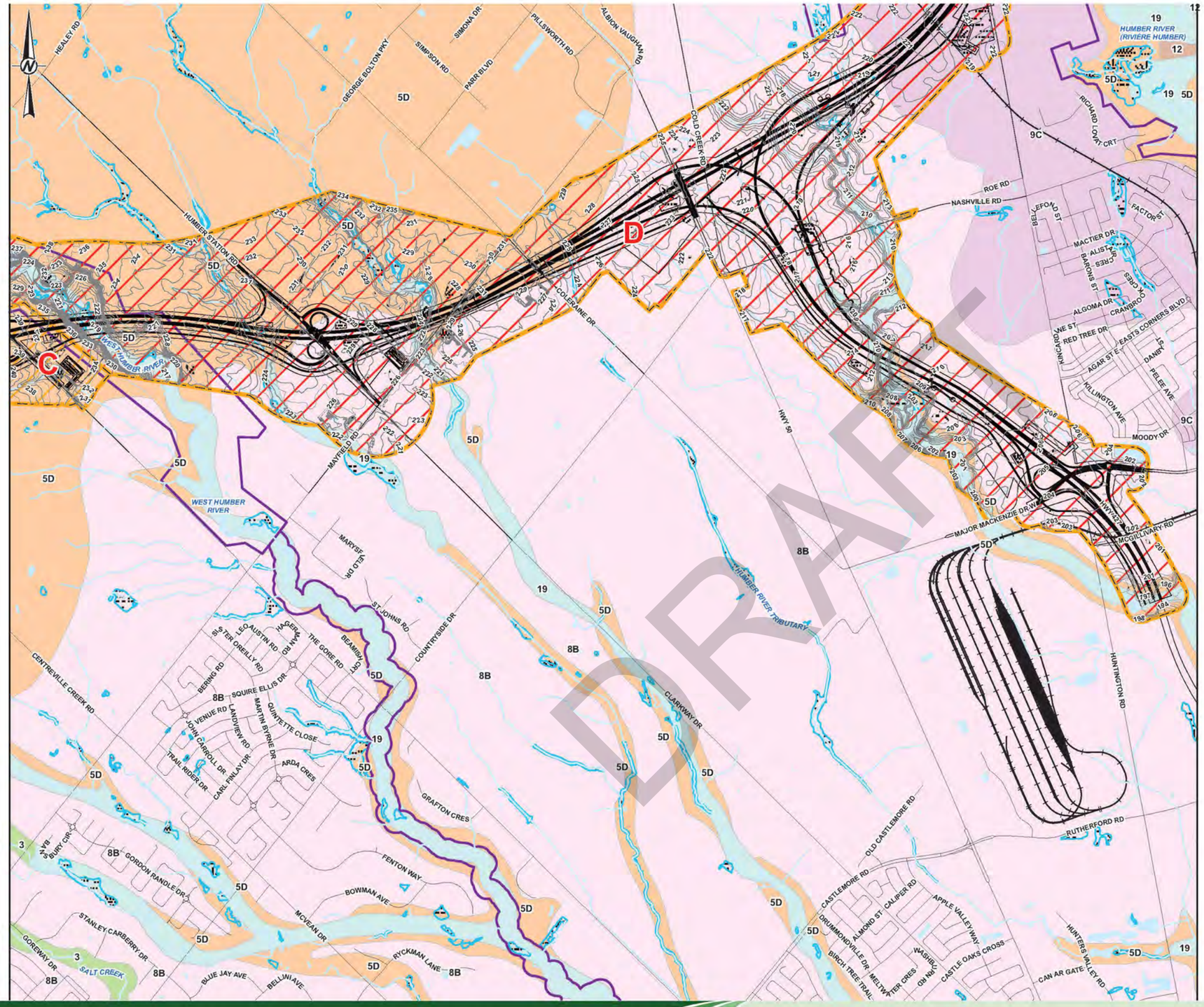
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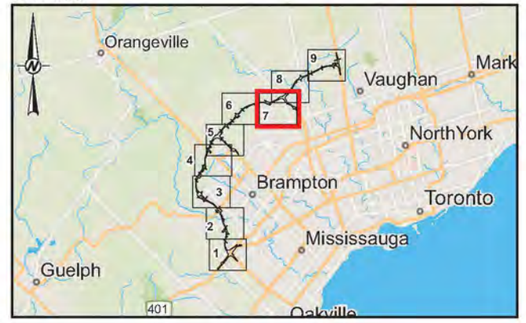
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Figure 2-4
Erosion and Sedimentation Environmental Conditions - Assessment by Corresponding Polygon



DRAFT

KEY MAP



LEGEND

- ROADWAY
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NOTE(S)
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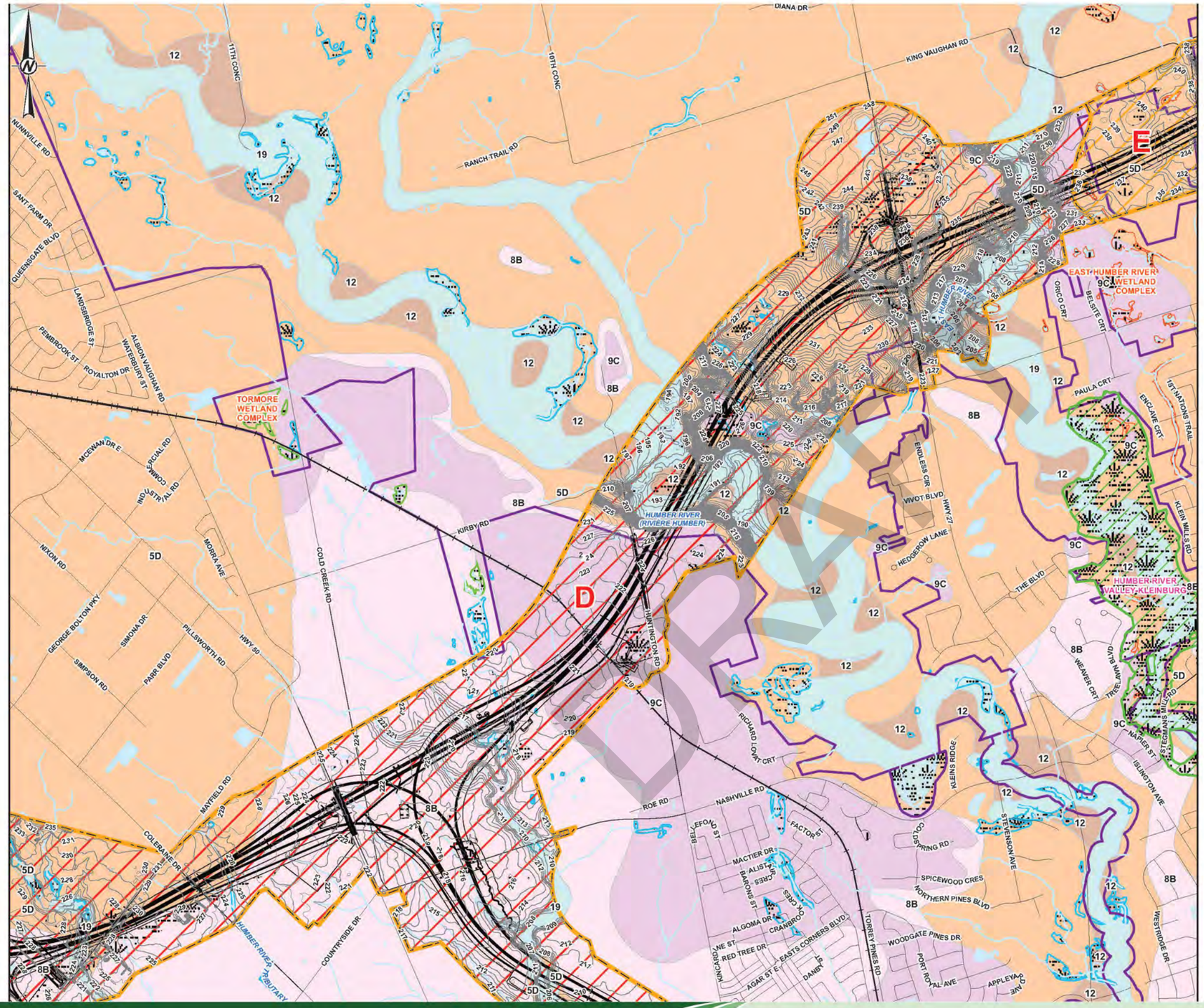
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Ontario

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Highway 413 Environmental Impact Assessment Report

Figure 2-4
Erosion and Sedimentation Environmental Conditions - Assessment by Corresponding Polygon



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EROSION PONTENTIAL AND CONSEQUENCE

- MODERATE
- HIGH

SURFICIAL GEOLOGY

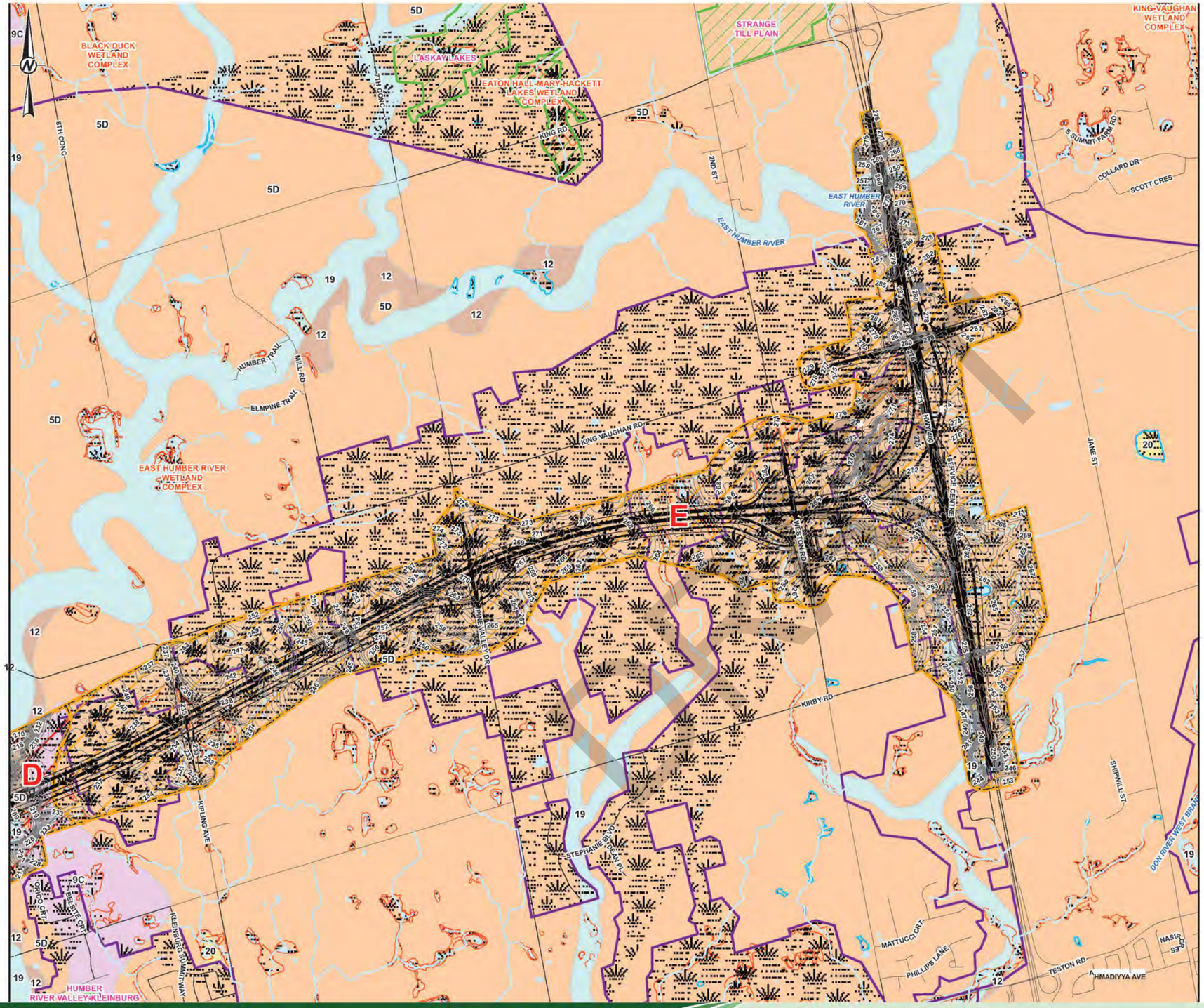
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0 250 500 1,000
METRES

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EROSION PONTENTIAL AND CONSEQUENCE

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- HIGH

SURFICIAL GEOLOGY

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- 20: ORGANIC DEPOSITS (PEAT, MUCK, MARL)

0 250 500 1,000
METRES

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3. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N

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Highway 413 Environmental Impact Assessment Report

Figure 2-4
Erosion and Sedimentation Environmental Conditions - Assessment by Corresponding Polygon

2.3.6 Drainage and Stormwater Management

2.3.6.1 Background

Drainage management refers to the regulation of the collection, storage and movement of water, while SWM refers to strategies to control runoff and discharge at rate suitable for the receiving area, based on quantity and quality control.

A drainage and SWM study was conducted to identify the existing hydrology, hydraulic, and SWM features of the Study Area. The overall objective of this study was to incorporate drainage management into the Preliminary Design to minimize impacts on existing drainage systems within the Study Area and on the natural environment in terms of water quantity and quality. For the drainage and SWM assessment, the Project was divided into sections based on the areas regulated by each Conservation Authority: CH, CVC, and TRCA.

- CH Section (an approximately 1.3 km long segment containing the Highway 413 interchange with Highway 401 / Highway 407 ETR);
- CVC Section (an approximately 12.4 km long segment of Highway 413 from west of Tenth Line to north of Mayfield Road); and
- TRCA Section (an approximately 36.7 km long segment from north of Mayfield Road to Highway 400 including Highway 413, Highway 410 Extension and Highway 427 Extension).

2.3.6.2 Data Collection

2.3.6.2.1 Desktop Review

The Preliminary Design for Drainage and Hydrology is based on a review of the existing documentation including, among others, background reports related to the Project, MTO contract documentation, development reports, and hydrologic reports within the Study Area. These criteria were reviewed to determine existing drainage conditions and to prepare a drainage mosaic for the Study Area. A drainage mosaic provides a comprehensive visual representation highlighting the various components and infrastructure involved in managing surface water flow across the Study Area. This includes illustrating culvert locations, ditch locations, ponds and watercourse realignments.

Hydrology

Generally, where approved sub-watershed models were available for use, flows have been referenced and verified. Where existing models are not available, flows were determined based on the site applicability of the hydrologic techniques, which are methodologies and software tools accepted by MTO and the Conservation Authorities: Visual Otthymo, Rational Method for areas less than 20 ha, and the Unified Ontario Flow Method for areas greater than 20 ha.

Hydraulics

The general methodology established for the Project was to obtain existing hydraulic models from Conservation Authorities, verify and use them in the hydraulic assessment for the required watercourses crossings for the Project. Where models were not available, the CulvertMaster hydraulic model was used in the assessment of existing and proposed culvert crossings.

2.3.6.2.2 Fieldwork

No field studies were undertaken specific to drainage and SWM. The analysis and modeling undertake for the drainage and SWM study is based on the background studies and field data collected by Conservation Authorities and other disciplines.

2.3.6.3 Summary of Environmental Conditions

Within the CH study limit, there are 18 existing culverts that convey flows across the Preliminary Design ROW. It should be noted that a section of the original Sixteen Mile Creek East Branch sub-watershed catchments located northwest of Eight Line and Highway 401 has been previously altered and diverted to the south and currently drains towards a tributary of one of the East Branch Lisgar tributaries. The area adjacent to Highway 413 is predominantly farmland and improved lands with some small industries and rural residential and natural areas, with the overall drainage pattern from northwest to southeast.

The existing Highway 401, Highway 407 ETR, and associated ramps traverse six minor and major tributaries of the Sixteen Mile Creek, the largest being the main Sixteen Mile Creek East Branch located east of Trafalgar Road. Several watercourse culvert crossings SWM ponds have been previously constructed during the Highway 401 and Highway 407 ETR developments in the 1950s and 1990s, respectively. The most recent development occurred in 2020-2022 with the widening of Highway 401. As part of this recent highway improvement, several existing watercourse crossings were recently replaced, and SWM measures were implemented.

Within the CVC jurisdiction, Highway 413 will traverse four different subwatersheds: Mullet Creek, Levi Creek, the Credit River, and Huttonville Creek. The surrounding area is predominantly farmland, rural residential and natural areas, with the overall drainage pattern from northwest to southeast.

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Within the TRCA jurisdiction, Highway 413 and the Highway 410 and Highway 427 Extensions will traverse two main watersheds: Humber River (West Humber River, Main Humber River, and East Humber River) and Etobicoke Creek. The region is predominately farmland and natural areas. No existing drainage control mechanisms are present. The existing conditions drainage mosaics were delineated based on TRCA sub-watershed catchments.

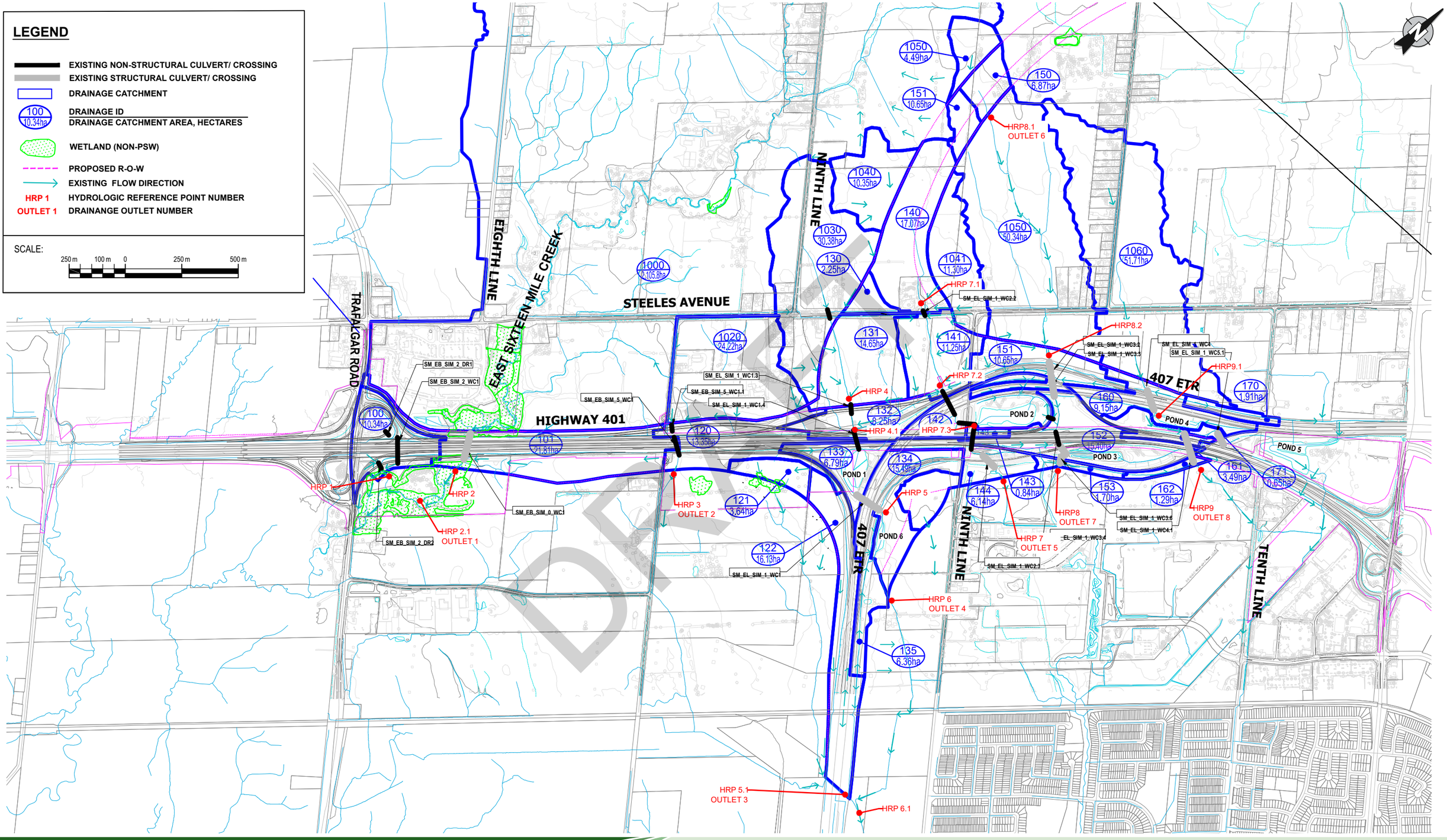
Features of the existing drainage conditions are identified in **Figure 2-5**, **Figure 2-6,** and **Figure 2-7**. Potential impacts and associated mitigation measures are outlined in **Chapter 5**.

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LEGEND

- EXISTING NON-STRUCTURAL CULVERT/ CROSSING
- EXISTING STRUCTURAL CULVERT/ CROSSING
- DRAINAGE CATCHMENT
- 100 / 10.34ha — DRAINAGE ID / DRAINAGE CATCHMENT AREA, HECTARES
- WETLAND (NON-PSW)
- PROPOSED R-O-W
- EXISTING FLOW DIRECTION
- HRP 1 — HYDROLOGIC REFERENCE POINT NUMBER
- OUTLET 1 — DRAINANGE OUTLET NUMBER

SCALE: 250 m 100 m 0 250 m 500 m



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Figure 2-5
Drainage and Stormwater Management Existing Drainage Conditions – Conservation Halton Area

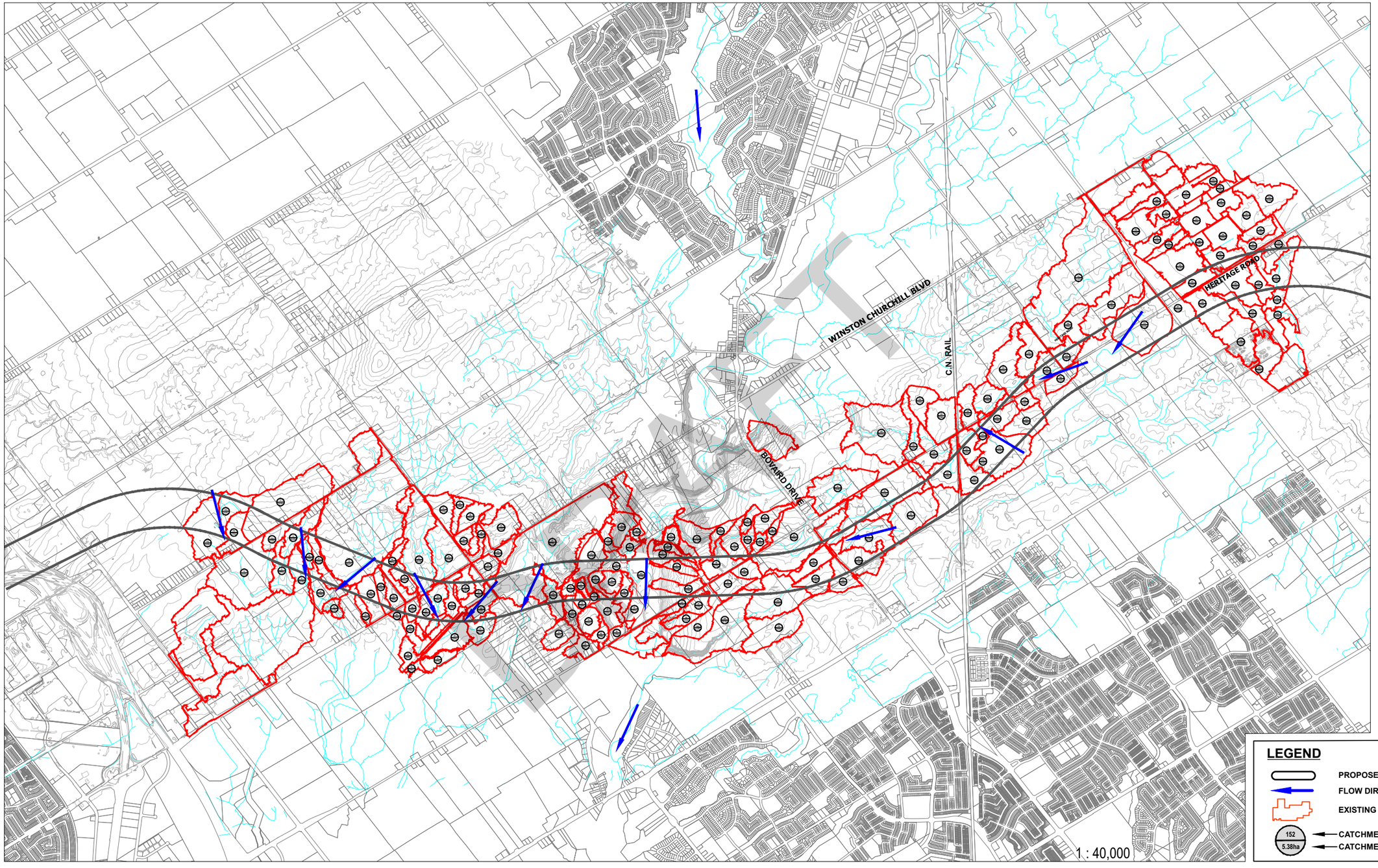


Figure 2-6
Drainage and Stormwater Management Existing Drainage Conditions – Credit Valley Conservation Area

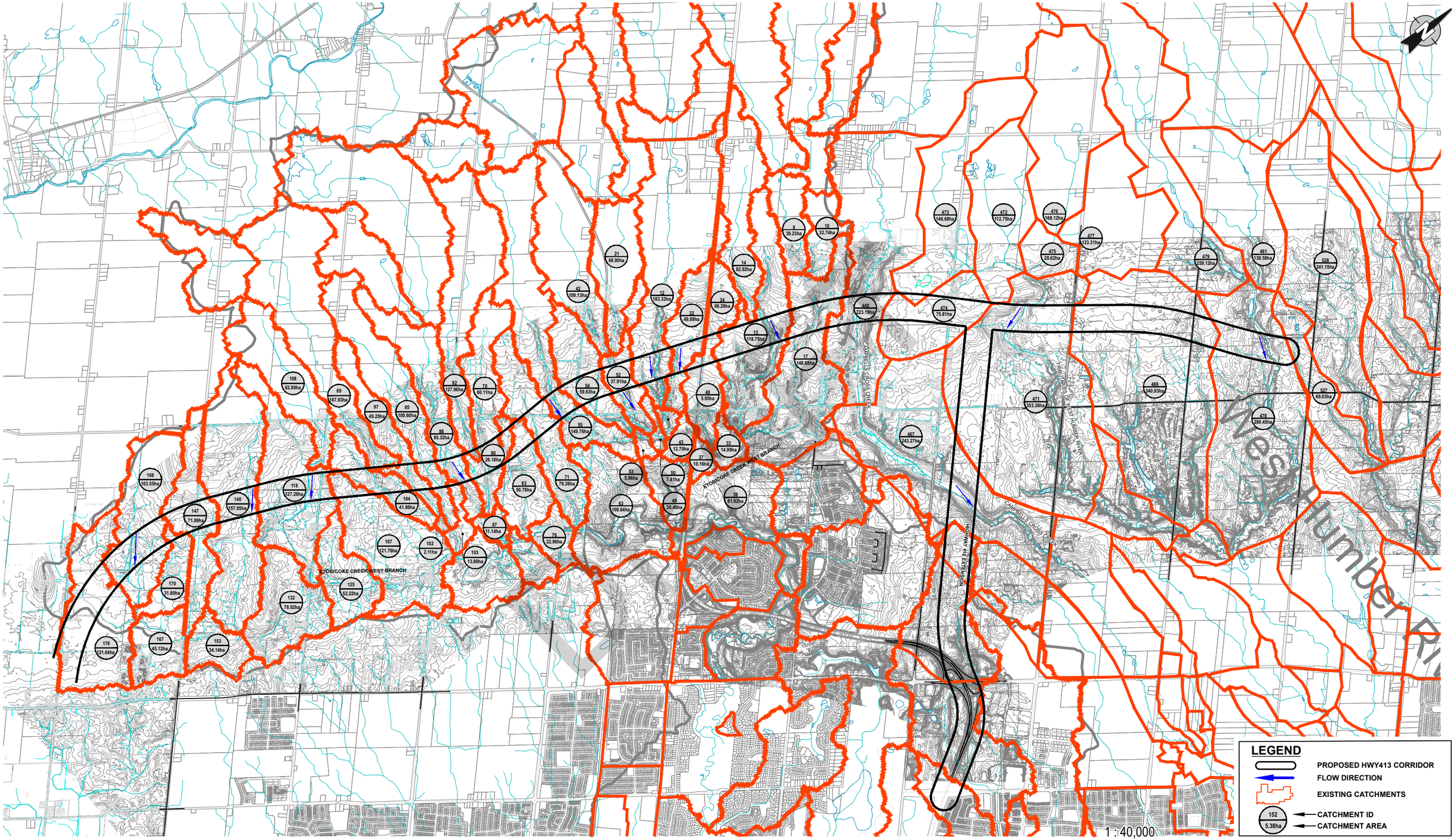


Figure 2-7

Drainage and Stormwater Management Existing Drainage Conditions – Toronto Region Conservation Area

2.4 Social and Economic Environment

Social and economic environment studies were completed as part of the Project to identify, assess and document the local environmental conditions, potential impacts and proposed mitigation measures, as well as applicable provincial, federal or other authorizations that may be required.

The subsections outlined below summarize the local environmental conditions for the following features of the social and economic environment:

- Land Use;
- Agriculture;
- Landscape;
- Noise;
- Air Quality;
- Waste and Contaminated Property;
- Climate Change;
- Community Wellbeing; and
- Snowdrift.

2.4.1 Land Use

2.4.1.1 Background

Land use planning policies have guided land use decisions within the Highway 413 Route.

Throughout the development of the Preliminary Design, applicable policies from the *Planning Act*, 1990, and the *Provincial Planning Statement*, 2024, informed the understanding of potential land use impacts of various alignment alternatives (described in **Chapter 3**) as well as the Preliminary Design of the Preferred Alignment (described in **Chapter 4**).

A land use assessment was completed to provide an overview of the planning policies that guide present and future land use throughout the Highway 413 Study Area since 2015. Applicable land use reporting was updated in 2025 with the applicable land use policies and procedures up to June 1, 2025 .

2.4.1.2 Data Collection

2.4.1.2.1 Desktop Review

Protection for Highway 413 as a new transportation corridor first became a formal requirement in land use planning documents in Ontario through a policy framework enacted in the 2006 Growth Plan for the GGH which identified a broad corridor between the City of Guelph and Highway 400.

Subsequently, in 2010, the Halton-Peel Boundary Area Transportation Study (HPBATS) was undertaken by the Region of Halton and the Region of Peel in consultation with the Town of Halton Hills and the City of Brampton. One of the results of that study was to establish a major transportation corridor to service the northwest Brampton area and southeast Halton Hills via a connection from the new transportation corridor to Highway 401. The HPBATS resulted in policy direction for protection of a high-order corridor through these lands. In 2013, the Highway 413 Route was aligned to follow the HPBATS corridor.

A review of provincial and municipal planning policy demonstrates how Corridor Protection policies were implemented to preclude the development of lands within the Study Area. These policies include:

Provincial Planning Policy

- *The Planning Act,* 1990;
- *Provincial Planning Statement*, 2024;
- *Connecting the GGH: A Transportation Plan for the Greater Golden Horseshoe*, 2022;
- *The Greenbelt Plan,* 2017; and
- *Parkway Belt West Plan*, 1978.

Provincial policy objectives include the promotion of economic development through the establishment of necessary large-scale infrastructure to support current and projected needs, while avoiding negative impacts to key natural heritage features and the water resource system where possible. This broad provincial policy direction includes the need to protect transportation and infrastructure corridors, including those identified in provincial transportation plans, and precludes the development of lands within the Study Area, pending completion of the Highway 413 planning and design process.

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Regional and Municipal Planning Policies

During the completion of the TDS (2012), the Ministry of Municipal Affairs and Housing (MMAH), regional and municipal levels of government developed and implemented Corridor Control policies. These policies were incorporated into regional and municipal Official Plans through amendments to those documents. While policies vary slightly from region to region, the general effect of the policies is to preclude the development of lands within the Highway 413 Study Area pending completion of the assessment of environmental impacts. The following regional and municipal plans were considered as part of the Project:

- **Halton Region:**
  - The Regional Plan: Official Plan for the Halton Planning Area (2024 Office Consolidation) (Regional Municipality of Halton, 2024).
  - Town of Halton Hills Official Plan (April 30, 2024 Office Consolidation) (Town of Halton Hills, 2024).
  - The Official Plan for the Town of Milton (December 2024 Office Consolidation) (Town of Milton, 2024).
- **Peel Region:**
  - Region of Peel Official Plan (April 2022) (Regional Municipality of Peel, 2022).
  - Mississauga Official Plan (August 7, 2024) (City of Mississauga, 2024).
  - City of Brampton Official Plan (May 16, 2024) (City of Brampton, 2024):
    - Highway 427 Industrial Secondary Plan (July 2024 Office Consolidation) (City of Brampton, 2024).
    - Heritage Heights Secondary Plan (July 2024) (City of Brampton, 2024).
    - Bram West Secondary Plan (April 7, 2025) (City of Brampton, 2025).
  - Town of Caledon Official Plan (2024 Office Consolidation) (Town of Caledon, 2024):
    - Mayfield West Secondary Plan (October 2021) (Town of Caledon, 2021).
- **York Region**
  - York Region Official Plan (June 2024 Office Consolidation) (Regional Municipality of York, 2024).
  - City of Vaughan Official Plan (December 2020 Office Consolidation) (City of Vaughan, 2020):
    - North Kleinburg-Nashville Secondary Plan (November 14, 2012) (City of Vaughan, 2012).
    - Highway 400 North Employment Area (Official Plan Amendment [OPA 637]) (November 21, 2011) (City of Vaughan, 2011).
    - West Vaughan Employment Area Secondary Plan (June 4, 2014) (City of Vaughan, 2014).
  - Township of King Official Plan (June 2023) (Township of King, 2023).

Municipalities implemented various amendments (in addition to the ones listed above) to their Official Plans to enforce policies to protect the corridor, and restricted development from occurring on the protected lands until Preliminary Design defined the Highway 413 ROW. Altogether, these policies enabled the protection of lands within the Highway 413 Route.

During the pause of the Project between 2015 and 2019, several planning approvals occurred through subsequent amendments to approved policies that facilitated development within the protected highway corridor area. While the Project was paused, the Highway 413 Route was never formally removed from provincial and municipal Official Plan policy. Some OPAs within the highway corridor area remain under appeal, subject to final decisions by the Ontario Land Tribunal. The province and municipalities continue to balance development interests to consider the competing needs for land in the Study Area while generally protecting for the Project.

2.4.1.2.2 Fieldwork

Throughout 2022, two windshield surveys of the Study Area were conducted to acquire land use data. This fieldwork was reinforced with additional drive-through surveys carried out in 2023. This information corroborated collected data on land use changes submitted online by various regional and municipal entities.

2.4.1.3 Summary of Environmental Conditions

The lands within the Study Area are within one of the most rapidly developing urban areas in Canada. Population and employment growth have not only created demand for an enhanced transportation system but also created development pressure on the lands within the area.

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The lands within the Highway 413 Route are home to many Indigenous Peoples and remain subject to treaties signed between the Crown and Indigenous Peoples. The Ministry is engaging with a number of Indigenous communities.

Thirty years ago, the lands within and surrounding the Study Area were part of the rural residential fringe around the GTA and provided a location for persons wishing to live in a rural setting, either on individual lots along country roads or in estate residential subdivisions. The area also consisted of many rural and recreational uses that were within an easy commute of the GTA. Uses such as riding stables, campgrounds, and golf courses were developed in this area given its natural features and proximity to the urbanized areas to the south.

Land uses throughout the Study Area have been described in the Land Use Report (2024). The province has worked with municipalities in the Study Area to place limitations on changes to land use within the area. These efforts have generally been successful and there have been few significant changes to land use in the Study Area to date. Through Bill 185, which received Royal Assent on June 6, 2024, all Regional planning authorities within the Study Area have become upper-tier municipalities without planning responsibilities effective July 1, 2024.

The following table summarizes the existing land use in the Study Area, as well as the planned future land use, by regional municipality, according to the regional and lower tier Official Plans and Secondary Plans.

Additionally, features of the existing and future land use within the Study Area are identified in **Figure 2-8** and **Figure 2-9**. Potential impacts and associated mitigation measures are outlined in **Chapter 5.**

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Table 2-3: Summary of Existing and Future Land Use by Region/Municipality

Location	Summary of Existing Land Use	Summary of Future Land Use
Regional Municipality of Halton	■ The Project traverses the eastern portion of Halton Region at the Highway 401 / 407 ETR interchange, linking the Town of Halton Hills, Town of Milton and City of Mississauga; and ■ Currently, lands within Halton Region near Highway 413 are used for low-density businesses, employment uses, and residential uses, with the majority being agricultural, and interspersed with rural residential uses and natural heritage features.	The Halton Regional Official Plan (OP) (2024) is now an OP of each of the local municipalities in Halton (the City of Burlington, Town of Halton Hills, Town of Milton, and Town of Oakville) until such time as it is revoked or amended by the respective municipality. ■ On November 4, 2022, MMAH approved, with modifications, Halton Regional OPA 49 (Regional Municipality of Halton, 2022). The resulting Halton Region OP (2024) designates the lands adjacent to Highway 401 in the Towns of Milton and Halton Hills as Employment Area and Future Strategic Employment Area; ■ Employment Areas are intended to ensure the availability of sufficient land for employment to accommodate the Region's forecasted growth to the year 2051; and ■ In Halton Region, the Future Strategic Employment Area overlay (Map 1C) generally follows Highway 413. Therefore, the Highway 413 Project will support the protection of employment uses in that area.
Town of Milton	■ The Project traverses the north-eastern corner of the Town of Milton at the Highway 401 / Highway 407 ETR interchange. ■ The Milton OP (2024) designated the lands impacted by Highway 413 Project as Agricultural. ■ A small portion in Milton, south of Highway 401, will be impacted by the Highway 413 interchange with Highway 401 and Highway 407 ETR. These lands were designated as part of the Parkway Belt West Plan, a provincial plan that designated the Highway 407 ETR and utilities corridor prior to the construction of Highway 407 ETR. These lands are currently being used for agricultural purposes.	■ The Draft Agerton Secondary Plan (Town of Milton, 2022), which spans from west of Sixth Line to east of Eighth Line, south of Highway 401, is located along the ROW for the Highway 413 interchange with Highway 401. ■ The Draft Agerton Secondary Plan (Town of Milton, 2022) proposes an Employment Area (Office Priority) south of Highway 401, between east of Sixth Line, west of Eighth Line and north of the Parkway Belt West Plan Area (Government of Ontario, 1978). The Employment Area is directed to prioritize manufacturing, offices, and associated ancillary uses, with a portion of the area being within the Natural Heritage System. ■ An updated Draft Agerton Secondary Plan is proposed to be released in 2025. The updated Draft will address changes to provincial policy and comments received through stakeholder consultation.
Town of Halton Hills	■ The Project traverses the Town of Halton Hills in a north-south direction, beginning at the Highway 401 / Highway 407 ETR interchange connecting with the Town of Milton and the City of Mississauga. ■ The lands north of Highway 401 in Halton Hills are currently used primarily for agricultural purposes. West of Highway 413, the lands are urbanizing with industrial and commercial uses. A regional retail centre, Toronto Premium Outlet Mall, was developed just west of the Highway 413 Route in 2013 (Retail Insider, 2013). ■ A place of worship, Saint Stephens Anglican Church, is located just west of the corridor at the corner of Steeles Avenue and the Ninth Line. There are also a number of small industrial uses located on Steeles Avenue in this area. ■ As Highway 413 proceeds easterly through Halton Hills, the lands have remained primarily agricultural; however, there are several rural residential properties fronting on Tenth Line and Winston Churchill Boulevard. There is a large place of worship, the	The Town of Halton Hills is undergoing an Official Plan Review (OPR) to bring the OP into consistency with the Provincial Planning Statement, 2024, update growth targets, and conform to the Regional OP. As of June 2025, the OPR is in Phase 1: Set the Stage, which establishes the goals, scope, and next steps for the OPR. The current Halton Hills OP (2024) does not conform to the Regional OP (Regional Municipality of Halton, 2024), and as such, the land uses outlined below may be subject to change through the OPR process. ■ The lands north of Highway 401 are designated as the Premier Gateway Employment Area. This area is directed to develop in phases, with each phase requiring the completion of a Secondary Plan. ■ The Premier Gateway Phase 2B Employment Area Secondary Plan (Town of Halton Hills, 2023) (OPA 50) is around 2,000 ha of land between Eighth Line and Winston Churchill Boulevard. The area is directed to be a leading and thriving Green Economy Innovation and Employment Hub, with permitted uses that reinforce a more intensive economic base the

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Location	Summary of Existing Land Use	Summary of Future Land Use
	Queen of Peace – Croatian Franciscan Centre, located west of Highway 413 at Embleton Road / 5 Side Road.	allows for the Town's economic development. Over 95% of future employment growth in the Town of Halton Hills is directed to take place here. ■ The area within the Premier Gateway Phase 2B Employment Area Secondary Plan (Town of Halton Hills, 2023) adjacent to Highway 413 Preliminary Design ROW is designated as Prestige Industrial Area, which permits for employment uses and limited ancillary uses. In addition, there are some areas within the Natural Heritage System in the vicinity of Highway 413.
Regional Municipality of Peel	■ The Project traverses through the middle of the Region of Peel, from Winston Churchill Boulevard to Highway 50, travelling through the City of Brampton and Town of Caledon. The Highway 413 interchange with Highway 401 / Highway 407 ETR is also partially located in the Region of Peel, in the City of Mississauga. ■ Currently, lands within the Region of Peel near Highway 413 are used for low-density businesses, employment uses, and residential uses, with the majority being agricultural, and interspersed with rural residential uses and natural heritage features. ■ The lands surrounding the Highway 410 Extension are primarily agricultural, interspersed with rural residential uses and natural heritage features.	The Peel Region OP (2022) is now an OP of each of the local municipalities in Peel (the City of Mississauga, City of Brampton, and the Town of Caledon) until such time as it is revoked or amended by the respective municipality. The summary of future land uses below addresses areas that are not addressed in their respective current approved local Official Plans. ■ The land south of Highway 413 in Caledon is within the Urban System. The Urban System is where urban development is directed to take place and comprises communities that contain diverse living, working and cultural opportunities. Specifically, the lands along Mayfield Road between Winston Churchill Boulevard and Mississauga Road; between Heart Lake Road and Dixie Road; and, between Torbram Road and Goreway Drive, are designated as Employment Area. ■ The lands north of Highway 413 on either side of Highway 10 from McLaughlin Road to approximately Kennedy Road; on either side of Airport Road, and east of The Gore Road are designated as Employment Area or Future Strategic Employment Area, where a range of employment uses are permitted. ■ A small portion of Highway 413 between Bramalea Road and Torbram Road, and between Kenedy Road and Heart Lake Road is within the Natural Heritage System, where sensitive and significant natural features and functions are directed to be managed and protected. ■ The land north of Highway 413 in Caledon, except the lands referenced above, is primarily within the Rural System. The Rural System consists of lands that are outside of the Regional Urban Boundary and contain diverse natural and rural landscapes and attractive communities. These lands are designated as Prime Agricultural lands, which permits uses related to conservation and resource management, low intensity recreational uses and agricultural uses.
City of Mississauga	■ Currently, the uses surrounding the Highway 413 interchange at Highway 401 / Highway 407 ETR consist of agricultural lands with some low-density warehouses, distribution centers, and transportation services.	■ The lands east of the Ninth Line, south of Highway 401 are within the Corporate Centre and are designated as an Employment Area in the Mississauga OP (2024), which are directed to contain employment uses.

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Location	Summary of Existing Land Use	Summary of Future Land Use
City of Brampton	Highway 413 is located in the City of Brampton in two geographic areas: ■ In the west, between Winston Churchill Boulevard and Mayfield Road; and ■ In the east, between Clarkway Drive and Highway 50, south of Mayfield Road. <u>West Portion</u> ■ Highway 413 enters Brampton's west side where it crosses Winston Churchill Boulevard south of Embleton Road. These lands are currently being used for agricultural purposes or contain rural residential homes, however they are designated for urban development. ■ The hamlet of Huttonville is located east of Highway 413, at Embleton Road. There are a number of residential properties and small-scale commercial uses in this area. ■ North of Embleton Road, Highway 413 passes through mainly agricultural lands. ■ There are rural residential lots located on Heritage Road that will be impacted by Highway 413. As the Project proceeds north through Brampton, the current land uses are primarily agricultural with scattered rural residential uses. These lands are all designated for urbanization in the future. ■ There are two places of worship near Bovaird Drive and Heritage Road, the Jehovah's Witness Kingdom Hall and Saint Elias the Prophet Ukrainian Catholic Church. Highway 413 impacts the Jehovah's Witness Kingdom Hall parcel but avoids impacts on the building and the general use of the property, and does not negatively impact the access to either property. <u>East Portion</u> ■ These lands are currently in agricultural use and are in the process of urbanizing in accordance with OPA 105 (Highway 427 Industrial Secondary Plan Area 47) (City of Brampton, 2014). ■ The Shiloh Cemetery is located on the west side of Highway 50, within the footprint for the Highway 413 / Highway 427 interchange, but will not be directly impacted by the Project. ■ A place of worship, the Bhagwan 1008 Adinatha Swami Temple, and a retirement home are located about 575-600 m southwest of Highway 413 in this area.	On May 9, 2024, the Region of Peel approved the City of Brampton Official Plan, subject to appeals to be adjudicated before the Ontario Land Tribunal (Regional Municipality of Peel, 2024). <u>West Portion</u> ■ Highway 413 is identified on Schedule 1A of the Brampton OP (City of Brampton, 2024). The City directs to protect lands for Highway 413 and rights-of-way for transportation and transit facilities, and other ancillary uses as needed for the Project. ■ Highway 413 crosses the draft Bram West Secondary Plan (City of Brampton, 2025) between Winston Churchill Boulevard and the Credit River. It permits Employment, Low-Rise Residential, Office, and Commercial uses adjacent to the Preliminary Design ROW. Further technical studies to inform the refinement of the Secondary Plan policies are proposed to be drafted in 2026. ■ The Heritage Heights Secondary Plan Area (City of Brampton, 2024) (Areas 51 and 52), east and west of Highway 413 between Bovaird Drive and Mayfield Road, provides for a variety of land use designations. Adjacent to the Preliminary Design ROW, Mixed-Use, Employment and Residential uses are permitted. ■ On April 30, 2025, Council adopted the removal of an Employment Area at the intersection of Mayfield Road and Winston Churchill Boulevard to allow the development of a gateway to the Secondary Plan area from neighbouring municipalities (City of Brampton, 2025). <u>East Portion</u> ■ The Highway 427 Industrial Secondary Plan (OPA 105) (City of Brampton, 2024), west of the Highway 413 / Highway 427 interchange, directs for a variety of Employment uses adjacent to the corridor, including office, industrial, warehouse, and mixed commercial/industrial uses.
Town of Caledon	■ Mayfield Road (Regional Road 14) is primarily the boundary between Brampton and Caledon. The lands north of Mayfield Road, west of Highway 10, are primarily used for agricultural purposes. Throughout this area, there are also scattered rural residential uses adjacent to the town roads. ■ Where the Highway 410 Extension meets Highway 413, the land is currently used for agricultural purposes. The land east of the Highway 410 Extension is developing with large scale industrial uses, primarily logistics facilities just north of Mayfield Road. West of the Highway 410 Extension, the current limit for urban residential uses in Mayfield West is located approximately 700 m from the Preliminary Design ROW.	■ Outside the settlement area, the lands adjacent to Highway 413 are designated as Prime Agricultural Area, with small portions designated as Environmental Policy Area. Within Agricultural Areas, land is directed to protect and promote agricultural uses and support the conservation of agriculturally productive soils and lands. ■ Within settlement areas, the lands adjacent to Highway 413 are within the Mayfield West (Town of Caledon, 2021) and Bolton (Town of Caledon, 2025) Secondary Plans. Settlement areas are directed to contribute to the development of Caledon as a complete community.

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Location	Summary of Existing Land Use	Summary of Future Land Use
Town of Caledon	■ Highway 413 crosses Highway 10 about 650 m south of the Brampton-Caledon Airport. The interchange with Highway 10 is 900 m north of the urban area of Mayfield West. Between Highway 10 and Highway 50 the land use pattern of primarily agricultural uses with scattered residential uses abutting the local road system continues to the westerly limit of Bolton. North of Mayfield Road near Airport Road, there are some warehouse uses. ■ West of the current Bolton Urban Area, there are several rural residential uses and industrial uses located on Mayfield Road west of Highway 50. ■ A number of significant warehousing facilities have been established in the area. Many of these contain a significant amount of space dedicated to parking for transport trucks.	<u>Mayfield West Secondary Plan</u> ■ The Mayfield West Secondary Plan (Town of Caledon, 2021) encompasses the lands generally between Chinguacousy Road, Old School Road, Dixie Road and Mayfield Road, and includes the lands for the Highway 410 Extension. Lands adjacent to both sides of the Highway 410 Extension are designated as Prestige Industrial and General Industrial, which permit manufacturing, warehousing, and other industrial and complementary uses. ■ Highway 413 crosses the northwest corner of the Mayfield West Study Area (Town of Caledon, 2021), where planning for future development has not yet commenced. The lands are not within the Urban Area in Caledon's OP (Town of Caledon, 2024), however, they are within the Urban Boundary in Peel Region's OP (Regional Municipality of Peel, 2022). <u>Bolton Secondary Plan</u> ■ Highway 413 is adjacent to the southern potion of the Bolton Secondary Plan (Town of Caledon, 2025). The Secondary Plan designates the lands in proximity to Highway 413 as Industrial area, which permits manufacturing, warehousing, and other industrial and complementary uses.
Regional Municipality of York	■ The Project traverses the southwestern area of the Region of York between Highway 50 and Highway 400. It includes both Highway 413 and the Highway 427 Extension. ■ The lands within York Region that will be impacted by Highway 413 and the Highway 427 Extension consist primarily of agricultural, open space, rural residential and employment uses. ■ A portion of the Preliminary Design ROW is within the Greenbelt – Protected Countryside. ■ The Nashville Conservation Reserve is located across lands from King Road and Albion-Vaughan Road to Nashville Road and Highway 27. The Nashville Conservation Reserve is a 900 ha property owned and managed by the TRCA.	The York Region OP (Regional Municipality of York, 2024) Update to 2051 was adopted by Regional Council on July 14, 2022, and was approved by the Minister in November 2022 (MMAH, 2022). ■ There remains a small portion of the lands in northern Vaughan as Agricultural Lands adjacent to the Highway 427 Extension. ■ The lands around Highway 413 are designated as Urban Area and contains a mixture of Community Area and Employment Area. ■ The Community Areas designation in the York Region OP (Regional Municipality of York, 2024) is where residential, population-related employment and community services are directed to accommodate concentrations of existing and future population and employment growth. ■ The Employment Areas designation in the York Region OP (Regional Municipality of York, 2024) is where clusters of industrial, business, transportation, warehousing and related economic activities are directed and where residential uses are prohibited. ■ The Agriculture Areas designation in the York Region OP (Regional Municipality of York, 2024) indicates where the continuous, productive agricultural land base is located.

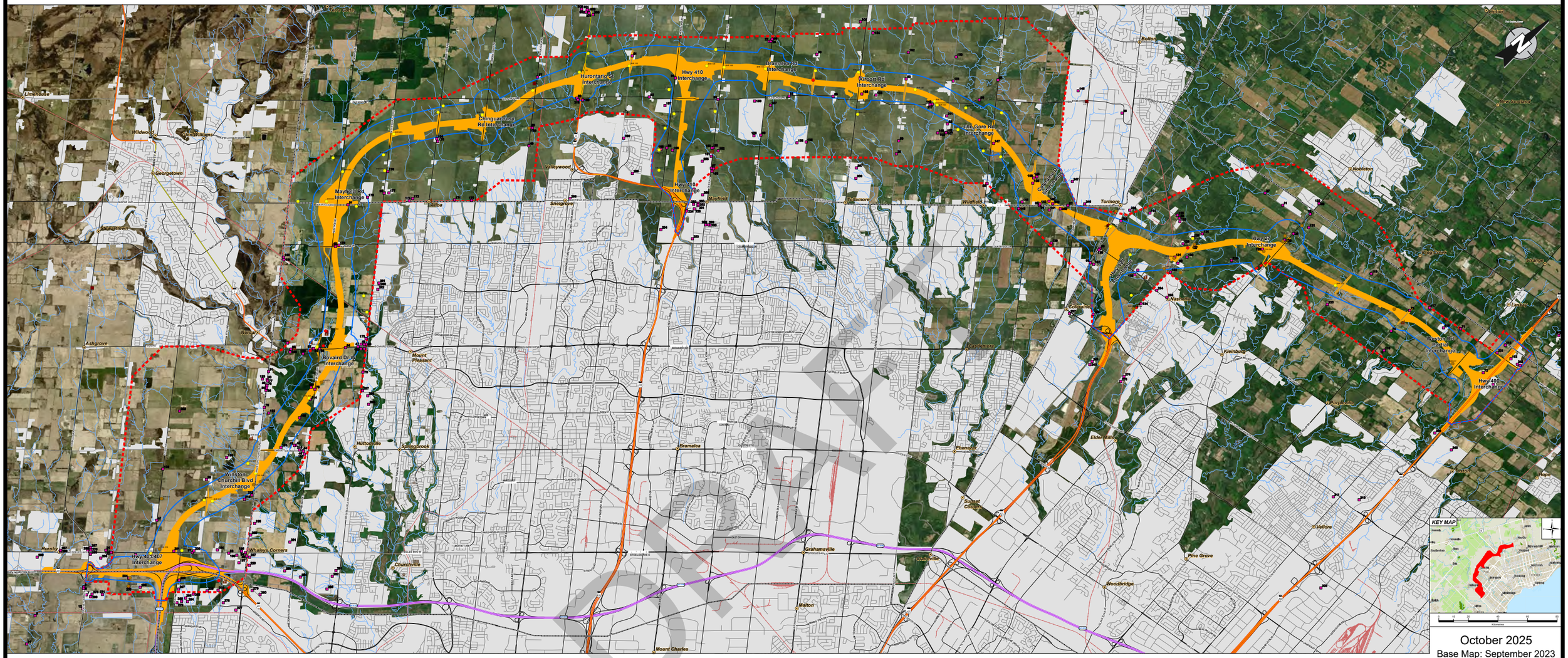
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Location	Summary of Existing Land Use	Summary of Future Land Use
City of Vaughan	■ The Project traverses the north-western portion of the City of Vaughan in an east-west direction. ■ Highway 50 is the boundary between Vaughan and Brampton in this area. The lands along Highway 50 south of the Bolton urban area, in both Vaughan and Brampton, are quickly developing for transportation logistic uses due to proximity to the Canadian Pacific Kansas City (CPKC) Railway Intermodal Yard and to Highway 427. ■ The Highway 427 Extension is located on lands that are primarily agricultural. There are a number of industrial logistics operations in the area, including the above noted CPKC Intermodal Yard; although these uses are not directly impacted by the Project. ■ East of the Highway 413 / Highway 427 interchange, the lands are primarily agricultural. There is a Hydro corridor and the CPKC Rail line that cross the Preliminary Design ROW. There is a large Hydro One training and transformer facility approximately 300 m north of Highway 413 at Kirby Road and Cold Creek Road. ■ Where Highway 413 crosses Huntington Road, there are a number of agricultural uses and a landscaping business that will be impacted by the Project. Progressing easterly, Highway 413 crosses the Main Humber River in the Nashville Conservation Reserve. There are a number of trails in this area. ■ Highway 413 will be located 2 km north of the existing residential area of Kleinberg in Vaughan and 1.7 km south of the community of Nobleton in King Township. ■ East of the Main Humber River, the lands are primarily used for agricultural purposes. There are a number of estate residential uses on the King Vaughan Line in this area, some of which have been converted to industrial uses in recent years. There are also estate residential uses fronting onto Highway 27 and Weston Road that will be impacted by the Project. ■ At the Highway 413 / Highway 400 interchange a concrete batching plant operates within the interchange footprint. Various industrial uses are located along King-Vaughan Road and Highway 400. ■ ONroute operates service centres adjacent to Highway 400 in both the northbound and southbound direction in the vicinity of the Highway 413 interchange. The ONroute Maple centre (adjacent to Highway 400 southbound) is closed and undergoing refurbishment.	■ The portions of the Project that are not within a Secondary Plan area, which are described below, primarily consist of employment, residential and community area uses. <u>North-Kleinburg Nashville Secondary Plan:</u> ■ The Project traverses the northwestern portion of the Secondary Plan area, and impacts Area 2 within the Secondary Plan, which is the Huntington Road Community (City of Vaughan, 2012). ■ The lands adjacent to Highway 413 in the North-Kleinburg Nashville Secondary Plan (City of Vaughan, 2012) primarily consists of future low-rise residential, low-rise mixed-use, agricultural and natural area uses. <u>Highway 400 North Employment Lands Secondary Plan:</u> ■ The eastern limit of the Project is the Highway 413 / Highway 400 interchange, which is located within the Highway 400 North Employment Lands Secondary Plan area (City of Vaughan, 2011). ■ The Secondary Plan (City of Vaughan, 2011) consists of OPA No. 637 (as approved by the Ontario Municipal Board on November 21, 2011) (City of Vaughan, 2011), which amends two existing amendments to the OP: OPA No. 450 (City of Vaughan, 1997) and OPA No. 600 (City of Vaughan, 2003). ■ The lands impacted by Highway 413 in the Secondary Plan primarily consist of Prestige Areas, Prestige Areas – Office/Business Campus, General Employment Areas, and Greenbelt Natural Heritage Systems uses. <u>West Vaughan Employment Area Secondary Plan:</u> ■ The Project traverses the north-eastern portion of the West Vaughan Employment Area Secondary Plan area (City of Vaughan, 2014). ■ The lands impacted by Highway 413 in the Secondary Plan (City of Vaughan, 2014) primarily consist of Natural Area, General Employment, Prestige Employment, and Utility uses.

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Location	Summary of Existing Land Use	Summary of Future Land Use
Township of King	■ The Project traverses a small portion of the Township of King, along Highway 400 between King Road and King-Vaughan Road to accommodate the Highway 413 / Highway 400 interchange. ■ Highway 413 will be located 1.7 km south of the Village of Nobleton. ■ The lands within the Township that will be impacted by Highway 413 consists primarily of rural area and agricultural uses. ■ ONroute operates service centres adjacent to Highway 400 in both the northbound and southbound direction in the vicinity of the Highway 413 interchange. The ONroute Maple centre (adjacent to Highway 400 southbound) is scheduled for closure and refurbishment. ■ Two event and conference centres are located southeast of King Road and Highway 400.	■ The OP (Township of King, 2023) addresses the growth, development and overall planning requirements of the Township and its villages, hamlets and rural areas to the year 2031 in conformity with regional and provincial land use policies. An OPR is underway to guide growth in the Township to 2051 (Township of King, 2025). ■ The area lands within King Township that will be impacted by Highway 413 primarily consist of Agricultural and Rural uses through the 2031 timeframe.

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October 2025
Base Map: September 2023

LEGEND

Base Features
- Town or Community
- Highway 413 Route
- Preliminary Design (2025)
- Focused Area Analysis (FAA, 2025)
- Watercourse
- Municipal Boundary

Roads
- Controlled Access Highway
- 407 ETR
- Highway
- Arterial Road
- Local Road
- Railway

Existing Land Use
- Commercial / Industrial Businesses (Google Maps, 2023)
- Cemetery
- Places of Worship
- Existing Development

*** Please refer to corresponding tables for Community Identified Features and Businesses lists.**

Built Heritage Features (2025)
- Designated Under the Ontario Heritage Act
- Built Heritage Resources and Cultural Heritage Landscapes Listed on the Municipal Registry of Heritage Properties
- Potential Built Heritage Resources and Cultural Heritage Landscapes Identified During the EA Process
- Closed Cemetery (2020)

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton.

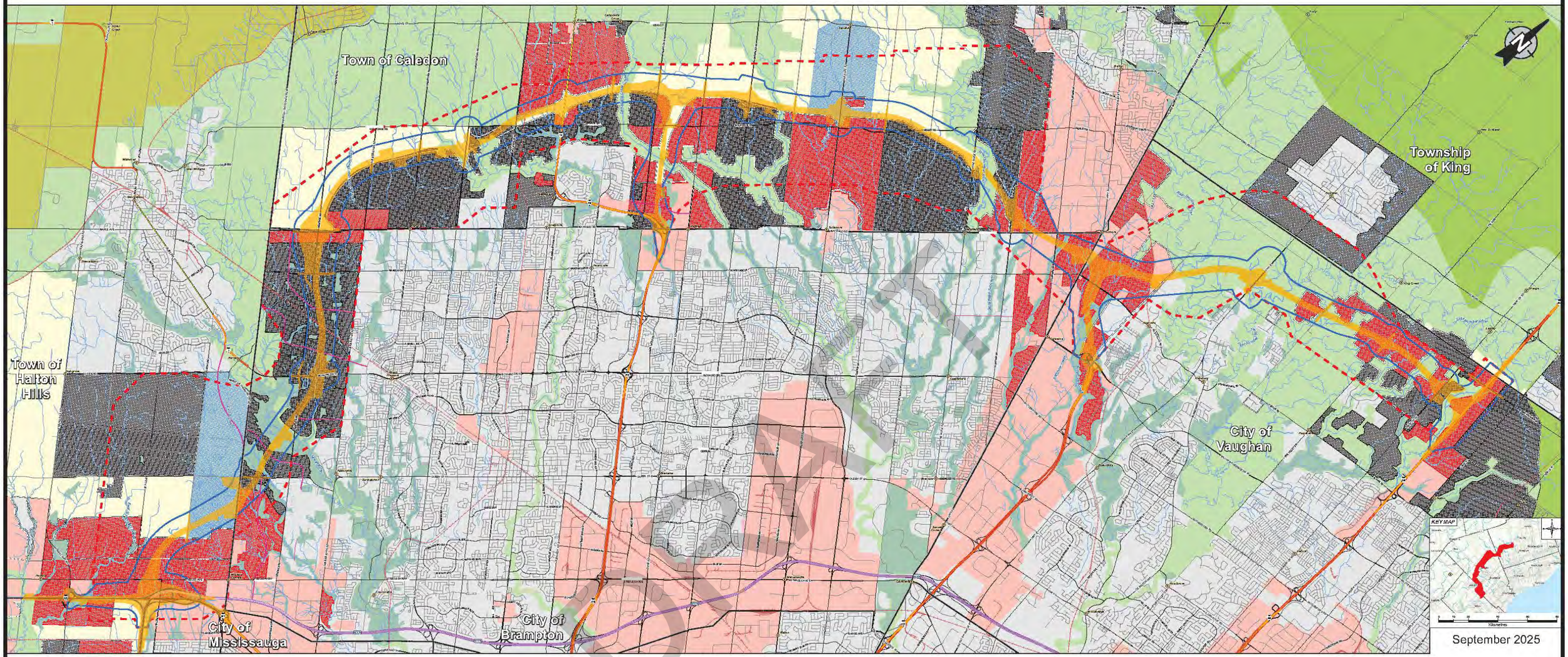
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Ontario

WSP AECOM

Highway 413 Environmental Impact Assessment Report

Figure 2-8
Highway 413 Existing Land Use Conditions



September 2025

LEGEND

Base Features

- Town or Community
- Route Planning Study Area
- Preferred Route (2025)
- Focused Area Analysis (FAA, 2025)
- Watercourse
- Municipal Boundary
- Section Limits
- Heritage Heights Secondary Plan

Roads

- Controlled Access Highway
- 407 ETR
- Highway
- Arterial Road
- Local Road
- Railway
- Planned Municipal Improvements

Generalized Land Use Designations

- Existing Urban Area
- Urban Area Expansion
- Designated Employment Area
- Future Urban Area
- Future Employment Area
- Future Strategic Employment Area (Outside Urban Boundary)
- Agricultural Area
- Environmental Policy Area
- Greenbelt - Protected Countryside
- Niagara Escarpment Plan
- Oak Ridges Moraine

Sources:

Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton.

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2.4.2 Agriculture

2.4.2.1 Background

The agri-food sector is a significant contributor to the province of Ontario's prosperity and helps to support biodiversity and locally grown food to a growing population (OMAFA, 2018).

An agricultural assessment was completed for the Project to fulfill the requirements outlined in the Greenbelt Plan (2017). The purpose of the assessment was to document the existing agricultural conditions and character; identify and assess potential agricultural impacts (direct and indirect); and provide avoidance or mitigative measures to offset or lessen any adverse impacts on agricultural resources and productivity to the extent feasible.

In an effort to meet the needs of the Project, the assessment was completed as a staggered reporting system where an Existing Conditions Report was completed in October 2023 to document the existing agricultural conditions. Then, in 2024 a fulsome assessment was completed to update the Existing Conditions Report (2023) and to assess potential impacts and provide appropriate mitigation measures.

The assessment was completed in compliance with the Ontario Ministry of Agriculture, Food and Agribusiness (OMAFA) Draft Agricultural Impact Assessment Guidance Document (2018) and through discussion with staff from OMAFA.

2.4.2.2 Data Collection

For the purpose of the assessment, the Highway 413 Preliminary Design ROW was referred to as the Primary Study Area (PSA). Agricultural operations and activities were evaluated in a larger area, the Secondary Study Area (SSA), described as a potential zone of impact extending a minimum of 1000 m (1.0 km) beyond the boundary of the PSA. A 1000 m (1.0 km) SSA was defined through discussions with OMAFA based on the potential direct impacts to the adjacent agricultural lands, and potential for direct impacts on agricultural lands, operations, services and agricultural infrastructure in the surrounding area.

The PSA and the SSA comprised a mix of land uses including urban uses, rural uses, agricultural lands, transportation corridors, and woodlands.

2.4.2.2.1 Desktop Review

A variety of data sources were utilized in the assessment of agricultural conditions in the PSA and SSA. Data was collected in a variety of formats including digital (shapefiles and imagery), paper copy, and through correspondence (telephone, meetings, email, etc.). A summary of the type and collection of the relevant data is provided below:

- **Policy Review** – relevant policy, by-laws and guidelines related to agriculture and infrastructure development were reviewed for the Agricultural Impact Assessment (AIA) (inclusive of provincial and municipal policy documents and relevant zoning bylaws).
- **Physiography** – A review of The Physiography of Southern Ontario 3rd Edition, Ontario Geological Survey Special Volume 2 (MNR, 1984) and the associated digital GIS shapefiles was completed to document the type(s) and depth of bedrock and soil parent materials, and how these materials, in conjunction with glacial land forming processes, have led to the development of the existing soil resources.
- **Topography and Climate** – Climate data was taken from the OMAFA document titled Agronomy Guide for Field Crops – Publication 811 (2017) and online OMAFA data sources.
- **Land Use** – A review of aerial photography, Google Earth Imagery, Bing Imagery, Birdseye Imagery, the regional and municipal online imagery, and correlation to the OMAFA Land Use Systems (Geospatial Ontario, 2022) mapping was undertaken.
- **Minimum Distance Separation (MDS)** – Formulae were developed by OMAFA (2016) to reduce and minimize nuisance complaints due to odour from livestock facilities and to reduce land use incompatibility. Agricultural facilities were assessed for livestock even though MDS calculations were not required or completed as part of the AIA.
- **Land Fragmentation/Severance** – Data was collected through a review of online interactive mapping on the Agmaps (OMAFA, 2021) website, the Agricultural System Portal (OMAFA, 2022), and parcel data.
  - Parcel data was used to determine the extent, location, relative shape of each parcel/property within both the PSA and the SSA.
  - Land fragmentation can be defined as the increase in the number of smaller parcels, which are generally non-agricultural uses, within a predominantly agricultural area. Over time the increase in smaller non-agricultural land uses creates a patchwork-like distribution of rural land uses, resulting in lands lost to agricultural production.
- **Soil Survey** - Soil survey data and Canada Land Inventory (CLI) data was provided by OMAFA in digital format through the Land Information Ontario (LIO) website warehouse (MNR, 2022).

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- The soils/CLI data is considered the most recent iteration of the soil information from OMAFA.

- **Agricultural System** - The OMAFA online Agricultural Systems mapping (OMAFA, 2022) was reviewed to determine the extent of agriculture in the PSA, and in the SSA. (Note that the OMAFA's Legacy Agricultural Land Base Map, 2018 is not being updated by the province and therefore is considered a legacy map).
  - OMAFA identifies that the Agricultural System comprises two parts: Agricultural Land Base; and the Agri-Food Network.
  - The Agricultural Land Base illustrates the Prime Agricultural Areas (including Specialty Crop Areas), while the Agri-Food Network illustrates regional infrastructure/ transportation networks, buildings, services, markets, distributors, primary processing, and agriculture communities.
- **Agricultural Statistics** - Census data was provided by Statistics Canada through the OMAFA website.
  - For the purposes of the AIA, the Census data was provided using the municipality nomenclature as was defined in the Statistics Canada data. Therefore, the municipalities were defined as Halton Regional Municipality, Halton Hills Township, Peel Regional Municipality, Caledon Township, Brampton Township, York Regional Municipality, Vaughan Township, and King Township.

2.4.2.2.2 Fieldwork

Agricultural land use data was collected through observations made during roadside reconnaissance surveys and field surveys conducted in Summer and Fall of 2023 and referenced previously collected agricultural land use data for the Project. Data collected included the identification of land use (both agricultural and non-agricultural), the documentation of the location and type of agricultural facilities/services, the location of non-farm residential units and the location of non-farm buildings (businesses, storage facilities, industrial, commercial and institutional usage).

Agricultural land use designations were correlated to the Agricultural Resource Inventory (OMAFA report and maps) (OMAFA, 1983) and the information provided in the Agricultural System Portal (OMAFA, 2022) for the purpose of updating the Land Use Systems mapping for both the PSA and SSA.

2.4.2.3 Summary of Environmental Conditions

Key details and findings regarding the agricultural lands and resources are split by PSA and SSA as detailed below.

Primary Study Area

The PSA, in its entirety, comprised approximately 1,566.6 ha based on a GIS assessment. The portion of the PSA that is located within the Prime Agricultural Areas as defined in the respective Regional Official Plans is approximately 781.9 ha.

The PSA (in its entirety, and within the Prime Agricultural Area designations) consisted of a variety of land uses including, but not limited to, built-up/disturbed areas, common field crops, forage/pasture lands, nursery stock, open field, orchard lands, railway lands, water (ponded areas), scrubland, and woodland areas.

The portion of the PSA that was located within the designated Prime Agricultural Areas comprised existing land use of approximately 17.0% as built up/disturbed areas, 54.9% as common field crop (soybean, corn), 5.8% as forage/pasture lands, 0.2% as market garden, 1.4% as open field areas, 0.0% as railway, 3.8% as scrubland, 14.1% as small grains, <0.1% as water, and 2.8% as woodland areas.

There were 52 agricultural buildings (including buildings that may be capable of housing livestock) within the entire PSA.

The construction and operation of the Project will result in the loss of 781.9 ha of lands that have been designated as Prime Agricultural Area. The impact to agriculture is the loss of the Prime Agriculture Area lands. Due to the nature of the construction and operation of the Project, this impact (loss of Prime Agriculture lands) cannot be avoided or mitigated.

Secondary Study Area

The SSA, in its entirety, comprised approximately 16,170.0 ha based on a GIS assessment. The portion of the SSA that is located within the Prime Agricultural Areas as defined in the respective Regional Official Plans is approximately 6,948.8 ha.

The SSA (in its entirety, and within the Prime Agricultural Area designations) consisted of a variety of land uses including, but not limited to built-up/disturbed areas (including portions of the City of Mississauga, the City of Brampton, the urban area of Bolton), common field crops, forage/pasture lands, nursery stock, open field, orchard lands, railway lands, water (ponded areas), scrubland, and woodland areas.

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The portion of the SSA that was located within the designated Prime Agricultural Areas comprised existing land use of approximately, 14.3% as built up/disturbed areas, 55.9% as common field crop (soybean, corn), 7.2% as forage/pasture lands, 0.5% as golf course, 0.8% as market garden, 2.3% as open field areas, 0.2% as railway, 2.2% as scrubland, 12.0% as small grains, 0.1% as water, and 4.5% as woodland areas.

A total of 621 agricultural buildings (including buildings that may be capable of housing livestock) were located in the SSA.

The construction and operation of the Project will not result in the loss of agricultural lands within the SSA.

Canada Land Inventory Class

The OMAFA document "Classifying Prime and Marginal Agricultural Soils and Landscapes: Guidelines for Application of the Canada Land Inventory in Ontario" (2021) defines the CLI classification as follows:

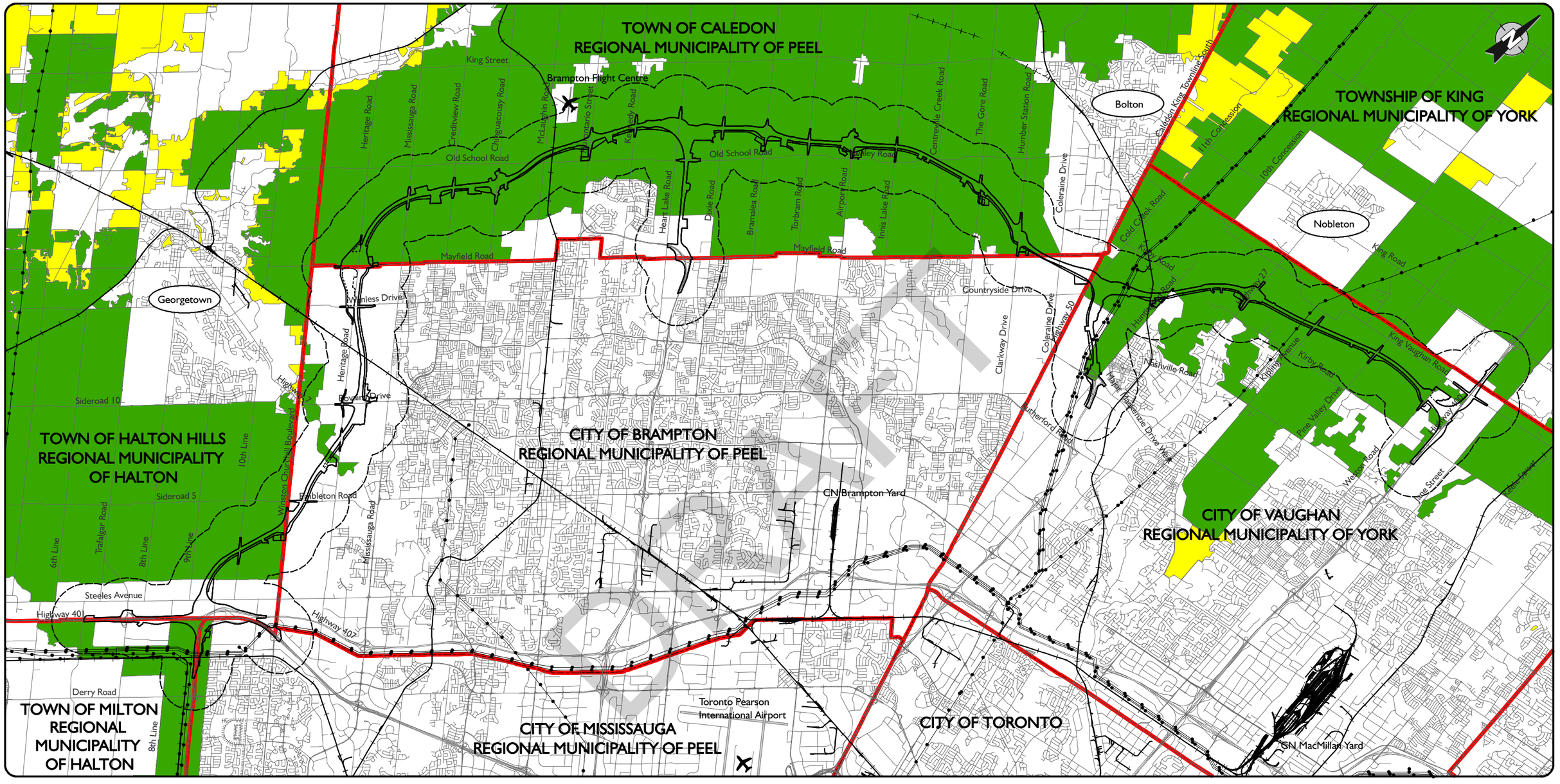
- **Class 1:** Soils in this class have no significant limitations in use for crops. Soils in Class 1 are level to nearly level, deep, well to imperfectly drained and have good nutrient and water holding capacity. They can be managed and cropped without difficulty. Under good management they are moderately high to high in productivity for the full range of common field crops.
- **Class 2:** Soils in this class have moderate limitations that reduce the choice of crops or require moderate conservation practices. These soils are deep and may not hold moisture and nutrients as well as Class 1 soils. The limitations are moderate and the soils can be managed and cropped with little difficulty. Under good management they are moderately high to high in productivity for a wide range of common field crops.
- **Class 3:** Soils in this class have moderately severe limitations that reduce the choice of crops or require special conservation practices. The limitations are more severe than for Class 2 soils. They affect one or more of the following practices: timing and ease of tillage; planting and harvesting; choice of crops; and methods of conservation. Under good management these soils are fair to moderately high in productivity for a wide range of common field crops.
- **Class 4:** Soils in this class have severe limitations that restrict the choice of crops, or require special conservation practices and very careful management, or both. The severe limitations seriously affect one or more of the following practices: timing and ease of tillage; planting and harvesting; choice of crops; and methods of conservation. These soils are low to medium in productivity for a narrow to wide range of common field crops, but may have higher productivity for a specially adapted crop.
- **Class 5:** Soils in this class have very severe limitations that restrict their capability to producing perennial forage crops, and improvement practices are feasible. The limitations are so severe that the soils are not capable of use for sustained production of annual field crops. The soils are capable of producing native or tame species of perennial forage plants and may be improved through the use of farm machinery. Feasible improvement practices may include clearing of bush, cultivation, seeding, fertilizing or water control.
- **Class 6:** Soils in this class are unsuited for cultivation but are capable of use for unimproved permanent pasture. These soils may provide some sustained grazing for farm animals, but the limitations are so severe that improvement through the use of farm machinery is impractical. The terrain may be unsuitable for the use of farm machinery, or the soils may not respond to improvement, or the grazing season may be very short.
- **Class 7:** Soils in this class have no capability for arable culture or permanent pasture. This class includes marsh, rockland and soil on very steep slopes.

The PSA comprised approximately 89.7% CLI capability of Class 1 – 3, with approximately 71.0% as Class 1, 5.6% as Class 2, and 13.1% as Class 3. Approximately 4.5% of the PSA was Class 4 lands, with approximately 5.6% as Class 5. The remaining 0.2% of the lands were not rated and included organic soils and urban areas, as based on the digital OMAFA soils dataset.

The SSA comprised approximately 83.7% CLI capability of Class 1 – 3, with approximately 66.0% as Class 1, 7.7% as Class 2, and 10.0% as Class 3. Approximately 5.0% of the SSA was Class 4 lands, with approximately 8.1% as Class 5, and approximately 0.1% as Class 6 lands. The remaining 3.1% of the lands were not rated and included organic soils, water, and urban areas, as based on the digital OMAFA soils dataset.

Features of the existing Agricultural Study Area are identified in **Figure 2-10**. Potential impacts and associated mitigation measures are outlined in **Chapter 5.**

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TOWN OF CALEDON
REGIONAL MUNICIPALITY OF PEEL
TOWNSHIP OF KING
REGIONAL MUNICIPALITY OF YORK
TOWN OF HALTON HILLS
REGIONAL MUNICIPALITY
OF HALTON
CITY OF BRAMPTON
REGIONAL MUNICIPALITY OF PEEL
CITY OF VAUGHAN
REGIONAL MUNICIPALITY OF YORK
TOWN OF MILTON
REGIONAL
MUNICIPALITY
OF HALTON
CITY OF MISSISSAUGA
REGIONAL MUNICIPALITY OF PEEL
CITY OF TORONTO
Georgetown
Bolton
Nobleton
Brampton Flight Centre
CN Brampton Yard
CN MacMillan Yard
Toronto Pearson
International Airport
King Street
Old School Road
Mayfield Road
Countryside Drive
Steeles Avenue
Derry Road
Sideroad 10
Sideroad 5
Embleton Road
Wanless Drive
Rutherford Road
Nashville Road
Kirby Road
King Vaughan Road
Highway 401
Highway 407
Highway 50
Heritage Road
Mississauga Road
Creditview Road
Chinguacousy Road
McLaughlin Road
Ontario Street
Kennedy Road
Hurontario Street
Heart Lake Road
Dixie Road
Bramalea Road
Torbram Road
Airport Road
Innis Lake Road
Centreville Creek Road
The Gore Road
Humber Station Road
Coleraine Drive
Caledon King Townline South
11th Concession
10th Concession
Cold Creek Road
Kirby Road
Humber Station Road
Clarkway Drive
Major Mackenzie Drive West
Pine Valley Drive
Weston Road
Jane Street
Keele Street
Winston Churchill Boulevard
Trafalgar Road
10th Line
6th Line
8th Line
9th Line
Mississauga Road
Legend
Airports (MNR)
Hydro Line (MNR)
Primary Study Area (PSA)
Railway (MNR)
Active
Abandoned
Roads (MNR)
Municipal Boundary (MNR)
Runways (MNR)
Secondary Study Area (SSA)
Provinical Agricultural Land Base Legacy Mapping Designations
Candidate Area
Prime Agricultural Area
Specialty Crop Area
1:120,000

2.4.3 Landscape Composition

2.4.3.1 Background

Landscape features, both natural occurring and maintained landscapes, are considered to be existing landscape conditions including vegetation, views and viewsheds (a “viewshed” is defined as a geographic area visible from a specific vantage point. A “view” broadly applies to landscapes viewed from a broader area or group of areas), topography and landform.

A landscape composition assessment was completed for the project in accordance with the MTO (ERHD) Section 3.9 – Landscape Composition and includes:

- An examination of the existing landscape conditions including vegetation within the Preliminary Design ROW, topography and views, landform and land use.
- Identification of potential effects of the Project on significant vegetation, views and viewsheds, topography and landform.
- Plates and a description of the existing landscape composition and potential impacts related to:
  - Culturally significant landscape vegetation relative to long-term soil protection, water and air quality;
  - Landscape vegetation relative to fisheries potential;
  - Rare species;
  - Topography and landform;
  - Visual environment;
  - Visual impacts of noise attenuation treatments;
  - Socio-economic conditions based on views of the Project; and
  - Cultural heritage features.
- Recommendations and mitigation strategies, considering input from other disciplines related to vegetation, wildlife, cultural heritage and the socio-economic conditions.

The scope of landscape work on the Project also involves designing and implementing green spaces, managing stormwater through potential Low Impact Development (LID) measures, identifying opportunities to preserve and enhance natural habitats, and identifying opportunities to commemorate cultural heritage along the corridor. The Project aims to balance infrastructure development with environmental sustainability by integrating natural elements into the highway design, to be carried forward in Detail Design.

2.4.3.2 Data Collection

2.4.3.2.1 Desktop Review

The following background documents were reviewed in the undertaking of the landscape composition assessment:

- Aerial Imagery and Google Street View;
- Highway 413 Technically Preferred Alignment Mapping (2020);
- Cultural Heritage Assessment Report: Built Heritage Resources and Cultural Heritage Landscape (CHAR) (2024);
- Ecosystem Services Assessment (2015);
- Documentation prepared during the evaluation of alignments (as discussed in **Chapter 3**);
- Groundwater Assessment Report (2024);
- Land Use Report (2024); and
- MTO Environmental Reference for Highway Design (2013).

2.4.3.2.2 Fieldwork

Information collected during field reviews by other disciplines was used in the development of the landscape composition assessment.

2.4.3.3 Summary of Environmental Conditions

The landscape composition assessment includes a summary of key existing conditions from a variety of relevant environmental discipline studies, including:

- The Project traverses the Peel Plain and South Slope physiographic regions, characterized by flat to gently rolling terrain with clay-rich soils.
- The Project intersects watersheds including Sixteen Mile Creek, Credit River, Etobicoke Creek, Humber River (Main and East), and Robinson Creek.

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- Several areas contain floodplains, alluvium deposits, and valley systems with ecological significance.
- The land use character is dominated by agricultural lands, rural residential properties, and scattered woodlots, and includes urban expansion zones, protected countryside under the Greenbelt Plan, and designated employment areas.
- Scenic views are common, especially near river valleys and cultural heritage landscapes.
- The Project lies within the Great Lakes-St. Lawrence Forest Region, with typical species such as sugar maple, beech, oak, birch, and pine.
- Numerous woodlands, Provincially Significant Wetlands (PSWs), Locally Significant Wetlands (LSWs), and unevaluated wetlands are present.
- Some areas contain large contiguous forest blocks, while others have fragmented or early successional vegetation.
- Watercourses include warmwater to coldwater systems, supporting diverse fish communities.
- Some tributaries are ephemeral or intermittent, with varying sensitivity levels.
- The Project intersects numerous built heritage resources (BHRs) and cultural heritage landscapes (CHLs). These include designated heritage homes, cemeteries, historic farmsteads, and river corridors.

Landscape design elements and recommendations determined based on community input and consultation as well as information on landscape treatments are further outlined in **Appendix C**-Community Value Plan (see **Section 5.2.3** for further details).

Potential impacts and associated mitigation measures pertaining to landscape composition are outlined in **Chapter 5**.

2.4.4 Noise

2.4.4.1 Background

Guiding the collection of existing conditions and preliminary noise impacts, MTO has two current guidelines and documents related to assessing highway traffic noise impacts, namely:

- Environmental Guide for Noise (MTO, 2022); and
- Environmental Reference for Highway Design (MTO, 2013).

These guidelines apply to the design and construction of new provincial highways, and the expansion of existing provincial highways. The Environmental Guide for Noise (MTO, 2022) includes guidance on how sound from highway traffic and related construction activity is to be assessed and how mitigation measures are considered.

Sound impacts are assessed by comparing the future sound levels with and without the Project. Sound levels are evaluated as 24-hour equivalent sound level based on the Average Annual Daily Traffic (AADT). If the predicted changes are equal to or greater than 5 dBA, or if the future sound levels with the Project are equal to or greater than 65 dBA, mitigation efforts within the ROW need to be investigated. The applicable method under MTO guidelines (MTO 2022, Version 2.0) is to be considered to investigate the feasibility of noise mitigation barriers at impacted NSAs due to new highways or the expansion of existing highways.

MTO Guidelines classifies “Traditional NSAs” as any of the following land uses which also have an Outdoor Living Area (OLA). An OLA is an area at ground level, adjacent to an NSA, intended and designed for the enjoyment of the outdoor environment and readily accessible from the building. For example, a backyard, swimming pool or tennis court:

- Private homes such as single-family residences (owned or rental);
- Townhouses (owned or rental);
- Multiple unit buildings, such as apartments with OLAs for use by all occupants; and
- Hospitals, nursing homes for the aged (long-term care homes), where there are OLAs for the patients.

Land uses without an OLA, such as apartments, commercial and industrial buildings are not considered an NSA. There is no minimum number of land uses that define an NSA.

Special Land Use NSAs are in addition to Traditional NSAs but are only considered for mitigation should Traditional NSAs pass all feasibility criteria. Such special land uses include:

- Educational facilities and day care centres, where there are OLA’s for students;
- Campgrounds that provide overnight accommodation;
- Hotels/motels where there are OLAs (i.e., swimming pool area, etc.) for visitors;
- Community centres with OLAs (e.g., outdoor basketball courts, etc.);
- Municipal parks (excluding golf courses and trails); and
- Places of worship with OLAs.

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Mitigation will be investigated if either the absolute sound criteria of 65 dBA or the relative sound increase of 5 dBA is predicted. The determination of whether mitigation is provided must be based on the review of technical, economical, and administrative feasibility as outlined in the Environmental Guide for Noise (MTO, 2022). Noise mitigation measures typically consist of noise barrier walls, berms, or a combination of both. Moreover, when a barrier is warranted under MTO guidelines, the barrier is constructed using specific materials included under MTO's Designated Sources for Materials list.

2.4.4.2 Data Collection

2.4.4.2.1 Desktop Review

The assessment of potential noise impacts is based on two fundamental noise models:

- Future Build (FB) – A prediction of noise levels at NSAs 10 years after the construction of the Project. The FB model incorporates predicted traffic flows along the existing highways, arterials roads and the proposed highway including all ramps and interchanges. Topographic information included in the FB model includes elevations for associated roadway elements such as Highway 413, the Highway 410 and Highway 427 Extensions, ramps and interchanges; and
- Future No-Build (FNB) – as above without the Project being constructed. The FNB model incorporates predicted future traffic flows along existing highways and arterial roads. Topographic information has also been included in the FNB model.

NSAs within the area of investigation have been identified using satellite imagery, online street photographs and other available mapping. During the review of NSAs a number of developments currently under construction were identified where NSAs have been identified based on the proposed development layouts.

For any other future residential developments, the developers would be responsible for addressing noise impacts upon the future/proposed development.

MTO provides guidance on deciding whether mitigation measures should be investigated at an NSA, as shown in **Table 2-4.**

Table 2-4: MTO Guidance – Mitigation Effort Required

Change in Noise Level due to the Project/Projected Future Build Noise Levels	Mitigation Effort Required
< 5 dB change AND < 65 dBA	■ None
≥ 5 dB change OR ≥ 65 dBA	■ Investigate noise control measures within MTO ROW. ■ Introduce noise control measures within ROW and mitigate to FNB noise levels if technically, economically, and administratively feasible. ■ Noise control measures, where introduced, should achieve a minimum of 5 dBA attenuation averaged over first row receptors.

Note:
Values from the assessment shall be rounded to the nearest whole number before being compared to the above.

The Guide (2022) further states that mitigation must be technically, economically, and administratively feasible as described in **Table 2-5**. Should mitigation not pass one or more of the feasibility criteria then it will be deemed not warranted.

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Table 2-5: MTO Guidance – Noise Mitigation Feasibility Considerations

Consideration	Action
Technical Feasibility	Review the constructability of the noise mitigation (i.e., design of wall, roadside safety, shadow effect, topography, ability to provide a continuous barrier). The proposed mitigation option must achieve a minimum 5 dB sound-level reduction averaged over the first row of receptors to be considered technically feasible.
Economic Feasibility	Carry out a cost-benefit assessment of the noise mitigation (i.e., determine cost per benefitted unit).
Administrative Feasibility	Determine the ability to locate the noise mitigation on lands within public ownership (i.e., provincial or municipal right-of-way) and within project constraints.

Notes:

[1] A benefitted receptor receives a minimum of 5 dB reduction in noise regardless of which row it is in or its absolute noise level.

[2] Values shall be rounded to the nearest whole number before being compared to the above.

Technical Feasibility: Any barrier considered should be assumed to be the highest permitted by MTO (i.e., 5 m). The length of noise walls is generally determined by applying a minimum 3:1 ratio to the distance between the noise wall and each end NSA.

The barrier that achieves technical feasibility is one that provides an average of at least 5 dB of reduction to the first-row receptors.

Economic Feasibility: A cost-benefit analysis should be undertaken for any noise mitigation to establish a cost per benefitted receptor. A receptor shall be considered benefitted if the barrier provides at least 5 dB reduction due to noise mitigation. A barrier is not typically considered economically feasible if the cost per benefitted receptor exceeds $125,000 per receptor.

Administrative Feasibility: The position of any noise mitigation should be located upon lands within public ownership within the constraints of the Project. This includes areas of provincial or municipal ROW. Noise mitigation on private lands is not considered administratively feasible.

2.4.4.2.2 Fieldwork

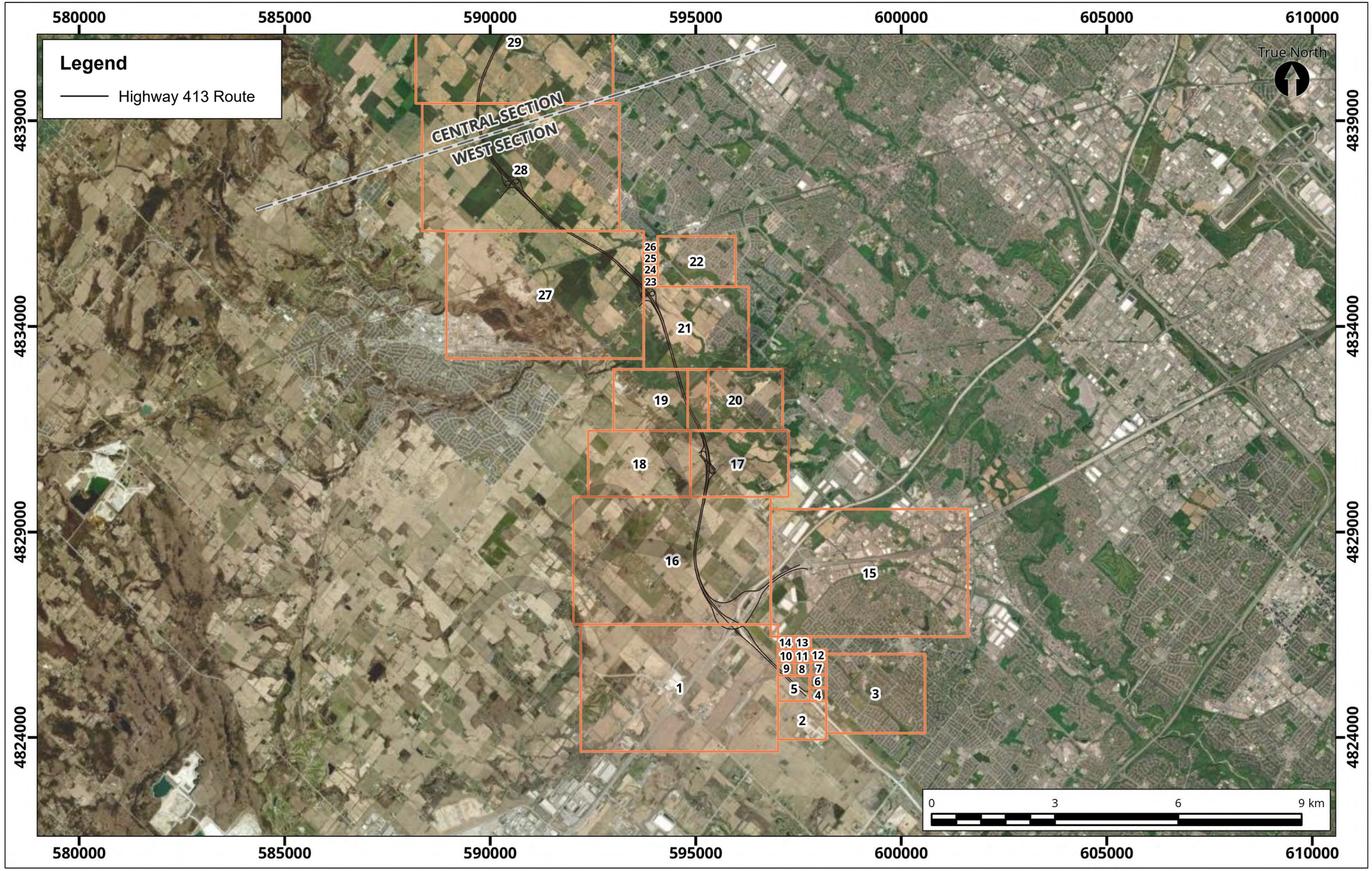
Noise analysis is conducted using mapping and traffic forecasts to develop a noise model. Field investigations were not required as part of this analysis.

2.4.4.3 Summary of Environmental Conditions

Out of the 70 modelled NSAs, approximately 57 NSAs have been identified as requiring the consideration of noise mitigation measures.

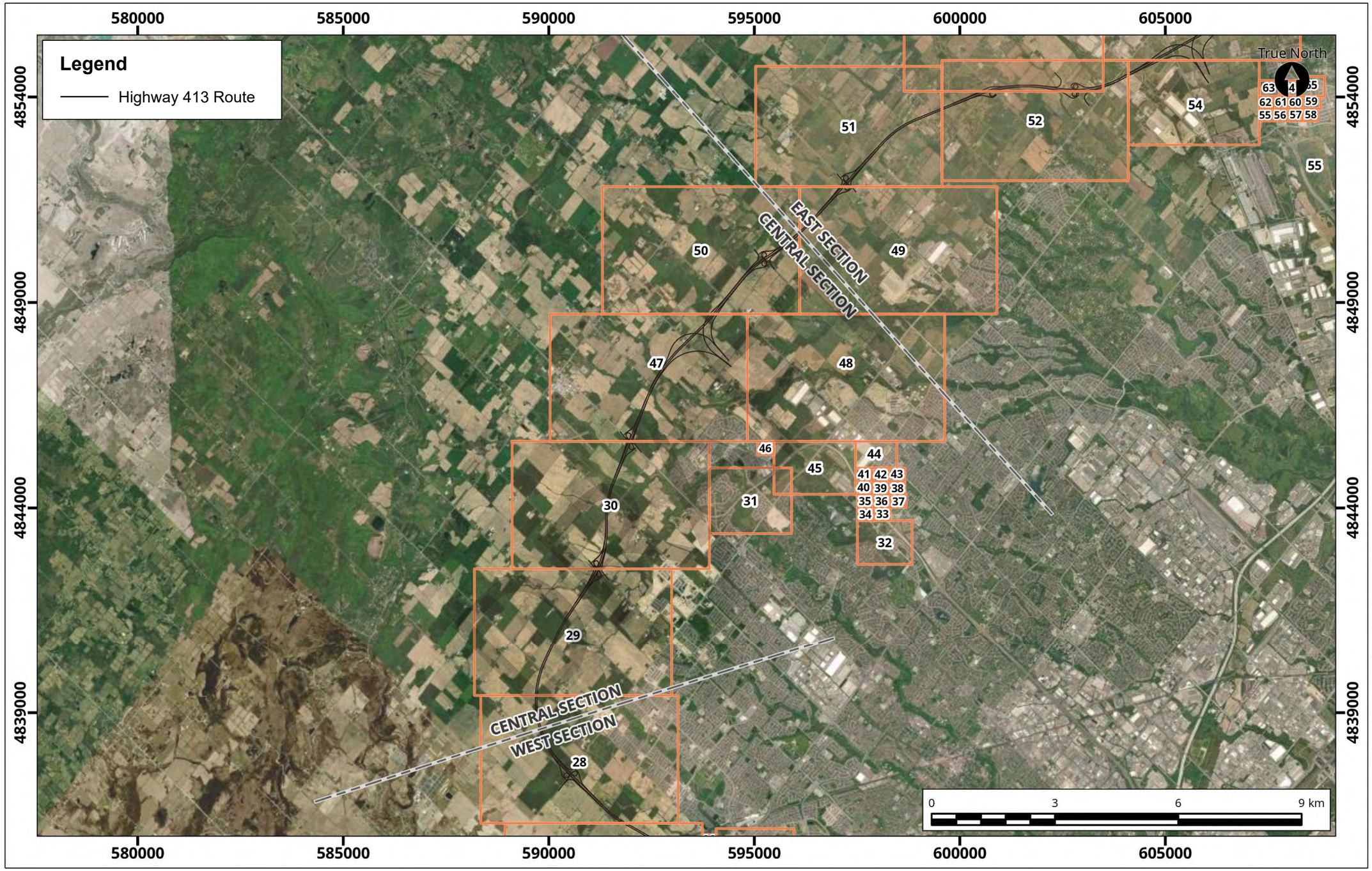
Modelled noise NSAs within the Study Area are identified in **Figure 2-11**. Potential impacts and associated mitigation measures are outlined in **Chapter 5**.

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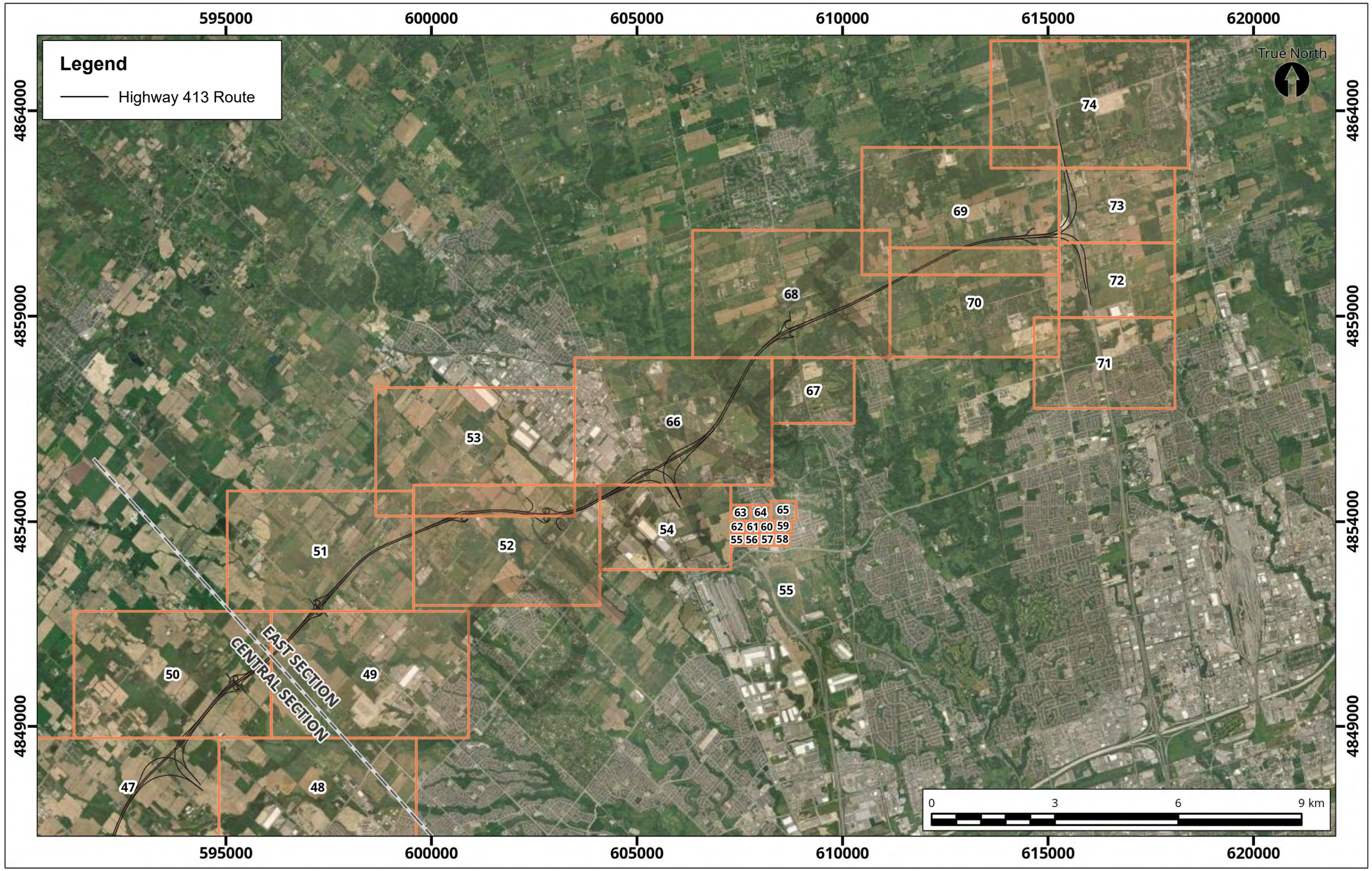


Service Layer Credits: Province of Ontario, Esri Canada, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, NRCan, Parks Canada

Figure 2-11
Modelled NSA Receptors



Service Layer Credits: Province of Ontario, Esri Canada, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, NRCan, Parks Canada



Service Layer Credits: Province of Ontario, Esri Canada, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, NRCan, Parks Canada

Figure 2-11
Modelled NSA Receptors

2.4.5 Air Quality

2.4.5.1 Background

An Air Quality assessment was completed which follows the MTO Environmental Guide for Assessing and Mitigating the Air Quality Impacts and Greenhouse Gas Emissions of Provincial Transportation Projects (May 2020) (the "MTO Air Quality Guide") as described below.

Vehicular traffic produces a variety of air contaminants which can adversely affect air quality, from fuel combustion inside the engine, evaporation of fuel from the tank, brake and tire wear, and re-entrainment of loose particles on the road surface as the vehicle travels over the road surface. The following key contaminants were assessed in accordance with the MTO Air Quality Guide (2020):

- Particulate Matter less than 2.5 microns ($PM_{2.5}$);
- Particulate Matter less than 10 microns (PM_{10});
- Carbon Monoxide (CO);
- Nitrogen Dioxide (NO_2);
- Benzo(a)pyrene;
- Acetaldehyde;
- Acrolein;
- Formaldehyde;
- Benzene; and
- 1,3-Butadiene.

Background concentration levels of these contaminants establish the baseline for local air quality within the Study Area. The background concentrations are added to any model-predicted contributions from vehicular traffic to determine the cumulative concentrations from the Project and all other sources. The comparison made is between "Future Build" (modelled results with the Project) and "Future No-Build" (modelled results without the project) for the same year (i.e., in 2041 or in 2051).

Potential impacts of these cumulative concentrations are inferred through comparison to the Ambient Air Quality Criteria (AAQC) established by MECP (2020) and the Canadian Ambient Air Quality Standards (CAAQS) established by the Canadian Council of Ministers of the Environment (CCME) (2025). The CAAQS (2025) were developed for use by provinces and territories to guide air zone management actions. They are not project-level regulatory standards, and they are not to be considered as "pollute-up-to" levels. Increasing contaminant levels when compared to the AAQC (2020) and CAAQS (2025) may lead to increasing air quality management actions.

2.4.5.2 Data Collection

2.4.5.2.1 Desktop Review

MECP has established Ontario AAQC (2020) for airborne concentrations of the key air contaminants considered in this assessment. The CCME has established CAAQS (2025) for $PM_{2.5}$, and NO_2. The AAQCs (2020) and CAAQS (2025) are collectively referred to as air quality thresholds, and these thresholds are summarized in **Table 2-6**.

Table 2-6: Summary of Relevant Air Quality Thresholds

Contaminant	Averaging Period	Threshold (µg/m^3)	Source [5]
$PM_{2.5}$	24-hour	27	AAQC/CAAQS 2020 [1]
$PM_{2.5}$	24-hour	23	CAAQS 2030 [1]
$PM_{2.5}$	Annual	8.8	AAQC/CAAQS 2020 [2]
$PM_{2.5}$	Annual	8.0	CAAQS 2030 [2]
PM_{10}	24-hour	50	AAQC
CO	1-hour	36,200	AAQC
CO	8-hour	15,700	AAQC
NO_2	1-hour	400	AAQC
NO_2	1-hour	83.1	CAAQS 2025 [3]
NO_2	24-hour	200	AAQC
NO_2	Annual	23.7	CAAQS 2025 [4]
Benzo(a)pyrene	24-hour	5.0E-05	AAQC
Benzo(a)pyrene	Annual	1.0E-05	AAQC

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Contaminant	Averaging Period	Threshold (µg/m^3)	Source [5]
Acetaldehyde	0.5-hour	500	AAQC
Acetaldehyde	24-hour	500	AAQC
Acrolein	1-hour	4.5	AAQC
Acrolein	24-hour	0.4	AAQC
Formaldehyde	24-hour	65	AAQC
Benzene	24-hour	2.3	AAQC
Benzene	Annual	0.45	AAQC
1,3-Butadiene	24-hour	10	AAQC
1,3-Butadiene	Annual	2	AAQC

Notes:

[1] The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations.

[2] The 3-year average of the annual average concentrations.

[3] The 3-year average of the annual 98th percentile daily maximum 1-hour average concentrations. Threshold converted from ppb to µg/m^3 at 10ºC and 101.325 kPa.

[4] The average over a single calendar year of all the 1-hour average concentrations. Threshold converted from ppb to µg/m^3 at 10ºC and 101.325 kPa.

[5] Ontario Ambient Air Quality Criteria (AAQC) from https://www.ontario.ca/page/ontarios-ambient-air-quality-criteria, accessed July 1, 2025.

Ambient background data for each key contaminant were obtained from representative air quality monitoring stations within the Environment and Climate Change Canada (ECCC) National Air Pollution Surveillance (NAPS) Program and MECP ambient air monitoring station network. Although current land use in the Study Area is predominantly rural, there are sections having low- to medium- density residential, commercial development, and industrial activity with the expectation that development will increase within proximity to the Project. Therefore, a review of air quality monitoring stations that are representative of this land use and have relevant data for the key contaminants was completed.

The NAPS monitoring station locations considered in this study are summarized in **Table 2-7**.

Table 2-7: NAPS Stations Used as Sources of Background Monitoring Data

Contaminant	NAPS ID and Location	Years Included
$PM_{2.5}$	60450 – BRAMPTON	2018, 2019, 2020, 2021, 2022
PM_{10} [1]	60450 – BRAMPTON	2018, 2019, 2020, 2021, 2022
CO	60440 – TORONTO NORTH - DOWNSVIEW	2018, 2019, 2020, 2021, 2022
NO_2	60450 – BRAMPTON	2018, 2019, 2020, 2021, 2022
Benzo(a)pyrene [2]	60427 – GAGE INSTITUTE 60439 – ROADSIDE - WALLBERG (UofT) 60430 – TORONTO WEST-125 RESOURCES ROAD	2014 2015 2016, 2017, 2018
Acetaldehyde [2]	60439 – ROADSIDE - WALLBERG (UofT)	2014, 2015, 2016, 2017
Acrolein [2]	60439 – ROADSIDE - WALLBERG (UofT)	2014, 2015, 2016, 2017
Formaldehyde [2]	60439 – ROADSIDE - WALLBERG (UofT)	2014, 2015, 2016, 2017
Benzene [3]	65101 – EAGLE ST. & McCAFFREY RD. NEWMARKET	2017, 2018, 2019, 2020, 2022
1,3-Butadiene [3]	65101 – EAGLE ST. & McCAFFREY RD. NEWMARKET	2017, 2018, 2019, 2020, 2022

Notes:

[1] PM_{10} background data is based on $PM_{2.5}$.

[2] Most recent data available at this station.

[3] No data for 2021 at this station.

For NO_2 and ozone (O_3), hourly monitoring data were available for the local Brampton monitoring station that allowed estimation of background concentration by hour of day. Project contribution of ozone was not assessed against air quality thresholds, but background ozone concentrations were used for converting nitrogen oxides (NO_x) to NO_2 using the Ozone Limiting Method (OLM). As background concentrations vary widely from day to day, a 90th percentile concentration was calculated for each hour of the day using 5 years of hourly monitoring data from 2019 to 2023, as

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this represents the most recent data set available and matches the time span of meteorological data provided by MECP (2024). The resulting background concentrations reflect the highest likely background levels expected to coincide with peak roadway-related concentrations. These values were applied to predict the maximum 1-hour and 24-hour cumulative concentrations of NO_2.

PM_{10} monitoring data were not available; therefore, PM_{10} background concentrations were estimated from the $PM_{2.5}$ values using a $PM_{2.5}/PM_{10}$ ratio of 0.54 (Lall et. al., 2004).

Emissions from vehicular traffic were estimated using U.S. EPA's MOVES4 model, accounting for vehicle mix, traffic volumes, and roadway characteristics. The resulting emission rates were used as inputs to AERMOD, the approved dispersion model under MECP guidance (2017), to predict the ambient concentrations for each contaminant. The modelling considered local meteorological conditions, terrain, and receptor locations, and included worst-case scenarios to account for potential seasonal variability in dispersion. Model-predicted concentrations are added to background concentrations, and the resulting cumulative concentrations are compared against the Air Quality Thresholds shown in **Table 2-6**. Construction emissions were also assessed using a similar modelling methodology based on MOVES emission factors for non-road equipment, and anticipated equipment activity during the construction of highway surfaces and major and minor bridges.

Meteorological data from 2019 to 2023 was provided by MECP for five monitoring stations. To align with these datasets, the Air Quality Impact Assessment Study Area was divided into five corresponding subsections, each associated with one of the meteorological stations. Overlap between adjacent subsections was included to ensure that transitional meteorological influences on dispersion were appropriately captured.

A combination of interactive GIS maps and satellite imagery were used to determine the locations of all representative sensitive receptors (e.g., residential dwellings) and critical receptors (e.g., retirement homes, hospitals, childcare centres, schools) within the Study Area. Future residences that have been publicly approved at the time the air quality assessment commenced have been included.

Terrain information for the Study Area was obtained from the Regional Meteorological and Terrain Data for Air Dispersion Modelling website of the MECP (2024).

2.4.5.2.2 Fieldwork

Air quality analysis is conducted using mapping and monitoring data to develop an air quality model. Field investigations were not required as part of this analysis.

2.4.5.3 Summary of Environmental Conditions

Table 2-8 presents a summary of background concentrations of the various air contaminants for averaging periods appropriate for comparison with relevant ambient air quality thresholds. These concentrations represent 90th percentile values which were added to model-predicted concentrations from project-related emissions to conduct the assessment of the impacts of the Project.

Table 2-8: 90th Percentile Background Concentrations of Transportation Related Contaminants for the Corresponding Averaging Period

Contaminant	Averaging Period	Background Concentration (µg/m^3)
$PM_{2.5}$	24-hour	12.2
$PM_{2.5}$	24-hour	12.2
$PM_{2.5}$	Annual	7.0
PM_{10}	24-hour	22.6
CO	1-hour	349
CO	8-hour	362
NO_2	1-hour	35.0
NO_2	24-hour	29.4
NO_2	Annual	14.7
Benzo(a)pyrene	24-hour	9.1E-05
Benzo(a)pyrene	Annual	5.1E-05
Acetaldehyde	0.5-hour [1]	4.43
Acetaldehyde	24-hour	1.5
Acrolein	1-hour [2]	0.15
Acrolein	24-hour	0.06
Formaldehyde	24-hour	2.55
Benzene	24-hour	0.46

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Contaminant	Averaging Period	Background Concentration (µg/m^3)
Benzene	Annual	0.31
1,3-Butadiene	24-hour	0.03
1,3-Butadiene	Annual	0.01

Notes:

[1] 0.5-hour average converted from 24-hour average background value following the method described in Section 4.4 of the Air Dispersion Modelling Guideline for Ontario (MECP, 2017).

[2] 1-hour average converted from 24-hour average background value following the method described in Section 4.4 of the Air Dispersion Modelling Guideline for Ontario (MECP, 2017).

Sensitive and critical receptors within the Study Area are identified in **Figure 2-12**. Potential impacts and associated mitigation measures are outlined in **Chapter 5**.

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Figure 2-12
Sensitive and Critical Receptors Within the Study Area



Service Layer Credits: World Imagery: Peel Region, Maxar, Earthstar Geographies World Topographic Map: Esri, Tom Tom, Garmin, FAD, NOAA, USGS, ©OpenStreetMap Contributors, and the GIS User Community World Hillshade: Esri, CGIAR, USGS

Figure 2-12
Sensitive and Critical Receptors Within the Study Area



Service Layer Credits: World Imagery: Peel Region, Maxar, Earthstar Geographies World Topographic Map: Esri, Tom Tom, Garmin, FAD, NOAA, USGS, ©OpenStreetMap Contributors, and the GIS User Community World Hillshade: Esri, CGIAR, USGS

Figure 2-12
Sensitive and Critical Receptors Within the Study Area

2.4.6 Waste and Contaminated Property

2.4.6.1 Background

Waste and contaminated properties are sites affected by hazardous materials, chemical spills or residues from industrial processes, all of which can pose risks to human health and the environment.

A Contamination Overview Study (COS) (2020) for the Preliminary Design ROW and a peripheral 250 m buffer zone (collectively referred to as the 2020 COS Study Area) was completed in 2020 to assist in evaluating alignment alternatives. The objective of the 2020 COS was to identify properties or areas with potential environmental (contamination) concern that may impact the selection of an alignment and development of the Preliminary Design.

The COS (2020) followed MTO's Environmental Standards and Practices User Guide dated December 2006 (the User Guide). The purpose of the User Guide (MTO, 2006) is to provide guidance for managing environmental impacts of properties involved in transportation project design. The scope of work included research into the site history through the review of available aerial photographs, regulatory agency databases, municipal OPs and available environmental reports/documents, as well as a visual assessment of the COS (2020) Study Area from publicly accessible lands. The COS (2020) did not require interviews with property owners or occupants.

A data gap analysis was conducted in 2023 and identified the potential for contamination on properties and areas located within the Preliminary Design ROW and adjacent buffer lands that were not included within the previously completed 2020 COS Study Area footprint (WSP, 2024). A total of five additional property areas that were not included in the 2020 COS were identified and underwent review in accordance with the User Guide (MTO, 2006) including available background information, site reconnaissance and visual assessment (WSP and AECOM, 2024).

2.4.6.2 Data Collection

2.4.6.2.1 Desktop Review

Available data was reviewed to analyze and identify known or potential contaminated sites within the COS Study Area. This included the following sources:

- Historical aerial photographs of the Study Area for 1960, 1976, 1988 and 1994 to 2014 to verify the historical land uses and to help identify the likelihood of recognizable environmental conditions in connection with the subject properties;
- Historical insurance plans, specifically Fire Insurance Plans; and
- Environmental Risk Information Services (ERIS) database results (2014, 2019), created by federal and provincial governmental agencies and private sources, to evaluate whether activities within the COS Study Area have the potential to impact the properties.

2.4.6.2.2 Fieldwork

In addition to the desktop review, a drive-by windshield survey was conducted to analyze and identify known or potentially contaminated sites. Based on the information collected, data was further analyzed to evaluate the relative potential for and severity of contamination. Ratings of "high", "medium" or "low" potential for contamination were applied to the properties within the COS – Planning Phase Report (2024) Study Area. The analysis was generally based on current and historical land-use (sources of contamination); and on surficial geology, hydrogeology and topography (contaminant migration and sensitive receptors).

Ratings were assigned based on the land use, the potential likelihood and severity of contamination, and the estimate of relative risk, as defined in the MTO Environmental Guide for Contaminated Property Identification and Management (2006):

- **High Potential Properties**: Properties where land uses consist of industrial, historical orchards, current or historical waste disposal sites, waste transfer sites, automobile wrecking yards and fuel service stations. In addition, properties where significant spills were reported were also considered as high potential properties.
- **Medium Potential Properties**: Properties where land uses consist of commercial (with no evidence of significant potential contaminating activities such as fuel/chemical storage tanks); agricultural and landscaping activities; vehicle and equipment storage/repair; institutional facilities such as religious, educational and community centres; and railway corridors.
- **Low Potential Properties**: Properties where land uses consist of open space, residential, or agricultural areas that are not suspected of using/generating chemical compounds harmful to the environment or human health.

2.4.6.3 Summary of Environmental Conditions

Several properties of "high" environmental concern have been identified to be present within the Preliminary Design ROW. These include gas stations/service centres, waste disposal sites, waste transfer stations and orchards. Gas stations/service centres operate pump islands (i.e., underground storage tanks (USTs) for storing fuel), small storage areas and service areas for changing engine oil. Gasoline and diesel fuel are transferred from bulk container trucks to large USTs. Spills at transfer areas and pumps, along with overfilling of and leakage from the USTs, are potential sources of site contamination.

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Historical/operating waste disposal sites and waste transfer stations present a “high” environmental concern. Depending on the nature and deposition of wastes and hydrogeological conditions, soil and groundwater contamination are likely present within and in the immediate vicinity of waste disposal sites/waste transfer stations. Migration of the landfill leachate often occurs from waste disposal sites off-site. Soils within these sites are typically impacted with petroleum hydrocarbons, heavy metals, solvents and other compounds. In addition to the potential contamination issues, revoking and/or amending MECP environmental compliance approvals associated with these facilities can be onerous and time consuming.

Properties which had historical or present use of orchards are rated as having “high” potential of contamination due to the extensive use of pesticides. Properties identified within the Pesticide Registry are rated according to use and if use is unspecified, are given a rating of “high”. Pesticide vendors (e.g., pesticide retailer on the property) are rated as having “medium” potential of contamination. Pesticide operators are generally rated as “low”, due to the fact the pesticides are often used elsewhere (e.g., landscaping company). Industrial properties have relatively “high” potential of contamination and the extent of contamination is likely more severe due to the industrial processes and materials involved.

Commercial properties, which do not involve industrial processes or deal with large amounts of chemicals or storage tanks, are given a relative moderate “medium” risk rating. Similarly, institutional facilities such as churches, public schools and community services are ranked as “medium”, unless specifically indicated to be known for contamination, which will then be ranked as “high”.

Most of the residential and agricultural properties present in the Preliminary Design ROW have a relatively “low” potential for contamination. Any potential contaminating activity associated with these properties would be related to potential historical leaking from private fuel USTs or on-site vehicle repair which would be expected to be very localized in nature.

Contamination potential rankings are identified in **Figure 2-13**. Potential impacts and associated mitigation measures are outlined in **Chapter 5**.

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KEY MAP



SCALE: 1:750,000

LEGEND

STUDY AREA

PROPERTIES WITH POTENTIAL ENVIRONMENTAL CONCERNS

LOW

MEDIUM

HIGH

0 250 500 1,000

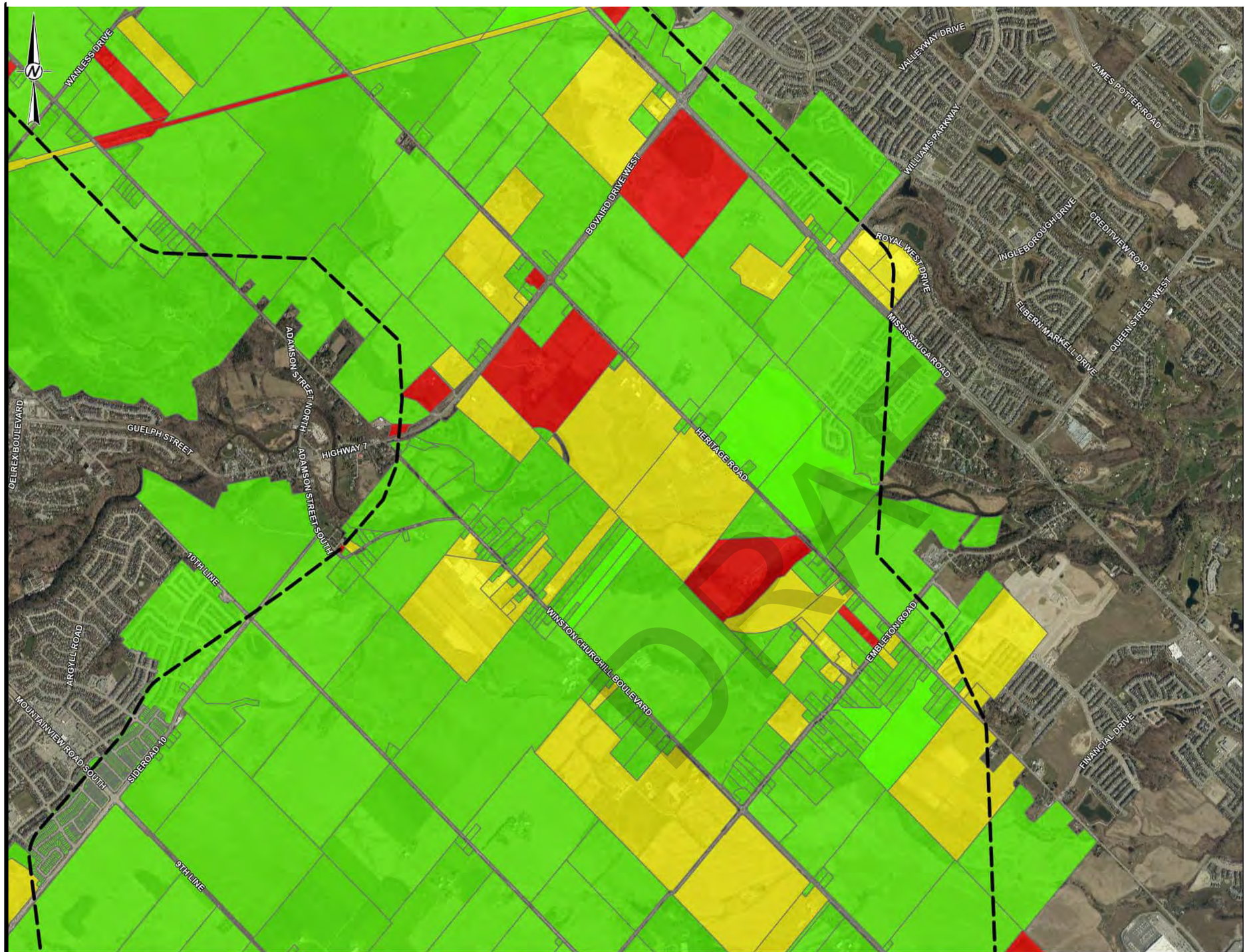
1:25,000 METRES

Ontario

WSP AECOM

Highway 413 Environmental Impact Assessment Report

Figure 2-13
Contamination Potential Ratings



KEY MAP



SCALE: 1:750,000

LEGEND

STUDY AREA

PROPERTIES WITH POTENTIAL ENVIRONMENTAL CONCERNS

- LOW
- MEDIUM
- HIGH

0 250 500 1,000

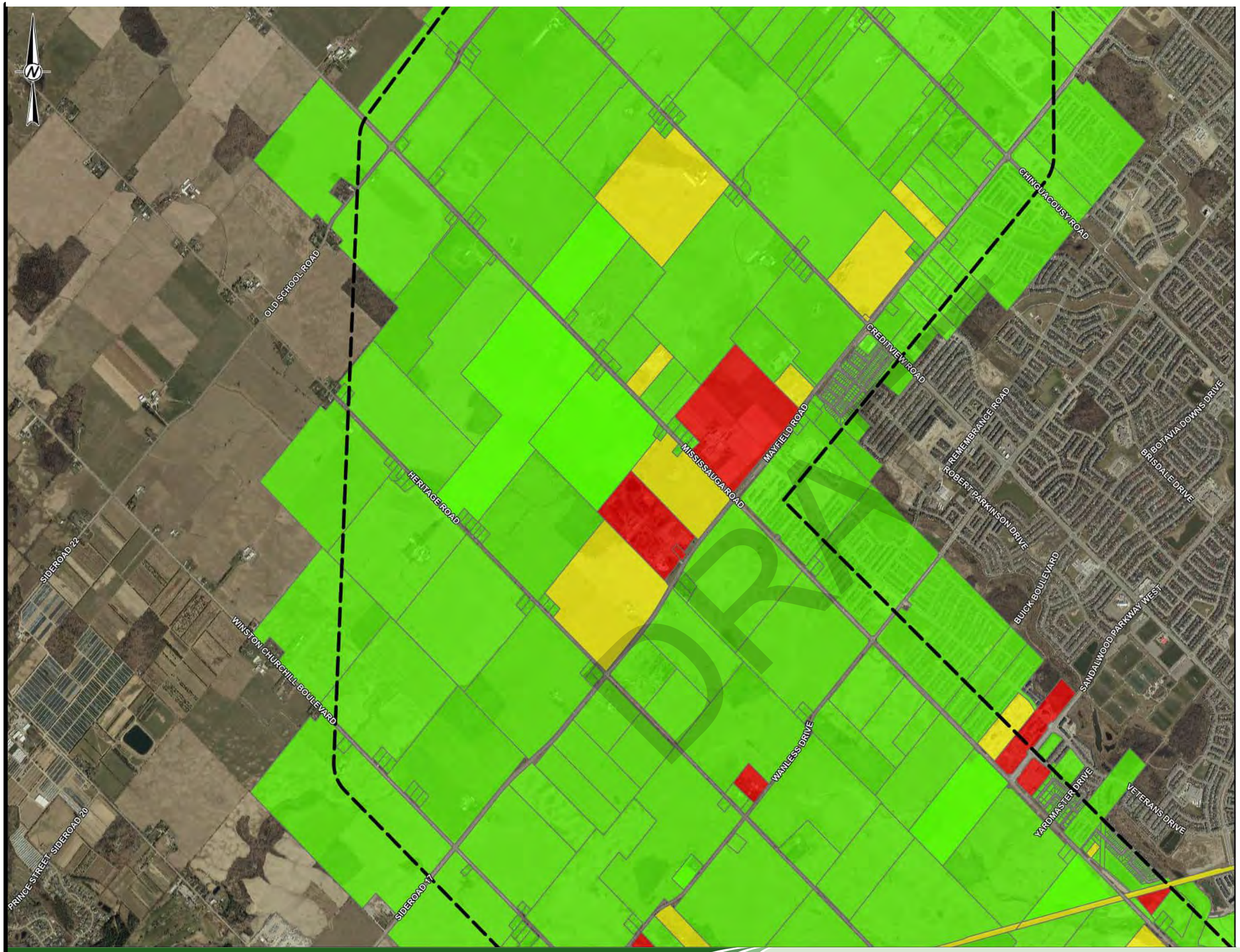
1:25,000 METRES

Ontario

WSP AECOM

Highway 413 Environmental Impact Assessment Report

Figure 2-13
Contamination Potential Ratings



KEY MAP



SCALE: 1:750,000

LEGEND

STUDY AREA

PROPERTIES WITH POTENTIAL ENVIRONMENTAL CONCERNS

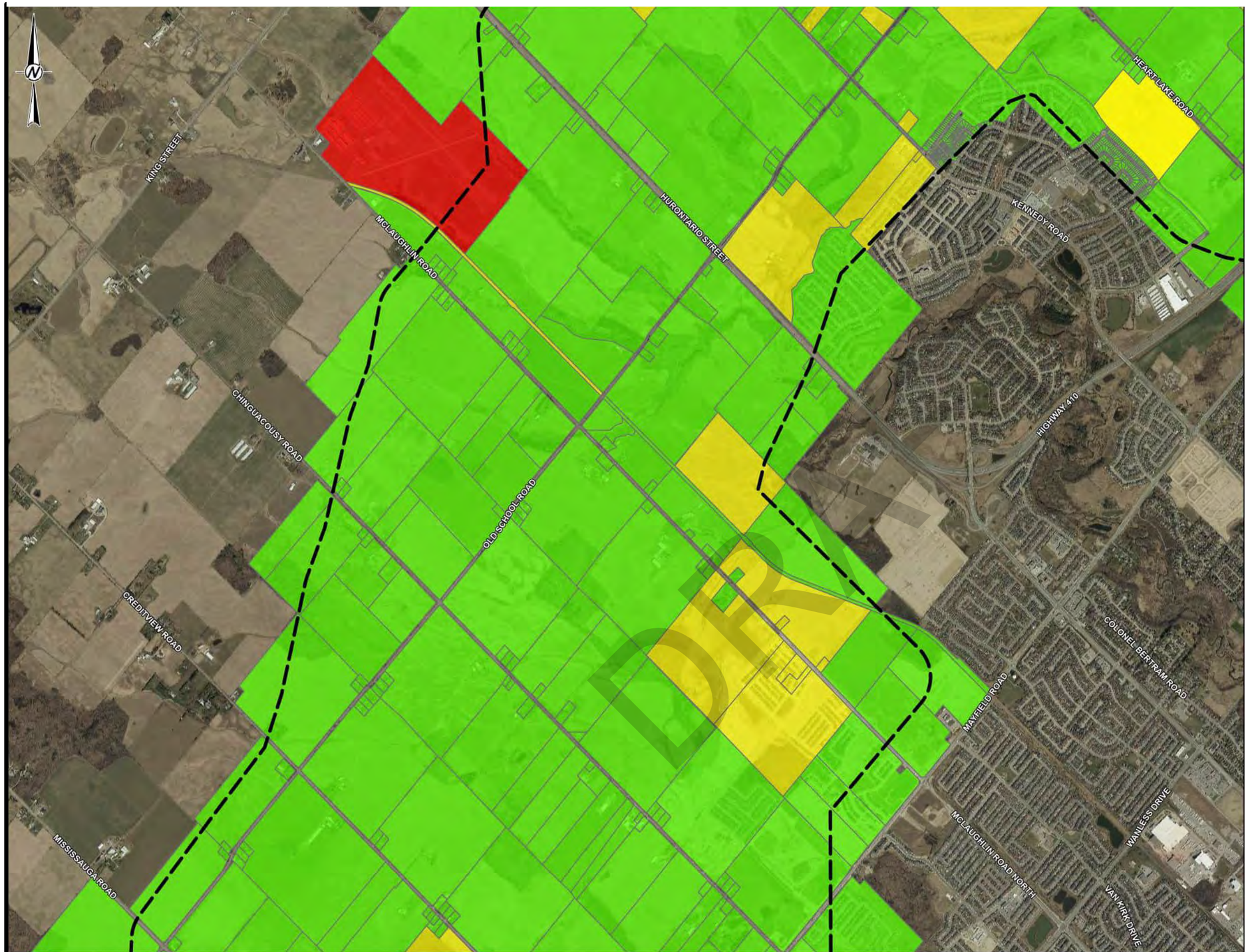
- LOW
- MEDIUM
- HIGH

0 250 500 1,000

1:25,000 METRES

DRAFT

Figure 2-13
Contamination Potential Ratings



KEY MAP



SCALE: 1:750,000

LEGEND

STUDY AREA

PROPERTIES WITH POTENTIAL ENVIRONMENTAL CONCERNS

LOW

MEDIUM

HIGH

0 250 500 1,000

1:25,000 METRES

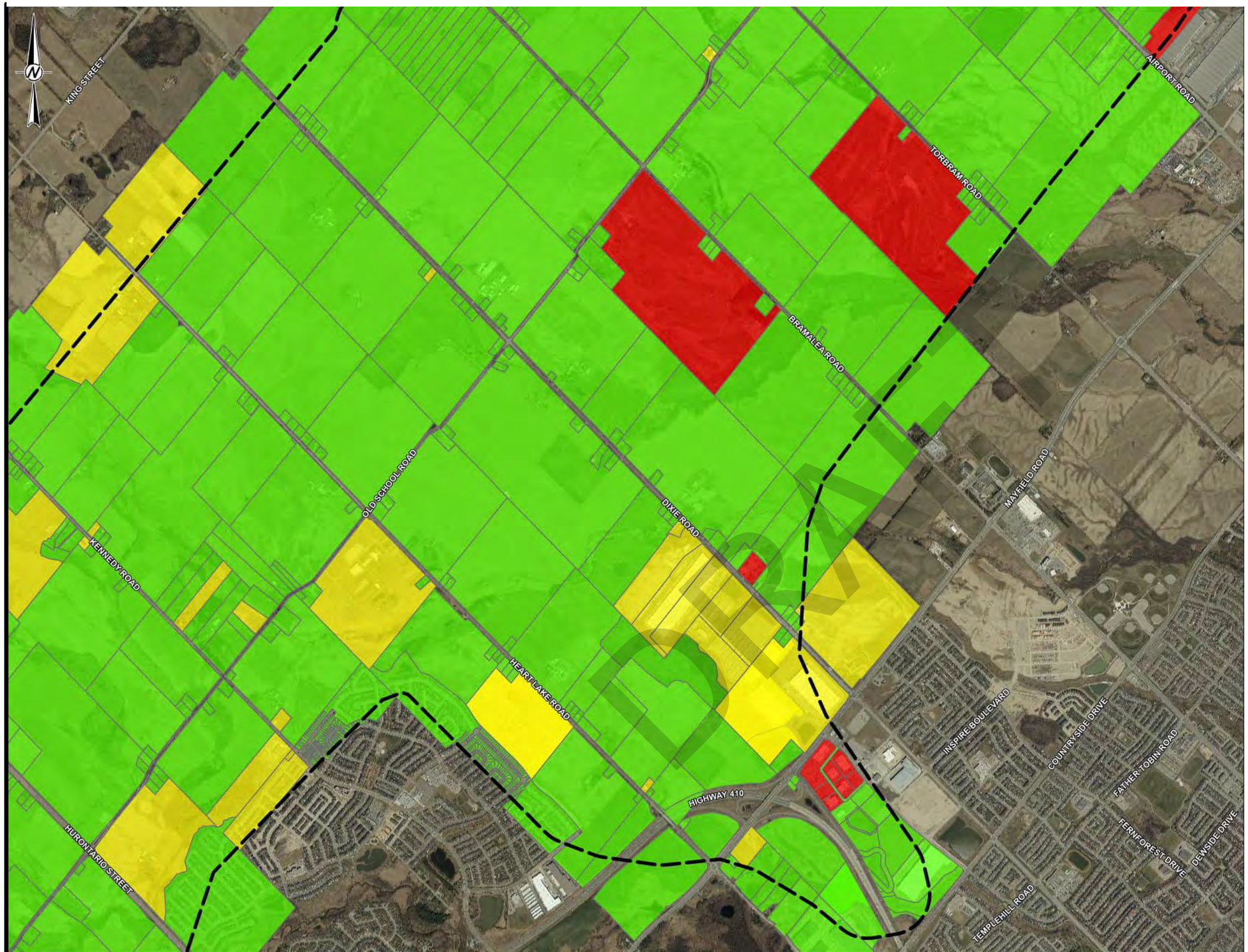
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Ontario

WSP AECOM

Highway 413 Environmental Impact Assessment Report

Figure 2-13
Contamination Potential Ratings



KEY MAP



SCALE: 1:750,000

LEGEND

STUDY AREA

PROPERTIES WITH POTENTIAL ENVIRONMENTAL CONCERNS

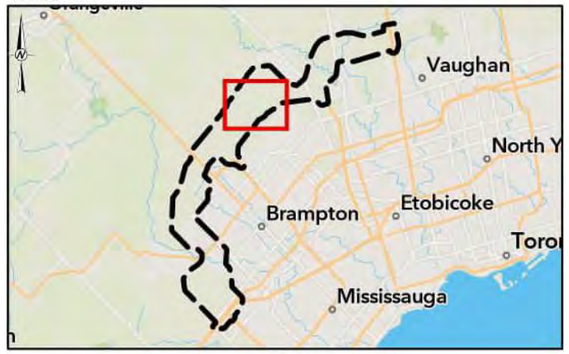
- LOW
- MEDIUM
- HIGH

0 250 500 1,000

1:25,000 METRES

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KEY MAP



SCALE: 1:750,000

LEGEND

STUDY AREA

PROPERTIES WITH POTENTIAL ENVIRONMENTAL CONCERNS

LOW

MEDIUM

HIGH

0 250 500 1,000

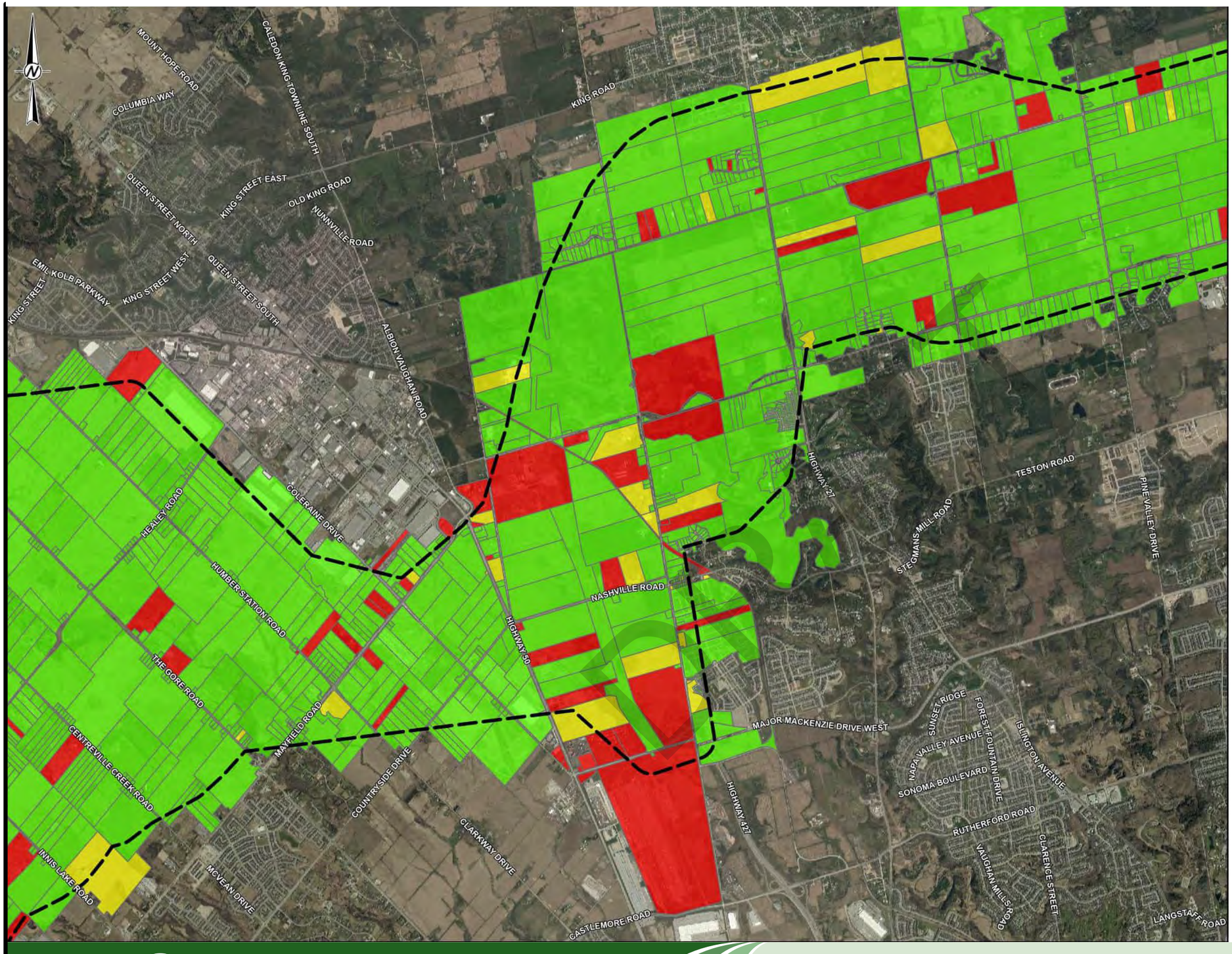
1:25,000 METRES

Ontario

WSP AECOM

Highway 413 Environmental Impact Assessment Report

Figure 2-13
Contamination Potential Ratings



KEY MAP



SCALE: 1:750,000

LEGEND

STUDY AREA

PROPERTIES WITH POTENTIAL ENVIRONMENTAL CONCERNS

- LOW
- MEDIUM
- HIGH

0 500 1,000 2,000

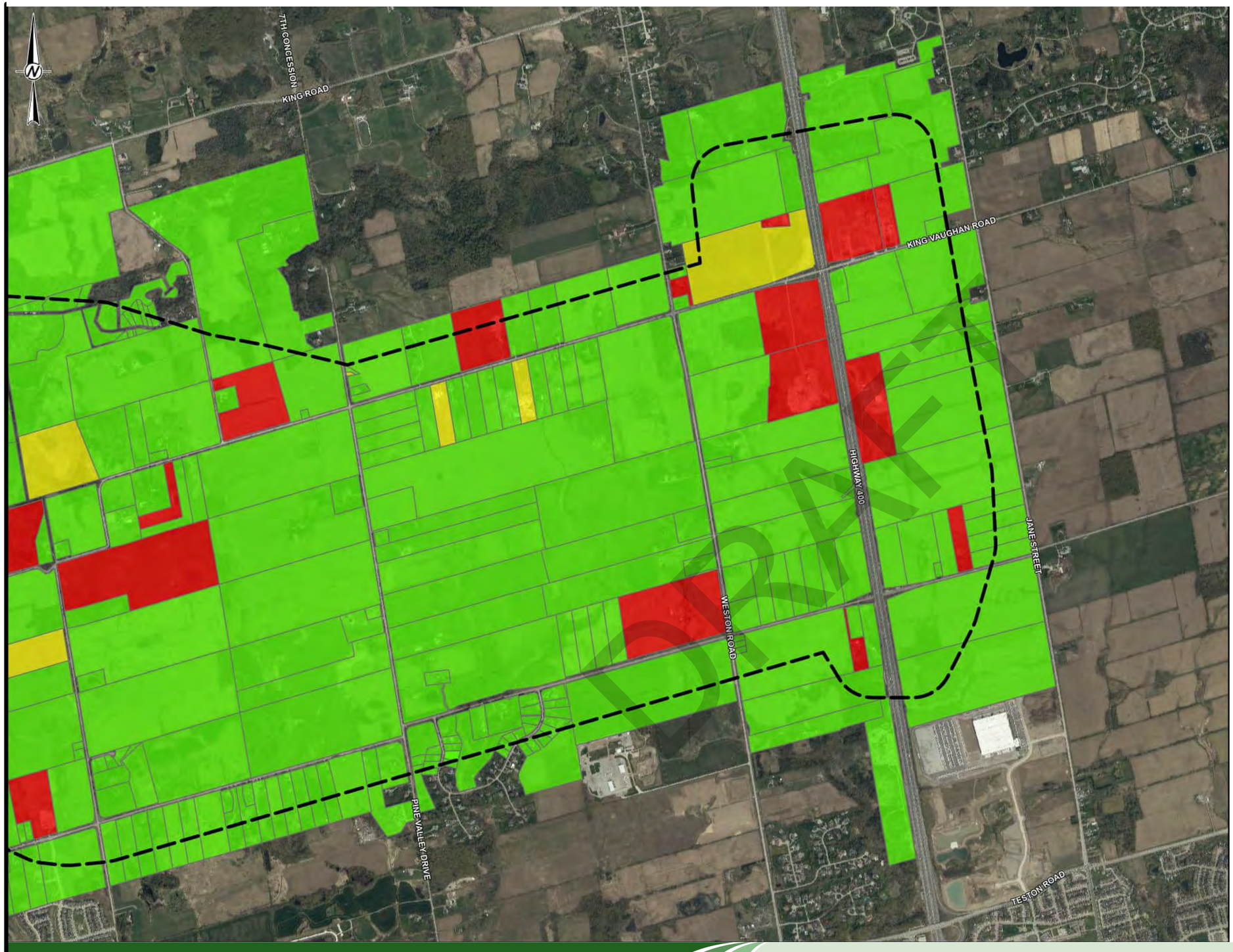
1:50,000 METRES

Ontario

WSP AECOM

Highway 413 Environmental Impact Assessment Report

Figure 2-13
Contamination Potential Ratings



KEY MAP



SCALE: 1:750,000

LEGEND

STUDY AREA

PROPERTIES WITH POTENTIAL ENVIRONMENTAL CONCERNS

LOW

MEDIUM

HIGH

0 250 500 1,000

1:25,000 METRES

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2.4.7 Climate Change

2.4.7.1 Background

Climate change is defined as a change in global or regional climate patterns, primarily attributed to increased atmospheric concentrations of GHGs (Government of Canada, 2021). GHGs have the potential to affect future climate as they contribute to the greenhouse effect by absorbing infrared radiation in the atmosphere, increasing temperature and changing weather patterns (Government of Canada, 2015).

Although not required under the *Highway 413 Act, 2024*, a climate change assessment was conducted in alignment with the Strategic Assessment of Climate Change (SACC) (Government of Canada, 2020), Ontario's guide for Considering Climate Change in the Environmental Assessment Process (Government of Ontario, 2017). This aligns with the MTO Guide for Assessing and Mitigating the Air Quality Impacts and Greenhouse Gas Emissions of Provincial Transportation Projects (MTO, 2020) and is consistent with the Air Quality Impact Assessment (2025) completed for the Project. This includes evaluating:

- How operation of the Project may affect climate change (i.e., the Project's contribution to climate through the emission of GHGs); and
- How potential changes in climate may affect the Project, including supporting facilities and infrastructure (i.e., the resilience of the Project to climate change).

A greenhouse gas assessment was conducted and quantifies the net GHG emissions (i.e., the emissions from the Project less any avoided emissions or offset measures) associated with the construction and operation of the Project, including emissions from construction equipment, land-use change, and traffic operations. The assessment compares project emissions to provincial and federal GHG inventories and targets, which is considered the baseline.

2.4.7.2 Data Collection

2.4.7.2.1 Desktop Review

A review of the most recent National Inventory Report (ECCC, 2025), which includes GHG emissions from 1990-2023, was completed to identify the total Ontario-wide GHG emissions in 2023 as well as the Canada-wide GHG emissions in 2023. Additionally, the federal and provincial GHG emissions targets were identified through a literature review. The Ontario target was identified in Sussex 2022 "Ontario Releases Modelling for its 2030 Emissions Reduction Target and Principles to Align the Emissions Performance Standards (EPS) with the Federal Benchmark for 2023-2030". The target for Canada was presented in the National Inventory Report (ECCC, 2025).

2.4.7.2.2 Fieldwork

There was no fieldwork required as a part of the GHG Assessment or the CCRA.

2.4.7.3 Summary of Environmental Conditions

To summarize the existing conditions of the environment as it relates to climate change and GHG emissions, **Table 2-9** presents the federal and provincial GHG totals for 2023.

Table 2-9: Provincial and Federal GHG Emission Totals for 2023

Source	GHG Emissions (CO_2e kilo tonnes/year)
Ontario-wide GHG Emissions[(a)] (2023)	158,728
Canada-wide GHG Emissions[(a)] (2023)	693,912

Note:

(a) Federal and Provincial total emissions taken for the year 2023 from National Inventory Report (NIR) 1990-2023, Part 1, Table 2-2 (ECCC, 2025). Federal and Provincial GHG Emissions have been converted from mega tonne to kilo tonnes.

Potential impacts and associated mitigation measures pertaining to climate change are outlined in **Chapter 5.**

2.4.8 Community Wellbeing

The Canadian Index of Well-being defines well-being as "the presence of the highest possible quality of life in its full breadth of expression focused on but not necessarily exclusive to: good living standards, robust health, a sustainable environment, vital communities, an educated populace, balanced time use, high levels of democratic participation, and access to and participation in leisure and culture" (Canadian Index of Wellbeing, 2016). As such, community well-being is a function of several factors that work together to improve wellness within a community. These factors are related to health, social, economic, cultural and environmental conditions, such as social cohesion, economic vitality, cultural preservation, environmental sustainability, access to services, mental health and wellness, and the integrity and accessibility of physical spaces. Community wellbeing can be achieved through a collection of non-clinical approaches for improving health, preventing disease and reducing health disparities by

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addressing social, behavioural, cultural, environmental, economic determinants of health and wellbeing in a community (Murphy, 2010).

Indigenous Services Canada also developed a Community Wellbeing Index, which provides a measure of the quality of life of communities across Canada, using the data and information collected via the census of the population (Indigenous Services Canada, n.d.). The scores from this Community Wellbeing Index, which consider information such as education, income, housing, and labour force activity, provide a systematic and reliable way to track the socio-economic well-being of communities over time and can also illustrate gaps in well-being between Indigenous and non-Indigenous communities (Indigenous Services Canada, n.d.).

Government agencies, health authorities and community organizations work to promote socio-economic wellbeing, healthy choices, and provide health services to foster both individual and community health and well-being. Physical infrastructure can also contribute to determining a community's health and well-being. Infrastructure development projects can have large impacts on the livelihood, lifestyle, culture and identity of those living in nearby communities.

Changes in air quality, noise effects, accidents and injuries, urban sprawl, access to traditional country foods, food security, social cohesion, employment growth, and public safety, can be infrastructure development-related effects that are intertwined and either directly or indirectly, impact the community's overall health and well-being. Hence, community health and well-being depends on a number of factors, including both the social and environmental factors.

By using community wellbeing as a guiding framework, decision-makers can evaluate impacts to meaningful indicators to measure both the benefits and drawbacks of proposed developments, using the planning process to further enhance the benefits and mitigate the drawbacks.

For the Project, community wellbeing was addressed by means of two main studies:

1. Socio-Economics Technical Report (AECOM, 2025); and
2. Human Health Implications (HHI) Study of Highway 413 Preliminary Design and Assessment of Environmental Impacts (HHI Study) (Intrinsik, 2025), in accordance with MTO's Environmental Guide for Assessing Human Health Implications of Provincial Transportation Projects (MTO, 2022).

Both of these studies have been completed for the Project. The following subsections provide a summary overview of the data collection methods as well as a summary of baseline conditions for each study.

2.4.8.1 Part A: Socio-Economic Conditions

2.4.8.1.1 Data Collection

Desktop Review

Sources for the background review included Statistics Canada, regional approved plans for the Halton, Peel, and York Regions (Regional Municipality of Halton, 2022; Regional Municipality of Peel, 2022; Regional Municipality of York, 2022) news and media, and community records.

This assessment relied on evidence from the following Highway 413 Preliminary Design and Assessment of Environmental Impacts studies:

- Agricultural Impact Assessment (2025);
- Consultation Record (Appendix A);
- Land Use Report (2024);
- Terrestrial Ecosystems Impact Assessment (2025);
- Fish and Fish Habitat Impact Assessment (2025); and
- Human Health Implications (HHI) Study of Highway 413 Preliminary Design and Assessment of Environmental Impacts (2025).

Sources of information regarding public issues and aspirations were derived from written comments submitted to MTO, input from open houses and public meetings, news and media sources, and community records such as Council meeting notes. In addition, conversations with some regional and study area lower-tier municipal representatives were conducted to gather insight, data, and confirmation of key social trends and conditions.

Fieldwork

There was no field work required as part of the socio-economic study.

2.4.8.1.2 Summary of Environmental Conditions

Findings from the baseline assessment include:

- There is an abundant and diverse labour force within the Study Area and the broader GGH. Specifically, in the large highway and bridge construction industry, the labour force is highly concentrated in close proximity to the Project. This means the companies and skilled trades

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needed to construct the Project are relatively local and could potentially be drawn upon for project construction.

- Construction of Highway 413 is expected to sustain many existing jobs and add new employment opportunities. Construction of Highway 413 is expected to sustain or create thousands of jobs.
- Approved Master Plans in Halton, Peel and York regions, and municipalities adjacent to the Project are projecting significant population and employment growth, all precipitating the need for extensive urban development expansion in the Study Area. Expansion of housing and employment areas is for the most part located within the Project area. It is important to note that approved urban growth will occur regardless of the Project.
- Housing affordability and homelessness are of concern, like with the rest of Ontario, and pose a challenge for regions and municipalities as housing and the projected population growth proceed as planned.
- The self-identified Indigenous population within the Study Area communities represents a small portion of the overall population yet are disproportionally represented in the homeless population.

MTO will continue to engage and consult with Indigenous communities in the Study Area to better understand any potential impacts of the Project on established or credibly asserted Aboriginal or treaty rights or any other interests.

2.4.8.2 Part B: Human Health

2.4.8.2.1 Data Collection

Desktop Review

The HHI Study (Intrinsik, 2025) relied on a high-level evaluation of the peer-reviewed and reputable grey literatures. Where readily available, the Study utilized feedback pertaining to human health from Indigenous communities, stakeholders, and the general public gathered as part of the Indigenous community engagement process and the public consultation process during the course of the Project. The HHI Study primarily focuses on potential health impacts to residential receptors within the Study Area, considering both the construction and operational phases of the Project. The HHI Study also relied on and utilized relevant and available data from existing reporting related to the Project, including those related to air quality, noise, land use, traffic, impacts to Indigenous peoples, and socio-economic impacts.

The main sources of baseline data collection for the HHI Study include:

- Statistics Canada 2021 Census Profile (Statistics Canada, 2021);
- Statistics Canada 2022 Health Characteristics (Statistics Canada, 2022);
- York Region Public Health website (Regional Municipality of York, 2024);
- Peel Public Health website (Regional Municipality of Peel, n.d.);
- Halton Region Public Health website (Regional Municipality of Halton, n.d.);
- Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC, 2021);
- Ontario First Nations Regional Health Survey Phase III (Chiefs of Ontario, 2019);
- Walkscore.com (2022-2023); and
- Other publicly available reputable open data sources.

The data from Statistics Canada can be an unreliable source for Indigenous communities due to issues like incomplete enumeration in Indigenous communities and data suppression for confidentiality when the sample numbers are below threshold. As a result, where available, data and information from the Ontario First Nations Regional Health Survey Phase III and other reputable sources has been utilized in identifying baseline health conditions.

Fieldwork

There was no field work required as part of the HHI Study.

2.4.8.2.2 Summary of Environmental Conditions

The HHI Study provided a high-level baseline community health profile for the Study Area. The Baseline Community Health Profile presents high-level information on the overall current sociodemographic and health status of the Study Area. The Study Area includes parts of the Regional Municipality of Halton, the Regional Municipality of Peel and the Regional Municipality of York. Baseline health information is also provided for Indigenous communities who are being consulted and engaged on the Project. The purpose of the baseline health profile is to provide context by describing at a high level how healthy the local population currently is, in comparison to other areas of Ontario, and identifying the health issues of top concern.

Physical and mental health and illnesses have a significant impact on how people live their lives. As such, it is crucial to understand the prevalence and incidence of chronic diseases as well as other health and social indicators in local communities, as this can help local governments and

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organisations define priorities for community health and manage health disparities. Indigenous individuals, families, communities, and nations who face historical inequities in the social determinants of health are more likely to bear an additional burden of illness and have difficulty accessing resources that could alleviate these concerns (Reading and Wien, 2009). The unequal status of the determinants of health in a society (such as high versus low-income households, having quality versus hazardous housing, stable versus precarious employment, etc.), as well as the related challenges that can arise as a result of this unequal distribution (such as food insecurity, mental illness, reduced access to services, etc.), are the underlying reasons behind disparate health outcomes in various population groups. Underpinning this unequal distribution of the determinants of health is the unequal distribution of money, power and resources at the local, national and global levels (WHO, n.d.). Hence, existing disparity in the determinants of health can, in many instances, be the driving force behind disproportionate health impacts experienced by individuals and/or communities due to a project.

In summary, the Baseline Health Profile (Intrinsik, 2025) suggests that:

- The percentage of visible minorities in all regional municipalities in the Study Area are higher than Ontario as a whole. Additionally, all the municipalities report lower percentages of Indigenous peoples than the average for Ontario.
- For all the First Nations included in this assessment, there is a greater percentage of registered First Nations individuals residing off-reserve rather than on their own or on other reserves.
- All three regional municipalities have a similar proportion of older adults (i.e., ages 75- 99 years old), and the Regions of Halton and York have a slightly higher proportion of the population between 0-19 years in comparison to the Region of Peel.
- Compared to Ontario as a whole, households within the regional municipalities in the Study Area have a higher median income. Additionally, when comparing to households within Indigenous communities, the regional municipalities in the Study Area have considerably higher incomes.
- The regional municipalities, except for Halton, have higher unemployment and participation rates than Ontario as a whole. Additionally, the Indigenous communities included in this assessment, all have higher rates of employment when compared to Ontario and are similar or higher than the regional municipalities in the Study Area.
- Although there is a higher number of homeowners, there is also a higher percentage of people spending greater than 30% or more of their income on housing costs within the regional municipalities in the Study Area as compared to Ontario as a whole.
- Information related to the overall burden of disease for Indigenous communities was available at the level of on-reserve First Nations who participated in the Regional Health Survey in Ontario, and for municipalities it was available at the level of the regional health unit. These data indicates that First Nations in Ontario have the highest burden of disease for all illnesses including, arthritis, diabetes, asthma, mood disorders (population aged 12 and over who reported that they have been diagnosed by a health professional as having a mood disorder, such as depression, bipolar disorder, mania, or dysthymia [Statistics Canada, 2022]), and high blood pressure when compared to Halton Regional Health Unit, Peel Regional Health Unit, York Regional Health Unit and Ontario as a whole.
- Females in all regional municipalities have higher rates of arthritis when compared to males. Males in all locations have higher rates of diabetes when compared to females.
- Compared to Halton Regional Health Unit, Peel Regional Health Unit, York Regional Health Unit and Ontario as a whole, First Nations in Ontario have the highest rate of adults self-reporting as obese.
- When considering transportation, commuting and the use of public transit, the regional municipalities in the Study Area have a higher percentage of people who utilize cars, trucks, or vans as their primary mode of transportation to commute, and a lower percentage of those who use public transit to commute when compared to Ontario as a whole, except for the Regional Municipality of Peel.
- In Ontario, traffickers reportedly use Highway 401 as a key route to move victims between various sex trade hubs, including Windsor, London, Toronto, Ottawa, and Montreal according to the Canadian Centre to End Human Trafficking, and almost half (48%) of all police-reported incidents of human trafficking in Canada between 2012 and 2022 were reported in five major urban centres, with Toronto reporting 23% of all incidents in Canada (Statistics Canada (Statistics Canada, 2023b).

Potential impacts and associated mitigation measures pertaining to community wellbeing (inclusive of both human health and socio-economic conditions) are outlined in **Chapter 5**.

2.4.9 Snowdrift

2.4.9.1 Background

Snowdrift is an accumulation of snow sculpted by wind into a mound.

A snow drifting assessment was conducted to assess potential snow accumulations and quantify the potential for the Project to experience undue snow drifting conditions, and to recommend

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strategies to minimize adverse snow conditions, where feasible. The snow drifting assessment includes a description of the local meteorological conditions, the snow drift potential results, recommendations for improved conditions, and general principles for highway design from a snow control perspective.

The assessment was based on:

- Preliminary Design drawings for the Project;
- A review of the local topography and upwind terrain conditions along the Project;
- A numerical analysis of the potential volume of snow to reach the Project, called the snow transport potential (STP);
- An understanding of the local meteorological conditions using weather data obtained from Toronto Pearson International Airport for the period of 1953 to 2020; and,
- Expertise with regards to wind and snow behaviour.

2.4.9.2 Data Collection

2.4.9.2.1 Desktop Review

A quantitative analysis along the Preliminary Design ROW was completed to assess the snow transport potential. In this assessment, the Project was broken down into three constituent areas.

A buffer zone of 50 m on either side of the Project's centreline was applied to account for local terrain changes when the highway is constructed. Beyond the buffer zone, the analysis considered the existing terrain information. Potential future changes to the land elevations, plantings, or built environment beyond the buffer zone were not included in the analysis.

For these areas, both an STP and a meteorological analysis was completed, with data collection and analysis methods as follows:

Snow Transport Potential

To understand the potential for snow to be wind-driven to the site, in addition to snow which falls directly on the road, an assessment of the upwind terrain with respect to the Preliminary Design ROW was undertaken. For every 100 m section of the Project, a radial analysis was performed over the surrounding area to determine the nearest snow boundary. A snow boundary is a feature such as a dense row or grouping of trees, a large ditch, buildings, a wind screen, etc. that would define the start of an open area where snow could be blown towards the site. A fetch distance is the distance upwind from the edge of the ROW to the nearest major boundary. In the analysis, fetch distances for 36 compass points were calculated at each representative location. This information was combined with surface roughness (i.e., open field, pasture, dense shrubs, etc.), as well as wind directionality and frequency to determine the STP for each 100 m section of the Project.

Once determined, the STP criterion was used to evaluate the potential for snow to cause adverse conditions over an area of interest. The STP was determined by comparing the snow transport at the representative location on the Project relative to the STP for the same area where it is surrounded by completely open terrain (worst case). The STP is expressed as a percentage of the snow transport for a reference open site with no snow barriers within a 3 km radius.

Meteorological Analysis

The analysis of long-term weather data from Toronto Pearson International Airport (1953-2020) identified predominant wind directions associated with drifting snow. Winds greater than 15 km/h, especially during snowfall or blowing snow events, mainly come from the west, west-southwest, and north-northwest, with a secondary component from the east. This was assessed for snowfall and wind, snow depths and temperature considerations.

2.4.9.2.2 Fieldwork

No field studies were required specific to snowdrift, the snowdrift assessment relied on qualitative and quantitative analysis based on drawings, mapping and data.

2.4.9.3 Summary of Environmental Conditions

The following table (**Table 2-10**) presents a summary of areas that have been identified with a moderate and/or high potential for problematic snow conditions:

Table 2-10: Summary of Problematic Snow Conditions

Area of Proposed Highway	Description	STP Rating
Near Highway 401	Exposure predominantly on west side. Recommend considering an elevated road profile with shallow batter slopes and/or snow barriers at an appropriate setback distance.	Moderate to High

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Area of Proposed Highway	Description	STP Rating
Near Mayfield Road	Openness on the west side. Recommend considering an elevated road profile with shallow batter slopes and/or snow barriers at an appropriate setback distance.	Moderate to High
Near Mississauga Road	Exposure on both sides. Elevated highway with shallow batter slopes is recommended.	Moderate to High
Near Highway 410 Extension	Gaps between winter vegetation; exposure on both sides. If vegetation is retained, recommend eliminating gaps with screens or additional plantings.	Moderate to High
Near Airport Road	Priority for mitigation should be given to the northwest side. Recommend considering an elevated road profile with shallow batter slopes.	Moderate to High
Near Highway 50	Priority for mitigation should be given to the northwest side. Recommend considering an elevated road profile with shallow batter slopes.	Moderate to High
Between Pine Valley Drive and Highway 400	Mitigation recommended on both sides. Increasing the density of the existing winter vegetation in the surroundings could be an effective strategy for snow control in this area.	Low to Moderate

Overall, the snow drifting potential for the Project is expected to be moderate to high in most areas. Where the road profile may be elevated with shallow side slopes, snow drifting in areas associated with moderate to high STP is expected to be less problematic, as the wind would be harnessed advantageously to promote scouring over the ROW.

Snow transport potential as identified in the Study Area is outlined in **Figure 2-14**. Potential impacts and associated mitigation measures are outlined in **Chapter 5.**

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583000 587000 591000 595000 599000 603000 607000

4840000 4836000 4832000 4828000 4824000 4820000

CENTRAL SECTION
WEST SECTION
CENTRAL SECTION
WEST SECTION
Bovaird Dr W
Highway 7
Guelph St
Highway 410
Macdonald Cartier Freeway
Highway 407
Highway 403
True North
7
410
401
407
403
25

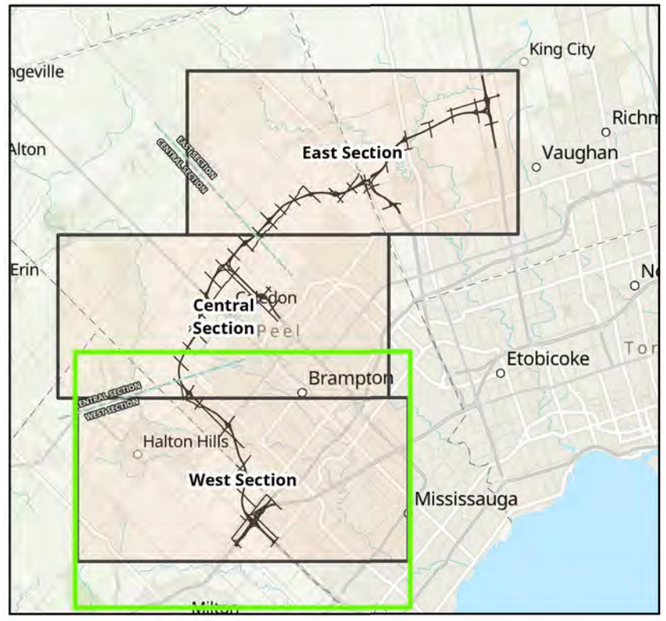
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Snow Transport Potential

- Insignificant
- Low
- High
- Moderate
- Right of Way

Existing Barriers

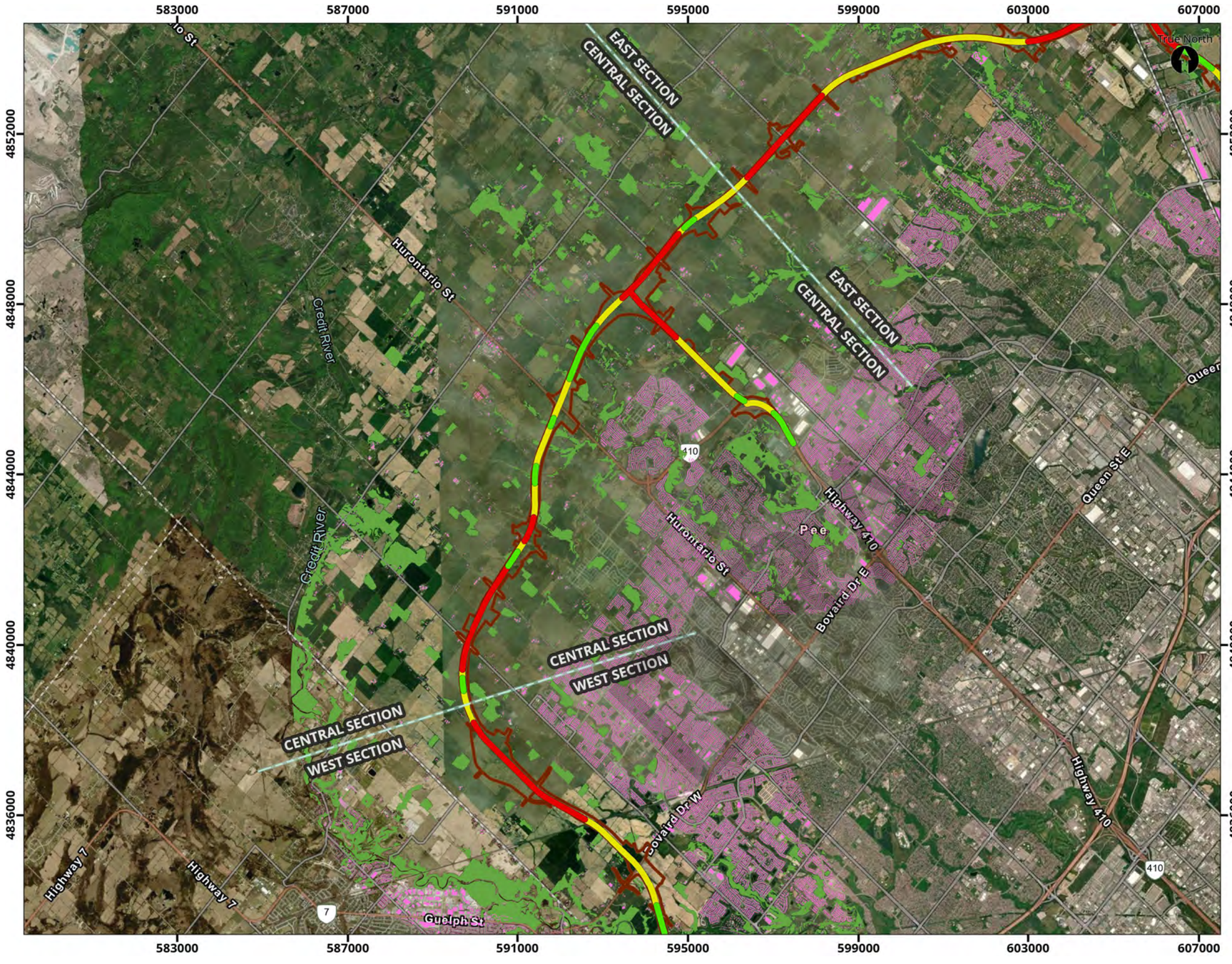
- Building
- Wooded Area



Service Layer Credits: World Imagery: : Peel Region, Earthstar Geographics
World Topographic Map: Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community
World Hillshade: Esri, NASA, NGA, USGS
Hybrid Reference Layer: Province of Ontario, Esri Canada, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, NRCan, Parks Canada

0 3 6 9 km

Figure 2-14
Snow Transport Potential



Legend

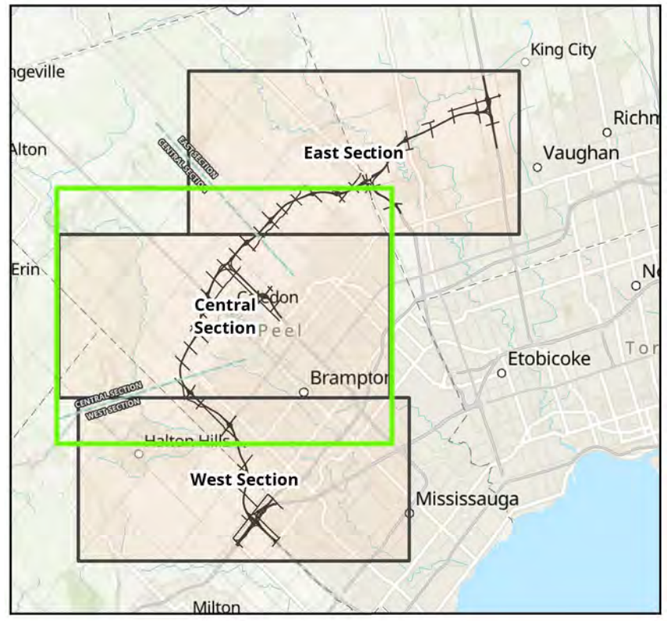
Snow Transport Potential

- Low
- High
- Moderate

Right of Way

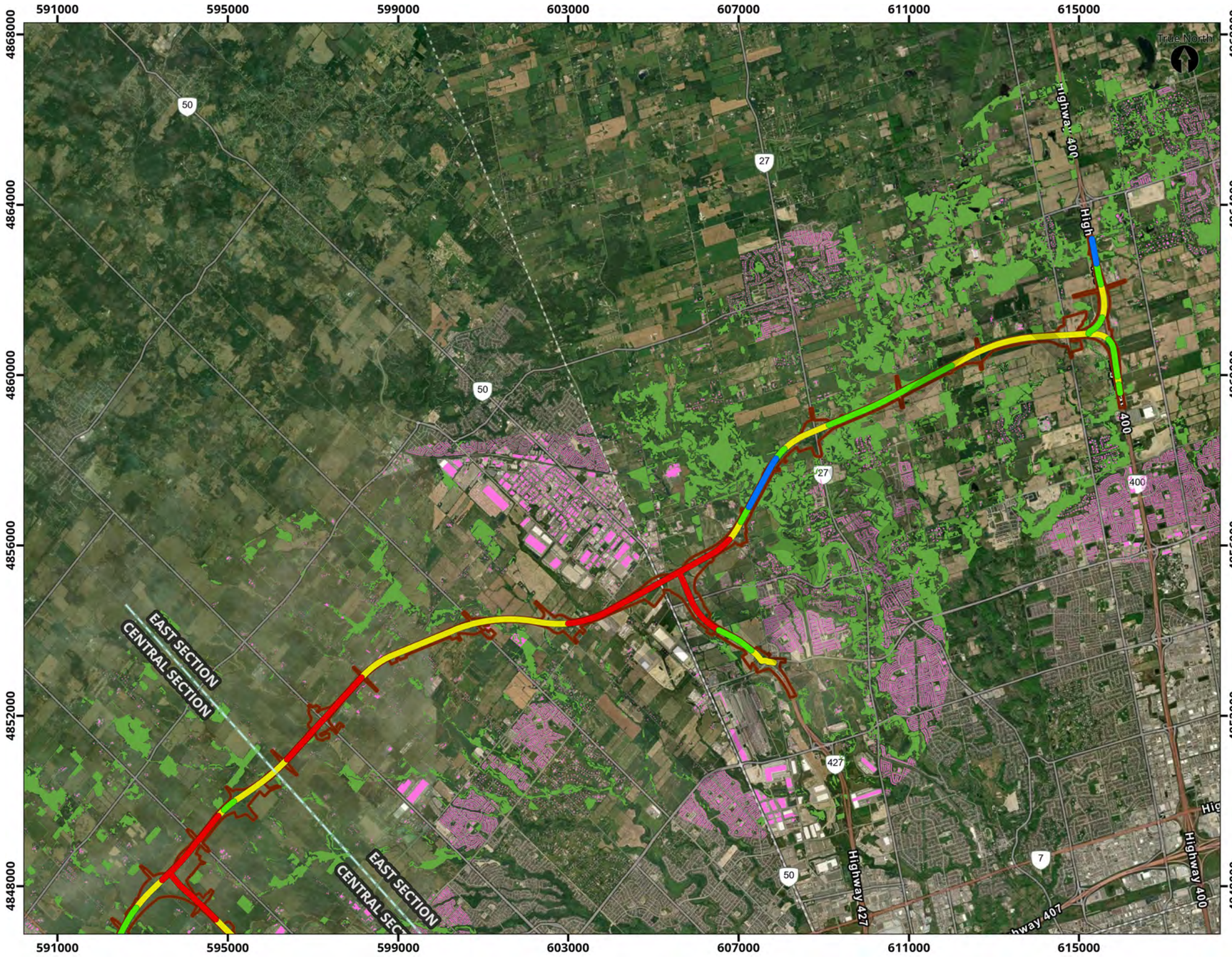
Existing Barriers

- Building
- Wooded Area



Service Layer Credits: World Imagery: : Peel Region, Earthstar Geographics
World Topographic Map: Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community
World Hillshade: Esri, NASA, NGA, USGS
Hybrid Reference Layer: Province of Ontario, Esri Canada, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, NRCan, Parks Canada

0 3 6 9 km



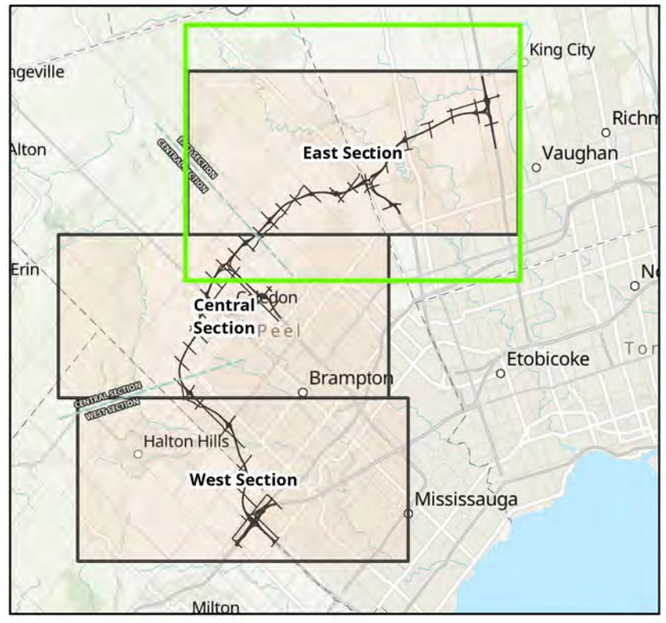
Legend

Snow Transport Potential

- Insignificant
- Low
- High
- Moderate
- Right of Way

Existing Barriers

- Building
- Wooded Area



Service Layer Credits: World Imagery: : Earthstar Geographics
World Topographic Map: Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community
Hybrid Reference Layer:
World Hillshade: Esri, CGIAR, USGS Province of Ontario, Esri Canada, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, NRCan,

0 3 6 9 km

2.5 Cultural Environment

Cultural environment studies were completed as part of the Project to identify, assess, and document the local environmental conditions, potential impacts and mitigation measures and to identify applicable provincial, federal or other authorizations that may be required.

The subsections outlined below summarize the local environmental conditions for the following aspects of the cultural environment:

- Built Heritage Resources and Cultural Heritage Landscapes; and
- Archaeological Resources.

2.5.1 Built Heritage Resources and Cultural Heritage Landscapes

2.5.1.1 Background

BHRs are considered to be one or more significant buildings (including fixtures or equipment located in or forming part of a building), structures, monuments, installations, or remains associated with architectural, cultural, social, political, economic, or military history and identified as being important to a community. For the purposes of reporting, “structures” does not include roadways in the provincial highway network and in-use electrical or telecommunications transmission towers.

CHLs are considered to be a defined geographical area of heritage significance that human activity has modified and that a community values. Such an area involves a grouping(s) of individual heritage features, such as structures, spaces, archaeological sites, and natural elements, which together form a significant type of heritage form distinct from that of its constituent elements or parts. Heritage conservation districts designated under the *Ontario Heritage Act*, villages, parks, gardens, battlefields, main streets and neighbourhoods, cemeteries, trails, and industrial complexes of cultural heritage value are some examples. A cultural heritage assessment for the Project was undertaken in accordance with the *Standards and Guidelines for Conservation of Provincial Heritage Properties* (MCM, 2010) issued under the authority of section 25.2 of the *Ontario Heritage Act* and with reference to MTO’s cultural heritage conservation policy and process.

A cultural heritage assessment documents existing cultural heritage conditions within the Study Area and the preliminary assessment of potential impacts from proposed project activities which was used to assist MTO with the development of the Preliminary Design for the Project. All known and potential BHRs and CHLs located within the Study Area were identified, potential impacts were assessed and recommendations to avoid or reduce adverse impacts, mitigation strategies and next steps were provided.

The cultural heritage assessment articulates the potential impacts to known and potential BHRs and CHLs. MTO has provided drafts of the cultural heritage assessment to Indigenous communities for their review, input and to provide traditional knowledge and histories of traditional land uses or geographic features with sacred or spiritual importance. This has assisted MTO with the research and evaluation of properties located within the Study Area. In addition, Indigenous communities have been engaged during the Cultural Heritage Evaluation Report (CHER) process, related to river landscapes.

2.5.1.2 Data Collection

2.5.1.2.1 Desktop Review

The following research methodology was used to establish the historical context of the Study Area:

- Archival research including review of primary and secondary sources, documents and reports;
- Desktop review of online municipal, provincial and federal heritage inventories and databases; and
- Field review of properties located within the Study Area.

2.5.1.2.2 Fieldwork

A field review was conducted on August 19 and 20, 2020 following the confirmation of the Preferred Alignment. Additional field reviews were conducted during 2021 and 2023, as the Preliminary Design was advanced, to document the existing conditions of the Study Area. These field reviews were conducted from publicly accessible areas, to confirm or identify potential BHRs or CHLs.

In addition, Indigenous communities have informed MTO that they consider the cultural heritage and archaeological sites within the Study Area to be of critical importance, inclusive of specific natural heritage features. MTO has been consulting and engaging with Indigenous communities throughout the archaeological assessment process.

2.5.1.3 Summary of Environmental Conditions

Through the consultation and engagement process, Indigenous communities conveyed to MTO that the Humber River (a Canadian Heritage River designated in 1999), the Carrying Place Trail (also known as the Toronto Carrying Place Trail among Europeans) and the Credit River were the

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three most significant cultural heritage features within the Study Area. They have emphasized that, for Indigenous peoples, cultural heritage landscapes are the environment. The environment is what Indigenous peoples have lived off of for thousands of years, therefore because the environment is cultural heritage the Project will have negative impacts to the cultural heritage for Indigenous peoples. They emphasized the significance of the waterways and associated valleys, forests, watersheds, sub-watersheds and Carrying Place Trails to MTO as important to Indigenous culture. The Forks of the Credit were flagged as having significance; however, it was determined that the landscape is 13.8 km from the Study Area and will therefore not be impacted.

Considering the information shared as a result of Indigenous consultation and engagement and field reviews as well as a thorough screening of background research (including municipal, provincial and federal heritage inventories and databases), a total of 61 known and potential BHRs and CHLs were identified within the Preliminary Design ROW. The preliminary impact assessment for the Study Area determined that 13 known and potential BHRs and CHLs are not anticipated to be directly adversely impacted and no further work is recommended beyond the general mitigation measures.

Of the remaining known and potential BHRs and CHLs, 48 are anticipated to be directly adversely impacted by the Project and are recommended for further heritage assessment. The following represents the anticipated direct adverse impacts to the 48 known and potential BHRs and CHLs:

- 36 known and potential BHRs and CHLs are anticipated to be directly adversely impacted by demolition/removal of potential heritage attributes and require further heritage assessment.
- 12 known and potential BHRs and CHLs are anticipated to be directly adversely impacted by significant land disturbance and require further heritage assessment.
- As the Preliminary Design progressed, two additional BHRs were identified as potentially being directly adversely impacted by the Project and are recommended for further heritage assessment.
- These properties are currently undergoing further assessment through CHERs. For BHRs and CHLs identified through the CHER as having cultural heritage value or interest and are still anticipated to be impacted, a Heritage Impact Assessment (HIA) will be prepared.

Potential impacts and associated mitigation measures pertaining to BHRs and CHLs are outlined in **Chapter 5**.

2.5.2 Archaeological Resources

2.5.2.1 Background

Archaeological potential on a subject property is determined by criteria set by the Ministry of Citizenship and Multiculturalism (MCM) (2011).

The Government of Ontario has recognized the importance of conserving Ontario's archaeological resources in the *Ontario Heritage Act*, the *Planning Act*, the Provincial Planning Statement, 2024, and other documents including the *Highway 413 Act, 2024*. In addition, several local governments throughout the Study Area have officially recognized the desire to properly manage archaeological resources, and to ensure that archaeological concerns are addressed during the planning stages of development projects.

A Stage 1 Archaeological Assessment (AA) (Background Study) was completed in 2009 which covered approximately 1,698 km^2 and was composed of the north half of the Region of Halton, the southern part of the County of Wellington, the central portion of the Region of Peel and a part of York Region (Archaeological Services Inc., 2009). This Stage 1 Background Study (Archaeological Services Inc., 2009) was completed to determine the presence/absence of archaeological potential.

A refined Stage 1 Background Study based on updated designs was completed in 2015 and documented the geographical, archaeological and land use history of lands identified within that area in order to assess the potential to contain archaeological resources (URS Canada Inc. / AECOM, 2015).

A Stage 2 AA (Property Assessment) was conducted in 2022 and 2023 to meet the requirements of the *Environmental Assessment Act*, in accordance with subsection 11(1) (Ontario Government, 1990). All archaeological consulting activities were conducted in accordance with the MCM *Standards and Guidelines for Consultant Archaeologists* (2011).

The objective of the Stage 2 Property Assessment was to document and provide an overview of the archaeological resources within the Highway 413 Route through field survey, make a determination as to whether any of the resources might be archaeological sites with cultural heritage value or interest (CHVI) requiring further assessments, and to make appropriate recommendations for all identified archaeological sites (e.g., Stage 3 Site-Specific Assessment).

The objective of Stage 3 AA (Site-Specific Assessment) is to further assess the CHVI of sites and determine its spatial extent. Should Stage 3 Site-Specific Assessments determine that sites have further CHVI, requirements for Stage 4 AA (Mitigation of Development Impacts) are determined based on MCM's *Standards and Guidelines for Consultant Archaeologists* (MCM, 2011).

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2.5.2.2 Data Collection

2.5.2.2.1 Desktop Review

In 2009, a Stage 1 Background Study was completed for an area encompassing large portions of the Regions of Halton, Peel, York and the County of Wellington. This area had been identified very early in the planning process prior to the completion of the TDS and identification of the Highway 413 Route. Based on a background study of the area, mapping of archaeological potential criteria indicators, including the presence of over 800 registered archaeological sites within the area studied, a high potential was determined for the recovery of pre- and post-contact archaeological resources within portions of the area not subject to deep and extensive previous disturbance. As such, Stage 2 Property Assessment was recommended for only those undisturbed portions of the archaeological study area (Archaeological Services Inc., 2009).

In 2015, a refined Stage 1 Background Study was completed for the Highway 413 Route. The Stage 1 research and subsequent property inspection again indicated potential for the recovery of pre- and post-contact archaeological resources within portions of the Highway 413 Route not subject to deep and extensive previous disturbance. As such, Stage 2 Property Assessment was recommended for only those undisturbed portions (URS Canada Inc./AECOM, 2015). Note that the MCM does not maintain a database of all properties that have had past archaeological investigations and as such searches of the MCM public register do not always result in a complete listing of all archaeological work conducted in a given area.

2.5.2.2.2 Fieldwork

The refined Stage 1 Background Study (2015) included property review that was conducted in 2015 under MCM PIF# P123-0249-2014. The Highway 413 Route was assessed from publicly accessible areas, due to PTE restrictions on the private properties. Photographs were systematically taken of the parcels of land requiring assessment to document field conditions and archaeological potential.

During the field review, landscape features including waterways and undisturbed agricultural/wooded terrains, were documented to provide insight into areas of archaeological potential. Within the Highway 413 Route, undisturbed areas that were in proximity to waterways, historic travel routes, historic homesteads, previously registered sites, physiographic features and other archaeological resources were identified as having high potential necessitating a Stage 2 Property Assessment.

Some Stage 2 field survey was conducted between 2022 and 2023, under MCM PIF# P438-0287-2022. The fieldwork involved the physical survey of lands identified to have archaeological potential that were to be impacted within the Archaeological Study Area, which included the Preliminary Design ROW plus a 250 m buffer. It should be noted that the entire Stage 2 Property Assessment (2025) Study Area has not been fully assessed at the time of production of this draft report. All archaeological concerns must be addressed, including all remaining required property assessments, prior to ground disturbing and construction activities.

In accordance with *Standards and Guidelines for Consultant Archaeologists* (MCM, 2011), the areas of ploughed agricultural fields within the Stage 2 Property Assessment (2025) area were subject to pedestrian survey (an archaeological method of systematically walking over a designated study area to identify and document surface artifacts) at 5 m intervals. The agricultural fields were ploughed and weathered prior to assessment, both in 2022 and again for the 2023 survey work; surface visibility was at least 80% or better. If archaeological resources were identified, survey intervals were adjusted to document the finds. Where archaeological resources were identified, survey intervals were decreased to a 1 m interval over a minimum of a 20 m radius around each find. Pedestrian survey continued at a 1 m interval until the full extent of the surface scatter was defined.

In accordance with *Standards and Guidelines for Consultant Archaeologists* (MCM, 2011), all areas that did not consist of agricultural fields (e.g., woodlot, manicured lawn, orchard, etc.) within the Stage 2 Property Assessment (2025) Archaeological Study Area were subject to assessment by the standard shovel test pit method at 5 m intervals. Each test pit measured approximately 30 cm in diameter and was excavated at least 5 cm into sterile subsoil. All test pits were examined for stratigraphy, cultural features, or evidence of fill. All soil was screened though hardware mesh with an aperture of 6 mm to facilitate the recovery of cultural material and was then used to backfill the pit. Where archaeological resources were found, the intensification strategy included the excavation of an additional eight test pits at 2.5 m around any positive test pits. In addition to conducting the intensified test pit survey, in order to better understand the context of the archaeological location, to obtain a representative sample of artifacts, and using professional judgement, 1 m^2 test units were excavated over select positive test pits in areas yielding a higher concentration of artifacts and/or yielding diagnostic artifacts (MCM, 2011). In instances where disturbed soils were encountered, the test pit survey was conducted at 10 m intervals to confirm the limits of the disturbance.

During the Stage 2 field survey, boreholes were required to be drilled to inform the ongoing Preliminary Design of the Project, including for bridge and culvert foundations and pavement design. An area of 20 m by 20 m where proposed boreholes might be drilled was targeted for Stage 2 Property Assessment in advance of borehole drilling. It was understood that in areas where specific targeted borehole investigations occurred, the entire property would eventually be subject to Stage 2 Property Assessment field survey where impacts were anticipated as part of the Project. Some areas subject to deep and significant previous disturbance, steeply sloped areas and low-lying/wet areas were also observed as part of the Stage 2 fieldwork. These areas

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were not subject to physical assessment but were photo-documented. These include building footprints, gravel parking areas, off-ramps, areas with buried underground utilities, concrete pads, culverts and active construction areas.

It should be noted that some archaeological materials were recovered when travelling to and/or from the Stage 2 Property Assessment (2025) Study Area or were collected outside of the Study Area only in very specific instances (five total). While these areas technically fall outside of the Stage 2 Property Assessment (2025) Study Area's boundaries, this information was recorded and reported on in the Stage 2 Property Assessment(2025).

Indigenous Community Involvement in the Stage 2 Property Assessment

In accordance with the draft technical bulletin entitled *Engaging Aboriginal Communities in Archaeology* (Ontario Government, 2011), the Indigenous communities with the closest cultural affiliation, or with interest in the Project, were engaged for the Project and sent representatives to participate as CFLs in the Stage 2 fieldwork completed in 2022 and 2023.

Indigenous communities have informed MTO that they consider the archaeological sites located within the Study Area to be of critical importance. To align with best practice and those requirements outlined in *Standards and Guidelines for Consultant Archaeologists* (MCM, 2011) and *Engaging Aboriginal Communities in Archaeology* (Ontario Government, 2011), MTO has been and will continue to engage with Indigenous communities through the entirety of the Project.

Indigenous communities have expressed interest in participating in the additional Stage 2 Property Assessments and Stage 3 Site-Specific Assessments to be conducted as part of the Project, an invitation will be extended for representatives of the Indigenous communities to join the archaeological team during fieldwork as CFLs.

2.5.2.3 Summary of Environmental Conditions

Stage 1 Background Study

The results of the Stage 1 Background Study completed in 2009 indicated that much of the area assessed contained high archaeological potential and it was recommended that once the Highway 413 Route was refined in the future, more detailed Stage 1 research should be completed (Archaeological Services Inc., 2009).

The refined Stage 1 Background Study (2015) completed in 2014 indicated that, while a small portion of the lands within the Highway 413 Route have been disturbed by past development, much of the area has archaeological potential for both pre- and post-contact archaeological resources. These areas require Stage 2 Property Assessment consisting of test pitting and pedestrian survey (URS Canada Inc./AECOM, 2015).

Stage 2 Property Assessment

The Stage 2 Property Assessment (2025) completed in 2022 and 2023 on portions of the Study Area (the Preliminary Design ROW plus 250 m buffer) resulted in the identification of 163 archaeological locations, of which 110 are classified as archaeological isolated findspots or small scatters (90 Pre-Contact Indigenous isolated findspots, nine Pre-Contact Indigenous small scatters, eight 19th-century Euro-Canadian small scatters, two 19th-century Euro-Canadian isolated findspots, and one multi-component small scatter). Fifty-one archaeological locations were determined to be archaeological sites with further CHVI and registered with the MCM (27 19th-century Euro-Canadian, 14 multicomponent, and 10 Pre-Contact Indigenous sites). Finally, two archaeological locations were determined to be extensions of previously registered archaeological sites with further CHVI (one multi-component and one 19th century Euro-Canadian). Further archaeological assessments will be undertaken as required as the Project progresses into Detail Design.

Based on the findings of the 2022 and 2023 Stage 2 Property Assessment (2025), 109 of 110 findspots and small scatters were determined to no longer retain CHVI and do not require further archaeological assessments. Archaeological concerns for the findspots and small scatters are considered fully addressed with exception being given to one findspot. It should be noted that this one findspot does not meet the Provincial standards that require Stage 3 site-specific archaeological assessment, however, the Mississaugas of the Credit First Nation retain interest in the location and have requested further assessment per their review of the Stage 2 Property Assessment report. Therefore, this findspot will also be recommended for further Stage 3 site-specific assessment.

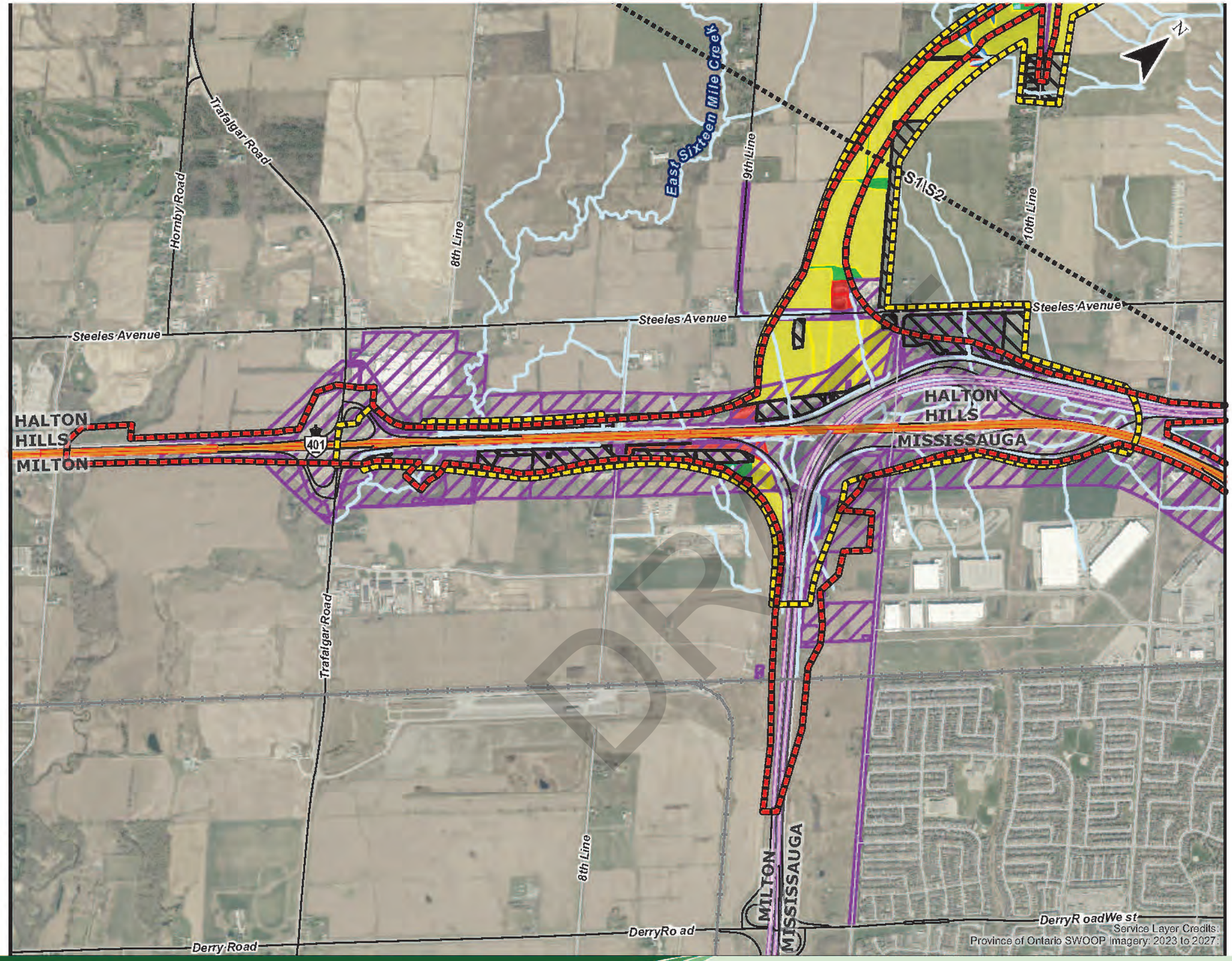
The Stage 2 Property Assessment also illustrates the areas that have been cleared of archaeological concerns (i.e., areas cleared by previous assessments, steeply sloped areas, and/or low lying and wet areas) and/or determined to have been subject to previous deep and extensive disturbance as part of Stage 2 fieldwork. No further work is recommended within these areas.

It should be noted that the entire corridor has not yet been fully subject to Stage 2 Property Assessment due to limits on gaining PTE and constraints associated with active agricultural operations. The Stage 2 Property Assessment findings encompass the work that has been completed as part of the Preliminary Design. Stage 2 investigations on areas identified as requiring assessment but that were not accessible during Preliminary Design will be completed in Detail Design.

It should be noted that at the time of production of this document the Stage 2 Property Assessment (2025) has not been reviewed and accepted by MCM, and therefore recommendations may be subject to change.

Features of the existing archaeological resources Study Area are identified in **Figure 2-15** below. Potential impacts and associated mitigation measures are outlined in **Chapter 5.**

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Legend

- Preliminary Design Right-of-Way
- Stage 2 Study Area Boundary (250 m)

General Features

- Section Boundary
- Railway
- Freeway
- 407 ETR Freeway
- Arterial Road
- Local Municipal Road
- Watercourse
- Municipal Boundary
- Property Boundary

Stage 2 Archaeological Assessments Results

- Stage 2 AA Required
- Previous Assessments
- Visually Confirmed Disturbance
- Potential Borehole Location – Test Pitted
- Stage 2 Pedestrian Survey at 5m Intervals
- Stage 2 Test Pit at 10m Intervals
- Stage 2 Test Pit at 5m Intervals
- Permanently Low/Wet

Highway 413 Preliminary Design and Assessment of Environmental Impacts

Archaeology Overview

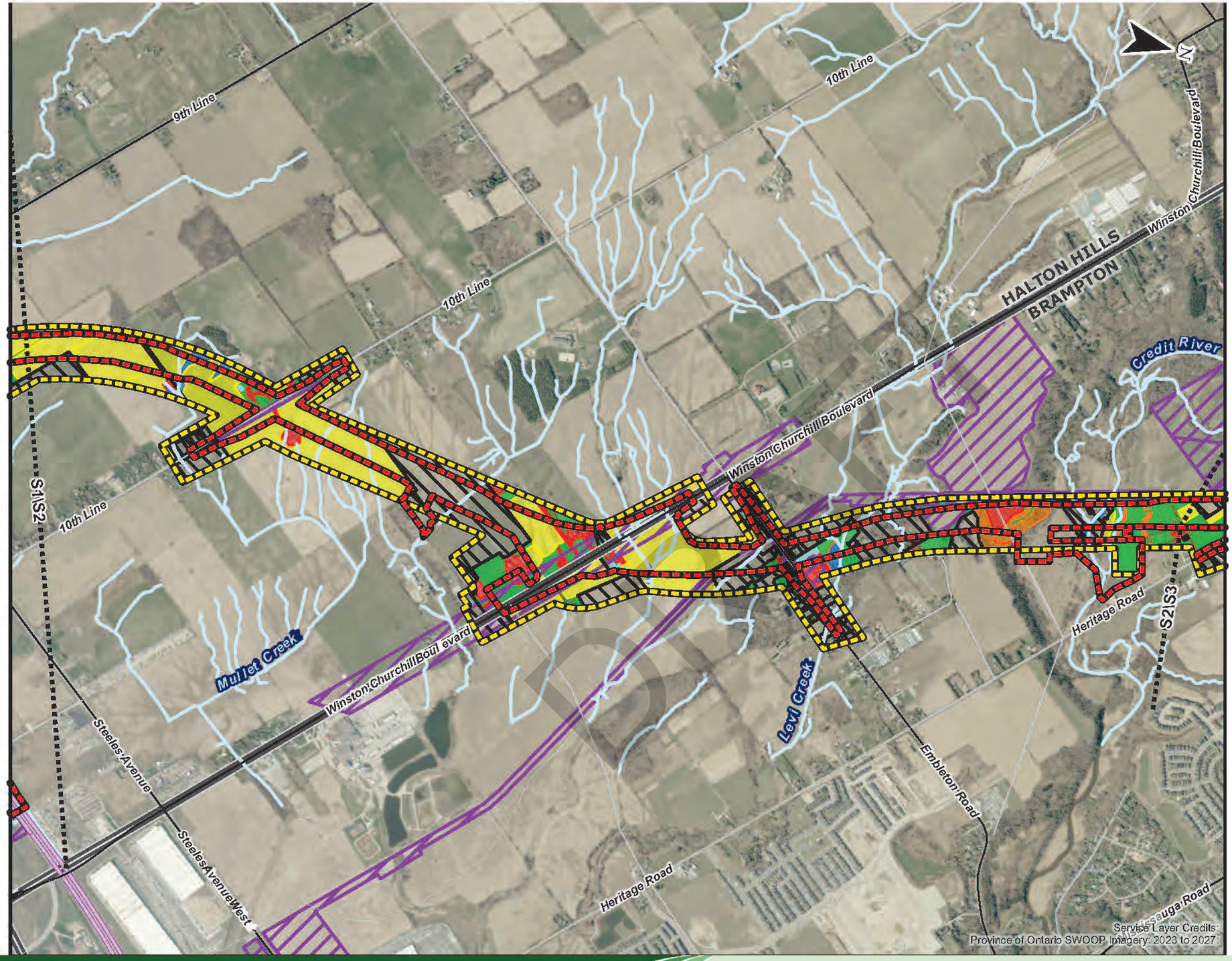
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Sources:
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0 400 800 1200 m

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Legend

- Preliminary Design Right-of-Way
- Stage 2 Study Area Boundary (250 m)

General Features

- Section Boundary
- 407 ETR Freeway
- Arterial Road
- Local Municipal Road
- Watercourse
- Municipal Boundary
- Property Boundary

Stage 2 Archaeological Assessments Results

- Stage 2 AA Required
- Previous Assessments
- Visually Confirmed Disturbance
- Stage 2 Pedestrian Survey at 5m Intervals
- Steeply-Sloped Area
- Stage 2 Test Pit at 10m Intervals
- Stage 2 Test Pit at 5m Intervals
- Permanently Low/Wet

Highway 413 Preliminary Design and Assessment of Environmental Impacts

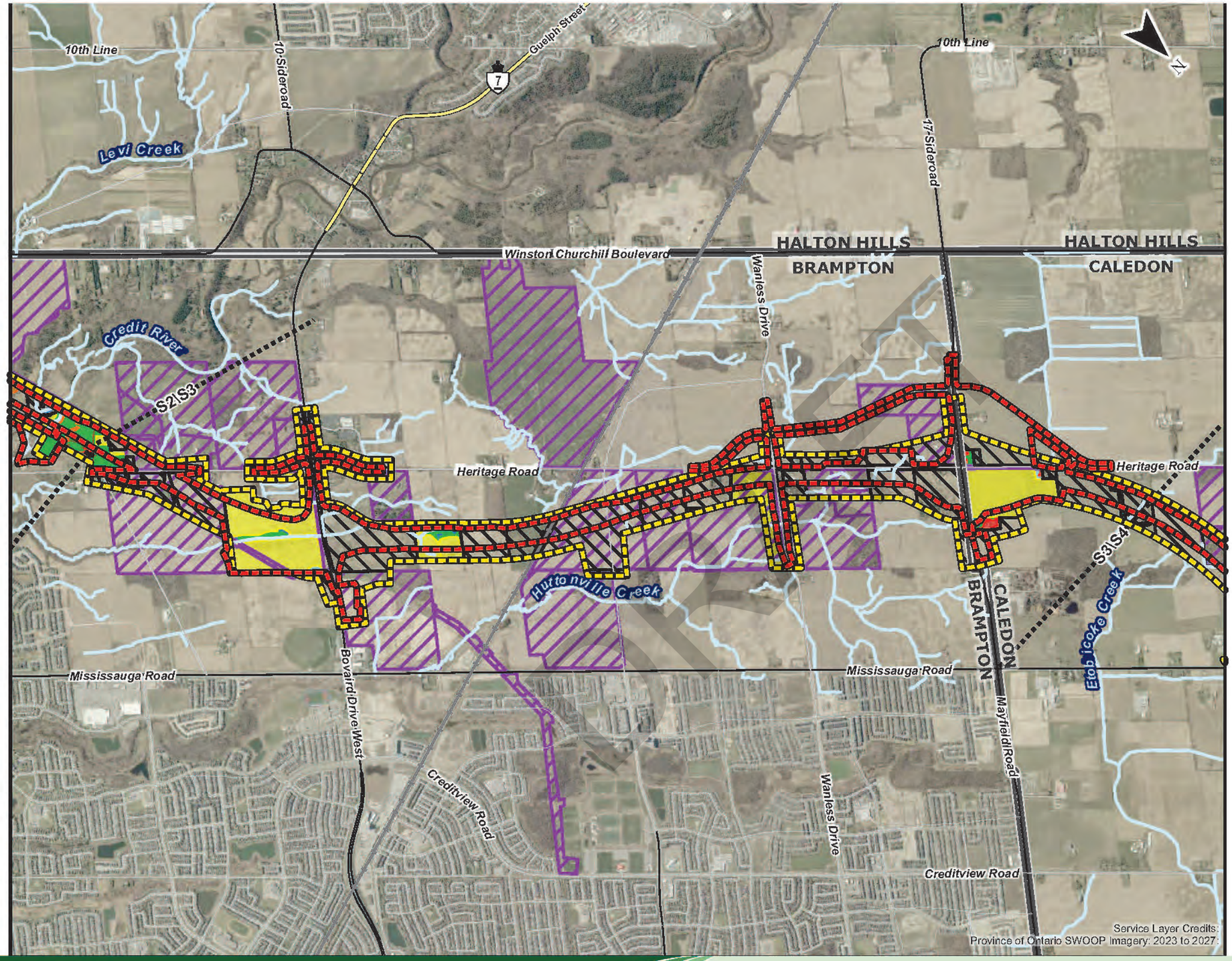
Archaeology Overview

Section: 2

Sources:
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0 400 800 m



Legend

- Preliminary Design Right-of-Way
- Stage 2 Study Area Boundary (250 m)

General Features

- Section Boundary
- Railway
- Provincial Highway
- Arterial Road
- Local Municipal Road
- Watercourse
- Municipal Boundary
- Property Boundary

Stage 2 Archaeological Assessments Results

- Stage 2 AA Required
- Previous Assessments
- Visually Confirmed Disturbance
- Stage 2 Pedestrian Survey at 5m Intervals
- Steeply-Sloped Area
- Stage 2 Test Pit at 10m Intervals
- Stage 2 Test Pit at 5m Intervals
- Permanently Low/Wet

Highway 413 Preliminary Design and Assessment of Environmental Impacts

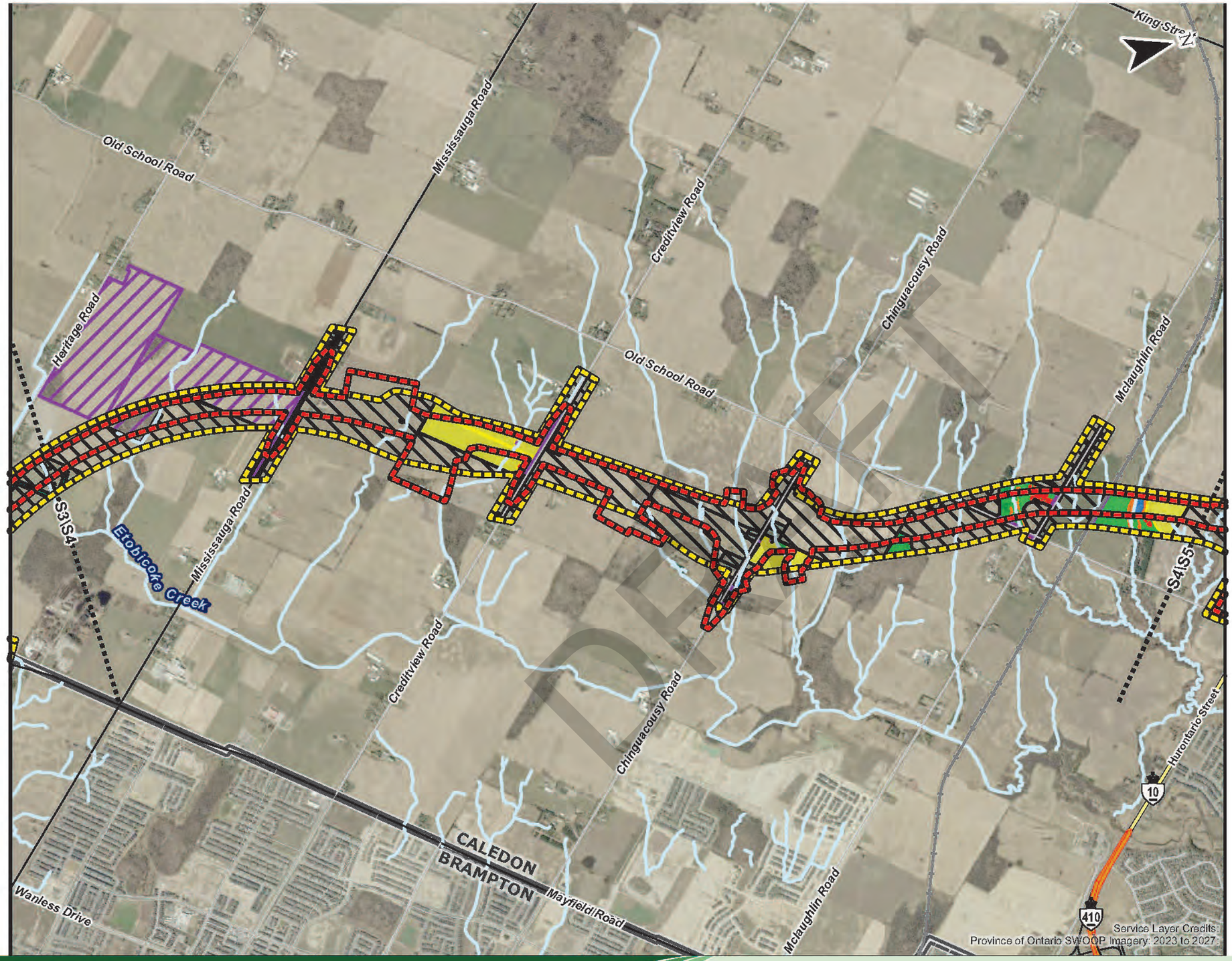
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0 400 800 1200 1600 m



Legend

- Preliminary Design Right-of-Way
- Stage 2 Study Area Boundary (250 m)

General Features

- Section Boundary
- Railway
- Freeway
- Provincial Highway
- Arterial Road
- Local Municipal Road
- Watercourse
- Municipal Boundary
- Property Boundary

Stage 2 Archaeological Assessments Results

- Stage 2 AA Required
- Previous Assessments
- Visually Confirmed Disturbance
- Potential Borehole Location – Test Pitted
- Stage 2 Pedestrian Survey at 5m Intervals
- Steeply-Sloped Area
- Stage 2 Test Pit at 5m Intervals
- Permanently Low/Wet

Highway 413 Preliminary Design and Assessment of Environmental Impacts

Archaeology Overview

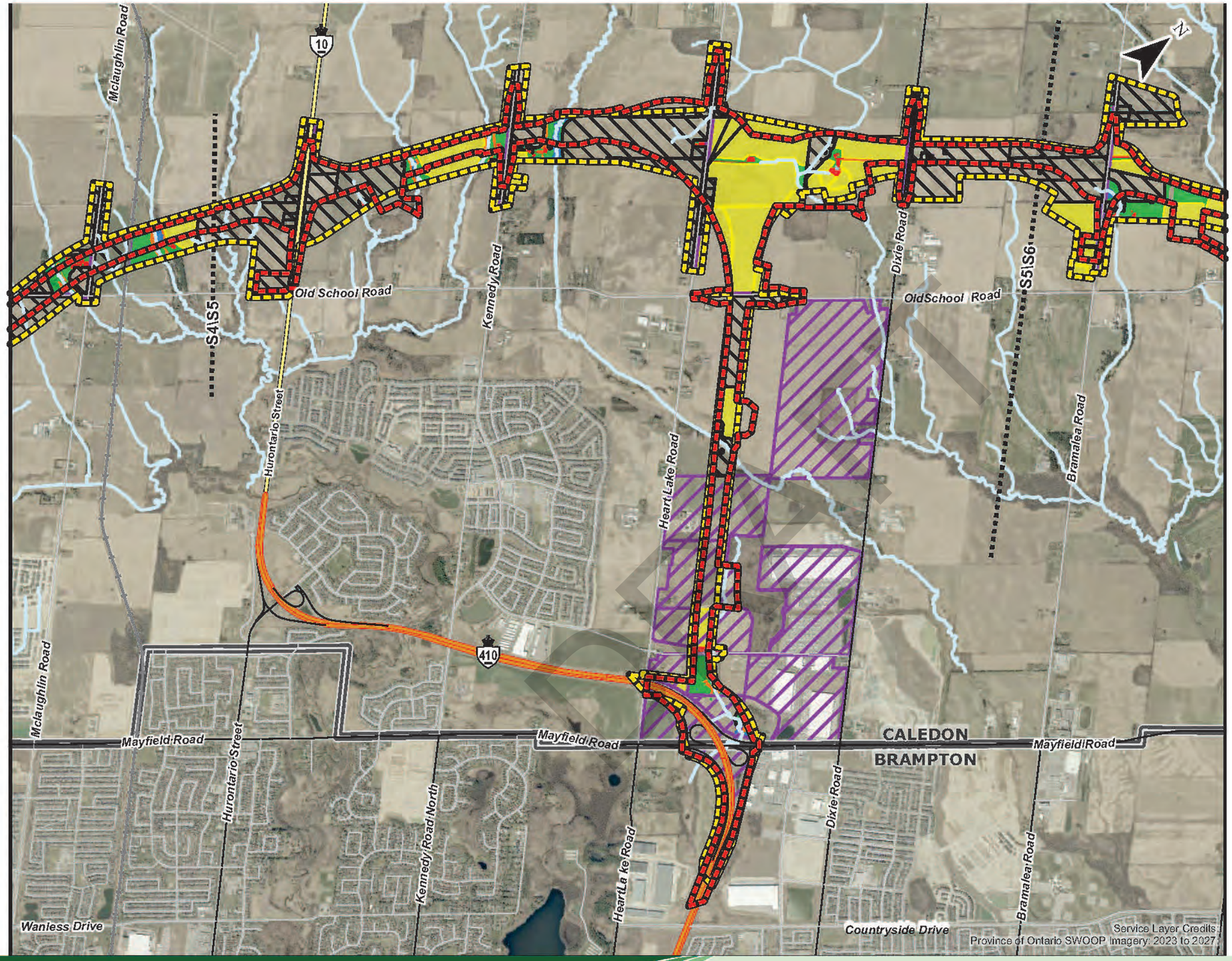
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Sources:
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0 400 800 1200 m

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Legend

- Preliminary Design Right-of-Way
- Stage 2 Study Area Boundary (250 m)

General Features

- Section Boundary
- Railway
- Freeway
- Provincial Highway
- Arterial Road
- Local Municipal Road
- Watercourse
- Municipal Boundary
- Property Boundary

Stage 2 Archaeological Assessments Results

- Stage 2 AA Required
- Previous Assessments
- Visually Confirmed Disturbance
- Stage 2 Pedestrian Survey at 5m Intervals
- Steeply-Sloped Area
- Stage 2 Test Pit at 10m Intervals
- Stage 2 Test Pit at 5m Intervals
- Permanently Low/Wet

Highway 413 Preliminary Design and Assessment of Environmental Impacts

Archaeology Overview

Section: 5

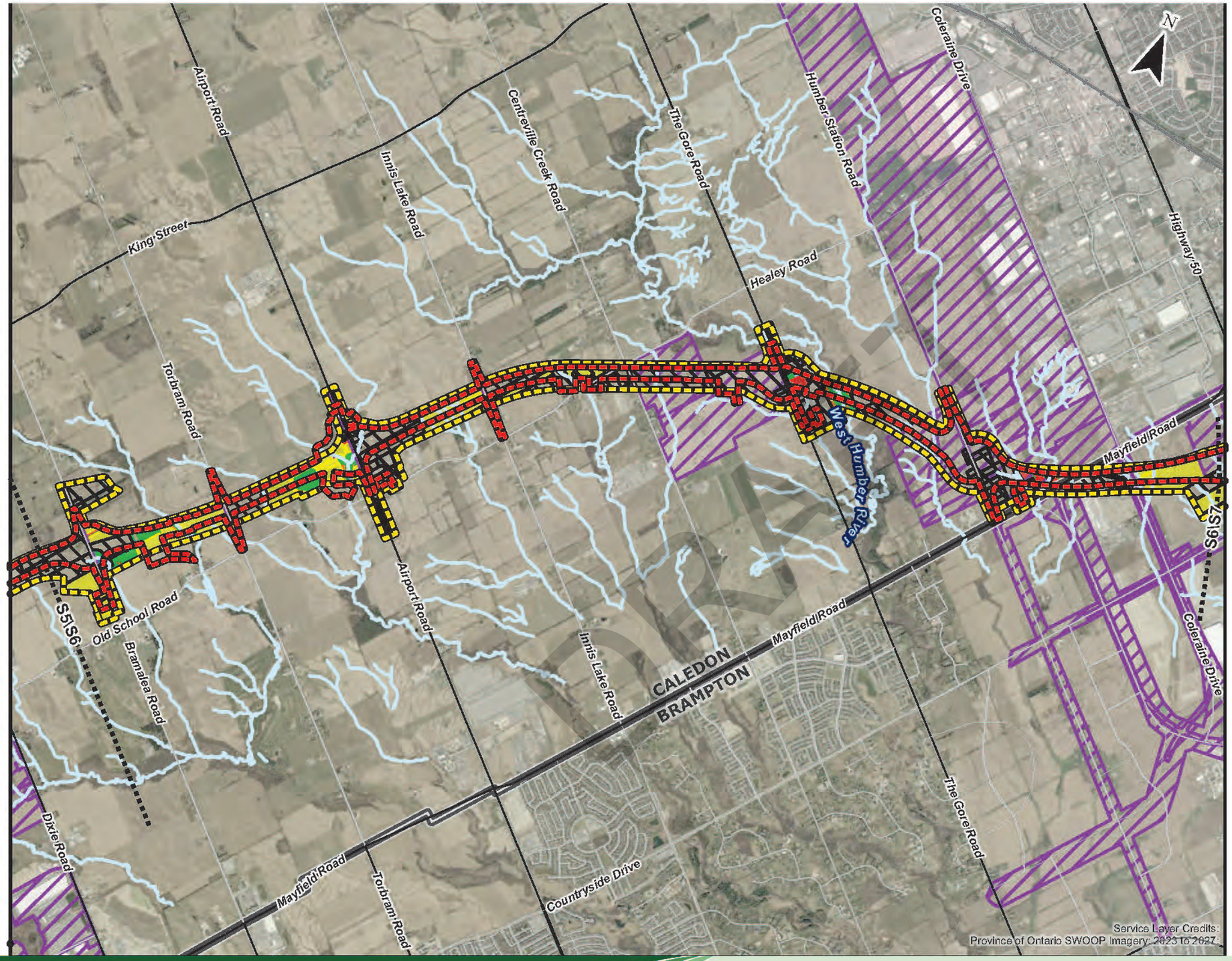
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Legend

- Preliminary Design Right-of-Way
- Stage 2 Study Area Boundary (250 m)

General Features

- Section Boundary
- Railway
- Arterial Road
- Local Municipal Road
- Watercourse
- Municipal Boundary
- Property Boundary

Stage 2 Archaeological Assessments Results

- Stage 2 AA Required
- Previous Assessments
- Visually Confirmed Disturbance
- Potential Borehole Location – Test Pitted
- Stage 2 Pedestrian Survey at 5m Intervals
- Steeply-Sloped Area
- Stage 2 Test Pit at 10m Intervals
- Stage 2 Test Pit at 5m Intervals
- Permanently Low/Wet

Highway 413 Preliminary Design and Assessment of Environmental Impacts

Archaeology Overview

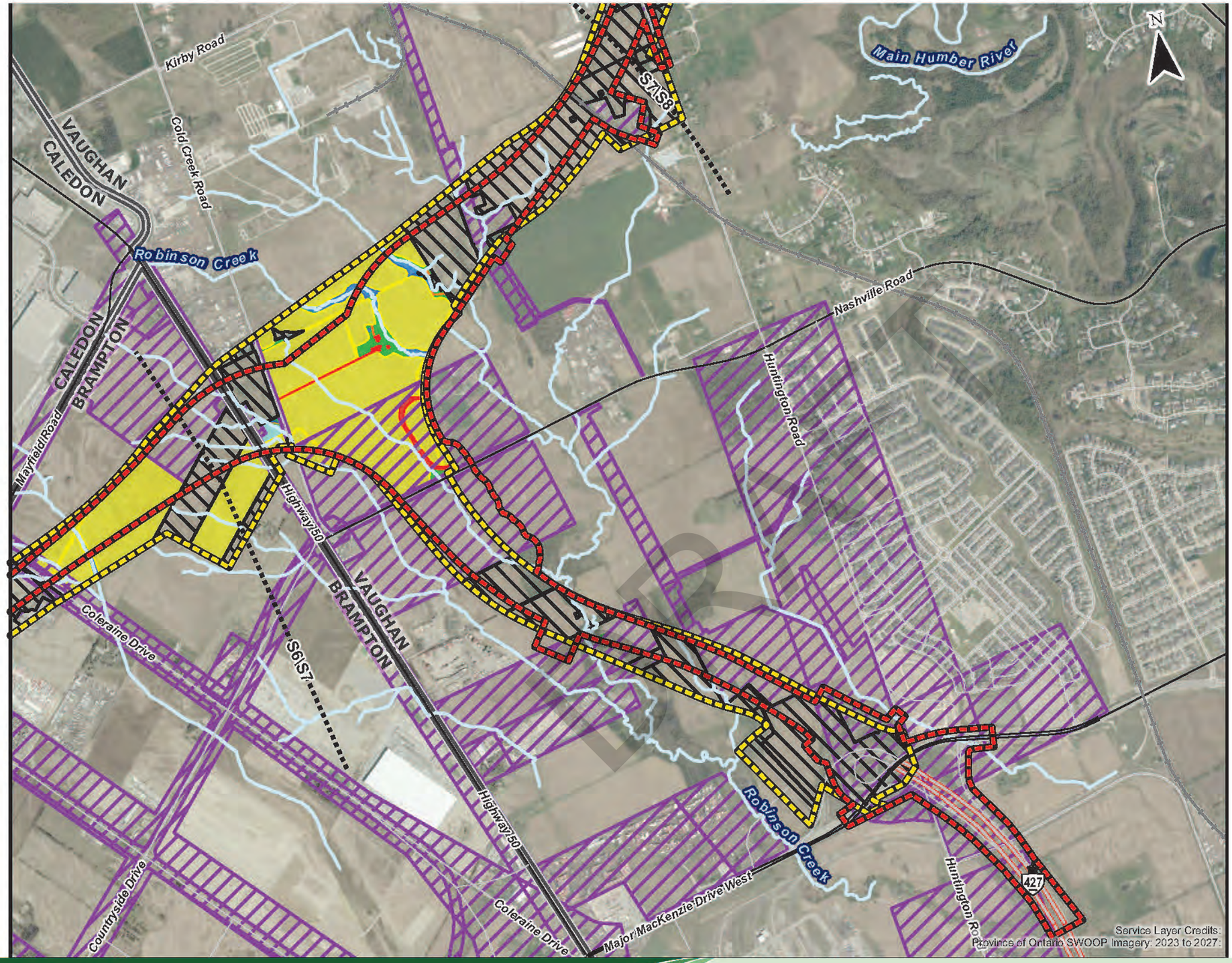
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Legend

- Preliminary Design Right-of-Way
- Stage 2 Study Area Boundary (250 m)

General Features

- Section Boundary
- Railway
- Future 427 Alignment
- Arterial Road
- Local Municipal Road
- Watercourse
- Municipal Boundary
- Property Boundary

Stage 2 Archaeological Assessments Results

- Stage 2 AA Required
- Previous Assessments
- Visually Confirmed Disturbance
- Potential Borehole Location – Test Pitted
- Stage 2 Pedestrian Survey at 5m Intervals
- Steeply-Sloped Area
- Stage 2 Test Pit at 10m Intervals
- Stage 2 Test Pit at 5m Intervals
- Permanently Low/Wet

Highway 413 Preliminary Design and Assessment of Environmental Impacts

Archaeology Overview

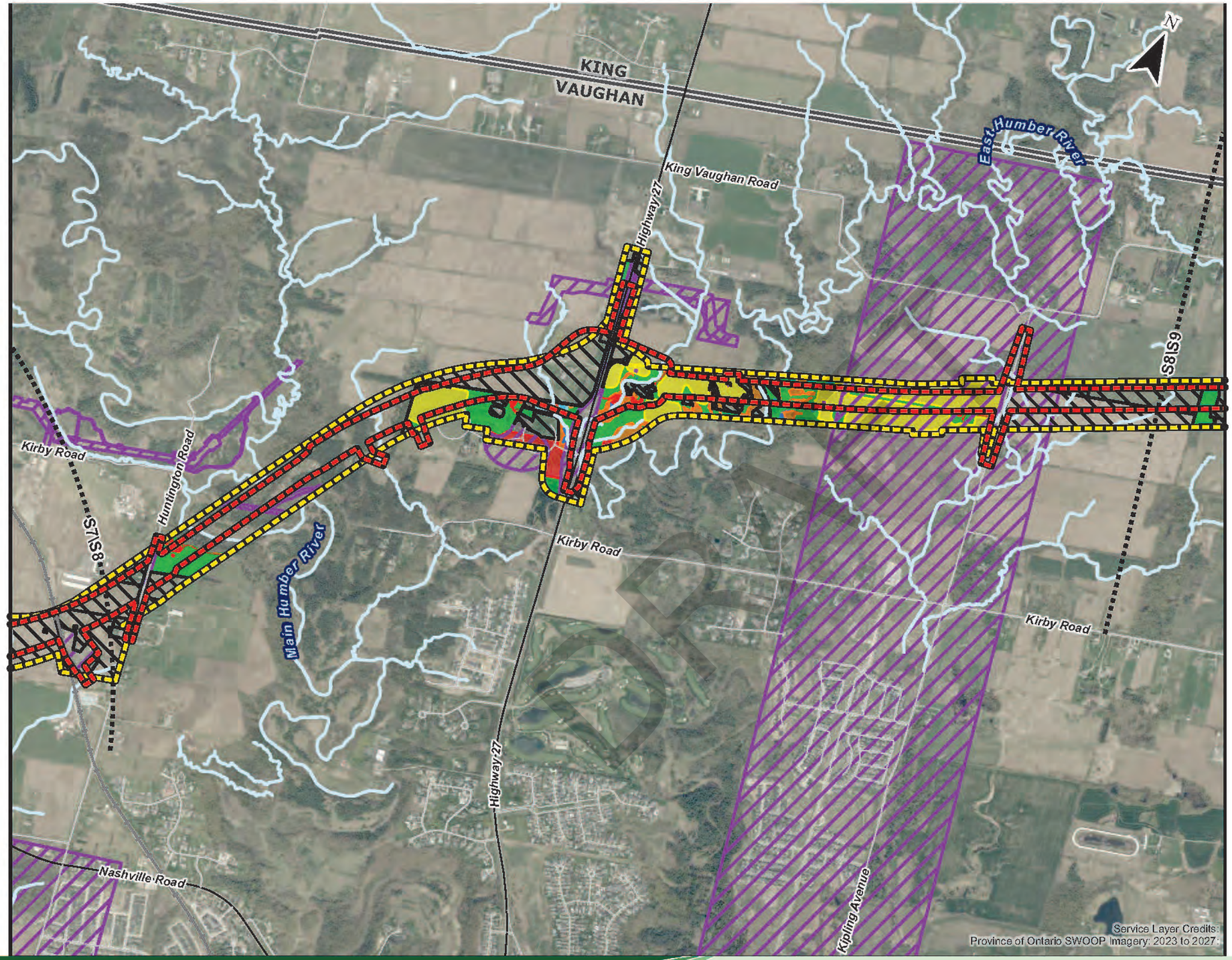
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N

Legend

- Preliminary Design Right-of-Way
- Stage 2 Study Area Boundary (250 m)

General Features

- Section Boundary
- Railway
- Arterial Road
- Local Municipal Road
- Watercourse
- Municipal Boundary
- Property Boundary

Stage 2 Archaeological Assessments Results

- Stage 2 AA Required
- Previous Assessments
- Visually Confirmed Disturbance
- Potential Borehole Location – Test Pitted
- Stage 2 Pedestrian Survey at 5m Intervals
- Steeply-Sloped Area
- Stage 2 Test Pit at 10m Intervals
- Stage 2 Test Pit at 5m Intervals
- Permanently Low/Wet

Highway 413 Preliminary Design and Assessment of Environmental Impacts

Archaeology Overview

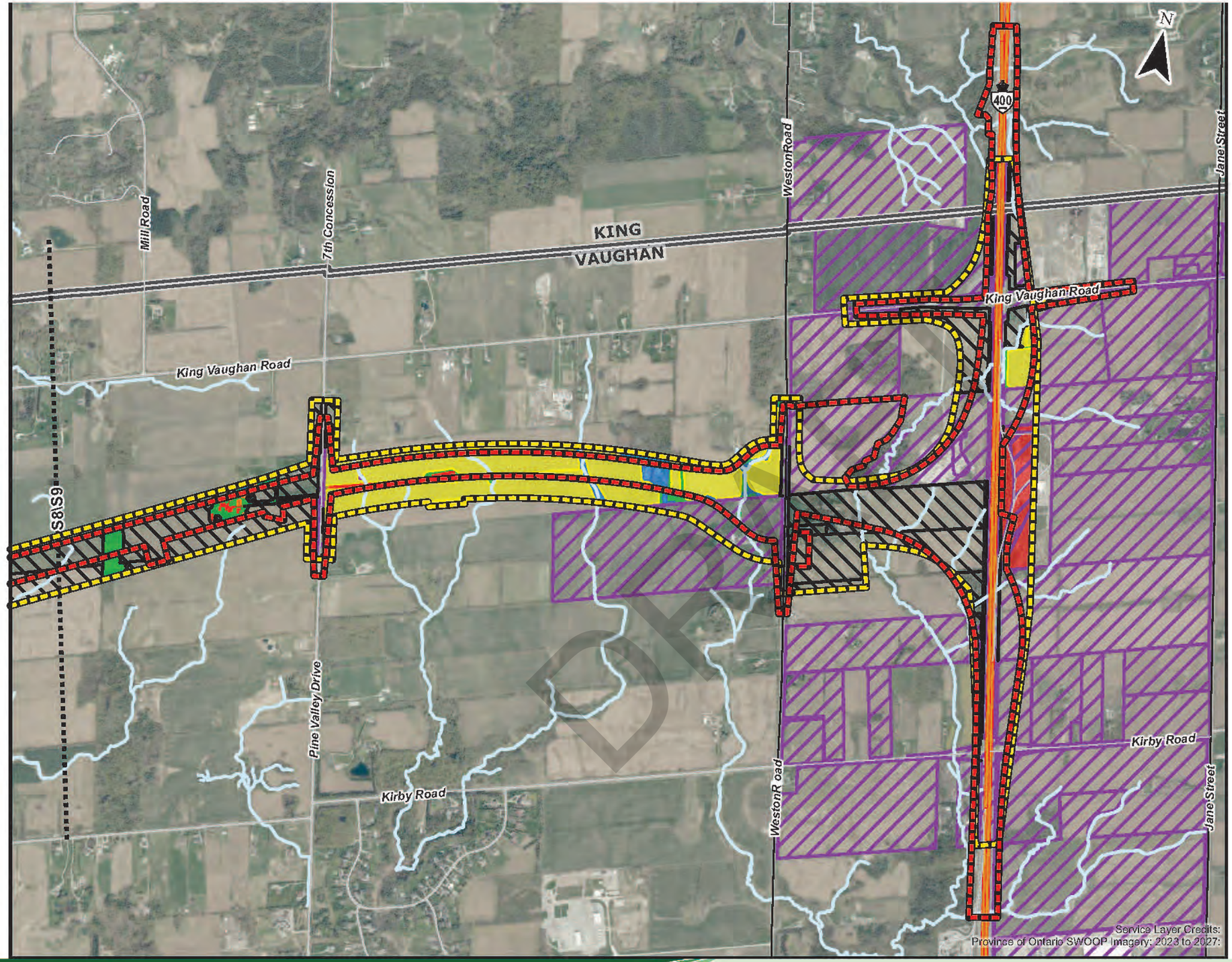
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Legend

- Preliminary Design Right-of-Way
- Stage 2 Study Area Boundary (250 m)

General Features

- Section Boundary
- Freeway
- Arterial Road
- Local Municipal Road
- Watercourse
- Municipal Boundary
- Property Boundary

Stage 2 Archaeological Assessments Results

- Stage 2 AA Required
- Previous Assessments
- Visually Confirmed Disturbance
- Potential Borehole Location – Test Pitted
- Stage 2 Pedestrian Survey at 5m Intervals
- Steeply-Sloped Area
- Stage 2 Test Pit at 10m Intervals
- Stage 2 Test Pit at 5m Intervals
- Permanently Low/Wet

Highway 413 Preliminary Design and Assessment of Environmental Impacts

Archaeology Overview

Section: 9

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

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2.6 Engineering Studies

2.6.1 Existing Road Network

The existing road network in the area within and surrounding the Highway 413 Route consists of provincial highways and regional and local municipal roads. The road network is generally in a grid configuration, oriented north-south and east-west. While there are discontinuities in roadway alignments at municipal boundaries in a few locations (which sometimes occurred when the original concessions were surveyed during early settlement of the area), the arterial and collector roadway network is continuous.

Consultation with each road authority (MTO, regional municipalities and local municipalities) was carried out during the development of the alignments and interchange alternatives, and then subsequently during Preliminary Design to identify existing and planned future roadway and active transportation improvements included in Transportation Master Plans and other approved planning policies. This informed decisions about crossings of the Highway 413 Project (interchanges or flyovers), and the width of structures to accommodate future roadway expansion and active transportation (where planned).

Figure 2-16 illustrates the existing road and rail network within and surrounding the Highway 413 Route, in addition to other critical infrastructure. **Table 2-11** summarizes the highways and municipal roadways crossing the Highway 413 Project, including the ultimate number of lanes and active transportation (AT) provisions, based on consensus with the roadway authorities. Further information about the Preliminary Design of these roadways is found in **Chapter 4**.

2.6.2 Regional Transportation Network and Traffic Conditions

The Greater Golden Horseshoe Model (GGHM), a travel demand model was developed for the regional transportation network for the base year of 2016 and the future planning horizon year of 2041. The demand model is an aggregate of land use information, as well as the roadway and transit infrastructure, generating a forecast trip generation and mode shares for the transportation network. The GGHM included all planned road improvements through the corridor, as identified by the municipalities and MTO. Demand modelling was completed using a 'no-build' scenario, assuming all planned road projects and non-roadway improvements were completed but without Highway 413. Modelling shows that growth in the GTA will inevitably result in significant and worsening congestion on the region's inter-regional roadways by 2031. The overarching problem of the inter-regional transportation system in 2031 relates to the road network. Much of the higher order road system (i.e., highways and inter-regional roads) is expected to be heavily congested during peak periods and increasingly congested throughout the day.

A traffic microsimulation model was developed to assess the existing traffic conditions and calibrated to observed traffic data. Development of the existing conditions model included application demand modelling to obtain travel patterns within the study region for a base year of 2016, based on the most recent population, employment and land use figures. Travel demand model runs were applied on the most recent transportation networks as of the base year, for all road segments within the regional transportation network that cross the highway corridor and are expected to connect to the highway via interchanges. The traffic input data used for the study was provided by MTO, the Regional Municipalities of Peel, York, and Halton, City of Vaughan, Town of Caledon. Observed conditions for the base year of 2016 were established for morning and afternoon peak hours. The calibration of the traffic microsimulation model for existing traffic was then applied to the evaluation of future traffic conditions with the Highway 413 corridor.

An area-wide travel demand analysis was completed for the 2041 modelling horizon year in support of future Highway 413 cross section alternatives. The future road network incorporates planned improvements identified in municipal capital works programs and reflects a posted speed of 110 km/h for all 400-series freeways, in line with new MTO policy. Operational performance analysis based on the 2041 travel demand volumes was conducted for the Preliminary Design and the future road network with provincial and municipal improvements. This analysis was focused on mainline operating speeds and ramp terminal operational performance, and confirmed the recommendations included in the Preliminary Design.

2.6.3 Active Transportation

As described in **Section 2.6.1**, consultation was undertaken with the regional and local municipalities to identify AT infrastructure within the Highway 413 Route. There is not a significant amount of AT infrastructure currently, however future plans for AT are identified in approved municipal planning policies. **Table 2-11** summarizes the roadways where accommodation for future multi-use paths is being provided as part of the Preliminary Design of bridges and approaches.

In 2022, the municipalities of Caledon, Brampton and Mississauga purchased 51 km of the Orangeville-Brampton Railway corridor, which is no longer being used as a railway, to convert it to a recreational trail. Provision has been made in the Preliminary Design to provide a crossing of Highway 413 for this corridor.

The Humber River Heritage Trail is located in the Nashville Conservation Reserve on the northern and eastern sides of the Main Humber River. Managed by the TRCA, this trail includes sections of natural surface and crushed limestone surface, and has two loop trails extending north of the main trail. Portions of these trails are located within the Highway 413 Route and will be impacted by the

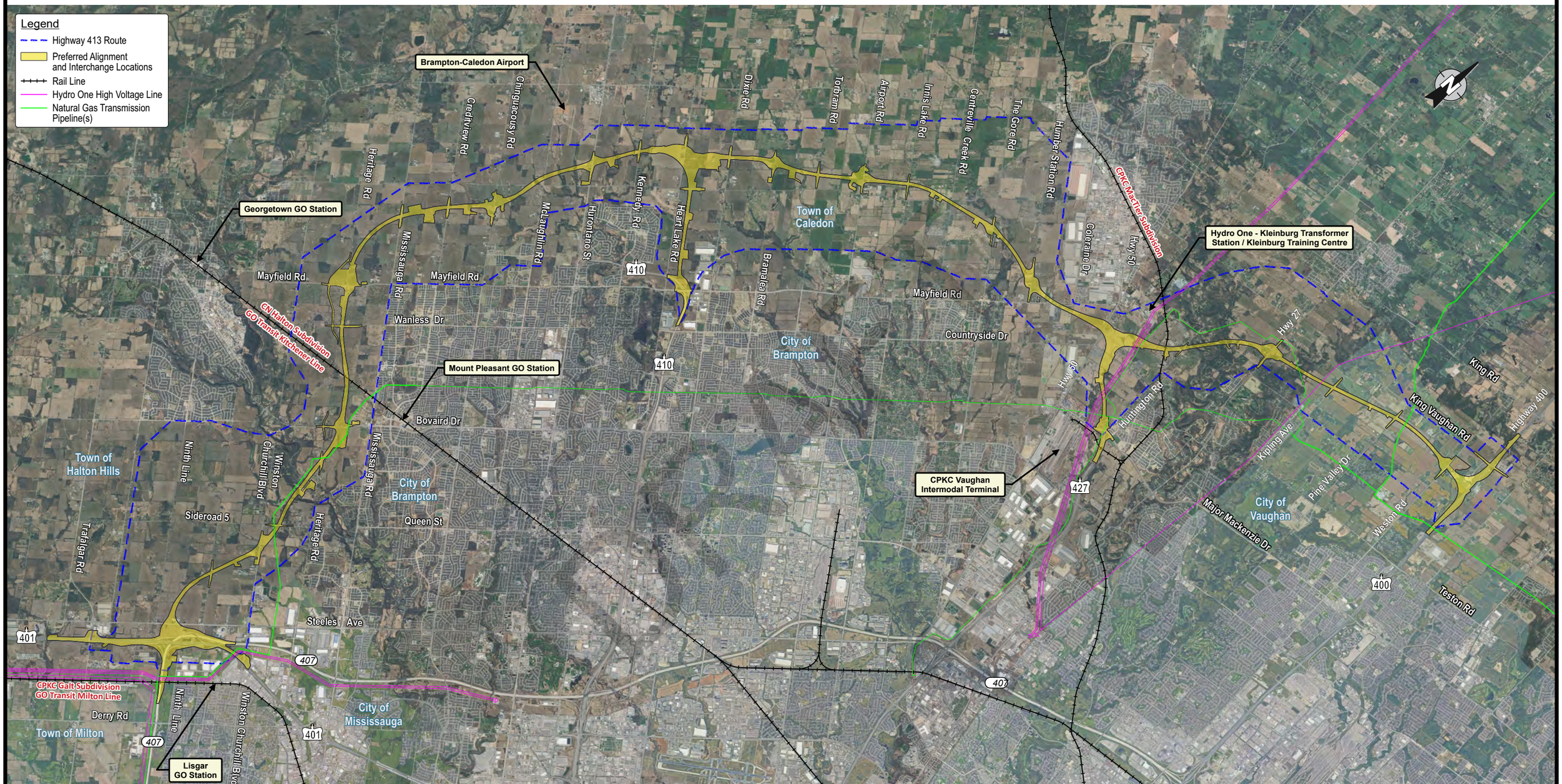
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highway alignment and structure pier locations, requiring realignment or modification. Further consultation with TRCA will be required in Detail Design to address modifications.

The TRCA, in association with the City of Vaughan, has identified proposed trails along the Main and East Humber Rivers and east of Pine Valley Drive that would cross Highway 413. Although the alignment and configuration of these trails has not yet been developed beyond a conceptual framework, MTO will assist TRCA and the City once these plans are approved and developed (or with any of the Conservation Authorities, Regional or local municipalities on their future AT concepts) to incorporate crossings of the Highway 413 Project where feasible as part of their implementation plans.

Further details regarding the Preliminary Design of future on-road AT facilities, the Orangeville-Brampton rail trail and the Humber River Heritage Trail are found in **Chapter 4**.

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Highway 413 Environmental Impact Assessment Report

Figure 2-16
Existing Road and Rail Network

Table 2-11: Highway and Municipal Roadway Crossings

Road	Crossing Type (1)	No. Lanes (2)	AT (2, 3)
Highway 413			
Steeles Avenue (Regional Road 8)	Overpass	6	Yes
Tenth Line	Underpass	4	Yes
Winston Churchill Boulevard (Regional Road 19)	Underpass (Interchange)	6	Yes
Embleton Road	Underpass	2	Yes
Heritage Road	Underpass	4	Yes
Bovaird Drive (Regional Road 107)	Underpass (Interchange)	6	Yes
Wanless Drive	Underpass	4	Yes
Mayfield Road (west) (Regional Road 14)	Underpass (Interchange)	6	Yes
Mississauga Road (Regional Road 1)	Underpass	2 (initial) 4 (ultimate)	No (initial) Yes (ultimate)
Creditview Road	Underpass	2 (initial) 4 (ultimate)	No (initial) Yes (ultimate)
Chinguacousy Road	Underpass (Interchange)	4	Yes
Old School Road	Overpass	2 (initial) 4 (ultimate)	No (initial) Yes (ultimate)
McLaughlin Road	Overpass	2 (initial) 4 (ultimate)	No (initial) Yes (ultimate)
Hurontario Street (Highway 10)	Underpass (Interchange)	4	No
Kennedy Road	Underpass	2 (initial) 4 (ultimate)	No (initial) Yes (ultimate)
Heart Lake Road	Underpass	2 (initial) 4 (ultimate)	No (initial) Yes (ultimate)
Dixie Road (Regional Road 4)	Underpass	2	No
Bramalea Road	Underpass (Interchange)	4	Yes
Torbram Road	Underpass	2 (initial) 4 (ultimate)	Yes
Airport Road (Regional Road 7)	Underpass (Interchange)	4	Yes
Innis Lake Road	Underpass	2 (initial) 4 (ultimate)	Yes
Healey Road	Overpass	2 (initial) 4 (ultimate)	No (initial) Yes (ultimate)
Centreville Creek Road	Overpass	2 (initial) 4 (ultimate)	No (initial) Yes (ultimate)
The Gore Road (Regional Road 8)	Overpass (Interchange)	4	Yes

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Road	Crossing Type (1)	No. Lanes (2)	AT (2, 3)
Humber Station Road	Underpass (Interchange)	4	Yes
Mayfield Road (east) (Regional Road 14)	Overpass	4 (initial) 6 (ultimate)	Yes
Coleraine Drive (Regional Road 15)	Overpass	4	Yes
Highway 50 (Regional Road 50 (Peel)/24 (York)	Overpass	6	Yes
Huntington Road	Overpass	2 (initial) 4 (ultimate)	No (initial) Yes (ultimate)
Highway 27 (Regional Road 27)	Overpass (Interchange)	4	Yes
Kipling Avenue	Underpass	2	Yes
Pine Valley Drive	Underpass	4	Yes
Weston Road (Regional Road 56)	Underpass (Partial Interchange)	4	Yes
Highway 410 Extension			
Old School Road	Underpass	2 (initial) 4 (ultimate)	No (initial) Yes (ultimate)
Highway 427 Extension			
Major Mackenzie Drive (Regional Road 25)	Overpass (Interchange)	6	Yes
Nashville Road	Overpass	2 (initial)	No (initial)
(Regional Road 49)		4 (ultimate)	Yes (ultimate)
Highway 400 (interchange ramps)			
King-Vaughan Road (Regional Road 14)	Underpass	4	Yes
Kirby Road	Overpass (widening existing)	2 (initial) 4 (ultimate)	No (initial) Yes (ultimate)

Notes: AT facilities will be reconfirmed during the Detail Design phase.

(1) Crossing types include:
- Underpass: Highway 413 traveling under the crossing road
- Overpass: Highway 413 traveling over the crossing road

(2) Where both an initial and ultimate configuration are indicated, the initial configuration will be constructed as part of the Preliminary Design, and the ultimate configuration will be accommodated through future widening (when warranted)

(3) AT facilities beyond the Highway 413 ROW or at overpass locations will be provided by the municipality

2.6.4 Freight and Commuter Rail

There are four railway corridors crossing the Highway 413 Route:

- The CPKC Galt Subdivision is located south of the Highway 401 / Highway 407 ETR interchange. New or widened bridges will be required to accommodate the reconfiguration of the interchange to incorporate ramps with Highway 413.
- The CN Halton Subdivision crosses Highway 413 between Bovaird Drive and Wanless Road. New bridges will be required to carry Highway 413 over the railway corridor.
- The CPKC MacTier Subdivision crosses Highway 413 between Highway 427 and Huntington Road. New bridges will be required to carry Highway 413 over the railway corridor.
- The CPKC operates a spur track from the MacTier Subdivision to the Vaughan Intermodal Terminal which crosses Highway 427 south of Major Mackenzie Drive. Widening of the existing Highway 427 southbound bridge will be required to carry the modified Highway 427 and ramp lanes over the railway corridor.

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These railway corridors carry significant freight traffic. The Galt Subdivision is CPKC's main line between Toronto and southwestern Ontario at London and then onwards to Windsor, and the MacTier Subdivision carries freight to northern Ontario and onwards through the western provinces. The CN Halton Subdivision connects to southwestern Ontario through Kitchener and London, and onwards to both Sarnia and Windsor.

The CPKC Galt Subdivision and CN Halton Subdivision are multi-track corridors and provide access for GO Transit commuter rail services as described in **Section 2.6.5**. VIA Rail also operates passenger services on the CN Halton Subdivision between Toronto and Kitchener, with onwards service to London, Windsor and Sarnia.

The Preliminary Design of the railway crossings is discussed in **Chapter 4**.

2.6.5 Public Transportation

Public transit services in and surrounding the Highway 413 Route include both regional transit and local transit. Regional transit services are provided by GO Transit and include rail and bus services. Local bus services are provided by Milton Transit, MiWay (Mississauga), Brampton Transit (including routes servicing portions of Caledon) and York Region Transit (Vaughan). As the Project includes provision of a dedicated transit corridor and carpool parking lots where interface with local transit can be provided, it is important to understand the current and future transit plans intersecting with Highway 413.

2.6.5.1 Regional and Rapid Transit

GO Transit provides regional commuter rail services on the GO Kitchener Line, which shares the CN Halton Subdivision and crosses Highway 413 between Bovaird Drive and Wanless Road. Stations are located in Georgetown to the west, and Mount Pleasant (Brampton) to the east. Metrolinx's Heritage Road Layover will be located west of Highway 413 and will accommodate storage for three 12-car GO trains, with construction anticipated to be complete in 2026.

GO Transit operates regional bus services along the following roadways in the vicinity of Highway 413:

- Bovaird Drive between Georgetown and Mount Pleasant GO (Brampton);
- Highway 10 (Hurontario Street) between Brampton and Orangeville; and
- Highway 50 between Malton and Bolton.

2.6.5.2 Local Transit

There are no local bus services within the Highway 413 Route, with the exception of:

- Milton Transit services operating on Steeles Avenue; and
- Brampton Transit services operating on Highway 50.

Brampton Transit and York Region Transit generally operate services as far north as Mayfield Road (Brampton) and Nashville Road/Teston Road (Vaughan), with some routes extending short distances further north where development has occurred.

2.6.5.3 Planned Transit Improvements

Future regional and rapid transit initiatives are described in the 2041 Regional Transportation Plan for the Greater Toronto Area (RTP) (Metrolinx, 2018). The RTP also identifies future commuter rail service on the CPKC MacTier Subdivision between Toronto and Bolton as a potential project beyond 2041.

The City of Brampton has identified an interest in a new GO station on the Kitchener Line, located in the Heritage Heights community east of Heritage Road. This initiative, along with any other potential future transit projects, would be subject to further study and approval by the Province, and would not be part of the Highway 413 Project.

Extensions of local transit services into new development areas are anticipated as development occurs.

Opportunities to integrate rapid and local transit services with the proposed Highway 413 Transitway and its stations will be considered as planning for these long-term projects is undertaken.

2.6.6 Surface Water and Drainage

The Highway 413 Route is located in watersheds administered by three conservation authorities: CH, CVC, and the TRCA, as discussed in **Section 2.3.6**.

- Within CH's regulatory area, the Project is located in the Sixteen Mile Creek watershed. Approximately 1.3 km of Highway 413 is located in this area, mainly consisting of the Highway 413 interchange with Highway 401 and Highway 407 ETR. The Project crosses tributaries of the Sixteen Mile East Branch and the Sixteen Mile Creek East Branch Lisgar.

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- Within CVC's regulatory area, the Project is located in the Credit River watershed. Approximately 12.4 km of Highway 413 is located in this area, from west of Tenth Line to north of Mayfield Road, including three interchanges. The Project traverses four subwatersheds: Mullet Creek, Levi Creek, Huttonville Creek, and Credit River – Norval to Port Credit.
- Within TRCA's regulatory area, the Project is located in the Humber River and Etobicoke Creek watersheds. Approximately 36.7 km of new highway is located in this area, which extends from north of Mayfield Road to Highway 400, including Highway 413 and the extensions of Highway 410 and Highway 427, and nine interchanges. The Project traverses the East, Main, and West Humber River subwatersheds within the Humber River watershed, and the Etobicoke Creek watershed contains four main branches, the Main Etobicoke Creek, Little Etobicoke Creek, Etobicoke Creek West Branch, and Spring Creek.

Hydrologic (the study of transforming rainfall amount into quantity of runoff) and hydraulic (the study of the motion of liquids) modelling was completed using existing subwatershed and hydraulic models provided by the Conservation Authorities, or where models were not available, using methodologies acceptable to MTO and the Conservation Authorities. Peak flow rates were established and simulated using the hydrologic models, with the peak flow rates for the major watercourses increased by 10% to account for climate change, and the upper limit of the range of estimates used for the smaller drainage areas. The hydraulic models included existing culverts, bridges and SWM ponds.

Potential SWM strategies were also identified based on MTO and MECP guidelines and policies, and the criteria established by the relevant conservation authorities. Quantity control requirements range from controlling post-development peak flow rates to pre-development levels, to meeting site-specific unit flow rates established by the relevant Conservation Authorities. For all subwatersheds crossed by the Highway 413 Route, quality control criteria are Enhanced (80% removal of Total Suspended Solids).

Once established, the hydrologic and hydraulic models were updated to include Highway 413 (and related facilities) and the proposed bridges and culverts. The models were used to size the proposed watercourse crossing structures (bridges and culverts) and other drainage structures (culverts, storm sewers), along with SWM facilities. Further details regarding the Preliminary Design of the drainage and SWM facilities are found in **Chapter 4**.

Further details on the existing drainage and SWM features are found in the Drainage and Stormwater Management Reports for the CH Area (2024), CVC Area (2025) and TRCA Area (2025).

2.6.7 Geotechnical

Geotechnical investigations were undertaken to evaluate subsurface conditions and provide foundation and pavement engineering recommendations for the Project.

The Highway 413 Route is situated within two major physiographic regions: the Peel Plain and the South Slope. The majority of the site is located in the South Slope, which is defined as the southern slope of the Oak Ridges Moraine. The soils within the South Slope are comprised of calcareous clay till with lacustrine clay and silt reworked by glaciers, with numerous scattered drumlins and deep valley cuts caused by streams flowing towards Lake Ontario. The section between Highway 50 and Huntington Road lies within the Peel Plain, which is characterized by a level to undulating topography, gradually sloping towards Lake Ontario, with surficial soil comprising a thin lacustrine clay layer underlain by glacial till deposits. The primary bedrock units are the Queenston Formation and the Georgian Bay Formation.

The subsurface investigations at proposed bridge and structural culvert locations were carried out between 2021 and 2024, following ecology and archaeology investigations, receipt of PTE, and utility clearances. In total, approximately 169 boreholes were drilled along the Preliminary Design ROW. Monitoring wells were installed in selected boreholes to observe groundwater levels at the site. Laboratory testing of soil samples was carried out in accordance with MTO guidelines and standards.

Geotechnical field investigations for pavement design included a condition survey of pavement on existing highways and municipal roads within the Highway 413 Route, and a borehole and coring program along the alignments of Highway 413, Highway 410 Extension, Highway 427 Extension, interchange ramps and crossing roads. These investigations were carried out in 2024, following ecology and archaeology investigations, receipt of PTE, and utility clearances. In total, approximately 231 boreholes were drilled for the Project. Laboratory testing of soil samples and pavement cores was carried out in accordance with MTO guidelines and standards.

The results of the subsurface investigations and laboratory testing were interpreted and analyzed by specialists in foundation and pavement engineering to develop recommendations for use in the Preliminary Design. Further information about the Preliminary Design of foundation and pavement elements for the Project is provided in **Chapter 4**.

2.6.8 Utilities

Consultation was undertaken with utility owners, municipalities and railway companies to identify existing and planned private and public utilities located within the Highway 413 Route which may be in conflict with the Preliminary Design. The information provided by the utilities along with

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visual observations made during field visits were compiled into a Utility Composite Plan for the purposes of identifying potential conflicts. The utilities identified are described in **Table 2-12** and **Table 2-13** below. Most utilities are located along existing highways, municipal roads and railways. Transmission corridors (high voltage power, natural gas) are typically in dedicated rights-of-way.

Table 2-12: Public Utilities within the Highway 413 Route

Utility Provider	Utility Type
Region of Halton	Watermain, Fire Hydrant
Region of Peel	Watermain, Fire Hydrant, Sanitary Sewer, Storm Sewer
Region of Peel Public Sector Network (PSN)	Telecommunications (aerial)
Region of York	Watermain, Storm Sewer
City of Vaughan	Watermain, Sanitary Sewer

Table 2-13: Private Utilities within the Highway 413 Route

Utility Provider	Utility Type
Halton Hills Hydro	Power (underground and aerial)
Alectra	Power (aerial)
Bell	Telecommunications (underground and aerial)
Rogers	Telecommunications (underground and aerial)
Enbridge	Natural Gas Transmission (pipeline, underground)
TC Energy	Natural Gas Transmission (pipeline, underground)
Hydro One	Power Transmission (high voltage, aerial) Power Distribution (aerial)
Hydro One Telecom/Acronym Solutions Inc.	Telecommunications (aerial)
Group Telecom	Telecommunications (underground)
Vianet	Telecommunications (underground)

As the Preliminary Design has been developed, potential conflicts have been identified which may require utility relocation or protection. All potentially affected utility companies will be contacted to develop a Utility Relocation Plan and any contract provisions related to protection of existing utilities during Detail Design. Utility relocations may occur prior to, or during construction.

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3. Description of the Alignments Considered and Rationale for Selecting the Preferred Alignment

3.1 Overview of the Methodology for Identifying the Preferred Alignment and Preliminary Design

3.1.1 Alignment and Interchange Selection Process

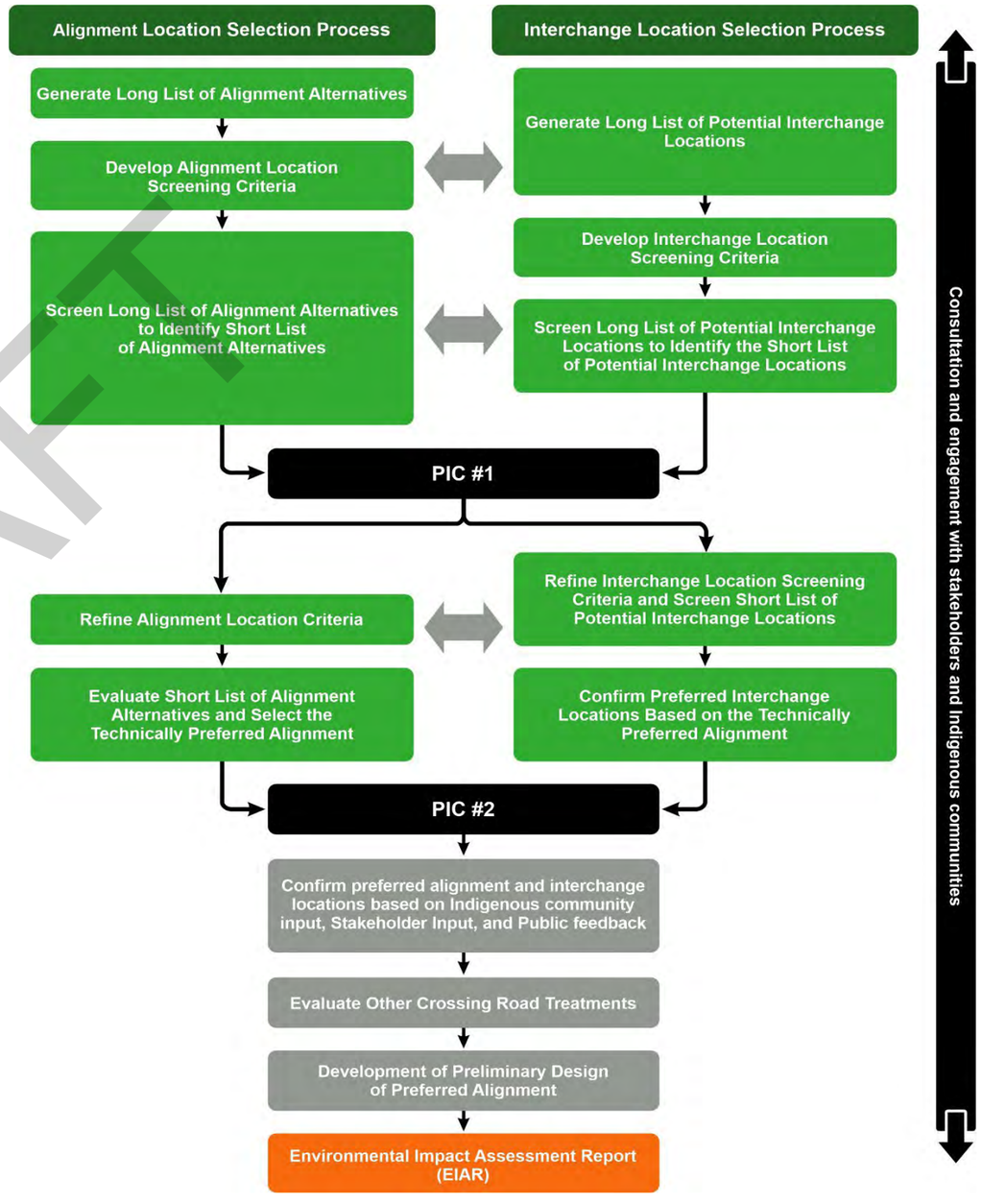
The selection process followed parallel, connected streams to examine alignment and interchange alternatives. As shown in **Figure 3-1**, the two streams are combined to create a complete transportation corridor, which was then carried forward for impact assessment and refinement, Preliminary Design, and documentation.

Understanding and considering the existing and anticipated future environmental conditions and constraints within the Highway 413 Route was a key element of the alignment selection process. Specific tasks for ensuring environmental (i.e., natural/socio-economic/land-use/cultural) protection during the alignment and interchange generation and evaluation process included:

- Identification of environmental features within the Highway 413 Route;
- Classification of environmental features to assess their significance; and
- Development of environmental features/constraints mapping to facilitate identification and development of alignment alternatives.

This work was based primarily on secondary source information, air photo interpretation, exploratory field visits to verify data, and workshops. The creation of the environmental features/constraints mapping was important in determining areas that should be avoided, to the greatest extent possible, and to identify the potential direct and/or indirect environmental impacts of the various alignments. Constraints maps were generated using information compiled as part of the existing conditions research, as detailed in **Chapter 2**, and through review of existing and planned future land use and development within the Highway 413 Route. The environmental features/constraints mapping was also used to identify areas where impacts may be less significant. This mapping was compiled into a series of composite plans for presentation at PIC #1 in fall 2014 and PIC #2 in fall 2019.

Figure 3-1: Alignment and Interchange Selection Process

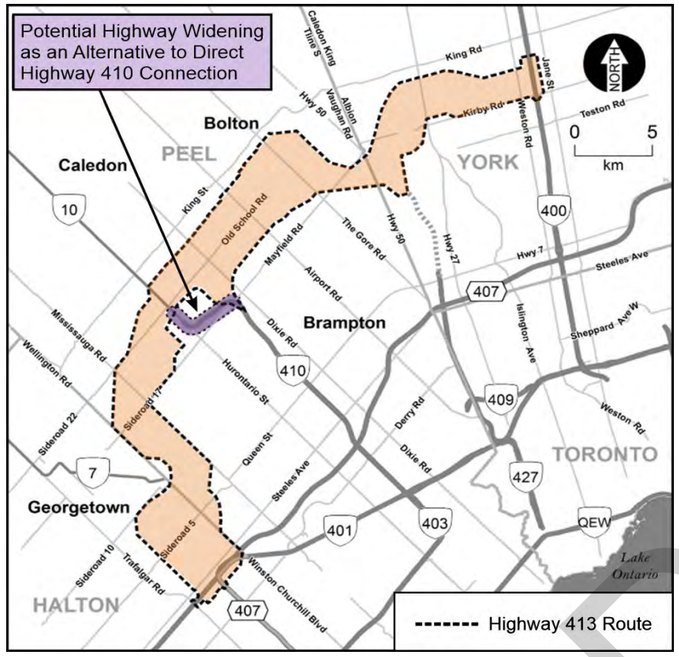


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3.1.2 Highway 413 Route

The Highway 413 Route was established as part of the TDS (2012). It represents an area within which a reasonable range of alignments can be generated. The Highway 413 Route is shown in **Figure 3-2**.

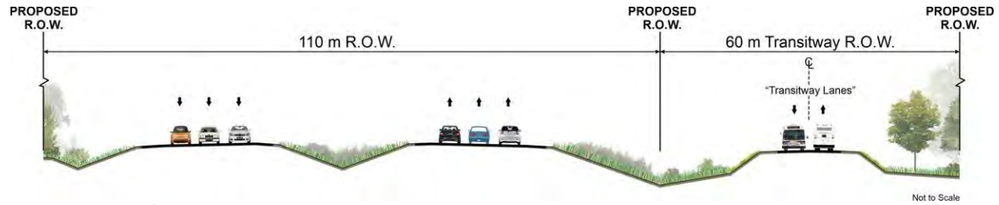
Figure 3-2: Highway 413 Route



3.1.3 Proposed Cross Section and Right-of-Way Configuration

Highway 413 will consist of a typical six -lane cross section (three lanes in each direction) with a grassed median. Highway 413 will be a fully controlled access 400-series highway as illustrated in **Figure 3-3.** Access to Highway 413 will be provided only at interchanges. The ROW has been designed to accommodate up to ten lanes (five lanes in each direction) should future traffic conditions warrant additional capacity. These additional lanes would be provided by widening the highway towards the median. The transitway will be a separate corridor running alongside the highway, dedicated for public transit, which will be subject to a separate future assessment of environmental impacts. A MUT parallel to Highway 413 may be accommodated within the proposed transitway ROW.

Figure 3-3: Typical Highway 413 Cross Section



3.1.4 Design Considerations in the Greenbelt

The *Guideline for Planning and Design of the GTA West Corridor* (now Highway 413*) Through the Greenbelt (2013)* or the Greenbelt Guideline, was prepared with input from the Greenbelt Transportation Advisory Group (GTAG). Further details on the role and contributions of the GTAG are found in **Section 8.5**.

The Greenbelt Guideline contains key planning and design principles, and recommendations for mitigation measures for placing Highway 413 within areas of the Greenbelt (when impacts to Greenbelt areas are unavoidable). Key elements include:

- Impact avoidance, where possible;
- Community sensitive design;
- Consideration of impacts to road ecology and wildlife;
- Consideration of impacts to agriculture;
- Stormwater management (SWM); and
- Flexibility with geometric and bridge design to avoid or reduce impacts (e.g., consider the use of reduced median and shoulder widths, steeper side slopes, tighter road curves, etc.).

The Greenbelt Guideline's planning and design principles were used to develop and screen the long list of alignment and interchange alternatives, and evaluate the short-listed alternatives:

- Avoided the Greenbelt where possible;
- Avoided sensitive features where possible and minimized habitat fragmentation;
- Crossed valleys at reduced angles; and
- Considered topography when identifying potential valley crossing locations.

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The Greenbelt Guideline was also referenced while developing the Preliminary Design and will continue to be referenced during implementation.

3.2 Long List to Short List of Alignments within the Highway 413 Route

3.2.1 Alignments

3.2.1.1 Generation of a Long List of Alignments

Based on principles for transportation engineering and environmental protection, a reasonable range of alignments were produced within the Highway 413 Route.

Consistent with the process outlined in **Figure 3-1**, alignments were developed that capitalize on transportation opportunities within the Highway 413 Route and the transportation system/network, while avoiding, or where this is not possible, minimizing impacts to environmental features. Environmental features are defined here in the broadest sense and encompass natural, socio-economic, land-use, and cultural factors.

Although the typical ROW for the new transportation corridor (highway and transitway) is 170 m, an initial width of 250 m was selected as an appropriate size to provide flexibility when generating alignments and to minimize impacts to environmental features.

Alignment planning is a complex iterative process. QUANTM Alignment Planning and Optimization software (QUANTM) was used to enhance this stage of the study process by assisting with the generation of alignment alternatives. This software has the unique ability to simultaneously consider environmental constraints, terrain configuration, and geometric requirements of a highway alignment as a three-dimensional object to generate and assess virtually every possible alternative, taking into account the relative significance of the constraints within the Highway 413 Route and geometric/constructability requirements of the highway alignment.

QUANTM generates thousands of potential alignments. The pattern of the alignments typically group into easily recognizable arrays or clusters. An example of QUANTM output, showing the section of the Highway 413 Route between Highway 401 to Mississauga Road, is shown in **Figure 3-4.**

In general, the long list of alignments corresponded to clusters of QUANTM alignments; however, using professional engineering and planning judgement, some of the alignments were refined to further minimize impacts to natural or land-use constraints.

The Highway 413 Route was divided into three geographic areas for the purposes of generating the long list of alignments (**Figure 3-5**):

- West Section – Highway 401/Highway 407 ETR to Mississauga Road;
- Central Section – Mississauga Road to Highway 50; and
- East Section – Highway 50 to Highway 400.

The alignment generation process was considered for each of the three areas individually; however, the connection points between the areas were reviewed together.

The long list of alignments carried forward for screening within the Highway 413 Route is shown in **Figure 3-5.**

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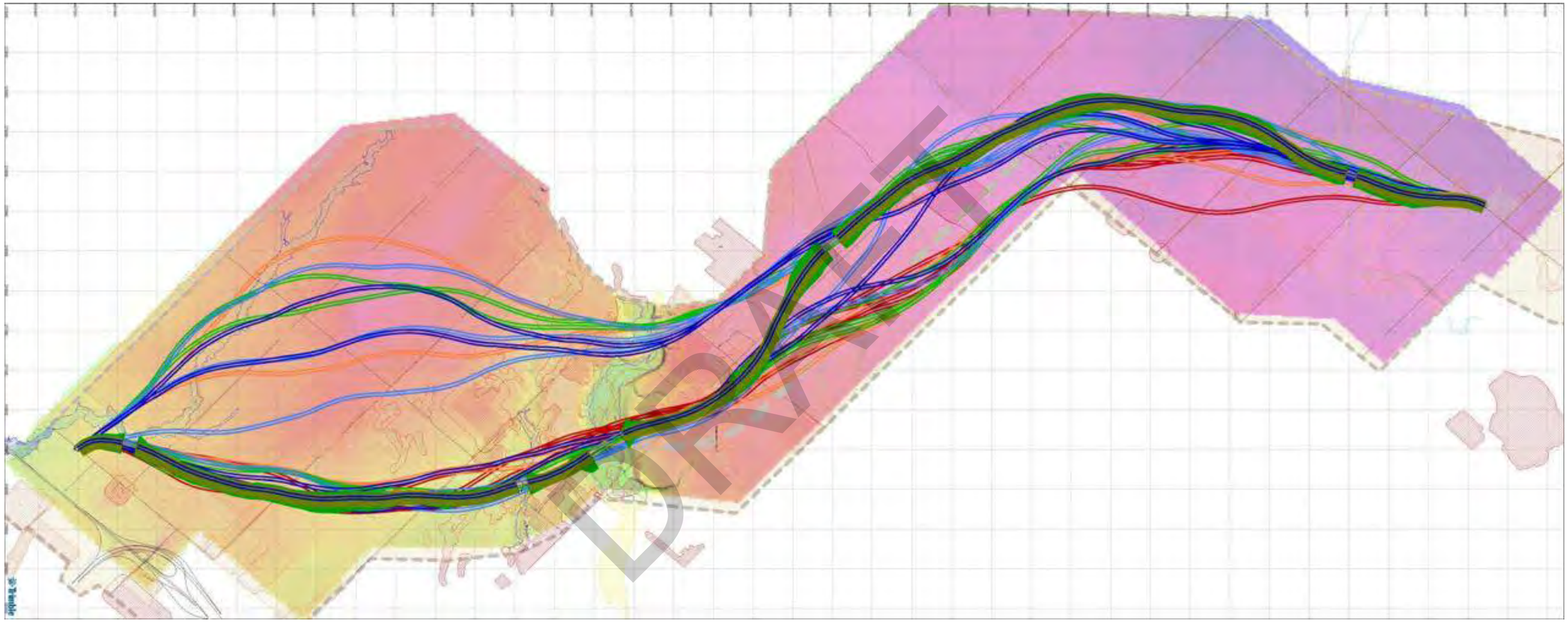
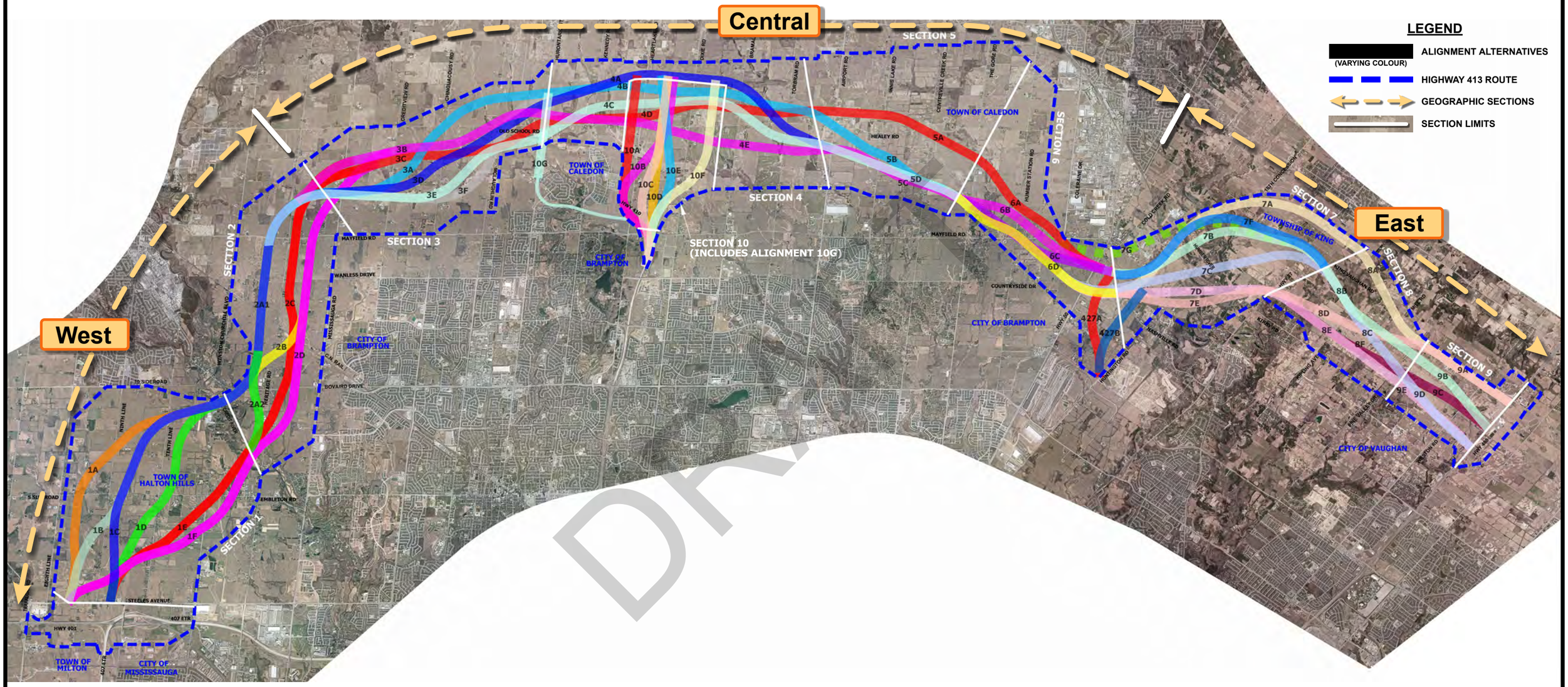


Figure 3-4
QUANTM Alignments – Highway 401 to Mississauga Road



Ontario

WSP AECOM

Highway 413 Environmental Impact Assessment Report

Figure 3-5
Long List of Alignments

3.2.1.2 Screening to a Short List of Alignments

Following the generation of the long list of alignments within the three geographic areas described previously, the Highway 413 Route was further divided into ten sections for the purpose of screening alignments, as shown in **Figure 3-5**. The screening was undertaken section by section, progressing from west to east. It was completed through a comparative assessment of each alignment using the criteria shown in **Table 3-1**, which were developed considering input received through consultation with Advisory Groups and Indigenous communities, information received about the Highway 413 Route at community workshops and PICs held during the development of the TDS, and comments submitted through the Project Website (summarized in detail in **Chapters 7 and 8**).

In preparation for the screening process, several months were spent collecting information and building knowledge about the sensitivities on the Highway 413 Route from secondary sources and field visits in the natural environment, land use, agriculture, heritage, and transportation disciplines. Tables were prepared to compare the long list alignments in each of the ten sections following the criteria in **Table 3-1**, which summarized the relative benefits and impacts of each alignment.

It should be noted that over the several years of work undertaken to select the Preferred Alignment there were some changes in terminology, and therefore the factor and criteria names and/or descriptions may not exactly match subsequent documentation and study reports. For example, Fisheries and Aquatic Ecosystems was subsequently referred to as Fish and Fish Habitat, and First Nations as Indigenous communities. The criteria described in this section reflect the terminology at the time the screening was completed.

The screening was completed via a facilitated workshop. Through a process of presentation, questions, and challenges, a technical consensus was reached regarding the alignments to be carried forward for more detailed evaluation as part of the short list for each section. The results of the screening process are summarized in **Figure 3-6**, and were presented to stakeholders and Indigenous communities at PIC #1. Further details about this consultation and feedback received are summarized in **Chapter 8**.

The short-listed alignments are presented following the discussion about interchange and crossing road alternatives in the next section.

Table 3-1: Criteria for Screening Long List Alignments

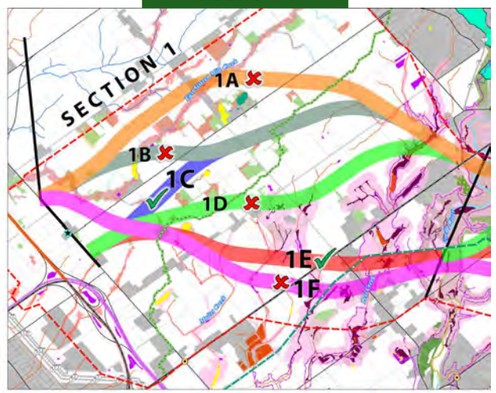
Factor	Criteria
Natural Environment:	
Fisheries and Aquatic Ecosystems	■ Number of sensitive watercourse crossings (watercourses with SAR, coldwater crossings, critical/specialized habitat). ■ Siting considerations (meandering crossing, complex valley crossing).
Terrestrial Ecosystems	■ Area of wetlands impacted (provincially and locally significant, non-significant).
Woodlands/Vegetation	■ Area of woodlands impacted (significant woodlands, intact habitat blocks, wildlife habitat).
Designated/Special/Natural Areas	■ Number of areas impacted (Greenbelt, Environmentally Sensitive Areas [ESA], Areas of Natural and Scientific Interest [ANSI]).
Land Use/Socio-Economic Environment:	
Land Use Planning Policies, Goals and Objectives	■ Compatibility with municipal land use planning policies, goals, and objectives.
Land Use - Community	■ Number of residential properties impacted. ■ Number of commercial/industrial properties impacted. ■ Number of tourist areas and attractions impacted. ■ Number of community facilities/institutions impacted. ■ Number of municipal infrastructure and public service facilities impacted.
Noise Sensitive Areas (NSA)	■ Number of existing and future planned residences within 600 m of alignments.
Land Use – Resources	■ Area of Class 1-3 soils impacted. ■ Number of Future Prime Agricultural Areas impacted. ■ Number of existing and future aggregate resource areas impacted.

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Factor	Criteria
Cultural Environment:	
Built Heritage Resources and Cultural Heritage Landscapes	■ Number of BHRs and CHLs impacted.
Archaeology	■ Number of known archaeological sites impacted. ■ Number of cemeteries impacted. ■ Number of Indigenous burial sites impacted.
Transportation:	
Network Compatibility	■ Compatibility with municipal/regional existing/planned key transportation corridors and potential interchange locations. ■ Compatibility and proximity to municipal/regional existing/planned transit initiatives.
Constructability	■ Alignment length. ■ Number and length of bridges. ■ Crossing of and proximity to utilities.
Compliance with Design Criteria	■ Ability of alignment to meet the geometric design standards.

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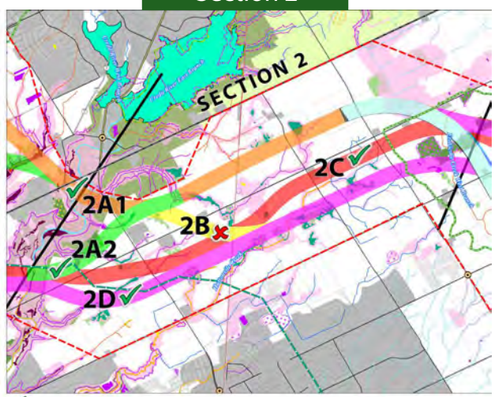
Section 1



✓ Carried Forward ✗ Screened Out

- **Key reasons for screening out Alignments 1A and 1B:**
  - Largest impact to Species at Risk habitat and complex crossings of Sixteen Mile Creek
  - Largest impact to agricultural area and Class 1-3 soils
  - **Additionally, Alignment 1B:**
    - Impacts 2 cemeteries
    - Largest impact to significant built heritage resources/cultural heritage landscapes
- **Key reasons for screening out Alignments 1D and 1F:**
  - Largest impact to commercial/industrial features
  - **Additionally, Alignment 1D:**
    - Impacts a very rare built heritage resource/cultural heritage landscape
  - **Additionally Alignment 1F:**
    - Large impact to existing and future noise sensitive areas
    - Requires up to 2 pipeline crossings

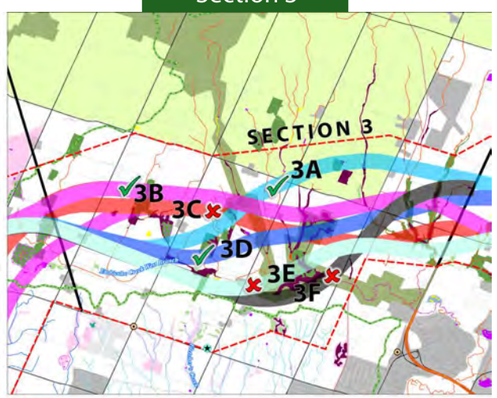
Section 2



✓ Carried Forward ✗ Screened Out

- **Key reasons for screening out Alignment 2B:**
  - Large impact to existing land use (particularly commercial/industrial land uses)

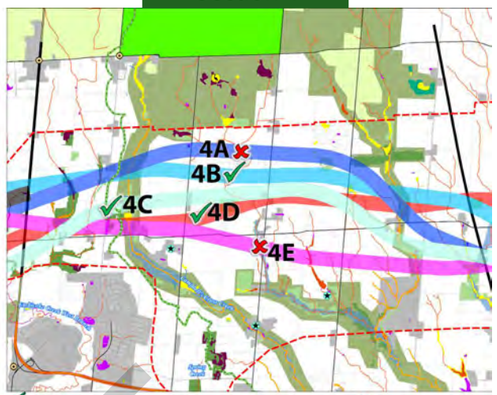
Section 3



✓ Carried Forward ✗ Screened Out

- **Key reasons for screening out Alignment 3C:**
  - Alternatives 3C and 3D result in similar impacts, however Alternative 3C results in an additional impact to Brentwood Academy
  - Large impacts to significant wetlands
- **Key reasons for screening out Alignment 3E:**
  - More complex crossings of Etobicoke Creek, and large impacts to woodlands and Provincially Significant Wetlands
  - Large impact to residential properties and future noise sensitive areas (in Mayfield West)
  - Very constrained (does not allow for design modification in future planning stages)
- **Key reasons for screening out Alignment 3F:**
  - Largest impact to residential and commercial/industrial properties, and future noise sensitive areas (in Mayfield West)
  - Largest impact to significant built heritage resources/cultural heritage landscapes

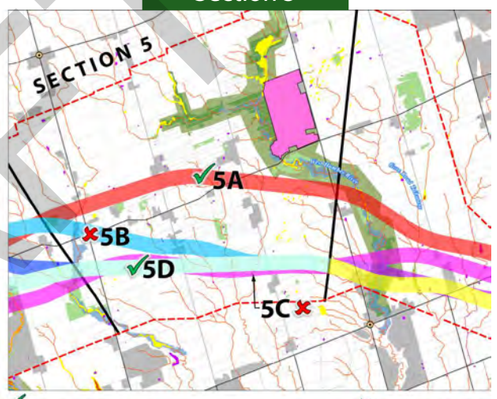
Section 4



✓ Carried Forward ✗ Screened Out

- **Key reasons for screening out Alignment 4A:**
  - Largest impact to agricultural area and Class 1-3 soils
  - Does not follow lot lines, resulting in large impacts to agricultural operations
- **Key reasons for screening out Alignment 4E:**
  - Largest impact to Etobicoke Creek Headwaters Wetland Complex, non-significant wetlands, woodlands, and Species at Risk habitat in Salt Creek
  - Large impact to residential properties and existing noise sensitive areas
  - Impacts the Brampton Fairgrounds and Banty's Roost Golf and Country Club
  - Largest impact to built heritage resources/cultural heritage landscapes
  - Requires the realignment of Old School Road

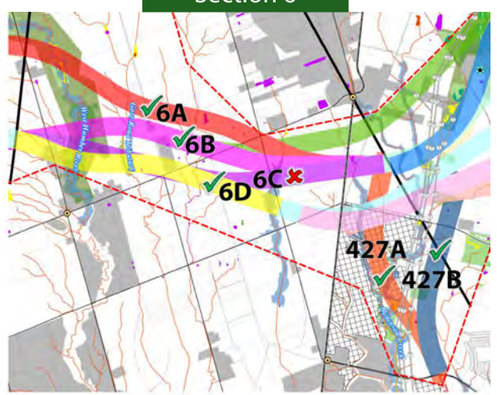
Section 5



✓ Carried Forward ✗ Screened Out

- **Key reasons for screening out Alignment 5B:**
  - Largest impacts to residential and commercial / industrial properties
  - Impacts a built heritage resource (designated building on Airport Road)
- **Key reasons for screening out Alignment 5C:**
  - Alternatives 5C and 5D result in similar impacts, however Alternative 5C crosses Salt Creek at a significant bend, resulting in a complex crossing

Section 6

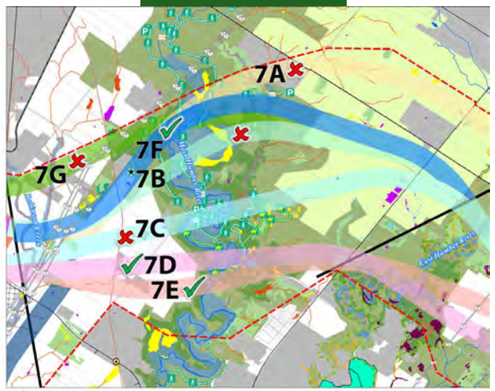


✓ Carried Forward ✗ Screened Out

- **Key reasons for screening out Alignment 6C:**
  - Crosses the Humber River and headwater tributary at a significant bend, resulting in a complex crossing
  - Large impact to agricultural area and Class 1-3 soils

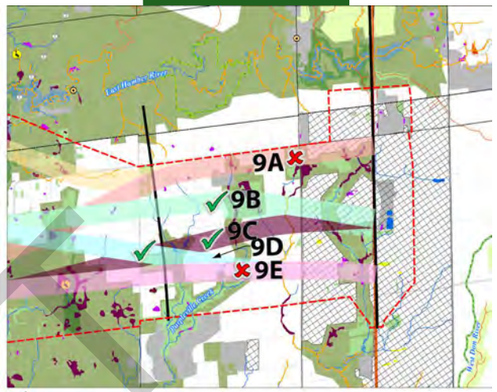
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Section 7



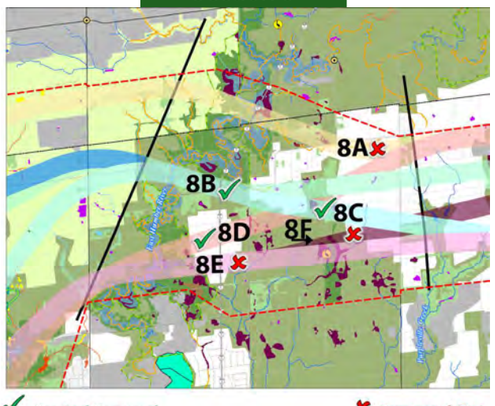
- **Key reasons for screening out Alignment 7A:**
  - Large impacts to headwater areas of tributaries, Species at Risk habitat, and woodland areas
  - Impacts a large unevaluated wetland
  - Largest impact to residential properties, Burlington Outdoor Recreation Facility, and existing noise sensitive areas
  - Largest impact to agricultural area and Class 1-3 soils
- **Key reasons for screening out Alignment 7B:**
  - Requires multiple crossings of the Humber River, Robinson Creek, and East Humber
  - Impacts a large unevaluated wetland
  - Large impact to agricultural area and Class 1-3 soils
- **Key reasons for screening out Alignment 7C:**
  - Requires crossing the Humber River multiple times and at its widest point
  - Large impacts to Robinson Creek, unevaluated wetlands
  - Large impacts to agricultural area and Class 1-3 soils
  - Impacts 4 hydro lines
  - Largest impact to built heritage resources/cultural heritage landscapes
- **Key reasons for screening out Alignment 7G:**
  - Impacts a Hydro One substation
  - Connected to 6F, which has a limited opportunity to incorporate a Highway 427 interchange within the study area

Section 9



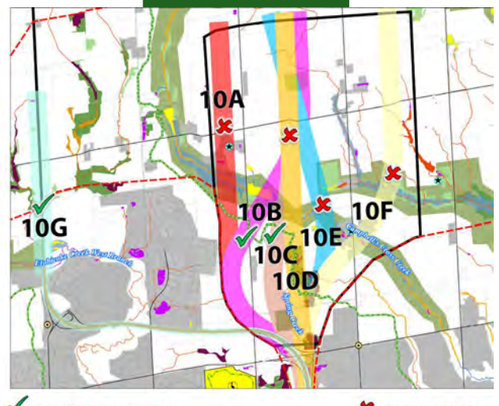
- **Key reasons for screening out Alignment 9A:**
  - Significant wetland and woodland impacts
  - Largest impact to commercial/industrial properties
  - Does not efficiently connect to the planned Highway 400 Employment Area
  - Largest impact to the planned Highway 400 Employment Area
- **Key reasons for screening out Alignment 9E:**
  - Alignments 9D and 9E are very similar, but Alignments 9E impacts a noise sensitive area
  - Largest impact on planned residential areas

Section 8



- **Key reasons for screening out Alignment 8A:**
  - Large impacts to Species at Risk habitat, East Humber River Wetland Complex, woodlands with interior habitat, and a complex crossing of the East Humber River
  - Largest impact on agricultural area
- **Key reasons for screening out Alignment 8E:**
  - Large impact to, and complex crossing of, the East Humber River
  - Impacts a heronry
  - Largest impact to existing noise sensitive areas
- **Key reasons for screening out Alignment 8F:**
  - 8F not required as it was a connector between 8E (screened out) and 9C

Section 10



- **Key reasons for screening out Alignment 10A:**
  - Impacts the largest number of properties
  - Very close to a new residential community
  - Displaces the Brampton Fairgrounds
  - Largest impact to existing and future noise sensitive areas
- **Key reasons for screening out Alignments 10D, 10E and 10F:**
  - Removes the Heart Lake Wetland Complex
  - Additionally Alternative 10F:
    - Impacts the Mayfield United Church and cemetery
    - Largest impact to agricultural area and Class 1-3 soils
    - Largest impact to significant built heritage resources/cultural heritage landscapes

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Figure 3-6
Rationale for Screening of Long List of Alignments

3.2.2 Interchanges and Crossing Roads

3.2.2.1 Generation of a Long List

Interchanges provide access between Highway 413 and other roads that cross the corridor. They are multi-level crossings: generally, two levels for an interchange between a highway and an arterial, collector or local crossing road, and two or more levels for an interchange between two highways. This provides for uninterrupted flow on the high-speed highway. Access between the highway and the crossing road is provided through ramps.

The key objectives of identifying potential interchange locations included optimizing the local and long-range network connectivity, providing community access, meeting minimum transportation modelling and spacing criteria, providing inter-regional and local transit access, and protecting environmental features.

Interchanges are to be provided at Highway 413 connections with Highway 401 / Highway 407 ETR, Highway 410, Highway 427, and Highway 400, and at some arterial crossing roads. Crossing roads not identified for interchanges would cross Highway 413 on overpasses or underpasses. The determination of an overpass or underpass would be based on impacts to the surrounding land use and the associated transportation benefits and impacts. Final decisions on treatments for crossing roads not identified for interchanges have been considered during Preliminary Design, in consultation with municipalities, and are described in **Chapter 4**.

All roads crossing the short list of alignments were initially considered as part of the long list of potential interchange locations.

Through the Greenbelt, interchange frequency was carefully considered with respect to impacts on mobility, emergency response, and other factors. Where interchanges are required, avoidance of sensitive features may be accomplished by footprint reduction or alternative interchange designs. This was assessed during the Preliminary Design, following confirmation of preferred interchange locations and is described in **Section 3.5.2**.

3.2.2.2 Screening to a Short List

A screening process was undertaken to identify the most favourable interchange locations to be carried forward from a long list to a short list, utilizing three basic screening principles:

- **Principle 1: Minimize impacts to significant natural features, functions, systems and communities.**
  - Avoid (where possible) water bodies, fish habitat, woodlands, wildlife habitats, PSW, ESA, ANSI and Greenbelt Protected areas.
- **Principle 2: Minimize impacts to existing and planned (approved OPs) population and employment areas.**
  - Maximize distance from sensitive receptors, minimize impacts to developed properties, minimize access impacts, maximize access to major generators.
  - Avoid where possible operating and non-operating waste disposal facilities.
  - Avoid where possible encroachment onto archaeological/cultural heritage sites.
  - Retain community, agricultural operations, and active transportation connections.
- **Principle 3: Ensure the interchange movements are efficient and direct, and address the transportation problems and opportunities.**

The assessment of potential interchange locations was conducted in parallel with the assessment of the long list of alignments and accounted for all possible interchange locations along the crossing road (i.e., each crossing road had an interchange location for each alignment alternative on the long list).

The screening of the long list of potential interchange locations is summarized in **Figure 3-7**.

3.2.3 Short-Listed Alignments, Interchanges, and Focused Analysis Area

The screening methodology, alternatives and recommended short-listed alignment and interchange alternatives were reviewed extensively with Advisory Groups, municipalities, agencies, and other stakeholders throughout the process, and through consultation and engagement activities with Indigenous communities. This culminated in the presentation of the short list alignments at PIC #1. Further details regarding the consultation activities are found in **Chapters 7 and 8**.

Following PIC #1 refinements were made in Sections 2 and 7 of the Highway 413 Route based on feedback received. The confirmed short list of alignment and interchange alternatives is illustrated in **Figure 3-8**.

Following the identification of the short list, the FAA was developed. The FAA was located within the Highway 413 Route and is shown in orange shading on **Figure 3-9**. The FAA surrounded the short list of alignments and reflected a zone within which refinements to the alignments could be accommodated if identified through the evaluation process, while maintaining adequate space for the elements of Highway 413 and ancillary uses. Properties located within the FAA would

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continue to be subjected to limitations on modification or development, pending the completion of the project process.

The lands outside the FAA but still within the Highway 413 Route, indicated in green on **Figure 3-9**, were areas that had lower likelihood of being impacted by refinements to the short list during the evaluation process. Limitations on these properties were reduced (but not eliminated), allowing applications to proceed through the municipal development process, with reviews and approvals by MTO on a case-by-case basis.

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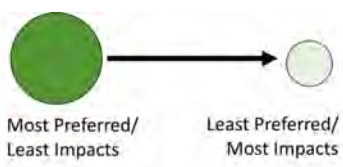
Principle	Regional Municipality of Halton				Regional Municipality of Peel							
	Steeles Avenue	5 Sideroad	Tenth Line	Winston Churchill Boulevard	Embleton Road	Heritage Road	Future Williams Parkway	Bovaird Drive	Future Sandalwood Parkway	Wanless Drive	Mayfield Road	Mississauga Road
Principle 1 – Minimize impacts to significant natural features, systems and communities	●	○	●	○	○	○	○	○	●	○	●	●
Principle 2 – Minimize impacts to existing and planned (approved Official Plans) population and employment areas	○	○	○	○	○	○	○	○	●	○	○	○
Principle 3 – Ensure the interchange movements are efficient and direct, and address the transportation problems and opportunities	◌	●	●	○	●	●	○	●	○	○	●	●
Recommendations	Do not carry forward	Carry forward	Carry forward	*Carry forward	Carry forward	Carry forward	Do not carry forward	Carry forward	Carry Forward	Do not carry forward	Carry forward	Carry forward

*East alignments only

Principle	Regional Municipality of Peel															
	Creditview Road	Chinguacousy Road	McLaughlin Road	Hwy 10	Kennedy Road	Heart Lake Road	Dixie Road	Bramalea Road	Torbram Road	Airport Road	Innis Lake Road	Centreville Creek Road	Gore Road	Humber Station Road	Mayfield Road (west of Coleraine Drive)	Coleraine Drive (future Bolton bypass)
Principle 1 – Minimize impacts to significant natural features, functions, systems and communities	●	○	●	●	●	●	●	●	●	●	●	●	○	●	●	●
Principle 2 – Minimize impacts to existing and planned (approved Official Plans) population and employment areas	○	○	○	○	○	○	○	○	○	○	○	○	○	○	◌	○
Principle 3 – Ensure the interchange movements are efficient and direct, and address the transportation problems and opportunities	◌	●	◌	●	◌	◌	●	○	◌	●	◌	◌	●	◌	●	○
Recommendations	Do not carry forward	Carry forward	Do not carry forward	Carry forward	Do not carry forward	Do not carry forward	Carry forward	Carry forward	Do not carry forward	Carry forward	Do not carry forward	Do not carry forward	Carry forward	Do not carry forward	Carry forward	Carry forward

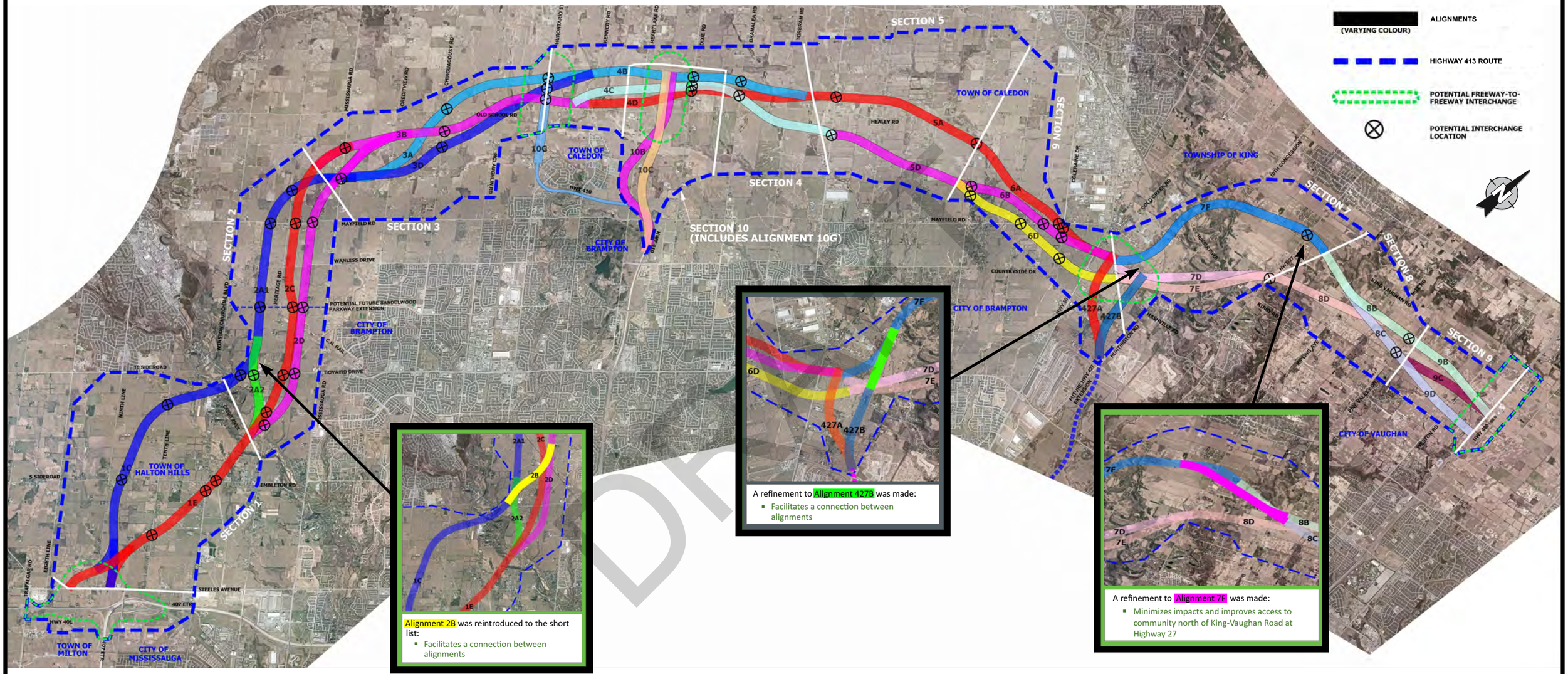
Note: not all of the interchange locations being carried forward will necessarily be incorporated into the recommended plan. Further evaluation will be carried out to confirm interchange locations.

Principle	Regional Municipality of York					
	Highway 50	Huntington Road	Highway 27	Kipling Avenue	Pine Valley Drive	Weston Road
Principle 1 – Minimize impacts to significant natural features, functions, systems and communities	●	◌	○	◌	●	◌
Principle 2 – Minimize impacts to existing and planned (approved Official Plans) population and employment areas	◌	○	○	●	○	◌
Principle 3 – Ensure the interchange movements are efficient and direct, and address the transportation problems and opportunities	○	◌	●	◌	○	◌
Recommendations	*Carry forward	Do not carry forward	Carry forward	Do not carry forward	Carry forward	Do not carry forward



*Depending on location of Highway 413/Highway 427 Interchange

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Figure 3-8
Short List of Alignments and Interchange Alternatives

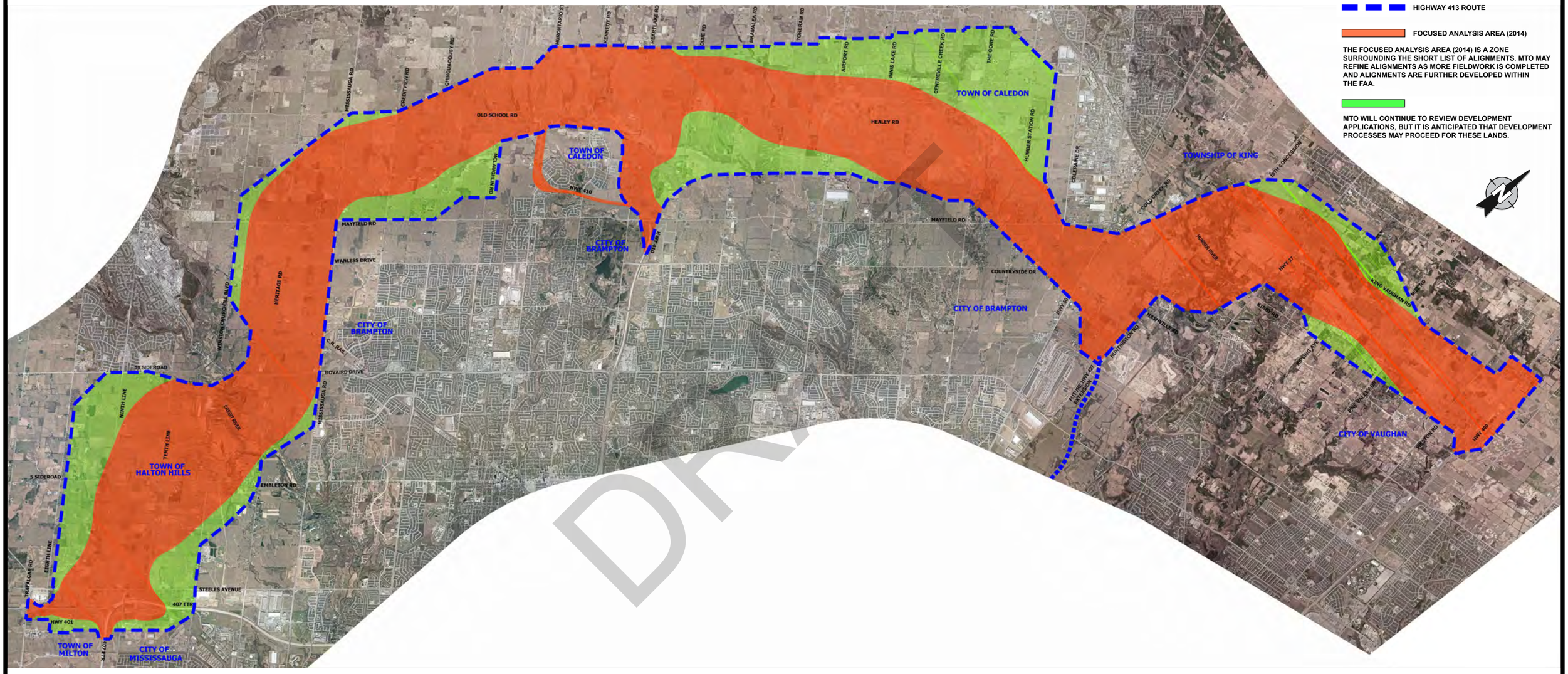
LEGEND

HIGHWAY 413 ROUTE

FOCUSED ANALYSIS AREA (2014)

THE FOCUSED ANALYSIS AREA (2014) IS A ZONE SURROUNDING THE SHORT LIST OF ALIGNMENTS. MTO MAY REFINE ALIGNMENTS AS MORE FIELDWORK IS COMPLETED AND ALIGNMENTS ARE FURTHER DEVELOPED WITHIN THE FAA.

MTO WILL CONTINUE TO REVIEW DEVELOPMENT APPLICATIONS, BUT IT IS ANTICIPATED THAT DEVELOPMENT PROCESSES MAY PROCEED FOR THESE LANDS.



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Figure 3-9
Focused Analysis Area Surrounding the Short List of Alignments and Interchange Alternatives

3.3 Short List to Technically Preferred Alignment

Following PIC #1 in fall 2014, the short list of alignments and interchange alternatives was confirmed and a subsequent more detailed evaluation of the short-listed alignments was initiated to select a Technically Preferred Alignment.

The evaluation of alternatives is an integral component of the process for assessing impacts to the environment. The evaluation process is generally based on five key principles:

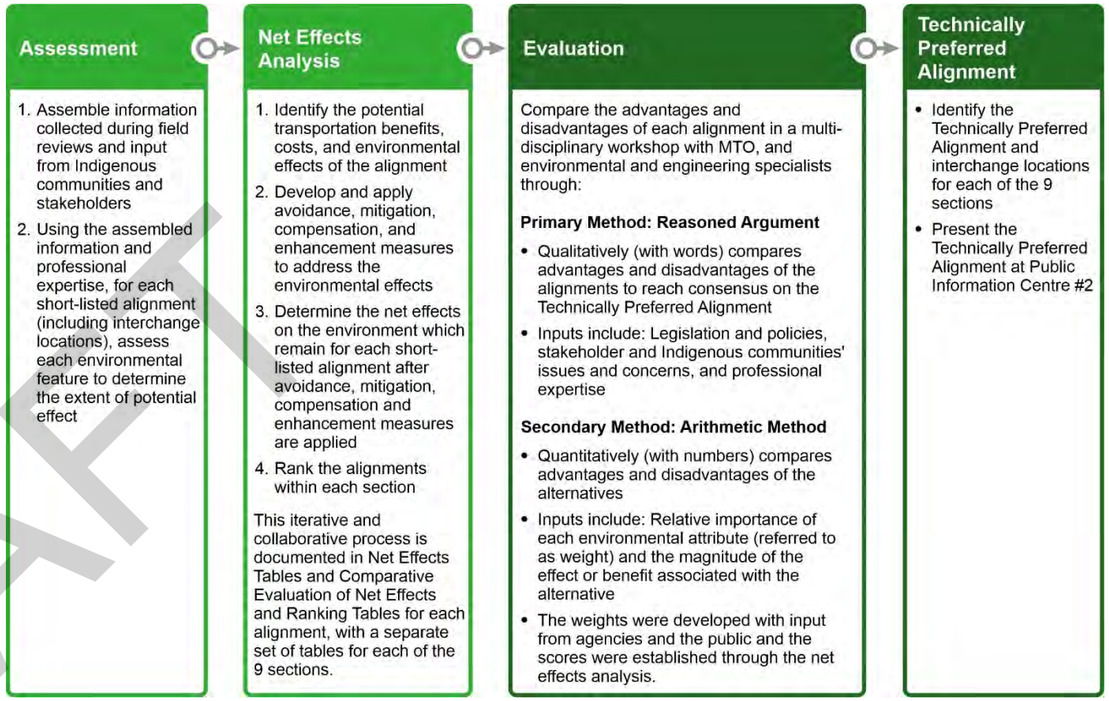
- The evaluation of alternatives must be comprehensible and systematic;
- The process must be rational and understandable;
- The results must be replicable;
- The data must be traceable; and
- The entire process must be participatory, with broad but not duplicative opportunities from the public, regulatory agencies, municipalities, Indigenous communities etc.

3.3.1 Evaluation Methodology

The evaluation was a two-step process. The first step (assessment) entailed the identification of advantages and disadvantages of the short-listed alternatives under consideration. At this stage, each environmental feature was examined to determine the extent of potential effect, based on existing data and field investigations. Net effects were identified; these refer to the effects on the environment that remain after standard mitigation measures have been applied to reduce the extent of the effect.

The second step was the evaluation itself. This step built upon the information obtained from the assessment stage and involved a comparative analysis of the advantages and disadvantages of the alternatives considered to select a Technically Preferred Alignment. At this stage, the relative importance of the environmental features and significance of the effects were determined.

Figure 3-10: Short List to Technically Preferred Alignment Methodology Flowchart



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3.3.1.1 Evaluation Criteria

The evaluation factors and criteria used are shown in **Table 3-2**. Two evaluation methods were employed to select the Technically Preferred Alignment: the Reasoned Argument Method (the primary tool) and the Arithmetic Method (the secondary tool). The Reasoned Argument Method provides a clear presentation of the key differences between the various alternatives and the reasons why one alignment is preferred over another. The Arithmetic Method provides a means to compare the alternatives based on a numerical scaling with weights assigned to each factor group. A numerical approach is a good sensitivity analysis tool to determine if the conclusions of the Reasoned Argument Method are valid and appropriate. Each method is described further below.

3.3.1.2 Methodology for Net Effects Analysis

An assessment of each short-listed alignment alternative was completed for the factors and sub-factors detailed in **Table 3-2** and used a “net effects analysis” approach. A net effects analysis takes into account potential impacts and mitigation to determine the net positive or negative potential effects of an alternative.

Input to the net effects analysis was taken from:

- Mapping and other secondary source information identifying existing features and constraints;
- Field investigations, where PTE was granted;
- Agricultural Operations Survey; and
- Professional expertise.

The net effects analysis was documented using two types of evaluation tables:

- Net Effects Tables: a separate table for each alignment alternative in the section; and
- Comparative Evaluation of Net Effects and Ranking Tables: one table for each section, incorporating all of the alignment alternatives in the section.

The following four steps were utilized to complete the net effects analysis:

1. **Identify the potential transportation benefits, costs, and environmental effects of the alternative.**
    - This included the use of existing conditions information, available secondary source data, input through stakeholder correspondence, and field work results.

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Table 3-2: Criteria for Evaluating the Short List of Alignment Alternatives

Factor	Sub-Factor	Criteria
1.0 Natural Environment:		
1.1 Fisheries and Aquatic Ecosystems	1.1.1 Fish Habitat	Potential degree of/scale of negative effects on fish habitat (extent, duration, intensity), considering sensitivity of fish habitat, e.g., critical/specialized fish habitat features, rarity of habitat types, habitat resilience, relative importance of riparian areas, and habitat rehabilitation goals, as relevant. Potential to design crossing or adjacent transportation corridor section to avoid serious harm to fish habitat.
	1.1.2 Fish Community	Potential degree of/scale of negative effects on fish (extent, duration, intensity) considering sensitivity of fish, e.g., species sensitivity to disturbance, species rarity, including SAR (special concern, threatened or endangered fish species), fish dependence on habitat (e.g., specialized/critical fish life stage processes like spawning, rearing, nursery, feeding) and fish movement/migration, and long-term fish community management goals. Potential to design crossing or adjacent transportation corridor section to avoid serious harm to fish.
1.2 Terrestrial Ecosystems	1.2.1 Wildlife and Wildlife Habitat	Potential and significance of encroachment, fragmentation, removal long-term alteration/disruption as applicable to the following: Habitat rarity (i.e., representation on landscape), Habitat sensitivity/resilience, Habitat diversity within feature and landscape, Habitat function within feature and landscape, Confirmed Significant Wildlife Habitat, Potential Significant Wildlife Habitat, Movement corridors and habitat connectivity, Potential or confirmed habitat for SAR, Presence of wildlife SAR Presence of wildlife of local and regional importance, and Interference with critical wildlife life stage processes (e.g., mating/rearing, etc.). Consideration of impacts to individuals of species or species groups and impacts to their respective habitats will be considered. Opportunities to design crossings or transportation corridor section(s) to avoid or minimize impacts to Wildlife and Wildlife Habitat.
	1.2.2 Wetlands	Potential and significance of encroachment, fragmentation, removal and/or long-term alteration/disruption on wetlands features as applicable to the following: PSW, Non-PSW, un-evaluated wetlands, lands adjacent to wetland features required to maintain ecological features and functions, and rarity, feature sensitivity/resilience, feature diversity, size and representation on the landscape. Opportunities to design crossings or transportation corridor section(s) to avoid or minimize impacts to wetlands.
	1.2.3 Woodlands and Vegetation	Potential and significance of encroachment, fragmentation, removal and the long-term alteration/disruption as applicable to the following: significant woodlands; significant valley lands; rarity, feature sensitivity/resilience, feature diversity, size and representation on the landscape; individuals/populations or habitats for vegetation SAR; and, individuals/populations or significant habitat representation for vegetation species of provincial or regional/local conservation. Opportunities to design crossings or highway section(s) to avoid or minimize impacts to woodlands and other vegetation.
	1.2.4 Designated/Special/Natural Areas	Potential and significance of encroachment, fragmentation and removal, and long-term alteration/disruption as applicable to the following: purpose/rationale for original designation (i.e., relative potential to affect the core feature/function designated); impact to the designated feature/function; change in area character/aesthetics of the features/area; and impact to the overall designation (i.e., does the impact potential effect the purpose of the designation). Designated natural areas, such as heritage rivers, ESAs, Environmentally Sensitive Policy Areas, ANSIs, Natural Heritage System(s), conservation lands (e.g., management tracts, reserves); and the designated special areas of national parks, provincial parks, conservation areas, etc.

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Factor	Sub-Factor	Criteria
1.3 Ecosystem Services	N/A	The relative potential impact for each alignment on ecosystem services. Ecosystem services are the direct and indirect benefits to human well-being that are provided by healthy functioning ecosystems.
1.4 Groundwater	1.4.1 Areas of Groundwater Recharge or Discharge	Potential and significance of alteration to areas of groundwater recharge or discharge due to physical intrusion or groundwater interception, draw-down, impoundment, obstruction, or soil compaction affecting groundwater base-flow and quality.
	1.4.2 Groundwater Source Areas and Wellhead Protection Areas	Potential and significance of alteration to groundwater source areas and wellhead protection areas due to physical intrusion, or groundwater interception, draw-down, impoundment, obstruction and by soil compaction.
	1.4.3 Large Volume Wells	Potential and significance of alteration to large volume wells due to physical intrusion or groundwater interception, draw-down, impoundment, obstruction and by soil compaction.
	1.4.4 Private Wells	Potential and significance of alteration to private well use due to physical intrusion, or groundwater interception, draw-down, impoundment, obstruction and by soil compaction.
	1.4.5 Groundwater Dependent Commercial Enterprises	Potential and significance of alteration to groundwater use by groundwater-dependent commercial enterprises due to physical intrusion, or groundwater interception, draw-down, impoundment, obstruction and by soil compaction.
	1.4.6 Groundwater Sensitive Ecosystems	Potential and significance of alteration to groundwater-sensitive ecosystems due to physical intrusion, or groundwater interception, draw-down, impoundment, obstruction and by soil compaction.
1.5 Surface Water	1.5.1 Watershed/Subwatershed Drainage Features/Patterns	Potential and significance of encroachment, severance, displacement; and, long-term alteration/disruption, as applicable to the following: watercourse crossings (permanent, intermittent and ephemeral); floodplain; riparian areas; sensitive headwater areas; and watershed and subwatershed management plans. The approach to the fluvial assessment will be confirmed, reviewed and made acceptable to reviewing agencies.
	1.5.2 Surface Water Quality and Quantity	Potential and significance of effects on quality through direct and indirect discharges of contaminated and sediment-laden run-off. Potential and significance of effects on hydrology due to changes in ground permeability, modifications to surface drainage patterns and alterations of water bodies.
1.6 Air Quality and Climate Change	1.6.1 Local and Regional Air Quality Impacts; GHG Emissions	Comparison of total air contaminant emissions and total GHG emissions for the various alternatives (Regional Assessment). Alignment alternatives will also be compared with respect to local community exposure. The approach will be based on emissions and dispersion models.
2.0 Land Use/Socio-Economic Environment:		
2.1 Land Use Planning Policies, Goals and Objectives	2.1.1 Indigenous Land Claims	Potential and significance of encroachment, severance, displacement to areas for which there are outstanding Indigenous land claims.
	2.1.2 Provincial/Federal Land Use Planning Policies/Goals/Objectives	Degree of compatibility with federal/provincial land use policies/goals/objectives (e.g., the Greenbelt Plan, the Oak Ridges Moraine Plan and the Growth Plan).
	2.1.3 Municipal (local and regional) Land Use Planning Policies/Goals/Objectives	Degree of compatibility with municipal Official Plans.
	2.1.4 Development Objectives of Private Property Owners	Potential to isolate property from current/future urban envelope. Effect on future land use.

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Factor	Sub-Factor	Criteria
2.2 Land Use – Community	2.2.1 First Nation Reserves	Potential and significance of encroachment, severance, displacement; long-term alteration/ disruption; change in area character/aesthetics; nuisance effects; and change to access/travel time, to First Nations Reserves.
	2.2.2 Indigenous Sacred Areas	Potential and significance of encroachment, severance, displacement; long-term alteration/ disruption; change in area character/aesthetics; nuisance effects; and change to access/travel time, to Indigenous sacred areas.
	2.2.3 Urban and Rural Residential Uses and Properties	Potential and significance of encroachment, severance, displacement, property acquisition; long-term alteration/ disruption; change in area character/ aesthetics; nuisance effects; change to access/travel time; and change to facilities/utilities/services, to urban and rural residential areas (residents [owners/tenants] and community groups).
	2.2.4 Commercial/Industrial Uses and Properties	Potential and significance of encroachment, severance, displacement, property acquisition; long-term alteration/ disruption; change in area character/ aesthetics; nuisance effects; change to access/travel time; and change to facilities/utilities/services, to commercial and industrial areas and agricultural operations (business owners/tenants and customers).
	2.2.5 Recreational Areas and Tourist Attractions	Potential and significance of encroachment, severance, displacement, property acquisition; long-term alteration/ disruption; change in area character/ aesthetics; nuisance effects; change to access/travel time; and change to facilities/utilities/services, to recreational areas and tourist attractions.
	2.2.6 Community Facilities/Institutions	Potential and significance of encroachment, severance, displacement, property acquisition; long-term alteration/ disruption; change in area character/aesthetics; nuisance effects; change to access/travel time; and change to facilities/utilities/services, to community facilities and institutions.
	2.2.7 Municipal Infrastructure and Public Service Facilities	Potential and significance of encroachment, severance, displacement; long-term alteration/ disruption; change to access/travel time; and change to facilities/utilities/services, to municipal infrastructure and public service facilities.
2.3 Noise Sensitive Areas	2.3.1 Transportation Noise	Number of NSAs where there is predicted to be a significant change in sound level (i.e., greater or equal to 5 dBA) or where the sound levels are predicted to be equal to or greater than 65 dBA.
2.4 Land Use – Resources	2.4.1 Indigenous Treaty Areas and Land Use Management	Potential and significance of encroachment, severance, displacement; long-term alteration/ disruption; nuisance effects; change to access/travel time, to land used for traditional purposes by Indigenous communities.
	2.4.2 Agriculture/Specialty Crop	Potential and significance of encroachment, severance, fragmentation of parcel, displacement, property acquisition; long-term alteration/disruption; change in area character/ aesthetics; nuisance effects; change to field/farm access/travel time; change to facilities/utilities/services; loss of agricultural facility/farm complex (barns and ancillary buildings), as applicable to the following: CLI Classes 1, 2 and 3 soils, Specialty crops/cropland, Diary/livestock operations, Field crop operations, High investment agricultural operations, Established agricultural farm communities.
	2.4.3 Recreation	Potential and significance of encroachment, severance, displacement, property acquisition; long-term alteration/ disruption; change in area character/ aesthetics; nuisance effects; change to access/travel time; change to facilities/utilities/services, to parks, designated open space and recreational areas.
	2.4.4 Aggregate and Mineral Resources	Potential and significance of encroachment, severance, displacement, property acquisition; long-term alteration/ disruption; change to facilities/utilities/services, to past (e.g., mine hazards and former mining operations) and current/future extraction of aggregate and mineral resources.

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Factor	Sub-Factor	Criteria
2.5 Major Utility Transmission Corridors and Pipelines	2.5.1 Major Existing Utility Transmission Corridors and Pipelines	Potential and significance of encroachment, severance, displacement; long-term alteration/disruption; change to facilities/utilities/services, to major existing and proposed utility transmission corridors and pipelines (e.g., railroads, hydro, gas, oil).
	2.5.2 Major Proposed Utility Transmission Corridors and Pipelines	
2.6 Contaminated Property and Waste Management	N/A	Potential and significance of encroachment, severance, displacement; long-term alteration/disruption; change to access/travel time; change to facilities/utilities/services, to contaminated property and waste management (e.g., Landfills, Hazardous Waste Sites, “Brownfield” Areas, other known contaminated sites, and high-risk contamination areas).
2.7 Landscape Composition	2.7.1 Terrain	Potential and significance of alterations to significant topography, landform and land uses.
	2.7.2 Vegetation	Potential and significance of impacts of alterations to flora along the alignment and its boundaries. Overall connectivity of greenways and vegetation communities.
	2.7.3 Visual Impacts	Potential and significance of impacts of alterations to the appearance of the landscape when viewed from outside the alignment and its boundaries.
	2.7.4 Aesthetics	Potential and significance of impacts of alterations to the aesthetic quality of the Project along the alignment and its boundaries.
3.0 Cultural Environment:		
3.1 Built Heritage Resources and Cultural Heritage Landscapes	3.1.1 Built Heritage Resources	Potential and significance of encroachment, severance, displacement, property acquisition; long-term alteration/ disruption; change in area character/aesthetics; temporary vibration related effects to built heritage structures; permanent obstruction of significant views or vistas; shadows from any new proposed structures (i.e., bridges); audible or atmospheric elements that may lead to impact (i.e., dust particles from construction activity); nuisance effects; change to access/travel time; change to facilities/utilities/services, to BHRs and CHLs of local, provincial or national cultural heritage value or interest including Ontario Heritage Foundation easements properties.
	3.1.2 Heritage Bridges	Potential for destruction or substantial alteration of significant MTO and/or municipal heritage bridges and culvert structures.
	3.1.3 Cultural Heritage Landscapes	Potential and significance of removal, destruction and/or change to the composition of cultural heritage landscapes and associated features.
3.2 Archaeology	3.2.1 Pre-Contact and Contact Period Indigenous Archaeological Sites	Potential for destruction or disturbance of pre-contact and contact period Indigenous archaeological sites of extreme local, provincial or national interest.
	3.2.2 Historic Euro-Canadian Archaeological Sites	Potential for destruction or disturbance of historic Euro-Canadian archaeological sites of extreme local, provincial or national interest.
	3.2.3 Indigenous Burial Sites	Potential and significance of encroachment, severance, displacement; long-term alteration/disruption; change in area character/aesthetics; nuisance effects; change to access/travel time, to Indigenous burial sites.
	3.2.4 Cemeteries	Potential and significance of encroachment, severance, displacement; long-term alteration/disruption; change in area character/aesthetics; nuisance effects; change to access/travel time; change to facilities/utilities/services, to cemeteries.

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Factor	Sub-Factor	Criteria
4.0 Transportation:		
4.1 System Capacity and Efficiency	4.1.1 Movement of People	Potential to support the efficient movement of people between communities and regions based on Level of Service (LOS) and volume to capacity (v/c) on a network, screenline and critical link basis.
	4.1.2 Movement of Goods	Potential to support efficient movement of goods between urban growth centres and regional intermodal facilities based on road network and highway performance measures (LOS and travel speed).
	4.1.3 System Performance during Peak Periods	Potential to reduce growth in peak hour travel demand through TDM and TSM strategies.
4.2 System Reliability/Redundancy	N/A	Potential to support system reliability and redundancy for travel (people and goods) between regions and communities during adverse conditions.
4.3 Safety	4.3.1 Traffic Safety	Potential to improve traffic safety based on opportunity to reduce traffic volumes and/or congestion on area road network.
	4.3.2 Emergency Access	Potential to provide and/or improve emergency access on existing and/or new provincial facilities. Impacts and opportunities to improve emergency access on municipal and regional roads.
4.4 Mobility and Accessibility	4.4.1 Modal Integration and Balance	Potential to improve modal choice and increase transit and other non-auto mode split shares between communities, regions and intermodal facilities at critical screenlines and for the highway corridor.
	4.4.2 Linkages to Population and Employment Centres	Potential to improve accessibility to urban growth centres for people and goods movement based on transportation network continuity and connectivity.
	4.4.3 Recreation and Tourism Travel	Potential to support recreation and tourism travel within and to/from the Highway 413 Route by provision of higher order network (roads and transit) continuity and connectivity and through network performance indicators (level of service, vehicle to capacity ratio, travel speed).
	4.4.4 Accommodation for Pedestrians, Cyclists, Snowmobiles and Specialized Vehicles	Potential to accommodate pedestrians, cyclists within critical travel corridors in urbanized areas and snowmobiles in recognized rural trails; and specialized vehicles such as farm equipment in rural agricultural areas.
4.5 Network Compatibility	4.5.1 Network Connectivity	Potential to improve provincial network connectivity within and to/from the Highway 413 Route.
	4.5.2 Flexibility for Future Expansion	Potential to address future transportation needs beyond the forecasted planning horizons.
4.6 Engineering	4.6.1 Constructability	Potential ease of implementation considering feasibility/difficulty of physical, property or environmental constraints.
	4.6.2 Compliance with Design Criteria	Conformity to applicable provincial safety and design standards.
4.7 Construction Cost	N/A	Relative road construction cost, excluding property and engineering costs.
4.8 Traffic Operations	N/A	Potential effects on traffic operations due to factors such as design features, private access, and transportation network connections.

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2. **Develop and apply avoidance, mitigation, compensation, and enhancement measures to address the environmental effects.**

   - Avoidance/mitigation/compensation/enhancement measures were developed based on specialists' expertise and reflected current procedures, historical performance and existing environmental conditions.
   - Avoidance: The first priority was to prevent the occurrence of the negative effects (adverse environmental effects) associated with implementing an alignment.
   - Mitigation: Where adverse environmental effects cannot be avoided, it would be necessary to develop the appropriate measures to remove or alleviate, to some degree, the negative effects associated with implementing the alignment.
   - Compensation: In situations where appropriate mitigation measures are not available, or significant net adverse effects would remain following the application of mitigation, compensation measures may be required to counterbalance the negative effect through replacement in kind, or provision of a substitute or reimbursement.
   - Enhancement: Wherever possible, the opportunity was taken to enhance the positive environmental effects associated with implementing an alignment rather than merely mitigating or compensating.

3. **Determine the net effects on the environment (High, Moderate, Low or No Net Effects).**

   - This involved application of the avoidance/mitigation/compensation/enhancement measures developed to determine the remaining net positive or negative environmental effect of each alignment.
   - The resulting net effect of each alignment was classified in terms of: High, Moderate, Low, or No Net Effects. For example, a High Net Effect means that the alignment has a high impact relative to the other alignments in that specific factor, whereas No Net Effect means that the alignment has no impact on that specific factor. It should be noted that the Transportation Factor Group is often evaluated in terms of Net Benefit; in this way a High Net Effect means that the alignment has a high benefit, relative to the other alignments in that specific factor.

4. **Rank the alignments within each section.**

   - For each sub-factor, the specialists' order of preference for each alignment within the section was ranked from most preferred to least preferred. In those cases where alignments were deemed to be equal in ranking (i.e., if the net effect and impacts were deemed the same between alignments), equal ranking ties were applied to the applicable alignments.

3.3.1.3 Reasoned Argument Evaluation Method

The Reasoned Argument Method qualitatively (with words) compares the advantages and disadvantages of the alternatives. This was the primary evaluation tool.

This method highlights the differences in net effects associated with the various alignments. Based on these differences, the advantages and disadvantages of each alignment were identified. The relative significance of the effects was examined to provide a clear rationale for the selection of a Technically Preferred Alignment. The rationale that favoured the selection of one alignment over all others was derived from:

- Government legislation, plans, policies, and guidelines;
- Municipal policy (e.g., approved OPs);
- Indigenous communities' input and concerns;
- Public, Agencies, Advisory Groups, and other stakeholder issues and concerns; and
- Specialist expertise.

3.3.1.4 Arithmetic Evaluation Method

The Arithmetic Method quantitatively (with numbers) compares the advantages and disadvantages of the alternatives. This was the secondary evaluation tool.

The Arithmetic Method helped to test and confirm the results of the Reasoned Argument method by running multiple numerical evaluations, each based on a stakeholder group's perspective. The Arithmetic Method incorporates:

- The relative level of importance of each environmental attribute (referred to as the weight); and
- The magnitude of the effect (or benefit) associated with an alternative (referred to as the score).

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Numerical values were derived for both the level of importance (weight) and the magnitude of the effect (score):

- The weights for the Natural Environment, Land Use/Socio-Economic Environment, Cultural Environment and Transportation factors were developed with input from consultation with Indigenous communities, the Municipal Advisory Group (MAG), Regulatory Agency Advisory Group (RAAG), the Community Advisory Group (CAG), the GTAG and the public. The weights assigned to the four factor groups added to 100%, with a minimum of 10% and a maximum of 50% for each factor group.
- The scores were established through the net effects analysis, with the qualitative High/Moderate/Low/No Effects categories reflected in a numerical score ranging from 0.0 (high effects) to 1.0 (no effects). This range resulted in the highest effects producing the lowest score.

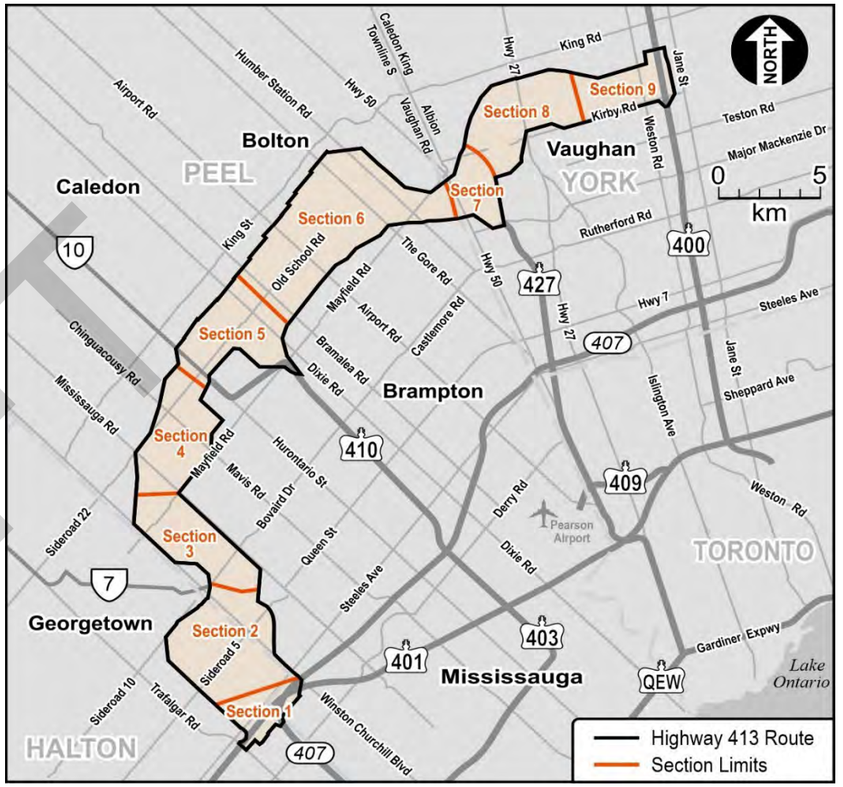
Multiplying the weight and the score resulted in a total for each factor. These were then added to determine the total for each alignment, out of a maximum of 100. As a sensitivity check, very high (50%) and very low (10%) scenarios were also analyzed for each factor, one at a time.

The totals for each alignment were then compared to determine the arithmetically preferred alternative, which was the alignment with the highest total. The Arithmetic Method generally confirmed the Technically Preferred Alignment in each section of the evaluation. Where the Arithmetic Method did not confirm the Technically Preferred Alignment as determined using the Reasoned Argument Method, the differences between the evaluation methodologies were reviewed and rationalized.

3.3.2 Evaluation and Identification of the Technically Preferred Alignment

While the Highway 413 Route was divided into ten sections for the screening of the long list of alignments, the section limits were updated and consolidated into nine sections for the detailed evaluation of the short-listed alignments. The updated section limits better grouped interchanges, land uses and key features within the Highway 413 Route. The updated section limits are shown in **Figure 3-11**.

Figure 3-11: Updated Section Limits for Evaluation of the Short-List Alignments



This exercise did not change the short-listed alignments, which were given new labels to match with the updated section limits.

The development of the net effects and comparative evaluation tables took place over several months. This iterative process involved field activities, consultation with a range of stakeholders and Indigenous communities, and significant coordination between environmental and engineering specialists. The Reasoned Argument and Arithmetic Methods were completed in a workshop format using detailed mapping and the completed tables, under the guidance of a professional independent facilitator. This comprehensive evaluation process was concluded and a preliminary Technically Preferred Alignment was identified. At this stage of the study (late 2015), the Project was suspended by the Province prior to presentation of the Technically Preferred Alignment to stakeholders or the public.

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When the Project resumed in 2019, the evaluation was updated including a review of more recent policies and plans, including, but not limited to:

- Growth Plan for the Greater Golden Horseshoe (2019);
- Greenbelt Plan (2017);
- Source Protection Plans for Credit Valley, Halton and Toronto and Region Conservation Authority (TRCA) Areas (2017);
- Municipal Official Plans and Transportation Master Plan updates;
- Municipal Secondary Plans including existing and proposed developments;
- General changes in land use and existing conditions since 2015;
- Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads (2017) and MTO Supplement for the TAC Geometric Design Guide for Canadian Roads (2017); and
- Updates to secondary source natural environment data, as applicable and publicly available.

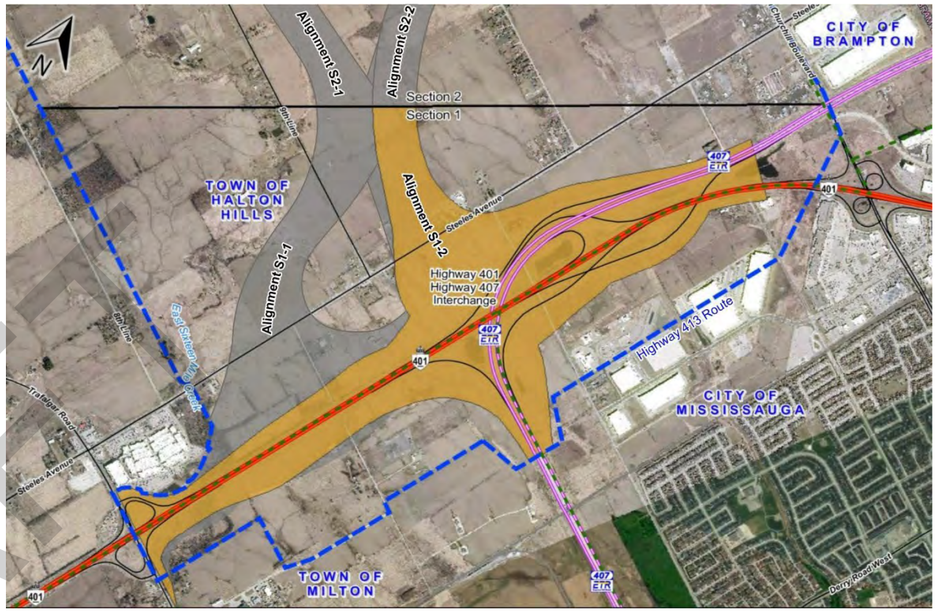
The net effects and comparative evaluation tables were updated to reflect the above information. Additional workshops were held to review the updated tables and identify and discuss any updates that might change the recommendations for the Technically Preferred Alignment. The outcome of this review was that the Technically Preferred Alignment identified in 2015 remained the same.

The rationale for the selection of the Technically Preferred Alignment in each section is detailed in the following sections. The net effects and comparative evaluation tables, along with information about the Arithmetic Evaluation, are found under separate cover on the Project Website.

3.3.2.1 Section 1 (Alignments S1-1 and S1-2)

The Section 1 alignments include the interchange between Highway 413 and Highway 401 / Highway 407 ETR to north of Steeles Avenue. Alignment S1-2 was preferred, as illustrated in **Figure 3-12**.

Figure 3-12: Technically Preferred Alignment for Section 1



Alignment S1-2 was technically preferred based on the following points:

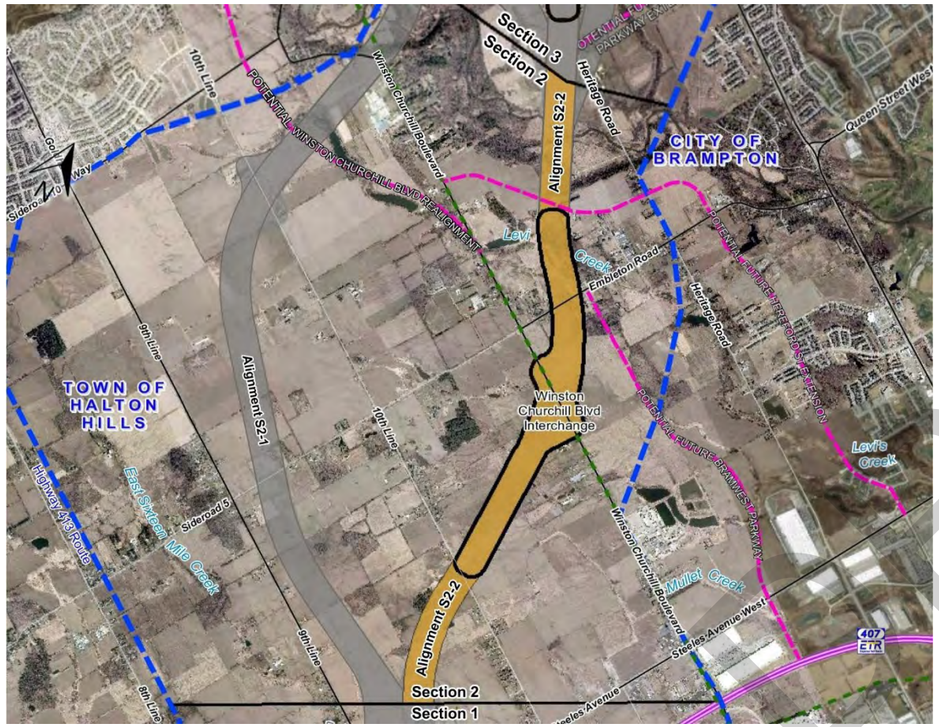
- Significantly smaller footprint resulting in fewer impacts to the natural environment and other surrounding land uses (particularly designated future employment and existing residential lands).
- Further from East Sixteen Mile Creek and the existing rural residences on Ninth Line.
- Shorter and more direct transportation link, resulting in smaller secondary effects (including reduced salt spray impacts, reduced fuel consumption, less runoff from impervious surfaces).
- Provides access between Highway 413 and Trafalgar Road, providing good access to the designated future employment lands, which is precluded with Alignment S1-1.
- Supports the efficient movement of people and goods, and network connectivity.
- Higher construction cost of Alignment S1-2 is offset by the anticipated increase in property cost associated with acquiring designated future employment area lands in Alignment S1-1 (anticipated to be a premium cost per acre).

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3.3.2.2 Section 2 (Alignments S2-1 and S2-2)

The Section 2 alignments are from north of Steeles Avenue to north of Embleton Road, in the vicinity of Winston Churchill Boulevard. Alignment S2-2 was preferred, as illustrated in **Figure 3-13**.

Figure 3-13: Technically Preferred Alignment for Section 2



Alignment S2-2 was technically preferred based on the following points:

- Provides the best crossing of the Credit River at the northern end of the Section – the crossing is easier to build (straighter), has a shorter span, and is less expensive.
- Lower impacts to fish and fish habitat, including aquatic SAR and salmonid spawning/rearing habitat. Crosses fewer permanent watercourses and has fewer watershed impacts.
- Shorter and more direct transportation link, resulting in smaller secondary effects (including reduced salt spray impacts, reduced fuel consumption, less impervious areas, and less runoff).
- Impacts fewer agricultural lands and livestock/high investment operations.
- Further east from the Village of Norval and avoids segregating that broader community.
- Provides convenient and improved access to Brampton and Georgetown, does not preclude a future Norval Bypass or connection to the proposed BramWest Parkway, aligns more closely with municipal transportation strategies for Halton Hills and Brampton, and better supports proposed employment lands.
- Most constructible and has the lowest construction cost and best traffic operations.

3.3.2.3 Section 3 (Alignments S3-1, S3-2, S-3, S3-4, and S3-5)

The Section 3 alignments are parallel to and between Winston Churchill Boulevard and Mississauga Road, from north of Embleton Road to north of Mayfield Road. Alignment S3-4 was preferred, as illustrated in **Figure 3-14**.

Figure 3-14: Technically Preferred Alignment for Section 3

Alignment S3-4 was technically preferred based on the following points:

- Minimizes wildlife habitat, wetland, and woodland community removal.
- Avoids impacts to designated natural areas, including Greenbelt lands.
- Connects well to the preferred crossing of the Credit River in Section 2.
- Minimizes significant impacts to existing institutional facilities.
- Opportunities to avoid/minimize impacts to proposed cemetery lands may be possible through design refinements.
- Generally aligns with future land uses.
- Considered to be the most constructible.
- Provides the best opportunity for an interchange at Bovaird Drive, as the presence of sensitive features and topography primarily related to the Credit River are less restrictive than on the other alternatives.
- Supports traffic safety and operations.

3.3.2.4 Section 4 (Alignments S4-1, S4-2, S4-3, and S4-4)

The Section 4 alignments are from north of Mayfield Road to west of Hurontario Street. Alignment S4-1 was preferred, as illustrated in **Figure 3-15**.

Figure 3-15: Technically Preferred Alignment for Section 4



Alignment S4-1 was technically preferred based on the following points:

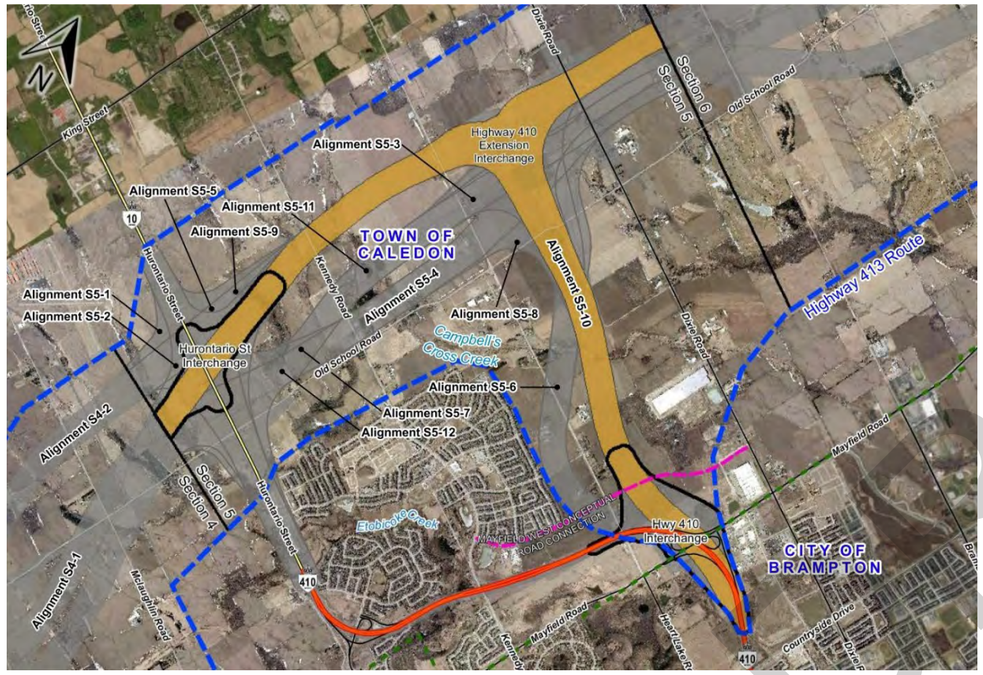
- Minimizes impacts to watersheds and sub-watersheds, wetlands, woodlands and designated areas (e.g., Greenbelt).
- Has the fewest residential noise impacts, in terms of both direct impacts and secondary noise impacts.
- Most preferred from an agricultural perspective as it has the lowest overall impacts. This is significant given the rural context of Section 4.
- Connects well with the preferred Section 3 alternative.
- Has similar cost, traffic operations and level of constructability as the other well ranked alternatives.

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3.3.2.5 Section 5 (Alignments S5-1 through S5-12)

The Section 5 alignments are from west of Hurontario Street to east of Dixie Road and include the extension of Highway 410 and the interchange between Highway 413 and Highway 410. Alignment S5-10 was preferred, as illustrated in **Figure 3-16**.

Figure 3-16: Technically Preferred Alignment for Section 5



Alignment S5-10 was technically preferred based on the following points:

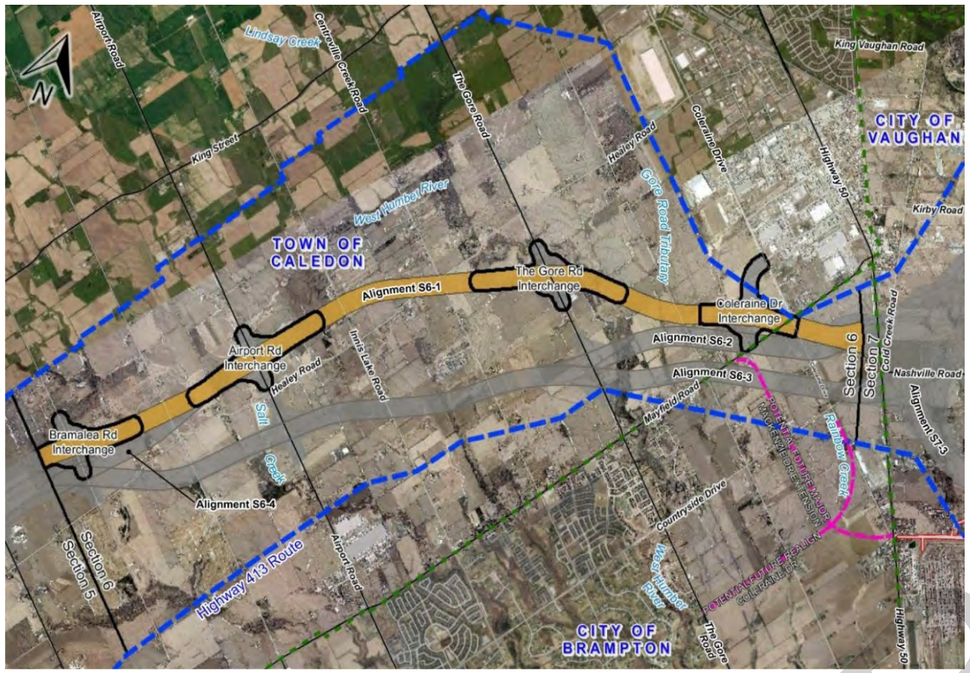
- Minimizes impacts to fish and fish habitat, and wetlands. Potential for restoration/enhancement of the Campbells Cross Creek valley that could enhance local aquatic and terrestrial features.
- Avoids impacts to large volume wells.
- Avoids existing residential subdivisions in Valleywood (noise and air quality impacts) and minimizes direct residential impacts elsewhere.
- Minimizes impacts to agricultural lands and operations (particularly the more long-term and permanent operations).
- Minimizes impacts to built heritage resources and cultural heritage landscapes.
- Avoids impacts to commercial and industrial properties.
- Minimizes impacts to future urban development including the Mayfield West planned community and Mayfield West employment lands.
- Less complex Highway 410 / Highway 413 interchange design since the connections to Hurontario Street are provided by a separate interchange rather than a combined Highway 410 / Highway 413 / Hurontario Street interchange, which is required if existing Highway 10 / 410 is utilized.
- Better ability to implement a transitway in the new Highway 410 corridor compared to existing Highway 10 / 410, if considered as part of a future study.
- Supports network compatibility and has a lower relative cost.

3.3.2.6 Section 6 (Alignments S6-1, S6-2, S6-3, and S6-4)

The Section 6 alignments are from east of Dixie Road to the vicinity of Nashville Road and Highway 50. Alignment S6-1 was preferred, as illustrated in **Figure 3-17**.

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Figure 3-17: Technically Preferred Alignment for Section 6



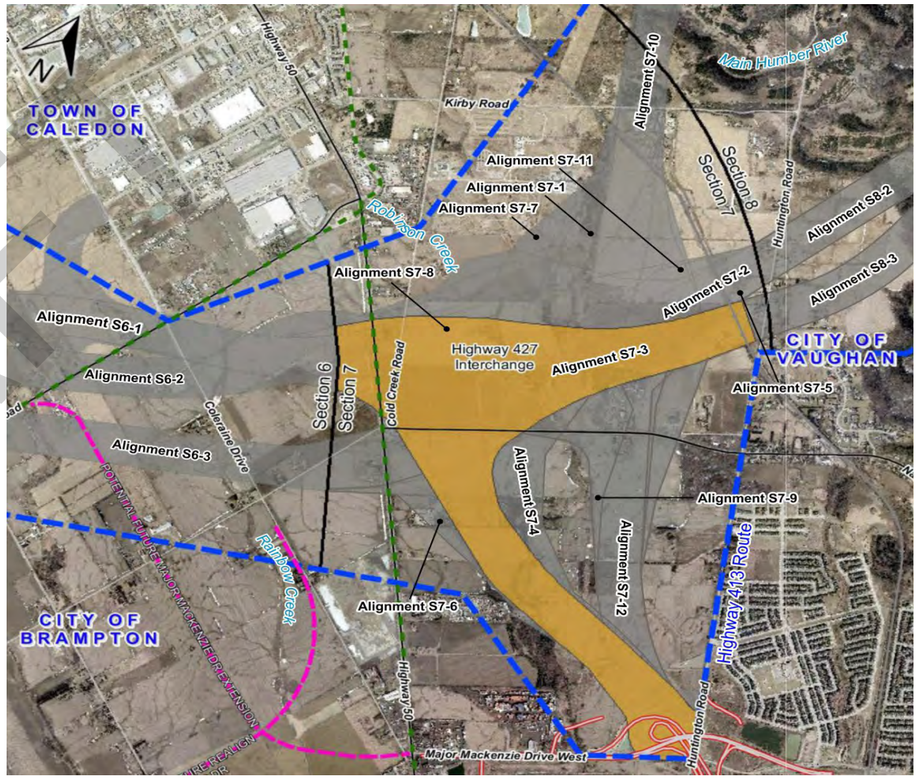
Alignment S6-1 was technically preferred based on the following points:

- Least impact to fish and fish habitat, and minimizes impacts to wildlife and wildlife habitat, and wetlands.
- Impacts the fewest residential properties and private wells.
- Low impacts to commercial/industrial properties and future development.
- Avoids impacts to high-investment farming operations, as does S6-4.
- Accommodates a full moves interchange in the area of Coleraine Drive (realignment likely required to achieve an acceptable separation distance to the Highway 427 extension).
- Has a moderate relative cost to the other well ranked transportation alignment (S6-4).
- Connects well to the preferred Section 5 alignment (S5-10).

3.3.2.7 Section 7 (Alignments S7-1 through S7-12)

The Section 7 alignments are from just west of Highway 50 to just west of Huntington Road, and include the extension of Highway 427 and the interchange between Highway 413 and Highway 427. Alignment S7-3 was preferred, as illustrated in **Figure 3-18**.

Figure 3-18: Technically Preferred Alignment for Section 7



Alignment S7-3 was technically preferred based on the following points:

- Fewer impacts to groundwater sensitive ecosystems and wellhead protection areas.
- Fewer noise impacts to existing and proposed residences to the east.
- Moderate impacts to built heritage resources and cultural heritage landscapes.
- Minor impacts to the hydro corridor, railway and TC Energy pipeline, all of which pose significant constructability challenges.

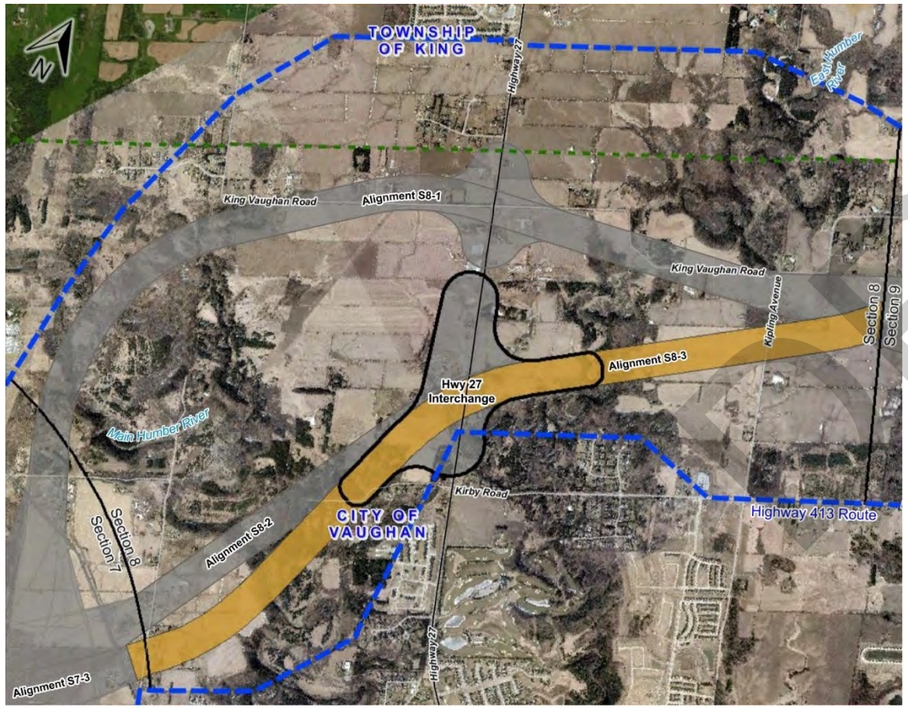
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- Accommodates a full moves interchange in the area of Coleraine Drive (realignment likely required to achieve an acceptable separation distance to the Highway 427 Extension and optimize traffic operations to/from Coleraine Drive interchange).
- Constructability and connectivity were principal considerations in Section 7. S7-3 is considered the most constructible and it connects well to the Humber River crossing in Section 8, reducing overall environmental impacts.

3.3.2.8 Section 8 (Alignments S8-1, S8-2, and S8-3)

The Section 8 alignments are from the Huntington Road area to east of Kipling Avenue. Alignment S8-3 was preferred, as illustrated in **Figure 3-19**.

Figure 3-19: Technically Preferred Alignment for Section 8



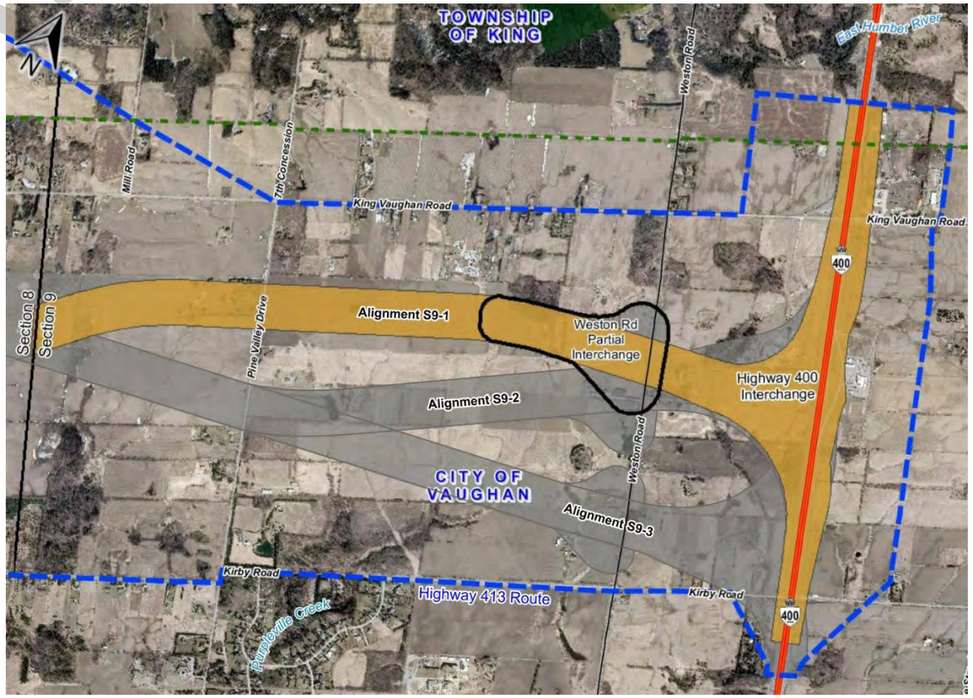
Alignment S8-3 was technically preferred based on the following points:

- Lowest overall impacts to fish and fish habitat, wildlife and wildlife habitat, woodlands and vegetation, watersheds, and surface water.
- Best location with most flexibility for the Humber River crossing due to its distance from the large meander (i.e., most perpendicular and stable crossing of the mainstem river).
- Impacts the least amount of Greenbelt and agricultural lands and is preferred from a provincial land use policy perspective.
- Impacts more residential properties but minimizes impacts to commercial properties, avoids impacts to high-investment farming operations, and has a higher probability of avoiding a waste disposal site.
- Low construction cost and is considered the most constructable.

3.3.2.9 Section 9 (Alignments S9-1, S9-2, and S9-3)

The Section 9 alignments include the section east of Kipling Avenue to Highway 400, and the interchange between Highway 413 and Highway 400. Alignment S9-1 was preferred, as illustrated in **Figure 3-20**.

Figure 3-20: Technically Preferred Alignment for Section 9



Alignment S9-1 was technically preferred based on the following points:

- Minimizes impacts to fish and fish habitat, designated areas and ecosystem services, with relatively simple and perpendicular watercourse crossings.
- Least impact on Greenbelt lands.
- Minimizes impacts to employment and future urban area lands.
- Low residential property impacts.
- Low potential for constructability issues.
- Better angle of approach for the Highway 400 interchange.

3.3.3 Evaluation and Identification of the Technically Preferred Interchanges

The short list of potential interchange locations underwent a detailed analysis congruent with the evaluation of the short list of alignments and selection of the Technically Preferred Alignment. The evaluation of alignments considered key trade-offs based on criteria outlined below for each potential interchange location.

- Level of connectivity to the provincial highway network.
- Provides a continuous connection with the provincial highway network.
- Level of connectivity to the municipal road network and initiatives.
- Provides appropriate connections with the existing municipal road network.
- Supports new or planned municipal road corridors.
- Level of connectivity to transit.
- Accommodates a potential transitway station/station access.
- Traffic demand.
- Provides direct connections to Urban Growth Centres and goods movement nodes.
- Avoids operational concerns in the network if an interchange is not provided.
- Appropriate spacing between interchanges.
- Accommodates desired interchange spacing requirements (approximately 2-3 km, based on design standards).
- Avoids safety concerns associated with traffic weaving.

Potential interchange locations were grouped together for review since interchange spacing is a critical factor in determining appropriate highway access locations. Interchange location alternatives were grouped together when the proximity of those interchange locations would preclude each other. For example, Mayfield Road and Mississauga Road were grouped together because an interchange at either location would preclude the other based on proximity. When an interchange or grouping of interchanges did not meet one or more of the criteria, it was eliminated as a potential interchange location.

After selection of the Technically Preferred Alignment, the potential interchange locations along that alignment were reviewed again using the above criteria, along with additional technical considerations associated with the selected alignment. A summary of the recommended interchange locations is provided in **Table 3-3**.

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Table 3-3: Technically Preferred Interchange Alternatives

Grouping	Preferred Location	Rationale
1: Highway 401 / Highway 407 ETR	Highway 401 / Highway 407 ETR	■ Interchanges are provided for all connections between provincial highways.
2: Tenth Line, Winston Churchill Boulevard or Embleton Road/5 Sideroad	Winston Churchill Boulevard	■ Winston Churchill Boulevard provides better connections to Urban Growth Centres and appropriate interchange spacing to provide desirable connections to the municipal road network. ■ Opportunity to integrate with future municipal road improvements such as realigned Winston Churchill Boulevard and/or Bram West Parkway (planned municipal initiative).
3: Heritage Road, Bovaird Drive or Future Sandalwood Parkway Extension	Bovaird Drive	■ Provides appropriate connections with the municipal road network and provides desirable interchange spacing. ■ Bovaird Drive is the major east/west arterial connecting urban centres in Halton Hills and Brampton. ■ Bovaird Drive provides better interchange spacing to the Winston Churchill Boulevard interchange than an interchange at Heritage Road. ■ Better road geometry for an interchange at Bovaird Drive than at Heritage Road. ■ An interchange at the future Sandalwood Parkway Extension is not precluded from future consideration by municipalities.
4: Mayfield Road or Mississauga Road	Mayfield Road	■ Based on continuity and proximity to Highway 413, Mayfield Road is envisioned to be a key east-west route. ■ Better road geometry at Mayfield Road than at Mississauga Road.
5: Chinguacousy Road	Chinguacousy Road	■ Provides north-south continuity in lieu of Mississauga Road and provides connectivity in the vicinity of Highway 410/Highway 10. ■ Provides desirable interchange spacing, although not an arterial road.
6: Highway 10 / Hurontario Street, Highway 410, Dixie Road or Bramalea Road	Interchange at Highway 410 Extension Connection (along Highway 410 Extension to the north) plus Interchanges at Hurontario Street and Bramalea Road	■ Interchanges are provided for all connections between provincial highways, including the Highway 410 Extension. ■ Interchanges at Hurontario Street and Bramalea Road are spaced at a desirable distance from the Highway 410 Extension interchange and will provide good access to the municipal road network. ■ An interchange at Dixie Road would result in undesirable grades and interchange spacing which would result in weaving concerns with the interchange at the Highway 410 Extension.
7: Airport Road	Airport Road	■ Airport Road is a regional high capacity arterial. ■ It provides desirable interchange spacing.
8: The Gore Road	The Gore Road	■ The Gore Road is a regional medium capacity arterial. ■ It provides desirable interchange spacing.

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Grouping	Preferred Location	Rationale
9: Mayfield Road (west of Coleraine Drive) or Coleraine Drive (future Bolton Bypass)	Coleraine Drive	■ A full moves interchange is desirable to connect to existing and future Urban Growth Centres. ■ Local municipalities support a full interchange with a road that runs north-south (like Coleraine Drive). ■ Proximity to the Highway 413 / Highway 427 Extension interchange creates a constraint to locating the interchange on Coleraine Drive (not enough spacing between interchanges); proposed strategy is to realign Coleraine Drive and then provide a full interchange.
10: Highway 427 or Highway 50	Interchange at Highway 427 Extension	■ Interchanges are provided for all connections between provincial highways, including the Highway 427 Extension. ■ Based on the Technically Preferred Alignment, an interchange at both Highway 427 and Highway 50 is not desirable due to the very close proximity of these roadways in the vicinity of the Technically Preferred Alignment.
11: Highway 27	Highway 27	■ Highway 27 is a regional major arterial. ■ It provides desirable interchange spacing.
12: Pine Valley Drive or Weston Road	Weston Road (partial interchange)	■ An interchange to the west of Highway 400 provides a desirable connection with the municipal road network. ■ Pine Valley Drive is not continuous north or south of the Highway 413 Route and there are no planned Urban Growth Centres along Pine Valley Drive. ■ Weston Road provides a connection to a planned Urban Growth Centre.
13: Highway 400	Highway 400	■ Interchanges are provided for all connections between provincial highways.

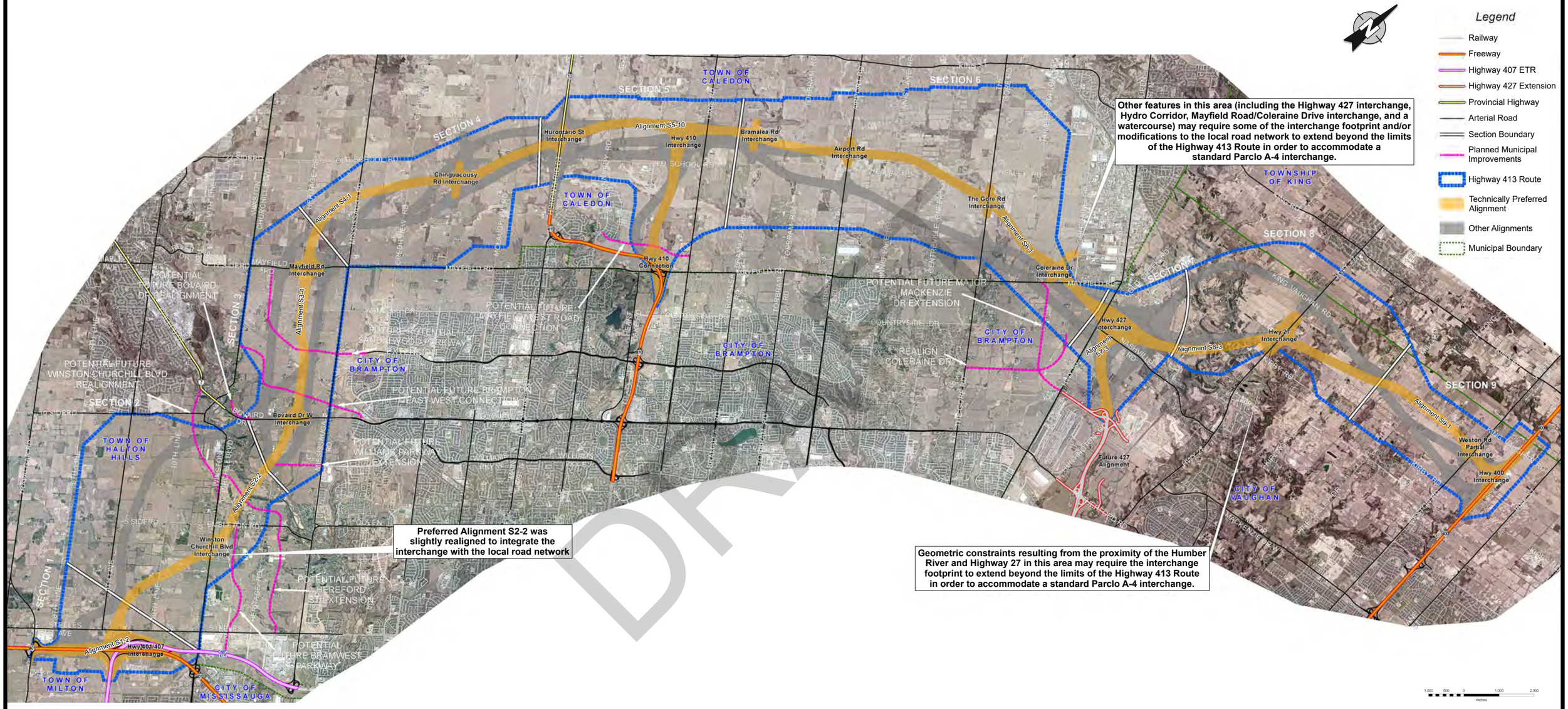
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3.3.4 Technically Preferred Alignment and Focused Analysis Area

The Technically Preferred Alignment, including the technically preferred interchange locations, was presented at PIC #2 in fall 2019 and is illustrated in **Figure 3-21**.

The FAA was also updated to surround the Technically Preferred Alignment. As discussed in **Section 3.2.3**, the FAA reflected a zone within which refinements could be accommodated, while maintaining adequate space for the elements of Highway 413 and ancillary uses. The updated FAA is shown in **Figure 3-22.**

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Note: The Highway 427 Extension was proposed in 2019 when the Technically Preferred Alignment was identified. Construction was completed in 2021.

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LEGEND

HIGHWAY 413 ROUTE

2015 FOCUSED ANALYSIS AREA FOR THE SHORT LIST OF ALTERNATIVES

THE 2015 FOCUSED ANALYSIS AREA IS SUPERSEDED BY THE 2019 FOCUSED ANALYSIS AREA FOR THE TECHNICALLY PREFERRED ALIGNMENT.

2019 FOCUSED ANALYSIS AREA FOR THE TECHNICALLY PREFERRED ALIGNMENT

THE 2019 FOCUSED ANALYSIS AREA (FAA) IS A ZONE SURROUNDING THE TECHNICALLY PREFERRED ALIGNMENT. PROPERTIES LOCATED WITHIN THE FAA COULD BE DIRECTLY IMPACTED BY THE HIGHWAY 413 PROJECT, ANCILLARY USES, OR IF REFINEMENTS ARE MADE TO THE TECHNICALLY PREFERRED ALIGNMENT

MTO HAS A REDUCED INTEREST IN PROPERTIES LOCATED IN THE GREEN AREAS. APPLICATIONS CAN PROCEED THROUGH MUNICIPAL DEVELOPMENT PROCESSES. MTO WILL CONTINUE TO REVIEW ALL DEVELOPMENT APPLICATIONS IN THE STUDY AREA, BUT IT IS ANTICIPATED THAT APPLICATIONS IN THE GREEN AREAS WILL NOT BE IMPACTED BY THE HIGHWAY 413 PROJECT.

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1000m 0m 1000m 2000m

Figure 3-22
Focused Analysis Area Surrounding the Technically Preferred Alignment

3.4 Technically Preferred Alignment to Preferred Alignment

The extensive consultation process to present the Technically Preferred Alignment included presentations to municipal councils, Advisory Group meetings, meetings with municipal and agency staff, meetings with Indigenous communities, and PIC #2. This consultation, which took place primarily over the summer and fall of 2019, provided the opportunity for a wide range of comments and input on the evaluation of the alignments and the rationale for the Technically Preferred Alignment. For a more detailed summary of consultation and engagement, please see **Chapters 7 and 8**.

In light of this input, opportunities to refine the Technically Preferred Alignment were examined in select locations. These locations, and the issues raised, are highlighted in **Table 3-4**.

Table 3-4: Areas of the Technically Preferred Alignment Identified for Refinement, based on Consultation and Engagement

Section/Location	Comments Received	Next Steps
Section 3: Parallel to Heritage Road, between Bovaird Drive and Mayfield Road	Request to mitigate impacts to lands east of Heritage Road.	Consider refinements to shift the alignment west to reduce impacts while maintaining appropriate interchange geometry at Mayfield Road.
Section 5: Highway 410 Extension	Request to mitigate impacts to lands within the Mayfield West Secondary Plan area, which was under construction.	Consider refinements to shift the alignment west to reduce impacts.
Section 6: Between The Gore Road and Highway 427, including the Coleraine Drive Interchange	Request to review interchange alternatives as the proposed interchange at Coleraine Drive impacts lands outside of the Highway 413 Route which had proceeded to advanced stages of development.	Examine additional interchange locations and configurations.
Sections 7/8: Humber River Crossing	Request to review additional alignments at the river crossing.	Develop and evaluate additional alignments.
Section 8: Vicinity of Huntington Road	Request to mitigate impacts to existing residential communities in proximity to the alignment and future development lands in the Nashville North Kleinberg Secondary Plan area	Develop and evaluate additional alignments.

The process followed to examine these refinements and the rationale for modifications to the Technically Preferred Alignment are outlined in more detail in the sections below. The refinement alternatives considered in Sections 3, 5, and 6 were localized in nature and were assessed based on a comparison of their relative benefits and potential impacts, with Reasoned Argument statements explaining the rationale for selecting the alternative identified as the Preferred Alignment. For Sections 7 and 8, given the extent of these alternatives in comparison to the Technically Preferred Alignment, the assessment of the alternatives followed the full evaluation process utilized for the evaluation of the short-listed alignments and selection of the Technically Preferred Alignment as described in **Section 3.1.1**.

3.4.1 Refinements in Section 3

Opportunities for alignment refinement to reduce property impacts to a proposed cemetery east of Heritage Road and north of Wanless Drive were considered.

The Technically Preferred Alignment as presented at PIC #2 is located parallel to and east of Heritage Road (see **Figure 3-14**). This included a conceptual realignment of Heritage Road north and south of Mayfield Road to maintain Heritage Road as a continuous road and provide adequate intersection spacing on Mayfield Road between Heritage Road and the interchange ramp. As described in **Section 3.3.2.3**, this was the Technically Preferred Alignment because it:

- Minimizes impact on terrestrial habitat (wildlife, wetland, and woodland communities);
- Avoids impacts to designated natural areas, including Greenbelt lands;
- Connects well to the preferred crossing of the Credit River in Section 2;
- Minimizes significant impacts to existing institutional facilities;
- Generally aligns with future land uses;
- Was considered the most constructable;

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- Provides the best opportunity for an interchange at Bovaird Drive, as the presence of sensitive features and topography primarily related to the Credit River are less restrictive than on the other alternatives; and
- Supports traffic safety and operations.

Consideration was given to whether an alignment could be developed to fully avoid the subject lands. The following constraints were identified:

- Additional significant impacts to Heritage Road alignment;
- Larger impacts to the Huttonville Creek floodplain area west of Heritage Road;
- Impacts to five additional properties west of Heritage Road compared to the Technically Preferred Alignment; and
- Highway 413 crossing Mayfield Road at a greater skew angle (not perpendicular to the highway), resulting in additional property impacts and less desirable geometric elements including possible sight distance concerns at the northbound exit ramp of the Mayfield Road interchange and reduced intersection spacing between the interchange and Heritage Road.

Given these constraints, two additional alternatives were developed at a conceptual level of detail to examine opportunities to reduce impacts on the subject property while avoiding significant additional impacts resulting from the alignment modification:

- Alternative 1 shifted Highway 413 to the west, aligned with the Heritage Road ROW (**Figure 3-23**), with two realignment concepts for Heritage Road; and
- Alternative 2 shifted Highway 413 further west of Heritage Road on a curved alignment (**Figure 3-24**), with two realignment concepts for Heritage Road.

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PRELIMINARY/DRAFT

Potential realigned Heritage Road

C.N. RAIL

HERITAGE ROAD

Alternative 1

WANLESS DR

MAYFIELD RD

Legend
- Technically Preferred Alternative
- Alternative 1
- Heritage Road Realignment
- Focused Analysis Area (2019)
- Future Planned Cemetery

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Ontario

WSP AECOM

Highway 413 Environmental Impact Assessment Report

Figure 3-23
Section 3 Refinement - Alternative 1

PRELIMINARY/DRAFT

Potential realigned Heritage Road

C.N. RAIL

HERITAGE ROAD

Alternative 2

WANLESS DR

MAYFIELD RD

Legend

- Technically Preferred Alternative
- Alternative 2
- Heritage Road Realignment
- Focused Analysis Area (2019)
- Future Planned Cemetery

Ontario

WSP AECOM

Highway 413 Environmental Impact Assessment Report

Figure 3-24
Section 3 Refinement - Alternative 2

The benefits and limitations of these alternatives are shown in **Table 3-5**.

Table 3-5: Assessment of Section 3 Refinement Alternatives

Benefits	Limitations/Potential Impacts
Alternative 1:	**Alternative 1:**
✓ Reduced impact to the subject property compared to the Technically Preferred Alignment. ✓ Fewer impacts to properties on the west side of Heritage Road as compared to Alternative 2. ✓ More desirable geometric elements compared to Alternative 2, including a perpendicular crossing of Mayfield Road which improves sight distance and reduces property impacts at the interchange.	✖ While reduced compared to the Technically Preferred Alignment, still impacts the subject property. ✖ Additional impacts on properties both west and east of Heritage Road in the vicinity of the Mayfield Road interchange compared to the Technically Preferred Alignment (potentially impacts four additional properties). ✖ Reduced spacing between intersections at Heritage Road and the ramp terminal on Mayfield Road, which affects traffic operations.
Alternative 2:	**Alternative 2:**
✓ Reduced impact to the subject property compared to the Technically Preferred Alignment, and slightly less impact than Alternative 1.	✖ While reduced compared to the Technically Preferred Alignment, still impacts the subject property. ✖ Requires a longer section of Heritage Road to be realigned. ✖ Additional impacts on properties west of Heritage Road compared to the Technically Preferred Alignment (potentially impacts three additional properties). ✖ Crosses Mayfield Road at a significant skew angle (13°), which increases the length of the structure and interchange ramps.

With fewer impacts to properties along Heritage Road and Mayfield Road and more desirable alignment elements, **Alternative 1 was identified as the Preferred Alignment for Section 3**.

The following issues will require further consideration during Detail Design:

- The configuration of the Wanless Drive bridge to ensure a viable entrance to the site from Wanless Drive. Based on the Preliminary Design, an underpass with Highway 413 crossing under Wanless Drive is preferred which provides visibility for vehicles approaching an entrance to the site, allows Wanless Drive to remain open during construction, and reduces property impacts.
- Opportunities to provide a secondary (service) entrance along Wanless Drive which considers property operations and the volume of vehicles accessing the site.
- Consideration of elevation differences between Highway 413 and the subject lands to reduce the property impacts associated with embankments.
- Opportunities for the owner to acquire other surplus lands adjacent to the subject property, once highway needs have been assessed.

3.4.2 Refinements in Section 5

The Town of Caledon requested that alternatives be considered to reduce impacts and better integrate the Highway 410 Extension with planned employment development in the Mayfield West Secondary Plan area between Heart Lake Road and Dixie Road, north of Mayfield Road. The Town also requested consideration of the planned extension of Abbotside Way and Dougall Avenue across the Highway 410 Extension to support the approved development in Phase 1 of the Mayfield West plan.

The Technically Preferred Alignment as presented at PIC #2 is located east of Heart Lake Road (**Figure 3-16**). As described in **Section 3.3.2.5**, this was the Technically Preferred Alignment because it:

- Minimizes impacts to fish and fish habitat, and wetlands;
- Avoids impacts to large volume wells;
- Avoids existing residential subdivisions in Valleywood and minimizes direct residential impacts elsewhere;
- Minimizes impacts to agricultural lands and operations;
- Minimizes impacts to built heritage resources;
- Avoids impacts to commercial and industrial properties;

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- Minimizes impacts to future urban development including the Mayfield West planned community and Mayfield West employment lands;
- Has a less complex Highway 410 / Highway 413 interchange design (connections to Hurontario Street are provided by a separate interchange);
- Has better ability to implement a transitway in the Highway 410 ROW, if considered as part of a future study; and
- Supports network compatibility and has a lower relative cost.

The key constraints in this area included:

- Environmental constraints north of Mayfield Road (Henry Wetland, Heartlake Gardens Woodlot);
- Proposed plans for the Mayfield West Employment Lands;
- Lands on the east side of Highway 410 south of Mayfield Road have been developed;
- Geometric design constraints associated with the curve of the existing Highway 410 alignment at Mayfield Road; and
- Watercourse crossing south of Old School Road.

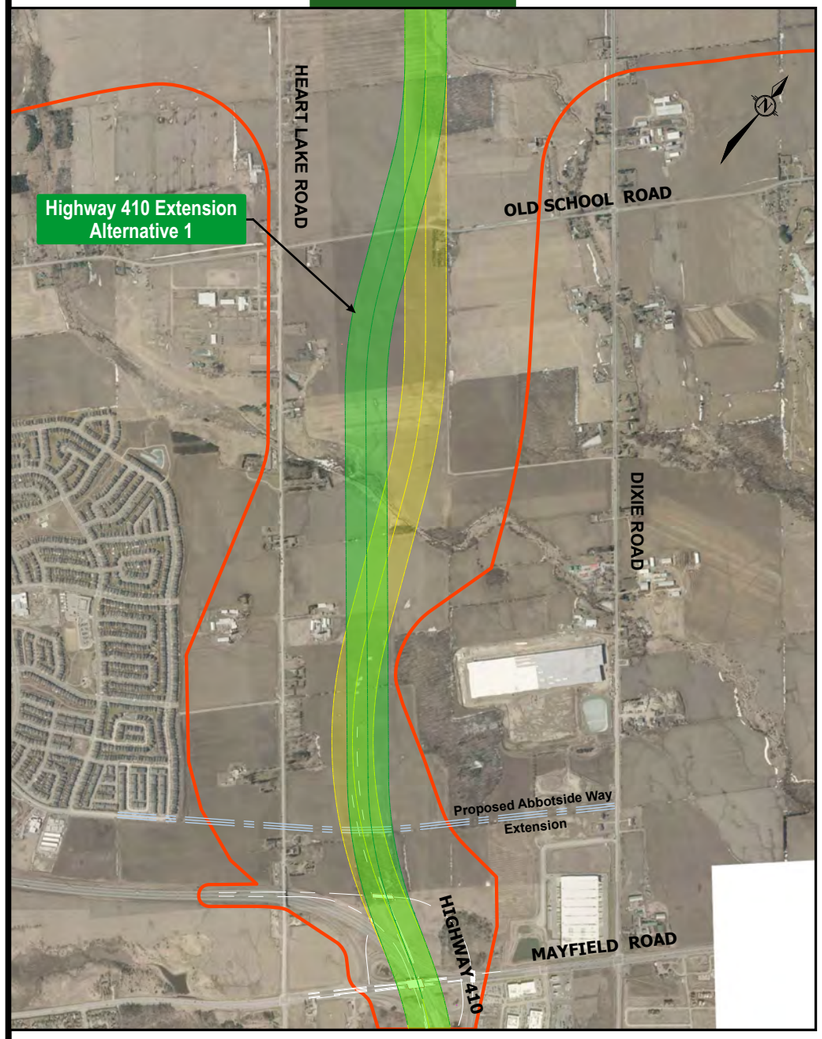
Given these constraints, three additional alternatives were developed at a conceptual level (**Figure 3-25**) to examine opportunities to reduce impacts on the subject property while avoiding significant additional impacts resulting from the alignment modification:

- Alternative 1 shifted the Highway 410 Extension to the west to increase the area of developable land east of Highway 410 while maintaining development opportunities between Highway 410 and Heart Lake Road.
- Alternative 2 shifted the Highway 410 Extension further to the west immediately adjacent to Heart Lake Road, to maximize the area of developable land east of Highway 410.
- Alternative 3 had the same alignment as Alternative 2, but also included the westerly realignment of Heart Lake Road, consistent with an option put forward by the Town of Caledon.

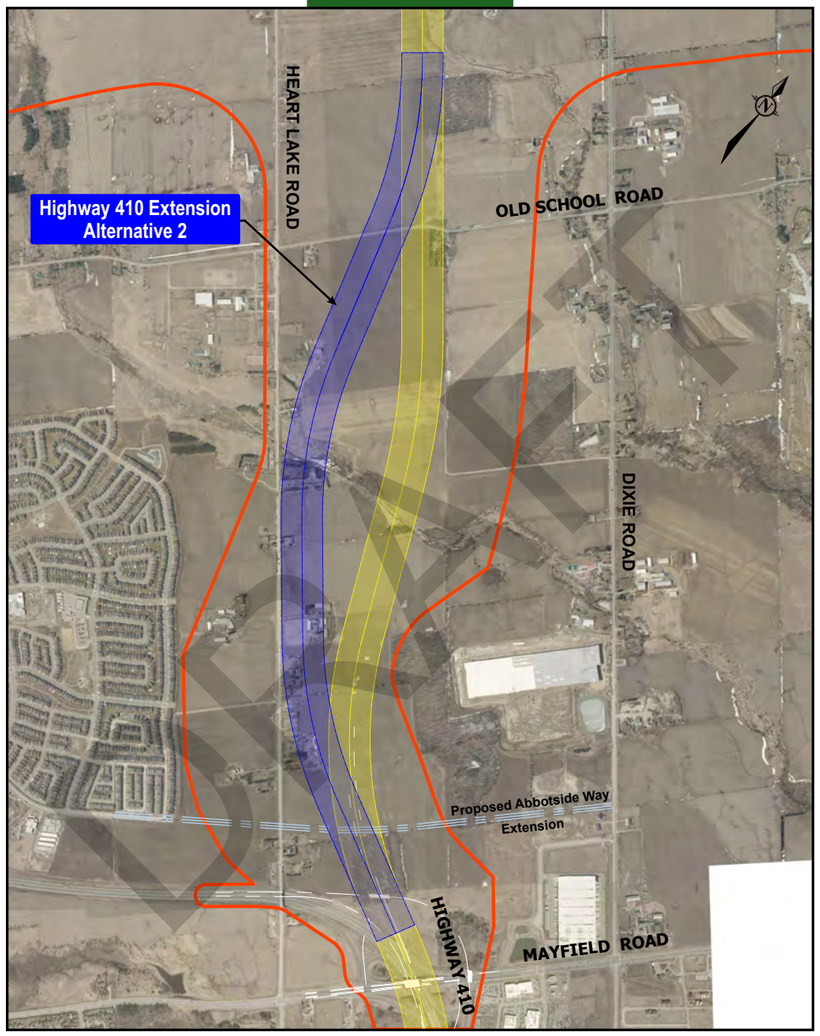
The benefits and limitations of these alternatives are shown in **Table 3-6**.

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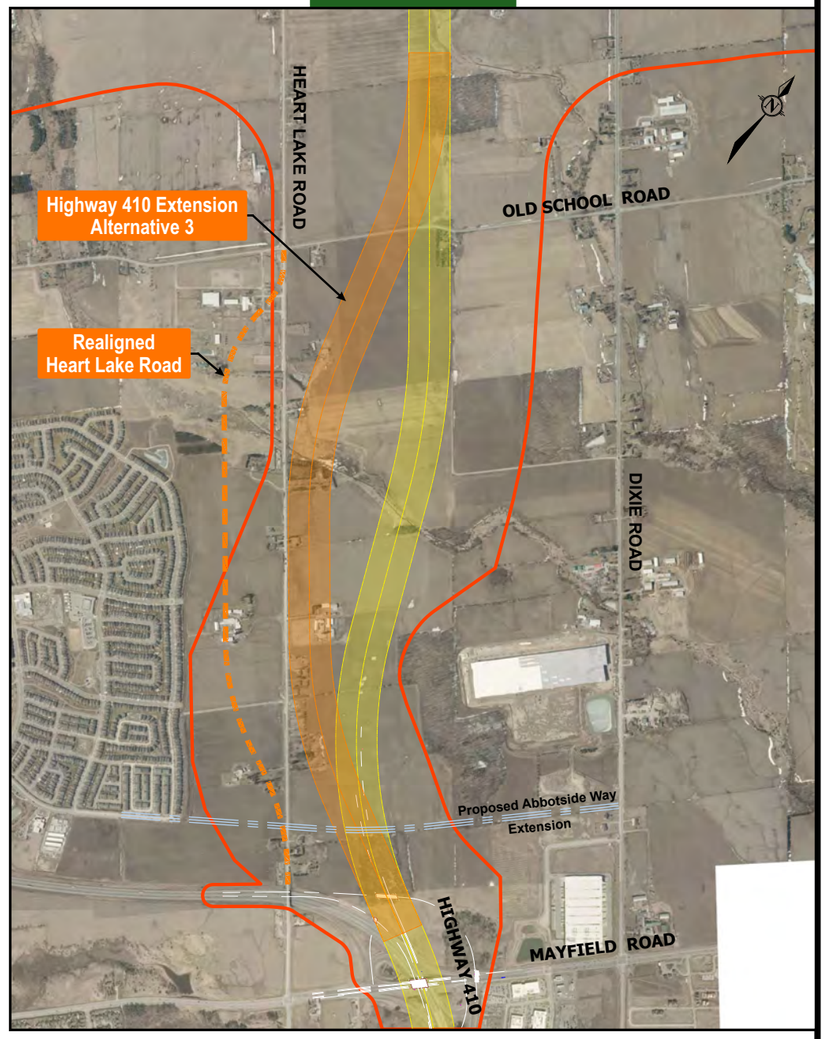
Alternative 1



Alternative 2



Alternative 3



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Legend
- Technically Preferred Alignment (2019)
- Focused Analysis Area (2019)

Figure 3-25
Section 5 Refinement - Alternatives 1, 2 and 3

Table 3-6: Assessment of Section 5 Refinement Alternatives

Benefits	Limitations/Potential Impacts
Alternative 1:	**Alternative 1:**
✓ Increases area of developable land east of the Highway 410 Extension while maintaining development opportunities between Highway 410 and Heart Lake Road. ✓ Protects for future east-west grade separated linkages between Mayfield Road and Old School Road. ✓ Protects for Abbotside Way Extension. ✓ Does not require realignment of Heart Lake Road.	✖ Crosses Old School Road and one watercourse at a higher skew angle, which reflects less desirable geometric design and increases the length of the structures. ✖ Impacts developable lands at Heart Lake Road and Old School Road.
Alternative 2:	**Alternative 2:**
✓ Maximizes area of developable land east of Highway 410. ✓ Protects for Abbotside Way Extension. ✓ Does not require realignment of Heart Lake Road; Highway 410 would be constructed adjacent to Heart Lake Road.	✖ Limited opportunities for future east-west linkages between Mayfield Road and Old School Road beyond Abbotside Way, due to the proximity of Highway 410 to Heart Lake Road. ✖ Crosses Old School Road and one watercourse at a higher skew angle than Alternative 1, which reflects less desirable geometric design and further increases the length of the structures.
Alternative 3:	**Alternative 3:**
✓ Maximizes area of developable land east of the Highway 410 Extension. ✓ Protects for Abbotside Way Extension. ✓ Protects for future east-west grade separated linkages between Mayfield Road and Old School Road.	✖ Requires realignment of Heart Lake Road to the west. ✖ Impacts additional property. ✖ Outside of the FAA. ✖ Would require additional environmental assessment studies and approvals. ✖ Impacts new watermains installed along Heart Lake Road including a sub-transmission main and feedermain servicing the Victoria Reservoir and distribution mains servicing homes and businesses. ✖ As with Alternative 2, crosses Old School Road and one watercourse at a higher skew angle than Alternative 1, which reflects less desirable geometric design and further increases the length of the structures.

The alignment of the Highway 410 Extension is the same in both Alternatives 2 and 3 and was consistent with the alignment proposed by the Town of Caledon. This alignment maximizes the developable lands east of Highway 410. This alignment has a more skewed crossing of Old School Road and one watercourse than Alternative 1 but provides for a more consolidated area for employment development.

Alternative 3 requires realignment of Heart Lake Road and the associated impacts on additional property and recently constructed watermains. In addition, this would require additional environmental assessment studies and approvals. Alternative 3 was therefore set aside.

Alternative 1 was identified as the Preferred Alignment for Section 5, with further refinements to be explored in Preliminary Design to improve the geometric design and reduce the impacts of the skewed crossing of Old School Road and the watercourse. This alternative maintains opportunities for development on both sides of Highway 410, including along Heart Lake Road (desired by the Town).

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3.4.3 Refinements in Section 6

In response to comments from the Region of Peel, Town of Caledon, and Town of Brampton, alternatives were considered for the interchange at Coleraine Drive, with connections to the proposed new Arterial Road A2 south of Mayfield Road (an undertaking planned by the City of Brampton to support development on the lands in the Highway 427 Industrial Secondary Plan (SP) 47 area (City of Brampton, 2024)). A portion of the footprint of the Technically Preferred Alignment (**Figure 3-17**) at the Coleraine Drive interchange extended outside the Highway 413 Route and into the Town of Caledon's Coleraine West Employment Area, where lands had proceeded to advanced stages of development.

As described in **Section 3.3.2.6**, this was the Technically Preferred Alignment because it:

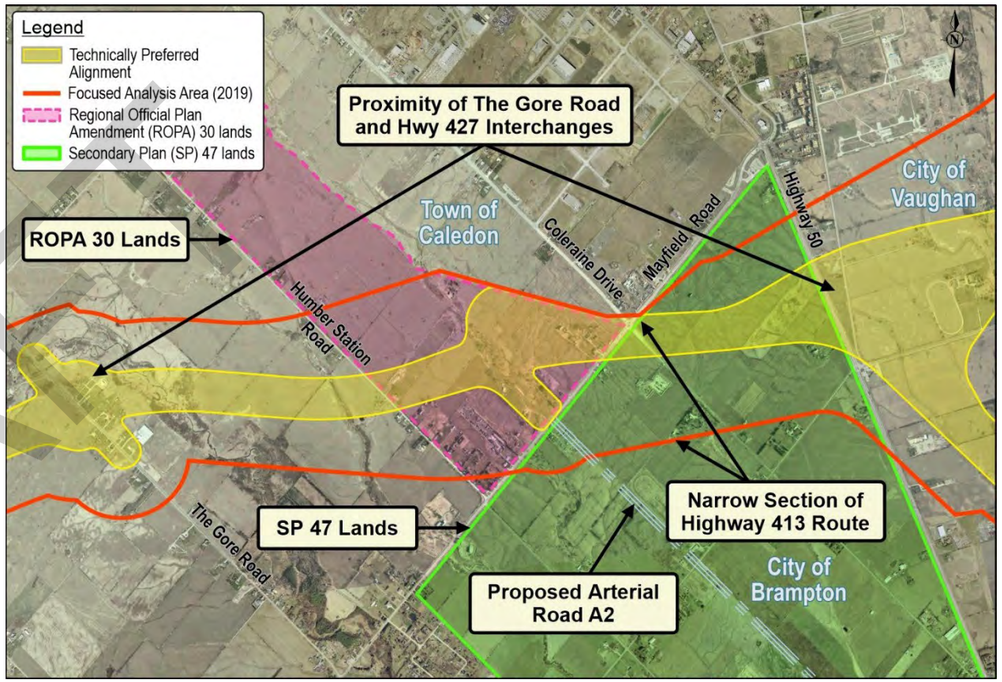
- Has the least impact to fish and fish habitat, and minimizes impacts to wildlife and wildlife habitat, and wetlands;
- Impacts the fewest residential properties and private wells;
- Has low impacts to commercial/industrial properties and future development;
- Avoids impacts to high-investment farming operations;
- Accommodates a full moves interchange in the area of Coleraine Drive (realignment likely required to achieve an acceptable separation distance to the Highway 427 Extension);
- Has a moderate relative cost to the other well ranked transportation alignment; and
- Connects well to the preferred Section 5 alternative.

The key constraints in this area are shown in **Figure 3-26** and included:

- A relatively narrow Highway 413 Route due to the adjacent City of Brampton Secondary Plan 47 area (City of Brampton, 2024) and the Region of Peel's Regional Official Plan Amendment (ROPA) 30 for Bolton Residential Expansion Settlement (Regional Municipality of Peel, 2016).
- The very close proximity of the interchange between Highway 413 and the Highway 427 Extension. The higher design standards required for this interchange results in extended ramp lengths, which provides a shorter distance to accommodate the ramps for adjacent interchanges. Shifting the interchange to the west, while maintaining the required spacing to Highway 427, reduces the spacing to the adjacent interchange at The Gore Road.

The desire of the municipal stakeholders to provide good connectivity to the municipal road system while minimizing impacts to potential development lands in both ROPA 30 (Regional Municipality of Peel, 2016) and SP 47 (City of Brampton, 2024s).

Figure 3-26: Section 6 Refinement – Key Constraints



To assist with the development and assessment of alternatives, municipal staff developed a series of objectives that were subsequently endorsed by Regional Council (February 27, 2020), as outlined in **Table 3-7**.

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Table 3-7: Section 6 Refinement – Municipal Objectives for Interchange Alternatives

#	Objective	Rationale
1.	Minimize bisecting properties or creating unusable remnants	■ To maximize development potential of the surrounding land
2.	The selected interchange option should be informed by a traffic analysis of the following configurations to minimize traffic impacts to the Regional and local road network: ■ An interchange configuration that provides access to and from the eastbound and westbound highway directions; ■ A partial interchange configuration; and ■ A no interchange option	■ To ensure the safe and efficient movement of people and goods on the planned Regional and local road networks
3.	Ensure access to existing and future employment lands in both the City of Brampton and the Town of Caledon	■ To facilitate goods movement; and ■ To support economic development
4.	Ensure interchange is completely located within the Highway 413 Route	■ To minimize impact to existing, approved, or planned development outside of the Highway 413 Route
5.	Minimize impacts to existing and planned infrastructure (i.e., water, wastewater, and transportation)	■ To reduce the need to relocate/realign existing and planned transportation and water/wastewater infrastructure (i.e., Arterial Road A2 which has significantly advanced in the EA process)
6.	Minimize impacts to the natural environment	■ To reduce the number of crossings over the watercourse in this area
7.	Ensure option does not preclude transit station at this location and a pedestrian/cycling crossing of the highway	■ To support the Region's goal of a 50% sustainable mode share by 2041

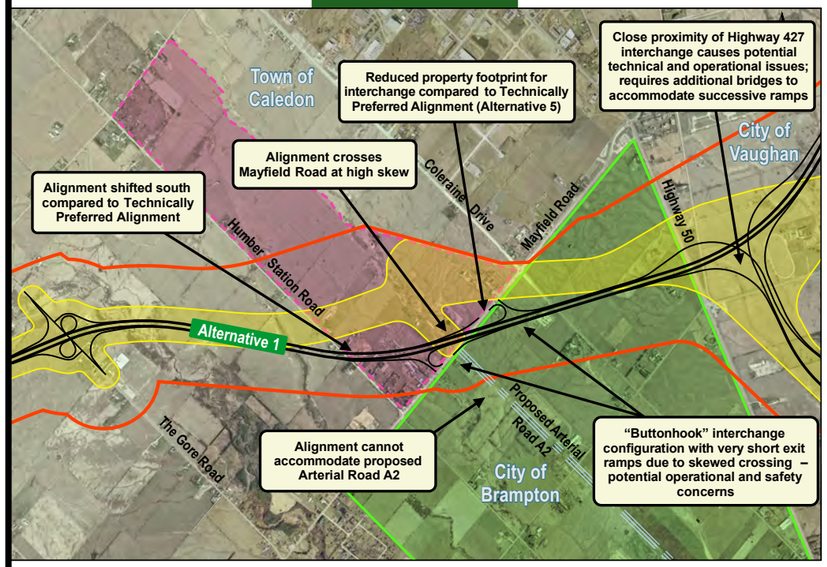
Five alternatives were developed for this area (**Figure 3-27**) considering the key constraints and municipal objectives: Alternative 1: The alignment was shifted to the south compared to the Technically Preferred Alignment, with a full interchange at Mayfield Road (i.e., providing access to and from Highway 413 in all directions).

- Alternative 2: The alignment was the same as Alternative 1, shifted to the south compared to the Technically Preferred Alignment, with a partial interchange at Mayfield Road (i.e., providing access to Highway 413 in the westbound direction only, and from Highway 413 in the eastbound direction only).
- Alternative 3: The alignment was the same as Alternative 1, shifted to the south compared to the Technically Preferred Alignment, with a full interchange at Humber Station Road.
- Alternative 4: The alignment was the same as the Technically Preferred Alignment, with a partial interchange at Humber Station Road (access to Highway 413 in the eastbound direction only, and from Highway 413 in the westbound direction only). A full interchange was not technically feasible at Humber Station Road on this alignment because of the close proximity of the interchange at The Gore Road. There is insufficient distance to accommodate the entrance and exit ramps at the two interchanges without creating safety and operational concerns caused by weaving of vehicles to and from the ramps.
- Alternative 5: This alternative reflected the Technically Preferred Alignment and interchange from PIC #2, with modifications to the interchange configuration to remain within the Highway 413 Route.

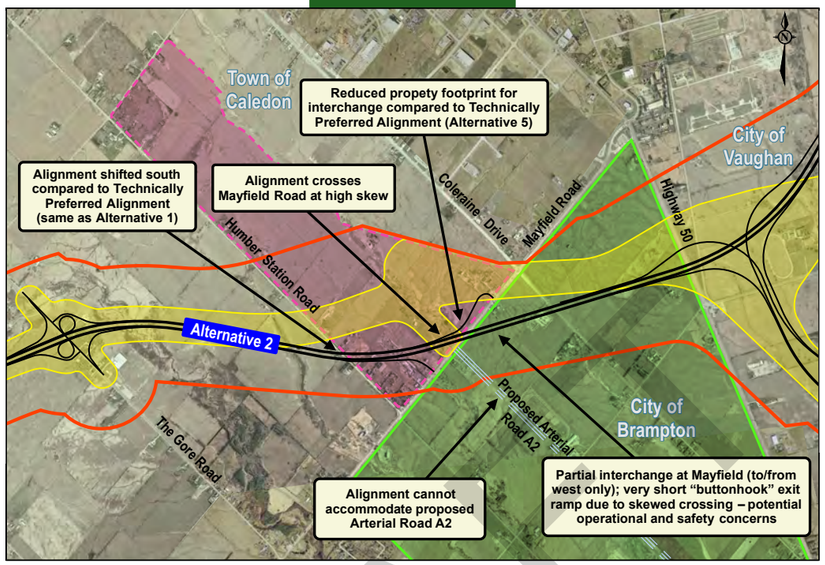
The benefits and limitations of these alternatives are shown in **Table 3-8**.

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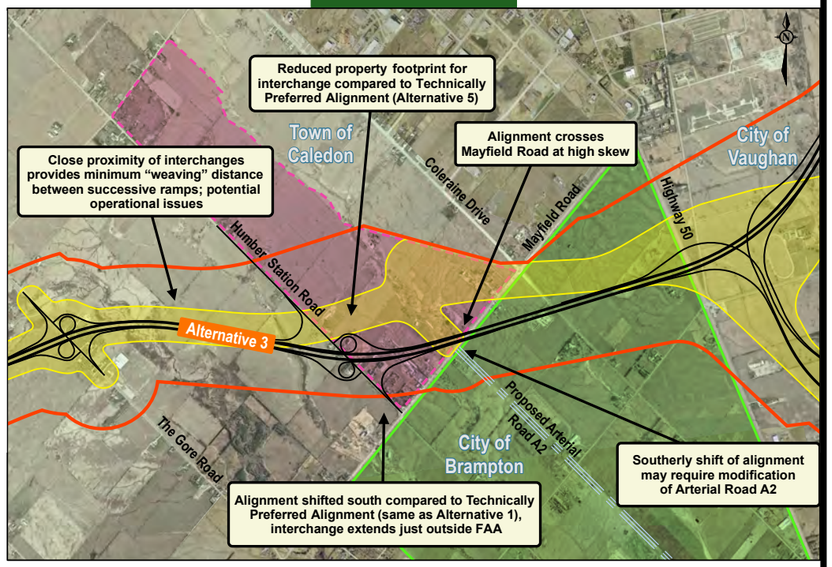
Alternative 1



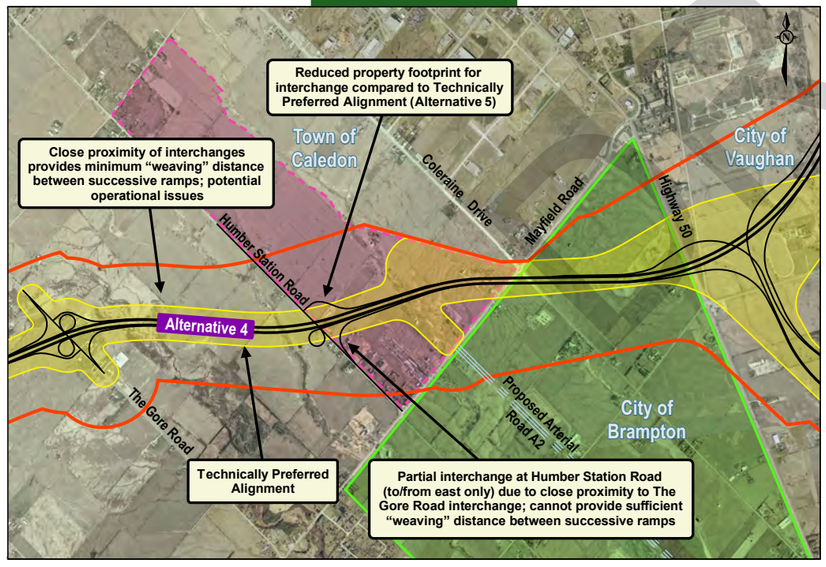
Alternative 2



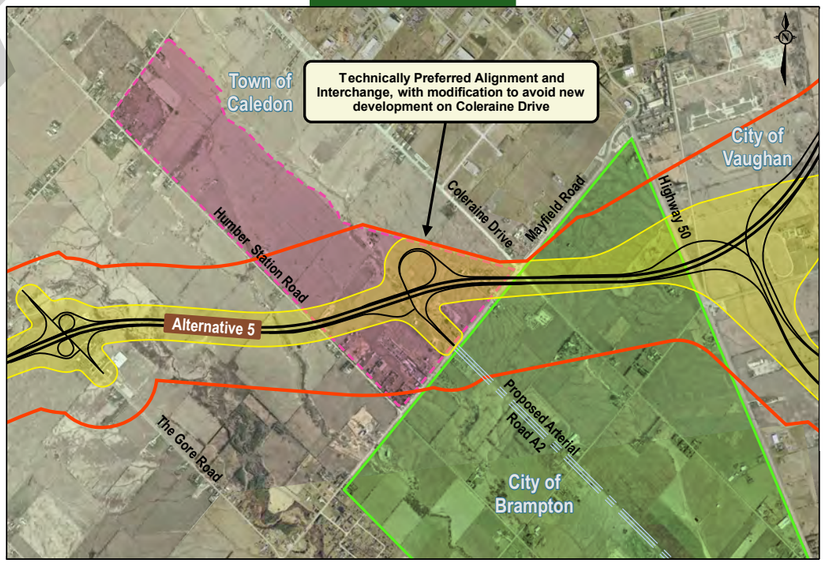
Alternative 3



Alternative 4



Alternative 5



Legend
- Technically Preferred Alignment
- Focused Analysis Area (2019)
- Regional Official Plan Amendment (ROPA) 30 lands
- Secondary Plan (SP) 47 lands

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Table 3-8: Assessment of Section 6 Refinement Alternatives

Benefits	Limitations/Potential Impacts
Alternative 1:	**Alternative 1:**
✓ Reduced impact to ROPA 30 lands – ~22 ha compared to ~60 ha for the Technically Preferred Alignment (Alternative 5) ✓ Full interchange at Mayfield Road serves all directions (but no exit for Highway 427 northbound traffic at Mayfield Road) ✓ Distance to the interchange at The Gore Road meets design standard; provides sufficient weaving distance for successive ramps	✖ Highly skewed crossing of Mayfield Road results in complex structure design, significantly increased construction cost ✖ Is not compatible with proposed Arterial Road A2 ✖ "Buttonhook" style exit ramps are undesirable and may not have sufficient length to accommodate vehicles; queues could back up onto Highway 413 ✖ Small radius loop ramps, in combination with the highly skewed crossing and the buttonhook exit ramp configuration, are not preferred for significant heavy truck traffic generated by local logistics companies ✖ Distance to the interchange at Highway 427 is insufficient, results in substandard weaving distance for successive ramps; requires additional structures to separate the ramp movements which then precludes Highway 427 northbound traffic from exiting at Mayfield Road ✖ Extends further into SP47 lands - ~46 ha compared to ~36 ha for the Technically Preferred Alignment (Alternative 5)
Alternative 2:	**Alternative 2:**
✓ Reduced impact to ROPA 30 land – ~27 ha compared to ~60 ha for the Technically Preferred Alignment (Alternative 5) ✓ Distance to the interchange at The Gore Road meets design standard; provides sufficient weaving distance for successive ramps	✖ Due to proximity to the Highway 427 interchange, only a partial interchange can be provided (access to and from the west) ✖ Highly skewed crossing of Mayfield Road results in complex structure design, significantly increased construction cost ✖ Is not compatible with proposed Arterial Road A2 ✖ "Buttonhook" style exit ramp is undesirable and may not have sufficient length to accommodate vehicles; queues could back up onto Highway 413 ✖ Buttonhook configuration is not preferred for significant heavy truck traffic generated by local logistics companies ✖ Extends further into SP47 lands ~44 ha compared to ~36 ha for the Technically Preferred Alignment (Alternative 5)

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Benefits	Limitations/Potential Impacts
Alternative 3:	**Alternative 3:**
✓ Reduced impact to ROPA 30 lands – ~32 ha compared to ~60 ha for the Technically Preferred Alignment (Alternative 5) ✓ Full interchange at Humber Station Road serves all directions, desirable interchange ramp configuration ✓ Distance to the interchanges at The Gore Road and Highway 427 meets design standard; provides sufficient weaving distance for successive ramps ✓ Provides access to the north along Humber Station Road	✖ Interchange at Humber Station Road results in some out-of-way travel for Bolton users wanting to access Highway 413 ✖ Humber Station Road is a local road, interchanges typically connect to arterial or regional roads ✖ Highly skewed crossing of Mayfield Road results in complex structure design, significantly increased construction cost ✖ May require modification to proposed Arterial Road A2 ✖ Small portion of Humber Station Road interchange footprint is outside the FAA ✖ Extends further into SP47 lands - ~45 ha compared to ~36 ha for Technically Preferred Alignment (Alternative 5)
Alternative 4:	**Alternative 4:**
✓ Reduced impact to ROPA 30 lands – ~43 ha compared to ~60 ha for the Technically Preferred Alignment (Alternative 5) ✓ Minimizes impact to SP47 lands – 36 ha, same as Technically Preferred Alignment (Alternative 5) ✓ Distance to the interchange at Highway 427 meets design standard; provides sufficient weaving distance for successive ramps ✓ Provides access to the north along Humber Station Road ✓ Does not conflict with Arterial Road A2	✖ Due to proximity to The Gore Road interchange, only a partial interchange can be provided (access to and from the east) ✖ Interchange at Humber Station Road results in out-of-way travel for Bolton users wanting to access Highway 413 ✖ Humber Station Road is a local road, interchanges typically connect to arterial or regional roads
Alternative 5:	**Alternative 5:**
✓ Least impact to SP47 lands – 36 ha ✓ Ramp configuration with larger radius design better accommodates volume of heavy vehicles; could be modified to accommodate northern leg by Region and/or Town ✓ Distance to the interchanges at The Gore Road and Highway 427 meets design standard; provides sufficient weaving distance for successive ramps ✓ Connects to Mayfield Road via extension of Arterial Road A2 ✓ Provides improved access to residential and employment lands in Bolton.	✖ Impacts the most ROPA 30 lands compared to other alternatives - ~60 ha ✖ Does not provide access to the north (but could be refined to include this, if planned)

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In addition to the comparative assessment above, and in preparation for consultation with the Region of Peel and Town of Caledon, each alternative was also compared qualitatively to the seven objectives proposed by the Region for the interchange analysis, as outlined in **Table 3-9** below.

Table 3-9: Section 6 Refinements – Comparison to Municipal Objectives

Objective	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
1. Minimize bisecting properties or creating unusable remnants	All options bisect properties to some degree, the alignment and interchange alternatives have different impacts on the ROPA 30 and SP47 lands.				
2. Minimize traffic impacts to the Regional and local road network	●	●	●	●	●
3. Ensure access to existing and future employment lands in both the City of Brampton and the Town of Caledon	●	●	●	●	●
4. Ensure interchange is completely located within the Highway 413 Route	●	●	●	●	●
5. Minimize impacts to existing and planned infrastructure	●	●	●	●	●
6. Minimize impacts to the natural environment	There is no significant difference between the alternatives				
7. Plan for transit and pedestrians/cycling	●	●	●	●	●

LEGEND: ● ● ● Best meets objective ← → Least meets objective

Following review with municipal staff, the below was noted:

- The Town of Caledon preferred Alternative 3 (more southerly alignment with full interchange at Humber Station Road) but would also support Alternative 5.
- The City of Brampton preferred Alternative 5 (Technically Preferred Alignment from PIC #2 with the modified interchange to stay within the Highway 413 Route) but would also be willing to consider Alternative 3, which has a larger impact on SP 47 lands (approximately 9 ha).

In comparing Alternatives 3 and 5, although Alternative 3 has an incremental additional impact on the SP 47 lands, the interchange configuration is most desirable from a design and operations perspective. It is a full interchange that provides access to/from all directions (where Alternative 5 only provides access to and from the south). The distance to the adjacent interchanges at The Gore Road and Highway 427 meets design standards, allowing sufficient weaving distance between successive ramps. Therefore, **Alternative 3 was identified as the Preferred Alignment for Section 6**.

3.4.4 Refinements in Sections 7 and 8

A wide range of feedback on the Technically Preferred Alignment in Section 8 was received following PIC #2, including:

- Requests to examine refinements to reduce impacts on natural heritage features from MNR and TRCA;
- Requests to mitigate impacts to existing residential communities in proximity to the route from local residents and ratepayer associations; and
- Requests to reduce impacts on future development lands in the North Kleinburg-Nashville Secondary Plan area from the City of Vaughan and Region of York.

Due to this mixed feedback from key stakeholders, MTO took additional time to analyze the alignments in Section 8 to fully understand their advantages and disadvantages before confirming a preferred alignment in this section.

The Technically Preferred Alignment for Section 8 is shown in **Figure 3-19**. As described in **Section 3.3.2.8**, this was the Technically Preferred Alignment because it:

- Had the lowest overall impacts to fish and fish habitat, wildlife and wildlife habitat, woodlands and vegetation, watersheds, and surface water;
- Was the best location with most flexibility for the Humber River crossing due to its distance from a large meander (i.e., most perpendicular and stable crossing of the mainstem river);
- Impacted the least amount of Greenbelt and agricultural lands and is preferred from a provincial land use policy perspective;

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- Impacted more residential properties but minimized impacts to commercial properties, avoided impacts to high-investment farming operations, and had a higher probability of avoiding a waste disposal site; and
- Had low construction cost and was considered the most constructable.

The alignment of Section 8 is intrinsically related to the alignment for Section 7 due to the close proximity of the Highway 427 Extension interchange. Therefore, any consideration of alternatives for Section 8 to address the feedback received must also include a review of Section 7. The Technically Preferred Alignment for Section 7 is shown in **Figure 3-18**, and as described in **Section 3.3.2.7**, this was the Technically Preferred Alignment since it:

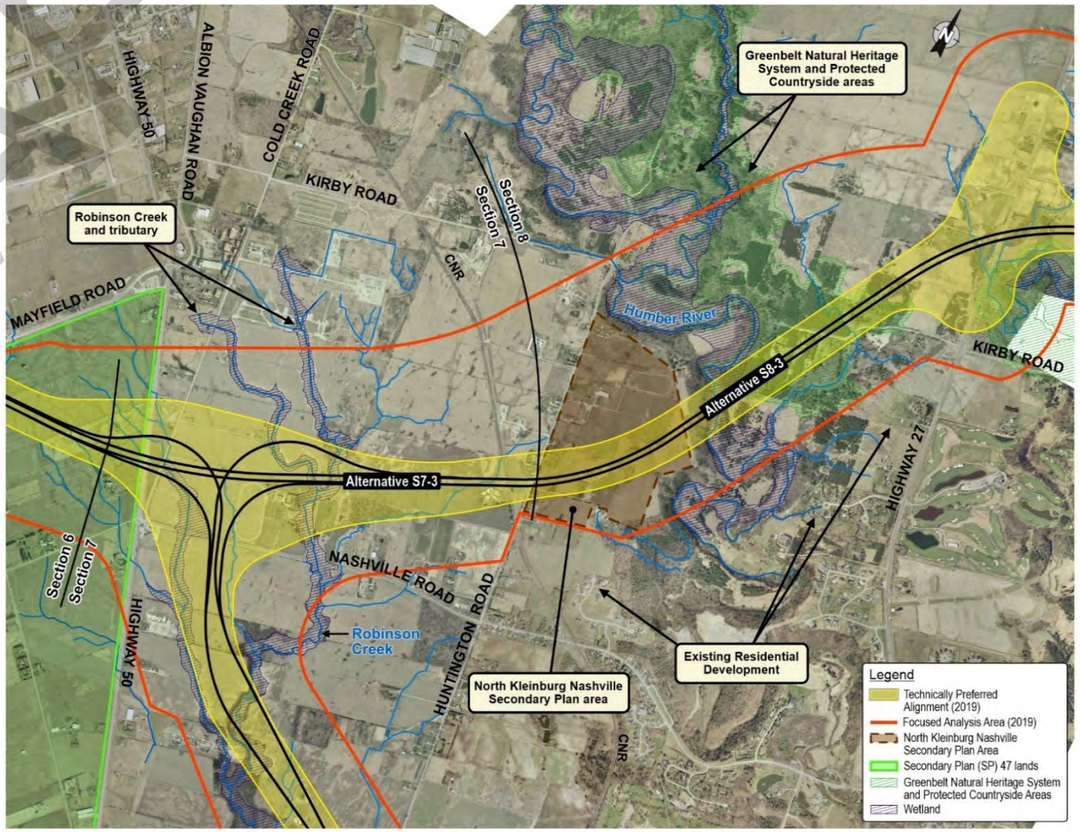
- Had fewer impacts to groundwater sensitive ecosystems and wellhead protection areas;
- Resulted in fewer noise impacts to existing and proposed residences to the east;
- Had moderate impacts to built heritage resources and cultural heritage landscapes;
- Had minor impacts to the hydro corridor, railway and TC Energy pipeline, all of which pose significant constructability challenges;
- Accommodated a full moves interchange in the area of Coleraine Drive (note that the Section 6 refinements described in **Section 3.4.3** resulted in refinement of the alignment for Highway 413 and relocation of the interchange to Humber Station Road, however this did not impact the Technically Preferred Alignment or Highway 427 interchange in Section 7); and
- Was the most constructable and connected well to the Section 8 alignment, reducing overall environmental impacts.

The predominant features in this area are the Humber River, with a deep, meandering valley, and the East Humber River, both of which have significant terrestrial and aquatic features, including habitat for SAR. Both watercourses are part of the Greenbelt Natural Heritage System Area. The Nashville Resource Management Tract (NRMT) is located along the Humber River system, north of the Technically Preferred Alignment for Section 8, consisting of 820 hectares owned by TRCA. The NRMT is an integral part of TRCA's natural heritage system and has been largely untouched for the past 50 years. Other constraints include:

- Portions of Greenbelt Protected Countryside, primarily located east of the Humber River system near the location where an interchange with Highway 27 would be developed;
- Robinson Creek and a tributary of the Robinson Creek located just east of the Highway 427 interchange;
- Existing residential areas surrounding and north of the intersection of Nashville Road and Huntington Road, and along Highway 27 south of Kirby Road;
- The proposed North Kleinburg-Nashville Secondary Plan area, located east of Huntington Road between Nashville Road and Kirby Road;
- The interchange with the Highway 427 Extension in Section 7; and
- Existing infrastructure including Highway 50, the CPKC Rail corridor, Huntington Road, and the Hydro One transmission corridor which would need to be maintained across Highway 413.

These constraints are highlighted on **Figure 3-28**, which also shows the Technically Preferred Alignment for Sections 7 and 8.

Figure 3-28: Sections 7 and 8 Refinement – Key Constraints

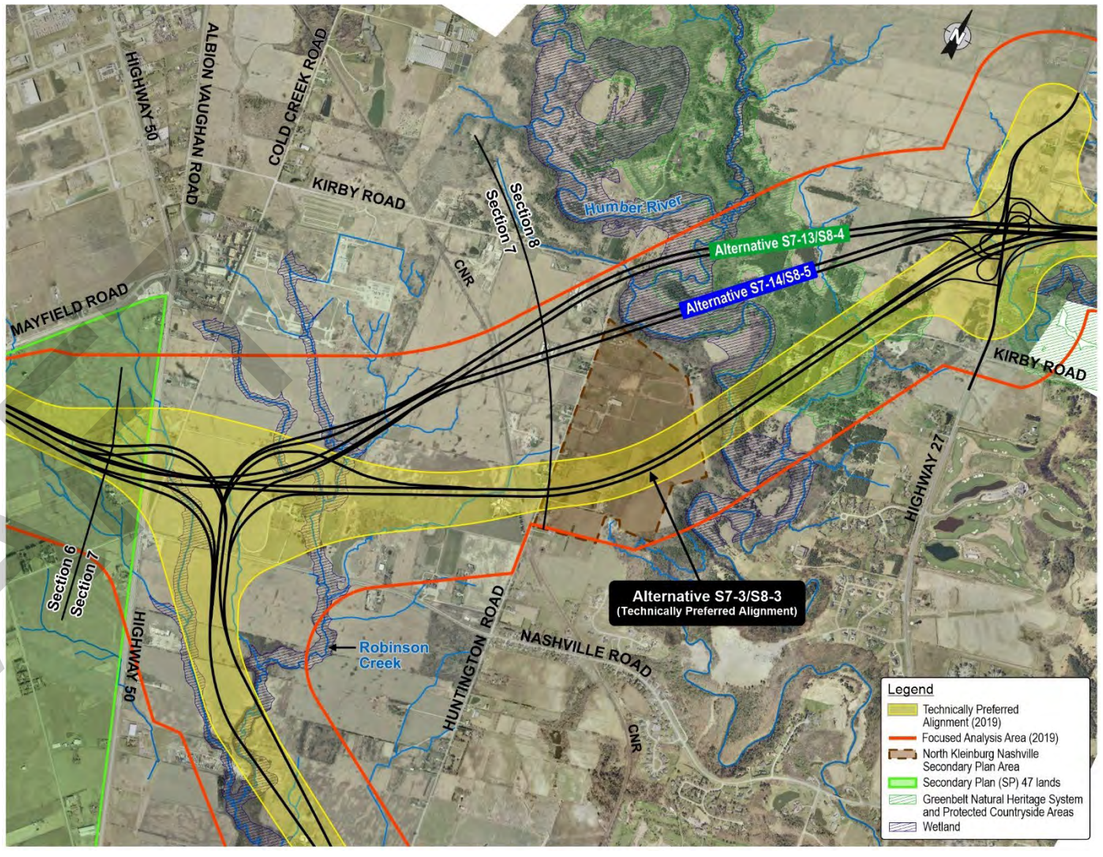


In addition to the Technically Preferred Alignment in Sections 7 and 8, Alignments S7-3/S8-3, two additional alternatives were developed to address stakeholder concerns to the extent possible while minimizing impacts on the most sensitive natural features in this area:

- Alternative S7-13/S8-4, which maximized the separation from the existing and planned residential areas but extended further into the natural heritage area along the Humber River. It crossed the Humber River at a wider location and required a curved alignment for Highway 413 to facilitate an interchange at Highway 27, which increased the length and complexity of the bridge at the river crossing. This crossing location of the Humber River was consistent with an alignment suggested by MNR to reduce impacts on forests, PSW and the Greenbelt Natural Heritage System where the designated area is narrower.
- Alternative S7-14/S8-5, which was located between the Technically Preferred Alignment (S7-2/S8-3) and Alternative S7-13/S8-4. This alternative significantly increased the distance from existing residential development on both sides of the Humber River and moderately increased the distance from existing residences on Highway 27 south of Kirby Road. It crossed the Humber River at a wider location, in an area with steep embankments and evidence of bank erosion. Although a longer crossing, the alignment of Highway 413 was straight along this alternative. The northwest corner of the North Kleinburg-Nashville Secondary Plan area was impacted with this alternative.

The three alternatives considered in this area are shown in **Figure 3-29**.

Figure 3-29: Sections 7 and 8 Refinement – Alternatives



Given the extent of these alternatives in comparison to the Technically Preferred Alignment, the assessment of the alternatives followed the full evaluation process utilized for the evaluation of the short-listed alignments and selection of the Technically Preferred Alignment as described in **Section 3.3.1**, including:

- Assessment: identification of advantages and disadvantages of the various alignments under consideration. At this stage, each environmental feature was examined to determine the extent of potential effect, based on existing data and field investigations. Net effects were identified; these refer to the effects on the environment that remain after standard mitigation measures have been applied to reduce the extent of the effect.

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- Evaluation: building upon the information obtained from the assessment stage, a Sections 7 and 8 Refinement – Alternatives/comparative analysis of the advantages and disadvantages of the alignments considered to select a preferred alternative. At this stage, the relative importance of the environmental features and significance of the effects were determined.

The evaluation criteria used for this analysis were also the same as that used previously, as detailed in **Table 3-2**.

The Section 8 alternatives were evaluated first, followed by Section 7. This sequence was followed because the potential differences between the alternatives in Section 8 were anticipated to be more significant and require in-depth discussion to reach consensus on the Preferred Alignment. As the Section 7 and 8 alternatives were paired in order to maintain continuous routes, the identification of a preferred Section 8 alignment would then determine the associated Section 7 alignment. Detailed net effects and comparative evaluation tables were still developed for the Section 7 alternatives.

The comparison of the Section 8 alternatives (S8-3, S8-4, and S8-5) is detailed in **Table 3-10**. The net effects and comparative evaluation tables are available under separate cover on the Project Website.

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Table 3-10: Sections 7 and 8 Refinement – Summary of Evaluation of Alternatives

Factor Group	Summary of Evaluation Results
Section 8 (Alternatives S8-3, S8-4, and S8-5):	
Natural Environment	The Natural Environment Factor Grouping demonstrates a **preference for S8-3 followed by S8-5**. ■ All alternatives cross both the main stems of the Main and East Humber Rivers as well as several permanent, fish bearing tributaries; tributaries of East Humber River identified as contributing habitat for Redside Dace, and occupied habitat for Redside Dace in the East Humber River. Fish Habitat supports S8-3, followed by S8-5, as it has the most perpendicular and stable crossing site of the Main Humber River. ■ S8-3 is most preferred from a Wildlife and Wildlife Habitat perspective, followed by S8-5. While S8-5 has a greater impact on candidate old growth, it results in fewer disturbed forest areas. ■ All alternatives result in moderate net effects to Wetlands. S8-3 results in less removal (~12.1 ha), followed by S8-5 with ~13.3 ha and S8-4 with ~15.8 ha. ■ S8-3 and S8-5 result in equal impacts to Woodlands and Vegetation. ■ All alternatives result in high net effects to Designated/Special/Natural Areas, with S8-3 removing the least overall amount of the Greenbelt Plan's Natural Heritage System and TRCA conservation lands. ■ S8-3 is preferred from a Surface Water perspective, followed by S8-5 and S8-4. ■ S8-4 is preferred from a Groundwater perspective, followed equally by S8-3 and S8-5. ■ S8-4 and S8-5 are most preferred from an Air Quality perspective, as they are more distant from existing residences east of Huntington Road and north of Nashville Road.
Land Use/Socio-economic Environment	Under the Land Use/Socio-economic Factor, S8-3 and S8-4 are equally preferred with **S8-5 best balancing net effects between the sub-factors**. ■ Provincial Land Use supports S8-3, followed equally by S8-5 and S8-4; ■ Municipal Land Use supports S8-3, followed equally by S8-5 and S8-4; ■ Development Objectives of Private Property Owners supports S8-4, followed by S8-5; ■ Alternative S8-3 impacts 46 ha of the North Kleinburg-Nashville Secondary Plan, S8-5 impacts 13.5 ha and S8-4 impacts 0.46 ha; ■ Alternative S8-3 impacts 22 ha of the Huntington Road Community Area, S8-5 impacts 1.4 ha and S8-4 has no impacts; and ■ Alternative S8-4 impacts 20 residential properties, S8-5 impacts 22 and S8-3 impacts 28.
Cultural Environment	**S8-3 is marginally preferred** in one sub-factor (Pre-Contact and Contact Period Indigenous Archaeological Sites), followed by S8-4 and S8-5 as equally second.
Transportation	Under the Transportation Factor **S8-3 and S8-5 are most preferred**, followed by S8-4: ■ For Constructability there are challenges associated with the crossing of the Main Humber River valley. S8-3 and S8-5 ranked equally preferred and S8-4 is ranked less preferred as S8-4 falls into a higher range in terms of combined structure length (1,440 m). Length of crossing and number of piers in deep river valley will contribute to more significant constructability issues. ■ For Construction Cost the ranking has both S8-3 and S8-5 preferred followed by S8-4 ranked less preferred (S8-5's preliminary cost estimate is approximately 95% of S8-3; S8-4's preliminary cost estimate is approximately 131% of S8-3).

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At this stage, Alternatives S8-3 and S8-5 were both considered preferable over Alternative S8-4. However, there was no clear preference between Alternatives S8-3 and S8-5:

- Alternative S8-3 was preferred for the Natural Environment factor group;
- Alternative S8-5 was preferred for the Land Use/Socio-Economic Environment factor group; and
- The alternatives ranked similarly for the Transportation factor group.

To further the rigor of this process, the detailed net effects and comparative evaluation tables were circulated to municipal and agency staff for input and comment. Their feedback is summarized as follows:

- MECP expressed a preference for S8-3. MECP noted that all three alternatives have similar impacts for Redside Dace regarding the crossing design and location over the East Humber River. MECP recognized that Alternative S8-3 would have the least impact on Ecological Land Classification (ELC) communities that likely support other SAR.
- The MNR did not identify a specific preference but provided input on the assessment of all three alternatives against the criteria within their mandate. They noted preference for the "MNR recommended alignment" discussed previously, which is similar to but slightly north of Alternative S8-4 to limit the amount of Greenbelt traversed.
- The OMAFA did not identify a specific preference and indicated that a full AIA should be conducted on each alternative (an AIA has been undertaken for the Preferred Alignment, see **Chapter 2**).
- TRCA expressed an overall preference for Alternative S8-3 and provided comments from the perspectives of Flood Plain, Valley and Location of Watercourse Crossings; Natural Heritage System; TRCA Owned Lands; and Nashville Conservation Reserve.
- The Region of York identified Alternative S8-4 as their preferred alternative as it is furthest from existing residences and avoids the North Kleinburg-Nashville Secondary Plan area.
- The City of Vaughan did not identify a specific preference but provided input on the assessment of all three alternatives against the criteria within their mandate. They advised that City Council has indicated that protection of existing and planned residential areas is important to the City, which is minimized by Alternative 8-4.

The Natural Environmental effects of the alternatives were carefully assessed with Land Use effects. Given the expectation to employ mitigation measures to many of the Natural Environmental effects as the Project progresses through Preliminary Design, Alternative S8-5 was considered the best overall compromise in Section 8 and was identified as the Preferred Alignment.

With the identification of Alternative S8-5 as the Preferred Alignment in Section 8, Alternative S7-14 was the presumed Preferred Alignment for Section 7. The detailed net effects and comparative evaluation tables were reviewed, and the following was noted:

- S7-3 is most preferred under the Natural Environment Factor, followed by S7-14.
- S7-13 and S7-14 are equally preferred under the Land Use/Socio-Economic Factor.
- For the Cultural Heritage Environment Factor, S7-13 and S7-14 are marginally preferred in one sub-factor (Built Heritage Resources), followed by S7-3.
- Under the Transportation Factor S7-3 is the most preferred, followed equally by S7-13 and S7-14. S7-3 has minor constructability issues, while S7-13 and S7-14 have moderate constructability issues related to crossing the Hydro One transmission corridor and other design challenges. All alternatives have moderate relative construction costs.

As there are no significant differences between the alternatives, Alternative S7-14 was confirmed as the Preferred Alignment.

Therefore, the Preferred Alignment in Sections 7 and 8 is Alternatives S7-14/S8-5.

The following issues were given further consideration during Preliminary Design and as part of the Major River Bridge Evaluation process developed for the Main Humber River crossings. (see **Section 3.5.3**:

- Conducting additional in-season field work and consulting with agency specialists;
- Reducing the footprint of Highway 413 to minimize impacts on sensitive environmental features at the watercourse crossings;
- Examining bridge design alternatives to span the watercourses to the greatest extent possible and avoid (or at least minimize) the placement of bridge piers in the watercourse;
- Incorporating wildlife crossing features within the design;
- Incorporating additional design refinements to avoid or minimize encroachment on sensitive habitat features;

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- Conducting detailed fluvial geomorphology studies of the Humber River and East Humber River to examine how the meander of the watercourses will change over time and ensure the design of the bridge crossing includes appropriate mitigation measures; and
- Maintaining recreational trail connectivity.

3.4.5 Preferred Alignment and Focused Analysis Area

The refinements to the Technically Preferred Alignment presented at PIC #2 and the related consultation program were incorporated, and the Preferred Alignment was confirmed and announced in August 2020. The Preferred Alignment shown in **Figure 3-30** illustrates the alignment and interchange locations for Highway 413 that were subsequently developed to a Preliminary Design level of detail.

With the refinements incorporated into the Preferred Alignment, the FAA was also adjusted to maintain a zone within which further refinements could be accommodated in Preliminary Design, while maintaining adequate space for the elements of Highway 413 and ancillary uses. Properties located within the FAA would continue to be subjected to limitations on modification or development, pending the completion of the assessment of environmental impacts. The lands outside the FAA, but still within the Highway 413 Route, were areas that had lower likelihood of being impacted by refinements and therefore limitations on these properties were reduced. The updated FAA is shown in **Figure 3-31.**

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Based on new information and stakeholder feedback, the Project Team developed additional alignment alternatives and undertook supplementary analysis on the alignments and crossings of the Humber River in Section 8. Given the interdependencies between sections, changes in Section 7 were also included in the supplementary analysis. The new alignment alternatives considered in Sections 7 and 8 are shown in Figure 3-29 of this EIAR. The Preferred Alignment in Section 7 maintains the Highway 427 interchange west of the hydro corridor with an alignment through Section 8 that is shifted northerly, giving consideration to the natural environment and associated community features, future development lands and existing residential communities. The alignment east of the Highway 27 interchange in Section 8 remains unchanged.

Shift to the west from south of Wanless Drive to north of Mayfield Road to mitigate impacts to lands east of Heritage Road.

Shift of the Highway 410 Extension to the west between Mayfield Road and Old School Road to mitigate impacts to the Mayfield West Secondary Plan, which is currently under construction.

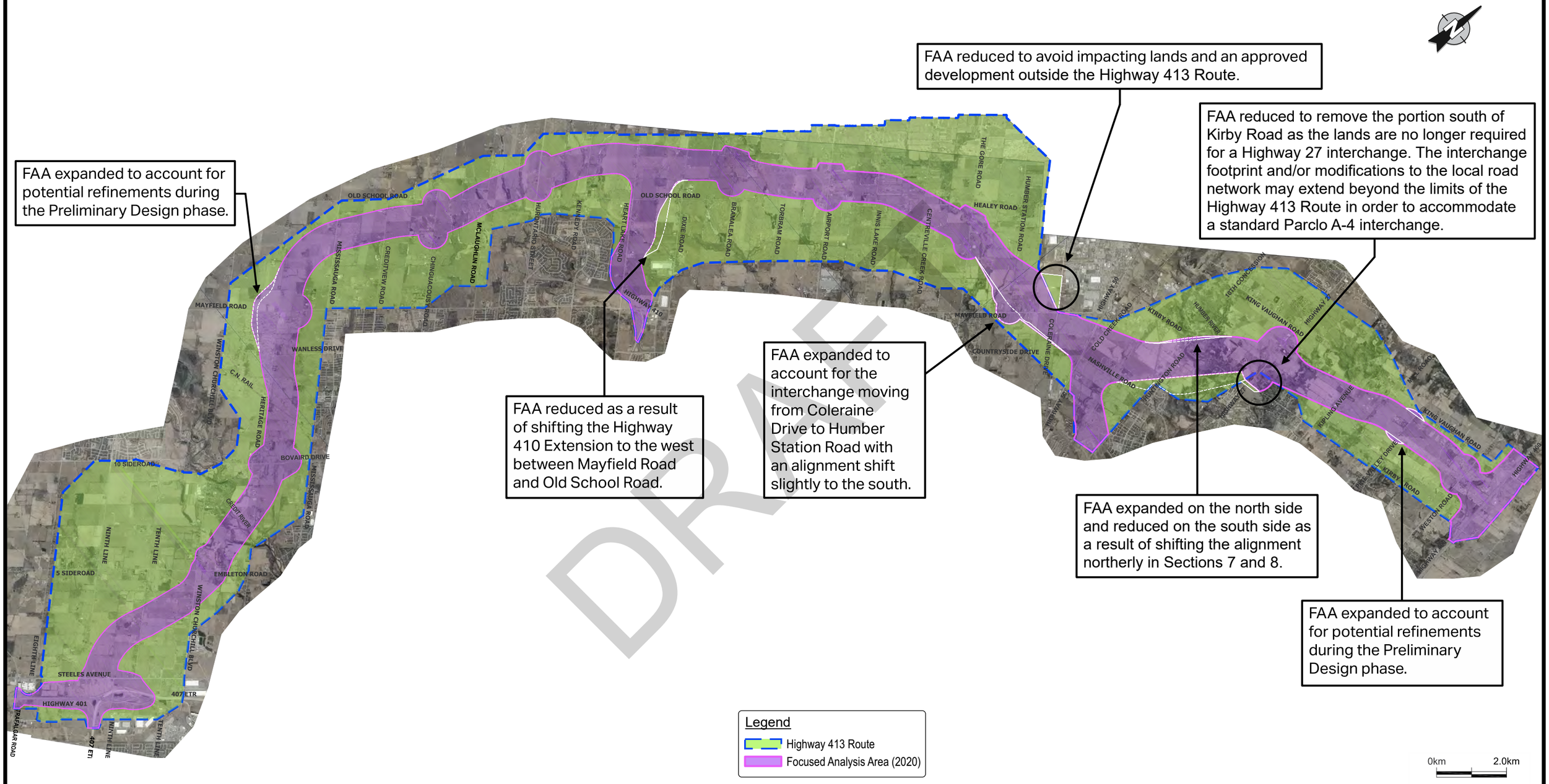
The Coleraine Drive interchange shown at PIC #2 is no longer viable due to identified impacts to an approved development outside of the Highway 413 Route, which is under construction. The Project Team reviewed interchange concepts and alignment alternatives east of The Gore Road in Section 6 in consultation with key stakeholders. The Preferred Alignment moves the interchange to Humber Station Road with an alignment shifted slightly to the south, which gives consideration to the proximity to adjacent interchanges, future development lands and other environmental and land use features.

Legend

- Highway 413 Route
- Technically Preferred Alignment and Interchange Locations (Presented at PIC #2)
- Preferred Alignment and InterchangeLocations

(M) - Indicates the alignment has been modified from the Technically Preferred Alignment (Presented at PIC #2)

1,000 500 0 1,000 2,000
metres
August 2020



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Figure 3-31
Focused Analysis Area (2020) Surrounding the Preferred Alignment

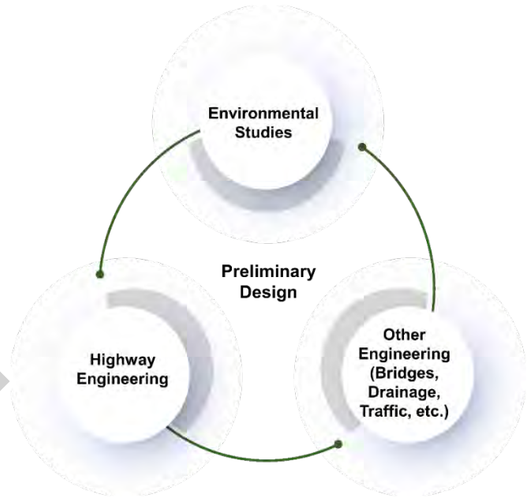
3.5 Preferred Alignment to Preliminary Design

The Preferred Alignment, as presented in **Section 3.4.5**, represents a corridor 250 m wide, with enlarged areas at interchange locations. To refine the Preferred Alignment and ROW into the Preliminary Design of the highway and interchanges, and its associated components including SWM, bridges, carpool lots, CVIF, and maintenance yards, an iterative, multi-disciplinary process was used that considered the following factors:

- Complying with standard engineering design guidelines;
- Minimizing environmental impacts;
- Minimizing impacts to the Greenbelt;
- Identifying and mitigating utility and municipal servicing conflicts;
- Integrating SWM solutions to protect local ecosystems;
- Complying with regulatory requirements to ensure that the Project aligns with environmental legislation; and
- Ongoing consultation with municipalities, regulatory agencies, and other stakeholders.

The development of the Preliminary Design was a coordinated process, integrating engineering and environmental studies to understand potential impacts, mitigation and avoidance measures (see **Figure 3-32**). This included considering Preliminary Design alternatives where feasible and effective.

Figure 3-32: Preliminary Design Process



Updates made during the Preliminary Design process included:

- Minor adjustments to the highway's horizontal and vertical alignment based on environmental or municipal inputs;
- Adjusting standard interchange types based on minimizing environmental impacts, impacts to the Greenbelt, and technical constraints;
- Addition of auxiliary lanes and ramp intersection turning lanes based on preliminary traffic results;
- Watercourse crossing designs, creek realignments, and SWM pond locations, based on fluvial, terrestrial, fish and drainage management needs; and
- Structural design of major river crossings based on detailed evaluation of alternatives (discussed in detail in **Section 3.5.3**).

The following sections describe key areas where alternative designs were assessed during the development of the Preliminary Design. A description of the complete Preliminary Design is provided in **Chapter 4**.

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3.5.1 Design Speed

One of the first decisions made in the development of a highway design is the selection of the design speed. The design speed establishes the geometric features of the roadway that affect vehicle operation, and by extension, safety. The design speed is not the posted speed; the posted speed is a speed limitation set through regulation mandating drivers travel at an appropriate speed for the surrounding conditions.

The Highway 413 Preferred Alignment and initial stages of the Preliminary Design were based on a design speed of 120 km/h in support of a 100 km/h posted speed, which was MTO policy for a freeway at the time the Preliminary Design process was initiated. In 2022, MTO issued a policy update requiring all new freeways and freeway extensions to accommodate a design speed of 130 km/h by default, to support a posted speed of 110 km/h. As the Preliminary Design process was already underway at that time, a review of the design was completed to confirm the necessary updates. All geometric elements were reviewed, including Highway 413, the Highway 410 and Highway 427 Extensions, the interchanges between Highway 413 and Highway 401 / Highway 407 ETR, Highway 410, Highway 427 and Highway 400, and the exit ramps at all crossing road interchanges. The design refinements incorporated as a result of the increase in design speed included the following:

- Slight adjustments to the highway geometrics to increase the size of horizontal and vertical curves in line with design parameters for increased design speed.
- Modifications to freeway-to-freeway and arterial interchange ramp geometry and footprint sizes to account for higher design parameters for increased ramp design speed.
- Increase in speed change lane lengths to account for greater distance required for vehicle acceleration and deceleration entering and exiting the highway.
- Where design modifications associated with an increased design speed resulted in additional impacts on property or environmental features, consideration was given to design refinements and mitigations to avoid additional impacts without compromising design standards or safety along the corridor.

3.5.2 Interchange Configurations

This section describes the development of the Preliminary Design for the Freeway-to-Freeway and Arterial Road interchanges.

3.5.2.1 Freeway-to-Freeway Interchanges

Various design alternatives were considered for the Highway 401/ Highway 407 ETR, Highway 410, Highway 427, and Highway 400 interchanges during the development of alignment alternatives. Depending on the alignment alternative, different interchange configurations were considered. Based on the Preferred Alignment, the interchange between Highway 413 and Highway 401 / Highway 407 ETR, Highway 410, Highway 427, and Highway 400 are designed as standard, fully directional interchanges (providing access to and from all directions) on single or double lane exits. The interchanges were developed to minimize impacts on technical and environmental constraints.

3.5.2.1.1 Highway 401 / Highway 407 ETR

Highway 401 was recently widened from six lanes to 12 lanes in the area where it connects with Highway 413.

A review of the preferred alternative was carried out for compatibility with the widened Highway 401 and included updates to how and where the connecting ramps join into Highway 401, as well as adjustments to bridge elevations, and ramp speed change lanes.

3.5.2.1.2 Highway 410

The alignment of the Highway 410 Extension in the vicinity of the Highway 413 interchange was refined keeping most of the Highway 410 alignment on tangent. This revision of the design shifts the interchange to the west, however maintained adequate separation between adjacent interchanges at Highway 10 (Hurontario Street) and Bramalea Road. As part of this refinement, the alignment of the ramps was also adjusted to meet the increased design speed on Highway 413.

The Highway 410 Extension and the continuity of Highway 10 (Hurontario Street) access to the west was reviewed. The existing Highway 410 alignment curves west just north of Mayfield Road and transitions to Highway 10 (Hurontario Street) between Mayfield Road and Old School Road. The need for this connection to Highway 10 was reviewed during Preliminary Design and it was determined that maintaining this connection would reduce traffic impacts on adjacent roads, minimize out-of-way travel and provide access to the community northwest of Mayfield Road. As such, refinements to the Mayfield Road interchange include:

- The new Highway 410 southbound exit ramp to Mayfield Road from the Highway 410 Extension will intersect with Mayfield Road at the same location as the existing ramp, which minimize reconstruction requirements and overall property impacts.

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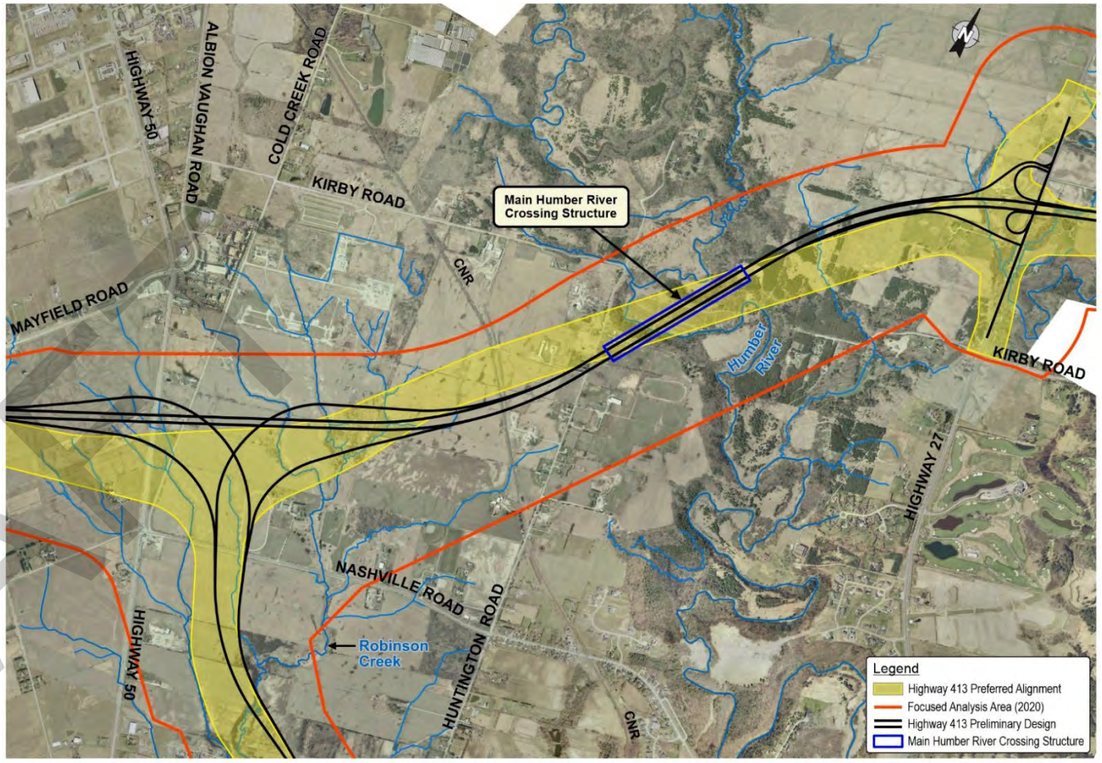
- Reconfiguring the interchange to access the Highway 410 Extension reduced the amount of property impacted in the southwest quadrant.
- The northbound Highway 410 ramp continuing to the existing Highway 410 alignment (in the northeast quadrant of the Mayfield Road interchange) was designed to cross under Mayfield Road to minimize environmental and property impacts. Configuring the ramp over Mayfield Road would result in significant impacts to property and a PSW in the northeast quadrant.
- Ramp connections between the existing Highway 410 alignment and Mayfield Road were removed to accommodate a full moves interchange at Mayfield Road with the Highway 410 extension. Providing ramps between Mayfield Road and both the existing Highway 410 alignment and the Highway 410 Extension would be technically complex and result in a very large interchange footprint, with significant impacts on property and the PSW in the northeast quadrant. Removing these ramps only impacts vehicles using the section of the existing Highway 410 alignment between Mayfield Road and Highway 10 (Hurontario Street); the reconfigured interchange provides access between both Highway 410 northbound and southbound and Mayfield Road. While some out-of-way travel will result for vehicles wishing to access existing Highway 10 between Mayfield Road and Old School Road, this impact is outweighed by the avoidance of impacts on property and environmentally sensitive lands.

3.5.2.1.3 Highway 427

The area surrounding the Highway 427 interchange has several constraints including a major hydro utility corridor with towers and a TC Energy pipeline located just east of the interchange, municipal road crossings, multiple watercourse tributaries, and critical habitat areas. Although the interchange design remains as a standard fully directional interchange, the individual horizontal and vertical ramp alignments were carefully considered in relation to these constraints.

The alignment of the Main Humber River crossing was rotated to avoid areas of erosion along the river slopes, and to improve the crossing angle of the structure to a more perpendicular crossing, thereby reducing the bridge length. This affected the alignment of the Highway 413 and Highway 427 ramps west of the Main Humber River. The revisions to the Highway 427 interchange orientation and crossing of the Main Humber River, from the Preferred Alignment are illustrated in **Figure 3-33**. These revisions remained within the 2020 FAA.

Figure 3-33: Highway 427 and Main Humber River

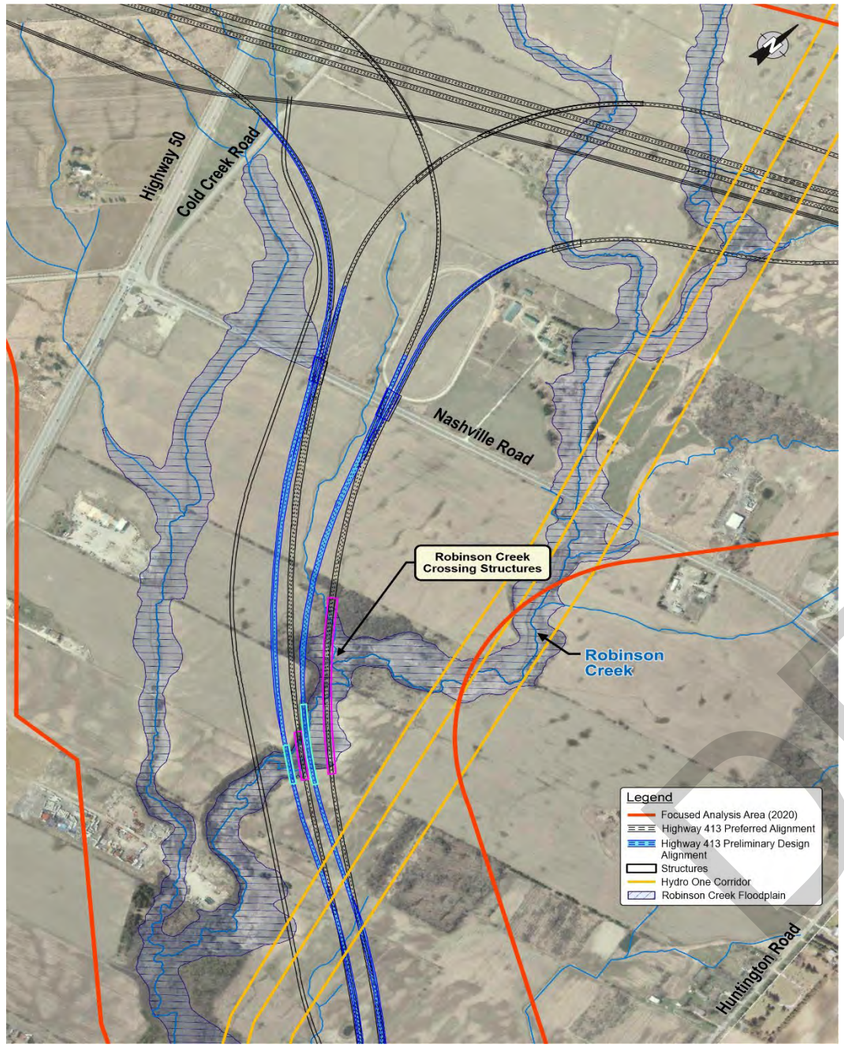


The alignment for the Highway 427 Extension just south of the interchange with Highway 413 features multiple horizontal curves as the highway alignment navigates the constraints in the area, including the sensitive environmental areas associated with Robinson Creek and tributaries.

Meeting the 130 km/h design speed introduced additional impacts to Robinson Creek and the associated floodplain, which is identified as SAR habitat. Crossing Robinson Creek with this design speed would require a 400 m long bridge to mitigate impacts to the floodplain area. As an alternative, increasing the curve to a radius higher than the minimum but below the desirable standard significantly reduces impacts at the Robinson Creek floodplain, with a much shorter bridge structure required to cross the watercourse, and reduced impact on SAR habitat. The median (inside) shoulder was to be increased in order to meet the design standard for stopping sight distance. An illustration of the design refinement to the Highway 427 extension crossing Robinson Creek is shown in **Figure 3-34.**

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Figure 3-34: Highway 427 Extension Interchange Ramp Refinements



3.5.2.1.4 Highway 400

The Highway 400 interchange had several constraints which needed to be considered during the design process. Some of the considerations included: access to and from the ONroute facility on northbound Highway 400, and the spacing between the Highway 413 eastbound to Highway 400 northbound entrance ramp and the King Road northbound exit ramp. Additionally, the ramp alignments at the Highway 413 / Highway 400 interchange were adjusted so that they do not preclude a potential future interchange at King-Vaughan Road. This interchange is not part of this Project but may be implemented in the future as a municipal undertaking.

3.5.2.2 Arterial Road Interchanges

The Partial Cloverleaf (Parclo) A4 is MTO's preferred interchange configuration with arterial roadways. This design has superior operational qualities, and where environmental and other constraints permit, it is preferable to all other interchange types. The Parclo A4 configuration has a single exit point from the highway in each direction on the approach to the interchange, which improves visibility and operations. The entrance ramps consist of two loop ramps and two direct ramps on the crossing road, which minimize the risk of wrong-way travel, and signage is simplified in all movements.

As an initial step in the Preliminary Design process, the standard Parclo A4 interchange design was utilized for each interchange location. As the design progressed, and initial environmental or design constraints were identified, alternate designs were considered and evaluated at The Gore Road and Highway 27. A Reasoned Argument Evaluation for each interchange was undertaken to compare and contrast the advantages and disadvantages for each alternative based on the key environmental and engineering criteria identified for each location.

3.5.2.2.1 The Gore Road

The Gore Road interchange is located immediately west of the West Humber River crossing, one of the major river crossings within the Highway 413 Route, requiring a bridge that is considerably larger and with higher design complexity than other conventional watercourse bridges. During the development of the initial plans for the Highway 413 / West Humber River bridge, it was identified that the proximity of the interchange at The Gore Road to the watercourse required variable width bridges to accommodate the ramp lanes. introducing further design complexity and cost challenges. To address these complexities, alternate interchange configurations were explored, focusing on technical requirements, environmental impacts, and cost. Four interchange design alternatives were considered: Parclo A4, Modified Parclo A4, Partial Diamond, and Parclo AB (these configurations are illustrated on **Figure 3-35**). Due to the existing vertical profile of The Gore Road and the West Humber River valley, only overpass (Highway 413 over The Gore Road) alternatives were considered. These alternatives were assessed based on key environmental and engineering criteria, including a traffic analysis to confirm operational performance of the preferred design.

The following describes the four design alternatives considered for the Highway 413 interchange at The Gore Road, as shown in **Figure 3-35**:

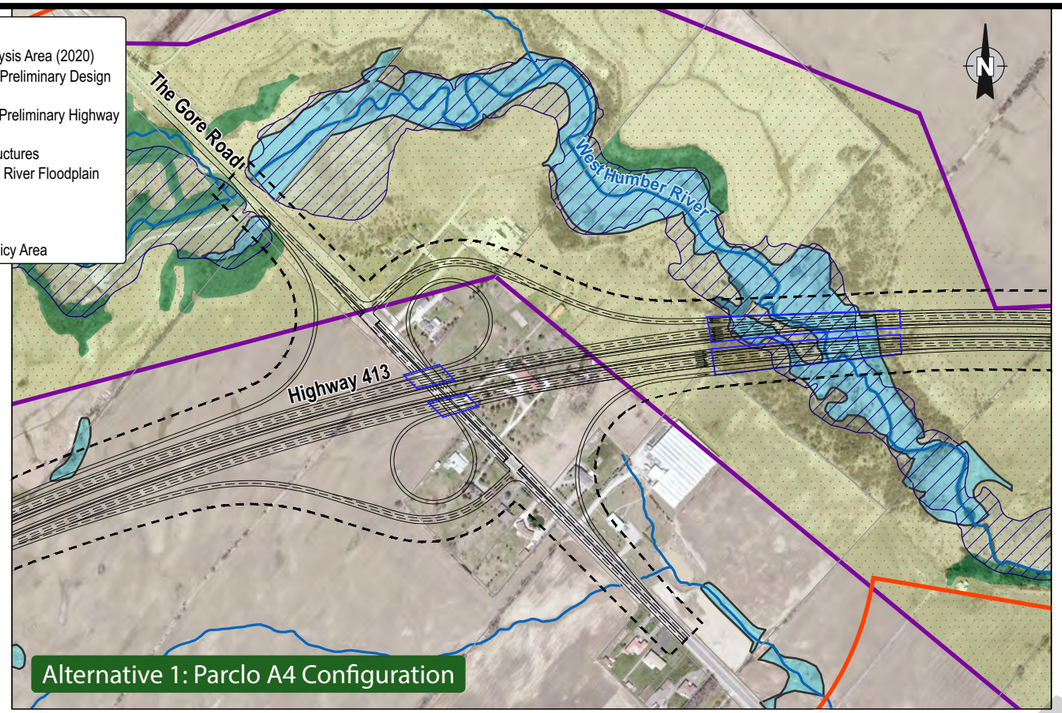
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- **Alternative 1, Parclo A4 Interchange**: As discussed previously, the Parclo A4 layout is generally preferred by MTO for arterial interchanges and is the typical interchange configuration used throughout the Highway 413 corridor. However, the Parclo A4 design at The Gore Road has environmental and property impacts, including the largest footprint within the Greenbelt Policy Area, larger impacts on species habitat and ecosystems, the greatest impacts on private properties compared to the other alternatives, and is the most likely to potentially impact Indigenous communities' ability to exercise their Aboriginal and/or treaty rights. Despite offering the most optimal traffic operations, the design requires an unconventional bridge configuration with large width variations along the West Humber River bridge, leading to the highest construction costs of the four alternatives. The wider bridges result in additional impacts on the fluvial dynamics of the West Humber River, its floodplain and wildlife movement corridors.
- **Alternative 2, Modified Parclo A4 Interchange:** This alternative is a modified version of the Parclo A4 configuration (Alternative 1), featuring a single-lane westbound exit ramp and a modified northbound entrance ramp which merges with the Highway 413 eastbound lanes before the West Humber River bridge. These changes reduce the interchange footprint and the size of the westbound bridge over the West Humber River, while maintaining similar traffic operations as Alternative 1. Of the four alternatives reviewed, this design has the second-largest footprint in the Greenbelt Policy Area. Its impacts on species habitats, ecosystems, on private properties, as well as potential impacts on Indigenous communities' ability to exercise their Aboriginal and/or treaty rights, are similar to Alternative 1. This design still requires an unconventional bridge configuration at the West Humber River, with estimated construction costs approximately 15% lower than Alternative 1, and comparable effects on the fluvial dynamics of the West Humber River, its floodplain and wildlife movement corridors.
- **Alternative 3, Partial Diamond Interchange:** A Diamond interchange design has entrance ramps accessed from intersections on the crossing road, rather than loop ramps or direct entrance ramps. In this case, a Diamond layout was considered on the north side of the interchange (to and from the Highway 413 westbound lanes), and the entrance ramps on the south side were combined into a single loop ramp. The diamond ramps on the north side connect to The Gore Road on an alignment closer to Highway 413, to reduce the overall interchange footprint. Signalized intersections would be required at the ramps on both the north and south sides to provide left turn access onto the entrance ramps. This alternative significantly reduces the size and complexity of the West Humber River bridge, and has the smallest footprint overall, and least impact to Greenbelt Policy Area, aquatic and terrestrial ecosystems, property, and potential impacts on Indigenous communities' ability to exercise their Aboriginal and/or treaty rights. While traffic operations are less optimal than a Parclo A4 configuration, traffic analysis confirmed that left turning at intersections to access the entrance ramps can be accommodated with signalized intersections. Due to the reduction in bridge size and complexity, the construction cost for Alternative 3 is the lowest of all four alternatives, approximately 40% lower than Alternative 1, and effects on the fluvial dynamics of the West Humber River, its floodplain and wildlife movement corridors are also reduced.
- **Alternative 4, Parclo AB Interchange:** The Parclo AB interchange alternative places all ramps on the west side of The Gore Road, with the westbound exit ramp as a large-radius loop. This configuration simplifies the West Humber River bridge design by eliminating lanes for the ramps on the bridge, allowing for a uniform width structure and thus reduced cost and impact. However, the larger footprint for the westbound exit ramp impacts The Gore Road's crossing of the West Humber River to north, which has been identified as habitat for SAR. The reconstruction of The Gore Road to accommodate the interchange would require replacement of the existing arch culvert with a four-lane bridge including design requirements to accommodate SAR habitat. Consequently, this alternative has greater environmental impacts, including a large footprint within the Greenbelt Policy Area, the greatest impact on species habitat and ecosystems, moderate effects on private properties, and is likely to have potential impacts on Indigenous communities' ability to exercise their Aboriginal and/or treaty rights compared to other options. Similar to Alternative 3, the traffic operations for this interchange configuration are manageable due to the relatively low traffic volumes. While the West Humber River bridges for Highway 413 are narrower and less expensive to build, with fewer effects on the fluvial dynamics of the West Humber River, its floodplain and wildlife movement corridors compared to the other alternatives, the additional construction required on The Gore Road north of the interchange results in this alternative having a high construction cost, similar to that of the Parclo A4 configuration. Overall, this alternative is considered the least preferred among the four alternatives.

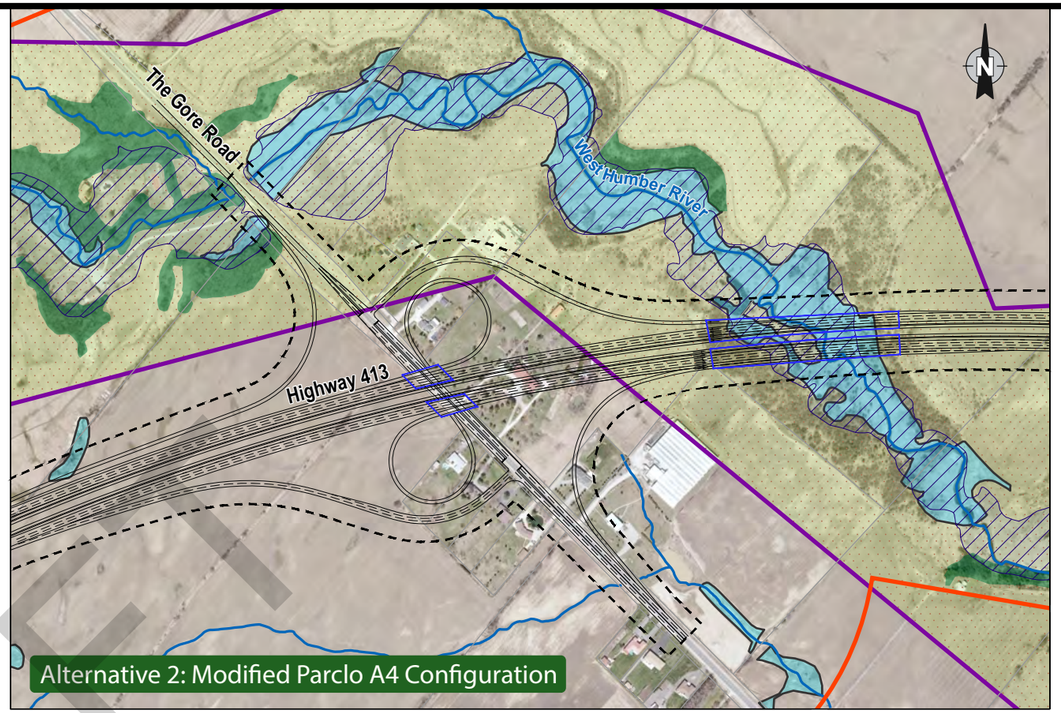
The Partial Diamond Interchange (Alternative 3) was identified as the preferred interchange configuration at The Gore Road, based on a balance of the environmental and technical issues that were considered. Alternative 3 has the least environmental and property impacts, including the smallest footprint within the Greenbelt Policy area and the least likely to potentially impact Indigenous communities' ability to exercise their Aboriginal and/or treaty rights, while also minimizing constructability and staging impacts, and with the lowest estimated construction cost. Additionally, while traffic operations are less optimal than a standard Parclo A4 configuration (Alternative 1), the left-turning traffic volumes for interchange entrance ramps are relatively low and are manageable, with traffic operations not anticipated to be critically impacted. The Partial Diamond interchange configuration was carried forward in Preliminary Design, with ramp lamp configurations further optimized through traffic analysis.

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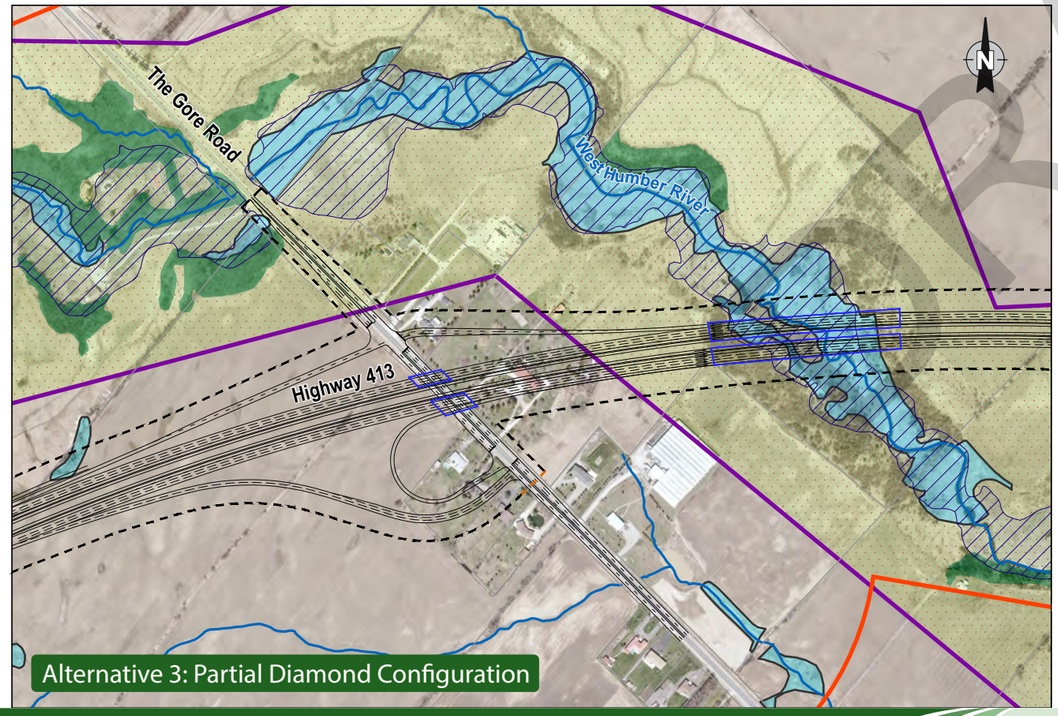
Legend
- Focused Analysis Area (2020)
- Highway 413 Preliminary Design Alternatives
- Highway 413 Preliminary Highway Right-of-way
- Proposed Structures
- West Humber River Floodplain
- Watercourses
- Wetlands
- Woodlands
- Greenbelt Policy Area



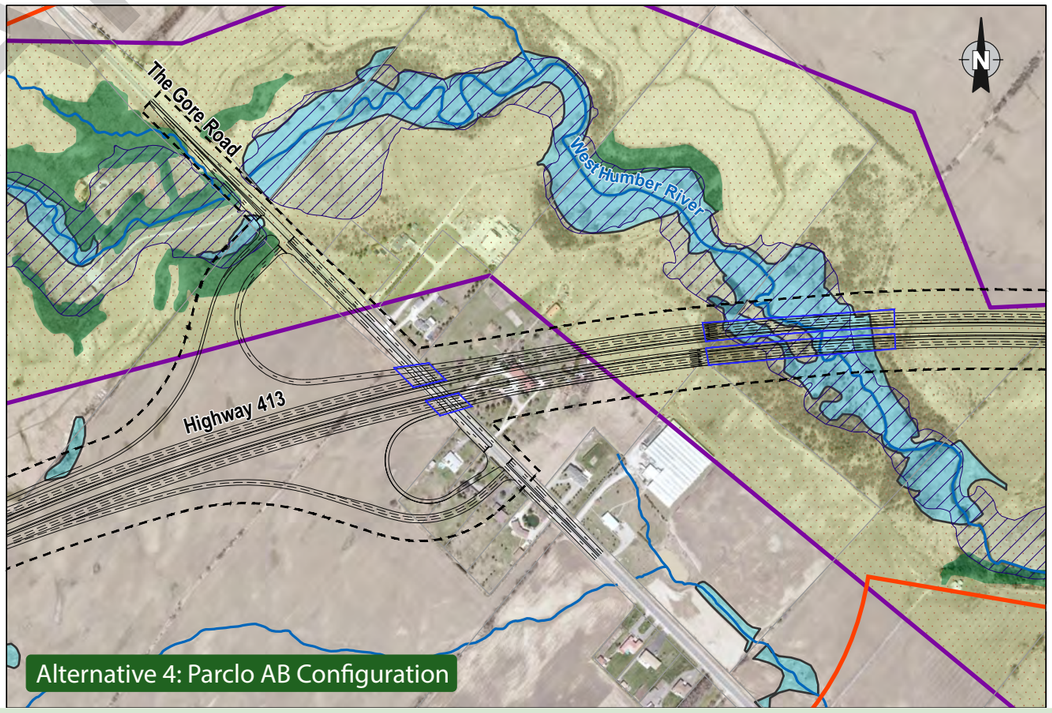
Alternative 1: Parclo A4 Configuration



Alternative 2: Modified Parclo A4 Configuration



Alternative 3: Partial Diamond Configuration



Alternative 4: Parclo AB Configuration

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Figure 3-35
Highway 413 and The Gore Road Interchange Alternatives

3.5.2.2.2 Highway 27

The interchange at Highway 27 and Highway 413, located within the Greenbelt Policy area, was initially planned with a Parclo A4 configuration. However, this configuration presented engineering and environmental challenges, including footprint impacts on land within the Greenbelt, impacts on sensitive ecological features, and high construction costs associated with the wider bridges required over the East Humber River to accommodate ramps. To address these issues, interchange configuration alternatives were developed to identify opportunities to reduce the interchange's footprint, minimizing environmental impacts and potentially lowering construction costs for the East Humber River bridges. Four interchange alternatives were considered: Parclo A4, Parclo AB, Diamond, and Diverging Diamond. These alternatives were evaluated using key environmental and engineering criteria, including a traffic analysis to assess operational performance.

All of the alternatives are fully contained within the Greenbelt Protected Countryside policy area, although there are variations in the overall footprint size. There are no feasible interchange alternatives that could partially or fully avoid impacting this policy area.

The following describes the four design alternatives considered for the Highway 413 interchange at Highway 27, as shown in **Figure 3-36**:

- **Alternative 1, Parclo A4 Interchange:** As discussed previously, the Parclo A4 layout is generally preferred by MTO for arterial interchanges and is the typical interchange configuration used throughout the Highway 413 corridor. However, at Highway 27, this alternative has the second largest overall footprint of the four alternatives and significantly impacts the Greenbelt Policy Area, PSW, ESA and significant woodlots, and property. The size of the interchange footprint has greater impacts on the watercourse crossings east and west of the interchange, terrestrial habitat, and has a greater likelihood of potentially impacting Indigenous communities' ability to exercise their Aboriginal and/or treaty rights. Despite offering the best traffic operations, the need for wider bridges crossing Highway 27 and the East Humber River for the interchange ramp lanes increases construction costs, making it the most expensive of the four alternatives (approximately 30% higher than the lowest cost alternative).
- **Alternative 2, Parclo AB Interchange:** The Parclo AB interchange alternative places all ramps on the west side of Highway 27, with the westbound exit ramp as a large-radius loop. This alternative has the second smallest footprint of four options, and by limiting ramp construction to the west side of Highway 27, has reduced impacts on the Greenbelt Policy Area, aquatic and terrestrial habitat for the most sensitive areas east of Highway 27, and property compared to the Parclo A4 configuration. As a result of the anticipated environmental impacts, this design has the potential to impact Indigenous communities' ability to exercise their Aboriginal and/or treaty rights. Traffic operations, while less optimal than a Parclo A4, are not anticipated be critically impacted. This configuration allows the ramp lanes to be removed from the East Humber River bridges, which results in the Parclo AB alternative having the lowest estimated construction cost among the four alternatives.
- **Alternative 3, Diamond Interchange:** The Diamond interchange alternative features direct entrance and exit ramps in each quadrant with access to and from the ramps provided at intersections on Highway 27 on both sides of the interchange. This alternative has the largest footprint of the four alternatives, with greater impacts to the Greenbelt Policy Area and property. Due to the absence of inner loop ramps, the impact on PSW, including aquatic and terrestrial habitats, is lower than the Parclo A4 configuration. Additionally, Indigenous communities' ability to exercise their Aboriginal and/or treaty rights may be impacted. Through traffic analysis, it was confirmed the Diamond alternative can accommodate future traffic operations but may operate near full capacity during peak hours. By eliminating loop ramps, the deck area and construction cost for Highway 27 overpasses is reduced, however the East Humber River bridges would need to be wider to accommodate ramp lanes, raising overall construction costs significantly, similar to those for the Parclo A4 configuration.
- **Alternative 4, Diverging Diamond Interchange:** The Diverging Diamond Interchange (DDI) is a relatively new design for freeway interchanges in Ontario, with the only operational DDI currently located at the Glendale Avenue and Queen Elizabeth Way (QEW) interchange in Niagara. The DDI offers potentially comparable traffic operations as the Parclo A4, but with a smaller footprint, reducing its impact on policy areas and property. The DDI has a considerably smaller footprint than the Parclo A4 but similarly affects fisheries and terrestrial ecosystems at nearby watercourses due to the number and length of ramps. As a result of the anticipated environmental impacts, this design still has the potential to impact Indigenous communities' ability to exercise their Aboriginal and/or treaty rights. The DDI configuration has increased conflict points for through traffic compared to the other alternatives, that could lead to longer queues, potentially causing congestion. While the DDI offers a more compact footprint, the larger bridge requirements and complex construction lead to higher costs (approximately 15% higher than the lowest cost alternative, the Parclo AB alternative, while significantly more cost-effective than the Parclo A4 and Diamond alternatives).

Alternative 2, the Parclo AB interchange design, was identified as the preferred alternative due to its reduced impact on the Greenbelt Policy Area and environmental sensitivities including tributaries, wildlife corridors, PSW, ESA, and Significant Woodland on the east side of Highway 27. The ramps are all located on the west side of the interchange, which minimizes disruption to potential SAR habitat near the East Humber River. Although it still may impact Indigenous communities' ability to exercise their Aboriginal and/or treaty rights, impacts would be

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lower compared to other alternatives. Alternative 2 reduces property impacts compared to the other alternatives. While traffic will not operate as efficiently as with the Parclo A4, the Parclo AB is expected to handle peak traffic volumes and provide flexibility for future growth. It avoids the need for additional width at the East Humber River bridges and bridges over tributaries east of Highway 27, which are required by other alternatives. As a result, this alternative has the lowest overall estimated construction cost. In response to municipal feedback regarding traffic operations associated with the Parclo AB configuration, the ROW protects for a larger footprint should refinements or alternative design concepts emerge in Detail Design, including a standard Parclo A4 configuration.

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Legend
- Focused Analysis Area (2020)
- Highway 413 Preliminary Design Alternatives
- Highway 413 Preliminary Highway Right-of-way
- Proposed Structures
- West Humber River Floodplain
- Watercourses
- Wetlands
- Woodlands
- Greenbelt Policy Area

Alternative 1: Parclo A4 Configuration

Alternative 2: Parclo AB Configuration

Alternative 3: Diamond Configuration

Alternative 4: Diverging Diamond Configuration

Highway 27
Highway 413
East Humber River

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Figure 3-36
Highway 413 and Highway 27 Interchange Alternatives

3.5.3 Major River Crossing Bridges

There are over 200 bridges along the Preferred Alignment. Bridges are required at locations where roads cross over the highway, where the highway crosses over roads, railways, valleys, or water features, and where freeway-to-freeway ramps cross each other or the highway. For each of these different types of crossings, different considerations are required for the bridge design.

For a road, ramp or railway that crosses the highway, the design would consider the length of the crossing, the height clearance under the bridge to the highway or railway, the width of the bridge including lanes, rail lines, AT facilities, as applicable, and other criteria.

Where the highway crosses an environmental or watercourse feature other factors are incorporated into the design of the highway bridge. These include:

- The width of the environmental feature or watercourse itself;
- Protected areas beyond the physical feature;
- Avoiding impacts within the meander belt of a watercourse; and
- Providing sufficient clearance to the potential height of the water level of the watercourse.

Specifically, regarding the watercourse bridges, there were continuous discussions and iterations between many engineering and environmental disciplines including: Bridge Engineering, Highway Engineering, Drainage Engineering, Terrestrial, Fish and Fish Habitat, and Fluvial Geomorphology, and others.

Four of the watercourse crossings were considered to be ‘major’ bridges based on the overall length of the bridge, the size of the watercourse itself, and the sensitive environmental features within and adjacent to the watercourse. These are located at four major river crossings along the alignment:

- Credit River;
- West Humber River;
- Main Humber River; and
- East Humber River.

These major river crossings required a unique set of design and assessment of alternatives, based on their unique features. Following the identification of evaluation criteria (see **Section 3.5.3.1**), an evaluation was completed to determine the preferred bridges for the Credit and Humber Rivers (West, Main, and East crossings) (see **Sections 3.5.3.2** to **3.5.3.5**).

3.5.3.1 Evaluation Methodology

3.5.3.1.1 Evaluation Criteria

As Preliminary Design progressed, MTO refined and added to the fulsome evaluation criteria used for the short-listed alignments (**Table 3-2**) to produce relevant evaluation criteria to be used specifically at the major river crossings. This further refinement ensured that, as structural Preliminary Design decisions progressed, appropriate location-specific, multi-disciplinary criteria were applied at these key major crossing locations to inform decision-making. The evaluation criteria used for the major river crossing bridges focused on allocating weight to those criteria pertinent to these types of crossings, as other criteria (e.g., cultural environment, land-use/socio-economic environment) had already been thoroughly considered during the evaluation of the short-listed alignments.

Three relevant factor areas for the evaluation criteria were identified: Structural, Cost, and Natural Environment. **Table 3-11** outlines the evaluation criteria (factors and sub-factors) used for the major crossing bridges, including the rationale for their inclusion. The sub-factors shaded in blue in **Table 3-11** represent new criteria included in the evaluation of the major river crossing bridges.

3.5.3.1.2 Analysis and Evaluation Approach

To complete a quantitative analysis, weights were assigned to the three factor areas. The Structural and Cost factors were each assigned a weight of 30, while the Natural Environment factor was assigned a weight of 40, totalling 100. The higher weight assigned to the Natural Environment factor reflects the prioritization of the natural environment, given the ecological sensitivity of the Credit and Humber River Valleys. Weights were then allocated for each sub-factor accordingly. The assigned weights were then reviewed and rationalized prior to proceeding with the evaluation process. Additionally, MECP, DFO, CVC, and TRCA were consulted and provided input on the proposed evaluation criteria and the weightings, as described further below.

Scores were then assigned to each criterion, 1 being Very Poor to 5 being Very Good. Once the scores were assigned, weighted scores were calculated by multiplying each score by the criterion’s weight. The total weighted score for each alternative within each factor was determined by summing all the weighted scores for each criterion. Consequently, a higher weighted score indicated the preferred alternative.

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While a quantitative evaluation approach was primarily used, all results were reviewed and rationalized prior to an overall recommendation being made.

As part of the expanded environmental reviews and evaluations of the bridge alternatives, and at the direction of MECP, shadow effect assessments were completed for each of the three Humber River bridge crossings of Highway 413. The shadow effects assessments were completed for both the interim and ultimate Preliminary Design.

Shade may affect fish and insect habitats at these locations by reducing exposure to sunlight for natural areas (e.g., waterbodies, wetlands, shorelines, and forests). The purpose of the shadow effects assessment was to evaluate the environmental impact of shadows cast by the different bridge configurations on local habitats. Particularly, the shadow effect assessments were completed on the West Humber River due to Redside Dace, on the Main Humber River due to Rapids Clubtail, and on the East Humber River due to Redside Dace and Rapids Clubtail.

Three-dimensional (3D) landscape models of the bridge designs were created to simulate shadows during different times of the year, including during summer and autumn solstices to capture the longest and shortest days of the season. The analysis included the extent of shadows cast by the bridge components and their impact on Redside Dace and Rapids Clubtail critical habitats, as applicable. The assessment identified the least and most impactful bridge design alternatives based on shadow coverage for each the three Humber River bridge crossings, which was incorporated into the overall evaluation of alternatives, particularly the Fish and Fish Habitat and the Terrestrial Ecosystems criteria.

The shadow assessment results concluded that:

- Alternative 1 was preferred for the West Humber River bridge crossing due to the least shadow effect on Redside Dace habitat;
- Alternative 1 was preferred for the Main Humber River bridge crossing due to the least shadow effect on Rapids Clubtail habitat; and
- Alternative 2 was preferred for the East Humber River bridge crossing due to the least shadow effect on Redside Dace habitat and Rapids Clubtail habitat.

3.5.3.1.3 Agency Consultation

During the development of the evaluation criteria, the MECP, DFO, CVC, and TRCA were consulted and provided input on the process and evaluation criteria. An initial meeting was held on December 6, 2022 to discuss the proposed approach. On March 3, 2023, a meeting was held with MECP and feedback was received on the proposed approach, which was previously presented to MECP, TRCA, CVC and DFO at the December 2022 meeting. Following the completion of the preliminary evaluation, the draft results were presented to MECP, TRCA, CVC, and DFO at the RAAG meeting held on December 5, 2024. Additionally, the major river crossing evaluation criteria and draft results were shared with the MAG, which consists of staff from Halton, Peel, and York Regions, as well as the municipalities of the Town of Halton Hills, Town of Caledon, Town of Milton, City of Brampton, City of Mississauga, City of Vaughan, and the Township of King, at meetings held in November 2024. The major river crossing evaluation criteria and draft results were also presented to the Federal-Provincial Technical Groups on May 27, 2025 and were provided to the Federal-Provincial Technical Groups for review and comment.

In addition to the evaluation criteria outlined in **Table 3-11**, the TRCA Crossing Guideline for Valley and Stream Corridors (September 2015) will be used as a general reference during Detail Design for any crossing of regulated watercourses within TRCA's jurisdiction. The TRCA SWM Criteria document (August 2012) will also be used as a general reference during Detail Design to ensure that TRCA SWM requirements are considered in the surface water design.

For further details on the abovementioned agency consultation, refer to **Chapter 8**.

3.5.3.1.4 Indigenous Community Engagement and Consultation

The major river crossing evaluation criteria and draft results were presented to Indigenous communities at their request, including the Williams Treaties First Nations, Mississaugas of the Credit First Nation, and Six Nations of the Grand River, through on-going presentations and information sharing with Indigenous communities throughout 2025. Additionally, the major river crossing evaluation criteria and draft results were provided to Indigenous communities for their review and to provide their input on May 22, 2025.

For further details on the abovementioned Indigenous Community engagement, refer to **Chapter 7** (Indigenous Engagement and Consultation).

3.5.3.2 Credit River

Highway 413 crosses the Credit River valley between Embleton Road and Heritage Road. Two separate bridges will be required to carry Highway 413 westbound and eastbound lanes over the Credit River valley. The bridges will initially be constructed to carry three through lanes and one auxiliary lane in each direction. The ROW was developed to accommodate future widening up to eight lanes (four general purpose lanes per direction), as needed. Due to the design challenges with these large span structures, widening the structure using conventional methods may not be feasible and therefore a median structure has been proposed to carry one high occupancy vehicle (HOV) lane in each direction. This concept would be subject to further study and additional alternatives may be considered to accommodate the HOV lanes.

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For the Credit River, a requirement to cross the valley without approach embankments infilling the valley and fluvial geomorphic requirements to allow the Credit River to meander across the approximately 450 m wide valley floor were parameters that determined the overall length of 600 m for the bridge alternatives. Several design concepts were investigated during the initial phase of the Preliminary Design. Since the river crosses the valley at approximately the midpoint within the valley, bridge configurations with an odd number of spans allow the central span to directly cross the river. This results in a more symmetrical and structurally efficient layout, avoiding the need to place piers or foundations within the river itself, which would be required with an even number of spans. Given the overall length of the bridges, three-span designs or less would result in very large span lengths, which significantly limits the type of bridge that can be designed to "signature bridges", such as cable-stayed or through-arch bridges. These bridges require bedrock near the surface or very strong soils to carry large loads imparted to the bridge foundations. While bedrock is close to the surface on the north side, deep bedrock overlayed by weak soils on the south side of the valley pose significant technical challenges that would result in complex and extremely high construction cost and were therefore not carried forward. The long list of alternatives included five-span, seven-span, and nine-span bridges. A number of different alternatives were developed for each span configuration, and the most technically feasible and constructable alternatives were carried forward for detailed evaluation, noting the requirement to fully span the Credit River.

Two configurations were considered for a nine-span bridge: one with equal 70 m spans over the Credit River and the remainder of the valley on either side, and another with a 90 m main span over the Credit River and 68 m spans over the remainder of the valley. The latter configuration offered a larger span over the Credit River and eliminated temporary encroachment into the river during the construction of the pier's foundations adjacent to the river that is required for the first configuration. However, it does not span over the erosion envelope (approximately 20 m on either side of the river) and directly impacts the environmentally sensitive tributary north of the Credit River. It would also result in higher construction costs while having a larger impact on ESAs in the valley.

Therefore, a nine-span bridge with equal 70 m spans over the Credit River and the reminder of the valley was selected for detailed evaluation as Alternative 1.

The seven-span alternative met all basic design requirements, including clear spanning the Credit River and the 20 m erosion envelope on either side of the river, and avoiding direct impact to the environmentally sensitive tributary on the north side of the Credit River. It features moderate span lengths that can be achieved with both structural steel and concrete superstructures. Therefore, the seven-span bridge featuring steel girders (Alternative 2) and post-tensioned concrete (Alternative 3) were carried forward for detailed evaluation.

A five-span bridge met most of the main requirements noted for the seven-span configuration. It was the only configuration that featured aligned abutments and piers for both northbound and southbound bridges, however it results in larger bridge embankment grading at the southeast quadrant. It featured long spans that could be achieved with a concrete superstructure. The superstructure was also the heaviest of all alternatives considered, and would require the largest foundations and footprint. Considering that the five-span configuration was the most expensive and complex to construct without offering tangible benefits compared with seven-span Alternatives 2 and 3, it was eliminated from further consideration.

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Table 3-11: Evaluation Criteria for the Major River Crossing Bridges

Legend: Blue shaded rows indicate new criteria not previously considered under the alignment alternatives evaluation but included specifically for the major river crossing bridges evaluation.

Factors	Sub-Factors	Criteria	Rationale for Inclusion
1.0 Structural			
1.1 Structural	1.1.1 Constructability	Challenges/difficulties in construction, past construction experiences, construction duration, construction access.	Construction methodology will impact the construction cost and environmental impacts of the alternatives.
	1.1.2 Durability and Maintenance	Overall structural durability, accessibility and easiness for future inspection and maintenance.	Durability of the alternatives will impact future maintenance cost, rehabilitation requirements, and disruption to users.
	1.1.3 Future Widening	Availability to accommodate future widening and flexibility for alignment changes.	The ability to widen will impact costs and disruptions to users, i.e., some alternatives may be widened by adding girders, while others may require a separate bridge with increased shoulders, larger foundations, etc.
	1.1.4 Aesthetics	Aesthetics from deck level and below the bridge.	Selecting bridge types and details that add aesthetic value is a project wide requirement (i.e., integral piers versus pier caps).
	1.1.5 Resilience to a Changing Climate	Presence and potential degree of effects from increase in vulnerability to physical climate impacts.	Certain bridge details may be susceptible to impacts from climate change and will need to be considered in the evaluation, such as the impacts of freeze-thaw cycles on expansion joints/bearings and the impacts of extreme rainfall events on SWM.
1.2 Structural Sustainability	1.2.1 Greenhouse Gas Emissions	Presence and potential degree of effects from increase in GHG emissions from construction equipment and activities.	The direct GHG emissions (and thus the impact to climate change) associated with construction of major crossing bridges will vary depending on the required construction activities. This can include the number of construction vehicles/equipment, the length of the construction activities, as well as the amount of vegetation (if any) that would need to be cleared to construct the crossing.
	1.2.2 Other Emissions (e.g., air, water, soil)	Presence and potential degree of effects from increase in other emissions from construction materials and activities.	The emissions to air, water and soil associated with construction of major crossing bridges will vary depending on the required construction activities. This can include the number of construction vehicles/equipment, the length of the construction activities, the amount of construction in or near a watercourse, and the amount of land impacted by the construction.
	1.2.3 Consumption of materials and energy	Presence and potential degree of effects from: ■ Increased consumption of materials and energy associated with construction activities; and ■ Increased consumption of materials and energy associated with required maintenance.	The consumption of materials and purchased energy for the construction and maintenance of major crossing bridges impacts indirect GHG emissions associated with the bridge, which will vary depending on the crossing design.

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Factors	Sub-Factors	Criteria	Rationale for Inclusion
2.0 Cost			
2.1 Cost	2.1.1 Construction Cost	Relative structural construction cost, excluding property and engineering costs.	The intention is to provide the best overall value, balancing financial efficiency, quality, and environment.
	2.1.2 Compensation/Restoration Costs This is a new criterion not previously considered under the alignment alternatives evaluation but included specifically for the major river crossing bridges evaluation.	Cost of restoration plan, Fisheries Act Offsetting, site preparation (clearing grading, etc.), seeding, planting and other natural materials. Includes possible funding of research regarding the specific SAR.	Bridge crossings over major valleylands, woodlands, fish habitat and significant wildlife habitat will require restoration of habitat and vegetation communities. Costs for ecological restoration may include: clearing, grading, seeding, planting and the installation of habitat features.
3.0 Natural Environment			
3.1 Fish and Fish Habitat	3.1.1 Fish and Fish Habitat	Potential degree of/scale of negative effects on fish and fish habitat (extent, duration, intensity), considering sensitivity of fish and fish habitat on permanent and temporary impacts, e.g., ■ critical/specialized fish habitat features (i.e., species' dependence on habitat; use of habitat by species); ■ rarity of habitat and species (relative strength of a fish species or population, or prevalence of a particular type of habitat; consideration of cumulative effects); ■ habitat resilience (ability of an aquatic ecosystem to recover from changes in environmental conditions; consideration of the physical characteristics of the stabilization design in understanding resiliency of the affected freshwater ecosystem); ■ species sensitivity (sensitivity of species to short term change in environmental conditions); ■ relative importance of riparian areas; ■ habitat rehabilitation goals, as relevant; ■ shadow effects to Redside Dace and critical habitat; and ■ fish passage/migration. Potential degree of/scale of negative effects on the channel form, function and erosion risk. Potential to design crossing or adjacent corridor sections to avoid or minimize death to fish and/or the harmful alteration, disruption or destruction (HADD) to fish habitat.	A bridge crossing over a watercourse has the potential to affect fish and fish habitat features through impediments to fish passage, loss of vegetation, changes to channel fluvial geomorphology (channel form and function), changes to substrate and cover, changes to the water quality due to erosion and sedimentation, stormwater discharge and temperature changes. The relative overall impact is higher (and potential for mitigation effectiveness lower or more difficult) for designs over less common and/or more sensitive fish communities and habitat features and functions. Certain fish species and habitats are more sensitive than others. Certain species of fish are also protected by the *Endangered Species Act, 2007** and/or the *Species at Risk Act* (2002). The rarity of these species elevates their sensitivity and many are depending on specific habitat features that are often not well understood.

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Factors	Sub-Factors	Criteria	Rationale for Inclusion
3.1 Fish and Fish Habitat	3.1.2 Permit Potential This is a new criterion not previously considered under the alignment alternatives evaluation but included specifically for the major river crossing bridges evaluation.	Potential need for requiring a DFO Fisheries Act Authorization and/or *Species at Risk Act* permit. Potential need for an *Endangered Species Act*, *2007** permit.	The federal *Fisheries Act* prohibits death to fish and/or the HADD of fish habitat unless authorized by DFO. Where effects cannot be mitigated and the Project works may result in death to fish and/or a HADD, the works may proceed with authorization by DFO, usually supported by a plan that includes measures designed to off-set the loss. Aquatic SAR may be impacted and require a permit under *Species at Risk Act* (federally listed) and/or *Endangered Species Act*, *2007** (provincially listed).
3.2 Terrestrial Ecosystems	3.2.1 Wildlife and Wildlife Habitat	Potential and significance of encroachment, fragmentation, removal and/or long-term alteration/disruption as applicable to the following: ■ Habitat rarity (i.e., representation on landscape); ■ Habitat sensitivity/resilience; ■ Habitat diversity within feature and landscape; ■ Habitat function within feature and landscape; ■ Confirmed Significant Wildlife Habitat; ■ Potential Significant Wildlife Habitat; ■ Movement corridors and habitat connectivity; ■ Potential or confirmed habitat for SAR; ■ Presence of wildlife SAR; ■ Presence of wildlife of local and regional importance; and ■ Interference with critical wildlife life stage processes (e.g., mating/rearing, etc.). Consideration of impacts to individuals of species or species groups and impacts to their respective habitats will be considered, on a permanent and temporary basis. Opportunities to design crossings or transportation corridor section(s) to avoid or minimize impacts to Wildlife and Wildlife Habitat.	A major bridge crossing over a valley corridor has the potential to affect wildlife movement, habitat connectivity, vegetation loss affecting habitat directly. Other potential impacts include sediment deposition in significant habitats and rare to uncommon vegetation communities, nesting sites, breeding habitat for SAR birds including bank swallows.

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Factors	Sub-Factors	Criteria	Rationale for Inclusion
3.2 Terrestrial Ecosystems	3.2.2 Wetlands	Potential and significance of encroachment, fragmentation, removal and/or long-term alteration/ disruption on wetlands features as applicable to the following: ■ PSW; ■ Non-PSW; ■ Unevaluated wetlands; ■ Lands adjacent to wetland features required to maintain ecological features and functions; ■ Rarity, feature diversity, size and representation on the landscape; and ■ Feature's sensitivity and adaptive capacity/resilience to climate change and other extremes. Opportunities to design crossings to avoid or minimize impacts to wetlands.	A major bridge crossing over a valley corridor has the potential to affect wetlands through direct loss, indirect disturbance, sedimentation and erosion, reduction in species diversity, loss of wetland connectivity through bisection of communities, etc. Impacts to wetlands also may result in impacts to wildlife through a reduction in food sources and refuge areas for wildlife. Impacts to wetlands may affect their capacity to adapt to extreme conditions including climate change.
	3.2.3 Woodlands and Vegetation	Potential and significance of encroachment, fragmentation, removal and/or long-term alteration/ disruption, considering permanent and temporary impacts, as applicable to the following: ■ Significant woodlands; ■ Significant valley lands; ■ Rarity, feature sensitivity/resilience, feature diversity, size and representation on the landscape; ■ Individuals/populations or habitats for vegetation SAR; ■ Individuals/populations or significant habitat representation for vegetation species of provincial or regional/local conservation; and ■ Shadow effect from bridge. Opportunities to design crossings or highway section(s) to avoid or minimize impacts to woodlands and other vegetation.	A major bridge crossing over a valley corridor has the potential to affect woodlands through the direct loss of forest communities along slopes and the valley corridor. Works related to bridge crossings may result in slope instability causing slope failure and loss of forest areas adjacent to the crossing footprint.

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Factors	Sub-Factors	Criteria	Rationale for Inclusion
3.2 Terrestrial Ecosystems	3.2.4 Designated/Special/Natural Areas	Potential and significance of encroachment, fragmentation, removal and/or long-term alteration/ disruption, considering permanent and temporary impacts, as applicable to the following: ■ Purpose/rationale for original designation (i.e., relative potential to affect the core feature/function designated); ■ Impact to the designated feature/function; ■ Change in area character/ aesthetics of the features/area; and ■ Impact to the overall designation (i.e., does the impact potential effect the purpose of the designation). Designated natural areas, such as heritage rivers, ESAs, Environmentally Sensitive Policy Areas, ANSIs, Natural Heritage System(s), conservation lands (e.g., management tracts, reserves); and the designated special areas of national parks, provincial parks, conservation areas, etc.	A major bridge crossing may affect designated features as these features are primarily limited to the valley corridors that those bridges are crossing. Bridge crossings in designated features can fragment the features causing a loss in the integrity of the features and the connectivity of those features across the landscape.
	3.2.5 Permit Potential This is a new criterion not previously considered under the alignment alternatives evaluation but included specifically for the major river crossing bridges evaluation.	Potential need for requiring a federal *Species at Risk Act* permit and/or a provincial *Endangered Species Act*, *2007** permit. Alternatives to a permit may be available for certain species. Recommendations were also made where Conditional Exemptions under Ontario Regulation 830/21 and Ontario Regulation 242/08 may be possible.	A major bridge crossing of valley corridors that provide Critical Habitat for SAR may require a permit under the *Species at Risk Act* and/or under the *Endangered Species Act, 2007**; however, the permitting requirements for this project will be determined through the Federal-Provincial Working Group
3.3 Surface Water	3.3.1 Watershed/Subwatershed/Drainage Features/Patterns	Potential and significance of encroachment, severance, displacement, and/or long-term alteration/ disruption, as applicable to the following: ■ Watercourse crossings (permanent, intermittent and ephemeral); ■ Floodplain; ■ Riparian areas; ■ Wetlands; ■ Sensitive headwater areas; and ■ Watershed and subwatershed management plans.	Impacts to watersheds and related drainage features can result in negative impacts on habitat as well as increase potential flooding and erosion upstream and downstream of the site which is detrimental to both the environment and a potential danger to people and property.
	3.3.2 Surface Water Quality and Quantity	Potential and significance of effects on quality through direct and indirect discharges of contaminated and sediment-laden run-off. Potential and significance of effects on hydrology due to changes in ground permeability, modifications to surface drainage patterns and alterations of water bodies.	Impacts to surface water quality and quantity can result in negative impacts on habitat as well as increase potential flooding and erosion upstream and downstream of the site which is detrimental to both the environment and a potential danger to people and property.

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Factors	Sub-Factors	Criteria	Rationale for Inclusion
3.4 Groundwater	3.4.1 Areas of Groundwater Recharge or Discharge	Potential of effects on areas of groundwater recharge or discharge due to increased impervious surfaces or soil compaction.	Impacts to areas of groundwater recharge or discharge can result in groundwater flowpath changes. Depending on the flowpath changes, the quantity of groundwater can be reduced or increased in localized areas.
	3.4.2 Groundwater Source Areas and Wellhead Protection Areas	Potential of effects on groundwater source protection areas and wellhead protection areas due to increased impervious surfaces, spills and releases, and soil compaction.	Spills and releases to groundwater source areas and wellhead protection areas can result in adverse effects to vulnerable area locations.
	3.4.3 Water Supply Wells	Potential effects on existing water supply wells.	Relocation of wells may be required if located in the ROW. The water supply well zone of capture may overlap the new ROW. Spills and releases near water supply wells can result in damage to water supply well water quality.
	3.4.4 Groundwater-Dependent Ecosystems	Potential to increase impervious surfaces.	An increase in impervious surfaces can impact groundwater flow to groundwater-dependent ecosystems. Impacts to groundwater-dependent ecosystems can result in negative impacts to the quantity and quality of groundwater.

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In summary, Alternatives 1, 2, and 3 were selected to be carried forward for detailed evaluation (see **Figure 3-37**). **Table 3-12** provides a high-level summary of the major structural differences between the alternatives.

Table 3-12: Summary of Credit River Bridge Alternatives

Bridge Characteristics	Alternative 1 Nine-Span Constant Depth Steel Plate Girders	Alternative 2 Seven-Span Constant Depth Steel Box Girders	Alternative 3 Seven-Span Segmental Post-tensioned CIP Concrete Box
Control Span Lengths (m)	70 m	110 m	150 m
Total Bridge Length (m)	600 m	600 m	600 m
Width (m)	2 x 21.55 m	2 x 21.55 m	2 x 21.55 m
Girder Depth (m)	2.4 m	3.3 m	Variable
Deck Area (Both Eastbound Lane and Westbound Lane Bridges)	25,860 m²	25,860 m²	25,860 m²

Table 3-13 summarizes the results of the evaluation of the Credit River bridge alternatives.

Table 3-13: Summary of Evaluation Results for Credit River Bridge Alternatives

Evaluation Criteria	Alternative 1	Alternative 2	Alternative 3
Structural	18.4	23.0	22.9
Cost	30.0	30.0	27.0
Natural Environment	15.7	21.4	21.4
Total Weighted Score	64.10	**74.48**	71.36

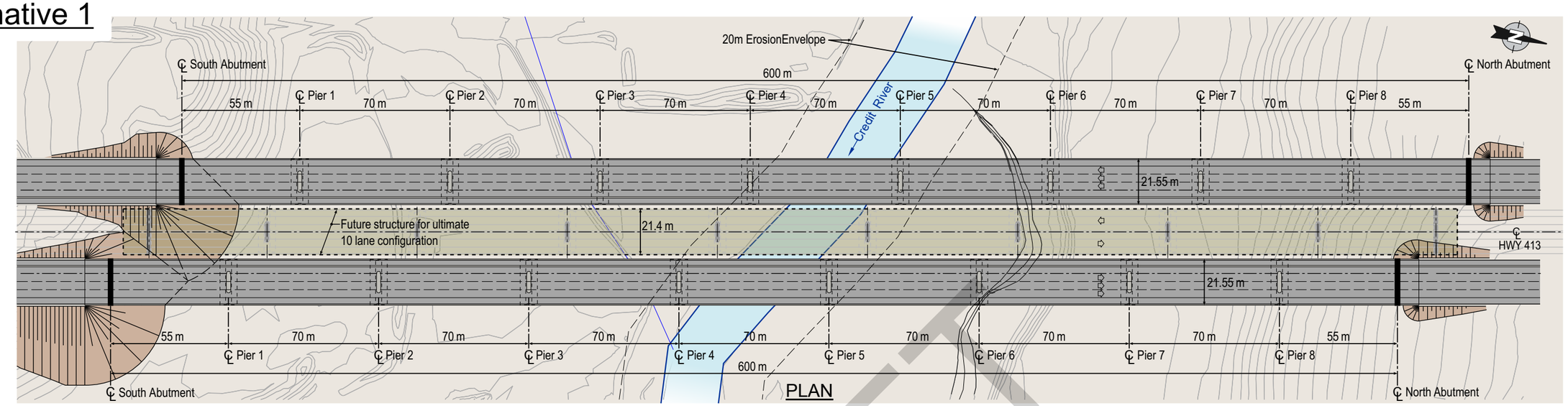
Key evaluation considerations and findings included:

- Alternatives 1 and 2 scored higher on constructability and future widening structural criteria, mainly due to their simpler construction methods. Alternative 3 scored higher on durability and aesthetics. From a structural perspective, Alternatives 2 and 3 are closely rated, with Alternative 2 rated slightly higher than Alternative 3, making it the preferred bridge type. Having said that, the differences in numerical rating between Alternatives 2 and 3 is minimal.
- Alternatives 1 and 2 have comparable construction cost, resulting in equal overall scores. The Construction Cost of Alternative 3 is approximately 11% higher, resulting in a lower score. Compensation/Restoration Costs were estimated to be the lowest for Alternatives 2 and 3 compared to Alternative 1.
- All alternatives performed consistently well for the Resilience to Climate Change criterion. Alternative 2 scored the highest for GHG Emissions and Other Emissions criteria. It also ranked the highest in the Material and Energy Consumption criterion, followed by Alternative 1, with Alternative 3 scoring the lowest. Despite Alternative 2 scoring the highest overall from a climate change resilience/sustainability perspective, the differences between the alternatives were minimal.
- From a natural environment perspective, Alternatives 2 and 3 are generally preferred over Alternative 1 due to their fewer impacts on wetlands, better potential for natural regeneration, providing slightly better conditions for wildlife movement, and fewer piers in the Credit River floodplain which benefits long-term floodplain health.
- Alternatives 2 and 3 are closely scored, with Alternative 2 preferred overall, as it achieved the highest score across all three factor areas. That said, Alternative 3 will require further consideration, and the selection of the preferred bridge type should be confirmed during Detail Design.

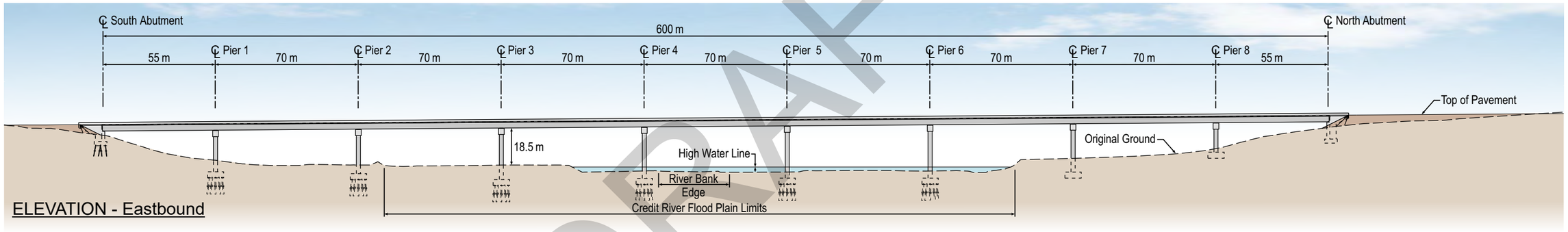
Overall, **Alternative 2 is the preferred Credit River Crossing**, scoring the highest across all three factor areas.

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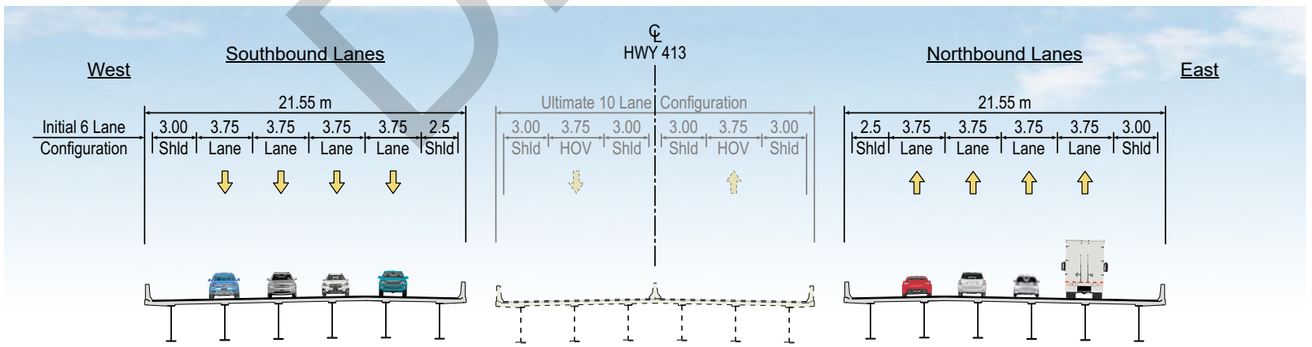
Alternative 1



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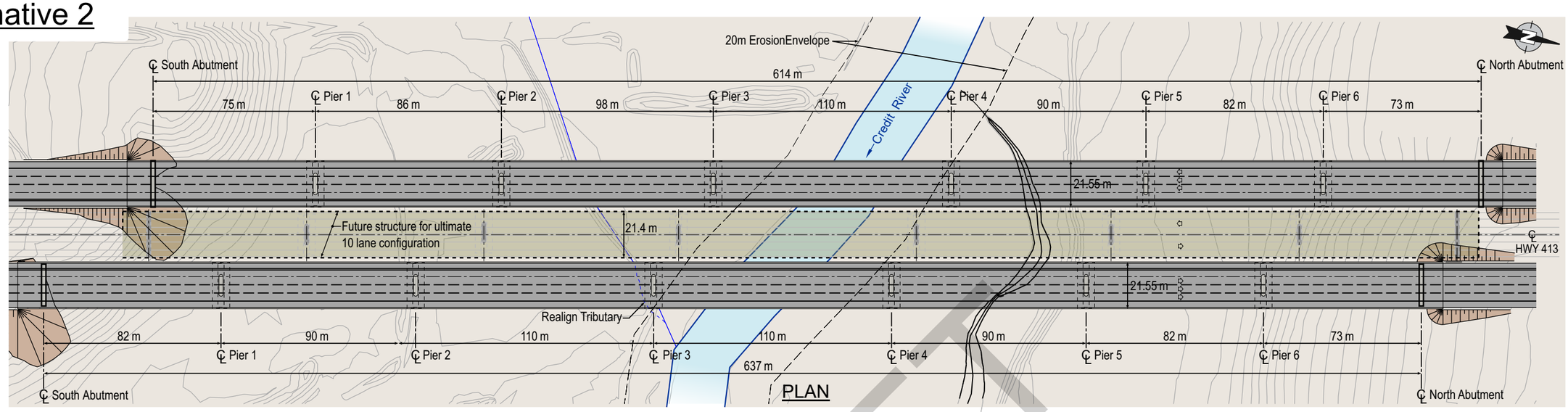
ELEVATION - Eastbound



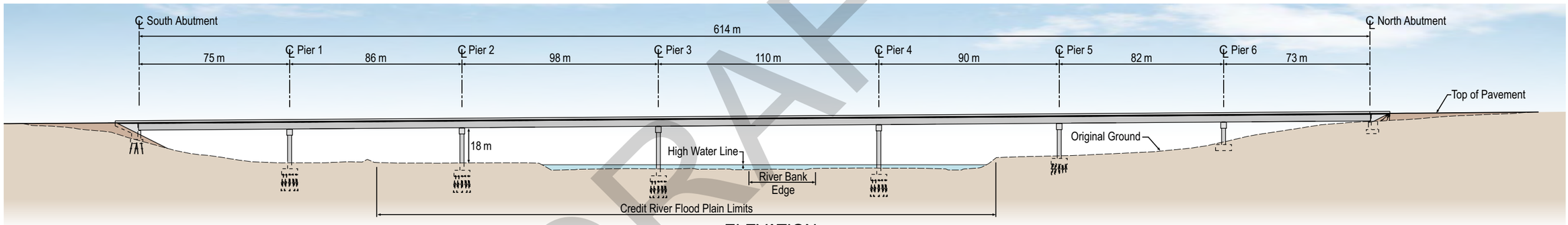
CROSS SECTION

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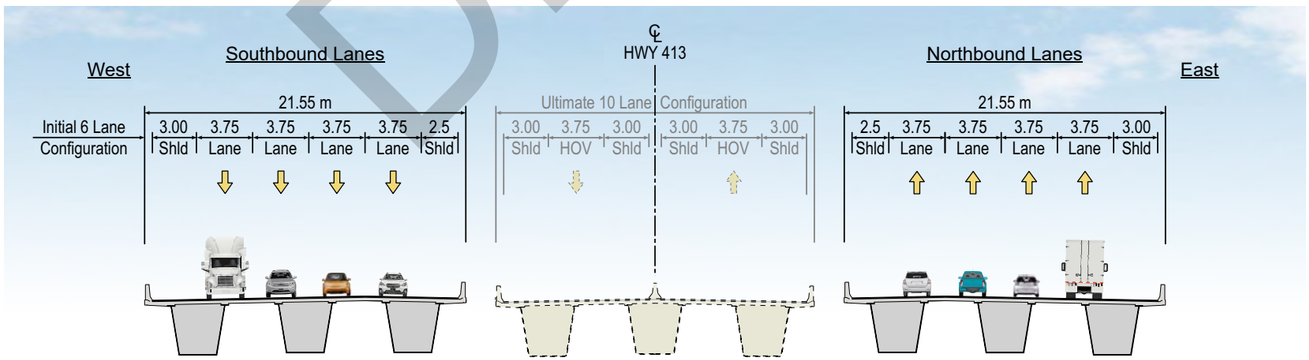
Alternative 2



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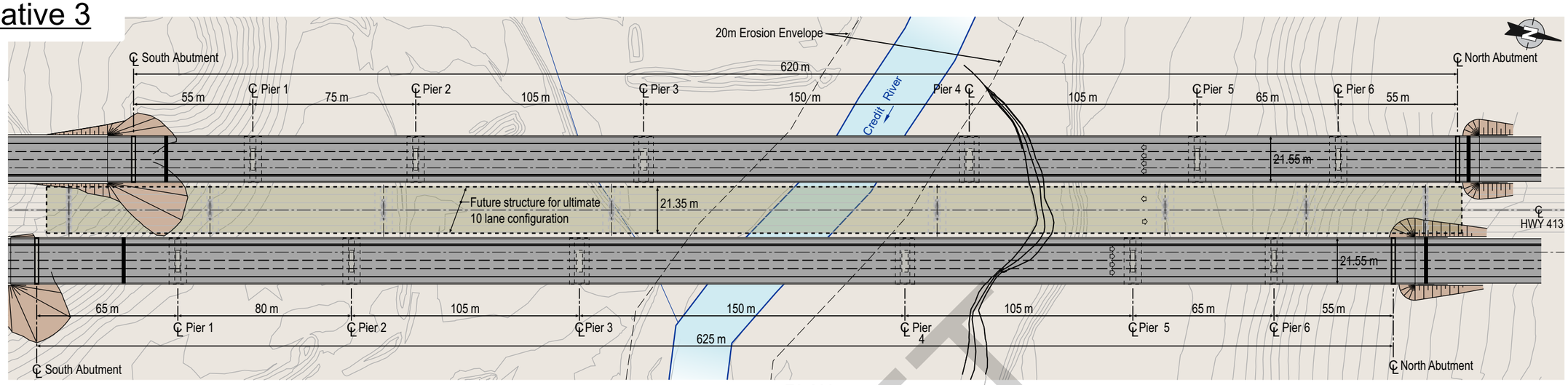
ELEVATION



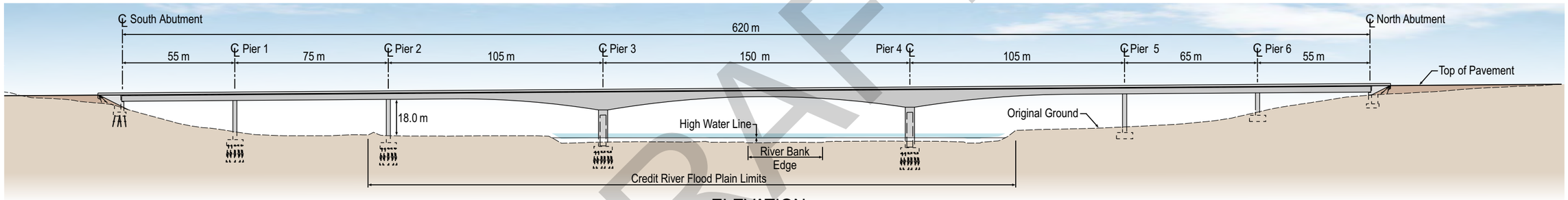
CROSS SECTION

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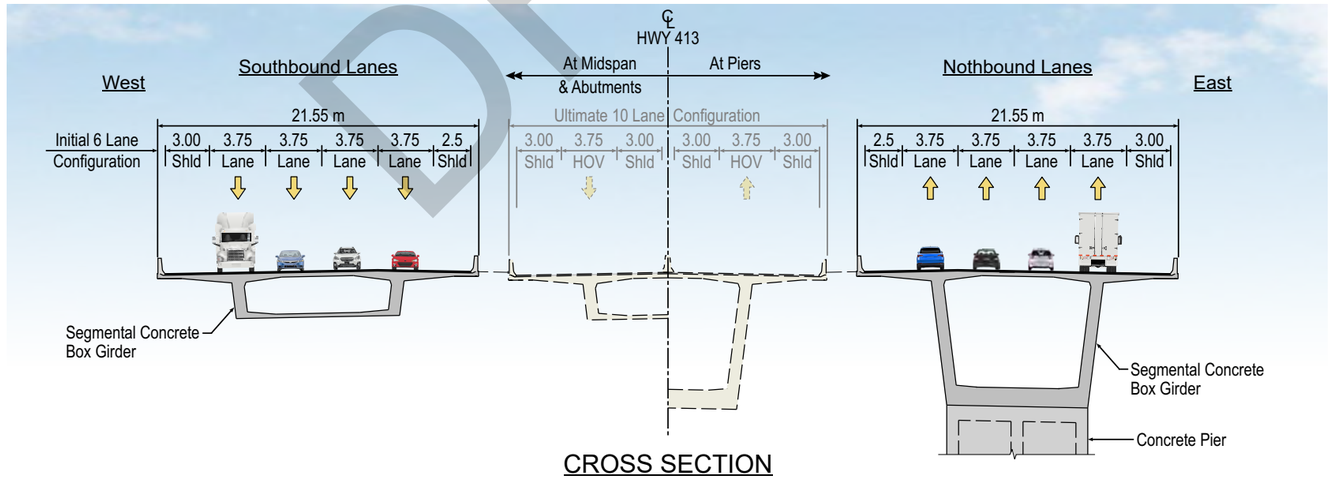
Alternative 3



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ELEVATION



CROSS SECTION

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3.5.3.3 West Humber River

Highway 413 crosses the West Humber River east of The Gore Road Interchange. The valley is 11 m to 16 m deep, approximately 120 m wide along the valley floor, and approximately 300 m wide between the table lands at the top of the valley, measured along the highway alignment.

Two separate bridges will be required to carry the eastbound and westbound lanes of Highway 413 over the valley, each accommodating three general purpose lanes and one auxiliary lane for the interchange ramps to and from The Gore Road. Due to the presence of SAR in the valley and on the valley walls, as well as fluvial geomorphic requirements to allow the river to meander across the valley floor, infilling of the valley is not permitted. As a result, the bridges will exceed 300 m in length. The ROW was developed to support future widening in the median of each structure, allowing for an ultimate ten lane highway configuration (four general purpose lanes and one HOV lane in each direction), as needed. In the ultimate highway configuration, the initial auxiliary lanes will be converted to general purpose lanes.

Given the 300 m valley width and the meandering alignment of the West Humber River down the central third of the valley floor, neither a single-span bridge nor a two-span bridge presents a viable option. A single-span bridge of this length would require a through arch design; however, such structures require very strong soils to carry the large thrust imparted to the bridge foundations. The weak soils present at the West Humber River are insufficient to support these loads. Similarly, a two-span bridge is unsuitable due to the river's meandering path, which precludes the placement of a central pier within the middle band of the valley.

Three-span bridge configurations were considered for the crossing, all requiring flaring at the west end of the bridge to accommodate the westbound exit ramp to The Gore Road (see **Figure 3-38**).

The river meanders generally down the centre of the valley where it passes under Highway 413. The bridges are on a horizontal curved alignment over the valley, each with a total length of approximately 312 m as measured along the highway centreline.

Alternative 1 consists of twin, three-span bridges. The main centre spans were designed to span over the erosion envelope (i.e., the potential 100-year meander belt) on both sides of the river. The meander of the river under the westbound bridge controls the centre span requirement of 131 m. The end-spans roughly span over the valley walls, ensuring the fill slopes at the abutments are outside of Redside Dace habitat.

Alternative 2 consists of twin, five-span bridges. The 89 m centre spans are smaller than those in Alternative 1 and were set to keep the piers out of the West Humber River bankfull width. However, the piers were located within the erosion limits on both sides of the river to reduce the length of the bridge spans and thus the overall cost. The locations of the abutments are unchanged from Alternative 1, ensuring they remain outside of Redside Dace habitat.

Alternative 3 retains the same five-span configuration as Alternative 2 for the westbound bridge. The number of spans for the eastbound bridge was increased to six to shorten the maximum span length for this bridge from 89 m to 55 m. The shorter main span for the eastbound bridge is possible without encroaching into the river bankfull width due to the more favourable orientation of the river underneath the bridge compared to the westbound bridge.

Table 3-14 provides a high-level summary of the major structural differences between the alternatives.

Table 3-14: Summary of West Humber River Bridge Alternatives

Bridge Characteristics	Alternative 1 Haunched Slab-on-Steel Girder Bridge	Alternative 2 Slab-on-Steel Girder Bridge	Alternative 3 Slab-on-Steel Girder Bridge – Reduced Eastbound Lane (EBL) Spans
Control Span Lengths (m)	131 m	89.0 m	WBL - 89 m EBL - 55 m
Total Bridge Lengths (m)	312 m	312 m	312 m
Width (m)	WBL - Varies (20.8 - 22.7 m) EBL - 20.8 m	WBL - Varies (20.8 - 22.7 m) EBL - 20.8 m	WBL - Varies (20.8 - 22.7 m) EBL - 20.8 m
Girder Depth (m)	Varies (6.6 m max/3.3 m min)	3.2 m	WBL - 3.2 m EBL - 2 m
Deck Area	13,058 m²	13,058 m²	13,058 m²

Table 3-15 summarizes the results of the evaluation of the West Humber River bridge alternatives.

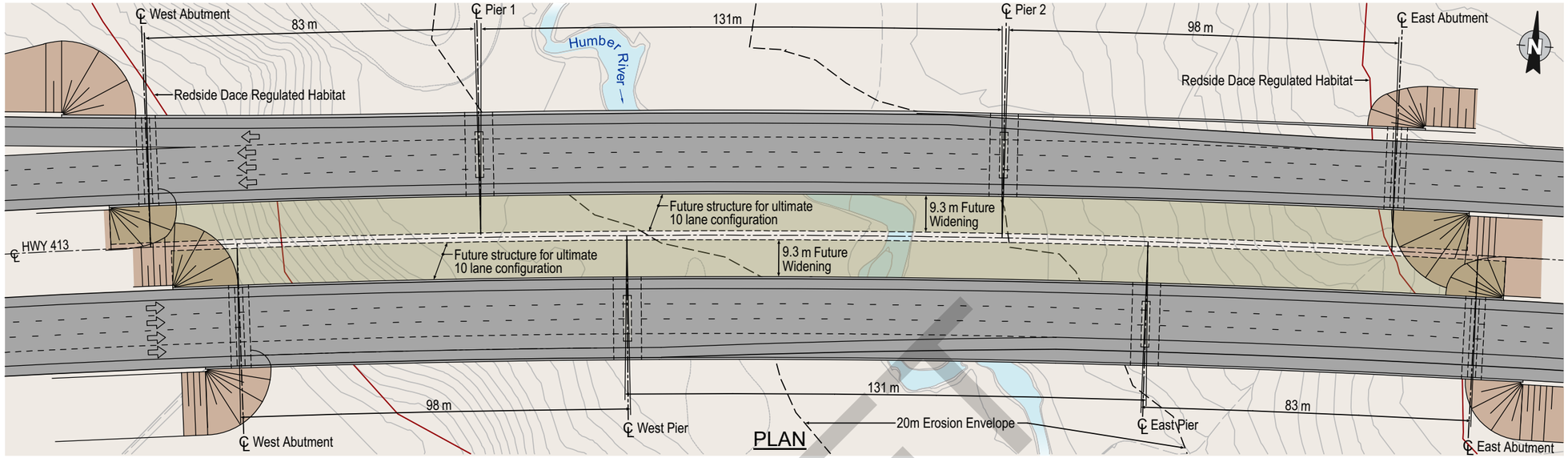
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Table 3-15: Summary of Evaluation Results for West Humber River Bridge Alternatives

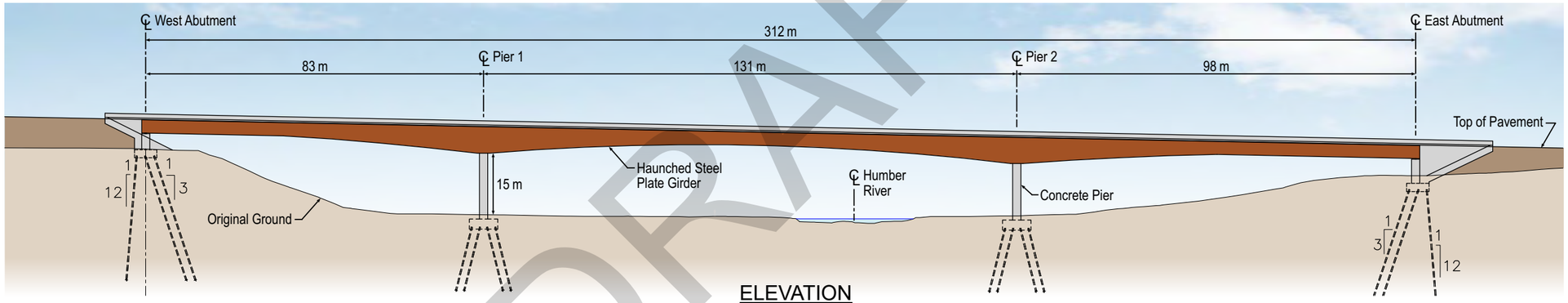
Evaluation Criteria	Alternative 1	Alternative 2	Alternative 3
Structural	22.3	28.4	26.6
Cost	30.0	30.0	30.0
Natural Environment	23.8	18.2	14.8
Total Weighted Score	**76.1**	76.6	71.4

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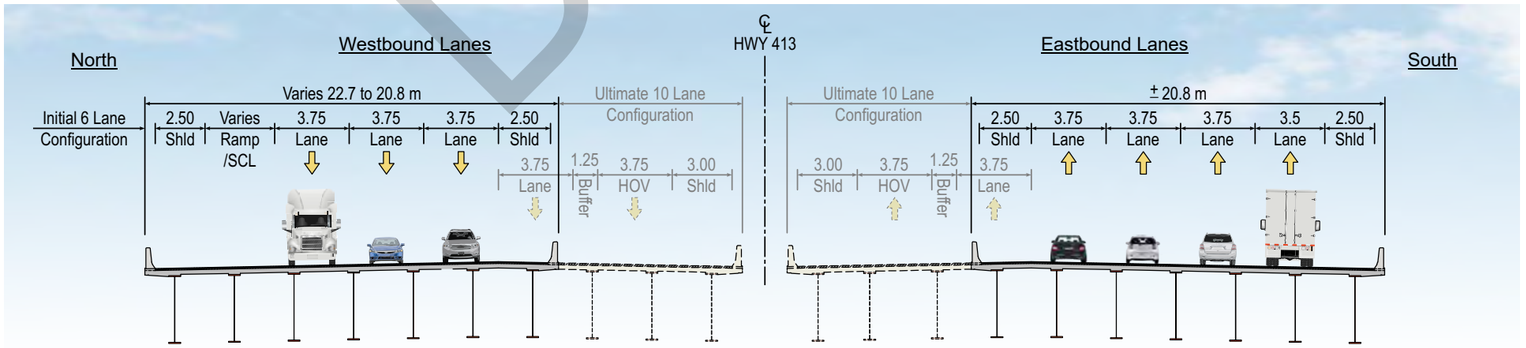
Alternative 1



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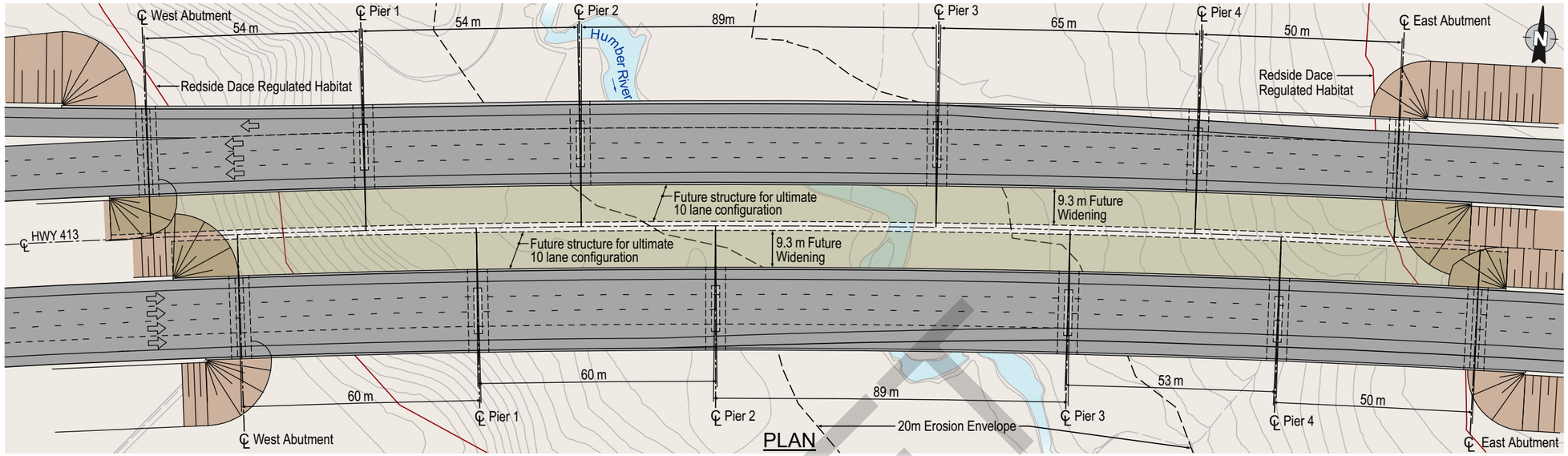
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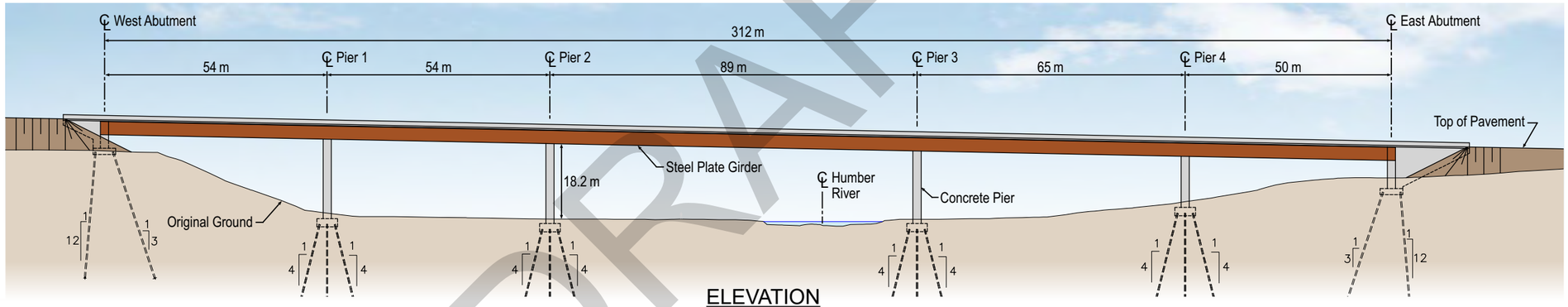
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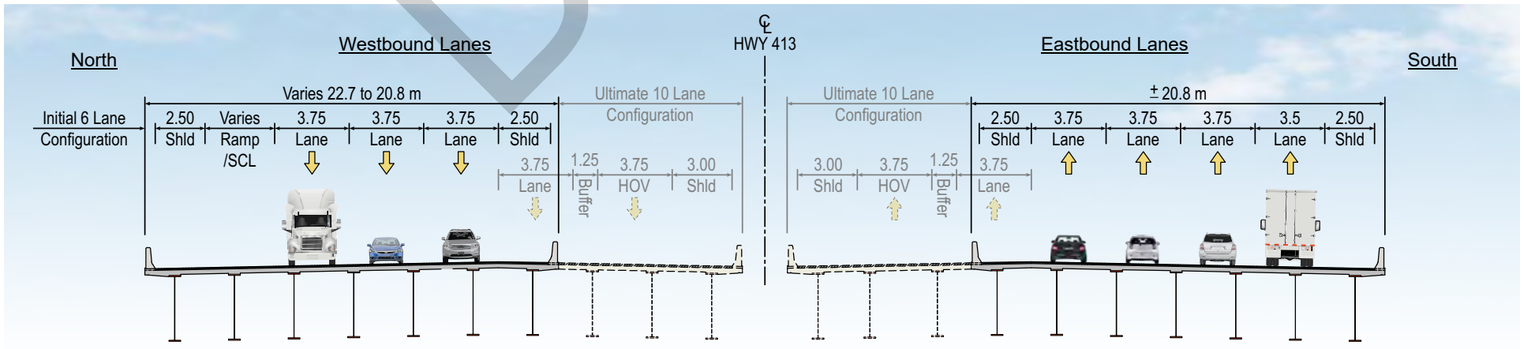
Alternative 2



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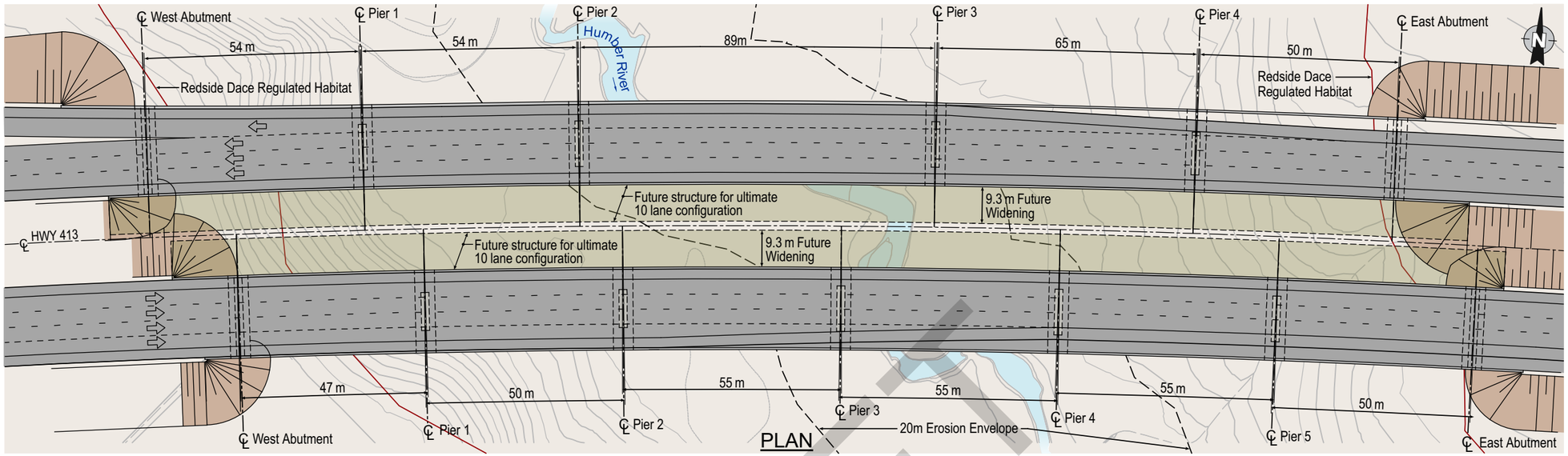
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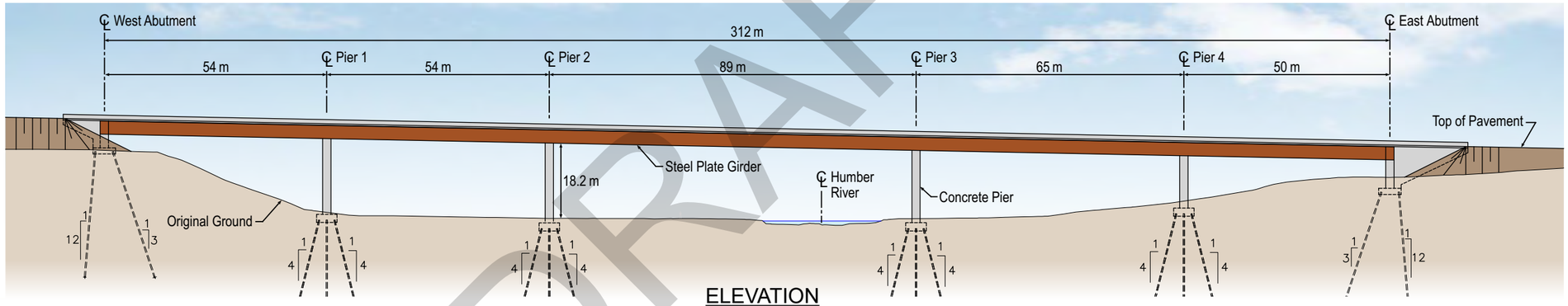


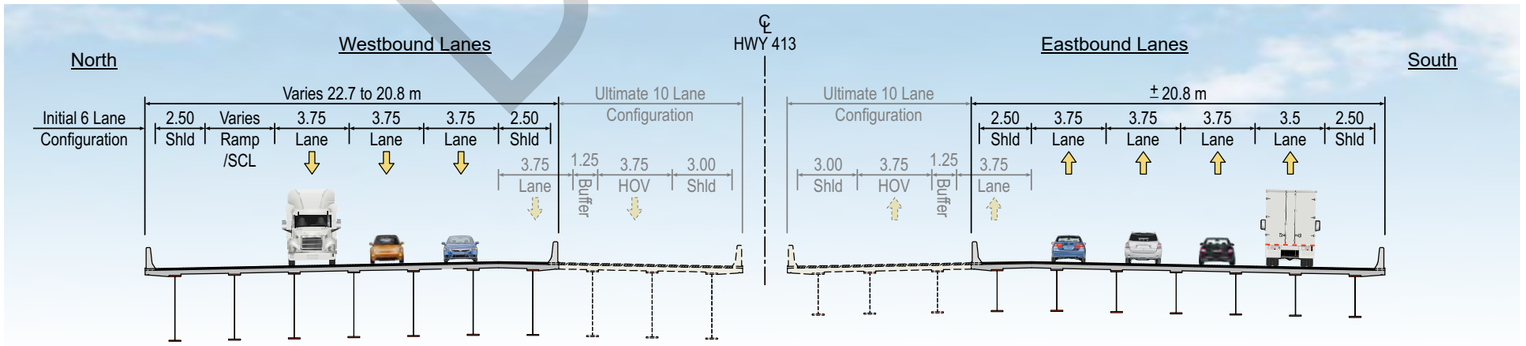
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Alternative 3







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Figure 3-38
Major River Crossing Alternatives - West Humber River

Key evaluation considerations and findings included:

- Alternatives 2 and 3 are preferred over Alternative 1 for better Constructability and ease of Future Widening, with Alternative 2 also preferred over Alternative 3 for Aesthetics. Thus, Alternative 2 is preferred from a structural perspective.
- Alternative 3 had a slightly lower overall cost compared to Alternatives 1 and 2. However, the cost difference between Alternative 1 (highest cost) and Alternative 3 (lowest cost) is approximately 4%, resulting in the same overall score for all alternatives.
- All alternatives scored equally for Resilience to Climate Change, GHG Emissions, and Other Emissions. For Material and Energy Consumption, Alternative 1 ranked the lowest, making Alternatives 2 and 3 equally preferred and Alternative 1 is the least desirable from a sustainability perspective.
- Alternative 1 is preferred for having the fewest piers in the valley, allowing for natural channel migration and effective compensation for pier impacts. It minimizes disruption to wildlife passage and provides more area for vegetation and habitat restoration. Additionally, its piers are outside erosion limits, reducing impacts on riparian areas and conveyance hydraulics. It also scored highest in preserving the meander belt and supporting groundwater-dependent ecosystems. Alternative 1 caused the least shadow effect on Redside Dace habitat and is preferred from a shadow assessment perspective. The shadow assessment concluded that Alternative 2 had slightly more shadow impacts on Redside Dace critical habitat than Alternative 1, but the alternatives are comparable.

Following the quantitative evaluation, the overall technical scores for Alternatives 1 and 2 were within 0.5 points of each other. In recognition of the environmental sensitivity of the area, the environmental weightings of the evaluation were prioritized and **Alternative 1 is the preferred West Humber River crossing.**

3.5.3.4 Main Humber River

Highway 413 crosses the Main Humber River between Huntington Road and Highway 27. The valley is 35 m to 40 m deep, approximately 450 m wide along the valley floor, and approximately 680 m wide between the table lands at the top of the valley, both measured along the highway alignment.

The valley walls show evidence of past global slope failures (landslides) along the west valley wall and in more localized areas on the east valley wall, near the Highway 413 crossing. As a result, construction on the existing west valley wall and lands above the valley is not permitted because of slope stability concerns. A similar restriction applies more locally on the east valley wall, immediately south of the ROW.

Two separate bridges will be required to carry the Highway 413 eastbound and westbound lanes over the valley. The bridges will initially be constructed to carry three through lanes and one auxiliary lane in the eastbound and westbound directions, respectively. However, the ROW was developed to accommodate future widening up to eight lanes (four general purpose lanes per direction), as needed. Due to the design challenges with these large span structures, widening the structure using conventional methods may not be feasible and therefore a median structure has been proposed to carry one HOV lane in each direction. This concept would be subject to further study and additional alternatives may be considered to accommodate the HOV lanes. The river runs tight along the bottom of the steep west valley wall. The bridges are on a straight horizontal alignment across the valley.

Slope stability issues along the valley walls and the presence of SAR within the valley and on the valley walls do not permit infilling of the valley and result in the need for the bridges to exceed 960 m in length.

Given the length of the bridges required to cross the valley and avoid the slope stability issues on the valley walls, five-span designs or less would result in very large span lengths, which significantly limits the type of bridge that can be designed to “signature bridges”, such as cable-stayed or through-arch bridges. These bridges would have extremely high construction cost and were therefore not carried forward.

A long list of eight initial span and bridge configurations was developed for the crossing, featuring alternatives with between six and nine spans. From this long list, three alternatives were selected to be carried forward for further development and detailed evaluation. These short-listed alternatives were selected for the following:

- Alternative 1: Prioritizes minimizing impacts to the valley, though it involves relatively high construction costs.
- Alternative 2: Offers a balanced compromise between valley impact and construction cost.
- Alternative 3: Focuses on minimizing construction costs but results in more significant impacts to the valley.

As part of the refinement process, the span configurations were further developed, resulting in a range from six spans for Alternative 1 to 11 spans for Alternative 3, with Alternative 2 falling between the two.

Three short-listed bridge configurations were considered for the crossing (see **Figure 3-39**).

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Alternative 1 consists of twin, six-span bridges. The four interior spans cross the valley, while the end spans are located on the table lands outside of the valley. The bridge span configuration is controlled by the first interior spans at both ends of the bridge, which span the east and west valley walls, respectively, including areas impacted by slope stability issues. At the east end of the bridge, the second span also crosses the Humber River, which runs tight along the bottom of the valley wall. The resulting spans are 200 m over the east valley wall and 180 m and 200 m for the westbound and eastbound bridges, respectively, over the west valley wall. The middle spans complete the valley crossing and are each 180 m long for the westbound bridge and 160 m long for the eastbound bridge. The exterior spans at the ends of each bridge are required to balance the long spans over the valley walls to avoid uplift of the bridge decks at the abutment locations. The bridge type for this alternative is a cast-in-place segmental concrete box girder. Segmental concrete box girders are a specialized bridge type required by the long spans with this alternative. They are typically less economical and more complex to build than more common bridge types, such as slab-on-steel girder bridges with shorter spans.

Alternative 2 consists of twin nine-span bridges. The span configuration was developed to retain the clear span over the west valley wall while utilizing additional piers in the valley and on the east valley wall to reduce the span lengths over the east half of the bridge. The reduced span lengths permit the use of a slab-on-steel girder bridge type for the east half of the bridge. Segmental box girders are still required for the longer spans at the west end of the bridge. Some of the economic advantages of the steel girders and shorter spans on the east half of the bridge are offset by the cost of the additional piers.

Alternative 3 consists of twin 11-span bridges. This alternative was developed to reduce the bridge spans over the full length of the bridge, permitting the use of slab-on-steel girders for the entire bridge. This requires the construction of piers on the west valley wall, which requires cutting back the full height of the valley wall to a 3:1 slope to eliminate the global slope stability issue at this location.

Table 3-16 provides a high-level summary of the major structural differences between the alternatives.

Table 3-16: Summary of Main Humber River Bridge Alternatives

Bridge Characteristics	Alternative 1 Segmental Concrete Box Girder Bridge	Alternative 2 Segmental Concrete Box Girder (West Spans) and Slab-on-Steel I Girders (East Spans)	Alternative 3 Slab-on-Steel I Girder Bridge
Control Span Lengths (m)	200 m	200 m (West Spans) / 80 m (East Spans)	80 m WBL / 90 m EBL
Total Bridge Lengths (m)	WBL: 960 m / EBL: 940 m	WBL: 885 m WBL / EBL: 895 m	805.0 m
Width (m)	21.55 m	21.55 m	21.55 m
Girder Depth (m)	Varies (10.8 m max / 4.2 m min)	West Spans: Varies (10.8 m max / 4.2 m min) East Spans: 3.0 m	3.3 m
Total Deck Area (Both Eastbound Lane and Westbound Lane Bridges)	40,945 m^2	38,144 m^2	34,695 m^2

Table 3-17 summarizes the results of the evaluation of the Main Humber River bridge alternatives.

Table 3-17: Summary of Evaluation Results for Main Humber River Bridge Alternatives

Evaluation Criteria	Alternative 1	Alternative 2	Alternative 3
Structural	23.2	22.7	24.7
Cost	18.0	24.0	30.0
Natural Environment	21.9	21.1	10.9
Total Weighted Score	63.08	**67.86**	65.60

Key evaluation considerations and findings included:

- From a structural perspective, Alternative 3 is preferred, with Alternatives 1 and 2 closely scored.

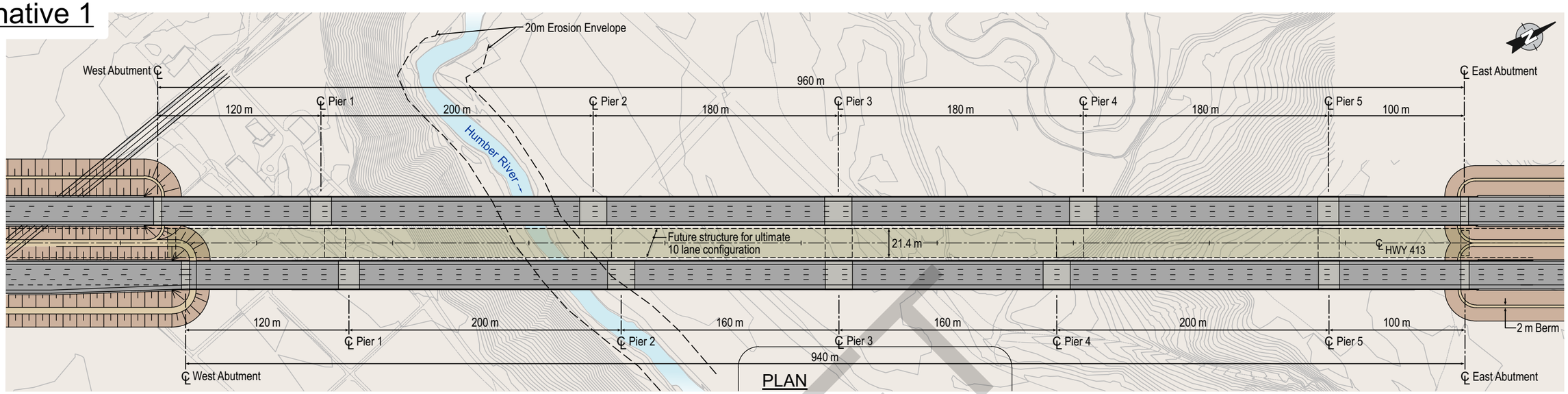
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- All alternatives performed consistently in Resilience to Climate Change and GHG Emissions criteria. Alternative 3 scored highest in Other Emissions criterion, while Alternative 1 scored the highest in Material and Energy Consumption criterion. No clear preference emerged from a climate change and sustainability perspective.
- From a cost perspective, Alternative 3 is preferred due to its lowest Construction Cost, followed by Alternative 2. Compensation/Restoration Costs were estimated to be the same for all alternatives.
- From a natural environment perspective, Alternatives 1 and 2 were more favourable than Alternative 3. Alternative 1 was slightly preferred overall for minimizing floodplain and vegetation impacts, allowing better natural regeneration, and having fewer piers in the floodplain. Alternative 2 was preferred over Alternative 1 for its shorter span. Larger spans mean larger surface drainage areas for the deck, which increases the risk of direct and indirect discharge of contaminated and sediment-laden runoff. Alternative 1 was preferred in the shadow assessment, with the least amount of shadow over Rapids Clubtail habitat.

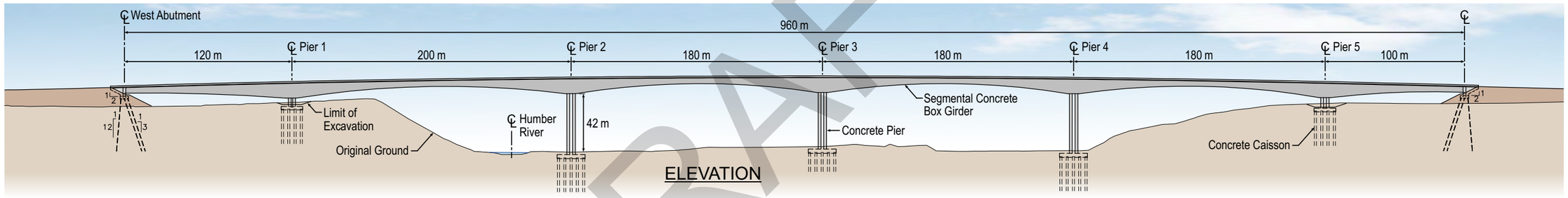
Overall, **Alternative 2 is the preferred Main Humber River crossing**. It achieved mid-range scores in both cost and natural environment factors, trailing only 0.8 points behind Alternative 1, which was the most favourable in the Natural Environment factor area. Although Alternative 2 scored the least favourable for the structural factor area, it scored only two points behind Alternative 3, the most favourable in the structural factor.

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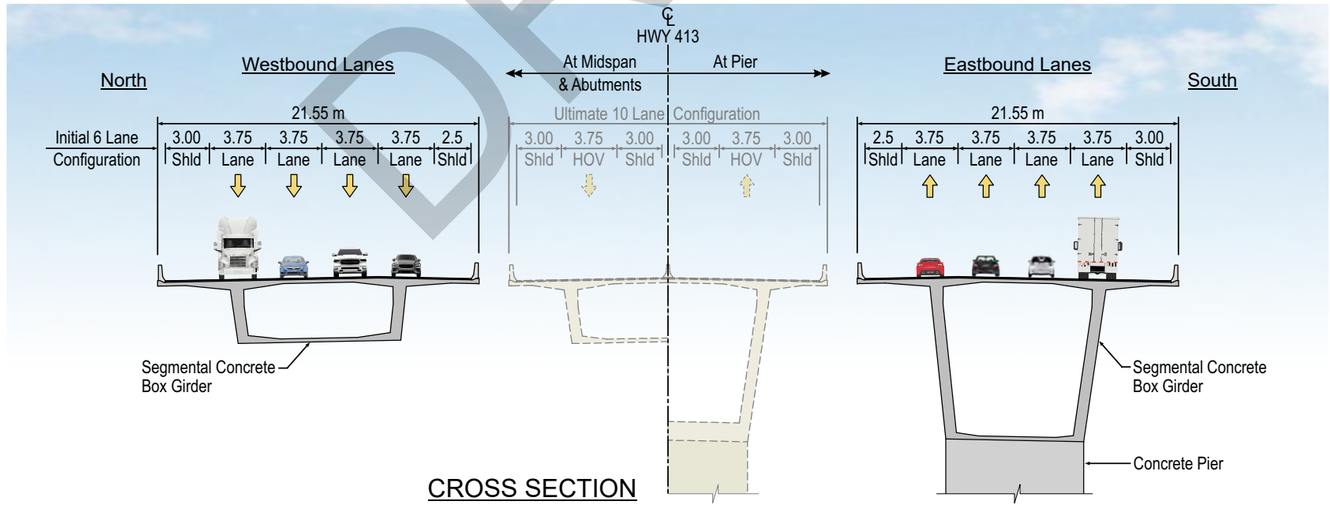
Alternative 1



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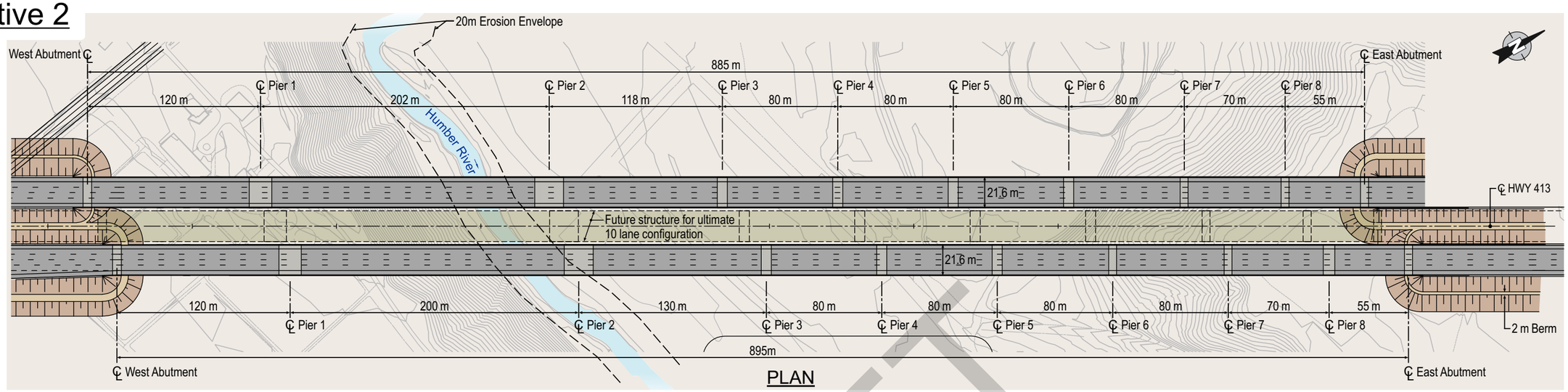
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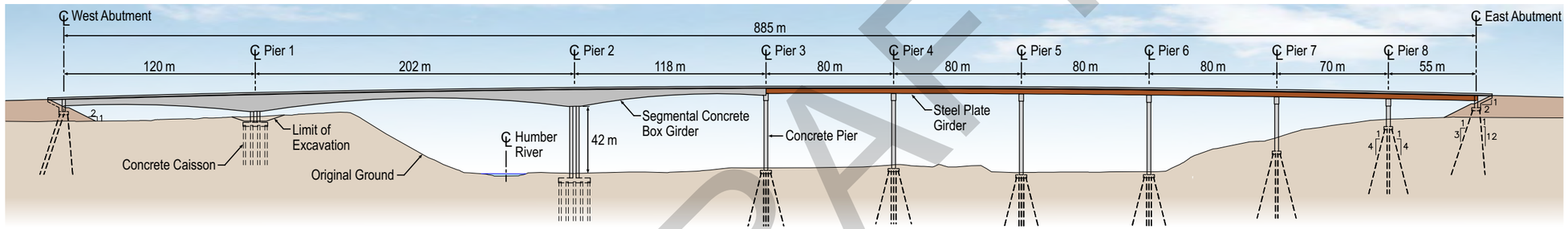
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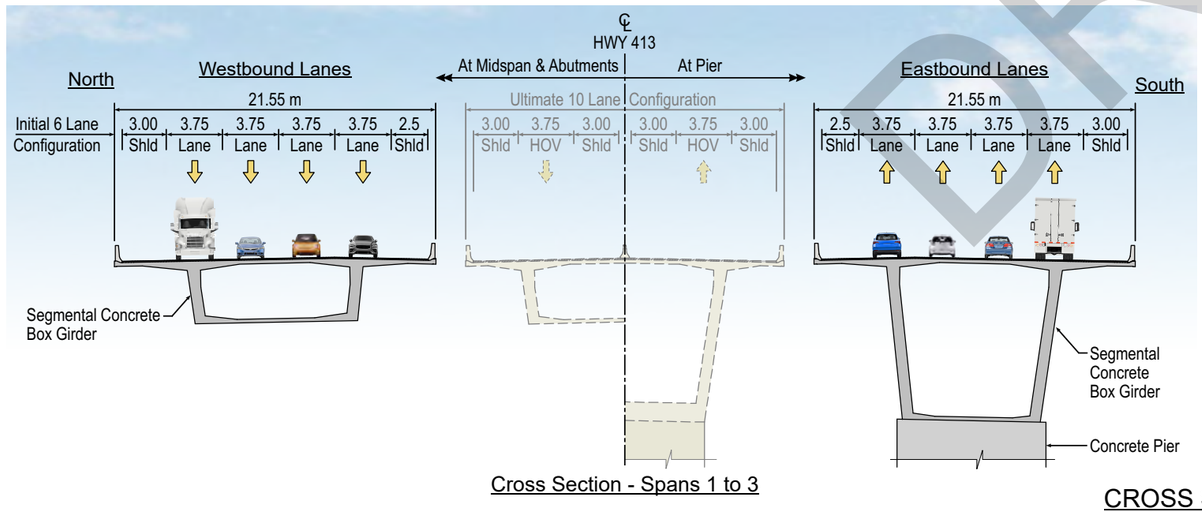
Alternative 2



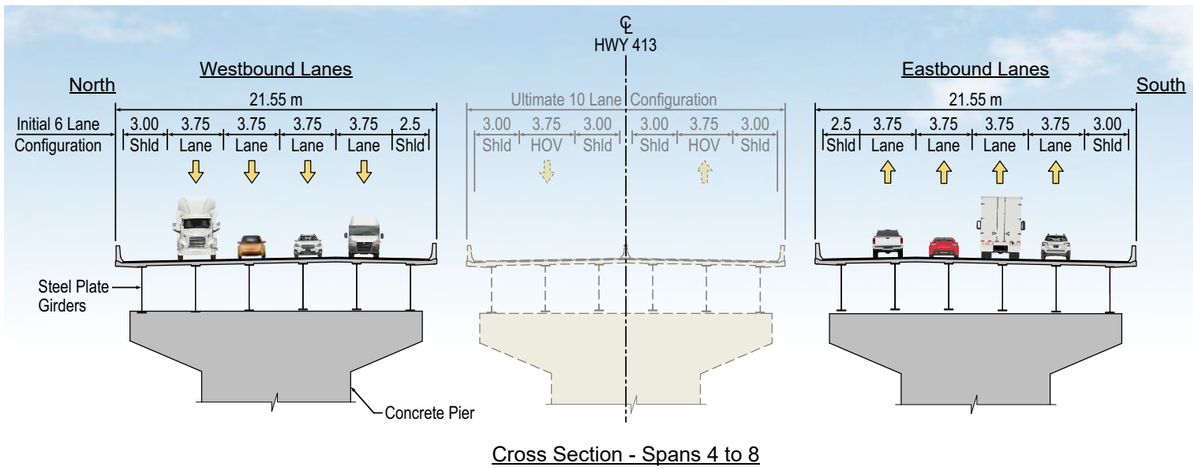
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Cross Section - Spans 1 to 3



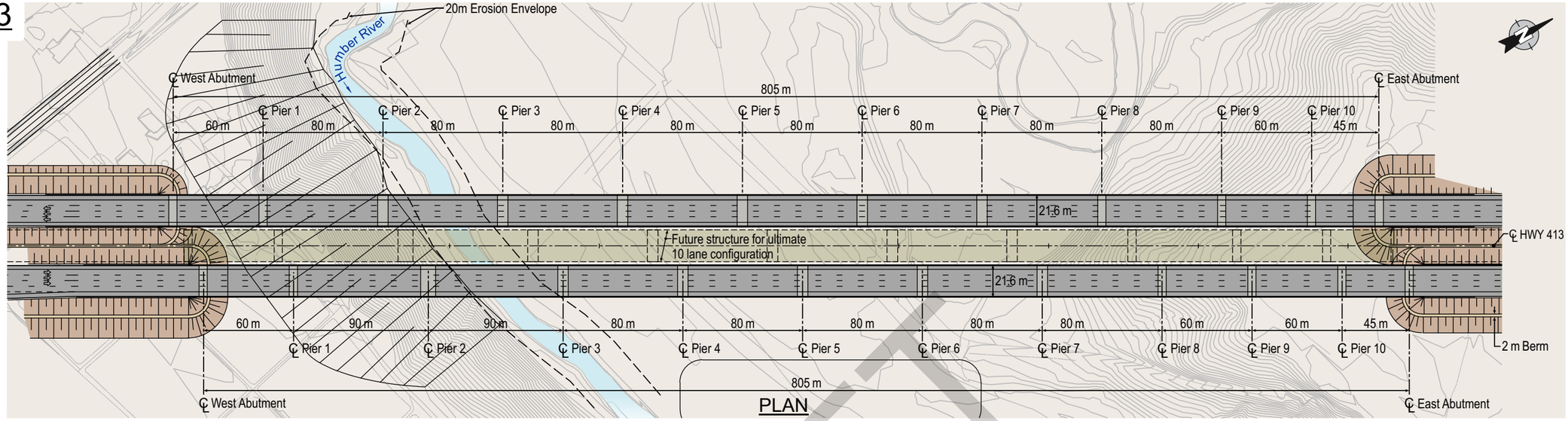
Cross Section - Spans 4 to 8

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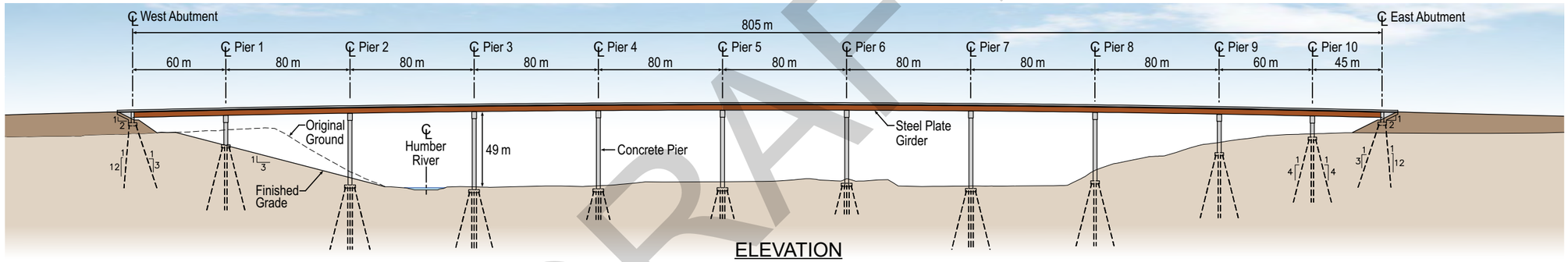
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Figure 3-39
Major River Crossing Alternatives - Main Humber River

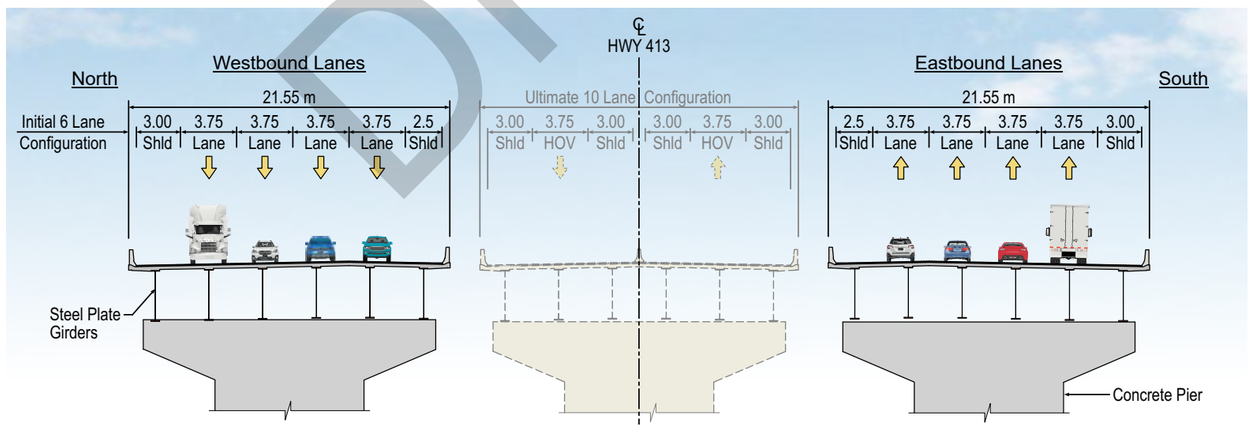
Alternative 3



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ELEVATION



CROSS SECTION

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Figure 3-39
Major River Crossing Alternatives - Main Humber River

3.5.3.5 East Humber River

Highway 413 crosses the East Humber River between Highway 27 and Kipling Avenue. The valley is 20 m to 25 m deep and approximately 100 m wide along the valley floor, measured along the highway alignment. The top of the valley has a long gentle slope on the east side. Slope stability investigations indicate that the steep west valley wall has global slope stability issues similar to those along the Main Humber River valley. Due to slope stability issues on the west valley wall, construction directly on the valley wall is not permitted. However, construction on the adjacent west table lands remains feasible. The overall valley width along the highway alignment from the west table lands to the east table lands is approximately 300 m.

Slope stability issues along the west valley wall, the presence of SAR within the valley and on the valley walls, and a TC Energy pipeline crossing the valley floor do not permit infilling of the valley and result in the need for bridges in excess of 300 m in length.

Two separate bridges will be required to carry the Highway 413 eastbound and westbound lanes over the valley. The ROW was developed to accommodate future widening to up to eight lanes (four general purpose lanes per direction), as needed. Due to the design challenges with these large span structures, widening the structure using conventional methods may not be feasible and therefore a median structure has been proposed to carry one HOV lane in each direction. This concept would be subject to further study and additional alternatives may be considered to accommodate the HOV lanes.

The East Humber River runs tight along the bottom of the west valley wall. The bridges are on a straight horizontal alignment across the valley.

Based on available information, the TC Energy pipeline is at a depth of 55 m to 60 m below the valley floor and crosses Highway 413 approximately in the middle of the valley. The pipeline ROW is 30 m wide, centred on the pipeline. TC Energy has identified an additional 7 m wide buffer along both sides of the pipeline ROW. The bridge alternatives typically ensure that the pier foundations remain outside of the pipeline ROW. The exception is Alternative 2, where the east pier (Pier 2) of the eastbound lane bridge encroaches into the pipeline ROW. This encroachment can be eliminated during Detail Design by slightly increasing the centre span length and/or reducing the foundation's plan area.

Given the 300 m valley width and the presence of the TC Energy pipeline, neither a single-span bridge nor a two-span bridge presents a viable option. A single-span bridge of this length would require a through arch design; however, such structures require very strong soils to carry the large thrust imparted to the bridge foundations. The weak soils present at the East Humber River are insufficient to support these loads. Similarly, a two-span bridge is unsuitable due to the TC Energy pipeline ROW, which precludes the placement of a central pier within the middle band of the valley.

Two bridge configurations were considered for the East Humber River crossing (see **Figure 3-40**).

Alternative 1 consists of twin, three-span, 425 m long bridges. The bridge length was established to ensure the abutments and associated approach embankments are effectively outside of Rapids Clubtail habitat, although there is a nominal encroachment at the west end of the bridge. The west abutments are located outside the limit of the slope stability issues along the west side of the valley. The 190 m long centre span clears the TC Energy pipeline entirely, including the ROW, and only nominally encroaches into the buffer zone. The end spans provide a balanced span arrangement and ensure the west piers are outside of the East Humber River bankfull width. The bridge type for this alternative is a cast-in-place segmental concrete box girder. Segmental concrete box girders are a specialized bridge type required for the long spans of this alternative. They are typically less economical and more complex to build, and have a longer construction duration than more common bridge types, such as slab-on-steel girder bridges.

Alternative 2 consists of twin, three-span, 312 m long bridges. The locations of the west abutments remain unchanged from Alternative 1, i.e., outside of the stability issues along the west side of the valley. The west piers are 10 m closer to the river but remain outside of the river bankfull width. The overall bridge length is reduced by shifting the east abutment 113 m west, reducing the bridge spans to permit the use of a slab-on-steel girder bridge deck. The east pier of the eastbound lane bridge slightly encroaches into the pipeline ROW.

Table 3-18 provides a high-level summary of the major structural differences between the alternatives.

Table 3-18: Summary of East Humber River Bridge Alternatives

Bridge Characteristics	Alternative 1 Segmental Concrete Box Girder Bridger	Alternative 2 Slab-on-Haunched Steel I Girder Bridge
Control Span Lengths (m)	190 m	120.0 m
Total Bridge Lengths (m)	425.0 m	312.0 m
Width (m)	21.55 m	21.55 m
Girder Depth (m)	Varies (10.4 m max / 4.1 m min)	Varies (5 m max / 3.75 m min)

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Bridge Characteristics	Alternative 1 Segmental Concrete Box Girder Bridger	Alternative 2 Slab-on-Haunched Steel I Girder Bridge
Total Deck Area (Both Eastbound Lane and Westbound Lane Bridges)	18,318 m²	13,447 m²

Table 3-19 summarizes the results of the evaluation of the East Humber River bridge alternatives.

Table 3-19: Summary of Evaluation Results for East Humber River Bridge Alternatives

Evaluation Criteria	Alternative 1	Alternative 2
Structural	22.9	25.9
Cost	6.0	30.0
Natural Environment	12.5	14.6
Total Weighted Score	41.40	70.56

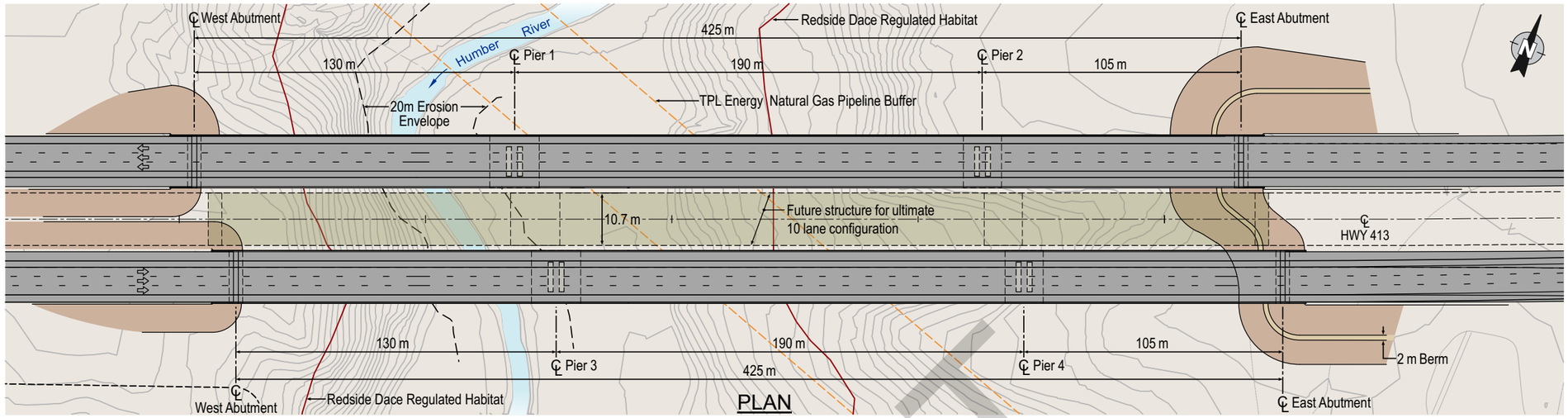
Key evaluation considerations and findings included:

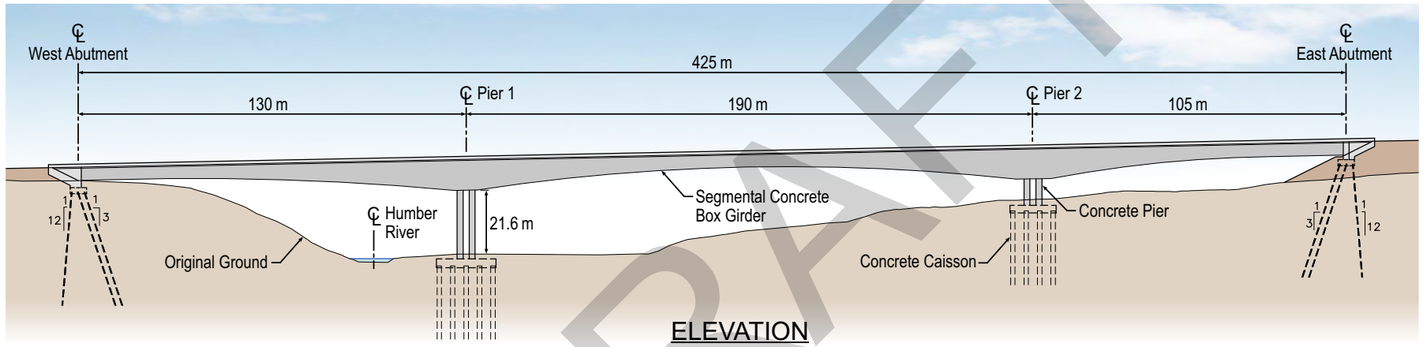
- From a structural perspective, Alternative 2 is preferred, scoring significantly higher than Alternative 1 in the Constructability and Future Widening criteria. Alternative 1 only outperformed Alternative 2 in Aesthetics, with all other criteria scoring similarly.
- From a cost perspective, Alternative 2 is preferred due to its lower overall Construction Cost. Compensation/Restoration Costs were estimated to be the same for both alternatives.
- Both alternatives are equally preferred with regard to climate change and sustainability.
- From a natural environment perspective, Alternative 2 is slightly preferred. It has a smaller grading footprint and more clearance on the northeast bank for wildlife crossings. Additionally, it has a shorter bridge span thereby reducing potential sediment-laden or contaminated runoff into the river valley. The shadow assessment also indicated a smaller long-term shadow footprint for Alternative 2.

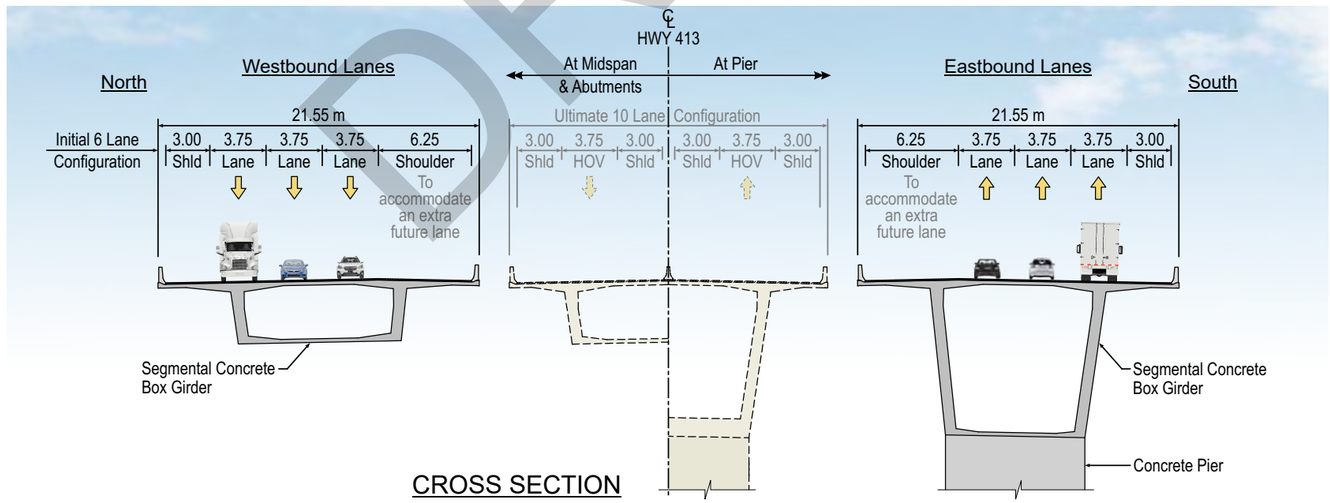
Overall, **Alternative 2 is the preferred East Humber River crossing**, scoring higher across all three factor areas.

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Alternative 1

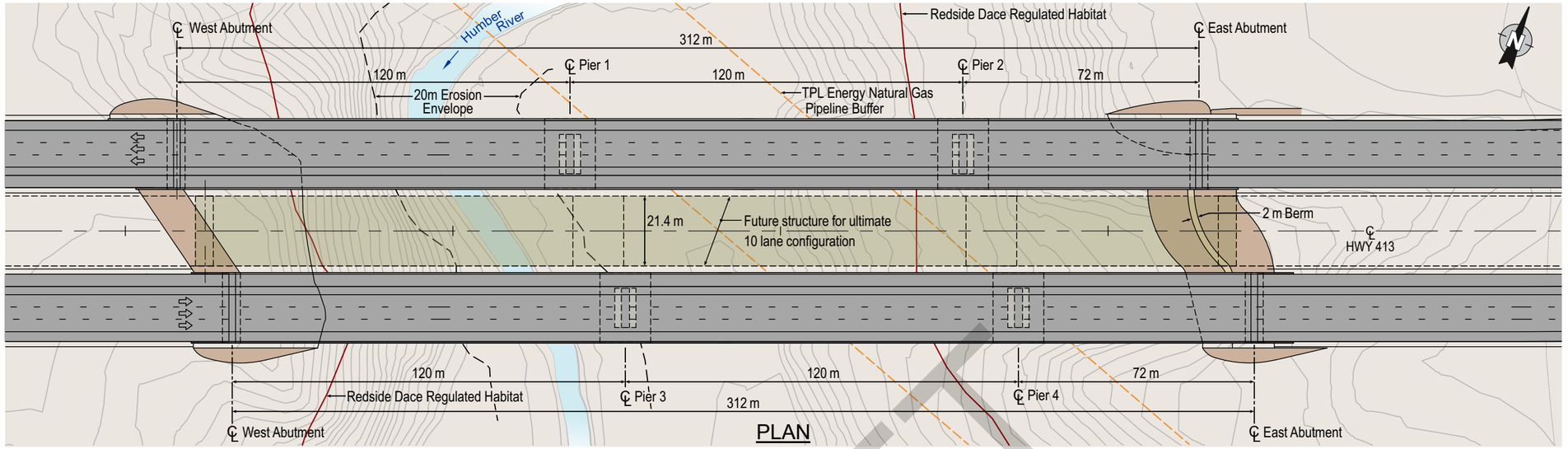




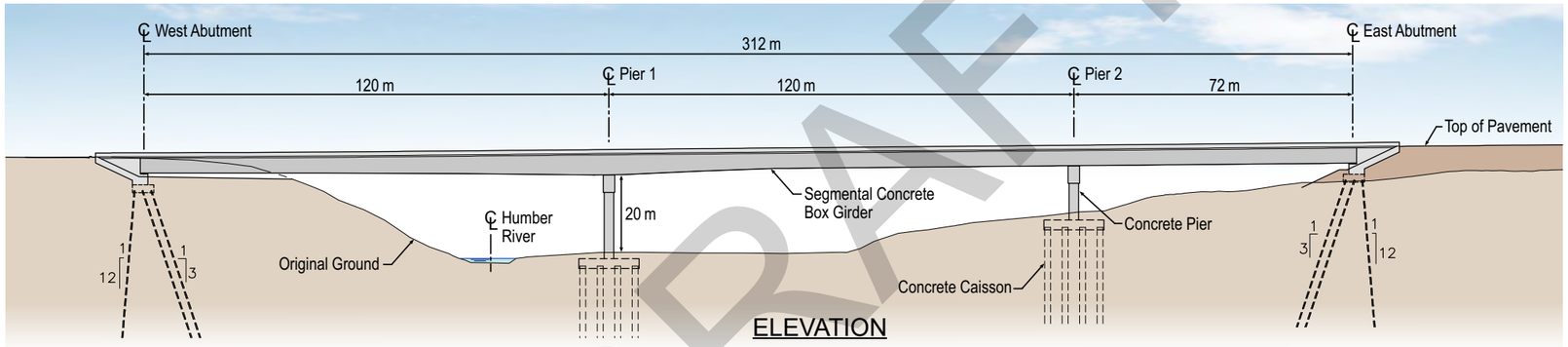


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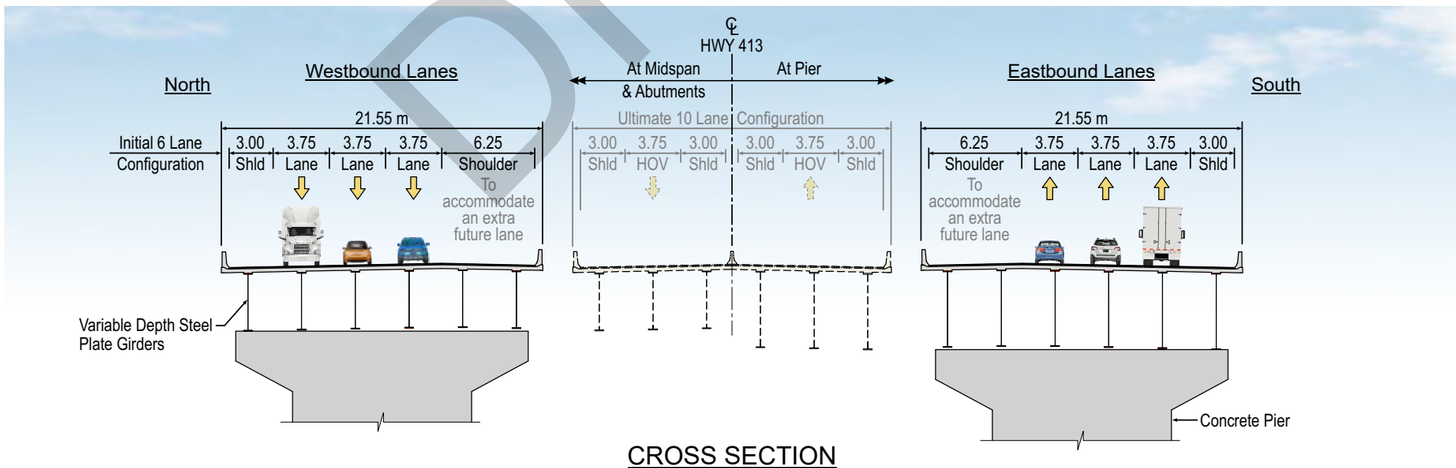
Alternative 2



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ELEVATION



CROSS SECTION

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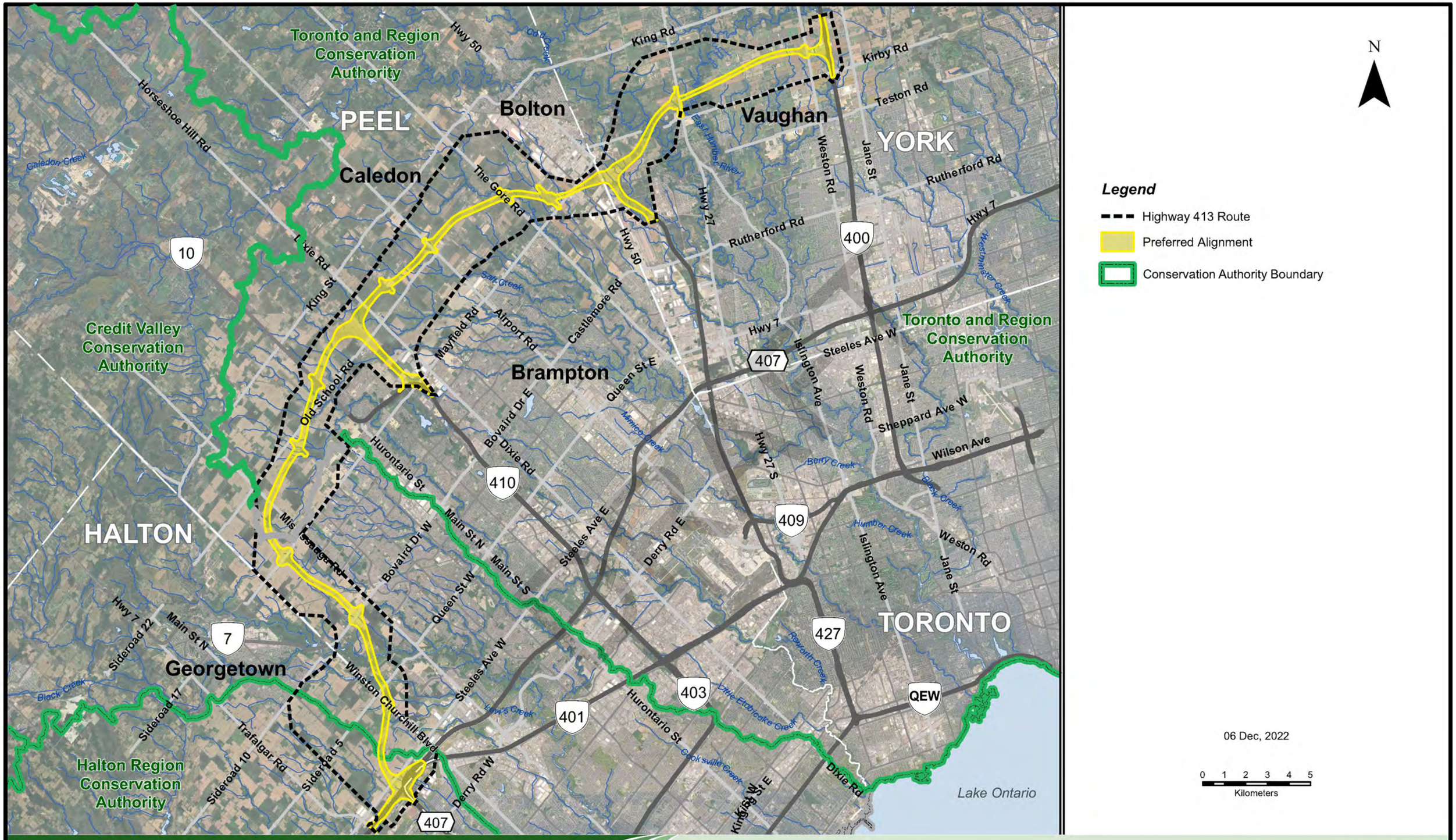
3.5.4 Drainage and Stormwater Management

For the drainage and SWM assessment, the Project was divided into three sections, reflecting the boundaries of the local Conservation Authorities (CAs): TRCA, CVC, and CH, as shown in **Figure 3-41**:

- CH Section - an approximately 1 km long segment of Highway 413, including the interchange with Highway 401 / Highway 407 ETR.
- CVC Section - an approximately 12 km long segment of Highway 413 from west of Tenth Line to north of Mayfield Road.
- TRCA Section – an approximately 37 km long segment of Highway 413 from north of Mayfield Road to Highway 400, including the approximately 4 km long extension of Highway 410, and the approximately 3 km long extension of Highway 427.

The existing conditions relevant to the drainage and SWM assessment, along with the modelling undertaken to develop an understanding of existing and anticipated future hydrologic and hydraulic conditions are described in **Chapter 2**. The Preliminary Design of the drainage and SWM plan is described in **Chapter 4**.

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Highway 413 Environmental Impact Assessment Report

Figure 3-41
Highway 413 in Proximity to Conservation Authority Boundaries

MTO's *Highway Drainage Design Standards* (2008) prescribe standards for designing Surface Drainage Systems, specifications for designing Water Crossings, and SWM.

Existing hydraulic models for the Highway 413 Route were obtained, where possible, from the CAs. These models were updated to represent existing and future (post-construction) conditions. Water levels were referenced from the output. Where hydraulic models were not available, typically for unregulated water crossings, a program was used to assess the culverts and determine the headwater elevations.

Regardless of mitigation measures, adding a new facility through an undeveloped area will have an impact on water levels. Efforts were made to design the bridges in a cost-effective manner to minimize the effects on upstream flood elevations at the ROW, with considerations for environmental impacts on terrestrial and aquatic habitats, and the fluvial geomorphology of the watercourse.

The overall objective of the drainage and SWM plan is to minimize water quantity and quality impacts to existing drainage systems and the natural environment.

The Project will consist of a rural cross section that conveys flows entirely through a series of roadside ditches and culverts. The highway runoff will be collected and conveyed through median and side ditches, SWM ponds, and ultimately discharging to adjacent watercourses. The transitway will also have a rural cross section and drain through a series of ditches and culverts. In future expansions or ultimate conditions, the highway will be widened into the median. The open median ditch will be replaced with a storm sewer to collect and convey storm runoff to SWM ponds or ditches and ultimately to the nearby creeks. As such, the SWM plan does not envision placing any quality or quantity control in the median area. The quantity and quality control measures fully account for any future expansion to the ultimate development condition, if warranted.

The pavement surface in the Preliminary Design ROW will increase the amount of impervious area compared to existing conditions. Quantity and quality control will be achieved with enhanced grassed swales and storage ponds located within the ROW.

Storage SWM facilities such as wet ponds, dry ponds, and linear SWM facilities can be effective in providing combined quality treatment and/or quantity control where drainage areas are sufficient and space is available. Within the Highway 413 Alignment, runoff from the highway will ultimately discharge to the existing watercourses via ditches or storm sewers. The increased impervious area presents a larger potential for erosion, flood risk, and water quality degradation along the receiving watercourses. Therefore, road runoff needs to be treated before discharging into the receiving watercourses.

There are 56 new ponds and three pond relocations/modifications for the Project located along Highway 413 and the Highway 410 and Highway 427 Extensions. Of these, 28 have contributing drainage areas of approximately 10 ha or greater and will be designed as Wet Ponds, while the remaining 31 will be Dry Ponds. Wet Ponds will provide required quality, quantity, and erosion control, while Dry Ponds will focus on quantity and erosion control. The wet ponds are designed for the ultimate design scenario and will include:

- A permanent pool of water with bottom draw outlets;
- Extended detention volume, where water will be stored and gradually released through a controlled outlet;
- Flood storage volume to store water during larger storm events to attenuate peak flow rates to the target unit flow release rates; and
- Landscaped areas around the pond to promote evapotranspiration.

Pond locations and sizes are determined based on hydraulic modelling and the SWM requirements for quality treatment, quantity control, and erosion control. These design requirements have been developed based on best management practices for SWM and through design criteria from the three CAs. Locations were selected to ensure positive drainage could be maintained for the highway, and with considerations for outlets to nearby creek systems and sufficient space for the pond was available given the sizes identified.

Through the development of the Preliminary Design, pond sizes and locations were reviewed and revised to address the following constraints and impacts:

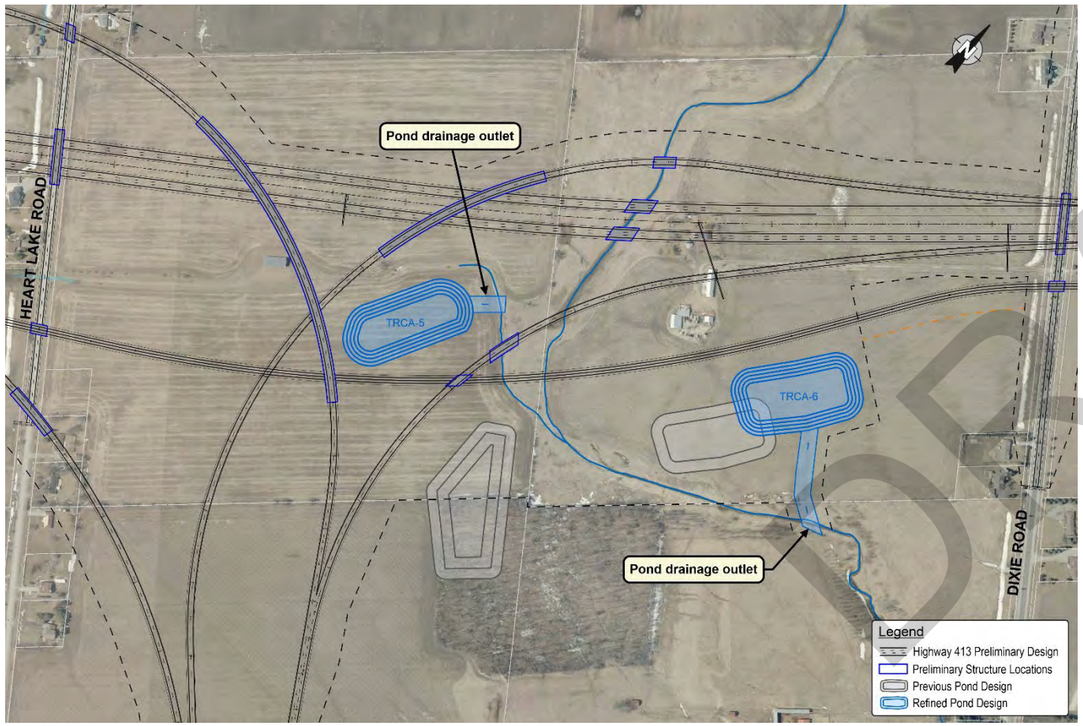
- Sizing adjustments based on updated design guidelines from CAs affecting pond sizing requirements. Where feasible, pond sizes were reduced in size or relocated to within interchange ramps to minimize the overall footprint of the Highway.
- Relocated outside of sensitive environmental features and woodlots.
- SWM ponds adjacent to the East and Main Humber Rivers were relocated where feasible to avoid or mitigate direct impacts to the environmental features near the river valleys.
- Locations and footprints for SWM ponds were optimized with considerations for municipal land uses at key locations along the corridor.
- SWM ponds were relocated to avoid major pipelines and transmission corridors, as required by the utility companies.

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Some specific examples of notable SWM ponds that were reviewed and had sizing and location refined based on the above noted considerations are summarized below and in the following figures:

- The two ponds located southeast of the Highway 413 and Highway 410 interchange were adjusted to avoid impacts to the adjacent woodlot and floodplain. One pond was shifted to within the interchange footprint, and the other shifted to the east, as shown in **Figure 3-42**.

Figure 3-42: Highway 413 Stormwater Management Pond Refinements – Highway 410 Interchange

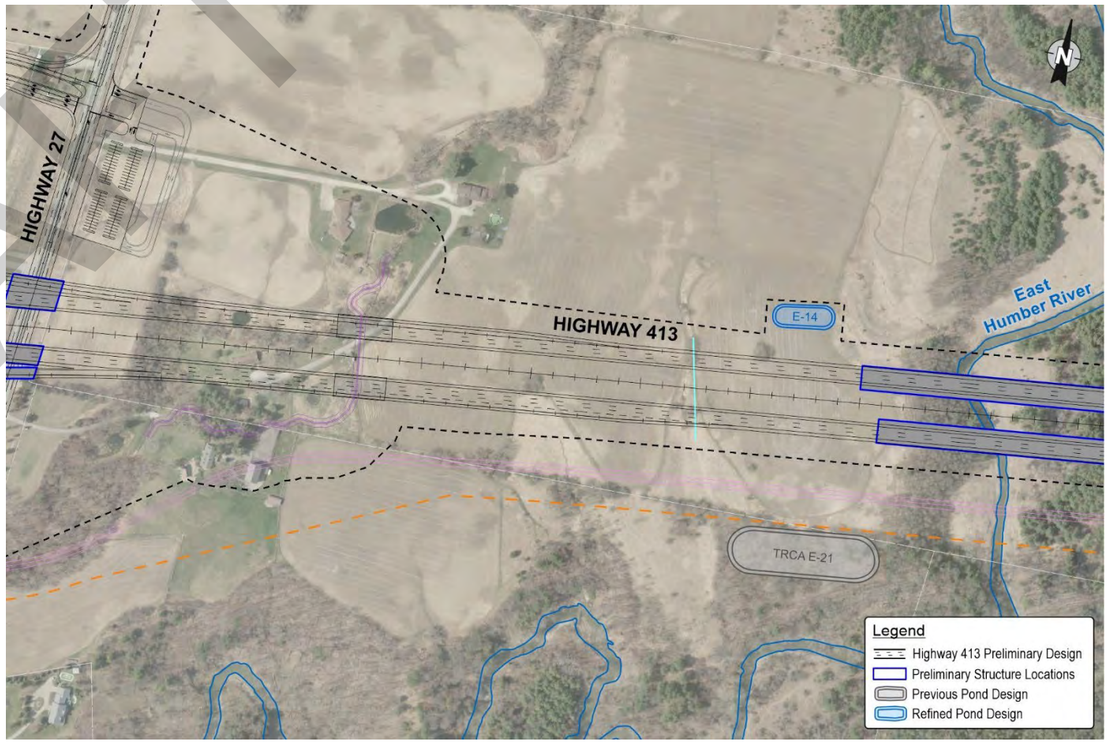


- The pond located east of the Highway 410 extension was shifted further north to a parcel located between the Highway and an existing woodlot. This change was to address municipal land use needs and to ensure adjacent lands would not be inaccessible due to the SWM pond footprint.

- The pond east of the Main Humber River crossing was resized in accordance with TRCA guidance, and location adjusted to mitigate impacts to two ecologically sensitive areas near the river valley. Provisions to consider meadow marsh attributes during detail design were documented as well to further mitigate environmental impacts.

- The pond located west of the East Humber River crossing was relocated to the north side of the highway to avoid impacts to the environmentally sensitive areas adjacent to the river south of the Highway, as shown in **Figure 3-43**.

Figure 3-43: Highway 413 Stormwater Management Pond Refinements East Humber River



- The pond located south of the Highway 413 Bovaird Drive interchange was relocated and modified to fit within the Heritage Heights Secondary Plan area which was already in construction. The pond size was adjusted and drainage to/from the pond coordinated with City of Brampton and TC Energy Pipelines.

Pond locations will be further reviewed with sizing and locations confirmed in the Detail Design phase. Additional considerations for environmental mitigations are to be considered as well, including meadow marsh attributes and habitat enhancements for SAR in the corridor.

3.5.5 Value Engineering

Value engineering (VE) is a systematic, organized approach to providing necessary functions in a project at the lowest cost. VE promotes the substitution of materials and methods with less expensive alternatives, without sacrificing functionality.

A five-day VE Study was undertaken as part of the Preliminary Design process in accordance with the SAVE International and Value Analysis Canada (formerly the Canadian Society of Value Analysis) VE Job Plan, and per guidance in the *MTO VE Guidelines for Service Providers (2019)* and the *MTO Design Supplement for the TAC Geometric Design Guide (2023).* The VE Study analyzed highway alignment, grading, structural, operational, and environmental design features for the Project using engineering drawings and quantity estimates, cost models, the preliminary implementation schedule and risk assessments.

Alternatives that achieved design or cost improvements were identified for more detailed assessment. In total, 133 creative ideas for project improvements were identified, and 60 ideas were considered to have potential for cost savings and/or value improvement. These ideas were developed further and resulted in 21 VE Proposals, 33 Design Comments, and 6 Project Delivery Alternatives for consideration by MTO.

The recommended modifications were presented to MTO, and were further reviewed and assessed for feasibility, cost-effectiveness, and additional undesirable environmental or technical impacts. Some of the VE proposals that were reviewed included the following:

- Use of steeper sideslopes to reduce overall grading footprint of the highway at key locations through the corridor;
- Opportunities to incorporate a partial interchange configuration and ramp access to Highway 413 and 427 at Highway 50;
- Advanced construction of future bridge piers at the major river crossings in advance of future median widening to reduce future construction costs; and
- Deep foundation load testing to optimize foundations design at bridges.

Implementation of the VE recommendations are not precluded, but would not effect changes to the Preliminary Design, and will be carried forward for further review in Detail Design.

3.5.6 Constructability Review

The purpose of the Constructability Review is to independently review the Preliminary Design and identify opportunities to improve construction staging, construction access, responsibilities of parties during Detail Design and construction phases, drainage, structures, pavement, and design from the perspective of constructability, to be carried forward for further assessment in Detail Design. The following topics were reviewed:

- Interchanges (particularly the complex Highway 413 interchanges with Highway 401 / Highway 407 ETR, the Highway 410 and Highway 427 Extensions and Highway 400);
- Major river crossings at Credit River and Humber River;
- Future expansion of Highway 413;
- Environmental construction impacts associated with working in the Greenbelt, archaeology, SAR, watercourse realignments, agricultural tile drainage, etc.;
- Stakeholder Reviews, Permits and Approvals – 407ETR, environmental agencies, rail authorities, utilities, municipalities and regions, etc.;
- Municipal coordination of adjacent projects and opportunities for Advanced Works;
- Construction schedule and phasing; and
- Risk and cost estimate refinement opportunities.

Results and recommendations from the Constructability Review were documented to be carried forward to Detail Design, and to inform phasing, design coordination, and procurement for future construction work.

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3.5.7 Commuter Parking Lots

Commuter parking lots along Ontario's provincial highways are a strategic component of the province's transportation and land use planning framework. These lots, often referred to as carpool or park-and-ride lots, are designed to support more efficient and sustainable travel by encouraging carpooling and transit use, particularly for long-distance commuters. Although independent of the proposed transitway, the commuter parking lots could be utilized as an initial phase of the development of future transit stations.

A review of carpool lot data for other MTO highways was conducted to confirm MTO needs, develop design criteria, and identify commuter parking lot locations along Highway 413. It was identified that the 11 future transitway stations identified at interchanges along the proposed Highway 413 transitway, along with the station planned at Major Mackenzie Drive and Highway 427, could be utilized for carpool lots in the initial stage of construction of Highway 413, with expansion for the full station footprint to be confirmed as part of a separate future assessment of environmental impacts.

At the Highway 27 interchange, given the environmental considerations and access constraints associated with the proposed transit station footprint, the commuter parking lot was recommended in the northeast quadrant in consideration of the non-typical interchange configuration. This location presented reduced environmental impacts for the initial stages of the highway corridor, and only small increases to property impacts and improved accessibility to Highway 413 at the Highway 27 interchange ramps. A review of the commuter parking needs and the proposed location at Highway 27 will be explored as part of the future transitway study and station planning.

The following design criteria and considerations were identified for the initial carpool lot layouts:

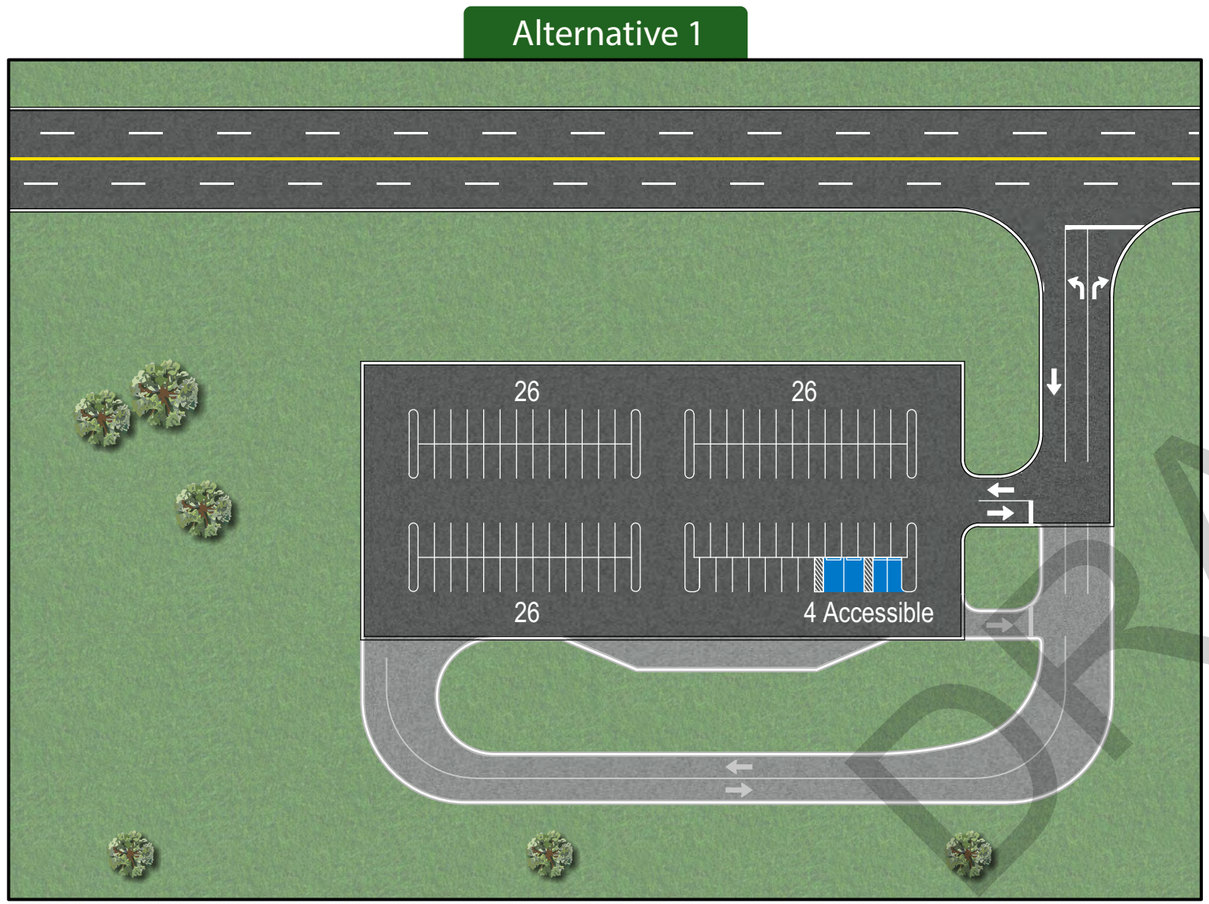
- The carpool lot is initially designed to accommodate 100 parking spaces;
- The lot is configured to fit within future transitway station footprint (1-2 ha), with the access from the crossing road located a desirable separation distance from the ramp terminal intersections;
- While no transit interface is required for initial stage, future carpool lot expansion accommodating transit circulation and bus bay platforms has been considered; and
- To meet AODA requirements, four percent (4%) of parking needs consist of accessible spaces.

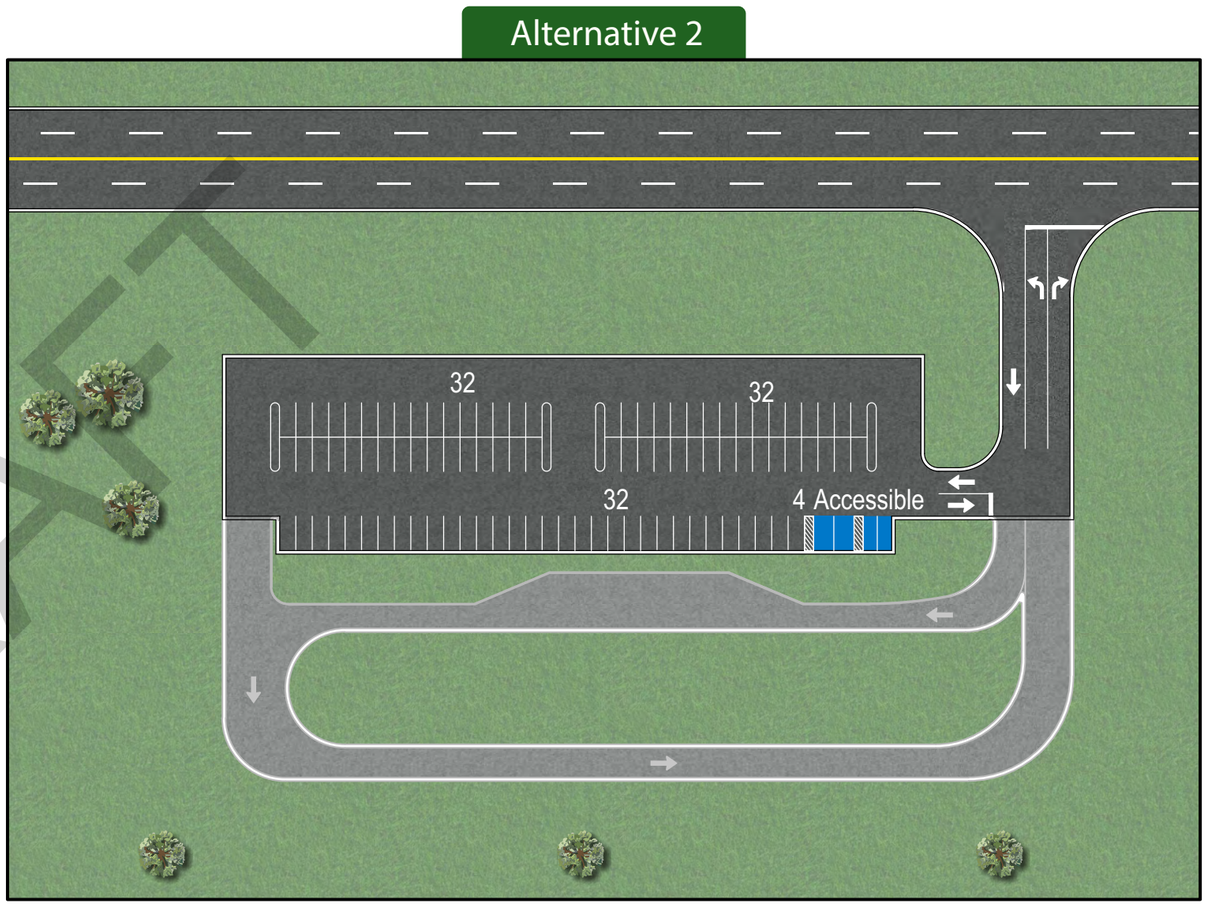
Two alternatives were developed and assessed for typical carpool lot layouts that could be incorporated at each of the 11 station locations along the corridor, as presented in **Figure 3-34**. Alternative 2 is preferred based on the following rationale:

- Alternative 2 allows for a longer segment of 38 spaces which can easily be converted to more accessible parking or electric vehicle charging stations, and provides direct access to a future bus platform.
- Alternative 2 has more desirable vehicle circulation as it separates transit from other road users and circulation is in a single direction.

The carpool lot configuration shown in Alternative 2 was carried forward to Preliminary Design at each proposed transit station along Highway 413, with potential for future expansion to include bus transit interface. In Detail Design, considerations for enhancements to user safety will be considered which could include, but is not limited to, lighting, transit hub details, cameras, etc. Carpool lot locations and configurations are included in the Preliminary Design Plans in **Appendix C**.

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Alternative 1
26
26
26
4 Accessible


Alternative 2
32
32
32
4 Accessible

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3.5.8 Maintenance Yards

Based on discussions and feedback from the MTO Maintenance Office, up to three maintenance yards are required for the length of the Highway 413 corridor and in consideration of other 400-series highways adjacent to the Project.

Potential yard locations were selected to provide coverage throughout Highway 413. The area required for the maintenance yards considered the following criteria:

- Vehicle storage, maintenance and cleaning bays;
- Outdoor vehicle parking for winter maintenance vehicles with block heater access;
- Salt and sand storage capacity;
- Office requirements for MTO and area maintenance contractors (office space, cubicles, boardroom, washrooms); and
- Number of staff parking spaces.

Based on MTO Maintenance considerations, design guidelines and drawings for similar facilities, and an assessment of future expansion needs, a minimum site size of 10 ha is required for each maintenance yard with a desirable area for up to 15 ha to be protected where suitable property is available.

Based on the technical constraints and in consideration for spacing throughout the corridor, four locations were considered as potential maintenance yard sites:

- Yard 1 at the Winston Churchill Boulevard interchange;
- Yard 2 at the Mayfield Road interchange;
- Yard 3 at the Bramalea Road interchange; and
- Yard 4 at the Weston Road interchange.

A short list of feasible maintenance yard configurations was developed for each location for review and evaluation. An analysis of these alternatives was conducted based on the engineering and environmental criteria shown in **Table 3-20**. Based on this criteria and evaluation, a recommendation for three maintenance yard locations and configurations was identified. Other environmental features and constraints would inform modifications and refinements to the yard location, size, layout, and access points.

Table 3-20: Evaluation Criteria for Maintenance Yard Site Alternatives

Factor	Description
Land Use	Impact on policy areas (Greenbelt – Protected Countryside), direct and indirect property impacts or effects on planned land use designations.
Natural Environment	Impact to fisheries and aquatic/terrestrial habitats, ground and surface water effects, and fluvial geomorphology.
Cultural Heritage and Archaeology	Impact on known archaeological or built heritage resources and cultural heritage landscapes.
Access	Considerations for how easily maintenance staff and vehicles can access Highway 413, impact on traffic operations, and response times for repairs or emergencies.
Constructability	Environmental, utility, or other constraints that could impact construction permits or timelines.

The analysis identified the feasible maintenance yard locations along the corridor, limitations associated with each site and alternative, and MTO Maintenance needs for number and spacing along Highway 413.

Yards 1 and 4 were considered due to their proximity to and connections with other highways including Highway 401/407 ETR and Highway 400; Yards 2 and 3 were considered as midway locations facilitating operations along to Highway 413.

3.5.8.1 Winston Churchill Boulevard

Based on MTO Maintenance requirements, considering the property parcels adjacent to the interchange and access to the municipal road network, the following maintenance yard alternatives were developed at the Winston Churchill Boulevard interchange, and are presented in **Figure 3-45**:

- Alternative 1 – 7.7 ha yard located east of Winston Churchill Boulevard and south of Embleton Road in the northwest quadrant of the interchange. While smaller than the preferred footprint size of 10 ha for a maintenance facility, this location maximizes available land in this quadrant of the interchange, however, impacts potential future development planned for this site. No significant environmental features are located on this site. No direct or indirect adverse impacts to any known or potential built heritage resources or cultural heritage landscapes are

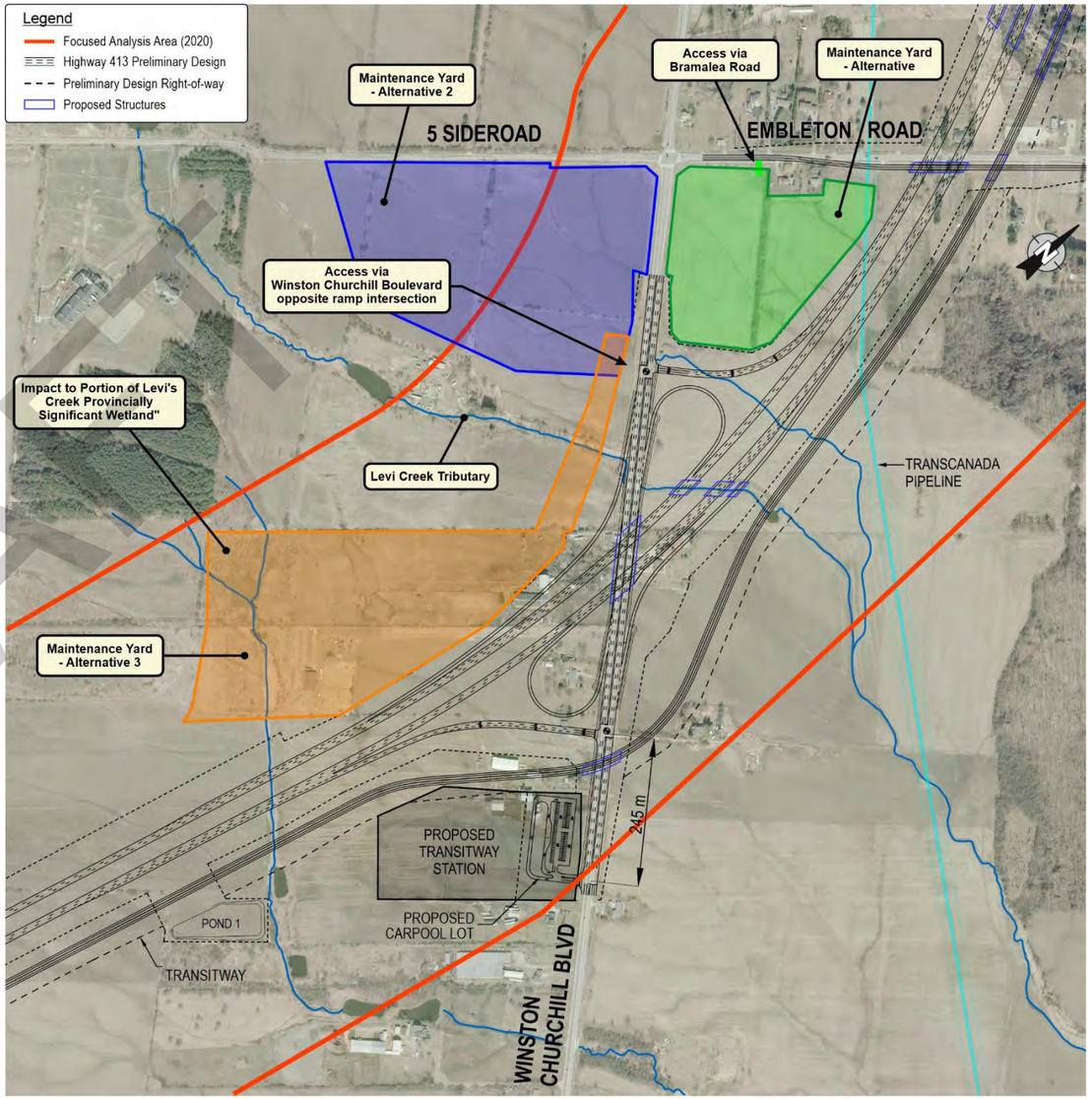
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anticipated. Allows access to/from site via Embleton Road, however, proximity of entrance to ramp terminal intersection and Winston Churchill Boulevard may be a concern.

- Alternative 2 – 15 ha yard located west of Winston Churchill Boulevard, south of 5 Side Road in the southwest quadrant of the interchange. This alternative extends outside of the FAA on agricultural land outside of the urban boundary. Impacts to the tributary of Levi Creek supporting direct fish habitat are avoided through refinements to the layout to avoid the sensitive areas on the south end of the property. There are no direct or indirect adverse impacts to any known or potential built heritage resources or cultural heritage landscapes anticipated. This alternative allows access to/from the site via Winston Churchill Boulevard (across the ramp terminal) and 5 Side Road, with several entrance options available; however, the proximity of entrances to the intersections may be a concern.
- Alternative 3 – 15 ha yard also located west of Winston Churchill Boulevard, and south of 5 Side Road, also in the southwest quadrant of the interchange. This alternative is set back from Winston Churchill Boulevard closer to Highway 413 and would include a short connection road to Winston Churchill Boulevard north/west of the interchange. It is located on agricultural land outside of the urban boundary. It crosses the Levi Creek tributary east of the interchange avoided by Alternative 2, as well as additional seasonally indirect features associated with Levi Creek. A number of drainage features come together at the corner of the parcel and so significant changes in the surface water drainage patterns could be a concern for the downstream fishery. Impacts habitat and candidate habitat of federally protected SAR, and a marginal portion of the Levi's Creek PSW complex. Direct adverse impacts on a CHL with a CHVI and provides access to the site across from the ramp terminal on the north side of the interchange. Allows access to/from site via Winston Churchill Boulevard (across ramp terminal).

Alternative 2 was identified as the preferred yard layout at this location, as it meets the desirable area required for a maintenance facility, has fewer environmental impacts than Alternative 3, and provides the opportunity for direct access to Highway 413 at the interchange north ramp terminal or through 5 Side Road. This Alternative was carried forward for further review in conjunction with other yard locations and in consideration of maintenance needs through the corridor and adjacent highway network.

Figure 3-45: Winston Churchill Boulevard Maintenance Yard



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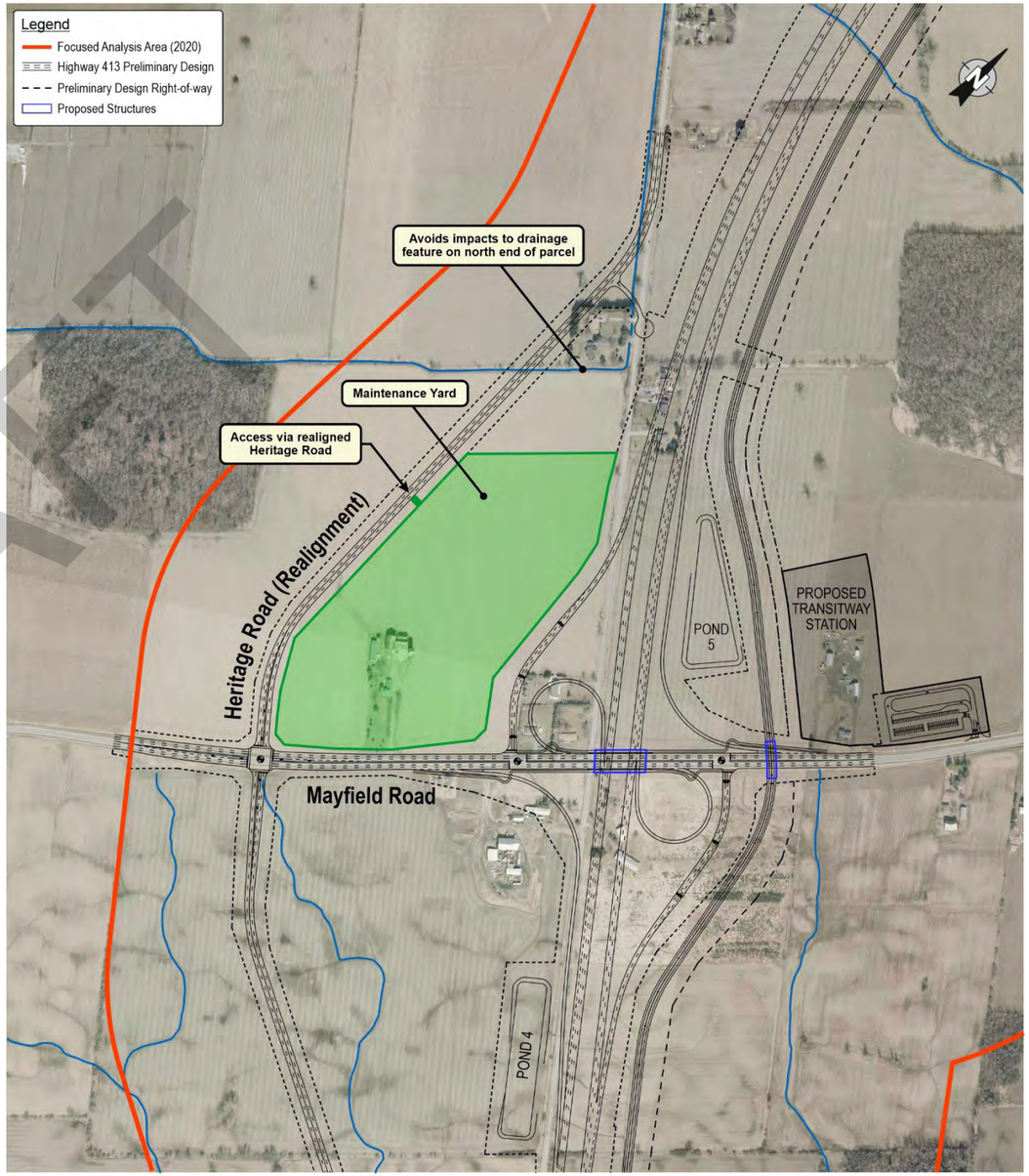
3.5.8.2 Mayfield Road

As an alternative to a maintenance yard at both Winston Churchill Boulevard and Bramalea Road, the Mayfield Road interchange was reviewed for a potential facility to service the western section of the Project. This site is located the northwest quadrant of the interchange, adjacent to the Heritage Road, as shown in **Figure 3-46**. Only one alternative location was identified at this interchange considering size requirements and adjacent land uses; south of Mayfield Road is within the Heritage Heights Secondary Plan, and the realignment of Heritage Road north of Mayfield Road provide a good opportunity to utilize remnant parcels for a maintenance yard. This location has the following benefits and challenges:

- It is fully located within the FAA and utilizes land between Highway 413 and Heritage Road.
- Provides an entrance from Heritage Road, which does not impact adjacent intersections and ramp terminals.
- Impacts agricultural lands as a result of highway and realignment of Heritage Road. The land will be acquired as part of the Highway 413 corridor.
- Impacts to a drainage feature on the north end of the parcel can be avoided through refinements to the layout and size.
- Can accommodate a 15 ha size yard.

This site would be considered an appropriate location for a maintenance yard, and was carried forward for further review in conjunction with the other maintenance yard sites along the corridor. Based on the maintenance needs of the corridor and wider highway network, this location could serve as an alternative to having yards at both Winston Churchill Boulevard and Bramalea Road and may eliminate the need for a yard at one or both of the other two locations.

Figure 3-46: Mayfield Road Maintenance Yard



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3.5.8.3 Bramalea Road

Based on MTO Maintenance requirements, considering the property parcels adjacent to the interchange and access to the municipal road network, the following maintenance yard alternatives were developed at the Bramalea Road interchange, and are presented in **Figure 3-47**:

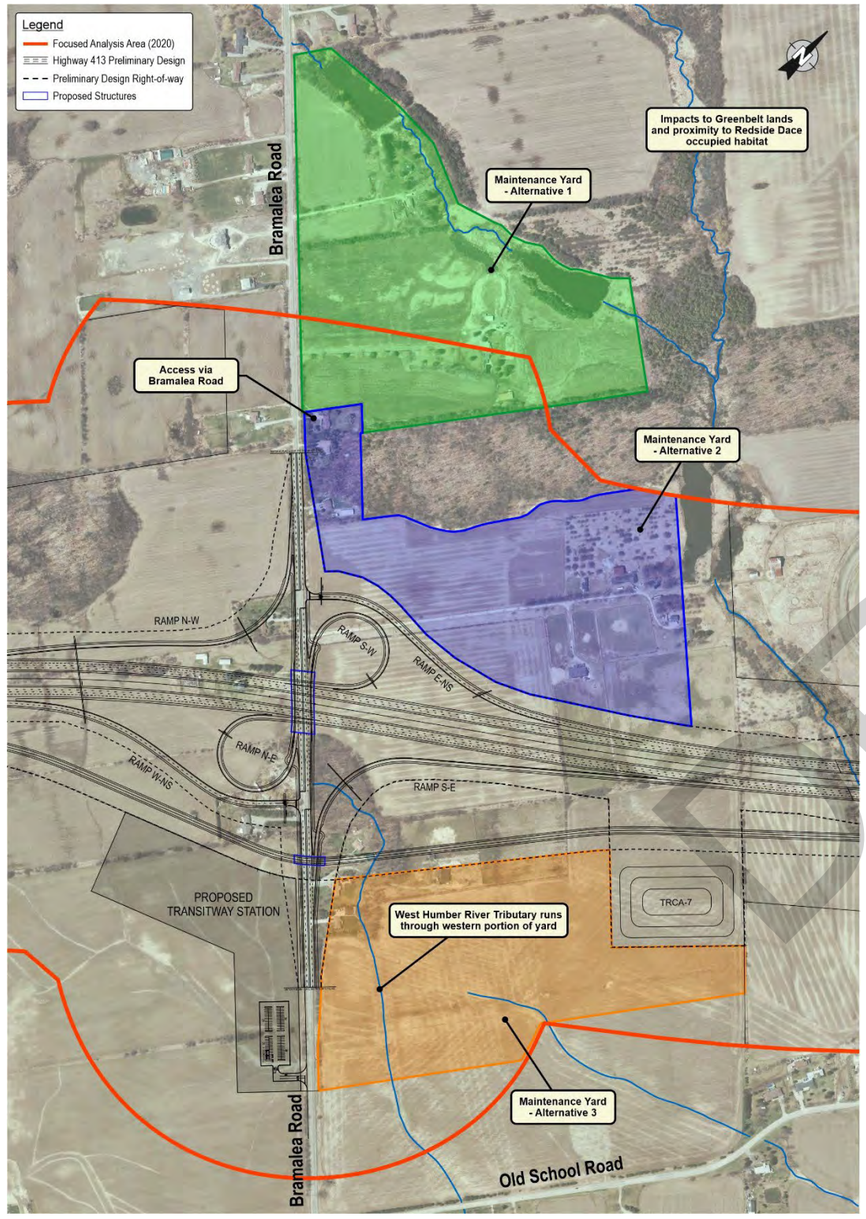
- Alternative 1 – 19.8 ha yard located north of the interchange and east of Bramalea Road; this represents the size of the whole parcel, but can be reduced to fit the needs of the maintenance yard. This alternative is located within a large single parcel of land but is set back considerably from Highway 413 and the interchange, outside of the FAA. This alternative impacts Greenbelt and agricultural lands. It is in close proximity a Humber River tributary with Redside Dace occupied habitat, and adjacent to candidate Bat SAR habitat, and significant woodlands. Direct adverse impacts of a potential BHR.
- Alternative 2 – 15.2 ha yard located in the northeast quadrant of the Bramalea Road interchange. This alternative is set back from Bramalea Road, with most of the area adjacent to the Highway 413 ROW to reduce impacts to the sensitive woodlot north of the ROW. This alternative impacts Greenbelt and agricultural lands. It is in close proximity to Redside Dace critical habitat, candidate Bat SAR habitat, significant woodland, and in proximity to tree SAR. Direct adverse impacts, including major land acquisition and the demolition of a potential built heritage resource. Entrance location from interchange ramp terminal (250 m), but could be expanded further north to allow for more distance between the ramp and the access. In order to provide an access to the site with adequate separation from the north ramp terminal intersection on Bramalea Road outside the interchange footprint, an additional property would be impacted.
- Alternative 3 – 15.7 ha yard located in the southeast quadrant of the Bramalea Road interchange. This alternative is within the FAA and allows for a desirable entrance location from Bramalea Road, across from carpool lot/future transitway station. It is not within Greenbelt lands, but impacts an agricultural area. There is a tributary of West Humber River that runs through the western portion of the parcel that would be impacted by the yard. No SAR anticipated to be impacted, however candidate Bat SAR habitat is present. No direct or indirect adverse impacts to any known or potential built heritage resources or cultural heritage landscapes are anticipated.

Alternative 3 is the preferred alternative for Bramalea Road as it allows for a single intersection providing access to the carpool lot/future transitway station to the west and the maintenance yard to the east. It minimizes impacts to natural environment and Greenbelt lands compared to Alternatives 1 and 2.

Considering that only up to three maintenance yard locations are needed along the corridor, based on the operational and maintenance requirements, and in comparison to other potential locations at Winston Churchill Boulevard and Mayfield Road servicing the west section of the corridor, a maintenance yard location at Bramalea Road is least preferred, as it has the greater environmental impacts than the preferred alternatives identified at the other two locations.

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Figure 3-47: Bramalea Road Maintenance Yard



3.5.8.4 Weston Road

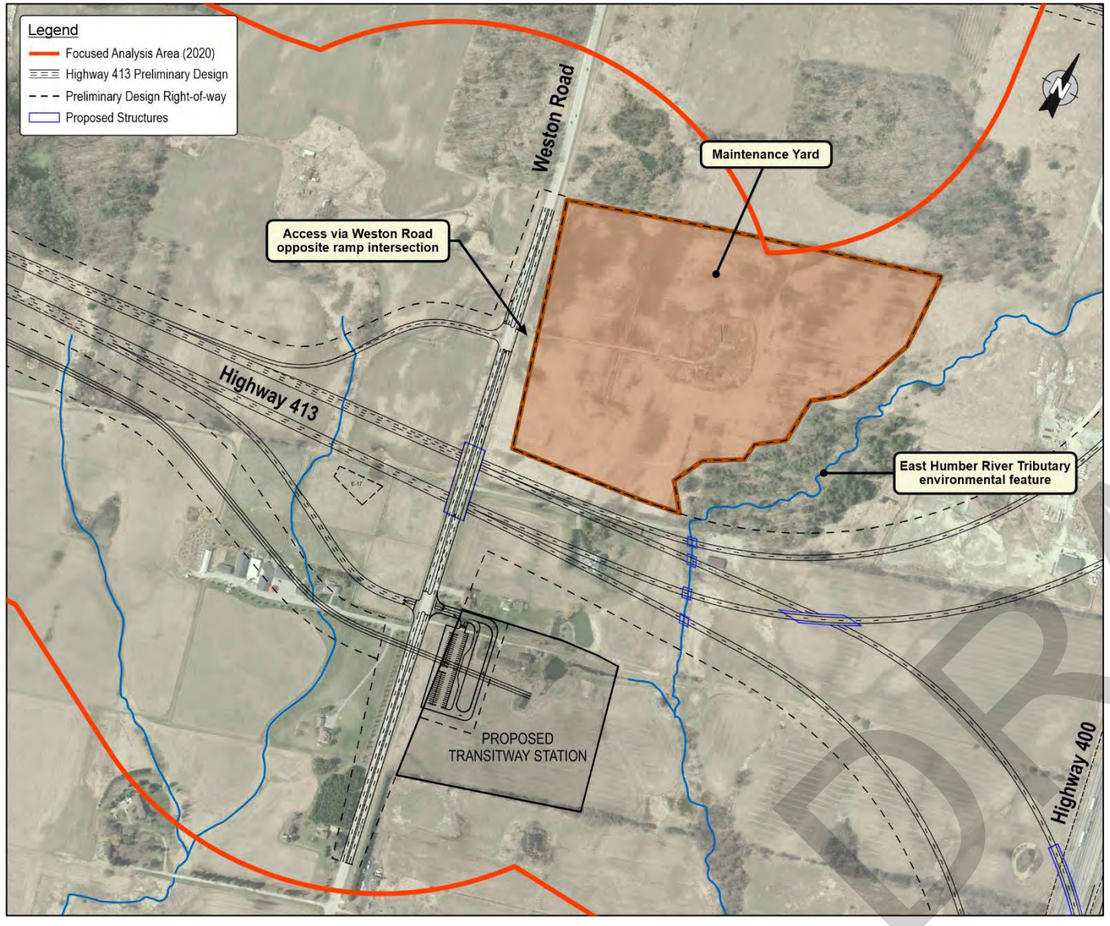
Based on MTO Maintenance requirements, considering constraints associated with the property parcels adjacent to the interchange, the surrounding Greenbelt Policy Areas, and providing direct access onto Highway 413 and to the municipal road network, only one maintenance yard location was identified at the Weston Road interchange, in the northeast quadrant of the interchange, as shown in **Figure 3-48**. This location has the following benefits and challenges:

- Provides a 15 ha size yard which meets the desirable lot size requirements.
- Located in close proximity to the Weston Road interchange, providing direct access to Highway 413 westbound. The entrance to the yard can be placed opposite the westbound entrance ramp terminal intersection providing direct connection to Highway 413, and along Weston Road to access adjacent interchanges with Highway 400. Access to Highway 400 could be accommodated through a future municipal interchange at King-Vaughan Road.
- Impacts a portion of Greenbelt lands. A tributary of East Humber River flows east of the parcel considered contributing habitat for Redside Dace; possible permit implications with works in close proximity to the drainage feature. The layout of the site has been refined to minimize impacts to the watercourse, and can be further optimized in Detail Design.

The Maintenance Yard at Weston Road has been carried forward into the preliminary design based on the Ministry maintenance needs for the corridor and servicing for the east section of the highway and adjacent network.

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Figure 3-48: Weston Road Maintenance Yard



3.5.8.5 Recommendations

Based on the operational needs for the highway network, and in consideration for the environmental and property impact noted above, the maintenance yards at Mayfield Road and Weston Road are the recommended locations to be carried forward for further study and implementation in Detail Design. They will provide adequate capacity to service the new infrastructure delivered under the Project. The Winston Churchill maintenance yard will not be carried forward as part of the Project, however, may be subject to future study to support maintenance needs on other existing highways, given its proximity to the Highway 401 / 407 ETR / 413 interchange.

The maintenance yard at Bramalea Road will not be carried forward as it presents additional environmental impacts compared to the other preferred locations, and the highway maintenance can be serviced by the two recommended yards.

3.5.9 Commercial Vehicle Inspection Facilities

Highway 413 is identified as a Goods Movement corridor, and given the length of new highway, and the facility requirements on 400-series highways, MTO has identified that one CVIF is required for each direction of travel along Highway 413. A CVIF is located between interchanges and features separate exit and entrance ramps connecting to a site consisting of large vehicle parking, weigh stations, and MTO offices as required. Opportunities to locate a CVIF were considered along the full length of Highway 413. Based on technical factors for interchange spacing and ramp requirements, and considering approximate footprints for similar sites on other MTO highways, only two feasible locations were identified along the corridor:

- In the west between Mississauga Road and Creditview Road; and
- In the east between Highway 27 and Pine Valley Road, at the Kipling Avenue crossing.

Other locations along the corridor were not feasible, as there was not sufficient interchange spacing to accommodate the exit and entrance ramp requirements for the CVIF.

Following the identification of these two potential CVIF locations, the recommended footprint size was increased to approximately 3 ha, based on MTO's assessment of anticipated needs for commercial vehicle parking areas based on similar sites recently constructed on other highways. The footprint design for each of the two CVIF locations was reviewed based on the larger size requirements to confirm feasibility, and the designs were refined accordingly.

With the identification of an environmentally sensitive floodplain north of Highway 413 between Mississauga Road and Creditview Road, the footprint of the eastbound CVIF in this area was further refined and shifted to the west to avoid impacts with the larger footprint design. This refinement to the CVIF at this location is presented in **Figure 3-49**.

Following these design reviews, the CVIF alternative at Kipling Avenue was not carried forward into the Preliminary Design due to the following undesirable technical and environmental impacts:

- The CVIF was located partially within the Greenbelt Policy area;

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- North of Highway 413 at Kipling Avenue is an existing environmentally sensitive woodlot that is further impacted by the CVIF;
- The westbound CVIF required an extension of the Kipling Avenue underpass structure to cross additional ramp lanes for the facility, with significant cost and technical impacts; and
- Technical limitations with Highway 413 structures and spacing between interchanges limited opportunities to shift the location east or west along Highway 413.

The CVIF on Highway 413 between Mississauga Road and Creditview Road was carried forward in the Preliminary Design. The Highway 413 ROW accommodates the typical footprint for these facilities as provided by MTO. The westbound facility at Mississauga Road will require further refinement in Detail Design to avoid impacts to floodplain north of the highway.

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Legend

Previous Commercial Vehicle Inspection Facility Design

Refined Commercial Vehicle Inspection Facility Design Concept

Mississauga Road

Creditview Road

Commercial Vehicle Inspection Facility

Commercial Vehicle Inspection Facility

Commercial Vehicle Inspection Facility

Commercial Vehicle Inspection Facility

Commercial Vehicle Inspection Facility

TRCA-1

100m 0m 100m

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Highway 413 Environmental Impact Assessment Report

Figure 3-49
Commercial Vehicle Inspection Facility Between Mississauga Road and Creditview Road

4. Preliminary Design

4.1 Overview of the Preliminary Design and Focused Analysis Area

The Highway 413 Preliminary Design was developed through an iterative and integrated process between the engineering and environmental disciplines. **Chapter 3** described the alternatives considered for highway alignments and ancillary features, and the rationale for selecting the Preferred Alignment.

This chapter provides a description of the Preliminary Design for the Project. The Preliminary Design incorporates the highway's horizontal and vertical profiles, interchanges, crossing roads, structural elements, carpool parking lots, CVIF, AT considerations, SWM, illumination, advanced traffic management systems (ATMS), maintenance yards, traffic operations, and pavement. The Highway 413 Preliminary Design is presented in the design plans included in **Appendix B**.

The proposed transitway and stations were developed in parallel with the highway to a planning level of design, meaning that the highway and ancillary facilities have been designed to not preclude a future transitway, but the proposed transitway itself has not undergone the same level of engineering design as the highway, and requires a separate future assessment of environmental impacts. The proposed transitway and transit stations are described in **Section 4.6**.

4.2 Highway 413

4.2.1 Horizontal and Vertical Alignment

Starting at the western end of the Project, Highway 413 begins from the Highway 401 / Highway 407 ETR interchange northward until Mayfield Road, where the alignment curves east towards Highway 400 (**Figure 1-5**). Extensions of Highway 410 and Highway 427 are included to facilitate new connections to Highway 413; Highway 410 will be extended northerly from the existing interchange at Mayfield Road, and Highway 427 will be extended northerly from the existing interchange at Major Mackenzie Drive.

The horizontal alignment for Highway 413 and the Highway 410 and Highway 427 Extensions generally follows the Preferred Alignment as identified through the process described in **Chapter 3**. The horizontal geometry of the highway has been designed based on the environmental and physical constraints identified in the evaluation process, with consideration for environmental features, watercourse crossings, and municipal road crossings and interchanges.

The majority of the highway is designed at-grade, meaning the vertical profile is generally level with existing ground, and crossing roads are reconstructed to pass over the highway. In some locations, as described in the sections below, the highway goes over existing roads. On the approach to watercourses, the highway profile typically rises to a higher grade to provide the necessary vertical clearance over the watercourse based on environmental and drainage criteria.

Highway 413 and the Highway 410 and Highway 427 Extensions were designed to meet a 130 km/h design speed, with a posted speed of 110 km/h. The horizontal and vertical geometry of the highway has been set to align with the corresponding design parameters for a 130 km/h design speed.

4.2.2 Cross-Section

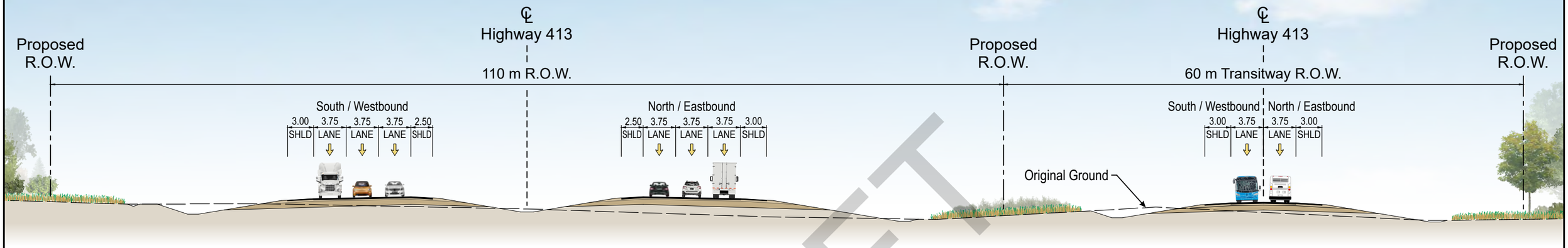
The typical ROW is 170 m wide, which includes 110 m for the highway and 60 m for the future proposed transitway and multi-use trail. The ROW is expanded at interchanges to accommodate entrance and exit ramps, in areas with high fills, and in locations with ancillary highway facilities such as CVIFs, maintenance yards, and SWM. The Preliminary Design consists of a typical six lane cross-section (three lanes in each direction) with a grassed median, as shown in **Figure 4-1.** The ROW has been designed to accommodate up to 10 lanes (five lanes in each direction) should future traffic conditions warrant additional capacity. These additional lanes would be provided by widening the highway towards the median. The proposed transitway will be a separate corridor running alongside the highway, dedicated for public transit, which will be subject to a separate future assessment of environmental impacts.

The Highway 410 and Highway 427 Extensions will each be comprised of a four lane cross-section, with two lanes in each direction, with a grassed median, as shown in **Figure 4-2.** Future widening for Highway 410 and Highway 427, if needed, will be toward the median within the established ROW.

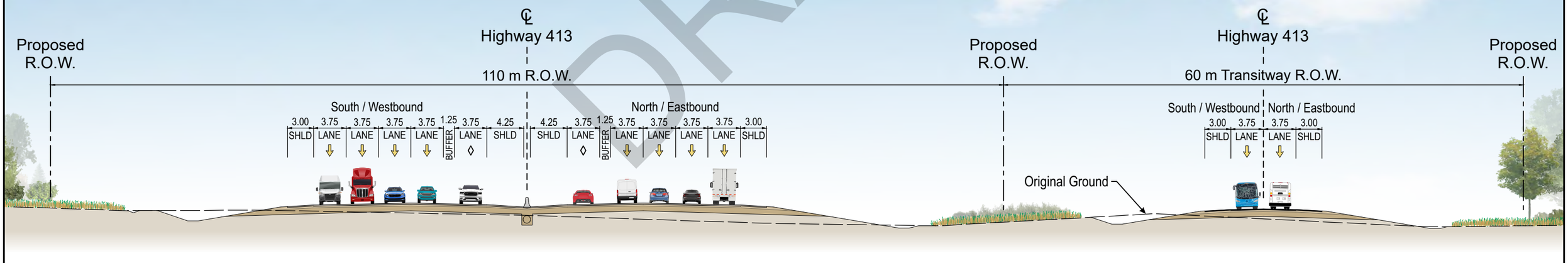
In some locations, an auxiliary lane has been added to the cross-section, connecting an entrance and exit ramp at adjacent interchanges, either based on design considerations for interchange spacing, or as a recommendation based on the traffic analysis.

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Highway 413 Initial Configuration



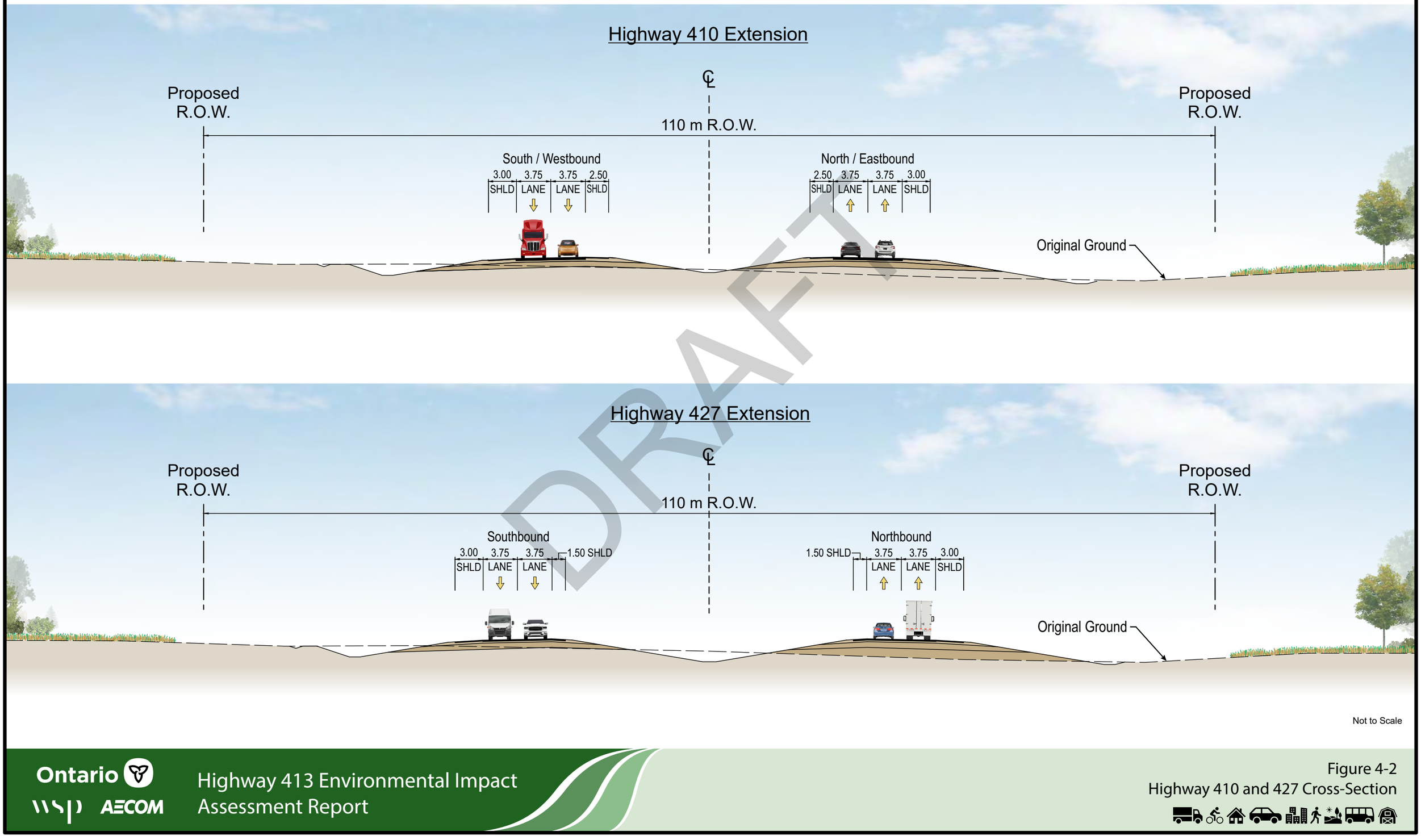
Highway 413 Ultimate Configuration



Not to Scale

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Figure 4-1
Highway 413 Initial and Ultimate Cross-Section



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Figure 4-2
Highway 410 and 427 Cross-Section

4.2.3 Active Transportation

Provisions for future AT facilities are included in the Project as described in **Section 2.6**. As requested by municipalities, and as appropriate based on anticipated traffic conditions, these facilities have been protected for at municipal crossing roads and interchanges. Proposed AT routes that have been protected for are outlined in municipal AT and Transportation Master Plans, and by the municipalities in ongoing consultation.

4.2.3.1 Multi-Use Paths and Multi-Use Trails

Multi-use paths (MUPs) have been reviewed and protected for at municipal road crossings in consultation with municipalities and consistent with MTO's AT guidelines, as shown in **Table 2-5**, in **Chapter 2**. These cross-section elements were discussed with stakeholders through several meetings and workshops.

The relatively wide, protected cross-section for the proposed transitway will allow for additional transportation opportunities to be explored that would provide significant community benefits. Throughout the study many stakeholders have expressed interest in the provision of an MUT running parallel to Highway 413. A concept for an MUT to be implemented within the ROW allocated for the proposed transitway has been developed, as shown in **Figure 4-3** and may be explored further in consultation with municipal partners as the project proceeds to Detail Design. MTO envisions the MUT as potentially connecting to other AT infrastructure, providing access to green spaces across the corridor, and providing another accessible transportation choice to residents and visitors to the GGH. The MUT would not preclude the proposed transitway.

4.2.3.2 Recreational Trails

As discussed in **Section 2.6**, the municipalities of Caledon, Brampton, and Mississauga purchased 51 km of the Orangeville-Brampton Railway corridor, which is no longer being used as a railway, to convert it to a recreational trail. Highway 413 will cross this trail, and an overpass structure is included in the Preliminary Design to accommodate it. Design and construction of the Orangeville-Brampton Railway corridor recreational trail will be completed under a future municipal design project.

The Highway 413 major river structure at the Main Humber River crosses the existing Humber River Heritage Trail within the Nashville Conservation Reserve. The trail is managed by the TRCA and includes sections of natural surface and crushed limestone. The existing trail will be impacted by the highway alignment and structure pier locations, and potential realignment options will be developed during Detail Design in coordination with the TRCA.

Other planned recreational trails crossing the ROW, as identified by the City of Vaughan in their Pedestrian and Bicycle Master Plan Study at the East Humber River and east of Pine Valley Drive are not precluded by the Highway 413 Preliminary Design. As design details are further developed by the City of Vaughan, opportunities to incorporate trail crossings of Highway 413, where feasible, may be considered as part of their implementation plans.

4.3 Interchanges

4.3.1 Freeway-to-Freeway Interchanges

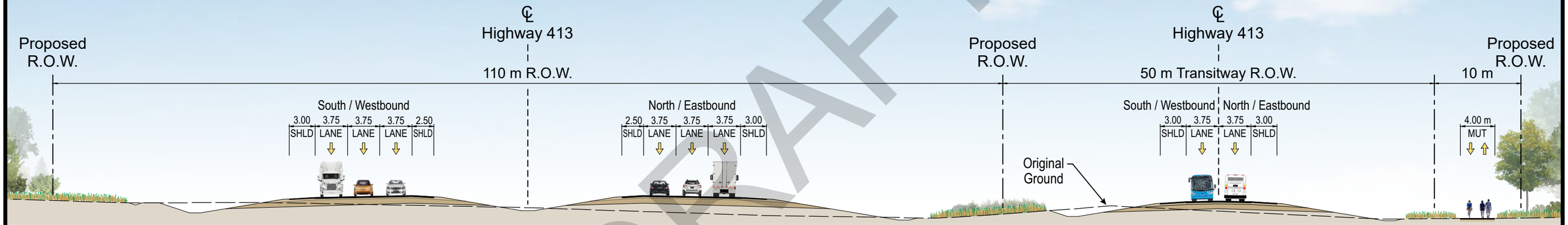
4.3.1.1 Highway 401 / Highway 407 ETR

The interchange between Highway 413, Highway 401, and Highway 407 ETR is a stacked interchange with four levels, facilitating all movements to and from Highway 401, Highway 407 ETR, and Highway 413. Also, a connection to and from the Highway 401 / Trafalgar Road interchange ramps has been accommodated. The interchange includes basketweave structures to facilitate exit and entrance ramps in close proximity.

Constraints that were considered in the interchange layout and footprint include providing all moves to and from Highway 413, a Hydro One transmission corridor crossing Highway 407 ETR south of Highway 401, SWM ponds, planned expansion of local roads and development of surrounding parcels (for example, the Premier Gateway Secondary Plan north of Steeles Avenue), and the existing Highway 401/Highway 407 ETR interchange structures and ramps.

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Highway 413 Initial Configuration



Not to Scale

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4.3.1.2 Highway 410 Extension

The interchange between Highway 413 and Highway 410 is a stacked interchange with three levels, facilitating all movements to and from the two highways. This interchange features four directional ramps; two ramps provide access to Highway 413 eastbound and westbound from Highway 410 northbound, and two ramps provide access to Highway 410 southbound from Highway 413 eastbound and westbound.

The proximity of the interchange to Heart Lake Road and the presence of the proposed transitway requires that the ramp carrying Highway 413 eastbound traffic to Highway 410 be designed with a larger radius, which increases the size of the footprint for the interchange. The interchange ramps cross Heart Lake Road on grade-separated structures.

The Preliminary Design for the interchange has been optimized to reduce impacts to sensitive environmental areas; development plans for lands east of Heart Lake Road; existing roads and municipal services (sewers, watermains); and to minimize the structure sizes.

Provisions for the proposed transitway were considered in the Preliminary Design for the interchange at Highway 413 and Highway 410. The conceptual alignment for the proposed transitway is parallel to Highway 413 through the interchange.

4.3.1.3 Highway 427 Extension

The interchange between Highway 413 and Highway 427 is a stacked interchange with three levels, facilitating all movements to and from the two highways. This interchange features four directional ramps; two ramps provide access to Highway 413 eastbound and westbound from Highway 427 northbound, and two ramps provide access to Highway 427 southbound from Highway 413 eastbound and westbound. The Hydro One transmission corridor to the east of the interchange is a significant constraint in the development of the interchange design. The interchange ramps include overpass structures crossing the Highway 413 mainline, Nashville Road to the south and Highway 50 to the west, and the Robinson Creek tributaries located within the interchange footprint.

The Preliminary Design for the interchange has been optimized to reduce impacts to the sensitive Robinson Creek environmental area and floodplain, and to minimize the structure size of the watercourse crossing. Realignment of a section of Robinson Creek tributary east of the interchange where it crosses Nashville Road is provided to remove the watercourse from the Highway 427 median. The Shiloh Cemetery on the west side of Highway 50 has been avoided through optimization of the Highway 427 northbound to Highway 413 westbound ramp alignment, and through the use of a retaining wall to mitigate grading impacts.

Provisions for the proposed transitway were considered in the Preliminary Design for the interchange. The conceptual alignment for the proposed transitway is parallel to Highway 413 through the interchange and includes an additional connection to a future transitway corridor adjacent to the Highway 427 Extension.

4.3.1.4 Highway 400

The interchange between Highway 413 and Highway 400 is a stacked interchange with three levels, facilitating all movements to and from the two highways. This interchange features four directional ramps; two ramps provide access to Highway 400 northbound and southbound from Highway 413, and two ramps provide access to Highway 413 from Highway 400 northbound and southbound. The existing accesses to the northbound and southbound ONroutes in proximity to the interchange have been maintained.

The Highway 400 northbound to Highway 413 westbound interchange ramp includes an additional overpass structure crossing Kirby Road at Highway 400. The Highway 413 eastbound to Highway 400 northbound ramp includes an additional underpass structure crossing King-Vaughan Road at Highway 400.

4.3.2 Municipal Road Interchanges

Design elements for crossing roads have been confirmed with the regional and local municipalities throughout the Preliminary Design process, in consideration of their Transportation Master Plans and/ or approved EA for planned improvements. Cross-sections for the approaches and structures were determined as part of Preliminary Design, and the transition between the MTO and municipal ROW at the limits of the Preliminary Design will be confirmed in Detail Design with the municipalities based on the timing of their roadway improvements, and subject to cost-sharing.

4.3.2.1 Winston Churchill Boulevard

The Winston Churchill Boulevard interchange is a full-moves Parclo A4 interchange, comprised of two directional entrance ramps, two loop entrance ramps, and two directional exit ramps with signalized ramp terminal intersections. Highway 413 crosses Winston Churchill Boulevard at an underpass (road over highway) structure.

The Winston Churchill Boulevard cross-section consists of three through lanes in each direction. Based on municipal feedback, provisions for AT are provided on both sides of Winston Churchill Boulevard within the interchange, consisting of a MUP with a buffer zone on either side to accommodate barrier separation (if required). Additionally, a 5 m wide boulevard will extend beyond the structure, providing space for a MUP with buffer zone on each side of Winston Churchill Boulevard. Beyond the interchange, the Preliminary Design will integrate with the future

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widening of Winston Churchill Boulevard, which will be undertaken as a separate municipal project. AT elements will be confirmed in Detail Design and are subject to cost-sharing with the respective municipalities.

A carpool parking lot is provided in the southwest quadrant of the interchange, with the potential for future expansion to a transitway station (see **Section 4.6**). The proposed transitway will be subject to a separate future assessment of environmental impacts.

4.3.2.2 Bovaird Drive

The Bovaird Drive interchange is a full-moves Parclo A4 interchange, comprised of two directional entrance ramps, two loop entrance ramps, and two directional exit ramps with signalized ramp terminal intersections. Highway 413 crosses Bovaird Drive at an underpass (road over highway) structure.

The construction of the Bovaird Drive underpass structure has been identified in the *Highway 413 Act*, *2024* as an early works project and has advanced into Detail Design.

The Bovaird Drive cross-section consists of three through lanes in each direction. Based on municipal feedback, provisions for AT are provided on both sides of Bovaird Drive, consisting of barrier-separated MUPs. AT elements are being confirmed through the Detail Design process and are subject to cost-sharing with the respective municipalities.

A SWM pond is located southeast of the interchange.

A carpool parking lot is provided in the northeast quadrant of the interchange, with the potential for future expansion to a transitway station (see **Section 4.6**). The proposed transitway will be subject to a separate future assessment of environmental impacts.

4.3.2.3 Mayfield Road

The Mayfield Road interchange is a full-moves Parclo A4 interchange, comprised of two directional entrance ramps, two loop entrance ramps, and two directional exit ramps with signalized ramp terminal intersections. Highway 413 crosses Mayfield Road at an underpass (road over highway) structure.

The Preliminary Design of the Mayfield Road cross-section has incorporated an ultimate lane configuration consisting of three through lanes in each direction. The initial build scenario may require fewer lanes and will be confirmed during Detail Design in alignment with municipal plans. Based on municipal feedback, provisions for AT are provided on both sides of Mayfield Road, consisting of a MUP with buffer zone on each side to accommodate barrier separation (if required). Additionally, a 5 m wide boulevard will extend beyond the structure, providing space for a MUP with buffer zone on each side of Mayfield Road. AT elements will be confirmed in Detail Design and are subject to cost-sharing with the respective municipalities.

A carpool parking lot is provided in the northeast quadrant of the interchange, with the potential for future expansion to a transitway station (see **Section 4.6**). The proposed transitway will be subject to a separate future assessment of environmental impacts.

A maintenance yard is located in the northwest quadrant of this interchange (see **Section 4.5.3**).

4.3.2.4 Chinguacousy Road

The Chinguacousy Road Interchange is a full-moves Parclo A4 interchange, comprised of two directional entrance ramps, two loop entrance ramps, and two directional exit ramps with signalized ramp terminal intersections. Highway 413 crosses Chinguacousy Road at an underpass (road over highway) structure.

The Chinguacousy Road cross-section consists of two through lanes in each direction, along with one auxiliary lane per direction for the loop ramps. The Preliminary Design would accommodate the possibility of a future widening of Chinguacousy Road to three through lanes in each direction by converting the auxiliary lanes to additional through lanes, and modifying the design of the loop ramps.

Based on municipal feedback, provisions for AT are provided on both sides of Chinguacousy Road, consisting of a MUP with a buffer zone on either side to accommodate barrier separation (if required). Additionally, a 5 m wide boulevard will extend beyond the structure, providing space for a MUP with buffer zone on each side of Chinguacousy Road. Beyond the interchange, the Preliminary Design will integrate with the future widening of Chinguacousy Road, which will be undertaken as a separate municipal project. AT elements will be confirmed in Detail Design and are subject to cost-sharing with the respective municipalities.

The interchange is located adjacent to a wetland area, and the Project will realign multiple watercourses which cross Highway 413 using structural culverts and bridges to the west of, within, and east of the interchange. A SWM pond is located southwest of the interchange.

4.3.2.5 Highway 10 / Hurontario Street

The Highway 10 / Hurontario Street interchange is a full-moves Parclo A4 interchange, comprised of two directional entrance ramps, two loop entrance ramps, and two directional exit ramps with signalized ramp terminal intersections. Highway 413 crosses Hurontario Street at an underpass (road over highway) structure.

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The construction of the Hurontario Street underpass structure has been identified in the *Highway 413 Act*, *2024* as an early works project and has been advanced into Detail Design.

The Hurontario Street cross-section consists of two through lanes in each direction, along with one auxiliary lane per direction for the loop ramps. The Preliminary Design would accommodate the possibility of a future widening of Hurontario Street to three through lanes in each direction by converting the auxiliary lanes to additional through lanes and modifying the design of the loop ramps.

A carpool parking lot is provided in the southwest quadrant of the interchange, with the potential for future expansion to a transitway station (see **Section 4.6**). The proposed transitway will be subject to a separate future assessment of environmental impacts.

4.3.2.6 Bramalea Road

The Bramalea Road interchange is a full-moves Parclo A4 interchange, comprised of two directional entrance ramps, two loop entrance ramps, and two directional exit ramps with signalized ramp terminal intersections. Highway 413 crosses Bramalea Road at an underpass (road over highway) structure.

The Bramalea Road cross-section consists of two through lanes in each direction, along with one auxiliary lane per direction for the loop ramps. The Preliminary Design would accommodate the possibility of a future widening of Bramalea Road to three through lanes in each direction by converting the auxiliary lanes to additional through lanes and modifying the design of the loop ramps.

Based on municipal feedback, provisions for AT are provided on both sides of Bramalea Road, consisting of a MUP with a buffer zone on either side to accommodate barrier separation (if required). Additionally, a 5 m wide boulevard will extend beyond the structure, providing space for a MUP with buffer zone on each side of Bramalea Road. Beyond the interchange, the Preliminary Design will integrate with the future widening of Bramalea Road, which will be undertaken as a separate municipal project. AT elements will be confirmed in Detail Design and are subject to cost-sharing with the respective municipalities.

A carpool parking lot is provided in the southwest quadrant of the interchange, with the potential for future expansion to a transitway station (see **Section 4.6**). The proposed transitway will be subject to a separate future assessment of environmental impacts.

4.3.2.7 Mayfield Road at Highway 410

The existing Mayfield Road interchange at Highway 410 remains a Parclo A4 interchange, comprised of two new directional ramps connecting Highway 410 to the south to and from Highway 10 to the west that are grade separated under Mayfield Road. The existing Mayfield Road ramps connecting to and from Highway 10 to the west will be modified to connect to the new Highway 410 extension.

No modifications are required to the existing cross-section of Mayfield Road or the existing structure.

4.3.2.8 Airport Road

The Airport Road interchange is a full moves Parclo A4 interchange, comprised of two directional entrance ramps, two loop entrance ramps, and two directional exit ramps with signalized ramp terminal intersections. Highway 413 crosses Airport Road at an underpass (road over highway) structure.

The Airport Road cross-section consists of two through lanes in each direction, along with one auxiliary lane per direction for the loop ramps. The Preliminary Design would accommodate the possibility of a future widening of Airport Road to three through lanes in each direction by converting the auxiliary lanes to additional through lanes and modifying the design of the loop ramps.

Based on municipal feedback, provisions for AT are provided on both sides of Airport Road, consisting of a MUP with a buffer zone on either side to accommodate barrier separation (if required). Additionally, a 5 m wide boulevard will extend beyond the structure, providing space for a MUP with buffer zone on each side of Airport Road. Beyond the interchange, the Preliminary Design will integrate with a future widened Airport Road; the Region of Peel has received EA approval for Airport Road widening and the design of the project is ongoing. AT elements will be confirmed in Detail Design and are subject to cost-sharing with the respective municipalities.

The Project will realign Salt Creek to the west of the new interchange, and includes a new four lane structure crossing of the realigned creek on Airport Road north of the interchange. This new structure includes MUPs on both sides, to connect with AT facilities within the interchange.

A SWM pond is located in the southwest interchange loop ramp.

A carpool parking lot is provided in the southeast quadrant of the interchange, with the potential for future expansion to a transitway station (see **Section 4.6**). The proposed transitway will be subject to a separate future assessment of environmental impacts.

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4.3.2.9 The Gore Road

The Gore Road interchange is a Partial Diamond design, comprised of a single direct entrance ramp and exit ramp with signalized intersection for the westbound lanes and a single loop entrance ramp and direct exit ramp for the eastbound lanes. Highway 413 crosses The Gore Road on overpass (highway over road) structures.

The Preliminary Design accommodates a future cross-section for The Gore Road consisting of two through lanes in each direction. To accommodate the Partial Diamond ramp configuration, northbound left turn lanes are provided to access the eastbound and westbound entrance ramps, and a southbound right turn lane provides access to the westbound entrance ramp.

Based on municipal feedback, provisions for AT are provided on The Gore Road, consisting of a wide boulevard for MUPs on both sides. Beyond the interchange, the Preliminary Design will integrate with the future widening of The Gore Road to four lanes, to be undertaken as a separate municipal project. AT elements will be confirmed in Detail Design and are subject to cost-sharing with the respective municipalities.

A SWM pond is located southeast and southwest of the interchange.

A carpool parking lot is provided in the southeast quadrant of the interchange, with the potential for future expansion to a transitway station (see **Section 4.6**). The proposed transitway is subject to a separate future assessment of environmental impacts.

4.3.2.10 Humber Station Road

The Humber Station Road interchange is a full-moves Parclo A4 interchange, comprised of two directional entrance ramps, two loop entrance ramps, and two directional exit ramps with signalized ramp terminal intersections. Highway 413 crosses Humber Station Road at an underpass (road over highway) structure.

The Humber Station Road cross-section consists of two through lanes in each direction, along with one auxiliary lane per direction for the loop ramps.

Based on municipal feedback, provisions for AT are provided on both sides of Humber Station Road, consisting of barrier-separated MUPs. Beyond the interchange, the Preliminary Design will integrate with the future widening of Humber Station Road, which will be undertaken as a separate municipal project. AT elements will be confirmed in Detail Design and are subject to cost-sharing with the respective municipalities.

Humber Station Road is realigned to the east of its current alignment at the interchange to avoid conflict with a sanitary sewer and watermain constructed by the municipality.

SWM ponds are located in each of the four quadrants of the interchange.

A carpool parking lot is provided in the southeast quadrant of the interchange, with access from Mayfield Road, with the potential for future expansion to a transitway station (see **Section 4.6**). The proposed transitway is subject to a separate future assessment of environmental impacts.

4.3.2.11 Highway 27

The Highway 27 interchange is a Parclo AB design, comprised of one directional entrance ramp to Highway 413 westbound, one loop entrance ramp to Highway 413 eastbound, one directional exit ramp from Highway 413 eastbound, and one loop exit ramp from Highway 413 westbound, and signalized ramp terminal intersections. Highway 413 crosses Highway 27 on overpass (highway over road) structures.

The design accommodates a future Highway 27 cross-section consisting of two through lanes in each direction, along with a southbound right turn lane and northbound left turn lane for access to the eastbound and westbound entrance ramps.

Based on municipal feedback, provisions for AT are provided on both sides of Highway 27, consisting of a wide boulevard for MUPs. Beyond the interchange, the Preliminary Design will integrate with future widening of Highway 27 to four lanes, to be undertaken as a separate municipal project. AT elements will be confirmed in Detail Design and are subject to cost-sharing with the respective municipalities.

South of the interchange, Highway 27 crosses an East Humber River tributary on a new four lane structure. This new structure includes MUPs on both sides, to connect with AT facilities within the interchange.

A SWM pond is located northwest of the interchange.

A carpool parking lot is provided on the northeast side of the interchange.

In response to municipal feedback regarding traffic flow with the Parclo AB interchange configuration, the ROW protects for a larger footprint should refinements or alternative design concepts emerge in Detail Design.

4.3.2.12 Weston Road

The Weston Road interchange is a partial interchange, comprised of one directional entrance ramp to Highway 413 westbound and one directional exit ramp from Highway 413 eastbound, each with signalized ramp terminal intersections. A full interchange is not technically feasible at

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this location due to its proximity to the Highway 413/Highway 400 interchange. Highway 413 crosses Weston Road at an underpass (road over highway) structure.

The Weston Road cross-section consists of two through lanes in each direction, along with a southbound right turn lane and northbound left turn lane for access to the Highway 413 westbound entrance ramp.

Based on municipal feedback, provisions for AT are provided on both sides of Weston Road, consisting of MUPs. Beyond the interchange, the Preliminary Design will integrate with the future widening of Weston Road to four lanes, which will be undertaken as a separate municipal project. AT elements will be confirmed in Detail Design and are subject to cost-sharing with the respective municipalities.

A SWM pond is located in the southwest quadrant of the interchange.

A carpool parking lot is provided in the southeast quadrant of the interchange, with the potential for future expansion to a transitway station (see **Section 4.6**). The proposed transitway is subject to a separate future assessment of environmental impacts.

A maintenance yard is located in the northeast quadrant of this interchange (see **Section 4.5.3**).

4.3.2.13 Major Mackenzie Drive at Highway 427

The existing partial interchange at Highway 427 and Major Mackenzie Drive will be reconstructed to a full-moves Parclo A4 design to accommodate the Highway 427 Extension. As part of this reconstruction, the existing interchange ramps providing access from Highway 427 northbound to Major Mackenzie Drive westbound will be removed and replaced with new, direct ramps.

The Parclo A4 design comprises two directional entrance ramps, two loop entrance ramps, and two directional exit ramps with signalized ramp terminal intersections.

The existing overpass (highway over road) structure at Major Mackenzie Drive will be widened to carry the Highway 427 northbound traffic, and a separate overpass structure will be constructed for Highway 427 southbound traffic.

The Major Mackenzie Drive cross-section consists of three through lanes in each direction. Based on municipal feedback, the Preliminary Design maintains the existing AT facilities through the interchange, which consists of a wide boulevard on each side of Major Mackenzie Drive and space for an MUP in the eastbound direction.

A new SWM pond and the expansion of an existing SWM pond are located north of the interchange.

A transit station is provided in the northwest quadrant of the interchange (see **Section 4.6**). This station connects to the proposed transitway that is currently being protected for along the existing Highway 427 and to the proposed transitway northerly to Highway 413. The transitway station was previously included in the EA for the extension of Highway 427 to Major Mackenzie Drive. The proposed transitway along the Highway 427 Extension and Highway 413 is subject to a separate future assessment of environmental impacts.

4.4 Crossing Roads

Design elements for crossing roads have been confirmed with the regional and local municipalities throughout the Preliminary Design process, in consideration of their Transportation Master Plans and/or approved EA for planned improvements. Cross-sections for the approaches and structures were determined as part of Preliminary Design, and the transition between the MTO and municipal ROW at the limits of the Preliminary Design will be confirmed in Detail Design with the municipalities, based on the timing of their roadway improvements, and subject to cost-sharing.

4.4.1 Tenth Line

The Preliminary Design includes realignment of Tenth Line to the east, and a new underpass structure to carry Tenth Line over Highway 413. The cross-section of Tenth Line consists of two lanes in each direction, with a MUP on each side to support AT, to be confirmed in Detail Design.

4.4.2 Embleton Road

The Preliminary Design includes realignment of Embleton Road to the south, and a new underpass structure to carry Embleton Road over Highway 413. The cross-section of Embleton Road consists of one lane in each direction, with a MUP on each side to support AT.

4.4.3 Heritage Road

The Preliminary Design includes realignment of Heritage Road to the east, just north of the Credit River, and a new underpass structure to carry Heritage Road over Highway 413. The cross-section of Heritage Road consists of two lanes in each direction, with a MUP on each side to support AT.

At Bovaird Drive, Heritage Road is realigned to the west to ensure the distance between the intersections along Bovaird Drive with Heritage Road and the southbound exit ramp meets minimum intersection spacing requirements to ensure operational performance of the interchange is not impacted.

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From south of Wanless Drive to north of Mayfield Road, the ROW of Highway 413 is in the same location as existing Heritage Road. Therefore, Heritage Road is realigned to the west to maintain its continuity. The alignment provides adequate intersection spacing along Mayfield Road between Heritage Road and the southbound exit ramp. Left turn lanes are provided at intersections.

4.4.4 Wanless Drive

The Preliminary Design includes a new underpass structure to carry Wanless Drive over Highway 413. The cross-section of Wanless Drive consists of four lanes, with a MUP on each side to support AT.

The City of Brampton advised that an EA has been completed for Wanless Drive, but has not yet been advanced to design. The ROW protects for a larger footprint should refinements or alternative design concepts emerge in Detail Design.

4.4.5 Mississauga Road

The Preliminary Design includes a new underpass structure to carry Mississauga Road over Highway 413. The cross-section of Mississauga Road consists of one lane in each direction, with shoulders/side clearance on the bridge. The ROW included as part of Preliminary Design supports the future widening of Mississauga Road, which includes two lanes in each direction and a MUP on each side of the structure to support AT.

4.4.6 Creditview Road

The Preliminary Design includes a new underpass structure to carry Creditview Road over Highway 413. The cross-section of Creditview Road consists of one lane in each direction, with shoulders/side clearance on the bridge. The ROW included as part of Preliminary Design supports the future widening of Creditview Road, which includes two lanes in each direction and a MUP on each side of the structure to support AT.

4.4.7 Old School Road (at Highway 413)

The Preliminary Design includes new overpass structures to carry Highway 413 over Old School Road. The cross-section of Old School Road consists of one lane in each direction, with shoulders. The overpass structures will not preclude the future widening of Old School Road and inclusion of a 5.0 m wide boulevard to support AT.

4.4.8 McLaughlin Road

The Preliminary Design includes new overpass structures to carry Highway 413 over McLaughlin Road. The cross-section of McLaughlin Road consists of one lane in each direction, with shoulders. The overpass structures will not preclude future widening of McLaughlin Road and inclusion of a 5.0 m wide boulevard on each side to support for AT.

4.4.9 Kennedy Road

The Preliminary Design includes a new underpass structure to carry Kennedy Road over Highway 413. The cross-section of Kennedy Road consists of one lane in each direction, with shoulders/side clearance on the bridge. The ROW included as part of Preliminary Design supports the future widening of Kennedy Road, which includes two lanes and a MUP on each side of the structure to support AT.

4.4.10 Heart Lake Road

The Preliminary Design includes new overpass and underpass structures to carry Heart Lake Road over Highway 413 and the ramp from Highway 410 to Highway 413 westbound, and to carry the ramp from Highway 413 eastbound to Highway 410 over Heart Lake Road. The cross-section of Heart Lake Road consists of one lane in each direction, with shoulders/side clearance on the bridge. The ROW included as part of Preliminary Design supports the future widening of Heart Lake Road, which includes two lanes and a MUP on each side of the structure to support AT.

4.4.11 Old School Road (at Highway 410)

The Preliminary Design includes realignment of Old School Road and a new underpass structure to carry Old School Road over the Highway 410 Extension. The cross-section of Old School Road consists of one lane in each direction, with shoulders/side clearance on the bridge. The ROW included as part of Preliminary Design supports the future widening of Old School Road, which includes two lanes and a MUP on each side of the structure to support AT.

4.4.12 Dixie Road

The Preliminary Design includes a new underpass structure to carry Dixie Road over Highway 413. The cross-section of Dixie Road consists of one lane in each direction with shoulders. Based on municipal feedback, AT elements are not provided for Dixie Road.

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4.4.13 Torbram Road

The Preliminary Design includes a new underpass structure to carry Torbram over Highway 413. The cross-section of Torbram Road consists of one lane in each direction, with a MUP on each side. The ROW included as part of Preliminary Design supports the future widening of Torbram Road, which includes two lanes in each direction and a MUP on each side of the structure to support AT.

4.4.14 Innis Lake Road

The Preliminary Design includes a new underpass structure to carry Innis Lake Road over Highway 413. The cross-section of Innis Lake Road consists of one lane in each direction, with a MUP on each side. The ROW included as part of Preliminary Design supports the future widening of Innis Lake Road, which includes two lanes in each direction and a MUP on each side of the structure to support AT.

4.4.15 Healey Road

The Preliminary Design includes new overpass structures to carry Highway 413 over Healey Road. The cross-section of Healey Road consists of one lane in each direction. The overpass structures will not preclude future widening of Healey Road and inclusion of a 5.0 m wide boulevard on each side to support AT.

4.4.16 Centreville Creek Road

The Preliminary Design includes new overpass structures to carry Highway 413 over Centreville Creek Road. The cross-section of Centreville Creek Road consists of one lane in each direction. The overpass structures will not preclude future widening of Centreville Creek Road and inclusion of a 5.0 m wide boulevard on each side to support AT.

4.4.17 Mayfield Road

The Preliminary Design includes a new overpass structure to carry Highway 413 over Mayfield Road. The cross-section of Mayfield Road consists of two lanes in each direction with a westbound left turn lane for access to the future Arterial Road A2 south of Mayfield Road. Widening of Mayfield Road and the future connection to Arterial Road A2 will be constructed through a separate municipal project. Mayfield Road includes a 5.0 m boulevard with MUP on each side to support AT, and a wide median for bridge piers at the overpasses. The overpass structures will not preclude future widening of Mayfield Road.

4.4.18 Coleraine Drive

The Preliminary Design includes new overpass structures to carry Highway 413 over Coleraine Drive. The cross-section of Coleraine Drive consists of two lanes in each direction, a 5.0 m boulevard with MUP on each side to support AT, which will be constructed through a separate municipal project.

4.4.19 Highway 50

The Preliminary Design includes new overpass structures to carry Highway 413 and the interchange ramps with the Highway 427 Extension over Highway 50. The cross-section of Highway 50 consists of three lanes in each direction, a MUP on the west side of Highway 50, and a sidewalk on the east side of Highway 50, each with a 1.5 m buffer, which will be constructed through a separate municipal project.

4.4.20 Cold Creek Road

Cold Creek Road will be realigned north of Highway 413 to connect with Highway 50 with a right-in/right-out intersection, and a cul-de-sac will be provided south of Highway 413. Cold Creek Road will not cross Highway 413.

4.4.21 Huntington Road

The Preliminary Design includes new overpass structures to carry Highway 413 over Huntington Road. The cross-section of Huntington Road consists of one lane in each direction. Based on municipal feedback, AT elements are not provided for Huntington Road. The overpasses will not preclude future widening of Huntington Road and inclusion of boulevards to support AT. Modifications to the Huntington Road profile are included in the Preliminary Design to improve road geometry and reduce structure heights and construction costs for the overpasses, however the improvements to the local road would be subject to cost sharing with the municipality.

4.4.22 Kipling Avenue

The Preliminary Design includes a new underpass structure to carry Kipling Avenue over Highway 413. The cross-section of Kipling Avenue consists of one lane in each direction, with a MUP on each side.

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4.4.23 Pine Valley Drive

The Preliminary Design includes a new underpass structure to carry Pine Valley Drive over Highway 413. The cross-section of Pine Valley Road consists of two lanes in each direction, with a MUP on each side.

The Region of York has indicated an interest in a potential future interchange at Pine Valley Drive as part of a separate municipal project. Future widening of the Pine Valley Road underpass and inclusion of a full-moves Parclo A4 interchange will not be precluded by the Preliminary Design.

4.4.24 Nashville Road (at Highway 427)

The Preliminary Design includes new overpass structures to carry the ramps between Highway 413 and the Highway 427 Extension over Nashville Road. The cross-section of Nashville Road consists of one lane in each direction. Based on municipal feedback, AT elements are not provided for Nashville Road. The overpass structures will not preclude future widening of Nashville Road and inclusion of a 5.0m wide boulevard on each side to support AT.

The Project includes realignment of a Robinson Creek tributary east of Highway 427, and a new watercourse crossing is included to carry Nashville Road over the realigned creek.

4.4.25 King-Vaughan Road (at Highway 400)

The Preliminary Design includes realignment of King-Vaughan Road to the south, replacement of the existing underpass structure and one new underpass structure to carry King-Vaughan Road over Highway 400 and the Highway 413/Highway 400 interchange ramps. The cross-section of King-Vaughan Road consists of two lanes in each direction, with a MUP on each side.

The Region of York has indicated an interest in a potential future interchange at Highway 400 and King-Vaughan Road as part of a separate municipal project. Future widening of the King-Vaughan Road underpasses and inclusion of a full moves Parclo A4 interchange will not be precluded by Highway 413.

4.4.26 Kirby Road (at Highway 400)

The Preliminary Design includes widening of the existing overpass structure and a new overpass structure to carry the Highway 413/Highway 400 interchange ramps over Kirby Road. The existing two lane cross-section on Kirby Road is maintained. The new overpass structure will not preclude future widening of Kirby Road and inclusion of a 5.0 m wide boulevard to support AT.

4.5 Supporting Facilities

4.5.1 Carpool Parking Lots

Carpool parking lots with approximately 100 spaces are included in the Project within lands protected for proposed transitway stations. A review of MTO Central Region carpool parking lot data (2005-2019) and MTO directives was completed, and a typical carpool parking lot footprint was developed. The footprint can be located within the lands identified for the proposed transitway stations and can accommodate expansion for transit circulation and bus bay platforms. Carpool parking lots have been included at each of the following Highway 413 interchanges:

- Winston Churchill Boulevard;
- Bovaird Drive;
- Mayfield Road;
- Hurontario Street;
- Bramalea Road;
- Airport Road;
- The Gore Road;
- Humber Station Road;
- Highway 27; and
- Weston Road.

Provisions for electric vehicle (EV) charging stations at the carpool parking lots are not precluded by the Preliminary Design and can be incorporated as required at each location. The needs and requirements for EV charging stations can be assessed and incorporated in Detail Design. Initial considerations established during Preliminary Design are as follows:

- EV charging technology is rapidly evolving, and public charging equipment has a relatively short service life. It is recommended that site designs be completed during Detail Design and charging infrastructure be installed closer to the highway being operational to ensure the latest technology and standards can be incorporated.
- At a minimum, carpool parking lot sites should include ductwork to ensure simple installation of charging infrastructure.

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- Level 2 alternating current fast chargers have typically been preferred for carpool parking lots based on usership, with vehicles typically parked for several hours and not requiring faster, more expensive Level 3 direct current fast chargers. The exact configuration for each carpool parking lot should be assessed during the implementation stage.

At the Highway 27 interchange, the lands identified for the proposed transitway station south of Highway 413 present additional constraints with environmental features and access. Therefore, the carpool parking lot at Highway 27 is in the northeast quadrant of the interchange, opposite the westbound on and off ramp intersection, which is not within the proposed transitway station footprint. This alternate location avoids direct impact to environmental features, provides better access by aligning the access with the interchange ramp intersection, and only introduces minor additional property impacts.

A phased approach for construction will be considered for the proposed transitway stations at the carpool parking lots. The proposed transitway will be subject to a separate future assessment of environmental impacts (see **Section 4.6**).

4.5.2 Commercial Vehicle Inspection Facilities

Two new CVIFs are provided along Highway 413, one on the eastbound and one on the westbound sides, between Mississauga Road and Creditview Road. CVIF footprint sizing was developed based on a typical design configuration that was identified by MTO to be used across the highway network. Design for the CVIF layout and configuration will be completed in Detail Design.

4.5.3 Maintenance Facilities

Based on MTO's requirements for maintenance needs, and evaluation of alternate locations through the Project (see **Chapter 3**), the Preliminary Design includes two maintenance facilities, at the following locations (see **Appendix B**):

- Highway 413/Mayfield Road – Located in the northwest quadrant of the interchange between Highway 413 and realigned Heritage Road. Access to the maintenance yard is provided from Heritage Road.
- Highway 413/Weston Road – Located in the northeast quadrant of the interchange, with access from Weston Road opposite the Highway 413 westbound entrance ramp.

To accommodate for planned maintenance needs for the Project, and to protect for future expansion of the highway network, maintenance yard footprints are sized to meet a minimum size of 10 ha with a desirable size of 15 ha within the lands identified. Design of layout and access requirements for each site will be developed in Detail Design and will follow the MTO Maintenance Patrol Yard Design Guidelines.

4.6 Proposed Transitway

4.6.1 Overview

The Highway 413 ROW includes a 60 m wide corridor for a proposed transitway that will run parallel to Highway 413 to the east and south of the highway. The proposed transitway is for exclusive use of transit vehicles; it has been planned for bus rapid transit (BRT), but the Preliminary Design has considered future light rail transit (LRT) when supported by demand in the future. The proposed transitway has been developed to a conceptual level as part of the Highway 413 Preliminary Design, to confirm the feasibility of the alignment and profile, and identify conceptually feasible transit station locations. The proposed transitway and stations will be subject to a future planning study and assessment of environmental impacts, which will be undertaken closer to the time of the implementation of the proposed transitway.

The conceptual design for the proposed transitway is shown on the Preliminary Design Plans in **Appendix B**.

4.6.2 Horizontal Alignment

The alignment for the proposed transitway was developed in conjunction with the alignment of Highway 413, within a 60 m ROW to the east (between Highway 407 ETR and Mississauga Road) and south (between Mississauga Road and Weston Road) of Highway 413. The Preliminary Design also includes a corridor for a proposed transitway parallel to the west side of the Highway 427 Extension, for future connection to the Highway 427 transitway south of the Project. Connections to the Highway 407 Transitway south of the Highway 401 / Highway 407 ETR interchange have been considered in the development of the proposed transitway which includes conceptual horizontal and vertical alignments that would allow for feasible connections between both infrastructure projects.

The horizontal alignment of the proposed transitway meets the design parameters for BRT and LRT operations, including in station areas. The wider ROW is provided around interchange ramps and to facilitate crossings with the municipal roads. A narrower ROW is provided at some specific locations to minimize or avoid impacts on constraints within proximity to the ROW, with the proposed transitway alignment adjusted accordingly:

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- At Bovaird Drive, the proposed transitway alignment was shifted to the west to avoid an existing TC Energy pipeline corridor; and
- For the crossing of Mayfield Road west of Coleraine Drive, the alignment for the proposed transitway was brought closer to the Highway 413 lanes to avoid conflicting with the future Arterial Road A2 intersection with Mayfield Road, and the ROW reduced accordingly.

4.6.3 Vertical Alignment

The vertical alignment for the proposed transitway was also developed in conjunction with the alignment of Highway 413 and meets design requirements for both BRT and LRT operations, including in station areas.

In general, the proposed transitway alignment is at grade, following the general profile of Highway 413. Vertical curves are introduced into the vertical alignment for grade separated crossings at the municipal road crossing roads and interchanges, and through the Highway 413 interchanges with Highway 410 and Highway 427. At most municipal road interchange crossings, the profile has been developed such that the proposed transitway crosses over the arterial road on an overpass structure beyond the extents of the interchange ramp footprint. At other crossing roads without interchanges, the proposed transitway will cross over or under the crossing road on a structure, generally following the Highway 413 profile. At locations considered for proposed transitway stations, profiles were developed to ensure flatter grades can be achieved to accommodate station platforms.

4.6.4 Cross-Section

The cross-section of the proposed transitway (see **Figure 4-1**) was developed based on design standards for a two lane undivided rural roadway (one lane in each direction). The cross-section elements of the proposed transitway can be modified for LRT within the 60 m ROW based on the needs identified in the future assessment of environmental impacts.

A concept for an MUT to be incorporated into the ROW identified for the proposed transitway has been developed. The MUT would be accommodated along with the proposed transitway, and will potentially be explored with municipal partners in Detail Design (See **Section 4.2.3**).

4.6.5 Stations

Potential station locations were identified at key locations along the proposed Highway 413 transitway to provide connectivity with GO Transit and municipal transit services, as well as future growth areas (see **Section 2.6.5**). This process examined crossing roadways and interchanges to identify potential locations for proposed transitway stations, based on a qualitative assessment of proximity to planned or future transit services, higher-order transit corridors, population and employment areas, and environmental impacts. From this assessment, proposed transitway station locations include:

- Steeles Avenue;
- Winston Churchill Boulevard;
- Bovaird Drive;
- Mayfield Road;
- Highway 10/Hurontario Street;
- Bramalea Road;
- Airport Road;
- The Gore Road;
- Humber Station Road;
- Highway 50;
- Huntington Road;
- Highway 27;
- Weston Road; and
- Major Mackenzie Drive (in conjunction with the Highway 427 transitway).

The proposed transitway station footprints are shown on the Preliminary Design Plans in **Appendix B**.

Additionally, a potential transitway station was identified at the future Sandalwood Parkway extension in the City of Brampton. As the alignment for this municipal road extension has not been finalized, the proposed transitway station footprint has not been included as part of the conceptual design work for the proposed transitway. Furthermore, the City of Brampton has noted the potential for a future GO Train station within the Heritage Heights Secondary Plan Area, in the vicinity of Highway 413. Should a new GO Train station be implemented, opportunities to locate a proposed transitway station in this vicinity should also be considered. Therefore, further examination of station locations in this area will be required as part of the future assessment of

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environmental impacts for the proposed transitway, to identify additional lands for inclusion in the Highway 413 ROW.

At each location where a proposed transitway station has been identified, alternate station sites were developed and assessed. Typical station footprint sizes of approximately 5 ha were developed to accommodate access, parking, local bus interface, passenger waiting areas and other station amenities. Each station footprint was reviewed and assessed based on technical and environmental factors, and proposed station footprints were carried forward at a conceptual level to be included in the Preliminary Design as part of the ROW. As required, consideration for property availability and development impacts were reviewed in the layout of the station footprint size and location.

Confirmation of the proposed station locations, sizes and layouts will be completed as part of the future assessment of environmental impacts.

4.7 Right-of-Way and Property Requirements

The Highway 413 ROW includes the highway corridors (Highway 413, Highway 410 Extension, and Highway 427 Extension), interchanges, crossing roads, SWM ponds, watercourse realignments, carpool parking lots, maintenance facilities, CVIF, and the proposed transitway (including station footprints) which has been identified to a conceptual level of detail. A typical ROW width of 110 m for the highway corridors and 60 m for the proposed transitway has been developed for the Preliminary Design, with additional area as required to accommodate interchanges and other highway features.

Fencing will be installed along the new ROW.

Entrances along crossing roads may be impacted temporarily or permanently by the Project and were reviewed during Preliminary Design. At Landowner Meetings, impacts to property and access were discussed with relevant property owners. Construction Staging Plans will be developed in Detail Design to manage temporary impacts to access.

4.8 Traffic Operations

The traffic operations analysis of the Preliminary Design was completed through the development and application of the Highway 413 travel demand model to serve as input into the microsimulation analysis of future traffic conditions for a 2041 planning horizon year. Iterations of the operational analysis were completed based on an evolving design including lane geometry and traffic control configurations. That analysis supports the current Preliminary Design on the basis of the forecast 2041 peak period traffic volumes.

The travel demand model is a trip-based forecasting model that estimates travel demand and patterns in the GGH region. It models a detailed roadway network and an extensive and complex transit network, which includes commuter rail, subway, and several regional and municipal bus services. The travel demand modelling confirmed the recommendations for the number of mainline lanes for Highway 413 and Highway 427 and 410 Extensions, and generated the numerical input microsimulation analysis.

The development of the Preliminary Design for the Project required traffic microsimulation to assess future-forecasted traffic conditions and detailed roadway requirements. To ensure that the traffic microsimulation best reflects real-world conditions, the traffic microsimulation model was first developed for existing/base year conditions on the existing road network and calibrated to observed traffic data before its application for evaluating future conditions. Following the completion of the model calibration, the adjusted numerical outputs established by the analysis were carried forward to the modelling for the future planning horizon year of 2041.

Development of a 2041 microsimulation network model considered planned provincial and municipal road improvements within the limits of the modelled corridors, based on published municipal capital works programs and improvements identified in municipal Transportation Master Plans up to a 2041 design year. These included the introduction of Highway 413 and improvements to the connecting freeways as well as the arterial roads crossing Highway 413. Consultation with the municipalities confirmed the inclusion of these road improvements in the model.

The microsimulation models predict operational performance during the weekday morning and afternoon peak periods for the 2041 horizon year. Conditions were modelled for a three-hour morning peak period between 06:00 and 09:00 and a three-hour afternoon peak period between 15:00, and 18:00. A summary of the morning and afternoon peak hour volumes on Highway 413 is presented in **Table 4-1** below, including a breakdown of the total number and percentage of trucks through each segment. The baseline modelling reflects the cross-section developed in the Preliminary Design. Highway 413 mainline operating performance was also evaluated for level of service and weaving impacts.

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Table 4-1: 2041 Mainline Highway 413 Traffic Volumes

Highway 413 Segment	Direction	2041 AM Peak Hour			2041 PM Peak Hour		
		Total Vehicles	Total Trucks	Truck Percentage (%)	Total Vehicles	Total Trucks	Truck Percentage (%)
Highway 401 to Winston Churchill Boulevard	NB	3482	887	25%	3995	660	17%
	SB	4026	611	15%	3770	693	18%
Winston Churchill Boulevard to Bovaird Drive	NB	4102	893	22%	5441	738	14%
	SB	4894	651	13%	4584	791	17%
Bovaird Drive to Mayfield Road	NB	3358	705	21%	4101	595	15%
	SB	3958	574	15%	3770	670	18%
Mayfield Road to Chinguacousy Road	NB	3240	704	22%	3552	632	18%
	SB	3489	606	17%	3337	726	22%
Chinguacousy Road to Hurontario Street	NB	4206	900	21%	4089	771	19%
	SB	3795	764	20%	4280	906	21%
Hurontario Street to Hwy 410	EB	5092	1090	21%	4049	865	21%
	WB	3894	874	22%	4970	1037	21%
Highway 410 to Bramalea Road	EB	4590	1018	22%	4419	874	20%
	WB	4568	907	20%	4734	1033	22%
Bramalea Road to Airport Road	EB	4395	1006	23%	4500	970	22%
	WB	4101	1031	25%	4801	1102	23%
Airport Road to The Gore Road	EB	4265	965	23%	3817	906	24%
	WB	3907	1002	26%	4565	1080	24%
The Gore Road to Humber Station Road	EB	3860	928	24%	3520	870	25%
	WB	3580	972	27%	4286	1069	25%
Humber Station Road to Hwy 427	EB	4627	1074	23%	4547	982	22%
	WB	4608	1079	23%	5080	1149	23%
Highway 427 to Highway 27	EB	4069	1040	26%	4988	947	19%
	WB	5112	933	18%	4464	1039	23%
Highway 27 to Weston Rd	EB	3666	979	27%	4085	838	21%
	WB	4156	829	20%	4169	996	24%

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As part of the traffic modelling, a speed analysis was completed to confirm vehicle speeds on Highway 413 and identify critical areas of high congestion or poor traffic operations. From this analysis, the recommendation for an additional through lane (auxiliary lane) between ramps of adjacent interchanges was identified at the following locations:

- Northbound and Southbound between Winston Churchill Boulevard and Bovaird Drive; and
- Eastbound and Westbound between Highway 427 and Highway 27.

Other analysis included a review of the operational performance of ramp terminal intersections, confirming the traffic control treatment and identifying recommendations for the lane geometry and number of turn lanes carried forward into the Preliminary Design.

In general, the microsimulation traffic analysis predicted good level of service for the 2041 mainline operations of the planned six lane Highway 413 cross-section, with modelled operating speeds reflecting generally free-flow conditions.

4.9 Structures

Table 4-2 summarizes the new structural elements associated with the Project. Conventional bridges include underpass and overpass structures at interchanges and crossing roads, ramps and watercourses. Overpass structures including structures at the Highway 413 interchanges with Highway 401/Highway 407 ETR, Highway 410, Highway 427 and Highway 400 are listed separately as a result of higher complexity of design and construction. Similarly, major river structures at the Credit River and the Humber Rivers have been identified. For conventional overpass bridges at road, rail, and watercourse crossings, separate structures for eastbound and westbound lanes (twin structures) are identified as two structures in the count shown below.

Table 4-2: New Structural Elements

Structure Type	Number of Structures
Conventional Bridges (Underpass, Overpass, Ramps, Watercourses)	127
Highway 413 Interchanges with Highway 401/Highway 407 ETR, Highway 410, Highway 427 and Highway 400	36
Major River Structures (Credit River, Humber River – West, Main and East, two structures at each crossing)	8
Structural Culverts	63

As part of the Preliminary Design process, an assessment of watercourses crossing the ROW was undertaken to identify navigable waterways to be protected in accordance with the *Canadian Navigable Waters Act*. This included an assessment of the fluvial geomorphology criteria for each watercourse to confirm navigability.

As part of the Preliminary Design, input was sought from Indigenous communities and members of the public to confirm past, present, or potential future uses of waterways. One way feedback was collected was through a Navigable Waterways Survey. The Survey was open on the Project website for a 30-day comment period (July 2024 – August 2024) to gain feedback from Project stakeholders on the use of waterways within and in proximity to the ROW. In total, 57 public survey submissions were received via the Project website.

In addition to the online survey, MTO continues to consult with Indigenous communities.

In total, 20 watercourses that are potentially navigable, and an additional three watercourses that are possibly navigable, were identified and have been addressed in the Preliminary Design of the structures (see **Section 5.2.10**).

Opportunities to further avoid and/or minimize potential impacts to navigation will be addressed in Detail Design.

4.9.1 Major Structures

The Preliminary Design includes the four major river crossings at the Credit, West Humber, Main Humber and East Humber Rivers that required the consideration of alternative designs to address technical and environmental criteria. A comprehensive evaluation was conducted to identify the preferred structure type and arrangements, as described in **Section 3.5.3**. The recommendations are summarized in **Table 4-3.**

Table 4-3: Major Structures

Structure Location	Structure Summary
Credit River	■ Twin Seven - Span Constant Depth Steel Box Girders ■ 600 m long, 21.55 m wide bridges ■ 110 m longest span length ■ 3.3 m girder depth ■ 18 m approximate vertical clearance

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Structure Location	Structure Summary
West Humber River	■ Twin Three - Span Slab on Steel Girder Bridges ■ 312 m long, 20.8 - 22.7 m wide bridges ■ 131 m longest span length ■ Variable girder depth – 3.3 to 6.0 m ■ 18 m approximate vertical clearance
Main Humber River	■ Twin Segmental Concrete Box Girders (Westbound Spans) and Slab on Steel I Girders (Eastbound Spans) Bridges ■ 885 m and 895 m long, 21.55 m wide bridges ■ 200 m longest span length ■ Variable (westbound spans) and 3 m (eastbound spans) girder depth ■ 42 m approximate vertical clearance
East Humber River	■ Twin slab on Haunched Steel I Girder Bridges ■ 312 m long, 21.55 m wide bridges ■ 120 m longest span length ■ Variable girder depth – 3.75 to 5.0 m ■ 21 m approximate vertical clearance

4.9.2 Bridges

The Preliminary Design includes 163 conventional or interchange bridges at the various road, rail, ramp or watercourse crossings for the Project. Typical bridge designs include two or three span structures with piers located within the highway or crossing road median. Bridges separating two roads are described as overpasses (highway over crossing road) or underpasses (crossing road over highway).

All structures are designed to accommodate future widening of crossing roads based on approved municipal plans, and future widening of the highway.

Structure types (concrete or steel; girder or slab) vary throughout the Project depending on local conditions (for example, topography, geotechnical conditions, watercourse details) and environmental sensitivities. The structure types and arrangements will be further reviewed in Detail Design.

4.9.3 Culverts

The Project includes 63 structural culverts for certain creek and watercourse crossings. Hydrology and hydraulic modelling completed as part of the drainage and SWM analysis (see **Section 4.10**), as well as input from the fluvial geomorphology analysis and natural environment assessment for fish habitat and wildlife passage concerns at each watercourse (see **Chapter 5**), was used to develop culvert sizing and layout. Input from MTO and Conservation Authorities was also utilized in the development of the culvert designs.

Culvert upstream and downstream invert elevations were determined from the preliminary grading design and existing watercourse elevations. Culvert lengths and sizing were confirmed from technical requirements for the crossing, including highway profile and ditch grading, hydraulic requirements, fluvial geomorphology considerations, and environmental constraints. Hydraulic analysis will be further reviewed and refined in Detail Design.

4.9.4 Active Transportation

As described in **Section 4.2.3**, the Project includes provision for future MUPs on both sides of many crossing road structures, based on consultation with municipalities. Beyond the crossing road underpass structures and at overpasses at these locations, 5 m boulevards have been provided on each side of the municipal roads to support future AT connections to the MUPs.

As described in **Chapter 2**, the municipalities of Caledon and Brampton are converting the former Orangeville-Brampton Railway to a recreational trail. The Project includes a crossing of Highway 413 for this trail, located east of McLaughlin Road. The Preliminary Design for this crossing consists of a structural culvert, providing 5 m of horizontal clearance under the highway for the recreational trail. Other future trails proposed by the municipalities have not yet been developed beyond a conceptual level, and alignments for these trails have not been identified. These crossings are not included in the Preliminary Design; MTO will assist the municipalities once these plans are further developed to incorporate crossings of Highway 413 as part of their implementation plans.

As described in **Section 4.2.3**, a MUT is also being contemplated that would run parallel to Highway 413 within the proposed transitway ROW that would connect to local AT networks.

4.9.5 Noise Walls

Based on the Operational Noise Impact Assessment completed for this Project, further detailed in **Section 5.2.4**, a noise barrier is recommended on the east side of the Highway 427 extension at Major Mackenzie Drive. This noise barrier will be further developed in Detail Design.

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4.10 Drainage and Stormwater Management

4.10.1 Overview

The Preliminary Design includes drainage and SWM elements for all aspects of the Project. The hydrologic and hydraulic analyses undertaken to support the Preliminary Design is described in **Sections 2.3.6** and **2.6.6**. **Table 4-4** summarizes the drainage and SWM elements within each Conservation Authority:

Table 4-4: Drainage and Stormwater Management Elements

Item	CH	CVC	TRCA
New Culverts (Non-Structural) [(a)]	1	45	64
New Culverts (Structural) [(a)]	10	6	40
Culvert Extensions	9 (7 structural and 2 non-structural)	-	-
Bridges over Watercourses	1	3	49
Stormwater Management Ponds	6 (3 relocations/ modifications and 3 new)	11	42

(a) A structural culvert is a major structure designed to carry significant loads and requiring design to the Canadian Highway Bridge Design Code. Non-structural culverts are typically smaller, pre-fabricated culverts with spans less than 3.0m, that are not requiring structural engineering design.

4.10.2 Bridges and Culverts at Watercourse Crossings

For the design of the watercourse bridges and culverts for the Project, hydrologic and hydraulic modelling was undertaken in consultation with the Conservation Authorities. Following MTO's Highway Drainage Design Standards, the Preliminary Design of bridges and culverts is based on design flow return periods for 50 years for spans less than or equal to 6.0 m, and 100 years for spans greater than 6.0 m.

Other design criteria for watercourse crossing sizes include clearance, minimum culvert sizes, maximum flood depth at culverts, and fish passage through crossings. Culvert types and sizes were determined for each crossing based on the hydraulic design criteria.

In addition to the hydraulic modelling, fisheries/wildlife and fluvial geomorphologic input was used to determine culvert/bridge spans for each crossing. The final culvert and bridge sizes were then determined based on criteria from all disciplines, and the hydraulic model was re-run with the final culvert spans to assess overall hydraulic performance.

Watercourse realignments are provided at locations where the existing watercourse alignment is either severely misaligned with respect to the Project or where it is not feasible to construct crossing structures. The Preliminary Design for the channel realignments was developed with input from the fluvial geomorphology analysis and natural environment assessment. The watercourse alignments and grading for these realignments are shown on the Preliminary Design Plans in **Appendix B** and will be further developed in Detail Design.

4.10.3 Stormwater Management Ponds

SWM ponds are located based on hydraulic modelling and accommodation of adjacent creek outlets. Consideration was given to environmental features, property impacts, and future land use in the identification of pond locations. Pond design was based on MTO's Best Management Practice guidelines for SWM design and with input from Conservation Authorities.

There are 59 new, relocated, or modified SWM ponds located within the ROW. Of these, 28 have contributing drainage areas of approximately 10 ha or greater and will be designed as wet ponds, while the remaining 31 will be dry ponds. Wet ponds provide quality, quantity, and erosion control, while dry ponds focus on quantity and erosion control.

The wet ponds are designed to accommodate future highway expansion and include the following design characteristics:

- A permanent pool of water with bottom draw outlets;
- Extended detention volume, where water will be stored and gradually released through a controlled outlet;
- Flood storage volume to store water during larger storm events; and
- Landscaped areas around the pond.

Further assessment will be carried out in Detail Design for the pond outfalls to evaluate the erosion threshold of each watercourse, and to determine the need for pond liners.

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4.11 Illumination and Traffic Signals

The Preliminary Design includes illumination, where warranted, within the project limits. Highway illumination is included at interchanges within the project limits that are adjacent to existing continuous freeway illumination at Highway 401/407, Highway 410, Highway 427, and Highway 400. Confirmation of illumination warrants and lighting type, either conventional or high mast, will be confirmed during Detail Design.

The Preliminary Design includes new traffic signals at all interchange ramp terminal intersections. The existing traffic signals will be modified at the existing ramp terminal intersection on the east side of the Highway 427 / Major Mackenzie Drive interchange to accommodate the Highway 427 Extension and new ramps.

During Detail Design, the need for traffic signals at the new Cold Creek Road intersection with Highway 50, and at carpool parking lot and maintenance yard entrances from municipal roads will be assessed.

Traffic signals will be designed in accordance with the *Accessibility for Ontarians with Disabilities Act*, *2005* (AODA) and will include vehicle detection, Emergency Vehicle Pre-Emption and traffic signal interconnection.

4.12 Advanced Traffic Management Systems

ATMS are a network of electronic equipment to monitor and manage traffic conditions on MTO highways. This includes collection of real-time traffic data and conditions through road sensors and cameras, using this information to update variable message signs to notify drivers of travel times, congestion, and collision alerts. ATMS infrastructure for the Project includes:

- Installation of 38 new closed-circuit television (CCTV) sites for full video coverage of Highway 413 and the Highway 410 and Highway 427 Extensions. An additional three existing CCTV sites on Highway 401 and Highway 400 will be reinstated. Each CCTV site location includes a roadside unit to accommodate the future deployment of Connected and Autonomous Vehicles (CAV) subsystems.
- Installation of 34 new variable message signs (VMS) which includes 12 overhead signs and 22 roadside signs on Highway 413. The new signs will also be able to provide information for congestion management and travel times on surrounding highways.
- Installation of 51 new Bluetooth readers (BTR) to support travel time services, and reinstatement of three BTR on Highway 401.
- Installation of a new fiber optic communication subsystem along one side of Highway 413 and the Highway 410 and Highway 427 Extensions. Three 10G nodes will be installed along Highway 413 to support the backbone communication as well as one 10G node along Highway 401.
- Deployment of new power and field equipment to support the new ATMS systems, and upgrades, expansion and reinstatement of some existing communications, power and associated field infrastructure.
- Configuration of the traffic management system software to accommodate the new infrastructure.

4.13 Pavement Design

Geotechnical investigations were conducted throughout the ROW in support of the Preliminary Design of pavement for highways, interchange ramps, and crossing roads. The investigations consisted of drilling boreholes in existing pavements and along the alignment within the ROW where access was permitted, and laboratory testing of samples collected. The laboratory test of soil samples identified locations susceptible to frost heaving.

The Preliminary Design for pavements includes the depth of excavation, granular material and asphalt paving, for each roadway or ramp. Recommendations for pavement depth vary by location depending on geotechnical conditions and anticipated traffic volumes, though a typical pavement structure depth of 1.4 to 1.5 m is proposed for the mainline Highway 413, Highway 410, and Highway 427 lanes, 1.0 to 1.4 m for interchange ramp lanes, and 0.7 to 1.2 m for crossing roads. Locations identified as susceptible to frost heaving are recommended to be excavated and replaced with select subgrade material. Further geotechnical investigations and refinement of the pavement design will be completed in Detail Design.

4.14 Foundation Design

Geotechnical investigations were conducted at the bridge and structural culvert locations identified in the Preliminary Design to support the design of foundation elements. The investigations consisted of drilling boreholes at or near the anticipated foundation locations, where PTE was provided and where ecological and archaeological clearances were granted. In most cases, boreholes were drilled until bedrock was encountered. Enhanced investigations were completed at the Main and East Humber River bridge sites, where specialized equipment and access methods were required due to the size of the structural design elements, challenging terrain, and

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anticipated depth of bedrock based on available records. Laboratory testing was conducted on the samples collected.

For sites that could not be drilled due to environmental or access constraints, a desktop study of the geotechnical conditions was completed using available secondary source information.

The Preliminary Design for each structure incorporates the foundation elements determined through these investigations. Further geotechnical investigations and review of the foundation designs will be completed in Detail Design.

4.15 Utilities

A desktop review including consultation with utility companies was conducted to identify existing and planned utilities crossing the ROW and identify potential conflicts with the Preliminary Design. An impact matrix and composite plan was developed for the Preliminary Design and included the following utilities located within the ROW:

- Hydro One High Voltage and Distribution;
- TC Energy Pipelines;
- Enbridge Gas;
- Conventional Gas;
- Local Hydro;
- Local communications (Bell, Rogers, etc.); and
- Municipal services (watermain, sanitary sewer).

Conflicts with the Hydro One transmission corridor at the Highway 427 Extension and Highway 427 and 413 interchange were identified, including the need for relocation of two towers and raising of the transmission lines to meet vertical clearance requirements over the highway and ramps. Hydro One has completed a feasibility study for the necessary tower relocations and vertical adjustments to review design and construction along the Hydro corridor in advance of construction of Highway 413.

Further coordination with utility companies and municipalities will be ongoing throughout Detail Design to initiate relocations or identify protection measures for utilities in conflict with the Project.

4.16 Construction Staging and Traffic Management

The majority of construction activities for the Project will be carried out on new alignments, with minimal impact on existing roads and traffic movement. As discussed in **Section 3.5.6**, a Constructability Review was carried out, which included methods to provide access for materials, equipment and workers without impacting private property or environmentally sensitive areas, including at the major watercourse crossings at the Credit, West Humber, Main Humber and East Humber Rivers. Construction staging and access will be examined in more detail during Detail Design.

Construction will require careful management where municipal roads and property accesses are potentially impacted, including at interchanges and crossing roads.

Construction of such a large corridor would occur in phases and in consideration of design requirements, traffic (staging, detours and closures), adjacent municipal projects, stakeholder collaboration and consultation, utility relocations, permits, funding, etc.

4.16.1 Highway Interchanges

Preliminary staging schemes for construction of the Highway 413 interchanges with Highway 401 / Highway 407 ETR, Highway 410, Highway 427 and Highway 400 have been developed and were assessed as part of the Constructability Review. Construction of the Highway 410 and Highway 427 interchanges can largely be completed away from existing traffic. Construction will require complex traffic staging on Highway 401, Highway 407 ETR and Highway 400 to construct new structures and ramp connections at these interchanges, with temporary lane and ramp closures as required. Local staging will also be required for structures where ramps cross existing roads (for example, Ninth Line, Steeles Avenue, Heart Lake Road, Highway 50, King-Vaughan Road and Kirby Road). Staging plans for each location will be developed in Detail Design.

4.16.2 Arterial Interchanges

New arterial road interchange ramps will typically be constructed as part of Highway 413 construction. Construction of underpass (road over highway) structures may require temporary detours of the crossing roads. Overpass (highway over road) structures can typically be constructed over the existing roadways with minimal impacts. Temporary short-term lane closures may be required on the arterial road to complete ramp connections. Staging plans for each location will be developed in Detail Design, including plans for maintaining access to properties within the construction area.

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4.16.3 Crossing Roads

Similar to the construction of arterial road interchange structures, temporary detours may be required for underpass (road over highway) structures. Staging plans for each location will be developed in Detail Design, including plans for maintaining access to properties within the construction area.

4.17 Environmental Considerations

Throughout the development of the Preliminary Design, engineering and environmental requirements were considered and integrated. This includes avoiding or minimizing impacts to sensitive features in the ROW such as the Greenbelt Policy area, SAR, woodlots, PSWs, terrestrial and fish habitat and privately owned property. This iterative approach to refining the design included:

- Refinement of horizontal and vertical alignments, ramps and interchange configurations to reduce or avoid impacts on environmentally sensitive areas and adjacent property, including examining different interchange layouts to reduce impacts on the Greenbelt Policy area and examining a wide range of structure alternatives at major watercourse crossings to reduce impacts on SAR and sensitive aquatic and terrestrial habitat (these studies are described in **Section 3.5**);
- Considering structural design elements associated with openness ratio, hydrogeology, hydraulics, wildlife crossing and potential impacts as a result of construction;
- Steeper slopes (2:1 with guiderail) to minimize encroachment on environmentally sensitive areas, reduce culvert lengths and length of watercourse realignments; and
- Adjustments to SWM pond locations, sizes and connections to existing watercourses to minimize environmental impacts and align with Conservation Authority requirements, where feasible.

In addition to these design refinements, opportunities for mitigation and compensation have been considered. As shown on the Landscape Community Value Plans (CVP) (**Appendix C**), potential areas have been identified where environmental mitigation and/or compensation opportunities can be explored further. MTO will also consider environmental mitigation and/or compensation opportunities for properties requiring full acquisition where excess lands extend beyond the ROW. These opportunities will be evaluated and developed during Detail Design, in consultation with Indigenous communities and regulatory agencies, including members of the Bilateral Federal-Provincial Working Group.

Following the integration of engineering and environmental studies, impact assessment and the development of mitigation strategies to address any remaining impacts were carried out on the Preliminary Design Plans shown in **Appendix B**. The impact assessment process and mitigation strategies are discussed further in **Chapter 5**.

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5. Potential Environmental Impacts and Mitigation Measures of the Preliminary Design

In accordance with Section 5 of the *Highway 413 Act, 2024*, this section identifies the key environmental issues and potential impacts associated with the Project, along with the recommended mitigation measures to be implemented during the subsequent Detail Design and construction phases of the Project. Where applicable, specific commitments, such as environmental monitoring, have been identified and will be carried forward into the construction phase to verify the effectiveness of the mitigation measures developed and implemented for this Project.

The recommended mitigation measures and commitments identified through the development of the Preliminary Design and Project-specific assessments of environmental impacts phase of the Project are summarized in **Table 5-23** (refer to **Section 5.4**).

The environmental studies discussed in this section are based on the Preliminary Design described in **Chapter 4**. With the completion of Preliminary Design, the mitigation measures and commitments outlined in this draft EIAR prepared for this Project will be carried forward into the subsequent Detail Design phases. Consultation with regulatory agencies will also continue throughout the subsequent Project phases to obtain permits, approvals or authorizations, as required (refer to **Chapter 6**).

A note about provincial species at risk protections discussed in the following subsections:

The *Species Conservation Act, 2025* was enacted as part of Bill 5 (Protect Ontario by Unleashing our *Economy Act, 2025*), and should it come into force, would replace the *Endangered Species Act, 2007*. At the time of writing this draft EIAR, the *Endangered Species Act, 2007* is still in force. It is recommended that regulatory requirements be confirmed as the Project approaches implementation to verify if adjustments are required for the Project (e.g., confirmation of applicable legislation at the time permits are sought). **All references to the *Endangered Species Act, 2007* throughout this document have been marked with an asterisk to illustrate this point.** Additionally, "habitat", as described within this document, refers to that habitat as determined pursuant to the *Endangered Species Act, 2007* and, where applicable, Ontario Regulation 832/21, prior to June 5, 2025, when the *Protect Ontario by Unleashing our Economy Act, 2025* received Royal Assent.

5.1 Natural Environment

5.1.1 Fish and Fish Habitat

Based on the existing conditions identified in **Section 2.3.1**, the section below outlines the potential impacts identified in the fish and fish habitat assessment.

A total of 107 watercourses were identified along the highway corridor, including the Highway 410 and 427 extensions, as well as the associated interchanges and municipal road realignments. Many of these watercourses have multiple crossings of the highway corridor, which require careful design considerations to minimize impacts on fish and fish habitat. In total, there are 174 crossing locations encompassing 190 individual crossing structures proposed by the Preliminary Design.

The fish and fish habitat preliminary/ general assessment of the potential impacts and application of the MTO Fish Guide and notification/review requirements are subject to change pending more detailed assessments of the proposed work as the design progresses (beyond the Preliminary Design assessed for the Project). A detailed assessment of the proposed work, the potential impacts of the Project, avoidance, and mitigation measures, will follow the guidance provided in the MTO Fish Guide during Detail Design. Field investigations were done per the 2020 Fish Guide and future assessments will be per the 2025 Fish Guide (as amended).

The proposed crossing bridges/structures will be designed in a manner that can meet the criteria of MTO's Clear Span Bridges BMP (MTO, 2020a), and MTO's Drainage Design Standards (MTO, 2024), including, but not limited to, WC-7 Culvert Crossings, WC-8 Minimum Culvert Size, WC-10 Culvert Extensions, and WC-12: Fish Passage Through Culverts.

Descriptions of proposed works and potential preliminary impacts are provided below for the following activities:

- Works Associated with Stormwater Management Facilities;
- Crossings of Coldwater/Coolwater, Redside Dace Occupied / Recovery / Critical Habitat, Silver Shiner Critical Habitat;
- Crossings of Warmwater, Redside Dace Occupied / Recovery Habitat;
- Crossings of Warmwater, American Eel Habitat;
- Crossings of Coldwater, Redside Dace Contributing Habitat – Direct;
- Crossings of Coldwater, Redside Dace Contributing Habitat – Indirect;

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- Crossings of Coolwater, Redside Dace Contributing Habitat – Direct;
- Crossings of Warmwater, Redside Dace Contributing Habitat – Direct;
- Crossings of Warmwater, Redside Dace Contributing Habitat – Indirect;
- Crossings of Direct Warmwater Habitat;
- Crossings of Indirect Coldwater Habitat; and
- Crossings of Indirect Warmwater Habitat.

Works Associated with Stormwater Management Facilities

An interdisciplinary review of the proposed SWM facilities was undertaken by MTO to refine the positioning of the SWM facilities and proposed locations for each facility's outlet channel to a receiving watercourse. Environmental constraints were identified, and adjustments to the SWM facilities designs were made to avoid environmental features to the greatest extent possible. The details of the SWM facilities are still preliminary and further review will be completed as these details are refined during the Detail Design process, particularly for facilities where complete avoidance of environmental features was not possible (facilities where potential impact to fish and fish habitat and Species at Risk are possible).

The SWM facilities will be designed to meet the water quantity and quality standards for outputs to receiving watercourses. For those facilities that outlet to Redside Dace habitat, the design will meet the quantity and quality requirements from the BMP for SWM detailed in the Guidance for Development Activities in Redside Dace Protected Habitat (MNRF, 2016). The requirements from Best Management Practice (BMP) for discharge of water from SWM facilities into Redside Dace habitat are:

- Discharge should not exceed 25 mg/L of total suspended solids above the background stream level of total suspended solids;
- Discharge temperatures should be below 24°C and have dissolved oxygen concentrations of at least seven mg/L;
- Post-development water balance should match pre-development water balance to protect the natural hydrological functions; and
- The SWM facilities should be designed as hybrid extended detention wetlands/wet ponds to maximize absorption of nutrients and contaminants harmful to Redside Dace, including nitrates, phosphorous, and copper, and prevent them from entering streams.

Crossings of Coldwater/Coolwater, Redside Dace Occupied / Recovery / Critical Habitat, Silver Shiner Critical Habitat

The following ten sites and five watercourses (labelled as water crossing nomenclature – watercourse name) were assessed as Occupied Habitat or Recovery Habitat / Critical Habitat for Redside Dace or are upstream of Critical Habitat for Silver Shiner that are either coldwater/coolwater permanent or coldwater intermittent watercourses:

- SM_MB_SIM_0_E1 - Middle Sixteen Mile Creek;
- SM_MB_SIM_1_E1 - Middle Sixteen Mile Creek;
- SM_EB_SIM_0_E1 - East Sixteen Mile Creek;
- HU_WH_CAC_0_E1-E2 - Campbell's Cross Creek Main Branch;
- HU_EH_EHR_0_E1 - East Humber River Main Branch;
- HU_EH_EHR_0_E3 - East Humber River Main Branch;
- HU_EH_EHR_18_E1 - Tributary of Purpleville Creek 18; and
- HU_EH_EHR_18_E8-E9 - Tributary of Purpleville Creek 18.

Proposed Works

The watercourses and associated riparian vegetation within the meander belt width plus an additional 30 m buffer on either side of the meander belt width are considered habitat that supports this SAR and protected provincially and federally under the *Endangered Species Act, 2007** and *Species at Risk Act* legislation. Alteration to this habitat, such as vegetation removal or placement of permanent footprints within the regulated area has the potential to reduce the food supply of insects on which Redside Dace depend as food sources. These impacts could adversely affect the species, making works that remove Regulated Habitat / Critical Habitat in contravention of both the *Endangered Species Act, 2007** and *Species at Risk Act*.

There are no new proposed highway crossings at SM_MB_SIM_0_E1, SM_MB_SIM_1_E1, HU_EH_EHR_18_E1, HU_EH_EHR_18_E8-E9 and HU_EH_EHR_0_E3. Culvert extension works are proposed for the existing crossing at SM_EB_SIM_0_E1 and HU_EH_EHR_0_E3. The remaining sites have no crossing works proposed. However, adjacent works (e.g., grading, embankments) that could potentially impact habitat above the high-water mark at these culverts will be determined during Detail Design, and opportunities to avoid or minimize these impacts will be assessed at that time.

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The coldwater/coolwater thermal regime of these sites is important for Redside Dace and Silver Shiner (directly in Occupied Habitat / Critical Habitat and indirectly through support downstream) and other fish populations in these watercourses. Alteration to the water temperature, such as by untreated stormwater or highway surface runoff without suitable thermal mitigation measures, poses a potential impact to Redside Dace, Silver Shiner, and the fish community generally in these watercourses.

SM_EB_SIM_0_E1 - East Sixteen Mile Creek Main Branch requires an extension of the existing concrete box culvert at both the inlet and outlet to account for the wider highway cross section where the Highway 413 lanes merge into Highway 401. The outlet extension will also require a short realignment for the channel to tie the new culvert outlet location with the downstream channel section. For the Preliminary Design, the location of the channel realignment has been determined, confirming that channel length lost for the realignment can be replaced in the new location, and that the landscape can accommodate positive drainage for the new channel section. Detail Design considerations for the realignment will need to include replacing habitat elements that will support resident fish, designed using natural channel design principles to replace lost habitat features and functions.

As of the Preliminary Design completion, culvert extensions or replacements have not been considered for SM_MB_SIM_0_E1 - Middle Sixteen Mile Creek Main Branch. There are currently no works planned for this tributary; however, culvert works, bank armouring, or channel tie ins may be required to accommodate the merging of the Highway 413 ramps with the Highway 401. A detailed impact assessment of those proposed works will be carried out at that time, as required.

HU_WH_CAC_0_E1-E2 - Campbell's Cross Creek Main Branch and HU_EH_EHR_0_E1 - East Humber River Main Branch have been designed as large bridge crossings over the watercourses to minimize impacts from bridges in/adjacent to the wetted channel and within the meander belt width plus the 30 m protected habitat area, to the extent possible. This has resulted in relatively long bridges/structures that require piers, which could not be structurally avoided, within the valleys and the Redside Dace riparian habitat.

HU_EH_EHR_0_E3 – East Humber River Main Branch will have culvert extension works completed on the existing arch culvert crossing. Details regarding the culvert extension works will be developed during Detail Design, and opportunities to avoid or minimize these impacts will be assessed at that time.

HU_EH_EHR_18_E8, E9 - The tributary of Purpleville Creek 18 flows in a southerly direction at the Highway 413 interchange with Highway 400. There are no highway crossing works proposed for this watercourse along Redside Dace Occupied/Recovery Habitat; however, adjacent works (e.g., grading, embankments) will be developed during Detail Design, and opportunities to avoid or minimize these impacts will be assessed at that time. Although there are no crossing works proposed, there are still potential impacts to Redside Dace Critical Habitat because the Preliminary Design ROW overlaps with the meander belt plus 30 m Regulated Habitat / Critical Habitat limit.

All in-water works will follow the timing window permissions for Redside Dace and Silver Shiner watercourses between July 1 and September 15 of any given year. One channel realignment will be required at SM_EB_SIM_0_E1 - East Sixteen Mile Creek Main Branch. No channel realignments are proposed for the remaining five crossings, although minor channel tie ins will likely be required for the culvert crossings of the Tributary of Purpleville Creek 18 crossings.

Preliminary Impacts

From a *Fisheries Act* and fisheries protection perspective, MTO's Clear Span Bridge BMP (Interim Environmental Guide for Fisheries – BMP Manual, MTO, 2020a) is not applicable to the bridge crossings since these crossings support Redside Dace Occupied or Recovery Habitat/Critical Habitat and bridge piers will be required within the Regulated Habitat / Critical Habitat for this species. Consultation with the appropriate regulatory agencies will be required during Detail Design to determine the impacts to Regulated Habitat and if permitting will be required.

The proposed culvert extension and channel realignment works at SM_EB_SIM_0_E1 - East Sixteen Mile Creek Main Branch will result in impacts to fish habitat, in addition to potential indirect impacts to Silver Shiner Regulated Habitat/Critical Habitat downstream. Some impacts cannot be adequately addressed with standard mitigation measures, and as such will require consultation with the appropriate regulatory agencies during Detail Design.

The culvert extension works at HU_EH_EHR_0_E3 – East Humber River Main Branch will result in impacts to Redside Dace Regulated Habitat / Critical Habitat. Consultation with the appropriate regulatory agencies will be required during Detail Design to determine the impacts to Regulated Habitat/Critical Habitat and if permitting will be required.

HU_EH_EHR_18_E8-E9 - Tributary of Purpleville Creek 18 may also result in impacts to Redside Dace Regulated Habitat/Critical Habitat due to adjacent works (e.g., grading, embankments) that are to be determined at Detail Design. Any impacts within Redside Dace Regulated Habitat / Critical Habitat cannot be adequately addressed with mitigation measures alone, and as such will require review of the proposed works by the appropriate regulatory agencies to determine permitting needs.

It is anticipated that species at risk permitting will be required with associated offsetting plans required to compensate for the cumulative impacts to Redside Dace and, if deemed necessary, Silver Shiner in these watercourses.

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Crossings of Warmwater, Redside Dace Occupied / Recovery Habitat / Critical Habitat

The following five watercourses were assessed as Occupied Habitat or Recovery Habitat / Critical Habitat for Redside Dace that are either warmwater permanent or warmwater intermittent watercourses:

- CR_LC_LEV_0_E1 - Levi Creek Main Branch;
- HU_WH_TWH_2_E1 - Tributary of West Humber River 2;
- HU_WH_SAL_0_E1-E8 - Salt Creek Main Branch;
- HU_WH_WHR_0_E1 - West Humber River Main Branch; and
- HU_WH_WHR_0_E2 - West Humber River Main Branch.

These five watercourses provide direct fish habitat within the highway corridor and are considered to support Occupied or Recovery Habitat / Critical Habitat for Redside Dace. Therefore, the watercourses and all associated riparian vegetation within the meander belt width plus an additional 30 m vegetated buffer are protected as Redside Dace habitat. Alteration to this habitat, such as vegetation removal or placement of permanent footprints within the protected area, has potential to reduce the food supply of insects on which Redside Dace depend and adversely affect the species in contravention of the provincial *Endangered Species Act, 2007** and federal *Species at Risk Act*.

Proposed Works

The CR_LC_LEV_0_E1 - Levi Creek Main Branch has been designed as a large bridge crossing to minimize impacts within the meander belt plus 30 m buffers to the extent possible. However, piers will have to be constructed within Redside Dace Regulated Habitat / Critical Habitat.

The existing location of HU_WH_SAL_0_E1-E8 - Salt Creek Main Branch meanders through the middle of the proposed Highway 413 interchange with Airport Road. To avoid impacts to Redside Dace, the proposed bridge would need to be designed to span the entire Redside Dace Regulated Habitat / Critical Habitat, and this would have required a number of large over-lapping bridges throughout the interchange that could not be constructed. As such, a channel realignment is proposed to relocate the channel to the west of its existing location, requiring only one crossing for the main Highway 413 corridor. For the Preliminary Design, the location of the channel realignment has been determined, confirming that channel length lost for the realignment can be replaced in the new location, and that the landscape can accommodate positive drainage and SWM for the new channel section. Detail Design considerations for the realignment will need to include replacing habitat elements that will support Redside Dace, designed using natural channel design principles to replace lost habitat features and functions.

Flows for Salt Creek Tributary 4 will be intercepted upstream of site HU_WH_SAL_4_E1-E2 at the existing outlet into the main branch of Salt Creek (HU_WH_SAL_0_E1-E8) to a new outlet location near site HU_WH_SAL_4_E3 as part of the realignment plans. Realignment and lengthening of Salt Creek Tributary 5 (HU_WH_SAL_5_E1) will also be required, with a new crossing bridge/structure installed under Airport Road to convey the feature towards its new outlet location into the newly realigned channel of Salt Creek main branch.

All in-water works will follow the permissible in-water timing window for Redside Dace watercourses; works will be allowed between July 1 and September 15 of any given year.

Preliminary Impacts

From a *Fisheries Act* and fisheries protection perspective, MTO's Clear Span Bridge BMP will not be applicable at CR_LC_LEV_0_E1 - Levi Creek Main Branch as bridge piers may be required within the Regulated Habitat / Critical Habitat for this species, and BMPs and recommended mitigation measures alone will not address concerns for impact to this aquatic SAR. As such, consultation and engagement with the appropriate regulatory agencies will be required during Detail Design to determine the impacts to Regulated Habitat / Critical Habitat and if permitting will be required.

The culvert crossings of HU_WH_SAL_0_E1-E8 - Salt Creek Main Branch will also result in impacts to Redside Dace Regulated Habitat / Critical Habitat, as well as other potential impacts on the fish and fish habitat associated with the significant realignment of the channel to allow for construction of the Highway 413/Airport Road interchange. These impacts cannot be adequately addressed with mitigation measures alone, and as such will require review of the proposed works by MECP and DFO during Detail Design to determine permitting needs.

Although further consultation with regulatory agencies will be required, based on the current designs, it is anticipated that permitting will be required for both the *Species at Risk Act* as well as the *Endangered Species Act, 2007** for both of these watercourses, with associated overall benefit and offsetting plans required to compensate for the cumulative impacts to Redside Dace habitat in these watercourses. A *Fisheries Act* authorization will likely be required for the realignment of the main branch of Salt Creek.

Crossings of Warmwater, American Eel Habitat

One warmwater permanent watercourse was assessed as supporting American Eel habitat within the Highway 413 Corridor - CR_NP_CRR_0_E1 - Credit River Main Branch. There are no recent records of eel in the publicly available datasets managed by MNR and MECP.

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American Eels receive species and general habitat protection provincially. Alteration to this habitat, such as invasive species and pollution inputs, has potential to impact habitat that supports feeding and rearing. Direct impacts to these habitats may require a permit by MECP under the *Endangered Species Act, 2007*.*

In addition, this watercourse functions as spawning habitat for salmonid species, with confirmed observations of salmonid redds. Alteration to this habitat, such as pollution inputs, has potential to impact habitat that supports spawning for salmonids.

Proposed Works

For Preliminary Design, the CR_NP_CRR_0_E1 - Credit River Main Branch crossing has been designed as a large bridge crossing that spans the meander belt and 100-yr migration rate. All in-water works will follow the timing window permissions for watercourses with migratory salmonids; allowed between July 1 and September 15 of any given year unless otherwise specified by regulatory agencies for American Eel migration. Additional design considerations such as placement of the bridge piers/abutments, deck drainage and SWM outlets and grading will be investigated further during Detail Design to minimize impacts on the valley and fish habitat to the extent feasible.

Preliminary Impacts

From a *Fisheries Act* and fisheries protection perspective, MTO's Clear Span Bridge BMP may be applicable to the bridge crossing of CR_NP_CRR_0_E1 - Credit River Main Branch, depending on whether access areas, bank works or scour protection is deemed required during Detail Design. However, since this crossing supports American Eel Habitat, the BMP and recommended mitigation measures alone may not address concerns for impacts to this aquatic SAR. As such, consultation and engagement with the MECP will be required during Detail Design to determine if the impacts to American Eel Habitat will require permitting.

Crossings of Coldwater, Redside Dace Contributing Habitat – Direct

The following four watercourses were assessed as Contributing Habitat for Redside Dace that are direct fish habitat either coldwater permanent or coldwater intermittent watercourses:

- HU_WH_CAC_0_E4 - Campbell's Cross Creek Main Branch;
- HU_EH_EHR_12_E1-E2 - East Humber River Tributary 12;
- HU_EH_EHR_17_E2-E3 - East Humber River Tributary 17; and
- HU_EH_EHR_21_E1 - East Humber River Tributary 21.

These four watercourses provide direct fish habitat and thus any proposed in-water work or associated near water work for the crossings of these watercourses has the potential to effect fish and fish habitat. These sites are also classified as Redside Dace Contributing Habitat and are required to maintain conveyance of flows and nutrients by these watercourses to downstream Redside Dace Occupied or Recovery Habitat. Alteration to the form or function of these watercourses poses a potential impact to Redside Dace Regulated Habitat in the receiving watercourses downstream.

The coldwater thermal regime of these sites is important for Redside Dace (indirectly through support downstream) and other fish populations in these watercourses. Alteration to the water temperature, such as by untreated stormwater or highway surface runoff without suitable thermal mitigation measures, poses a potential impact to Redside Dace and the fish community generally in these watercourses.

Proposed Works

The HU_WH_CAC_0_E4 - Campbell's Cross Creek Main Branch has been designed as a bridge crossing that spans the bankfull width of the channel to minimize impacts on fish and fish habitat, to maintain fish passage and migration throughout the year.

A channel realignment will also be required. As part of the development of the Preliminary Design, the location of the channel realignment has been determined, confirming that channel length lost for the realignment can be replaced in the new location, and that the landscape can accommodate positive drainage and SWM for the new channel section. Detail Design considerations for the realignment will need to include replacing habitat elements that will support Redside Dace, designed using natural channel design principles to replace lost habitat features and functions.

HU_EH_EHR_12_E1-E2 - East Humber River Tributary 12 and HU_EH_EHR_17_E2-E3 - East Humber River Tributary 17 will have four circular culverts and three concrete box culverts that have been designed to span the wetted and bankfull width of the channel.

A culvert extension will be completed at the existing crossing at HU_EH_EHR_21_E1 - East Humber River Tributary 21 to accommodate highway works.

All in-water works will follow the timing window permissions for Redside Dace watercourses – works will be allowed between July 1 and September 15 of any given year.

Preliminary Impacts

MTO's Clear Span Bridge BMP will not apply to the bridge crossing of HU_WH_CAC_0_E4 - Campbell's Cross Creek Main Branch due to a channel realignment proposed in the Preliminary Design. Application of the BMP cannot occur on works that include encroachment or channel

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realignment works within the wetted channel. In such a case, review by DFO under the *Fisheries Act* would be required during Detail Design.

As this crossing also supports Redside Dace Contributing Habitat, consultation and engagement with MECP will be required during Detail Design to determine if the impacts to Regulated Habitat will require permitting under the *Endangered Species Act, 2007**. Contributing Habitat is not included in the definition of Redside Dace Critical Habitat and therefore, is not afforded protection under the *Species at Risk Act*.

The culvert crossings of the East Humber River Tributaries will also result in impacts to Redside Dace Contributing Habitat, as well as other potential impacts on the fish and fish habitat associated with the enclosure of the channel within culvert structures. These impacts may not be adequately addressed with mitigation measures alone, and as such may require review of the proposed works by DFO during Detail Design to determine permitting needs under the *Fisheries Act*.

Although it cannot be confirmed yet whether a permit will be required under the *Endangered Species Act, 2007**, it is assumed that a permit under the *Fisheries Act* will be required for the channel realignment at HU_WH_CAC_0_E4 - Campbell's Cross Creek Main Branch.

Further details and impact assessment will be required during Detail Design to determine permitting requirements for these crossings.

Crossings of Coldwater, Redside Dace Contributing Habitat – Indirect

The following four watercourses were assessed as Contributing Habitat for Redside Dace that were determined to support fish only indirectly:

- CR_HC_HUT_0_E1 - Huttonville Creek Main Branch;
- CR_HC_HUT_5_E1 - Tributary of Huttonville Creek 5;
- CR_HC_HUT_6_E1 - Tributary of Huttonville Creek 6; and
- HU_EH_EHR_18_E2-E4, E7 - Tributary of the East Humber River 18.

These sites are classified as Redside Dace Contributing Habitat and are regulated such that the conveyance of flows and nutrients by these watercourses to downstream Redside Dace Occupied or Recovery Habitat must be maintained. Alteration to the form or function of these watercourses poses a potential impact to downstream Redside Dace Regulated Habitat.

The coldwater thermal regime of these sites is important for Redside Dace (indirectly through support downstream). Alteration to the water temperature, such as by untreated stormwater or highway surface runoff without suitable thermal mitigation measures, poses a potential impact to Redside Dace and the fish community generally in the receiving watercourses downstream.

Proposed Works

The tributary of the East Humber River 18 (sites HU_EH_EHR_18_E2-E4 and E7) is being spanned by three bridges that have been designed to span the bankfull width of the watercourse. Works for this tributary also include works to existing culverts at the Highway 400.

CR_HC_HUT_5_E1 - Tributary of Huttonville Creek 5 and CR_HC_HUT_6_E1 - Tributary of Huttonville Creek 6 will be conveyed by four circular culverts and one concrete box culvert; all designed to span the wetted and bankfull width of the channel.

No channel realignments are required for these watercourses, but minor channel tie in works are assumed for the culverts. At Detail Design, these tie ins will be designed following MTO's Drainage Design Standards for water crossings to ensure that their conveyance function continues to support Redside Dace indirectly.

All in-water works will follow the timing window permissions for Redside Dace watercourses – works will be allowed between July 1 and September 15 of any given year.

Preliminary Impacts

All four watercourses support fish only indirectly through conveyance of seasonal flow, nutrients, and allochthonous inputs to the recovery and occupied Redside Dace habitat beyond the Highway 413 Corridor. These indirect tributaries are still defined under the *Fisheries Act* as fish habitat, therefore impacts to them will still need to be considered and assessed as they would for direct fish habitat. Realignments of indirect fish habitat also require a review by DFO as they may result in a HADD requiring authorization. Works to these indirect features would also still require review by MECP given their classification of Contributing Habitat for Redside Dace; there may be some elevated concern for the design of the crossings here to ensure that the contributing function of the features is maintained post construction. Agency consultation and engagement during Detail Design will determine if there are any additional design considerations or permitting needs for works on these four watercourses.

Crossings of Coolwater, Redside Dace Contributing Habitat – Direct

Three watercourses and three sites within the Fish and Fish Habitat Study Area were assessed as supporting coolwater fish habitat that is also classified as Contributing Habitat for Redside Dace:

- HU_EH_EHR_1_E1 - Tributary of East Humber River 1-1;
- HU_EH_EHR_1_E2 – Tributary of East Humber River 1-2; and

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- HU_EH_EHR_1_E3 – Tributary of East Humber River 1-3.

The Tributary of the East Humber River 1 provides direct fish habitat and Redside Dace Contributing Habitat, thus any proposed in-water work or associated near water work for the crossings of this watercourse has the potential to effect fish and fish habitat. The tributary functions as conveyance of flows and nutrients to downstream Redside Dace Occupied or Recovery Habitat that must be maintained in the crossing designs, as alteration to the form or function of this watercourse poses a potential impact to Redside Dace Regulated Habitat.

The coolwater thermal regime of this watercourse is important for Redside Dace downstream and other fish populations in the feature. Alteration to the water temperature, such as by untreated stormwater or highway surface runoff without suitable thermal mitigation measures, poses a potential impact to the fish community in these watercourses.

Proposed Works

This tributary of East Humber River 1 is being crossed by seven bridges that have been sized to span the bankfull widths of the individual reaches to minimize impacts on fish and fish habitat. Although there are a number of crossings required for this watercourse, channel realignments are not currently being proposed to minimize the crossing numbers.

All in-water works will follow the timing window permissions for Redside Dace watercourses – works will be allowed between July 1 and September 15 of any given year.

Preliminary Impacts

MTO's Clear Span Bridge BMP may be applicable to the bridge crossings of HU_EH_EHR_1_E1-E3 - Tributary of East Humber River 1 provided that the bridge approaches, abutments, footings and armouring can remain outside of the high-water mark of the channel, and realignments between the bridges are not required. Although the tributary supports Contributing Habitat for Redside Dace, only the channel of watercourse itself is provincially regulated (i.e., spanning the meander belt width and 30 m vegetated buffer is not required), and it does not receive protections under the *Species at Risk Act*.

Works to these watercourses would require review by MECP given their classification of Contributing Habitat for Redside Dace; there may be some elevated concern for the design of the crossings here to ensure that the contributing function of the features is maintained post construction. Agency consultation and engagement during Detail Design will determine if there are any additional design considerations or permitting needs for works on these three watercourses.

Crossings of Warmwater, Redside Dace Contributing Habitat – Direct

One watercourse was assessed as Contributing Habitat for Redside Dace with direct fish habitat and an ephemeral/intermittent flow regime:

- HU_WH_SAL_5_E1 - Tributary of Salt Creek 5.

This watercourse is Redside Dace Contributing Habitat and is regulated such that the conveyance of flows and nutrients by the watercourse to downstream Redside Dace Occupied or Recovery Habitat must be maintained. Alteration to this habitat, such as vegetation removal or placement of permanent footprints within the protected area, has potential to reduce the food supply of insects on which Redside Dace depend and adversely affect the species in the receiving watercourse downstream.

Proposed Works

The Highway 413 Corridor does not require a crossing of this watercourse, however a channel realignment of the feature is required to maintain the contributing function of this watercourse to the Redside Dace Occupied Habitat in the realigned section of the Salt Creek Main Branch (HU_WH_SAL_0_E1-E8 - Salt Creek Main Branch). The realignment will relocate the outlet of this feature to the west of Airport Road, requiring a culvert crossing under Airport Road.

For the Preliminary Design, the location of the channel realignment has been determined, confirming that channel length lost for the realignment can be replaced in the new location, and that the landscape can accommodate positive drainage and SWM for the new channel section. Detail Design considerations for the realignment will need to include replacing habitat elements that will maintain the conveyance function of the habitat for Redside Dace Recovery and Occupied Habitat downstream. The design will incorporate natural channel design principles to replace lost habitat features and functions.

Preliminary Impacts

Generally, channel realignments of this magnitude are likely to require further review by DFO under the *Fisheries Act* to determine if the works would result in a HADD of fish habitat that would impact the use of that habitat by the resident species for the life cycle functions it supports. Given that this watercourse also provides Redside Dace Contributing Habitat to the main branch of Salt Creek, the MECP may also want to review the works as it relates to impacts on the function of this Contributing Habitat.

Although it cannot be confirmed yet whether a permit will be required under the *Endangered Species Act, 2007**, it is assumed that a permit under the *Fisheries Act* will be required for the extensive channel realignment required for this watercourse.

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Crossings of Warmwater, Redside Dace Contributing Habitat – Indirect

The following three watercourses were assessed as Contributing Habitat for Redside Dace that only support fish indirectly as warmwater permanent or warmwater intermittent watercourses with no direct fish use:

- CR_LC_LEV_0_E3 - Tributary of Levi Creek Main Branch 2;
- CR_LC_LEV_0_E4 - Tributary of Levi Creek Main Branch 3; and
- HU_WH_SAL_4_E1-E3 - Tributary of Salt Creek 4.

These sites are Redside Dace Contributing Habitat and are regulated such that the conveyance of flows and nutrients by these watercourses to downstream Redside Dace Occupied or Recovery Habitat must be maintained. Alteration to the form or function of these watercourses poses a potential impact to downstream Redside Dace Regulated Habitat.

Proposed Works

CR_LC_LEV_0_E3 - Tributary of Levi Creek Main Branch 2 will have one circular culvert that will be designed to span the wetted and bankfull width of the channel to ensure that conveyance of the flow, nutrients and allochthonous inputs to the main Brach of Levi Creek is being maintained.

As of the Preliminary Design completion, a crossing to convey CR_LC_LEV_0_E4 - Tributary of Levi Creek Main Branch 3 under the Highway 413 Corridor was not considered as the hydraulic requirements, and drainage/SWM area were small enough that the seasonal flows would be captured by the highway roadside drainage and SWM ditches. During Detail Design, agency consultation and engagement will be required to determine if the conveyance function of this feature requires its own crossing under Highway 413, or if flow re-direction to the highway ditch line and outlet to Levi Creek would be sufficient to address agency concerns for this tributary. These works would result in a HADD as the existing channel would be destroyed and realigned into the ditch lines.

The existing location of HU_WH_SAL_4_E1-E3 - Tributary of Salt Creek 4 will be impacted by the relocation of HU_WH_SAL_0_E1-E8 - Salt Creek Main Branch to the west of Airport Road. The preliminary realignment design will capture flows from HU_WH_SAL_4_E1-E3 - Tributary of Salt Creek 4 approximately 300 m upstream of its existing outlet location, and upstream of the Highway 413 and Airport Road interchange. As such, a crossing of this drainage and SWM feature will not be required for the highway, but the contributing function of the feature will be intercepted by the realigned main branch of Salt Creek upstream of the highway corridor.

All in-water works will follow the timing window permissions for Redside Dace watercourses – works will be allowed between July 1 and September 15 of any given year.

Preliminary Impacts

All three watercourses support fish only indirectly through conveyance of seasonal flow, nutrients and allochthonous inputs to the recovery and occupied Redside Dace habitat beyond the Highway 413 Corridor. These indirect tributaries are still defined under the *Fisheries Act* as fish habitat, therefore impacts to them will still need to be considered and assessed as they would for direct fish habitat. Realignments of indirect fish habitat also require a review by DFO as they may result in a HADD requiring authorization. Works to these indirect features would also still require review by MECP given their classification of Contributing Habitat for Redside Dace; there may be some elevated concern for the design of the crossings here to ensure that the contributing function of the features is maintained post construction. Agency consultation and engagement during Detail Design will determine if there are any additional design considerations or permitting needs for works on these three watercourses.

Crossings of Direct Warmwater Habitat

The following 38 watercourses were assessed as supporting direct fish habitat within either warmwater permanent or warmwater intermittent watercourses:

- SM_EB_SIM_2_E2 - Tributary of East Sixteen Mile Creek 2;
- SM_EB_SIM_4_E4 - Tributary of East Sixteen Mile Creek 4;
- CR_MC_MUL_8_E1 - Tributary of Mullet Creek 8;
- CR_LC_LEV_2_E1 - Tributary of Levi Creek 2;
- CR_NP_CRR_6_E1 - Tributary of Credit River 6;
- CR_NP_CRR_13_E2 - Tributary of Credit River 13;
- EC_EH_ETW_0_E0 - Etobicoke Creek West Main Branch;
- EC_EH_ETW_12_E1 - Etobicoke Creek West Tributary 12;
- EC_EH_ETW_9_E1-E2 - Etobicoke Creek West Tributary 9;
- EC_EH_ETW_7_E6 - Etobicoke Creek West Tributary 7;
- EC_EH_ETW_7_E5 - Etobicoke Creek West Tributary 7;
- EC_EH_ETW_7_E4 - Etobicoke Creek West Tributary 7;

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- EC_EH_ETW_7_E3 - Etobicoke Creek West Tributary 7;
- EC_EH_ETW_7_E1-E2 - Etobicoke Creek West Tributary 7;
- EC_EH_ETW_6_E7 - Etobicoke Creek West Tributary 6;
- EC_EH_ETW_6_E6 - Etobicoke Creek West Tributary 6;
- EC_EH_ETW_1_E6 - Etobicoke Creek West Tributary 1;
- EC_EH_ETW_1_E9 - Etobicoke Creek West Tributary 1;
- EC_EH_ETW_1_E11-E13 - Etobicoke Creek West Tributary 1;
- EC_EH_ETW_1_E16-E19 - Etobicoke Creek West Tributary 1;
- EC_EH_ETW_1_E26-E28 - Etobicoke Creek West Tributary 1;
- EC_SC_ETE_1_E1-E4 - Etobicoke Creek East Tributary 1;
- HU_WH_SAL_3_E1-E2 - Salt Creek Tributary 3;
- HU_WH_WHR_1_E4 - West Humber River Tributary 1;
- HU_WH_WHR_3_E1 - West Humber River Tributary 3;
- HU_WH_GRT_0_E1-E2 - Gore Road Tributary Main Branch;
- HU_WH_CDT_2_E2 - Clarkway Drive Tributary 2;
- HU_WH_CDT_0_E1-E3 - Clarkway Drive Tributary Main Branch;
- HU_MH_RAI_1_E5-E6 - Rainbow Creek Tributary 1;
- HU_MH_RAI_1_E1-E4 - Rainbow Creek Tributary 1;
- HU_MH_ROB_0_E1-E4 - Tributary of Robinson Creek Main Branch;
- HU_MH_ROB_4_E1 - Tributary of Robinson Creek 4;
- HU_MH_ROB_7_E1-E3 - Tributary of Robinson Creek 7;
- HU_MH_ROB_8_E1 - Tributary of Robinson Creek 8;
- HU_MH_ROB_9_E1 - Tributary of Robinson Creek 9;
- HU_MH_ROB_6_E2 - Tributary of Robinson Creek 6;
- HU_MH_MHR_0_E4 - Humber River Main Branch; and
- HU_MH_MHR_3_E3 - Tributary of the Humber River 3.

All of these watercourses provide direct fish habitat and thus any proposed in-water work or associated near water work for the crossings of these watercourses has the potential to affect fish and fish habitat.

Proposed Works

The following reaches are being crossed by culverts that have been sized to span the bankfull widths of the associated reaches to minimize impacts of the crossings on fish and fish habitat. During Detail Design, additional design considerations from MTO's water crossing Design Standard, standard construction mitigation measures can be applied, and Erosion and Sediment Control measures are designed for site specific features:

- SM_EB_SIM_2_E2 - Tributary of East Sixteen Mile Creek 2 will have one circular culvert at the highway crossing.
- CR_MC_MUL_8_E1 - Tributary of Mullet Creek 8 and CR_LC_LEV_2_E1 - Tributary of Levi Creek 2 will each be crossed by one concrete box culvert at the highway crossing.
- CR_NP_CRR_6_E1 - Tributary of Credit River 6 will have two circular culverts one for the eastbound lanes and one for the westbound lanes.
- CR_NP_CRR_13_E2 - Tributary of Credit River 13 will be crossed by have two box culverts, one for the proposed Heritage Road realignment at Wanless, and a second at the Wanless Road and Highway 413 interchange.
- EC_EH_ETW_0_E0 - Etobicoke Creek West Main Branch will by crossed by one concrete box culvert.
- EC_EH_ETW_12_E1 - Etobicoke Creek West Tributary 12 will be crossed with two bridges that will span the bankfull width of the channel.
- EC_EH_ETW_7 - Etobicoke Creek West Tributary 7 will have one bridge crossing that spans the width of both east and westbound lanes, and two concrete box culverts that also span the width of both east and westbound lanes.
- EC_EH_ETW_6- Etobicoke Creek West Tributary 6 will have a total of four bridge crossings associated with the eastbound lanes, the westbound lanes, as well as both the Chinguacousy Road onramp to Highway 413, and the Chinguacousy Road exit ramp.

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- EC_EH_ETW_1 - Etobicoke Creek West Tributary 1 will have as total of five bridge crossings associated with the east and westbound lanes from west of McLaughlin Road to east of Hurontario Street.
- HU_WH_SAL_3_E1-E2 - Salt Creek Tributary 3 will be crossed by one bridge crossing associated with the eastbound and westbound lanes.
- HU_WH_WHR_1_E4 - West Humber River Tributary 1 will be crossed by one bridge spanning the width of both the east and eastbound lanes.
- HU_WH_GRT_0_E1-E2 - Gore Road Tributary Main Branch will be crossed by two bridge crossings that each span the eastbound and westbound highway lanes.
- HU_WH_CDT_2_E1-E2 - Clarkway Drive Tributary 2 will have two structural concrete box culverts for the eastbound lanes and Humber Station Road onramp and the westbound lanes and Humber Station Road offramp.
- HU_WH_CDT_0_E1-E3 - Clarkway Drive Tributary Main Branch will have two bridge crossings associated with the eastbound lanes and the westbound lanes.
- HU_MH_RAI_1 - Rainbow Creek Tributary 1 will have two circular culverts associated with the eastbound and westbound lanes.
- HU_MH_ROB_0_E1-E4 - Tributary of Robinson Creek Main Branch will have six bridge crossings associated with the north and southbound lanes of the Highway 427 extension, the east and westbound lanes of the Highway 413 mainline, and the on and off ramps for the Highway 413 and Highway 427 interchange. HU_MH_ROB_4_E1 - Tributary of Robinson Creek 4 will have three bridge crossings associated with one long bridge spanning the east and westbound lanes of the main highway and two shorter bridges for the north and southbound lanes of the Highway 413 and Highway 427 interchange.
- HU_MH_ROB_7_E1-E3 - Tributary of Robinson Creek 7 will have seven bridge crossings associated with the two separate crossing locations (each consisting of one eastbound lane bridge and one westbound lane bridge) for the main highway corridor (ROB_7_1_1 and ROB_7_2_1, total of four bridges and four separate bridges associated with the on and off ramps on the Highway 427 interchange for both ROB_7_1_1 and ROB_7_2_1.
- HU_MH_ROB_8_E1 - Tributary of Robinson Creek 8 will have two concrete box culverts crossing the north and southbound lanes of the Highway 427 extension.
- HU_MH_MHR_0_E4 - Humber River Main Branch crossing will be designed as large separate bridge crossings – one for the eastbound lanes and one for the westbound lanes - that span from top of valley to top of valley, although given the size of the spans required for the valley widths, piers have had to be sited in the valley floor for these crossings.
- HU_MH_MHR_3_E3 - Tributary of the Humber River 3 will have one long concrete box culvert that will span the length of both the east and westbound lanes.

Channel realignments will be required at EC_EH_ETW_12_E1 - Etobicoke Creek West Tributary 12, EC_EH_ETW_7 - Etobicoke Creek West Tributary 7, EC_EH_ETW_6 - Etobicoke Creek West Tributary 6, and EC_EH_ETW_1 - Etobicoke Creek West Tributary 1 to accommodate the crossings for the highway. For the Preliminary Design, the locations of the channel realignments have been determined, confirming that channel length lost for the realignments can be replaced in the new locations, and that the landscape can accommodate positive drainage and SWM for the new channel sections. More detailed design considerations for the realignments will need to be completed during Detail Design to ensure that site specific habitat features and functions are replicated in the new channel sections.

As of the Preliminary Design completion, culverts or crossings are not anticipated at SM_EB_SIM_4_E4 - Tributary of East Sixteen Mile Creek 4, EC_EH_ETW_9 - Etobicoke Creek West Tributary 9, HU_WH_WHR_3_E1 - West Humber River Tributary 3, HU_MH_ROB_9_E1 - Tributary of Robinson Creek 9, or HU_MH_ROB_6_E2 - Tributary of Robinson Creek 6. There are currently no works planned for these tributaries; however, culvert works, bank armouring, or channel tie ins may be required to accommodate the construction of the highway in these locations. Detail Design will determine any potential crossing needs or works associated with these features, including an assessment of potential impacts and permitting requirements.

All in-water works will follow the timing window permissions for warmwater watercourses – works will be allowed between July 1 and March 30 of any given year.

Preliminary Impacts

For those watercourses that are crossed by bridges design to span the bankfull widths of the reaches, impacts to fish and fish habitat should be minimized such that there is no death of fish or HADD of fish habitat that would limit the use of the habitat for the various life cycle functions they provide. These crossings may not require further review by DFO if the operational constraints and conditions outlined in MTO's Clear Span Bridge BMP can be applied or, if the BMP is not applicable, additional protection measures will avoid or mitigate potential impacts.

Provided that the culvert crossings of the various watercourses follow MTO's Drainage Design Standards, impacts to fish and fish habitat associated with the highway works may be mitigated such that the death of fish and HADD of fish habitat can be avoided, further review by DFO under the *Fisheries Act* may not be required. Further assessment will be required during Detail Design.

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Crossings of Indirect Coldwater Habitat

The following seven watercourses were assessed as either coldwater permanent or coldwater intermittent watercourses that support fish indirectly through conveyance of nutrient and allochthonous inputs to their receiving watercourses downstream that support fish directly:

- HU_EH_EHR_12_E3 - Tributary of East Humber River 12;
- HU_EH_EHR_13_E1 - Tributary of East Humber River 13;
- HU_EH_EHR_15_E2-E3 - Tributary of East Humber River 15;
- HU_EH_EHR_16_E3 - Tributary of East Humber River 16;
- HU_EH_EHR_18_E5-E6 - Tributary of East Humber River 18;
- HU_EH_EHR_22_E1 - Tributary of East Humber River 22 (presumed); and
- HU_EH_EHR_23_E1 - Tributary of East Humber River 23 (presumed).

Alteration to the form or function of these watercourses poses a potential impact to downstream fish habitat if the conveyances are not maintained in some way. Additionally, the coldwater thermal regime of these sites is important for fish populations downstream of these watercourses. Alteration to the water temperature, such as by untreated stormwater or highway surface runoff without suitable thermal mitigation measures, poses a potential impact to the fish community downstream of these watercourses.

Proposed Works

The designs of these seven watercourses are as described below:

- HU_EH_EHR_12_E3 - Tributary of East Humber River 12 will have two circular culverts, one each for EHR_12_E3_ and EHR_12_E3_3, that span both the east and westbound lanes of the main highway corridor.
- HU_EH_EHR_13_E1 - Tributary of East Humber River 13 will have one circular culvert spanning both the east and westbound lanes of the main highway corridor.
- HU_EH_EHR_15 - Tributary of East Humber River 15 will have two concrete box culverts that span both the east and westbound lanes of the main highway corridor.
- HU_EH_EHR_16_E3 - Tributary of East Humber River 16 will have two concrete box culverts that span both the east and westbound lanes of the main highway corridor.
- HU_EH_EHR_18_E5-E6 - Tributary of East Humber River 18 will have five concrete box culverts associated with the crossing of the Highway 400 on and off ramps, as well as the main Highway 400.

As of the Preliminary Design completion, culverts or crossings are not anticipated at HU_EH_EHR_22_E1 - Tributary of East Humber River 22 or HU_EH_EHR_23_E1 - Tributary of East Humber River 23. There are currently no works planned for these tributaries; however, culvert works, bank armouring, or channel tie ins may be required to accommodate the construction of the highway in these locations. Detail Design will determine any potential crossing needs or works associated with these features, including assessment of potential impacts and permitting requirements.

There are no channel realignments required for any of these features.

All in-water works will follow the timing window permissions for coldwater watercourses – works will be allowed between June 15 and September 30 of any given year.

Preliminary Impacts

Provided that the culvert crossings of the various watercourses follow MTO's Drainage Design Standards, impacts to fish and fish habitat associated with the conveyance of these flows and nutrients to the receiving watercourses downstream may be mitigated such that the death of fish and HADD of fish habitat can be avoided, further review by DFO under the *Fisheries Act* may not be required. Further assessment will be required during Detail Design.

Crossings of Indirect Warmwater Habitat

The following 39 sites were assessed as being either warmwater permanent or warmwater intermittent watercourses that support fish indirectly through conveyance of flow, nutrients and allochthonous inputs to receiving watercourses:

- SM_EB_SIM_5_E1 - Tributary of East Sixteen Mile Creek 5;
- SM_EB_SIM_1_E1 - Tributary of East Sixteen Mile Creek 1;
- SM_EB_SIM_3_E3 - Tributary of East Sixteen Mile Creek 3;
- CR_LC_MUL_8_E2 - Tributary of Mullet Creek 8;
- CR_LC_LEV_1_E1-E2 - Tributary of Levi Creek 1;
- CR_LC_LEV_2_E2-E4 - Tributary of Levi Creek 2;
- CR_NP_CRR_1_E1 - Tributary of Credit River 1;

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- CR_NP_CRR_9_E2-E4 - Tributary of Credit River 9;
- CR_NP_CRR_4_E1 - Tributary of Credit River 4;
- CR_NP_CRR_3_E1 - Tributary of Credit River 3;
- CR_NP_CRR_3_E2 - Tributary of Credit River 3;
- CR_GW_CRR_15_E1 - Tributary of Credit River 15;
- EC_EH_ETW_12_E1 - Etobicoke Creek West Tributary 12;
- EC_EH_ETW_11_E1 - Etobicoke Creek West Tributary 11;
- EC_EH_ETW_10_E1 - Etobicoke Creek West Tributary 10;
- EC_EH_ETW_9_E3 - Etobicoke Creek West Tributary 9;
- EC_EH_ETW_7_E7 - Etobicoke Creek West Tributary 7;
- EC_SC_ETE_1_E5-E9 - Etobicoke Creek East Tributary 1;
- HU_WH_TWH_1_E0 - Tributary of West Humber River 1;
- HU_WH_TWH_1_E1 - Tributary of West Humber River 1;
- HU_WH_TWH_1_E2 - Tributary of West Humber River 1;
- HU_WH_TWH_1_E3 - Tributary of West Humber River 1;
- HU_WH_TWH_1_E4 - Tributary of West Humber River 1;
- HU_WH_TWH_1_E5 - Tributary of West Humber River 1;
- HU_WH_TWH_1_E6 - Tributary of West Humber River 1;
- HU_WH_SAL_2_E1 - Salt Creek Tributary 2;
- HU_WH_WHR_1_E1 - West Humber River Tributary 1;
- HU_WH_WHR_1_E2 - West Humber River Tributary 1;
- HU_WH_WHR_1_E3 - West Humber River Tributary 1;
- HU_WH_WHR_1_E5 - West Humber River Tributary 1;
- HU_WH_GRT_1_E1 - Gore Road Tributary 1;
- HU_WH_GRT_2_E1 - Gore Road Tributary 2;
- HU_WH_GRT_3_E1 - Gore Road Tributary 3;
- HU_WH_GRT_4_E1 - Gore Road Tributary 4;
- HU_WH_CDT_1_E1 - Clarkway Drive Tributary 1;
- HU_MH_ROB_3_E1-E2 - Tributary of Robinson Creek 3;
- HU_MH_ROB_3_E3 - Tributary of Robinson Creek 3;
- HU_MH_ROB_3_E4 - Tributary of Robinson Creek 3; and
- HU_MH_ROB_4_E1 - Tributary of Robinson Creek 4.

Alteration to the form or function of these watercourses poses a potential impact to downstream fish habitat.

Proposed Works

For those design considerations incorporated during the development of the Preliminary Design, additional details are provided below by crossing. The remainder of the design considerations will be investigated further during Detail Design and incorporated where appropriate.

- SM_EB_SIM_1_E1 - Tributary of East Sixteen Mile Creek 1 will have six box culverts that will span the eastbound and westbound lanes of the Highway 413 Corridor, as well as the interchange ramps associated with the Highway 413 and Highway 401 interchange.
- SM_EB_SIM_3_E3 - Tributary of East Sixteen Mile Creek 3 will span the eastbound and westbound lanes of the Highway 413 Corridor, as well as the interchange ramps associated with the Highway 413 and Highway 401 interchange.
- CR_LC_MUL_8_E2 - Tributary of Mullet Creek 8 will have one box culvert that will span both the east and westbound lanes of the highway corridor.
- CR_LC_LEV_1_E1-E2 - Tributary of Levi Creek will have one box culvert that will span both the east and westbound lanes of the highway corridor.
- CR_LC_LEV_2_E2-E4 - Tributary of Levi Creek 2 will have two box culverts, one spanning both the east and westbound lanes of the main highway, and the other for the Winston Churchill Boulevard off ramp.

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- CR_NP_CRR_9_E2-E4 - Tributary of Credit River 9 will have one box culvert and one circular culvert that span the crossing of Heritage Road and Bovaird Drive west of the Highway 413 Corridor.
- CR_NP_CRR_3_E1-E2 - Tributary of Credit River 3 will have one box culvert that will span both the east and westbound lanes of the highway corridor.
- EC_EH_ETW_12_E1 - Etobicoke Creek West Tributary 12 will have one bridge crossing that will span both the east and westbound lanes of the highway corridor.
- EC_EH_ETW_11_E1 - Etobicoke Creek West Tributary 11 will have one box culvert and one circular culvert that will span both he east and westbound lanes for the main highway corridor on either side of Mississauga Road.
- EC_EH_ETW_10_E1 - Etobicoke Creek West Tributary 10 will have one bridge crossing that will span both the east and westbound lanes of the highway corridor.
- EC_EH_ETW_9_E3 - Etobicoke Creek West Tributary 9 will have one bridge crossing that will span both the east and westbound lanes of the highway corridor.
- EC_EH_ETW_7_E7 - Etobicoke Creek West Tributary 7 will have one box culvert that will span both the east and westbound lanes of the highway corridor.
- HU_WH_WHT_1 - Tributary of West Humber River 1 will have three bridge crossings designed to span the east and westbound lanes of the highway in three locations where the valley is deep, and three box culverts that will also span the east and westbound lanes of the highway.
- HU_WH_SAL_2_E1 - Salt Creek Tributary 2 will have one box culvert that will span both the east and westbound lanes of the highway corridor.
- HU_WH_WHR_1 - West Humber River Tributary 1 will have four box culverts that that will span both the east and westbound lanes of the highway corridor at each of the tributary crossings (WHR_1 _E1, E2, E3 and E-5).
- HU_WH_CDT_1_E1 - Clarkway Drive Tributary 1 will have one box culvert that will span both the east and westbound lanes of the highway corridor.
- HU_MH_ROB_3_E3 - Tributary of Robinson Creek 3 will have three circular culverts that will span the east and westbound lanes of the main highway section, as well as the north and southbound ramps for the Highway 427 extension.
- HU_MH_ROB_4_E1 - Tributary of Robinson Creek 4 will have three bridges that span the east and westbound lanes of the highway in three locations where the valley is deep, and three concrete box culverts span the east and westbound lanes of the main highway section, as well as the north and southbound ramps for the Highway 427 extension.

Channel realignments will be required at EC_EH_ETW_12_E1 - Etobicoke Creek West Tributary 12 and HU_WH_WHR_1 - West Humber River Tributary 1 to avoid the need for an extremely long culvert crossing through the highway corridor.

As of the Preliminary Design completion, culverts or crossings are not anticipated at CR_NP_CRR_1_E1 - Tributary of Credit River 1, CR_NP_CRR_4_E1 - Tributary of Credit River 4, CR_GW_CRR_15_E1 - Tributary of Credit River 15, HU_WH_GRT_1_E1 - Gore Road Tributary 1, and HU_WH_GRT_4_E1 - Gore Road Tributary 4. There are currently no works planned for these tributaries; however, culvert works, bank armouring, or channel tie ins may be required to accommodate the construction of the highway in these locations. Detail Design will determine any potential crossing needs or works associated with these features, including assessment of potential impacts and permitting requirements.

All in-water works will follow the timing window permissions for warmwater watercourses – works will be allowed between July 1 and March 30 of any given year.

Preliminary Impacts

Provided that the culvert crossings of the various watercourses follow MTO's Drainage Design Standards, standard construction mitigation measures can be applied, and Erosion and Sediment Control measures are designed for site specific features, impacts to fish and fish habitat associated with the highway works may be mitigated such that the death of fish and HADD of fish habitat can be avoided. As a result, further review by DFO under the *Fisheries Act* may not be required; further assessment will be confirmed during Detail Design.

5.1.2 Terrestrial Ecosystems

Based on the existing conditions identified in **Section 2.3.2** and **Figure 2-2**, the section below outlines the potential impacts identified in the terrestrial ecosystems assessment.

For the purposes of the Preliminary Design and the terrestrial ecosystems impact assessment, it is assumed that the Project will affect all natural features delineated within the ROW limits, which includes the highway, interchange ramps, municipal crossing roads, SWM facilities, carpool lots, commercial vehicle inspection facilities, and MTO maintenance yards. Indirect effects on adjacent natural features may also occur on both sides of the Highway 413 ROW, as well as within areas enclosed or isolated between the ROW and associated supporting infrastructure.

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Data was gathered to characterize terrestrial ecosystems through the 2020 field investigations on the Preferred Alignment as well as through additional field investigations completed in 2022, 2023, and 2025 based on the design work available at the time of assessment. Areas now included within the ROW due to minor design updates that were not field verified during the 2020, 2022, 2023, or 2025 field program have been assessed based on extrapolation of available field and secondary source data. Terrestrial features along the ROW were included as part of the assessment of potential impacts to terrestrial ecosystems that may occur as a result of the Project.

The quality and quantity of natural features, as well as associated sensitivity to disturbance and importance of providing ecological functions were assessed when determining the degree of potential impacts. Generally, the major potential impacts associated with the Project include:

- Loss or degradation of vegetation cover, wildlife habitat, Significant Wildlife Habitat and SAR habitat;
- Disturbance to wildlife, including *Migratory Birds Convention Act, 1994* protected birds, SAR and Species of Conservation Concern through noise or other indirect disturbances; and
- Possible injury and mortality of wildlife, including Species of Conservation Concern and SAR, during construction and operation.

Existing Impacts (prior to the implementation of Highway 413)

It is recognized that many, if not all, natural areas within southern Ontario have been affected by human disturbance. Therefore, to assess the potential impacts of the Project, it is necessary to consider existing impacts that are present within the Terrestrial Ecosystems Study Area (refer to **Table 2-2**) prior to the initiation of Project development-related work.

The following existing impacts are relevant and should be considered for future management of natural heritage features and functions:

- **Fragmentation of Ecological Communities and Habitat**: Vegetation communities, Designated Areas and wildlife habitat within the Terrestrial Ecosystems Study Area have already been fragmented or altered and heavily affected by the extensive and existing development, including urban expansion, transportation corridors (e.g., existing provincial highways, and municipal roads) and agricultural activities. This existing fragmentation has led to reduced biodiversity, barriers to wildlife movement and disruption to ecological processes by breaking continuous habitats into smaller, isolated patches.
- **Noise and Light Pollution**: Existing noise and light pollution may have an effect on birds and other wildlife species inhabiting the area resulting in a reduction in species abundance and/or richness within the area. Conversely, some species may be acclimated to the current noise levels generated by human activities (Partecke et al., 2006, Tennessen et al., 2018).
- **Invasive Species**: The surrounding developed landscape has created edge effects which facilitated the gradual invasion of invasive and weedy species introduced by adjacent roads and human movement. A total of 251 of the 682 plant species (37%) recorded within the Terrestrial Ecosystems Study Area during field investigations were non-native, 36 of which are listed as Category 1 invasives by the Ontario Invasive Plant Council or listed under the *Invasive Species Act*, *2015* or the *Weed Control Act*. Non-native species recorded within the Terrestrial Ecosystems Study Area included highly invasive species such as Common Reed (*Phragmites australis* ssp. *Australis*), Garlic Mustard (*Alliaria petiolata*) and Common Buckthorn (*Rhamnus cathartica*) as well as 63 species ranked Category 2 to 4. These species can outcompete and displace native species, forming monocultural stands that impact the form and function of the community. Within the ROW, monocultures of such vegetation communities are present including 0.93 ha of Common Reed Graminoid Mineral Meadow Marsh (MAMM1-12) and 6.85 ha of Buckthorn Deciduous Shrub Thicket (THDM2-6).
- **Soil and Water Contamination**: Runoff of pollutants such as heavy metals, pesticides, salt, fertilizers, and chemicals from existing roads, highways, agricultural fields, and urban development has negatively affected the quality of some terrestrial ecosystems through degrading soil quality, disrupting plant growth and altering habitat quality for wildlife in natural or naturalized areas closest to development.

Potential Impacts

As with any large-scale linear infrastructure project, the Highway 413 Project will result in impacts to terrestrial ecosystems across the landscape. Many of the potential impacts of this Project have been avoided or reduced through the Preliminary Design and Assessment of Environmental Impacts whereby the development of alignments, the evaluation of those alignments and the selection of a Preferred Alignment have been conducted to minimize or avoid terrestrial ecosystem features, to the greatest extent possible.

The assessment of potential impacts is primarily focused on construction wherein most of the Project-related impacts may occur if appropriate mitigation measures are not implemented. Consideration for operational effects that may occur on the terrestrial ecosystems because of ongoing use and maintenance of Highway 413 after it is constructed are also considered where applicable. A general discussion of the potential impacts is provided in the following sections.

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During Detail Design, the limits of impact during construction within the ROW may be refined or reduced to minimize potential impacts to terrestrial ecosystems, which could be further reduced through avoidance and mitigation measures. Any references to areas of direct or indirect impacts may also be refined as the Project design progresses. Additional studies will be carried out during Detail Design to supplement data gaps and to facilitate the refinement of the Preliminary Design to minimize impacts, as needed. Proposed mitigation measures in **Table 5-23** will continue to be refined in consultation with the appropriate agencies, available guidelines and with consideration of future permitting and approvals and their associated monitoring requirements throughout Detail Design.

For a summary of the existing terrestrial ecosystems features within the Study Area, refer to **Section 2.3.2.3**.

Descriptions of potential preliminary impacts are provided below specific to the following:

- Designated Natural Areas, Vegetation Communities, and Plants;
- Wildlife and Wildlife Habitat;
- General Wildlife; and
- Species at Risk.

Designated Natural Areas, Vegetation Communities and Plants

The locations of the Designated Areas, wetlands and woodlands present within the ROW are illustrated on **Figure 2-2**. The potential impacts to vegetation communities are described as follows:

- **Loss of and/or damage to vegetation and Ecological Land Classification communities:** Vegetation removal required to support the proposed works will be limited to the extent of the ROW resulting in 388.99 ha of total potential impacts to vegetation communities. In total, 87 vegetation community types have the potential to be affected by the proposed works, including a mixture of forest, wetland and meadow habitats. The size (in ha) of the affected vegetation communities is provided in **Table 5-1**. The amount of potential habitat loss and community tolerance for disturbance (disturbance tolerance of communities can be assessed using the Mean Coefficient of Conservatism scores calculated through the results of the floristic surveys. Low scores indicate that a community can withstand some disturbance or is already anthropogenically disturbed. Higher scores indicate that a community is not tolerant of disturbance, requires specific environmental conditions and that the amount of time required to reach such an advanced successional stage would be greater once disturbed as compared to lower scores.) is summarized in **Table 5-2**. The Woodland Communities are the least disturbance tolerant, whereas the Wetland/Shallow Aquatic Communities have an average tolerance as compared to other habitat types such as Agricultural, Meadow, and Thicket Communities that are most tolerant to disturbances in the ROW.
- **Loss of rare vegetation communities:** A total of 2.17 ha of two rare vegetation community types are anticipated to be impacted: Fresh Moist Black Walnut Deciduous Forest Type (FOD7 – 4) (Appendix M of the Significant Wildlife Habitat Technical Guide does not list known occurrence data for FOD7 – 4 in York, Peel, and Halton. Black Walnut is adventive in York, Peel, and Halton [Varga., 2000] e.g., it has established in a place that does not correspond to its native range of the Carolinian Zone due to anthropogenic influence and is considered a widespread introduction outside of the Carolinian Zone [Fox and Soper, 1953]. In the context of the Study Area, Black Walnut is only native within the Carolinian Zone e.g., Ecodistrict 7E – 4, and the respective vegetation community, FOD7 – 4 is likewise only tracked by the Natural Heritage Information Centre within the Carolinian Zone. Elsewhere within the Study Area, Black Walnut is adventive, and the vegetation community FOD7 – 4 is not tracked by the Natural Heritage Information Centre nor considered provincially rare [Bakowsky, pers. comm., 2024]. Therefore, only 6.30 ha of 7.43 total ha of FOD7 – 4 within the ROW are also within Ecodistrict 7E – 4 and are considered as a rare vegetation community), and Fresh Moist Bur Oak Deciduous Forest Type (FOD9 – 3). Two additional rare vegetation community types may be affected indirectly: Dry to fresh Oak Hickory Deciduous Forest Type (FOD2 – 2), and Fresh to Moist Sugar Maple Black Maple Deciduous Forest Type (FOD6 – 2).

Refer to **Table 5-1** for areas of anticipated loss from each of these rare vegetation communities. Loss or degradation of rare habitats will lead to more species becoming rare, vulnerable, threatened and endangered, while reducing the population of each species that is already considered rare or vulnerable. Over time, this may contribute to a decrease in biodiversity within the planning area and province.

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Table 5-1: Summary of Vegetation Community Impacts

Ecological Land Classification Community	Total Area within the Study Area (ROW + 120 m on each side) (ha)	Total Area within the ROW (ha)	Subnational Rank(a)
Mineral Cultural Meadow Ecosite (CUM1)	396.09	182.74	-
Cultural Meadow (CUM) Subtotal	396.09	182.74	-
Cultural Plantation (CUP)	0.26	0.16	-
Deciduous Plantation Ecosite (CUP1)	3.00	0.08	-
Sugar Maple Deciduous Plantation Type (CUP1 – 1)	0.22	0.00	-
Coniferous Plantation Ecosite (CUP3)	12.72	3.29	-
Red Pine Coniferous Plantation Type (CUP3 – 1)	16.99	7.70	-
White Pine Coniferous Plantation Type (CUP3 – 2)	2.38	0.54	-
Scotch Pine Coniferous Plantation Type (CUP3 – 3)	0.91	0.73	-
European Larch Coniferous Plantation Type (CUP3 – 6)	0.16	0.00	-
White Spruce – European Larch Coniferous Plantation Type (CUP3 – 8)	2.91	0.94	-
Norway Spruce – European Larch Coniferous Plantation Type (CUP3 – 9)	0.35	0.05	-
Cultural Plantation (CUP) Subtotal	39.90	13.49	-
Mineral Cultural Savannah Ecosite (CUS1)	10.72	5.99	-
Cultural Savannah (CUS) Subtotal	10.72	5.99	-
Cultural Thicket (CUT)	1.10	0.88	-
Mineral Cultural Thicket Ecosite (CUT1)	29.14	6.49	-
Cultural Thicket (CUT) Subtotal	30.24	7.37	-
Cultural Woodland (CUW)	0.20	0	-
Mineral Cultural Woodland Ecosite (CUW1)	30.13	8.65	-
Cultural Woodland (CUW) Subtotal	30.56	8.65	-
Coniferous Forest (FOC)	0.18	0	-
Dry – Fresh White Cedar Coniferous Forest Type (FOC2 – 2)	1.32	0.01	S5
Fresh Hemlock Coniferous Forest Type (FOC3 – 1)	1.91	0.42	S4S5
Moist – Fresh White Cedar – Hemlock Coniferous Forest Type (FOC4 – 2)	3.18	0.02	S5
Naturalized Coniferous Plantation (FOCM6)	1.00	0.31	-
Dry – Fresh White Pine Naturalized Coniferous Plantation Type (FOCM6 – 1)	3.82	1.47	-

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Ecological Land Classification Community	Total Area within the Study Area (ROW + 120 m on each side) (ha)	Total Area within the ROW (ha)	Subnational Rank(a)
Coniferous Forest (FOC) Subtotal	11.42	2.23	-
Deciduous Forest (FOD)	7.62	1.22	-
Dry Oak – Hickory Deciduous Forest Type (FOD2 – 2)	0.59	0.00	S3S4
Dry – Fresh Oak – Sugar Maple Deciduous Forest Type (FOD2 – 4)	0.82	0.18	S5
Dry – Fresh Aspen – Poplar Deciduous Forest Type (FOD3 – 1)	3.43	1.13	S5
Dry – Fresh White Birch Deciduous Forest Type (FOD3 – 2)	0.29	0.00	S5
Dry – Fresh Upland Deciduous Forest Ecosite (FOD4)	2.54	1.25	-
Dry – Fresh White Ash Deciduous Forest Type (FOD4 – 2)	3.43	0.97	S5
Dry – Fresh Sugar Maple – Hardwood Calcareous Shallow Deciduous Forest Ecosite (FOD5)	0.04	0.00	-
Fresh Sugar Maple Deciduous Forest Type (FOD5 – 1)	28.57	4.82	S5
Fresh Sugar Maple – White Birch – Aspen Deciduous Forest Type (FOD5 – 10)	1.24	0.90	S5
Fresh Sugar Maple – Beech Deciduous Forest Type (FOD5 – 2)	2.18	1.15	S5
Dry – Fresh Sugar Maple – Oak Deciduous Forest Type (FOD5 – 3)	12.01	3.93	S5
Dry – Fresh Sugar Maple – Ironwood Deciduous Forest Type (FOD5 – 4)	5.07	1.20	S5
Dry – Fresh Sugar Maple – Hickory Deciduous Forest Type (FOD5 – 5)	1.67	0.05	S4
Dry – Fresh Sugar Maple – Basswood Deciduous Forest Type (FOD5 – 6)	2.03	0.54	S5
Dry – Fresh Sugar Maple – Black Cherry Deciduous Forest Type (FOD5 – 7)	0.55	0.33	S4S5
Fresh Sugar Maple – White Ash Deciduous Forest Type (FOD5 – 8)	0.39	0.39	S5
Fresh Sugar Maple – Red Maple Deciduous Forest Type (FOD5 – 9)	0.68	0.00	S5
Moist – Fresh Sugar Maple – Black Maple Deciduous Forest Type (FOD6 – 2)	0.36	0.00	S3?
Fresh – Moist Sugar Maple – Hardwood Deciduous Forest Type (FOD6 – 5)	4.28	0.81	S5
Fresh – Moist Lowland Deciduous Forest Ecosite (FOD7)	2.42	0.44	-
Fresh – Moist Ash Lowland Deciduous Forest Type (FOD7 – 2)	1.36	0.68	S4S5
Fresh – Moist Willow Lowland Deciduous Forest Type (FOD7 – 3)	6.76	1.92	S4S5
Moist – Fresh Black Walnut Deciduous Forest Type (FOD7 – 4)	11.79	3.11	S2S3
Moist – Fresh Aspen – Poplar Deciduous Forest Type (FOD8 – 1)	1.64	0.10	S5
Fresh – Moist Oak – Sugar Maple Deciduous Forest Type (FOD9 – 1)	1.64	1.06	S4

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Ecological Land Classification Community	Total Area within the Study Area (ROW + 120 m on each side) (ha)	Total Area within the ROW (ha)	Subnational Rank(a)
Fresh – Moist Bur Oak Deciduous Forest Type (FOD9 – 3)	0.67	0.26	S3S4
Dry – Fresh Black Locust Deciduous Forest Type (FODM4 – 11)	5.42	2.26	-
Dry – Fresh Basswood Deciduous Forest Type (FODM4 – 9)	0.79	0.25	-
Dry – Fresh Sugar Maple – Hardwood Deciduous Forest Type (FODM5 – 11)	5.08	2.11	-
Fresh – Moist Manitoba Maple Lowland Deciduous Forest Type (FODM7 – 7)	5.76	1.34	-
Deciduous Forest (FOD) Subtotal	121.12	32.39	-
Mixed Forest (FOM)	< 0.01	0.00	-
Dry – Fresh White Pine – Sugar Maple Mixed Forest Type (FOM2 – 2)	7.79	0.51	S5
Moist – Fresh Hemlock – Sugar Maple Mixed Forest Type (FOM3 – 2)	6.15	2.46	S4S5
Fresh – Moist Sugar Maple – Hemlock Mixed Forest Type (FOM6 – 1)	8.87	2.59	S4S5
Fresh – Moist Hemlock – Hardwood Mixed Forest Type (FOM6 – 2)	0.18	0.00	S5
Mixed Forest (FOM) Subtotal	22.98	5.56	-
Meadow Marsh (MAM)	2.64	0.60	-
Forb Bedrock Meadow Marsh Type (MAM1 – 3)	0.06	0.06	S4
Graminoid Mineral Meadow Marsh Ecosite (MAM2)	5.75	1.85	-
Forb Mineral Meadow Marsh Type (MAM2 – 10)	12.93	5.55	S4S5
Reed-canary Grass Mineral Meadow Marsh Type (MAM2 – 2)	48.34	17.03	S5
Red – top Mineral Meadow Marsh Type (MAM2 – 3)	0.51	0.00	S5
Broad – leaved Sedge Mineral Meadow Marsh Type (MAM2 – 6)	0.17	0.00	S5
Common Reed Graminoid Mineral Meadow Marsh Type (MAMM1 – 12)	3.26	0.93	-
Cattail Graminoid Mineral Meadow Marsh Type (MAMM1 – 2)	2.14	1.06	-
Mixed Mineral Meadow Marsh Type (MAMM3 – 1)	5.13	3.25	-
Meadow Marsh (MAM) Subtotal	80.93	30.32	-
Shallow Marsh (MAS)	0.64	0.33	-
Graminoid Mineral Shallow Marsh Ecosite (MAS2)	0.57	0.01	-
Cattail Mineral Shallow Marsh Type (MAS2 – 1)	14.93	6.10	S5
Bur – reed Mineral Shallow Marsh Type (MAS2 – 7)	0.10	0.04	S4
Rice Cut – grass Mineral Shallow Marsh Type (MAS2 – 8)	0.19	0.00	S4

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Ecological Land Classification Community	Total Area within the Study Area (ROW + 120 m on each side) (ha)	Total Area within the ROW (ha)	Subnational Rank(a)
Forb Mineral Shallow Marsh Type (MAS2 – 9)	0.13	0.00	S4
Cattail Organic Shallow Marsh Type (MAS3 – 1)	1.80	0.50	S5
Common Reed Mineral Shallow Marsh Type (MASM1 – 12)	0.28	0.26	-
Reed-canary Grass Mineral Shallow Marsh Type (MASM1 – 14)	2.27	0.98	-
Shallow Marsh (MAS) Subtotal	20.91	8.23	-
Open Agriculture (OAG)	7.82	0.01	-
Annual Row Crops – Wheat (OAGM1)	54.07	16.89	-
Open Pasture (OAGM4)	111.41	52.35	-
Open Agriculture (OAG) Subtotal	173.30	69.25	-
Open Aquatic (OAO)	13.57	5.27	-
Open Aquatic (OAO) Subtotal	13.57	5.27	-
Floating-leaved Shallow Aquatic (SAF)	0.13	0.07	-
Duckweed Floating – leaved Shallow Aquatic Type (SAF1 – 3)	0.42	0.04	S5
Floating – leaved Shallow Aquatic (SAF) Subtotal	0.55	0.11	-
Submerged Shallow Aquatic (SAS)	0.05	0.00	-
Submerged Shallow Aquatic Ecosite (SAS1)	0.40	0.00	-
Pondweed Submerged Shallow Aquatic Type (SAS1 – 1)	0.37	0.09	S5
Stonewort Submerged Shallow Aquatic Type (SAS1 – 3)	0.39	0.31	S4S5
Submerged Shallow Aquatic (SAS) Subtotal	1.21	0.40	-
White Cedar Mineral Coniferous Swamp Type (SWC1 – 1)	1.60	0.00	S5
Coniferous Swamp (SWC) Subtotal	1.60	0.00	-
Deciduous Swamp (SWD)	5.55	1.03	-
Red / Green Ash Mineral Deciduous Swamp Type (SWD2 – 2)	0.19	0.08	S5
Silver / Red Maple Mineral Deciduous Swamp Type (SWD3 – 1)	4.09	0.98	S5
Silver Maple Mineral Deciduous Swamp Type (SWD3 – 2)	0.87	0.01	S5
Swamp Maple Mineral Deciduous Swamp Type (SWD3 – 3)	9.46	3.32	S5
Manitoba Maple – Willow Mineral Deciduous Swamp Type (SWD3 – 4)	2.01	1.42	S5
Mineral Deciduous Swamp Ecosite (SWD4)	0.05	0.00	-

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Ecological Land Classification Community	Total Area within the Study Area (ROW + 120 m on each side) (ha)	Total Area within the ROW (ha)	Subnational Rank(a)
Willow Mineral Deciduous Swamp Type (SWD4 – 1)	3.79	1.39	S4
Aspen – White Birch – Poplar Mineral Deciduous Swamp Type (SWD4 – 3)	0.08	0.00	S5
Silver Maple Organic Deciduous Swamp Type (SWD6 – 2)	1.15	0.55	S5
Swamp Maple Organic Deciduous Swamp Type (SWD6 – 3)	0.58	0.57	S5
Aspen – White Birch – Poplar Deciduous Organic Swamp Type (SWD7 – 1)	0.40	0.36	S5
Deciduous Swamp (SWD) Subtotal	28.19	9.70	-
Mixed Swamp (SWM)	1.08	0.01	-
White Cedar – Mixed Mineral Swamp Type (SWM1 – 1)	0.01	0.00	S5
White Cedar Mixed Organic Swamp Type (SWM4 – 1)	0.29	0.09	S5
Mixed Swamp (SWM) Subtotal	1.39	0.10	-
Thicket Swamp (SWT)	0.20	0.14	-
Alder Mineral Thicket Swamp Type (SWT2 – 1)	0.20	0.00	S5
Willow Mineral Thicket Swamp Type (SWT2 – 2)	1.20	0.05	S5
Red-osier Mineral Thicket Swamp Type (SWT2 – 5)	0.27	0.14	S5
Mixed Willow Mineral Deciduous Thicket Swamp Type (SWTM3 – 6)	0.30	0.00	-
Thicket Swamp (SWT) Subtotal	2.16	0.33	-
Buckthorn Deciduous Shrub Thicket Type (THDM2 – 6)	12.75	6.18	-
Buckthorn Deciduous Hedgerow Thicket Type (THDM3 – 1)	0.21	0.67	-
Deciduous Thicket (THD) Subtotal	12.96	6.85	-
Grand Total	1,000.02	388.99	-

Notes:

(a) The natural heritage provincial ranking system (provincial Subnational rank) is used by the Ministry of Natural Resource's Natural Heritage Information Centre to set protection priorities for rare species and natural communities. Communities ranked S1 to S3 are considered provincially rare. The following status definitions were taken from NatureServe Explorer's (2025a) National and Subnational Conservation Status Definitions:

S1 – Critically Imperiled — At very high risk of extirpation in the jurisdiction due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors.

S2 – Imperiled — At high risk of extirpation in the jurisdiction due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.

S3 – Vulnerable — Vulnerable in the province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

S4 – Apparently Secure — Uncommon but not rare, some cause for long-term concern due to declines or other factors.

S5 – Secure — Common, widespread, and abundant in the nation or state/province.

SNR – Unranked — Province conservation status not yet assessed.

S U – Unrankable — Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.

SNA – Not Applicable — A conservation status rank is not applicable because the species is not a suitable target for conservation activities.

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S # – Range Rank — A numeric range rank (e.g., S2 S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., S U is used rather than S1 S4).

S # ? – Inexact Numeric Rank.

Appendix M of the Significant Wildlife Habitat Technical Guide does not list known occurrence data for FOD7-4 in York, Peel, and Halton. Black Walnut is adventive in York, Peel, and Halton (Varga, 2000) e.g., it has established in a place that does not correspond to its native range of the Carolinian Zone due to anthropogenic influence and is considered a widespread introduction outside of the Carolinian Zone (Fox and Soper, 1953). In the context of the Study Area, Black Walnut is only native within the Carolinian Zone e.g., Ecodistrict 7E-4, and the respective vegetation community, FOD7-4 is likewise only tracked by the Natural Heritage Information Centre within the Carolinian Zone. Elsewhere within the Study Area, Black Walnut is adventive, and the vegetation community FOD7-4 is not tracked by the Natural Heritage Information Centre nor considered provincially rare (Bakowsky, pers. comm., 2024). Therefore, only 6.30 ha of 7.43 total ha of FOD7-4 within the ROW are also within Ecodistrict 7E-4 and are considered as a rare vegetation community.

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Table 5-2: Summary of Potential Impacts within the ROW by General Habitat Type

Habitat Type	Total Area within the Study Area (ROW + 120 m on each side) (ha)	Total Area within the ROW (ha)	Percent of Total Vegetation Communities in Study Area Affected (%)	Mean Coefficient of Conservatism
Agricultural Communities	173.30	69.25	39.96	0.33
Woodland Communities	226.19	62.32	27.55	2.72
Meadow Communities	396.09	182.74	46.14	0.68
Thicket and Successional Communities	53.92	20.22	37.50	1.57
Unvegetated Open Water Communities	13.57	5.27	38.84	1.35
Wetland/Shallow Aquatic Communities	136.95	49.20	35.93	2.07
Grand Total	1,000.02	388.99	38.89	1.66

Notes:

1. Agricultural Communities include Ecological Land Classification Community Series: OAG (where only pastures or hay/wheat fields were identified that could support wildlife)
2. Woodland Communities include Ecological Land Classification Community Classes/Series: FO, CUP, and CUW
3. Meadow Communities include Ecological Land Classification Community Series: CUM
4. Thicket and Successional Communities include Ecological Land Classification Community Series: CUT, CUS, and THD
5. Unvegetated Open Water Communities include Ecological Land Classification Community Class: OA
6. Wetland/Shallow Aquatic Communities include Ecological Land Classification Community Classes: MA, SW, and SA

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Adjacent Ecological Land Classification communities and Designated Areas may also be inadvertently damaged or indirectly affected, as described below, if not appropriately mitigated:

- **Indirect Loss and/or Damage to Vegetation Communities:** Incidental intrusion into the adjacent vegetation communities surrounding the ROW may occur during construction. Damage to adjacent natural vegetation from roadway maintenance activities such as salting and sanding, structure/culvert repairs and ditch cleanout during the operation of Highway 413.
- **Fill and sediment transport from disturbed areas to undisturbed areas:** During grubbing or grading of the site, fill and sediment runoff from the active construction area may enter adjacent, undisturbed vegetation communities and adjacent watercourses if not appropriately controlled.
- **Soil or water contamination (including groundwater):** Oil, gasoline, grease and other materials from construction equipment, materials, storage and handling may enter vegetation communities and adjacent watercourses, if not appropriately managed. Damage from excessive or improper application of herbicides and pesticides for ROW maintenance requirements may occur. Salt runoff and salt spray into vegetated areas may cause loss of vegetation vigor and in extreme cases, vegetation dieback and spread of salt tolerant flora (halophytes) including invasive species such as Common Reed.
- **Introduction or spread of invasive species:** A total of 251 of the 682 plant species (37%) recorded within the Study Area during field investigations were non-native, 36 of which are listed as Category 1 invasives by the Ontario Invasive Plant Council or listed under the *Invasive Species Act, 2015* or the *Weed Control Act.* Non-native species recorded within the Study Area included highly invasive species such as Common Reed, Garlic Mustard and Common Buckthorn as well as 63 species ranked Category 2 to 4. These species can outcompete and displace native species, forming monocultural stands that impact the form and function of the community. Within the ROW, monocultures of such vegetation communities are present including 0.26 ha of Common Reed Graminoid Mineral Meadow Marsh (MAMM1-12) and 6.85 ha of Buckthorn Deciduous Shrub Thicket (THDM2-6). Vegetation clearing, grubbing, grading, and movement of construction equipment may perpetuate invasive species in new areas and advance the spread of the species in already established areas if control measures are not implemented.
- **Changes in light levels:** Shade effects resulting from the constructed bridges/structures on vegetation primarily involve reduced light availability, which can limit photosynthesis, leading to slower growth and lower productivity in plants. Shade-tolerant species may adapt by adjusting leaf structure and chlorophyll content, but overall dense shade can reduce biodiversity by favouring certain species over others.
- **Fragmentation**: Project-related fragmentation at a landscape scale could reduce the overall size of habitat patches altering the quality, function and resistance to external biotic and abiotic disturbance pressures. The least amount of vegetation community cover by area when excluding meadow or agricultural type communities within the Study Area is in highway Sections 2, 3, 4, and 7. These areas can be considered already highly fragmented with smaller patch sizes. Conversely, Section 8 is the least fragmented due to the natural areas surrounding the Main and East Humber Rivers. The potential impacts of fragmentation are greatest in Section 8.
- **Changes in hydrology and drainage patterns:** Groundwater dewatering may be required for excavation activities during construction, which may temporarily affect nearby natural features such as the watercourses and wetlands that are particularly sensitive to changes in the hydrological regime if the zone of influence overlaps with these features. Significant groundwater drawdown may affect the functions of wetlands and the wildlife habitats supported by them (for example, plant assemblage may change the community structure or lowering of groundwater levels may affect amphibian breeding habitat). Generally, this potential impact will be temporary and short in duration during construction. Increased impervious surfaces as result of construction and operation of the Project can indirectly affect the hydrology, drainage and SWM, and water quantity of nearby natural features such as the watercourses and wetlands that are particularly sensitive to changes in the hydrological regime. Changes in drainage patterns (groundwater and/or surface runoff flow) can impact dependent vegetation areas located either up-gradient or down-gradient of the ROW. An increase in downstream runoff can result in erosion impacts on receiving vegetation.
- **Dust accumulation:** Dust accumulation from construction emissions on vegetation can block sunlight from reaching leaf surfaces, reducing the efficiency of photosynthesis and potentially slowing plant growth (Farmer, 1993; Thompson, et.al., 1984). It can also clog stomata, affecting gas exchange – leading to water stress in plants. Over time, dust can alter soil pH and nutrient availability, further impacting plant health and productivity (Farmer, 1993).

Wildlife and Wildlife Habitat

Migratory Birds as Defined in the *Migratory Birds Convention Act, 1994*

Migratory breeding birds protected under the *Migratory Birds Convention Act, 1994* were confirmed to be present within the Study Area through the breeding bird surveys completed across all surveyed years. Nests of Green Heron (*Butorides virescens*), Great Blue Heron (*Ardea herodias*) and Pileated Woodpecker (*Dryocopus pileatus*), which are protected under Schedule 1 of the Migratory Birds Regulations (2022), may occur within the ROW. However, to confirm

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presence and locations of Pileated Woodpecker, Great Blue Heron and/or Green Heron nests, targeted surveys would be required at Detail Design.

Land clearing, demolition of buildings or bridges/structures, grubbing and vegetation removal have the potential to result in the destruction or disturbance of active nests (e.g., nests with eggs or young birds), and/or the wounding or mortality of birds protected under the *Migratory Birds Convention Act, 1994* and/or Regulations under the Act. Migratory breeding birds may be temporarily disturbed or displaced as a result of noise or construction from adjacent construction activities.

General Wildlife

Vegetation communities provide a variety of habitats for wildlife. The potential impacts to general wildlife and wildlife habitat are described as follows:

- **Loss of wildlife habitat:** Land clearing, grubbing and vegetation removal will directly remove or indirectly degrade the quality and ecological integrity of adjacent wildlife habitats. Loss of habitat can also occur indirectly in the operational stage through habitat avoidance resulting from traffic-related disturbances or changes to drainage patterns that can impact dependent vegetation communities.
- **Disturbance to wildlife from lighting, noise, vibration, dust or other environmental contaminants, including sediment, fuels and salt run-off**:
  - Light pollution can disrupt the natural behaviours of amphibians, reptiles, birds, and mammals, affecting their mating, feeding and migration patterns by altering night-time visibility and circadian rhythms. Noise pollution can further exacerbate these effects by masking communication signals, increasing stress levels and reducing the ability of these animals to detect predators or prey, ultimately impacting their survival and reproduction. Although wildlife within the majority of the Study Area is likely already adapted to existing anthropogenic sources of lighting and noise (e.g., homesteads, farms and adjacent roads), they may be temporarily disturbed or displaced by increased lighting and noise emissions from construction activities and future use of Highway 413.
  - Wildlife within the larger tracts of natural habitat associated with the Main Humber River and East Humber River may not be as adapted and tolerant to the same existing anthropogenic noise sources other wildlife are exposed to in sections of the Study Area that are more fragmented and under anthropogenic influences (the Credit River and the West Humber River are surrounded by agricultural fields and therefore considered to be more disturbed compared to the Main Humber River and East Humber River). As such, the additional light and noise generated by construction activities and vehicular traffic in these areas may cause the permanent displacement of some species to locations outside the limits of the Study Area.
- **Incidental wildlife injury or mortality from construction activities:**
  - Wildlife may enter the construction work area and become susceptible to accidental injury or mortality associated with construction machinery and equipment if not mitigated.
  - Increased road mortality through vehicle collisions and barriers to wildlife movement:
    - Without effective mitigation measures, operation of Highway 413 can increase the risk of wildlife-vehicle collisions, which can have severe impacts on wildlife population, particularly for species with low reproductive rates, as well as human safety. Highway 413 could also disrupt animal movement and fragment habitats, which can threaten biodiversity and local ecosystems.
    - As part of Detail Design, impacts related to road mortality and wildlife movement will be mitigated by applying the Environmental Guide for Mitigating Road Impacts to Wildlife (MTO, 2017) which includes appropriate sizing and design features for crossing bridges/structures at watercourses and other key terrestrial movement corridors, signage and permanent wildlife exclusion fencing in combination with escape features (e.g., jump-outs). The Preliminary Design of bridges/structures and drainage and SWM culverts has considered maintenance of suitable wildlife passage and has been informed by agency consultation and engagement and guidance documents; this process has been completed through an iterative, collaborative approach between the ecological, drainage and SWM and engineering teams, which will continue into Detail Design. Key locations where the design will seek to maintain and/or funnel wildlife movement include specific SAR habitats (e.g., Western Chorus Frog) and the following major riparian valley corridors of the Study Area which act as regional and local landscape level linkages: Levi Creek, Credit River, West Humber River, Robinson Creek, Main Humber River and East Humber River.

Significant Wildlife Habitat

Several types of candidate and confirmed Significant Wildlife Habitats were identified in the Study Area. Potential effects associated with construction and operation of Highway 413 include habitat loss and degradation as well as potential injury and mortality of wildlife associated with each specific Significant Wildlife Habitat. The potential effects for Designated Areas and vegetation communities, and those described for wildlife, generally apply to Significant Wildlife Habitats. Impacts on certain categories of candidate Significant Wildlife Habitat may be assessed at the

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Detail Design stage through additional field investigations. The following potential effects are related to specific types of Significant Wildlife Habitat:

- Impacts on Bat Maternity Colonies can be mitigated through appropriate timing windows for tree removals (e.g., outside of March 15 to November 30, refer to **Table 5-23**) and minimizing the extent of removals in areas identified as higher quality habitat. Mitigation measures developed for the protection of SAR Bats will also mitigate impacts on Bat Maternity Colonies.
- Impacts on herpetofauna including Amphibian Breeding Habitat and Turtle Wintering Areas can be mitigated through implementation of appropriate timing windows for in-water works or pond works and wildlife salvage measures.
- Although Deer Yarding and Winter Congregation Areas have not been identified in the Study Area, potential impacts on White-tailed Deer (*Odocoileus virginianus*) movement across the landscape will be mitigated through the application of the Environmental Guide for Mitigating Road Impacts to Wildlife (MTO, 2017), which will be reviewed further at Detail Design.
- Although Significant Wildlife Habitat for Woodland Area-Sensitive Bird Breeding habitat was not confirmed in the Study Area, reduction in the interior forest area resulting from fragmentation can impact Regionally Rare Bird Breeding Habitat for Woodland Area-Sensitive birds. Impacts on this type of habitat can be mitigated through minimizing forest removal areas in these habitats and appropriate forest edge management plans, which will be developed at Detail Design.

Species At Risk

Several SAR may be negatively affected by the removal/disturbance of vegetation communities within the ROW and by sources of disturbance during construction and operation. Potential impacts to SAR and their habitats that were identified as being confirmed or having a medium or high probability of occurrence in the Study Area are described in the following subsections.

Provincially Protected SAR

SAR listed as Endangered or Threatened under the provincial *Endangered Species Act, 2007** are discussed as follows.

- **Possible injury or mortality of Black Ash (*Fraxinus nigra*):** Black Ash typically prefers wet environments such as swamps but can also persist in moist upland communities (Committee on the Status of Endangered Wildlife in Canada, 2018a). Black Ash individuals and their habitat are afforded protection under Ontario Regulations 6/24 and 832/21 of the *Endangered Species Act, 2007**, respectively. Additional detailed plant inventories are recommended during Detail Design to identify the total number of Black Ash within the ROW, as well as health assessments of any Black Ash that are identified. Authorization under the *Endangered Species Act, 2007** will be required if removal of healthy Black Ash with a diameter at breast height of 8 cm or greater cannot be avoided through refinements at Detail Design.
- **Possible injury or mortality of Butternut:** Several Butternuts were identified within the ROW during the development of the Preliminary Design. Additional detailed plant inventories and further studies such as visual hybridity assessments and/or genetic testing are recommended during Detail Design to identify the total number of pure Butternuts within the ROW. Any ground disturbance work (e.g., grading, excavation) within 25 m of a Butternut or removal of Butternuts will require a Butternut Health Assessment to be completed at Detail Design by a qualified Butternut Health Expert and an authorization under the *Endangered Species Act, 2007** and/or the *Species at Risk Act* for the harm or removal of any identified Butternuts may be required.
- **Disturbance or displacement of Chimney Swift and destruction of their nests:** Although no targeted surveys were completed to inspect chimneys for potential use by Chimney Swift, this species was observed throughout the Study Area during the multi-year field program. Candidate habitat for Chimney Swift was also identified in 2025 where observations of the species occurred proximate to buildings containing suitable chimneys for nesting or roosting. Removal of buildings that have suitably sized and uncapped chimneys within the Study Area may therefore result in the disturbance or displacement of Chimney Swift and destruction of their nesting habitat. During Detail Design, buildings proposed for demolition should be assessed for the presence of suitable chimneys and surveys to assess habitat use by Chimney Swift should be completed to identify potential nesting/roosting habitats. If confirmed habitat is identified within the ROW and impacts to Chimney Swift habitat cannot be avoided, consultation and engagement with the MECP and ECCC is required. Potential permitting requirements under the *Endangered Species Act, 2007** and/or the *Species at Risk Act* will be determined by the Bilateral Federal-Provincial Working Group. Under the *Species at Risk Act*, the structure used for roosting is considered a residence throughout the year because Chimney Swift are likely to return every year to the same structure (exhibiting strong roost fidelity). The roost sites remain residences throughout the year until there is documented evidence that the species has not used the roosting structure for three consecutive years (Government of Canada, 2023).
- **Removal of candidate Short-eared Owl (*Asio flammeus*) habitat and possible disturbance, mortality or injury:** Short-eared Owl breeding habitat may be present within the ROW; however, nocturnal owl surveys were not completed during the development of the Preliminary Design to confirm the presence of the species. Short-eared Owl is a ground-nesting owl that prefers open habitats such as grasslands, marshes and meadows for breeding. If vegetation removal occurs within marshes and meadows between April 1 and

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August 31, nesting Short-eared Owls (if present), their nests and young may be incidentally killed or harmed by vegetation clearing activities. Based on the background records review, the occurrences of Short-eared Owl in vicinity of the ROW are more likely associated with winter/non-breeding foraging visitants. While all types of habitat are currently protected under the *Endangered Species Act, 2007**, foraging habitat is generally considered less sensitive and more widely available, which reduces the severity of potential impacts related to habitat loss. However, if impacts on Short-eared Owl habitat cannot be avoided, consultation and engagement with the MECP and ECCC is required. Potential permitting requirements under the *Endangered Species Act, 2007** and/or the *Species at Risk Act* will be determined by the Bilateral Federal-Provincial Working Group.

- **Removal of confirmed and candidate grassland bird SAR habitat and possible disturbance, mortality or injury:** Both Bobolink and Eastern Meadowlark require large areas of grassland habitat to carry out their life cycle processes and are often found nesting in agricultural settings such as pastures and hayfields (McCracken et al., 2013). As such, the presence of candidate habitat for Bobolink and Eastern Meadowlark largely depends on the type of crop planted within the agricultural fields that intersect the ROW. There were several pastures and winter wheat fields recorded within the ROW. However, additional or less habitat may exist within the ROW due to crop rotation. Given that crop rotation is a common agricultural practice, it is recommended that the presence of suitable habitat is confirmed and associated grassland SAR surveys are completed to confirm the presence or absence of Bobolink and Eastern Meadowlark during Detail Design. Bobolinks and Eastern Meadowlarks are ground nesters and build their nests on soil that is concealed by dense vegetation. If vegetation removal occurs between April 1 and August 31, nesting Bobolink and Eastern Meadowlark, their nests and young, may be incidentally killed or harmed by vegetation clearing activities. If impacts to Bobolink and Eastern Meadowlark habitat cannot be avoided, consultation and engagement with the MECP and ECCC is required. Potential permitting requirements under the *Endangered Species Act, 2007** and/or the *Species at Risk Act* will be determined by the Bilateral Federal-Provincial Working Group.
- **Removal of confirmed Bank Swallow habitat and possible disturbance, mortality or injury:** Two confirmed Bank Swallow nesting locations were recorded along aquatic features that intersect the ROW, but outside the Study Area boundaries. Bank Swallows generally exhibit a strong site fidelity, often returning to the same nesting sites year after year as long as site conditions remain suitable. However, nesting colonies can be temporary on banks of watercourses where erosion dynamics primarily determine habitat suitability (Garrison and Turner, 2020). Bank Swallows are therefore adaptable in finding new sites if their previous colonial nesting sites have been eroded away. Given that the confirmed nesting sites were identified more than 50 m away from the ROW, the nesting sites are not anticipated to be directly affected based on the provincial General Habitat Description for Category 2, which has a moderate tolerance to alteration (MECP, 2022a). Updated habitat use surveys during Detail Design and/or monitoring during construction are recommended for the candidate nesting habitat areas within the Study Area; however, Bank Swallows are generally known to be tolerant to some forms of anthropogenic disturbance (frequently nesting in construction sites and aggregate extraction operation, MNR, 2017b) and so the risk of indirect disturbance from the Project is low. The ROW overlaps approximately 6.69 ha of candidate foraging habitat for Bank Swallow. Therefore, there will be minimal loss of foraging habitat as result of the Project. However, foraging habitat is not limiting within the greater landscape.
- **Removal of confirmed Red-headed Woodpecker habitat and possible disturbance, mortality or injury:** One confirmed nest cavity tree for Red-headed Woodpecker was observed in 2023 within the Study Area but outside of the ROW. The ROW does, however, overlap approximately 0.92 ha of confirmed nesting and foraging habitat for Red-headed Woodpecker based on applying a 200 m radius surrounding the nest location (ECCC, 2021a). Approximately 1.04 ha of areas containing the biophysical attributes of Critical Habitat for Red-headed Woodpecker will also be overlapped by the ROW. An *Endangered Species Act, 2007** habitat regulation for Red-headed Woodpecker has not been released; however, the provincial Recovery Strategy (MECP, 2022c) recommends using the federal definition of Critical Habitat to develop the provincial habitat regulation. As noted above, the snag tree with the confirmed nest was located just outside of the ROW and is not anticipated to be removed. However, noise and vibration disturbance from adjacent construction activities and future highway operation may indirectly disturb and displace the one breeding pair observed using the snag tree or other suitable trees in the adjacent forest community. Consultation with the MECP and ECCC are required to establish appropriate protection, mitigation and/or compensation measures to minimize impacts to Red-headed Woodpecker and its habitat. Potential permitting requirements under the *Endangered Species Act, 2007** and/or the *Species at Risk Act* will be determined by the Bilateral Federal-Provincial Working Group.
- **Removal of candidate bat SAR habitat and possible disturbance, mortality or injury:** The ROW overlaps approximately 49.04 ha of suitable maternity roosting habitat, represented by forest communities and treed swamp communities. These communities are often associated with larger, contiguous wooded communities that extend beyond the limits of the ROW providing available roosting and foraging habitat in the greater landscape. The Significant Woodlands in and adjacent to the ROW (e.g., those that intercept the ROW at some point) are 931.54 ha in size, or 1,380.45 ha of woodland when including non-significant woodlands. This results in a 5.26% or 3.55% loss in woodland habitat respectively in the greater landscape. Bat SAR may be inadvertently killed or injured due to the removal of or accidental damage to suitable maternity roost trees if vegetation clearing occurs during the bat roosting season

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between March 15 and November 30. Therefore, mitigation measures include timing windows to avoid removals during this period (refer to **Table 5-23**).

- Bat SAR may also roost in anthropogenic structures such as buildings and sheds. Additionally, Eastern Small-footed Myotis (*Myotis leibii*) prefer to roost in open, sunny rocky habitats including cracks and crevices in cliffs and boulders, in talus slopes, beneath stones on rock barrens and in rock outcrops containing crevices. Species-specific surveys targeting the presence of bat SAR were not completed as part of the development of the Preliminary Design. Therefore, bat acoustic monitoring in forested habitat and bat exit surveys for suitable buildings proposed for demolition are recommended during Detail Design. Bat acoustic monitoring is also recommended at all suitable rock piles and other rocky habitat features. If impacts to bat SAR and their habitats cannot be avoided, consultation and engagement with the MECP and ECCC is required. Potential permitting requirements under the *Endangered Species Act, 2007** and/or the *Species at Risk Act* will be determined by the Bilateral Federal-Provincial Working Group.

- **Removal of confirmed Rapids Clubtail habitat and possible disturbance, mortality or injury:** The ROW overlaps 9.02 ha of potentially critical habitat for Rapids Clubtail, resulting in direct habitat loss through removal, physical alteration, grading and infilling activities. Rapids Clubtail, like other Odonata species, are sensitive to water quality given their biophysical requirements and life-stages, particularly in their larval stage (Committee on the Status of Endangered Wildlife in Canada, 2018b). Changes in drainage patterns during construction and operation may increase or decrease drainage and SWM flows and surface water levels beyond the natural range of variation, which could lead to reduced availability of habitat and habitat quality. Additionally, pollutants and salt runoff resulting from construction and operation may also alter water quality and impact Rapids Clubtail, particularly downstream of the ROW. There is potential for an increase in the risk of injury or death to Rapids Clubtail through collisions with construction vehicles during construction as well as with traffic along the highway while in operation. Consultation with the MECP and ECCC is required during Detail Design. Potential permitting requirements under the *Endangered Species Act, 2007** and/or the *Species at Risk Act* will be determined by the Bilateral Federal-Provincial Working Group.

Federally Protected SAR

The following SAR do not receive individual or habitat protections under Section 9 and 10 respectively of the *Endangered Species Act, 2007** but are listed as Endangered or Threatened under Schedule 1 of the federal *Species at Risk Act* and are therefore given special consideration as follows:

- **Removal of confirmed Western Chorus Frog habitat and possible disturbance, mortality or injury:** The ROW overlaps 5.44 ha of confirmed breeding wetlands and 28.90 ha of potential wetland and terrestrial habitat for Western Chorus Frog resulting in direct impacts on breeding, foraging and overwintering habitats through removal, physical alteration, grading and infilling activities. As with other anuran species, Western Chorus Frog are known to be sensitive to changes in hydrological conditions, including hydro-periods, aquatic contaminants and vegetation composition in wetland breeding habitats. In addition, because of their reliance on auditory calls for successful breeding, anurans can be sensitive to anthropogenic noise disturbances. In a scientific study conducted along Highway 401, Eigenbrod et al. (2009) observed significant negative effects of major highways on abundances of four of seven anuran species, including a “road-effects zone” for Western Chorus Frog that extended 1,100 to 2,400 m from the highway. However, there is uncertainty in the extent and severity of the road-effects zone, depending on local site conditions, including topography and vegetation, which may buffer noise and other indirect disturbances and habituation or adaption of local populations to road-related disturbances. In the ROW, the local population may be partially habituated to noise and other disturbance from the adjacent major roadways (e.g., Highway 27, Highway 50, and Highway 427). It is estimated that a zone of at least 120 m beyond the ROW has a high potential for indirect impacts, primarily due to avoidance of breeding habitat resulting from traffic noise disturbance. If impacts to Western Chorus Frog and its habitat cannot be avoided, consultation and engagement with ECCC is required. Potential permitting requirements under the *Species at Risk Act* will be determined by the Bilateral Federal-Provincial Working Group.

- **Removal of confirmed and candidate Barn Swallow nesting and foraging habitat, and possible disturbance, mortality or injury:** Although no targeted surveys were completed to inspect buildings or other structures for potential use by Barn Swallow, this species and its nests were observed throughout the ROW during the multi-year field program. Areas of candidate Barn Swallow nesting habitat are mapped as Significant Wildlife Habitat. During Detail Design, buildings and other structures proposed for demolition should be assessed for the presence of Barn Swallow nests. The *Species at Risk Act* protects Barn Swallow residences, which are defined as the nest, occupied or not, from May 1 or the date when adults are first seen building or occupying the nest, whichever is earlier, to August 31 or the date when a bird is last seen at the nest, whichever is later (Government of Canada, 2019). For compliance with the *Species at Risk Act*, building/structure demolition activities or other works impacting Barn Swallow nesting habitat must be completed outside of the protected nesting period. If impacts to Barn Swallow and its habitat cannot be avoided, consultation and engagement with ECCC is required. Potential permitting requirements under the *Species at Risk Act* will be determined by the Bilateral Federal-Provincial Working Group.

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- **Removal of candidate Eastern Whip-poor-will (*Antrostomus vociferus*) habitat and possible disturbance, mortality or injury:** Eastern Whip-poor-will breeding habitat, which includes a mix of open and forested habitats, may be present within the ROW, however, crepuscular surveys were not conducted during the development of the Preliminary Design. Areas of candidate Eastern Whip-poor-will breeding habitat are mapped as Significant Wildlife Habitat. If vegetation removal occurs between April 1 and August 31, there is potential for incidental harm or mortality for Eastern Whip-poor-will nests and/or young. If impacts on Eastern Whip-poor-will habitat cannot be avoided, consultation and engagement with ECCC is required. Potential permitting requirements under the *Species at Risk Act* will be determined by the Bilateral Federal-Provincial Working Group.
- **Removal of confirmed and candidate Monarch habitat and possible disturbance, mortality or injury:** Although no targeted Monarch surveys have been completed, this species and its reproductive habitat (e.g., Milkweed [*Asclepias*] with caterpillars) were observed within the ROW during the multi-year field program. Areas of candidate Monarch reproduction habitat are mapped as Significant Wildlife Habitat. During Detail Design, candidate Monarch habitat should be assessed to determine reproductive habitat use. The *Species at Risk Act* protects Monarch individuals and their residences. Mitigation measures to prevent direct impacts on Monarch individuals (e.g., timing windows for vegetation removals in reproductive habitat areas) and to avoid impacts to areas containing residences will therefore be developed and refined during Detail Design. If impacts to Monarch and its habitat cannot be avoided, consultation and engagement with ECCC is required. Potential permitting requirements under the *Species at Risk Act* will be determined by the Bilateral Federal-Provincial Working Group.
- **Removal of confirmed and candidate Wood Thrush habitat and possible disturbance, mortality or injury:** Wood Thrush and its breeding habitat were recorded in suitable forested areas throughout the ROW during the multi-year field program. Areas of candidate Wood Thrush habitat are mapped as Significant Wildlife Habitat. The ROW overlaps 12.11 ha of confirmed Wood Thrush breeding habitat. While there is potential for localized reduction in breeding habitat availability and displacement due to indirect disturbances, including traffic noise during operation, the majority of the confirmed Wood Thrush habitat was located outside of the ROW and impacts will be minimized through bridge designs. For compliance with the *Species at Risk Act* and the *Migratory Birds Convention Act, 1994*, tree/vegetation removals in confirmed Wood Thrush habitat must be completed outside of the general nesting period for migratory birds (April 1 to August 31). If impacts to Wood Thrush and its habitat cannot be avoided, consultation and engagement with ECCC is required. Potential permitting requirements under the *Species at Risk Act* will be determined by the Bilateral Federal-Provincial Working Group.

The list below provides a summary of additional field investigations likely required to confirm habitats and assess effects as part of the Detail Design:

- Targeted surveys to confirm the presence or absence of federally protected SAR may be required following the most approved agency guidelines. In addition, presence of SAR will be further discussed with applicable regulatory agencies and Indigenous communities and impacts will be mitigated and offset in accordance with established permit conditions.
- Detailed nest cavity tree searches for Pileated Woodpecker in suspected Ecological Land Classification Units.
- Searches for Green Heron and Great Blue Heron nests may be required in candidate habitats where vegetation removal is proposed.
- Targeted SAR surveys in accordance with the MECP's latest guidelines and protocols for the following:
  - Bobolink and Eastern Meadowlark;
  - Bat SAR via acoustic monitoring in treed habitats and bat exit surveys for buildings proposed for demolition;
  - Tree SAR detailed searches and inventories;
  - Black Ash and Butternut health assessments;
  - Chimney Swift habitat suitability and monitoring of chimney use for buildings proposed for demolition;
  - Short-eared Owl via crepuscular surveys; and
  - Bank Swallow colony nest surveys.

5.1.3 Groundwater and Hydrogeology

Based on the existing conditions identified in **Section 2.3.3**, the section below outlines the potential impacts identified in the hydrogeological impact assessment.

Impacts to Drinking Water

There are 21 potential impacts for which the CTC Source Protection Committee (the CTC Source Protection Committee is comprised of 21 people from across the CTC Source Protection Region, including stakeholders from municipalities, businesses, and the general public. Under the *Clean*

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Water Act, 2006, the Committee is responsible for the development of the Source Protection Plan, which is aimed at keeping drinking watercourses clean and encouraging wise water use) must write policies in areas where a threat of impact could be significant. For the scope of this Project, the following prescribed threats will be discussed as they relate to the construction and operation of a roadway/highway:

- Application of road salt;
- Application of commercial fertilizer; and
- Handling and storage of fuel.

These three construction and operation activities are considered to pose a low-risk threat to the drinking water systems in the area, with the exception of application of commercial fertilizer in the areas where managed land is present within the Credit Valley Source Protection Area. Based on the Approved Assessment Report for Credit Valley Source Protection Area (CTC Source Protection Committee, 2024), the application of commercial fertilizer is considered as a moderate threat in the areas where managed land is present. The source protection plans do not provide prescriptive policies for low-risk threats. MTO will apply current BMPs to minimize threats from these activities by way of adherence to MTO plans and policies, the use of special contract provisions, and contract oversight and monitoring.

Temporary and Permanent Construction Impacts

The following temporary and permanent construction activities have been identified as potentially being associated with the Project. Any adverse impacts may be more significant where PSWs were identified or where geological formations have high permeability (i.e., sands and gravels).

Clearing and Grubbing

The removal of trees, stumps and other vegetation may result in increased surface water runoff and a decrease in water infiltration into the subsurface. This can affect groundwater quantity and quality. Watercourses may also be affected due to an increase in the amount of suspended particles carried by surface water runoff.

Grading

The use of heavy equipment to cut or fill the original topography for the Project can have a significant effect on groundwater. Excavations made into the shallow aquifer system can result in temporary or permanent changes in groundwater flow patterns and could result in the need for dewatering. Dewatering activities (e.g., discharging to an alternate location) may change the water supply to private water users; lead to settlement of the ground surface; and/or change the quality of groundwater. The Preliminary Design will be refined and finalized in Detail Design, including final grading.

Bridges/Interchanges

Embankments, foundations, footings, abutments, and piers will be required for the construction of bridges, interchange ramps, and crossing roads. This may result in obstruction and/or interception of groundwater as baseflow to surface watercourses.

Preparation of the Road Bed

Compaction of the land prior to road surfacing activities can reduce groundwater recharge to the overburden and bedrock aquifer systems. Obstruction to groundwater recharge will have the greatest impact in upland (elevated) areas where permeable deposits are removed, compacted, or paved over. Obstruction to groundwater discharge may occur if compaction takes place adjacent to surface water features and seepage zones. Compaction can also increase surface water runoff to nearby watercourses.

Road Surfacing

The installation of concrete and/or asphalt roadway surfaces for the construction of Highway 413 and ancillary highway facilities can increase imperviousness and result in the entrainment or wash-off of residual material such as lime, cement, oil and grease, and asphalt into surface water runoff. Runoff can flow to nearby watercourses or adjacent areas where infiltration into the aquifer system may result in groundwater contamination if residuals are not appropriately managed.

Well Decommissioning

Based on the Preliminary Design, private water wells for residences and commercially-dependent enterprises that are within the ROW and likely to be impacted will be decommissioned to facilitate the construction of the Project.

Overall Change in Groundwater Recharge and Discharge

Effects on groundwater recharge could reduce infiltration capacity to the aquifer system and result in an alteration of groundwater storage and flow patterns. Road construction activities might also disrupt groundwater discharge or result in the formation of new discharge areas, which could impact groundwater quantity and flow; change water table levels; and/or result in a change in the distribution of wetlands.

Changes in surface water flow are generally reflected in a corresponding alteration of the groundwater flow pattern, specifically, flow rate, water level, and direction of flow. Some components of road construction might cause changes in the amount of surface water runoff,

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drainage patterns, water levels, and flow volumes. In general, changes in groundwater quantity or flow in response to changes in surface water recharge are expected to be attenuated (i.e., more subdued in magnitude and potentially of longer duration).

Overall Likelihood of Release of Contaminants

During any phase of any roadway construction and operation activities, due care should be exercised to avoid fuel, lubricant and fluid spills. Spill and contamination prevention practices should be implemented to avoid potential environmental hazards and cleanups. Where practical, activities such as refueling should not be undertaken in areas with high susceptibility to groundwater contamination. Small spills and leaks during construction and operations activities have the potential to affect areas of shallow groundwater in high permeability soils. As part of Detail Design, additional assessment of the grading plans for the Project should be undertaken, including comparison to bedrock elevation and overburden thickness mapping to determine the potential for excavations to encounter bedrock and bedrock aquifers.

Road salting activities during the winter season are currently undertaken for roads present within the ROW and will include Highway 413 and crossing roads when the Project is constructed. Concentrations of sodium and chloride will continue to be present in the runoff along roadside drainage and SWM ditches and through roadside infiltration, which may impact surface water features. MTO employs and recognizes the importance of salt BMPs and has developed a Salt Management Plan in accordance with ECCC's Code of Practice for the Environmental Management of Road Salts (ECCC, 2004).

5.1.4 Fluvial Geomorphology

Based on the existing conditions identified in **Section 2.3.4** and **Figure 2-3**, the section below outlines the potential impacts identified in the fluvial geomorphological assessment.

Proposed Works

The Fluvial Geomorphic Analysis provides an opportunity to mitigate future erosion risk to watercourse crossing structures and/or enhance the natural channel processes by informing crossing design, while minimizing unnecessary construction of oversized crossing structures. It serves two main functions: (1) it provides a multi-criteria evaluation to determine the proper crossing size for watercourses affected by the highway work, and (2) it identifies the preferred alignment concepts for watercourses that presently (a) cross the proposed highway obliquely, and (b) identifies locations where installing a crossing is not feasible (e.g., complex highway interchanges, etc.).

Numerous factors were considered to provide appropriate crossing size and alignment recommendations. This included:

1. Reviewing available background documentation (previous studies, surficial physiography, and surficial geology) to provide a general understanding of the natural, historical, and anthropogenic conditions that influence channel morphology and watercourse stability in a broad sense.
2. Reviewing the provincial and federal protocols and guidelines to ensure crossings are designed with due consideration of relevant policies and legislation.
3. Assessing the pre-construction existing conditions through a desktop assessment encompassing:
    a. A broad-scale review of watershed characteristics;
    b. A review of historical imagery from multiple decades to inform how each watercourse has responded to local changes in land use/cover; and
    c. Delineation of fluvial geomorphological reaches for all watercourses that cross the proposed alignment.
4. Assessing the pre-construction existing conditions through a field assessment of each watercourse reach as close to the proposed crossing location as possible (where PTE allowed) by considering:
    a. Critical reach-specific information about hydraulic flow regime, channel definition, channel dimensions, watercourse stability (Rapid Geomorphic Assessment and evidence of erosion); and
    b. Any additional risk factors identified through fieldwork for the proposed crossing locations.

Once the existing conditions were defined for each reach, a preliminary crossing assessment was completed by determining the meander belt width and erosion rate for all defined watercourses that cross the Highway 413 ROW based on channel form, function, future erosion risk, and site-specific features such as current erosion or sedimentation issues, identified through desktop and field assessments.

Crossing recommendations for each reach were refined using a risk matrix developed specifically for the Project. The risk matrix reflects the potential risk to the natural channel and implications for the longevity of the crossing bridge/structure itself. The risk assessment matrix considered pre-existing channel conditions including feature definition and anthropogenic alteration, evidence of instability (Rapid Geomorphic Assessment), evidence of pre-existing erosion, drainage area, valley confinement, and planform of watercourse at the proposed watercourse crossing location.

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Each risk factor was rated from low to high to generate a final overall risk factor for each watercourse crossing. In general, smaller undefined channels had a lower risk, while large meandering watercourses that displayed evidence of erosion especially in urbanized areas had a larger risk. Each crossing recommendation was provided to reflect this risk accordingly.

Crossing assessments for each reach were then finalized after consideration of key additional factors including:

1. A high-level review of HEC-RAS modelling results for pre-existing and proposed conditions to identify any significant future changes in the channel and floodplain hydraulics that would increase the local erosion potential;
2. A review of federal (i.e., SAR habitat considerations as they pertain to watercourse crossings) and provincial crossing design recommendations; and
3. Any site-specific considerations noted during fieldwork/the desktop assessment.

For instance, crossing recommendations were increased for crossings over Critical Redside Dace habitat in accordance with federal legislation or where the background review identified that the watercourse should be classified as a “large unstable watercourse” according to TRCA (2015) guidance.

Input on pier placement was also provided as part of the crossing recommendation so that piers could be located outside of the erosion hazard limit. Further input into bank hardening measures and crossing type (e.g., it was recommended that crossing be open footed where possible to maintain continuity and allow for the creation of bed morphology within the crossing) was also provided as appropriate as the designs were developed and discussed at design meetings.

- Preliminary channel designs/conceptual channel realignments were also provided where the orientation of the existing watercourse crossings are either severely misaligned with respect to the Preliminary Design, or where it is not feasible to construct crossing structures, such as at complex highway interchanges.

4. The realignments themselves fall into two categories:
    a. Instances where minor channel realignments fall within the existing meander belts. These realignments aim to protect the footings and/or gradings of the watercourse crossing structures and have no direct impact on crossing size. Consequently, model updates and reassessments can be deferred to the Detail Design stage to inform the final channel design configuration.
    b. Instances where major channel realignments falling outside of the existing meander belts are required to accommodate the proposed watercourse crossings. Here, the HEC-RAS models are updated with the preliminary channel designs (i.e., planform, long profile and channel sections, but without geomorphic features such as riffles and pools) to inform the structure sizing. The models will subsequently be updated and reassessed during the Detail Design stage to inform the final natural channel design.

Conceptual channel realignments have been completed using natural channel design principles for the following watercourses listed in **Table 5-3**. Realignment details will be finalized during Detail Design. Additional channel realignments may be required during Detail Design, to accommodate proposed infrastructure such as stormwater facilities, maintenance yards, carpool lots, etc.

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Table 5-3: Summary of Conceptual Channel Realignments for Watercourses within the Study Area

Fluvial Geomorphology Reach ID	Ecology ID	Drainage Culvert ID	Structure ID	Road Location
SIM_EB_SM_0_2	SM_EB_SIM_0_E1	SM_EB_SIM_0_WC1	W-W4	Highway 401 East of Trafalgar Rd
EC_EH_ETW_12_3	EC_EH_ETW_12_E1	EC_EH_ETW_12_WC1	W-W100	West of Mississauga Road
EC_EH_ETW_7_1	EC_EH_ETW_7_E4	EC_EH_ETW_7_WC4.1 EC_EH_ETW_7_WC4.2	W-W108	West of Chinguacousy Interchange
EC_EH_ETW_6_1	EC_EH_ETW_6_E1-E5	EC_EH_ETW_6_WC1.4 EC_EH_ETW_6_WC1.5	W-W111 W-W112	Chinguacousy Road
EC_EH_ETW_1_7	EC_EH_ETW_1_E3-E6	EC_EH_ETW_1_WC5	W-W121	West of Hurontario Street
HU_WH_CAC_0_1	HU_WH_CAC_0_E4	HU_WH_CAC_0_WC1	W-W141	East of Kennedy Road
HU_WH_CAC_0_2a	HU_WH_CAC_0_E3	HU_WH_CAC_0_WC2	W-W142	410 Mainline (north of Mayfield Interchange)
HU_WH_THW_1_4 (Includes part of HU_WH_TWH_1_2)	N/A	HU_WH_TWH_1_WC2.3	W-W148	West of Dixie Road
HU_WH_SAL_0_3 **HU_WH_SAL_0_2** **HU_WH_SAL_0_1** **HU_WH_SAL_4_1** **HU_WH_SAL_5_1**	HU_WH_SAL_0_E6 HU_WH_SAL_0_E5 HU_WH_SAL_0_E4 HU_WH_SAL_0_E3 HU_WH_SAL_0_E2 HU_WH_SAL_4_E1	HU_WH_SAL_0_1 HU_WH_SAL_0_2 HU_WH_SAL_0_3 HU_WH_SAL_0_4 HU_WH_SAL_0_5 HU_WH_SAL_0_6 HU_WH_SAL_0_7 HU_WH_SAL_0_8 HU_WH_SAL_0_9 HU_WH_SAL_4_1 HU_WH_SAL_4_2 HU_WH_SAL_4_3	E-W2A E-W2B E-W3	Airport Road
HU_MH_ROB_4_1 (us) **HU_MH_ROB_4_1 (ds)**	HU_MH_ROB_4_E1	HU_MH_ROB_4_4 HU_MH_ROB_4_5 HU_MH_ROB_4_6	E-W15 E-W16A E-W16B	Highway 427
HU_MH_ROB_7_2	HU_MH_ROB_7_E3	HU_MH_ROB_7_2_1 HU_MH_ROB_7_2_2 HU_MH_ROB_7_2_3HU_MH_ROB_7_2_4	E-W24 E-W25A E-W25B	Highway 427
HU_MH_EHR_1_6	HU_EH_EHR_1_E2	HU_EH_EHT_1_2_2, HU_EH_EHT_1_2_1	E-W30A E-W30B E-W29	East of Highway 27

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Preliminary Impacts

When crossings are placed over a reach without due consideration towards the geomorphic processes occurring within the watercourse, risks to the crossing bridge/structure and/or channel form and function may occur. Such risks could lead to the need for continual or emergency maintenance of the crossing and/or could adversely affect channel stability, fish passage potential and aquatic habitat conditions. Provided that crossings are designed in accordance with the fluvial geomorphic recommendations, impacts to the natural watercourses and associated fish and fish habitat can be minimized.

Channel processes that may contribute to impacts at a bridge or culvert crossing and associated aquatic habitat include:

- Channel bed degradation/lowering and scour of banks at the crossing inlet/outlet – this often occurs due to flow contraction/expansion can lead to undercutting of bridge/culvert abutments/footings;
- Establishment of a local base-level control point (e.g., closed bottom culvert) that affects channel bed profile development;
- Development of a perched culvert – which will affect channel profile and fish passage;
- Channel migration – movement of meanders could cause erosion of culvert/bridge embankments;
- Channel expansion – enlargement of cross section areas (e.g., in response to urban hydro modification) may lead to increased stress around the culvert entrance, leading to outflanking of the culvert and flow constriction;
- Knickpoint regression along the channel bed profile;
- Loss of riparian vegetation which can greatly diminish bank shear resistance and increases the potential for bank erosion and channel translation;
- Establishment of a local base-level control point (e.g., closed bottom culvert) that affects channel bed profile development;
- Sediment deposition – due to a loss of sediment transport capacity upstream or within the culvert;
- Sediment loading – at road crossings due to the wash of road-based sediment into the channel; and
- Channel bed degradation and/or instability.

Channel realignments may result in the following impacts:

- Temporary channel adjustments including:
  - Time required for vegetation to reestablish;
  - Temporary disruption of terrestrial and aquatic habitat; and
  - Anticipated adjustment of the realigned channel to its design, particularly after experiencing the full annual range of flows. This may include minor changes to channel geometry and substrate.
- Channel realignments could be used to mitigate existing channel instabilities where they are observed including:
  - Stabilization of the channel where feasible, based on field assessments and incorporated into natural channel design;
  - Rehabilitation of channel form and function degraded by past land use through application of natural channel design principles to enhance morphology and habitat complexity; and
  - Consideration will be given to removal of failed structures (e.g., concrete or gabion baskets) to stabilize the channel where feasible during the natural channel design process.
- Channel realignments could also provide an opportunity to maintain or enhance the natural habitat where appropriate. These enhancements should be discussed with the multi-disciplinary team during Detail Design and may include:
  - Incorporating larger key stones in the proposed substrate material mix where appropriate to provide cover and resting areas for aquatic species;
  - Adding overhanging vegetation and in-stream features such as boulders;
  - Designing a sinuous channel to the proposed channel planform where feasible to increase channel length, create more aquatic habitat, and improve morphological diversity;
  - Consideration for existing wildlife habitats for breeding bird communities could present opportunities for enhancements, such as improving and expanding riparian habitat to support ecological function;
  - Including low-flow channels to maintain aquatic habitat accessibility during periods of reduced flow; and

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- Opportunity to enhance riparian vegetation with woody plantings.

Channel realignments will be avoided where possible. Where realignments are necessary, natural channel design principles will be used to inform their design so that the new realigned channel mimics the form and function of a naturally occurring stream and support long-term channel stability.

5.1.5 Erosion and Sedimentation

Based on the existing conditions identified in **Section 2.3.5** and **Figure 2-4**, the section below outlines the potential impacts identified in the erosion and sedimentation overview risk assessment.

As a part of the erosion and sedimentation overview risk assessment, the erosion potential and risk consequence were assessed for the Project. The assessments were based on existing site conditions, including land use, surficial geology, topography and proximity to significant natural features, as well as proposed construction aspects for the Project. The erosion potential and risk consequence were categorized as low, moderate, or high. **Table 5-4** provides the erosion potential and risk consequence assessment summary for the Project.

Potential erosion and sedimentation impacts due to the Project were evaluated. Erosion at construction sites can impact project costs and timelines. Sedimentation can adversely impact aquatic habitat and environments, wetlands and ecologically significant areas, including fish and fish habitat and wildlife habitat, notably those supporting SAR. Significant rainfall events can impact erosion and sediment control measures. The Highway 413 Project has moderate and high-risk consequences of uncontrolled erosion and resultant sedimentation, due to the moderate to high erosion potential, proposed construction activities and proximity to provincially significant wetlands, watercourses, waterbodies, unevaluated and evaluated wetlands, and the Greenbelt. Therefore, erosion and sediment control plans will be required, including recommendations for erosion and sediment control measures, which are to be installed and maintained. Regular erosion and sediment control inspections will be completed to monitor and identify erosion and sediment control needs. Temporary erosion and sediment control measures will also be inspected within the 24 hours prior to a forecasted significant rainfall event and also within 24 hours following significant rainfall events (approximately 15 mm or greater within 24 hours).

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Table 5-4: Erosion Potential and Consequence Assessment Summary

Polygon in Figure 2-4	Land Use (e.g., residential, commercial, etc.)	Natural Features (wetlands, waterbodies, watercourses)	Surficial Geology	Soil Erodibility (Low, Medium, High)	Topography (range of contours)	Slope Length (<70 m or >70 m)	Slope Gradient (0-10%, 10-20%, >20%)	Erosion Potential (Low, Moderate, High)	Risk/Consequence (Low, Moderate, High)
A	Rural Area, predominately agricultural with rural residential houses	East Sixteen Mile Creek, tributaries to East Sixteen Mile Creek, tributaries to Credit River, Provincially Significant Wetland, Unevaluated Wetlands, Waterbodies	~89% Silty to Clayey Till (5D), ~2% Sand and Gravel (6), ~5% Silt and Clay (8B), ~4% Silt, Clay, Sand and Gravel (19)	Medium	190-231	<70 m	0-20%	Moderate	Moderate
B	Rural Area, predominately agricultural with rural residential houses	Levi's Creek, Credit River, tributaries to Credit River, Provincially Significant Wetland, Greenbelt	~3% Silty to Clayey Till (5D), ~45% Sand and Gravel (6/9A/9C), ~17% Silt and Clay (8B), ~30% Silt, Clay, Sand and Gravel (12/19), ~5% bedrock (3)	Medium	189-227	<70 m	0-20%, >20%	High	High
C	Rural Area, predominately agricultural with rural residential houses	Tributaries to Credit River, Etobicoke Creek, tributaries to Etobicoke Creek, Salt Creek, tributaries to Salt Creek, tributaries to West Humber River, Provincially Significant Wetlands, Unevaluated Wetlands, Evaluated Wetlands, Waterbodies, Greenbelt	~86% Silty to Clayey Till (5D), ~5% Silt and Clay (8B), ~9% Silt, Clay, Sand and Gravel (19)	Medium	214-286	<70 m	0-20%	Moderate	Moderate
D	Rural Area, predominately agricultural with rural residential houses	West Humber River, tributaries to West Humber River, Main Humber River, tributaries to the Main Humber River, East Humber River, tributaries to the East Humber River, Provincially Significant Wetlands, Unevaluated Wetlands, Waterbodies, Greenbelt	~38% Silty to Clayey Till (5D), ~38% Silt and Clay (8B), ~14% Sand and Gravel (9C), ~10% Silt, Clay, Sand and Gravel (12/19)	Medium	190-251	<70 m	0-20%, >20%	High	High
E	Rural Area, predominately agricultural with rural residential houses	East Humber River, tributaries to the East Humber River, Provincially Significant Wetlands, Unevaluated Wetlands, Waterbodies, Greenbelt	~95% Silty to Clayey Till (5D), ~5% Silt, Clay, Sand and Gravel (19)	Medium	230-285	<70 m	0-20%	Moderate	Moderate

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5.1.6 Drainage and Stormwater Management

Based on the existing conditions identified in **Section 2.3.6**, the section below outlines the potential impacts identified in the drainage and SWM assessment.

Drainage

The sections below describe the drainage and SWM plan for the sections of the Project within each Conservation Authority area. The limits of each Conservation Authority are illustrated on **Figure 2-5**, **Figure 2-6**, and **Figure 2-7**.

Conservation Halton Area

In total, 18 existing watercourse culverts may be impacted by the Project within the CH limits. A preliminary review indicated that four of these culverts likely do not require extension or rehabilitation works and were excluded from the hydraulic assessment, though this will be further confirmed during Detail Design. Of the remaining culverts, two will require removal and relocation, three may require structural modification, and nine will require extension.

Five culverts were not included in the hydraulic assessment due to potential conflicts with highway re-alignments and embankments and will need further assessment during Detail Design. These five culverts are affected by ramp embankments, regrading, and changes to drainage paths, with recommendations for partial removal, skewed extensions, or new connections to maintain hydraulic efficiency.

The existing Pond 2 is located in the northeast quadrant of the Highway 413 and Highway 407 ETR interchange as shown on **Figure 2-5**. Three culverts that direct flow to Pond 2 are outside the grading limits and are not expected to be significantly impacted. Flow attenuation will be provided upstream through the new Pond 9 (located in the northeast quadrant of the Highway 413 and Highway 407 ETR interchange as shown on **Plate A11** of **Appendix B**) to mitigate potential hydraulic impacts to the culverts and Pond 2. Additionally, 12 new watercourse culvert crossings are required to convey run-off from upstream drainage and Highway 413, including the interchange at Highway 401 / Highway 407 ETR.

It should be noted that the majority of the crossings are existing structures. As such, the recommended culvert sizes were primarily determined by hydraulic requirements, with the exception of two watercourse crossings. For these two locations, the culvert sizing was governed by the environmental requirement for openness ratio.

Additionally, given that most of the watercourses are classified as either direct or indirect fish habitats, a minimum of 300 mm substrate has been incorporated into the recommended culvert designs, in accordance with MTO's Highway Drainage Design Standards (MTO, 2024) WC-12: Fish Passage through Culverts.

Credit Valley Conservation Area

Four different subwatersheds will be impacted by the Project within the CVC limits. As this area is currently undeveloped, the majority of the culverts are new, with only a few existing culverts conveying flow beneath local roads. The following summarizes the three interchange locations that currently contain existing culverts (**Figure 2-6**):

- Winston Churchill Boulevard – There are five existing culverts conveying flow from the west side of Winston Churchill Boulevard to the east within the Highway 413 interchange. The analysis is based on replacing all five culverts in order to accommodate grading for Highway 413 and the interchange ramps.
- Bovaird Drive – An existing culvert crosses Bovaird Drive near the centreline of Highway 413. This culvert will be removed, and two new culverts will be constructed on either side of Highway 413. The east culvert will convey ROW flow to a new pond, and the west culvert will bypass the pond, as it conveys mainly external area runoff.
- Mayfield Road – An existing culvert conveys flow from the north side to the south, east of Highway 413. Due to its proximity to the Mayfield Road interchange ramps, this culvert will be removed and replaced with a new one positioned farther east.

Many new culverts and bridges are required to convey watercourses and tributaries across the Project. The crossings are as follows:

- A 605 m long Credit River bridge;
- A 94 m long Levi's Creek bridge;
- A 12.2 m long Levi's Creek South Tributary bridge;
- Six structural culverts; and
- 44 non-structural culverts.

These crossings have been designed based on hydrologic and hydraulic assessments, in coordination with fluvial geomorphology, fisheries, ecology, and structural teams.

Six SWM ponds are provided in the CVC section: five to treat ROW runoff and one to treat runoff from the Credit River bridge. The pond at the Credit River bridge and one other pond are only

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designed for quality control, whereas the remaining ponds provide both quality and quantity control. Additionally, five linear dry ponds provide treatment to smaller drainage areas within the ROW.

Toronto and Region Conservation Authority Area

Four different subwatersheds will be impacted by the Project within the TRCA limits. These subwatersheds are Etobicoke Creek, West Humber, Main Humber, and East Humber. As this area is currently undeveloped, most culverts are new, with only a few existing culverts conveying flow beneath local roads. The following summarizes the interchange locations where existing culverts are present and outlines proposed modifications (**Figure 2-7**):

- **Mayfield Road / Highway 410 Interchange**: Existing culverts at this interchange require further assessment during Detail Design.
- **Airport Road**: Two existing culverts currently convey flow from the eastern side and western side of Airport Road. The proposed design includes replacing one culvert to accommodate grading for Highway 413 and the interchange ramp. The second culvert is proposed to be upsized and realigned to accommodate the proposed realignment of Salt Creek (refer to **Plate E3A** of **Appendix B**).
- **Coleraine Drive**: A single culvert conveys flow from a tributary of the Main Humber River from the west to the east under Coleraine Drive. Although no interchange is proposed at this location, the existing culvert is proposed to be realigned and upsized as part of the Highway 413 proposed works (refer to **Plate E13** of **Appendix B**).
- **Highway 50**: Two existing culverts currently carry flow from the Robinson Creek tributary from west to east. These existing culverts are proposed to be removed, and flow will be diverted through a single, larger culvert under Highway 50 (refer to **Plate E15** of **Appendix B**).
- **Highway 27**: A single culvert conveys flow of a tributary of the East Humber River from east to west under Highway 27. To accommodate the proposed interchange and widening of Highway 27, this existing culvert is proposed to the upsized (refer to **Plate E22A** of **Appendix B**).
- **Highway 400**: Three existing culverts convey flow from eastern to the western side of Highway 400. These culverts are currently proposed to be extended only (refer to **Plates G2** and **G4** of **Appendix B**).

Within the jurisdiction of the TRCA, a total of:

- 53 bridges;
- 45 structural culverts; and
- 67 non-structural culverts are required to cross watercourses within this Study Area.

In addition to the above interchange work, the Etobicoke Creek watershed is at the western limit of the TRCA's jurisdiction and is heavily urbanized. This section of Highway 413 passes largely through the Municipality of Caledon and extends from west of Mississauga Road to Kennedy Road. The alignment also crosses Creditview Road, Chinguacousy Road, McLaughin Road, and Hurontario Street. A creek realignment is provided west of the Chinguacousy Road interchange and west of Hurontario Street to accommodate the intersections and straighten the passage of the creek through the ROW.

The West Humber section extends from Heart Lake Road to Humber Station Road. It also crosses the Highway 410 Extension, Dixie Road, Bramalea Road, Torbram Road, Airport Road, Innis Lake Road, Centerville Creek Road, and The Gore Road. Passing largely through the Municipality of Caledon, the region is predominantly farmland and natural areas. It crosses multiple regulated watercourses, with the Salt Creek being of most significance. To accommodate the Highway 413 interchange at Airport Road, Salt Creek will require realignment (refer to **Plate E3A** of **Appendix B**). The realignment includes diverting the southward flowing main branch westward under Airport Road. The main branch then continues southward through the Highway 413 ROW, avoiding the need to weave the creek through the interchange. Considerations were given to Redside Dace habitat in the design of this realignment. Furthermore, a 312 m long bridge is required to span the West Humber River (refer to **Plate E9** of **Appendix B**). The majority of the structures are new structures, and sizing was governed by openness ratio.

The Main Humber section extends from east of Humber Station Road to Highway 27, crossing Mayfield Road, Coleraine Drive, Highway 50, the Canadian Pacific Kansas City MacTier Rail line, and Huntington Road. The region is predominantly farmland and natural areas. Two realignments will be required for the Robinson Creek in this section:

1. The first is to accommodate the Highway 427 extension to Major Mackenzie Drive. A reach of the Robinson Creek will be realigned eastward. This requires a new bridge/structure at Nashville Road (refer to **Plates F4** and **F5** of **Appendix B**).
2. The second realignment is minor and is proposed to reduce the stream's angle and straighten its path through the ROW (refer to **Plate E16** of **Appendix B**).

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Additionally, an 895 m long bridge is required to cross the Main Humber River (refer to **Plate E19** of **Appendix B**). The majority of the structures in this section are new, and their sizing has been governed by the openness ratio.

The East Humber section extends from Highway 27 to Highway 400, within the Municipality of Vaughan. It also crosses Kipling Avenue, Pine Valley Drive, and Weston Road. The region is predominantly farmland and natural areas. A realignment of the East Humber tributary, located east of Highway 27, is required to straighten its passage through the ROW (refer to **Plate E22** of **Appendix B**). A 312 m long bridge is required to span the East Humber River (refer to **Plate E23** of **Appendix B**). The majority of the structures in this section are new, and their sizing has been governed by the openness ratio.

Stormwater Management

The Project will result in an increase in impervious and pavement areas. Runoff from the Project will discharge to a combination of intermittent, ephemeral, and permanent watercourses and to municipal sewer systems. Potential impacts to the receiving watercourses and municipal sewer system are addressed by stormwater quality treatment and quantity control measures.

The increase in impervious and pavement areas may lead to higher pollutant levels and peak flow rates. The total increase in pavement areas is approximately 31 ha within the CH area, approximately 95 ha within the CVC area, and approximately 145 ha within the TRCA area as described further below.

CH Area

The SWM plan for the CH area includes:

- Maintain existing Ponds 2, 4, and 5 (located in the northeast quadrant of the Highway 413 and Highway 407 ETR interchange as shown on **Figure 2-5**);
- Relocate Pond 1 (located in the southwest quadrant of the Highway 413 and Highway 401 interchange as shown on **Figure 2-5**);
- Relocate and increase Pond 6 capacities (located in the southeast quadrant of the Highway 413 and Highway 407 ETR interchange as shown on **Plate A14** of **Appendix B**);
- Modify Pond 3 (located in the southeast quadrant of the Highway 413 and Highway 407 ETR interchange as shown on **Figure 2-5**; and
- Provide three new Wet Ponds (Ponds 7, 8, and 9) as shown on **Plates A3, A4, A15, A6**, and **A11** of **Appendix B**, respectively).

The existing Ponds 2 and 5 will not be significantly impacted by the Project and will continue to function as constructed. This will be further confirmed during Detail Design.

Grass swales will be provided on both sides of highway, adjacent to ramps, and in the open median. These ditches/swales will be designed with a flat bottom and check dams, and will collect, treat, attenuate, and convey storm runoff generated from new highway surfaces. Hydraulic design of these swales will be carried out during Detail Design, but typically these swales will have a bottom width of 1 m and 2:1 (H:V) side slopes.

CVC Area

Within the CVC area, SWM facilities are provided for drainage areas approximately 10 ha or greater. This includes:

- Six SWM ponds across the Study Area as shown on **Plates B1** to **B28** of **Appendix B**.
- Two of the six ponds serve water quality control only:
  - Pond 1, located within the Levi Creek watershed, is designed solely for water quality treatment, as the target outflow is already met without requiring quantity storage; and
  - The Credit River bridge pond, located south of the Credit River on the east side of the highway, is intended to treat runoff from the Credit River bridge. The drainage area is under 10 ha, making it unsuitable for quantity control. Due to the steep slopes and proximity to the river, the pond could not be placed outside of the regional floodplain, through it remains outside of the 100-year floodplain. Due to the steep slopes along the edge of the Credit River Valley, the pond may require a drop-down structure, and a spillway or diversion channel may be required, the details of which will be determined during Detail Design.
- Five additional dry ponds could be designed to provide additional treatment to drainage areas less than 10 ha, if required. These will be confirmed at the Detail Design stage.

Grass swales will be provided on both sides of highway and in the open median under the initial widening plan. In the CVC's jurisdiction, approximately 33 km long swales are provided along Highway 413 and the Highway 410 Extension. These ditches/swales will be designed with a flat bottom and check dams, and will collect, treat, attenuate, and convey storm runoff generated from new highway surfaces. Hydraulic design of these swales will be carried out during Detail Design, but typically these swales will have a bottom width of 1 m and 2:1 (H:V) side slope. Enhanced swales with check dams will be provided for smaller drainage areas.

For larger contributing drainage areas with no downstream SWM controls, enhanced grass swales or bio swales will provide additional quality controls. Bio swales or enhanced grass swales or

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vegetated swales are vegetated open channels designed to convey, treat, attenuate and convey stormwater runoff to respective outlets. Check dams and vegetation in the swale reduces the flow velocity to allow sedimentation, filtration, evapotranspiration and infiltration into the underlying native soil (CVC, TRCA, 2010).

TRCA Area

Within the TRCA area, SWM facilities include:

- 16 new wet ponds for outlets with drainage areas greater than 10 ha, three of these 16 will service the Etobicoke Creek watershed and the rest will service the Humber River watershed (refer to **Plates C1** to **D8** and **E1** to **F4** of **Appendix B**). Wet ponds provide required quality, quantity, and erosion control; and
- 26 new dry ponds for outlets with drainage areas between 5 ha and 10 ha; six of these will service the Etobicoke Creek watershed and the rest will service the Humber River watershed (refer to **Plates C1** to **D8** and **E1** to **F4** of **Appendix B**). Dry Ponds will focus on quantity and erosion control.

In the Humber River watershed, the maximum volume identified for a 100-year event is regarded as the maximum quantity control volume necessary to reduce flows to the desired unit release rates. Similarly, for the Etobicoke Creek watershed, the maximum volume determined for a regional storm event is considered the required quantity control volume to manage flows to the target unit release rates.

Grassed swales with check dams will provide quantity control and quality control for smaller catchments (< 5 ha) on both sides of highway and in the open median under the initial widening plan. These ditches/swales will be designed with a flat bottom and check dams, and will collect, treat, attenuate, and convey storm runoff generated from new highway surfaces. Hydraulic design of these swales will be carried out during Detail Design, but typically these swales will have a bottom width of 1 m and 2:1 (H:V) side slope. However, they cannot provide quantity control to the desired target unit release flow rates.

5.2 Social and Economic Environment

5.2.1 Land Use

The Highway 413 Project is a vital transportation corridor that will support projected population and employment growth and will deliver multiple benefits including:

- Greater connectivity between urban areas;
- Enhanced people and goods movement;
- More efficient commuting; and
- Greater economic vitality.

Applicable provincial and municipal policies, as well as the *Planning Act*, were used to inform the Highway 413 Project regarding land use impacts of the Preliminary Design and were considered in the recommendation of mitigation measures for properties impacted by the Preliminary Design. The land forming Highway 413 has been protected since the enactment of the Growth Plan (2006) and the HPBATS in Halton and Peel Regions (2014). The majority of the Highway 413 ROW is designated for urban development (note that in Caledon, the Highway 413 ROW itself is primarily designated as rural, however, the adjacent lands are designated urban).

The identification and assessment of potential impacts is paramount to determining potential mitigation measures to either eliminate or offset the impact to the extent feasible.

Potential impacts of the highway on the existing lands may include the following:

- Approximate interim or permanent loss of agricultural lands (24%), employment lands (37%), environmental policy areas (4%), urban areas (17%), future strategic employment areas (7%), and Greenbelt lands (11%);
- There is a potential that the agricultural viability of the remaining farmlands will be limited due to land severances and a consequent reduction in parcel size, potential irregular parcel shapes and taking access issues into account;
- Impacts on regular traffic flow (due to temporary traffic congestions) and travel time during construction; however, these effects are temporary in nature and will be reduced by the implementation of appropriate mitigation measures and will eventually diminish after completion of construction;
- Loss of some non-employment (i.e., residential, commercial, institutional) lands to facilitate the Highway 413 ROW is expected;
- While the ROW will result in the loss of some current and future employment areas, the overall impact of Highway 413 to businesses is expected to be positive as traffic flow and accessibility will be improved; and
- There are impacts on existing natural heritage features throughout the highway corridor. These impact and mitigation measures are addressed in the Natural Heritage section of the report (see **Section 5.1.2**).

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Impacts of the Highway on broader land use patterns may include the following:

- Community design of areas impacted by the Highway will need to take into account appropriate land uses, land use compatibility, and minimum separation distances required from the highway corridor;
- Noise berms will need to be included into the design of adjacent buildings and structures along parts of the highway corridor (see **Section 5.2.4** for further details);
- Air Quality will need to be mitigated in the design of adjacent buildings and structures along the Highway corridor (see **Section 5.2.5** for further details);
- Community design (i.e., through Secondary Plans) will need to consider intersection spacing for local roads near Highway interchanges;
- Development that was awaiting completion of the Preliminary Design is able to move forward, following designation of the ROW;
- The Highway facilitates connection to Employment Areas and other areas adjacent to the Highway;
- There are a number of existing businesses (commercial/industrial) and employment areas operating in proximity to the Highway 413 Route. Once completed, Highway 413 would attract more business to the area, creating and sustaining local jobs;
- The Project is expected to generate impacts to areas which currently or could in the future support the following land uses: parks and open spaces, areas of environmental constraint and environmental protection (e.g., floodplains, valleylands, Natural Heritage System), mixed-use areas, utilities, and urban non-employment uses (e.g., recreational, educational and institutional uses); and
- The Highway will impact access to various parcels. A new access may need to be constructed for some parcels, recognizing that for lands within urban areas, once those lands are developed, access issues can be addressed at a community design (i.e., Secondary Plan) level.

5.2.2 Agriculture

Based on the existing conditions identified in **Section 2.4.2**, the section below outlines the potential impacts identified in the agricultural impact assessment.

The identification and assessment of potential impacts is paramount to determining potential mitigation measures to either eliminate or offset the impact to the extent feasible. A review of the OMAFA draft Agricultural Impact Assessment guidance document identified numerous potential impacts to agriculture which may include:

- Interim or permanent loss of agricultural lands;
- Fragmentation, severing or land locking of agricultural lands and operations;
- The loss of existing and future farming opportunities;
- The loss of infrastructure, services or assets;
- The loss of investments in bridges/structures and land improvements;
- Disruption or loss of functional drainage and SWM systems;
- Disruption or loss of irrigation systems;
- Changes to soil drainage and SWM;
- Changes to surface drainage and SWM;
- Changes to landforms;
- Changes to hydrogeological conditions;
- Disruption to surrounding farm operations;
- Effects of noise, vibration, dust;
- Potential compatibility concerns;
- Traffic concerns; and
- Changes to adjacent cropping due to light pollution.

Table 5-5 provides some context as to the extent of the potential impacts.

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Table 5-5: Types of Potential Agricultural Impacts of the Highway 413 Project

Type of Potential Impact	Description of Impact
Interim or permanent loss of agricultural lands	There will be a permanent loss of the use of agricultural lands within the entire PSA including the portion of the PSA located in the Prime Agricultural Area. There will be no loss of agricultural lands in the SSA. The impact is applicable for both the construction and the operation of the Project.
Fragmentation, severing or land locking of agricultural lands and operations	There will be fragmentation and severing of agricultural lands as a result of the Project. A total of 90 parcels will be severed (resulting in a portion of the parcel on either side of the PSA). A total of 36 parcels will be severed in the portion of the PSA in the Prime Agricultural Area. The Project will result in the creation of 172 landlocked parcels within the PSA, and 67 landlocked parcels in the PSA Prime Agricultural Area. This calculation relied on an overlay of Highway 413 (PSA) on the 2020 parcel data.
The loss of existing and future farming opportunities	There will be a loss of existing and future farming opportunities on the PSA lands incorporated into the Highway 413 ROW. The impact is applicable for both the construction and the operation of the Project.
The loss of infrastructure, services or assets	There will be no loss of infrastructure or services as a result of the Project.
The loss of investments in bridges/structures and land improvements	There is a net loss of investment in agriculture (buildings, tile drainage) in the PSA as a result of the Project. There will be no loss of investment in the SSA. The impact is applicable for both the construction and the operation of the Project.
The loss of use of ground water wells	There is potential for impact resulting from the loss of the use of groundwater wells due to the construction and the operation of the Project.
Disruption or loss of functional drainage and SWM systems	There will be a net loss of artificial tile drainage on the PSA, and there is no net loss of artificial tile drainage systems in the SSA. The impact is applicable for the construction and operation of the Project.
Disruption or loss of irrigation systems	There will be no loss of investment in irrigation systems in the PSA or the SSA.
Changes to soil drainage and SWM	There will be a change to soil drainage and SWM in the PSA as a result of the construction and operation of the Project. There will be no net change in soil drainage and SWM in the SSA as a result the Project. The impact is applicable for the construction and operation of the Project.
Changes to surface drainage and SWM	There will be a net change in surface drainage and SWM in the PSA and no net change in surface drainage and SWM within the SSA as a result of the Project. The impact is applicable for the construction and operation of the Project.
Changes to landforms	There will be no changes to landforms (with respect to agriculture) in the SSA as a result of Project. There will be changes in the PSA landforms as part of the development of interchanges within the corridor. The impact is applicable for the construction and operation of the Project.

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Type of Potential Impact	Description of Impact
Changes to hydrogeological conditions	Any potential changes in hydrogeological conditions are addressed in the hydrogeological impact assessment.
Disruption to surrounding farm operations	There will be disruption for surrounding/adjacent farms in the SSA as the Project will create a new highway corridor. Potential impacts may include limited access to field during critical points of the growing season, inability to move large machinery/equipment through construction zones adding delays or requiring alternative routes, crop loss or damages due to construction or early work activities, long-term compaction to soils, etc.). The impact is applicable for both the construction and the operation of the Project.
Effects of noise, vibration, and dust	There should be limited potential for additional vibration and dust in the SSA during the operational phase of the Project. There is a potential for noise, vibration and dust during the construction phase, and the potential for increased noise during the operation of the Project.
Potential compatibility concerns	There should be limited potential for compatibility concerns with the Project and the adjacent agricultural lands in the SSA. Significant portions of the adjacent lands have been identified as Official Plan designated non-agricultural land uses. In areas of adjacent agricultural lands, mitigation measures including fencing, vegetated buffers, sound attenuation, tile drainage maintenance, etc. will assist in offsetting potential impacts during the construction and operation of the Project.
Traffic concerns	It is noted that population and employment are forecasted to rise over time, and as a result it is anticipated that traffic volumes on the local road network in the SSA are anticipated to increase. As a result, coordination of agricultural traffic may be required. The impact is applicable for both the construction and the operation of the Project.
Changes to adjacent cropping due to light pollution	There is potential for changes in cropping due to light pollution in the SSA, as the Project will include lighting. Any use of lighting should take into consideration the impact on adjacent agricultural lands. The impact is applicable for both the construction and the operation of the Project.
Fugitive dust, salt spray, and de-icing substances/compounds	There is the potential for fugitive dust, salt spray and de-icing compounds to potentially impact the adjacent agricultural areas in the SSA. The impact is applicable for both the construction and the operation of the Project.
Lack of access from one side of the ROW to the other side	There is the potential for impacts related to no/limited access across/through/below the ROW to allow for livestock movement to adjacent fields, or the use of pipes and hoses to transport liquid manure from one side of the ROW to the other side. The impact is applicable for both the construction and the operation of the Project.

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5.2.3 Landscape

A CVP was developed using public input and design recommendations to identify opportunities for landscaping enhancement and to propose protection and restoration measures for existing landscape features impacted by the Project. The areas of potential impacts to vegetation and impacts to visual aesthetics were also reviewed to determine appropriate landscape treatments within the corridor. This included considerations for designing and implementing green spaces, managing stormwater, preserving and enhancing natural habitats, and commemorating cultural heritage along the corridor. Measures such as planting native vegetation, creating wildlife corridors, and protecting existing ecosystems aim to promote biodiversity, ecological health, and enhance the aesthetic appeal of the highway. The CVP can be found in **Appendix C** of this report.

For the development of the CVP, all areas within the ROW are assumed to be impacted by the Project. However, refinements during Detail Design are expected to reduce the amount of impacted area within the ROW, where feasible. The CVP will be further reviewed during Detail Design.

In areas requiring snowdrift mitigation, setback distances have been set based on the recommendations of the snowdrift assessment. Further details about the snowdrift assessment are found in **Section 5.2.9**.

Similarly, areas requiring noise mitigation were incorporated into the CVP in accordance with the recommendations outlined in the noise impact assessment. Further details about the noise assessment are found in **Section 5.2.4**.

5.2.4 Noise

The purpose of the noise impact assessment was to identify NSAs, determine the predicted future sound levels with and without the Project and provide recommendations for noise mitigation for the Project, as required. The noise impact assessment was undertaken in accordance with methods and procedures recommended in the Environmental Guide for Noise (MTO, 2022) (the Ministry Guide) and the Environmental Reference for Highway Design (MTO, 2013). Although noise exemption bylaw permits are not required by MTO, local municipal noise control bylaws were referenced during the assessment for consideration during the construction phase of the project. Relevant guidelines from MECP will also be considered and followed during the Detail Design stage of the stationary facilities associated with this project.

Results of the assessment indicated that the consideration of noise mitigation is required for several locations along the ROW as per the Ministry Guide. Noise mitigation investigation showed that noise barriers are feasible to address noise levels in one area in accordance with MTO's policies and criteria.

Road geometry, traffic data, topographic data, and other features (e.g., existing barriers, berms, and buildings) were input into the Traffic Noise Model to predict the operational noise levels and assess the requirements for noise mitigation investigation. Out of the 70 modelled NSAs, approximately 57 NSAs satisfied the criteria to be considered for mitigation (≥ 5 dB change or ≥ 65 dBA when comparing the Future No-Build and Future Build sound levels).

Results indicate that noise control investigation is required at several locations. For noise mitigation to be qualified as feasible, MTO has three metrics which must be satisfied:

- **Administrative Feasibility:** Mitigation measures to be considered must be located on lands within public ownership. In the context of this Project, all noise barriers to be evaluated were located within the ROW to satisfy the administrative feasibility requirement;
- **Technical Feasibility:** Review the constructability of the noise mitigation (i.e., design of wall, road side safety, shadow effect, topography, ability to provide a continuous barrier, etc.). As per the Environmental Guide for Noise, if a minimum attenuation of 5 dB can be achieved in the Outdoor Living Area averaged over first row receivers, the selected measures within the ROW are considered technically feasible; and
- **Economic Feasibility:** Carry out a cost/benefit assessment of the noise mitigation (i.e., determine approximate cost per benefited unit).

Noise walls constructed for MTO projects must be chosen from the MTO-approved Designated Sources for Materials list. The Designated Sources for Materials list includes approved noise barrier materials, manufacturers, and material acoustic performance. The maximum allowable height on the Designated Sources for Materials list is 5 m. This is supported with standard industry practices as standard designs typically exist up to 5 m in height. Barriers greater in height require non-standard designs and have escalating unit costs. As such, barriers higher than 5 m were not considered in the mitigation investigation.

Where investigated, noise mitigation is required to provide a minimum reduction of 5 dB in noise levels, with a goal of achieving resultant noise levels as close to or below the objective (for the purposes of this report the 'basis of assessment') noise levels. Noise barriers were only investigated within the future MTO ROW to satisfy the administrative feasibility metric. Generally, the most effective location is next to the edge of pavement. Therefore, noise barriers were not

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investigated beyond the ROW. Should the footprint change or be modified in any way, a review of the changes will be required in Detail Design.

Noise barriers were investigated for 57 NSAs, where nine were found to achieve technical feasibility. Of the nine NSAs with a barrier achieving technical feasibility only NSA-67, at Major Mackenzie Drive was found to achieve both technical feasibility and economic feasibility, as shown in the CVP (**Appendix C**). Accordingly, it is recommended to construct a barrier 5 m tall and 1012 m long.

In addition to noise resulting from the operation of the Project, noise generated during construction was also considered. Construction noise is temporary in nature and exists only for the duration of the construction activities. While it exists, it can be a cause of disturbance to the surrounding NSAs. Construction noise disturbance and potential for complaints can be reduced with the implementation of best practices and other noise control measures.

Although Ontario does not have any applicable regulatory noise level limits for construction noise impacts on NSAs, the Ministry Guide provides guidance on the control and mitigation of construction noise. The Construction Contractor and MTO typically share the responsibility of the control and mitigation.

Construction Contractor requirements are normally set out in Special Provisions No. 199F33 and 199F31.

Special Provision No. 199F33 is used to:

- Identify the extent of NSAs; and
- Stipulate constraints in NSAs including those specific to relevant municipalities.

Special Provision No. 199F31, Environmental Exemptions and Permits, is used to set out notification requirements for operation of construction outside of noise By-law limits.

MTO (through their contract administrator) is required to:

- Set up a noise complaint process in accordance with MTO's Environmental Guide for Noise; and
- Investigate and address noise complaints in accordance with the Ministry Guide.

A variety of construction noise mitigation strategies can be employed, depending on a variety of conditions. The appropriateness and application of these types of mitigation strategies will be examined further during Detail Design when the design and construction details of the Project have been determined.

Although not a requirement of the noise assessment, vibration is a component sometimes related to noise associated with a construction project. As a result of construction, sometimes temporary vibration concerns resulting from the use of construction equipment may be raised by a stakeholder. Should vibration related concerns be raised, MTO and Contractor will investigate the source of the vibration.

In summary, this noise assessment has determined that noise mitigation measures are warranted and considered to be feasible at one location for the Project: NSA-67 at Major Mackenzie Drive, on the Highway 427 Extension. A noise barrier is recommended for this location and can be optimized during Detail Design. Grading and existing site conditions will be confirmed during Detail Design. Should the Project design or traffic data change or be altered in a manner that may affect the results of the noise assessment and/or recommendations for noise mitigation measures, an updated review of the noise assessment will be undertaken.

5.2.5 Air Quality

Based on the existing conditions identified in **Section 2.4.5**, the section below outlines the potential impacts from the operational phase of the Project identified in the air quality impact assessment.

The air quality impact assessment was undertaken for the following scenarios:

- No-Build of the Project for 2041;
- Build of the Project for 2041;
- No-Build of the Project for 2051; and
- Build of the Project for 2051.

The No-Build scenario represents future traffic volumes on highways and arterial roads within the study area without the completion of Highway 413, and in this sense represents existing conditions for the purposes of the Air Quality Impact Assessment. The Build scenario represents future traffic volumes on Highway 413, the Highway 410 and Highway 427 Extensions, interchange ramps, and highways and arterial roads within the study area with the completion of Highway 413. Realignments of highways and arterials roads to accommodate Highway 413 (e.g., Heritage Road) have been considered in the Build scenario. The air quality impacts under these Build conditions are compared to the No-Build conditions to gauge the net impacts from future operations of the Project.

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The Project is expected to impact local air contaminant levels at receptors throughout the area, with the maximum predicted cumulative concentrations increasing with the Project at most receptors, especially in the sections of the Highway 413 ROW which are currently predominantly rural.

Although model-predicted concentrations are expected to increase, the maximum cumulative concentrations for most contaminants and averaging periods remain below their respective current thresholds. Contaminants and averaging periods with modelled cumulative concentrations exceeding AAQC or CAAQS thresholds include 24-hour and annual benzo(a)pyrene, 1-hour NO2 (CAAQS), 24-hour and annual $PM_{2.5}$, and 24-hour PM_{10}. Some of these exceedances can be attributed to high background concentrations as 24-hour and annual benzo(a)pyrene have background concentrations over 100% of the threshold value and annual $PM_{2.5}$ has a background level at 88% of the threshold. The maximum cumulative concentrations for the 2041 Build and 2051 Build scenarios are summarized in **Table 5-6** and **Table 5-7**.

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Table 5-6: Maximum Cumulative Concentration – 2041 Build

Contaminant	Averaging Period	Adopted Background Concentration ($\mu g/m^3$)	Maximum Cumulative Concentration ($\mu g/m^3$)	Air Quality Threshold ($\mu g/m^3$)	% of Threshold
$PM_{2.5}$	24-hour	12.2	23.6	27	87%
$PM_{2.5}$	24-hour	12.2	23.6	23	102%
$PM_{2.5}$	Annual	7.0	9.1	8.8	103%
$PM_{2.5}$	Annual	7.0	9.1	8.0	113%
PM_{10}	24-hour	22.6	78.2	50	156%
CO	1-hour	349	3,069	36,200	8%
CO	8-hour	362	1,129	15,700	7%
NO_2	1-hour	35.0	131.1	83.1	158%
NO_2	24-hour	29.4	73.1	200	37%
NO_2	Annual	14.7	22.9	23.7	97%
Benzo(a)pyrene	24-hour	9.1E-05	1.93E-04	5.0E-05	386%
Benzo(a)pyrene	Annual	5.1E-05	6.89E-05	1.0E-05	689%
Acetaldehyde	0.5-hour	4.43	5.0	500	<1%
Acetaldehyde	24-hour	1.5	1.6	500	<1%
Acrolein	1-hour	0.15	0.19	4.5	4%
Acrolein	24-hour	0.06	0.07	0.4	17%
Formaldehyde	24-hour	2.55	2.62	65	4%
Benzene	24-hour	0.46	0.57	2.3	25%
Benzene	Annual	0.31	0.33	0.45	72%
1,3-Butadiene	24-hour	0.03	0.03	10	<1%
1,3-Butadiene	Annual	0.01	0.01	2	<1%

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Table 5-7: Maximum Cumulative Concentration – 2051 Build

Contaminant	Averaging Period	Adopted Background Concentration ($\mu g/m^3$)	Maximum Cumulative Concentration ($\mu g/m^3$)	Air Quality Threshold ($\mu g/m^3$)	% of Threshold
$PM_{2.5}$	24-hour	12.2	24.5	27	91%
$PM_{2.5}$	24-hour	12.2	24.5	23	106%
$PM_{2.5}$	Annual	7.0	9.2	8.8	105%
$PM_{2.5}$	Annual	7.0	9.2	8.0	115%
PM_{10}	24-hour	22.6	83.1	50	166%
CO	1-hour	349	2,373	36,200	7%
CO	8-hour	362	971	15,700	6%
NO_2	1-hour	35.0	127	83.1	153%
NO_2	24-hour	29.4	65.5	200	33%
NO_2	Annual	14.7	21.3	23.7	90%
Benzo(a)pyrene	24-hour	9.1E-05	1.69E-04	5.0E-05	338%
Benzo(a)pyrene	Annual	5.1E-05	6.45E-05	1.0E-05	645%
Acetaldehyde	0.5-hour	4.43	4.8	500	<1%
Acetaldehyde	24-hour	1.5	1.5	500	<1%
Acrolein	1-hour	0.15	0.2	4.5	4%
Acrolein	24-hour	0.06	0.1	0.4	16%
Formaldehyde	24-hour	2.55	2.6	65	4%
Benzene	24-hour	0.46	0.6	2.3	24%
Benzene	Annual	0.31	0.3	0.45	72%
1,3-Butadiene	24-hour	0.03	0.03	10	<1%
1,3-Butadiene	Annual	0.01	0.01	2	<1%

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Exceedances of the 1-hour CAAQS threshold for NO_2 at receptors in the analysis area for the No-Build scenario are generally at the western and eastern ends of the Project close to existing Highways 401 and 400. Under the Build scenario, exceedances increase in frequency and extend throughout the area. There is a low frequency of exceedance, less than 2.5% for the worst-case receptors, with increases in frequency due to the Project ranging from an additional 0.1% to 1.5%. This is summarized in **Table 5-8** and **Table 5-9** for the 10 receptors with the highest modelled maximum cumulative concentrations in 2041 and 2051 respectively.

24-hour PM_{10} threshold exceedances follow a trend similar to NO_2. Exceedances expand from localized areas in proximity to Highways 401 and 400 under the No-Build scenario to the general extent of the area under the Build scenario. Predicted cumulative concentrations increase between 2041 and 2051 due to higher vehicle volumes and the resulting increase in re-entrained road dust although there is still a low frequency of exceedance in 2051, less than 2.2% for the worst-case receptors, with increases in frequency due to the Project ranging from an additional 0.4% to 2.0%. This is summarized in **Table 5-10** and **Table 5-11** for the 10 receptors with the highest modelled maximum cumulative concentrations in 2041 and 2051 respectively.

Relative to other pollutants, $PM_{2.5}$ has smaller relative increases between the No-Build and Build scenarios. PM is generated from two sources: tailpipe emissions and re-entrained road dust. For $PM_{2.5}$ in 2041, tailpipe emissions standards emerge, tailpipe emissions of particulate matter decrease. In 2051, though, the decreases in tailpipe emissions are offset by increases in re-entrained road dust due to higher traffic volumes. This is summarized in **Table 5-12** and **Table 5-13** for the 10 receptors with the highest modelled maximum cumulative concentrations in 2041 and 2051 respectively.

Changes in maximum cumulative concentration of benzo(a)pyrene between the 2041 No-Build and Build scenarios are summarized in **Table 5-14** for the 10 receptors having the highest maximum cumulative concentration in 2041. The frequency of exceedance for all receptors is 100% because the background concentration of benzo(a)pyrene is greater than the AAQC threshold concentration. The percent change due to contribution from the Project is variable, from a low of 5.5% of the benzo(a)pyrene background concentration for receptors close to existing Highways 401 and 400 to a high of 88% of background for receptors in areas that are currently predominantly rural.

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Table 5-8: Summary of No-Build vs Build for 1-Hour NO_2 – 2041

Receptor ID	Description	Maximum Cumulative Concentration (µg/m³)			Frequency of Exceedance (%)	
		2041 No-Build	2041 Build	Percent Change	2041 No-Build	2041 Build
RW110000_024	Residential	129.4	131.3	1%	1.7%	2.4%
RW312700_001	Residential	57.9	130.2	125%	-	1.5%
RW110000_002	Residential	123.2	130.1	6%	1.3%	2.1%
RE110000_005	Residential	128.6	129.1	0%	2.4%	2.5%
RW311300_001	Residential	53.2	128.1	141%	-	0.9%
RE317000_001	Residential	71.3	127.0	78%	0.0%	1.0%
RW110100_001	Residential	114.8	126.9	10%	0.4%	1.3%
RW233500_001	Residential	50.0	126.3	153%	-	1.4%
RE512200_003	Residential	49.6	126.3	155%	-	1.0%
RE110000_001	Place of Worship	126.0	126.0	0%	1.7%	1.8%

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Table 5-9: Summary of No-Build vs Build for 1-Hour NO_2 – 2051

Receptor ID	Description	Maximum Cumulative Concentration (µg/m³)			Frequency of Exceedance (%)	
		2051 No-Build	2051 Build	Percent Change	2051 No-Build	2051 Build
RW110000_024	Residential	124.4	127.0	2%	1.2%	1.6%
RW110000_002	Residential	120.8	125.3	4%	0.8%	1.4%
RE110000_005	Residential	125.7	124.0	-1%	1.5%	1.6%
RW312700_001	Residential	53.4	123.2	131%	-	0.9%
RE110000_004	Residential	121.2	120.9	0%	1.0%	1.1%
RE110000_001	Place of Worship	120.6	120.2	0%	1.1%	1.2%
RE317000_001	Residential	68.4	120.1	76%	0.0%	0.6%
RW110100_001	Residential	101.7	120.1	18%	0.3%	0.8%
RW311300_001	Residential	50.4	118.9	136%	-	0.5%
RW233500_001	Residential	48.5	118.4	144%	-	0.8%

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Table 5-10: Summary of No-Build vs Build for 24-Hour PM_{10} – 2041

Receptor ID	Description	Maximum Cumulative Concentration ($\mu g/m^3$)			Frequency of Exceedance (%)	
		2041 No-Build	2041 Build	Percent Change	2041 No-Build	2041 Build
RW224200_001	Residential	35.1	78.2	123%	-	1.0%
RW110000_017	Residential	62.8	74.0	18%	0.2%	1.0%
RW110100_001	Residential	52.1	73.1	40%	0.1%	1.5%
RW226000_001	Residential	36.3	72.0	98%	-	0.5%
RW110000_024	Residential	61.6	71.5	16%	0.5%	1.6%
RW110000_016	Residential	58.2	69.0	19%	0.1%	0.7%
RW110000_019	Residential	48.3	67.7	40%	-	1.1%
RW312700_001	Residential	42.5	67.7	59%	-	0.7%
RW110000_015	Residential	56.7	67.2	19%	0.1%	0.8%
RW214200_004	Residential	45.8	65.1	42%	-	0.2%

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Table 5-11: Summary of No-Build vs Build for 24-Hour PM_{10} – 2051

Receptor ID	Description	Maximum Cumulative Concentration ($\mu g/m^3$)			Frequency of Exceedance (%)	
		2051 No-Build	2051 Build	Percent Change	2051 No-Build	2051 Build
RW224200_001	Residential	34.2	83.1	143%	-	1.4%
RW110000_017	Residential	67.7	79.8	18%	0.1%	1.5%
RW110100_001	Residential	56.0	77.5	38%	-	1.8%
RW110000_024	Residential	66.3	75.4	14%	0.2%	2.2%
RW110000_016	Residential	62.8	74.4	19%	-	1.3%
RW110000_015	Residential	60.8	71.7	18%	-	1.0%
RW110000_019	Residential	51.9	71.1	37%	-	1.4%
RW226000_001	Residential	41.4	71.0	72%	-	0.4%
RW317500_003	Residential	50.1	70.8	41%	0.1%	0.9%
RW312700_001	Residential	40.0	70.8	77%	-	1.0%

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Table 5-12: Summary of No-Build vs Build for Annual $PM_{2.5}$ – 2041

Receptor ID	Description	Maximum Cumulative Concentration ($\mu g/m^3$)			Frequency of Exceedance (%)	
		2041 No-Build	2041 Build	Percent Change	2041 No-Build	2041 Build
RE110000_005	Residential	8.89	9.06	2%	n/a	n/a
RW110000_002	Residential	8.12	8.70	7%	n/a	n/a
RW110000_024	Residential	8.25	8.68	5%	n/a	n/a
RE316600_001	Residential	8.01	8.68	8%	n/a	n/a
RE110000_001	Place of Worship	8.53	8.67	2%	n/a	n/a
RW110000_019	Residential	8.06	8.64	7%	n/a	n/a
RE110000_390	Residential	8.44	8.63	2%	n/a	n/a
RE110000_004	Residential	8.45	8.59	2%	n/a	n/a
RE110000_003	Residential	8.27	8.54	3%	n/a	n/a
RW312700_001	Residential	7.75	8.52	10%	n/a	n/a

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Table 5-13: Summary of No-Build vs Build for Annual $PM_{2.5}$ – 2051

Receptor ID	Description	Maximum Cumulative Concentration (µg/m³)			Frequency of Exceedance (%)	
		2051 No-Build	2051 Build	Percent Change	2051 No-Build	2051 Build
RE110000_005	Residential	9.11	9.23	1%	n/a	n/a
RE316600_001	Residential	8.09	9.01	11%	n/a	n/a
RW110000_002	Residential	8.26	8.81	7%	n/a	n/a
RE110000_001	Place of Worship	8.70	8.80	1%	n/a	n/a
RE110000_390	Residential	8.52	8.79	3%	n/a	n/a
RW110000_024	Residential	8.38	8.77	5%	n/a	n/a
RW110000_019	Residential	8.16	8.77	8%	n/a	n/a
RE110000_004	Residential	8.63	8.73	1%	n/a	n/a
RE110000_003	Residential	8.37	8.67	4%	n/a	n/a
RE110400_002	Residential	8.42	8.62	2%	n/a	n/a

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Table 5-14: Summary of No-Build vs Build for 24-Hour Benzo(a)pyrene – 2041

Receptor ID	Description	Maximum Cumulative Concentration (µg/m³)			Frequency of Exceedance (%)	
		2041 No-Build	2041 Build	Percent Change	2041 No-Build	2041 Build
RW110100_001	Residential	1.50E-04	1.93E-04	29%	100%	100%
RW110000_017	Residential	1.69E-04	1.92E-04	14%	100%	100%
RW226000_001	Residential	1.06E-04	1.86E-04	76%	100%	100%
RW110000_024	Residential	1.75E-04	1.86E-04	6%	100%	100%
RW110000_019	Residential	1.42E-04	1.84E-04	29%	100%	100%
RE521600_004	Residential	1.79E-04	1.84E-04	2%	100%	100%
RW312700_001	Residential	1.11E-04	1.83E-04	65%	100%	100%
RW110000_016	Residential	1.60E-04	1.83E-04	14%	100%	100%
RW317500_003	Residential	1.33E-04	1.82E-04	37%	100%	100%
RW317500_001	Residential	1.30E-04	1.82E-04	40%	100%	100%

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The potential air quality impacts due to construction of the Project were estimated based on modelling of a representative construction operation scenario and assessing the potential impacts at receptors against the MECP AAQCs and CCME CAAQS threshold concentrations. Predicted concentrations at some receptors were above the thresholds for 1-hour NO_2, annual NO_2, 24-hour TSP, annual TSP, 24-hour PM_{10}, 24-hour benzo(a)pyrene, and annual benzo(a)pyrene. In practice, air quality impacts from construction activities are temporary in nature, and the emissions are highly variable, difficult to predict, and depend on the specific, localized activities that are taking place and the effectiveness of standard mitigation measures. Best practices to reduce impacts of these emissions can include diligent implementation of operating procedures such as application of dust suppressants, reduced travel speeds for heavy vehicles, efficient staging of activities, and minimization of haul distances. To minimize potential air quality impacts during construction, it is recommended that the construction tendering process should include requirements for implementation of an air quality management plan that would establish best management practices specific to the details of construction required for the Project.

5.2.6 Waste and Contaminated Property

Based on the existing conditions identified in **Section 2.4.6**, the section below outlines the potential for environmental contamination impacts as determined in the COS (see **Figure 2-13**). Based on the COS, 112 properties were identified as having a high potential for environmental contamination, while 144 properties were identified as having a medium potential for environmental contamination. The remaining properties where land uses consist of open space, residential, or agricultural areas that are not suspected of using or generating chemical compounds harmful to the environment or human health were identified as having a low potential for environmental contamination.

To support property acquisition, environmental due diligence, road construction, and the management of excess soils and materials, it is recommended that further environmental studies and investigations be conducted for those high and medium-risk properties directly impacted by the ROW. These assessments will help confirm the existing environmental conditions of the impacted lands. The scope of these investigations may include Phase One and Phase Two Environmental Site Assessments. Should any contamination be identified, appropriate mitigation measures will be developed and recommended for implementation. These may involve environmental site clean-up, remediation activities, and/or the application of risk assessment strategies to ensure regulatory compliance and minimize potential environmental impact.

5.2.7 Climate Change

Based on the existing conditions identified in **Section 2.4.7**, the section below outlines the potential impacts identified in the climate change analysis. As described below, there are two components of the climate change analysis: a GHG Assessment, and a CCRA.

GHG Assessment

The GHG Assessment considered site preparation, construction and operation of the Project. A decommissioning phase was not included in the assessment as these are rare occurrences for linear infrastructure and is not anticipated.

- Consistent with the SACC guidance, the net GHG emissions for the Project were calculated based on the sum of Direct GHG emissions and the Indirect Acquired Energy GHG emissions. As a measure of conservatism, the GHG assessment does not consider offset credits. Additionally, avoided emissions were not identified for the Project. The following sections describe the methods used to quantify emissions associated with the following GHG sources for the Project:
  - Construction Emissions
    - Construction equipment (direct emissions);
    - Land clearing/land-use change (direct emissions); and
    - Electricity consumption during construction (acquired energy).
  - Operational Emissions
    - Traffic emissions during operations (direct emissions); and
    - Impacts to carbon sinks (direct emissions).

Project Construction GHG Emissions

For each construction emission source, the total annual emissions have been expressed as carbon dioxide equivalent (CO_2e). The direct emissions represent:

- **Road Construction:** This included emissions from construction equipment for activities such as road preparation, utility relocation, earthworks, sewer/drainage installation, base preparation, barrier walls/fencing, and paving.

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- **Bridge Construction:** This included emissions from construction activities such as piles/footings, pier columns/wingwalls, girders, deck, barrier walls, sidewalks approaches, and paving.
- **Major Bridge Construction:** This included emissions from construction activities such as coffer dam/dewatering, caissons, foundations, columns/abutments, girders, post tensioning, deck, barriers, expansion joints, and paving.
- **Electricity Consumption:** The construction phase is not expected to require electrical services as all power will be supplied by fuel-fired generators, whose emissions are included under the Construction Equipment Source.
- **Land-Use Change Emissions:** This included the carbon losses in biomass due to disturbances (e.g., removal of vegetation), defined in the SACC as carbon stock change resulting in direct GHG emissions or removals from land use conversions.
- **Impact to Carbon Sinks:** The annual emissions associated with lost carbon sinks due to the removed vegetation (i.e., lost ability to store additional carbon on an annual basis because the vegetation has been removed) was included in both the construction and the operational emissions. The SACC defines this as the post-disturbance GHG emissions included in direct GHG emissions resulting from land use change.

The results of the GHG assessment for the construction phase are provided in **Table 5-15**.

Table 5-15: Greenhouse Gas Emissions (Construction Phase)

Phase	Activity	Highest-year Emissions (tonnes CO_2e/year)	Number of years	Total Emissions for Construction Phase (tonnes CO_2e)
Construction Phase	Road Construction[(a)]	15,274	10	152,740
Construction Phase	Bridge Construction[(a)]	2,312	10	23,120
Construction Phase	Major Bridge Construction[(a)]	1,972	10	19,720
Construction Phase	Acquired energy[(b)]	n/a	10	n/a
Construction Phase	Land-Use Change[(c)]	87,076	1	87,076
Construction Phase	Impact to Carbon Sinks[(d)]	519	10	5,188
	Total	**107,153**	**n/a**	**287,844**

Notes:

(a) Road construction, bridge construction, and major bridge construction emissions are from the Highway 413 Greater Toronto Area Preliminary Construction GHG Assessment (RWDI, 2022).

(b) Electrical services are not expected to be required during the construction phase; all power will be supplied by fuel-fired generators, whose emissions are included under the Construction Equipment Source (RWDI, 2022).

(c) Land-Use Change from loss of carbon from carbon stock change (e.g., removal of vegetation/disturbances) is included in construction phase emissions. This does not have an associated no. of years, because this value is only emitted one time, when the disturbance occurs. For conservatism, it is assumed that the emissions associated with land-use change will all occur in a single year, and all vegetation removed will be burned, representing the worst-case scenario.

(d) Impact to Carbon Sinks – post disturbance is the annual lost ability to store additional carbon on an annual basis because the vegetation has been removed. For the construction phase, this annual loss occurs for 10 years, as this is the duration of the construction phase. This annual loss will continue into the operations phase.

Project Operations GHG Emissions

Estimated annual GHG emission estimates from within the Air Quality LSA for the No-Build and Build scenarios are presented in **Table 5-16**, along with the percent change in emissions between the No-Build and Build conditions. This is presented for both the 2041- and 2051-time horizons based on traffic modelling for these horizons. The total emissions from each scenario were compared to assess the incremental impact from the Project.

In addition to these local GHG emission estimates, **Table 5-17** presents the regional impacts to GHG emissions for the 2041 No-Build and Build scenarios, along with the percent change in emissions between the No-Build and Build conditions.

Within the LSA, GHG emissions are anticipated to increase by 157% in the Build Scenario compared to the No Build Scenario in the 2041 scenario and by 153% in the 2051 scenario

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(RWDI, 2025). Regionally, GHG emissions are anticipated to increase by 0.3% as a result of the Project (RWDI, 2024).

Based on these results, GHG emissions associated with traffic are expected to more than double locally, however, considering the larger region and the related changes in traffic (including diversion from other routes), GHG emissions are expected to increase only marginally.

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Table 5-16: Maximum LSA Annual Tailpipe Emissions Between No-Build and Build Scenarios

Roadway Type	2041 Time Horizon (CO_2e)			2051 Time Horizon (CO_2e)		
	Maximum Annual Tailpipe Emissions (Tonnes) No-Build Scenario	Maximum Annual Tailpipe Emissions (Tonnes) Build Scenario	Change in Maximum Annual Tailpipe Emissions (%)	Maximum Annual Tailpipe Emissions (Tonnes) No-Build Scenario	Maximum Annual Tailpipe Emissions (Tonnes) Build Scenario	Change in Maximum Annual Tailpipe Emissions (%)
Highway 413 and Associated Ramps	0	657,598	—	0	572,569	—
Other Highways	230,630	272,889	18%	210,726	244,891	16%
Arterial	209,094	200,891	-4%	183,730	178,602	-3%
Total	**439,724**	**1,131,378**	**157%**	**394,456**	**996,062**	**153%**

Source: RWDI 2025

Table 5-17: Maximum Regional Annual Tailpipe Emissions Between No-Build and 2041 Build Scenarios

Roadway Type	Maximum Annual Tailpipe Emissions (Tonnes) No-Build Scenario	Maximum Annual Tailpipe Emissions (Tonnes) 2041 Build Scenario	Change in **Maximum** Annual Tailpipe Emissions (%)
	CO_2e	CO_2e	CO_2e
Freeway	2,890,987	3,147,467	8.9%
Highway	1,165,218	1,070,530	-8.1%
Arterial	2,489,218	2,349,432	-5.6%
Total	**6,545,423**	**6,567,428**	**0.3%**

Source: RWDI 2024

Table 5-18 summarizes the local GHG emissions in the Build scenario from the impacts to carbon sinks (i.e., the annual loss of carbon uptake) during the operational phase and from changes in local traffic in both the 2041- and 2051-time horizons. The comparison tables that follow only consider the change in local GHG emissions from traffic rather than that from the regionally estimated emissions to represent the emissions attributed to the Project. This is for conservatism since the change in emissions locally is larger than that estimated for the region.

Table 5-18: Total Annual GHG Emissions during the Operational Phase Attributed to the Project

Source	Emissions in 2041 (CO_2e tonnes/year)	Emissions in 2051 (CO_2e tonnes/year)
Traffic GHGs[(a)]	691,654	601,597
Impact to Carbon Sinks (Annual Losses)[(b)]	519	519
Total	**692,173**	**602,116**

(a) The traffic GHG emissions listed here are based on the difference in local emissions between the No-Build and Build scenarios.

(b) This represents the impacts to carbon sinks from the Project only.

A comparison of the estimated annual GHG emissions from the Project for the modelled year with the highest emissions of the operations phase (in this case the 2041-time horizon) to the federal and provincial totals are provided in **Table 5-19**.

A comparison of the Project GHG emissions to Canada's and Ontario's 2030 targets is also presented in **Table 5-19** to identify the impact of the Project on Canada's GHG reduction target. Canada continues to aim to reduce its GHG emissions by approximately 40-45% compared to the 2005 levels (ECCC, 2023) by 2030. Ontario aims to reduce its GHG emissions by approximately 30% by 2030 compared to the 2005 levels (Sussex 2022). The total estimated GHG emissions from the Project represent less than 0.2% of Canada's 2030 GHG emissions target.

Table 5-19: Comparison of Estimated Annual GHG Emissions from the Project to Provincial and Federal Totals

Source	GHG Emissions (CO_2e kilotonnes/year)
Project GHG Emissions (Maximum Annual Emissions)	692(a)
Ontario-wide GHG Emissions[(a)] (2023)	158,728
Canada-wide GHG Emissions[(b)] (2023)	693,912
Ontario 2030 Target Emissions[(c)]	144,000
Canada 2030 Target Emissions[(d)]	408,000
Comparison to Ontario 2023 Total	0.44%
Comparison to Canada-wide 2023 Total	0.10%
Comparison to Ontario's 2030 Targets	0.48%
Comparison to Canada's 2030 Targets	0.17%

Notes:

(a) This represents the total annual GHG emissions attributed to the Project for the 2041 Build scenario within the LSA, as well land use change associated with the Project.

(b) Federal and Provincial total emissions taken for the year 2023 from NIR 1990-2023, Part 1, Table 2-2 (ECCC, 2025). Federal and Provincial GHG Emissions have been converted from mega tonne to kilo tonnes.

(c) Ontario 2030 targets taken from Sussex 2022.

(d) For conservatism, these emissions were calculated based on a 45% reduction compared to 2005 levels (rather than 40%). Canada 2030 targets taken from NIR 1990-2023, Part 1 (ECCC, 2025).

The maximum annual emissions for the operations phase of the Project are 692 kilotonnes CO_2e/year, which is 0.44% of the 2023 Ontario-wide annual emissions, and 0.10% of the 2023 Canada-wide emissions. The maximum annual emissions make up approximately 0.48% of Ontario's 2030 targeted emissions, and 0.17% of Canada's 2030 targeted emissions.

Climate Change Resilience Assessment

The CCRA assessment anticipated future climatic conditions for the Project region, and how climate change related disruptions or impacts may affect the Project. The assessment focused on

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key impacts to the Project (i.e., interactions with climate that have the potential to present the highest risks).

Based on the CCRA assessment, the vulnerability of the Project to a changing climate is primarily concentrated in its operational phase. The construction phase is not expected to experience notable climate-related impacts beyond seasonal variability, which will be managed through standard planning and operational procedures. Similarly, decommissioning phase is not anticipated due to the long-term nature of linear infrastructure. The operational phase, however, is subject to a range of climate hazards such as extreme temperatures, precipitation, wind, and wildfire, with several medium to high-risk interactions identified. The potential impacts were assessed under a range of potential future climate scenarios provided in the Intergovernmental Panel on Climate Change's Sixth Assessment Report (AR6). These scenarios are called Shared Socioeconomic Pathways (SSPs) and represent the uncertainty in human contribution to climate change, ranging from a future with a high pace of sustainable development (SSP1) to a case where there is an absence of climate policies (SSP5). The potential impacts to the Project were particularly evident under SSP5 scenario for the 2080s.

Climate change poses several risks to the Project, particularly through interactions that could lead to infrastructure damage, service disruption, and safety hazards.

The Project may indirectly influence the resilience of surrounding ecosystems to climate change. The Project's footprint and associated infrastructure could contribute to ecosystem vulnerability if not properly managed, especially in the face of increasing climate stressors such as wildfire and flooding. The environmental mitigation and compensation features identified as part of the Project (such as wetland and fisheries compensation and habitat offsetting) are designed to enhance ecological resilience and reduce potential impacts on the surrounding environment.

Alternative methods to reduce climate-related risks include enhancing the robustness of design standards, such as increasing culvert capacity, using climate-resilient materials, and integrating adaptive management strategies. The Project already incorporates several in-design mitigation measures aligned with MTO and Canadian Standards Association (CSA) standards. Further refinements, such as incorporating nature-based solutions, could further reduce environmental risks.

Finally, while the assessment does not explicitly address Indigenous cultural resources, the potential for climate change to disrupt lands and waters associated with such resources exists, particularly through increased flooding, wildfire, and extreme weather events. These disruptions have the potential to affect access, integrity, and use of culturally significant areas and resources.

5.2.8 Community Wellbeing

Based on the existing conditions identified in **Section 2.4.8**, the section below outlines the potential impacts identified for Community Wellbeing, which were addressed via a socio-economic assessment and a HHI study.

Socio-Economic Conditions

The eight social values evaluated in the socio-economics assessment are:

1. Urban Sprawl;
2. Farmland;
3. Natural Heritage Features;
4. Recreation;
5. Social Cohesion;
6. Business and Employment;
7. Travel Times; and
8. Indigenous Cultural Practices

For each of the eight social value components, the assessment of potential effects considered a synopsis of the baseline condition followed by a qualitative assessment of likely effects. A summary of these effects is presented below.

Urban Sprawl

Within the Study Area, including the Regions of Halton, Peel, and York, Highway 413 is expected to form the urban boundary for planned development up to 2051, as designated by regional plans (Halton, 2022; Peel, 2022; York, 2022). The planned residential and employment lands largely follow the ROW, indicating a structured approach to growth.

One area of concern regarding urban sprawl is through the Town of Caledon, where the classification of lands as urban or rural is less clear. The lands impacted by the highway are, for the most part, designated as urban, though the development is planned into 2051 (Peel, 2022). When comparing the ROW and the approved Regional Plans for up to 2051, there are some pockets of the alignment in the Town of Caledon that are not currently planned for development that will be consumed for the Project. There are, however, pockets planned for long-term development on either side of the ROW.

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While the highway is adjacent to rural lands, these are mostly north of the highway. The current planned urban development generally extends up to the Highway 413 Route. However, it is expected that some land not already slated for urban development will be required for the highway itself.

Farmland

The Project has the potential to reduce some prime agricultural land across the three regions it traverses, reducing the total farmland area as follows:

- **Halton Region**: With a total farm area of 72,920 acres, the net loss 225.5 acres represents approximately 0.31% of the total farmland.
  - **Impact Concentration**: The losses are concentrated in Milton (123.92 acres) and Halton Hills (101.54 acres).
- **Peel Region**: Out of 95,583 acres of farmland, the net loss of 1,318 acres accounts for about 1.38% of the total farmland.
  - **Impact Concentration**: The losses are concentrated in the Town of Caledon (1,317.87 acres).
- **York Region**: With a total farm area of 134,414 acres, the net loss of 388.7 acres constitutes roughly 0.29% of the total farmland.
  - **Impact Concentration**: Most of the impact will be in the city of Vaughan (385.8 acres), with a smaller portion in King City (3.21 acres).

However, the net loss of farmland across the three regions is ultimately considered negligible, at approximately 0.36% of the total prime agricultural lands, or approximately 1,932 acres, currently within the impact regions. This does not imply no effect for some farmers in the ROW of the Project. These few farmers will be compensated for the purchase of their property thereby offsetting impacts.

Natural Heritage Features

The protection of natural heritage features is an important factor in the socio-economic environment, as Indigenous communities and local stakeholders have emphasized the desire to maintain these areas despite planned urban development. The Project will potentially impose negative impacts to several natural heritage features. The findings presenting impacts to Natural Heritage Features are primarily drawn from the terrestrial ecosystems impact assessment:

- Habitat fragmentation, which may disrupt the connectivity between different ecological areas and affect wildlife movement and breeding patterns, particularly for SAR.
- Watercourse alterations, such as the installation of culverts and bridges, may impede fish movement and affect aquatic habitats.
- Wetland disturbances may lead to the loss of critical habitats and affect the hydrological functions of these ecosystems.
- Vegetation removal for the highway right-of-way may result in the loss of significant and non-significant woodlands and other sensitive habitats, reducing biodiversity and disrupting the ecological balance.
- Construction activities may also result in the incidental injury or mortality of wildlife and may lead to increased erosion and sedimentation in nearby watercourses and wetlands, potentially degrading water quality and harming aquatic habitats.

Recreation

While the Project is not expected to impact the long-term accessibility to recreational activities along river corridors, there are many water crossings and associated trails that will be transected by the Project. Construction activities may temporarily limit some access to these recreational areas. However, post construction, the Project may enhance the accessibility of some trail systems.

Though the long-term accessibility of recreational activities may be maintained, the quality of recreational activities may be impacted due to the combination of approved growth and development, and additional noise from the Project.

Social Cohesion

The Project has created division within study area communities which may cause added stress among residents. Public opposition has been noted, with some residents voicing concerns regarding losing recreational, natural heritage or agricultural use spaces and the rapid changes to their environment (Morgan, 2024; DeClerg, 2024). The loss of farmland and the transformation of the landscape from rural to urban can be particularly distressing for individuals who have strong connections to their land and community in its current state. Hence, impacts to social cohesion can be related to community division and stress; landscape changes; environmental and lifestyle changes; and changes to farmland and heritage. Some Indigenous communities have also told MTO that the potential loss of land or change in the quality of the land is of particular concern.

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Business and Employment

The Project is a major investment in transportation infrastructure. Preliminary estimates of the Highway 413 construction indicate that between 2,600 to 3,300 direct jobs (on-site labour) may be supported from construction over the course of five years (Prism Economics and Analysis, 2021). It is further estimated that an additional 2,300 to 2,900 indirect jobs (e.g., labour employed by material suppliers to the Project) could be supported in the construction phase of the Project. These employment opportunities are in addition to the potential job creation associated with housing and commercial developments approved in regional master plans to 2051.

Travel Times

The Project is expected to reduce travel times for commuters in the GTA as modelled by MTO relative to a scenario where the highway is not built. The Project is anticipated to alleviate congestion on existing major routes such as Highway 401 and Highway 400, improving overall traffic flow and connectivity within the region relative to a scenario where the highway is not built.

The Project will provide relief for future congestion, offering travel time savings for drivers using the future highway. It will also provide broader secondary benefits by reducing congestion on local roads in the broader region, resulting in travel time savings for drivers even if they do not use the highway. While the projected travel time savings may vary, it is possible that during peak times, a decrease in travel time could be realized, providing relief to the region's congested roadways.

Indigenous Cultural Practices

As approved growth and development plans unfold over the next 25 years, Indigenous communities have told MTO that the ability for Indigenous communities to exercise Aboriginal and/or treaty rights may become more constrained in developed areas within the GGH and the Project area.

As noted in the urban sprawl and agriculture lands discussions, the amount of net land loss associated with the Project is very small compared to the baseline condition where large tracts of land will be lost to approved urban growth and development plans.

Human Health

The human health assessment phase involved an evaluation of the potential broader health impacts due to changes to the determinants of health identified in the scope of the HHI Study. Based on the feedback received during engagement, the following determinants of health were evaluated in the HHI Study:

- Active transportation and levels of physical activity;
- Noise levels;
- Climate change;
- Social cohesion;
- Traffic congestion and delay;
- Traffic-related safety;
- Access to neighbourhood resources;
- Food security, including access to local healthy food sources;
- Access to traditional foods and lands and ability to harvest traditional foods;
- Mental health and wellness;
- Human trafficking; and
- Potential Impacts to Indigenous cultural practices.

Addressing human health concerns due to changes in air quality is a major part of the HHI Study. These concerns are being addressed in a Screening Level Human Health Risk Assessment (SLHHRA) of air quality impacts.

Broadly, the following assessment approach was undertaken for each of the health determinants evaluated in the HHI Study:

Health Context/ Linkages – making the connection to health

The first step in assessing potential health impacts is to identify the connection between a determinant of health and health, in the context of the Project. For each determinant of health, a description of how the determinant is relevant to health and well-being outcomes in the context of the Project is provided. Where available, both peer-reviewed and grey literature data on potential health impacts due to major transportation infrastructure projects like the Project is provided.

Project Impact

Using information from the relevant studies/assessments conducted on and for the Highway 413 Project, as well as the peer-reviewed and reputable grey literatures, an assessment was conducted for the selected determinants of health on the overall potential for health impacts due to the Project. A summary of the assessment is provided below for each of the identified determinants of health.

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Levels of Physical Activity and Addition of Active Transportation Elements

The addition of active transportation can increase levels of physical activity as well as reduce energy consumption and greenhouse gases (Reynolds et al., 2010). Individuals who utilize active transport regularly show increased physical activity (Reynolds et al., 2010). In addition, individuals who commute using active transport engage in more physical activity than individuals using motorized transportation (Oja et al., 1998). The addition of public transport has been associated with benefits including improved mental health, basic access to medical care, access to healthy food and reducing financial stress from transportation affordability (Litman, 2012).

During stakeholder engagement, the Project raised concerns regarding the impact on healthy development and healthy living, indicating that car-centric and automotive-dependent communities can lead to sedentary lifestyles and more health challenges long term. The health of communities in proximity to the corridor will benefit the more the Project can contribute to increased physical activity through active transport. Active transportation can improve health aspects such as mental and physical health, but vulnerable subgroups including people of colour, the elderly, and low-income may face disparities accessing its benefits, or face negative impacts such as safety concerns and lack of access to suitable transportation options (Mizdrak et al., 2023).

Noise Levels

Noise is an underestimated threat that can cause both acute or chronic health problems, including irritation, sleep disturbances, cardiovascular disease, risk of stroke, diabetes, hypertension, and loss of hearing (Singh et al., 2017). Noise pollution can be caused by vehicular traffic and is a rising hazard due to rapid urbanization and growth of traffic loads (Singh et al., 2017). Noise exposure can lead to adverse health effects through exposure to extreme higher decibel levels resulting in damage to the ear organ, while exposure to lower decibel levels can negatively affect sleep and communication (Babisch, 2002; Hahad et al., 2025). The link between noise related stress and mental health impacts can lead to maladaptations and behavioural changes (Hahad et al., 2019; 2025).

When mitigation noise levels (MNLs) for construction sound levels are exceeded, Health Canada recommends implementing mitigation measures to reduce potential for community complaints (Health Canada, 2016). The Study Area is identified as quiet suburban or rural, normal suburban, urban residential, noisy urban, or very noisy urban. Older adults, children, pregnant women, and individuals with chronic illnesses are sub-groups who may be disproportionately impacted by any exceedance in noise levels.

Climate Change

Traffic related air pollution such as methane, nitrous oxide, and carbon dioxide are known for increasing temperatures due to the GHG effect (Petralli et al., 2014; United States Environmental Protection Agency, 2016). The impact of increasing local temperatures and additional GHG emissions can contribute to climate change. Additionally, increasing road capacity is related to the increase in impervious surfaces (i.e., concrete) known to increase local temperatures (Zhang et al., 2013; Gago et al., 2013). Neighbourhoods with a higher proportion of paved areas will be disproportionately affected by the rising temperature and heat island effects. Heat-related illnesses are likely to occur in individuals who are more susceptible such as elderly people, children, pregnant women, and individuals with chronic illnesses.

The average net emissions from the Project during construction phase (including direct emissions from construction equipment) were estimated to be 287,844 tonnes of CO_2e per year, with construction estimated to take 10 years to complete. GHG emission estimates were based on construction activities and associated equipment, including their fuel consumption and hours of operation to complete each activity (RWDI, 2022). The projected maximum annual emissions for the operations phase are 692 kilotonnes CO_2e per year. These estimated annual emissions make up approximately 0.02% of Ontario's 2030 emission targets, indicating that the Project is not expected to have a major impact on health due to changes in GHG emissions that wouldn't occur without the Project. Sub-groups including the elderly, children, pregnant women, Indigenous peoples, individuals with chronic health conditions or disabilities may be disproportionately impacted by climate change.

Social Cohesion

Social cohesion is related to a sense of belonging in a community and relationships among community members (Manca, 2014). A lack of social support and increased social isolation has been shown to lead to poor physical and mental health (Stansfeld et al., 2006). Transportation networks can connect people and communities, increasing social cohesion. When transportation corridors function poorly, including when travelers spend increased time commuting, community involvement may be reduced, as they have less time for outside activities (Putman, 2020).

Social cohesion may be disturbed in areas where Highway 413 bisects existing neighbourhoods and communities, a potential issue for low-income households without access to a car, as they would need to find alternate routes of connection to the community which may result in negative health impacts. In addition, perception of the Project within communities may be a determinant of social cohesion, as residents may be divided on their support for the Project. The impact of the Project will depend on the level of free-flowing traffic and fragmentation of communities in the Study Area. The Project also has the potential to provide better, faster, and easier connections between areas within the GGH which can boost social cohesion and improve health and well-being.

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Traffic Congestion and Delay

New transportation infrastructure, like the Highway 413 Project, can assist in mitigating traffic congestion on both local and regional roads, which can lead to positive health outcomes. However, traffic congestion can be intensified by physical bottle necks and increased demand (US Department of Transportation, 2020). At times, the expansion of transportation infrastructure may increase travel volumes, resulting in additional traffic congestion, that is also known as 'induced demand' (Handy & Boarnet, 2014; Duranton and Turner, 2011). When they occur, traffic congestion-related delays can impact business, affecting business hours, perishable deliveries, inventory, and labour costs, negatively impacting people due to high travel times, which can further impact economies, and reduce quality of life (US Department of Transportation, 2020).

Highway 413 is expected to have more localized traffic volume in the peak AM and PM and may reduce traffic volume along arterial roads north and south of corridor, which would decrease traffic congestion and associated delays and improve quality of life and wellbeing for those who benefit from the reduced traffic volume. Some areas along the corridor may experience increased traffic volume, such as some arterial roads in King City (WSP, 2025). The Project is also expected to divert traffic from Highway 407 and arterial roadway segments to Highway 413, resulting in more traffic that will travel at a higher average speed, decreasing overall air emissions per unit of distance travelled (WSP, 2025). Traffic modelling indicated less congestion and marginally improved service across the regional roadway network (WSP, 2025).

Traffic-related Safety

High volumes of vehicular traffic and subsequent congestion can have negative impacts on traffic safety, and increased traffic density is related to increased fatal accidents (Retallack & Ostendorf, 2019). Traffic related casualty rates have decreased as the use of public transportation increased (Litman, 2012). Additionally, frequent and reliable public transportation allows for reduced risk of high-risk driving (i.e., drinking and driving) (Litman, 2016).

The Project has the potential to improve safety of municipal roads by redirecting truck traffic onto Highway 413. However, if Highway 413 has high traffic volumes, traffic may 'spill onto' adjacent arterial roads which could lead to increased collisions as these smaller roadways are incapable of handling large traffic volume, having a negative impact on traffic-related safety in the Study Area. Health impacts resulting from traffic-related accidents and collisions will be dependent on traffic volume and calming measures on and around Highway 413.

Access to Neighbourhood Resources, Including Access to Emergency Response Services

Affordable, reliable, and convenient transportation options, including public transportation allows for better neighbourhood resource accessibility, which can include health and fitness centers, locations of work, shopping centers, and critical services (Litman, 2022). Approximately 20-40% of individuals in a typical community may not be able to drive and are left unable to fulfill their daily needs without the use of a vehicle (Litman, 2022). Affordable, reliant, and convenient transportation allows those who are unable to drive to better access neighborhood resources (Atherton et al., 2021). Furthermore, access to emergency response services can have a significant impact on the health of a population and is linked to the overall health and well-being of individuals. Insufficient emergency response services may cause individuals to feel anxious and worried for their safety if said services cannot reach them in time.

While the Project has the potential to improve access between neighbourhoods and improve response times of emergency vehicles, some residents may be separated from their neighbourhood resources, impacting their health negatively. Due to the further development that is expected in the municipalities, the quantity and quality of neighbourhood resources such as health care services, emergency response services, grocery stores, community centres, schools, clinics, places of worship, and parks is expected to increase (MTO et al., 2023). Access to new developments may be limited or difficult to those who cannot drive due to disabilities, or those who are low income and cannot afford a car. Low-income individuals/households as well as individuals with disabilities may not benefit from these resources as Highway 413 would only be accessible by car, which may result in inequitable health impacts to different population groups.

Food Security, Including Access to Local Healthy Food Sources

An individual's or household's income as well as accessibility of food are the main indicators of food security. Food insecurity can affect malnutrition and obesity rates in both adults and adolescence (Health Canada, 2001). Lack of access to healthy and affordable foods can be associated with food insecurity and unhealthy eating habits, leading to both acute and chronic health issues (Wright et al., 2016). Communities which are low-income or low-access to healthy food sources tend to have poor access to other services and resources (US Department of Agriculture, 2022).

Construction of Highway 413 will lead to irreversible loss of designated agricultural lands and will affect agricultural tile drainage systems (MTO et al., 2023). Fuel spills and winter salt application on highway surfaces among other operations related to Highway 413 may lead to the contamination of nearby agricultural lands. (MTO et al., 2023). Reduction in agricultural land will reduce Ontario's ability to grow its own food, have limitations on food security and increase food prices, the extent of which is unknown. Highway 413 will however expedite access to a transportation corridor, enhancing distribution efficiency, potentially leading to lower grocery prices.

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Access to Traditional Foods and Lands and Ability to Harvest Traditional Foods

Traditional foods include food species that are available to a particular culture from natural resources (Kuhnlein and Chan, 2000). Indigenous communities traditionally gather, fish, and hunt which can foster a sense of community, promoting knowledge transfer and spiritual connection to the land (Willows, 2005; Receveur et al. 1998; Lambden et al., 2007; Schuster et al., 2011).

Some Indigenous communities have told MTO that further development in the Study Area has the potential to impact their rights, as areas for harvesting may be removed (MTO et al., 2023). Highway 413 may have impacts on fish habitats and terrestrial ecosystems that are important to Indigenous communities, as well as a potential impact on harvesting through habitat loss or fragmentation, as the environment provides a home for seeds, animals, and pollinators (MTO et al., 2023). Some Indigenous communities have told MTO that they consider the health of the land and environment to be intertwined with the health of Indigenous peoples, and that it is a priority to ensure mitigation, enhancement, and avoidance measures are in place to protect the natural environment (MTO et al., 2023).

Mental Health and Wellness

Longer commute times have been associated with lower job satisfaction, lower leisure time satisfaction, increased strain and poorer mental health, as well as commuting being viewed as a negative experience (Clark et al., 2019). Human-powered transport and public transport have both been shown to improve mental health and reduce driving related stress (Litman, 2012). For Indigenous communities, the harmonization of mental, emotional, physical, spiritual selves, and holism is interconnected in the holistic view of mental wellness (Salerno et al., 2021).

Highway 413 may provide multiple transportation options to surrounding communities improving mental wellbeing. Improvements on arterial roads around Highway 413 could lead to an overall reduction in congestion and increase in access to services. However, there is potential for the Project to negatively impact mental health and wellbeing of residents and Indigenous communities through increased traffic congestion and loss of linkages to community, and environmental impacts. Furthermore, there may be individuals who are disproportionately affected by the impacts of the Project, including those who cannot afford to drive or are unable to operate a vehicle due to disability, individuals who experience chronic respiratory or cardiovascular illnesses, the elderly, and those who are pregnant.

Human Trafficking

Human trafficking relies on the transportation industry for recruitment, moving and controlling, and delivering survivors to buyers, and often involves an offence related to the sex trade, assault, or sexual offences (Federal Highway Administration, 2021; Cotter, 2020). The majority of reported human trafficking cases involved sexual exploitation, also referred to as sex trafficking. Targets of trafficking include young women and girls, as well as boys and men and those who identify as 2SLGBTQ+ (Government of Ontario, 2025). In addition, Indigenous women and girls comprise a disproportionate number of persons trafficked for sexual exploitation in Canada (Government of Ontario, 2021). Survivors of human trafficking can suffer from severe trauma and often need the support of intensive specialized services while healing and rebuilding their lives (Government of Ontario, 2020).

Zones within the Study Area, particularly in Peel Region are important transit networks for human trafficking. There are concerns associated with how Highway 413 can additionally contribute to human trafficking by potentially providing a transportation corridor to be used by traffickers. Multiple First Nations raised concerns to MTO regarding human trafficking and the luring of Indigenous women and youth along highways including the Highway 402 and Highway 401 corridors (MTO et al., 2023).

Potential Impacts to Indigenous Cultural Practices

Indigenous peoples face many challenges due to historical colonization including activities such as harvesting traditional foods. Today, effects of racism include prevention of Indigenous peoples from exercising self-determination, failing to recognize Aboriginal and treaty rights and restricting access to services and resources (Allan and Smylie, 2015).

Some Indigenous communities have communicated to MTO that their ability to practice traditional activities, such as harvesting, in the lands within the Study Area is difficult and that further development in the area (e.g., the Project) may impact their ability to exercise harvesting rights. As well, any changes to the environment as a result of the Project may have the potential to impact Aboriginal or treaty rights. This includes changes in the atmospheric environment such that food sources and species of cultural significance are impacted; temporary noise and vibration impacts to sensitive receptors that may influence movement and migration patterns; potential impacts to natural resources that support significant species such as watercourses and fish; etc.

5.2.9 Snowdrift

The snow drifting assessment assessed the potential snow accumulations for Project. The focus of the assessment was to predict the potential for snow drifting conditions that could interfere with road operability or visibility.

As noted in **Section 2.4.9**, seven sections of the Project are predicted to have a moderate to high STP (**Figure 2-14**) and require mitigation. This is due to the high wind exposure in many areas along the proposed corridor, which is surrounded primarily by fields and open terrain. These areas of snow drift concern have been incorporated into the CVP (**Appendix C**).

- Near Highway 401, interspersed patches of winter vegetation (shown in green coloured shading on **Figure 2-14**) on the west side of the highway will impede snow locally (low STP in the middle), but exposure remains high for significant distances with respect to the Project, resulting in moderate to high STP when unmitigated. Dense developments to the east (shown in pink coloured shading on **Figure 2-14**) will help to trap snow before it arrives at the ROW.
- Near Mayfield Road, the high degree of openness to the west, coupled with alignment with prevailing winds associated with snow drifting from westerly directions, results in a high potential for problematic snow drifting in the absence of mitigation. Dense developments to the east (shown in pink coloured shading on **Figure 2-14**) will help to trap snow when winds approach from that direction.
- Near Mississauga Road, the exposure to the west, from where prevailing winds associated with snow drifting approach, results in a high STP along the ROW in the absence of mitigation measures.
- Near the Highway 410 Extension, mitigation efforts should be prioritized on the west side of the proposed corridor where there is approximately a north-south alignment.
- Near Airport Road, the STP is reduced in areas where there is proximity to dense winter vegetation to the northwest.
- Near Highway 50, where the ROW is aligned approximately east-west, there is a greater skewness between the prevailing winds associated with snow drifting and the road.
- Near Highway 400, the existing vegetation in the surrounding area is significant, resulting in a low to moderate STP.

Due to the exposure and openness of the surrounding terrain in most areas around the ROW and the road alignment in context of the prevailing winds, most sections of the Project are expected to have a moderate to high potential for problematic wind-driven snow accumulations.

Depending on the use of screens/landscaping on the Project and their porosity/density, shape, and height, the snow conditions over the proposed highway may potentially be worsened. For example, if a wind screen is mostly solid and within 15x the fence height to the edge of the proposed highway, snow drift formations over the road are expected to be frequent and may be severe if the road is in an even or a cut road profile. In general, areas that are reforested with dense, coniferous trees are expected to improve the snow control along the highway.

Overall, the snow drifting potential along the ROW is expected to be moderate to high in most areas. Where the road profile may be elevated with shallow side slopes, snow drifting in areas associated with moderate to high STP is expected to be less problematic, as the wind would be harnessed advantageously to promote scouring over the proposed highway.

It should be noted that snow removal operations themselves may impact snow deposition on the roadway. Snowbanks from snow clearing operations and any concrete safety barriers may obstruct wind flow and initiate additional drifting downwind. MTO will assess the appropriateness and safety of the snowdrift conditions on the highway throughout the course of the winter as part of their ongoing maintenance operations and to act accordingly for user safety.

5.2.10 Navigable Waters

This section provides an overview of the efforts undertaken during Preliminary Design to begin fulfilling the federal legislative requirements for the protection of navigation on waterways within the Highway 413 Route and advance the requirements for securing the necessary approvals prior to the commencement of construction.

The *Canadian Navigable Waters Act* includes protections for navigation on all navigable waters in Canada. Scheduled navigable waters are listed on a Schedule to the *Canadian Navigable Waters Act* so that any works in those waterways that may interfere with navigation can receive extra oversight. There are no scheduled waterways within the Highway 413 Route.

For navigable waterways not on the Schedule, a screening process has been undertaken to collect sufficient information about past, current, and potential future navigation uses during Preliminary Design to inform permitting during Detail Design. The Navigational Requirements will continue to be refined in Detail Design.

Transport Canada (TC) has developed a Navigability Assessment Framework to consistently assess whether a waterway is navigable. The framework includes criteria to be considered in each assessment. These criteria are summarized below:

1. **Navigable in fact**: Do the physical characteristics of the waterway support carrying a vessel of any size from one point to another?
2. **Use by the public for navigation**: Is the public currently using the waterway as an aqueous highway?
3. **Historical use**: Did the public historically use the waterway as an aqueous highway?
4. **Reasonable appeal for public use**: Is there a reasonable likelihood that the public will use the waterway as an aqueous highway?

As part of the assessment to initially determine the navigability of the watercourses crossing the Highway 413 ROW, including the Highway 410 and Highway 427 extensions, fluvial geomorphic

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data (channel definition, hydraulic flow regime, and channel dimensions) was used to set the criteria for the initial assessment.

Navigation is very generally defined by the *Canadian Navigable Waters Act* as “a waterway that is used or where there is a reasonable likelihood that it will be used by vessels, in full or in part, for any part of the year as a means of transport or travel for commercial or recreational purposes, or as a means of transport or travel for Indigenous peoples of Canada exercising rights recognized and affirmed from section 35”.

The results of this initial screening assessment were based on a previous navigable waters requirement that a channel must be approximately at least 3 m wide across and approximately 0.30 m deep. The 3 m wide x 0.30 m deep criteria provides a baseline (or, screening tool) however it is recognized that further consultation and field investigations will be carried out in Detail Design to further complete the assessment for navigability at the initially screened water crossings. Channels that did not have at least a mean bankfull depth of 0.30 m and a bankfull channel width of 3 m were identified as not having a required criteria for navigability. In addition, channels that were classified as “undefined” were eliminated as they lack a defined bed and banks.

The results of the initial assessment showed that 20 watercourse reaches are considered to be potentially navigable and an additional three watercourse reaches are also possibly navigable. Some watercourse locations will require further assessment as further field data and PTE becomes available in Detail Design. The additional field data will help identify any potential navigability impediments such as blockages, narrow structures, and changes in bankfull width and/or depth etc., are identified.

As part of the Preliminary Design, input was sought from Indigenous communities and members of the public to confirm past, present, or potential future uses of waterways. One way feedback was collected was through a Navigable Waterways Survey. The Survey was open on the Project Website for a 30-day comment period (July – August 2024) to gain feedback from project stakeholders on the use of waterways within the Study Area. 57 public survey submissions were received via the Project Website as summarized in **Table 5-20**.

Table 5-20: Most Common Vessel Types based on the Navigable Waters Public Survey Submissions

Vessel Type	Number of Responses
Canoe/ Kayak	43
Stand-up Paddleboard	11
Motorized Boats < 5m	3
Total	57

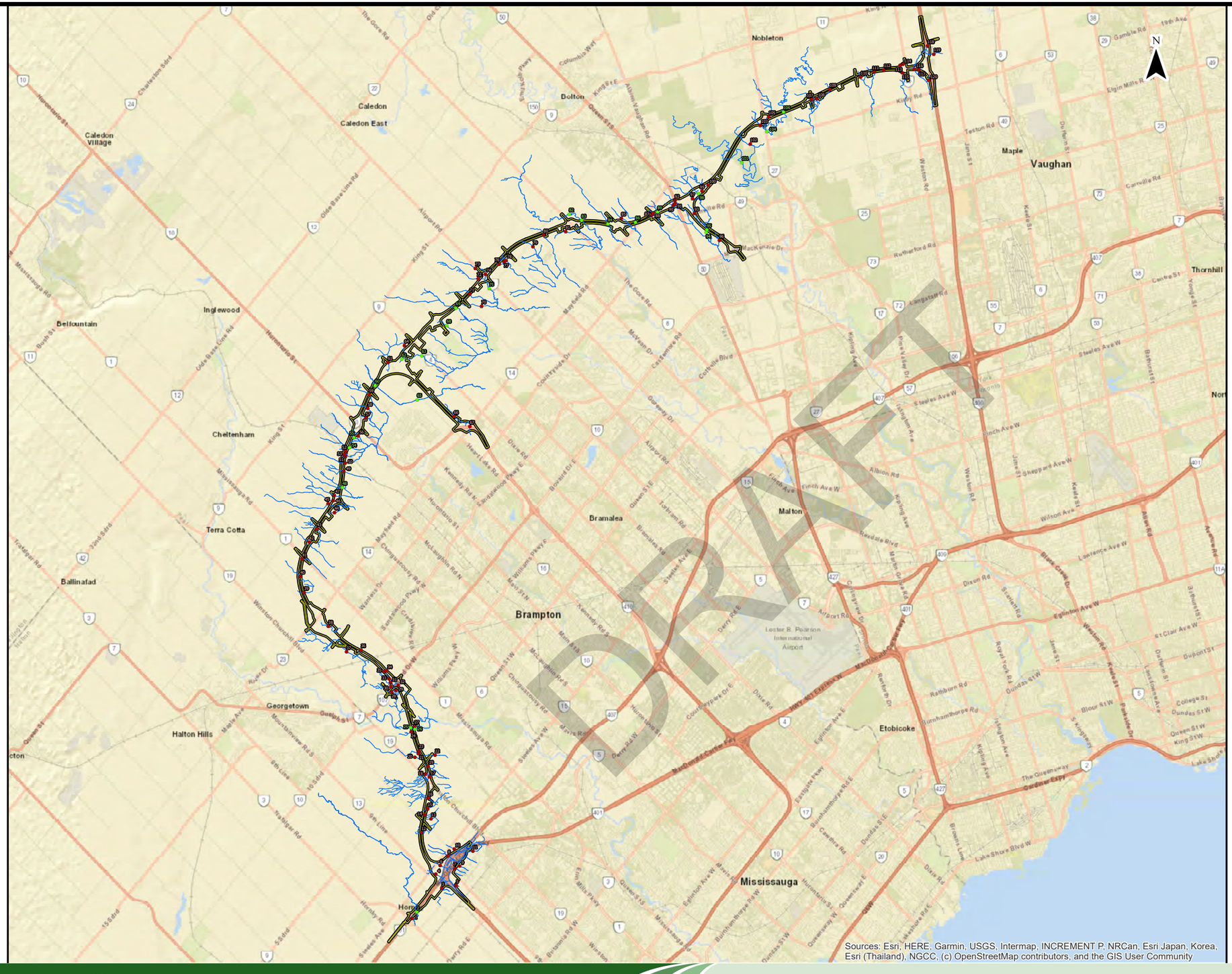
In addition to the online survey, MTO continues to consult and engage with Indigenous communities whose Aboriginal and/or treaty rights may be adversely affected by the Project.

From the public survey, the most common locations identified for use were waterways #101 (26 responses) and #25/#26 (16 responses), as shown in **Figure 5-1**.

Table 5-21 below summarizes all of the differences identified from the initial screening assessment and the results from the public survey where the public consultation identified the channel as navigable, but the initial screening did not.

The MTO will continue working to avoid and/or minimize potential impacts to navigation and follow the processes outlined in the *Canadian Navigable Waters Act* through the Detail Design phase. This will include ongoing consultation and engagement with TC, Indigenous communities and the public as the project progresses.

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Legend

- Potentially Navigable
- Not Navigable
- Watercourse

Sources:
Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton

Contains information licensed under the Open Government Licence - Ontario

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

10 Jan, 2024

0 1,750 3,500 5,250 7,000

Metres

Figure 5-1
Navigable Waters Initial Screening Mapping

Table 5-21: Summary of Differences between Public Consultation and the Navigable Waters Initial Screening

Location of use	Public Consultation Response	Public Consultation Use (Vessel Type)	Fluvial Geomorphology Reach ID	Hydraulic Flow Regime based on Fluvial Geomorphic Assessment	Channel definition classification (Undefined, Poorly Defined, Defined, Heavily Modified) based on Fluvial Geomorphic Assessment	Bankfull Cross-Sectional Measurement based on Fluvial Geomorphic Assessment	Classification based on Initial Screening for the Navigable Waters Assessment
14	Yes - Navigable	Stand-up paddleboard	CR_MC_MUL_8_6	Ephemeral - swale	Poorly Defined Feature (likely vegetation, groundwater, or topography controlled)	No Bankfull	Not identified as Navigable
90	Yes - Navigable	Motorized Boats < 5 m	HU_MH_ROB_3_3	Ephemeral - swale	Poorly Defined Feature	No Bankfull	Not identified as Navigable
50, 39	Yes - Navigable	Canoe/Kayak	EC_EH_ETW_1_1	Permanent	Defined	Bankfull width: 3.8 m Bankfull depth: 0.2 m	Not identified as Navigable
			EC_EH_ETW_13_1	Intermittent	Defined in one section that has a steep slope	Bankfull width: 1.8 m Bankfull depth: 0.32 m	
20, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40	Yes - Navigable	Canoe/Kayak	CR_LC_LEV_9_1	Ephemeral	No Defined Feature (likely vegetation, groundwater, or topography controlled)	No Bankfull	Not identified as Navigable
			CR_NP_CRR_9_5,	Ephemeral	Undefined	No bankfull cross section	
			CR_NP_CRR_9_6	Ephemeral	Undefined	No bankfull cross section	
			CR_NP_CRR_3_1	Ephemeral	No PTE within proposed route, field assessment occurred upstream. Possible channel has been altered with in this location. Within agricultural area likely straightened. Largely poorly defined. Appears to be slightly defined but likely altered for agricultural purposes	No bankfull cross section	
			CR_NP_CRR_3_2	Ephemeral	Largely poorly defined. Appears to be slightly defined, but likely altered for agricultural purposes	No bankfull cross section	
			CR_NP_CRR_3_3	Ephemeral	No Defined Feature	No bankfull cross section	

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Location of use	Public Consultation Response	Public Consultation Use (Vessel Type)	Fluvial Geomorphology Reach ID	Hydraulic Flow Regime based on Fluvial Geomorphic Assessment	Channel definition classification (Undefined, Poorly Defined, Defined, Heavily Modified) based on Fluvial Geomorphic Assessment	Bankfull Cross-Sectional Measurement based on Fluvial Geomorphic Assessment	Classification based on Initial Screening for the Navigable Waters Assessment
			CR_NP_CRR_3_3a	Ephemeral	No Defined Feature	No bankfull cross section	
			CR_NP_CRR_3_3b	Ephemeral	No Defined Feature	No bankfull cross section	
			CR_NP_CRR_13_1	Ephemeral	No Defined Feature	No bankfull cross section	
			CR_NP_CRR_13_MW	Ephemeral	Poorly defined	No bankfull cross section	
			CR_HC_HUT_6_3	Ephemeral	No Defined Feature	No bankfull cross section	
			EC_EH_ETW_13_1,	Intermittent	Defined in one section that has a steep slope	Bankfull cross section width: 1.8 m Bankfull cross section depth: 0.32 m	
			EC_EH_ETW_12_3	Ephemeral to Intermittent	Poorly Defined. Only defined in one portion upstream of the proposed route (likely has been modified as the upstream watercourse is not defined and channel not seen during field work). Channel disappears to the north of the proposed 413 crossing location. Property owner mention that this is a tile drain and the upstream portion of the reach was backfilled when the drain was installed. Multiple tile drains were observed along the left bank of the feature.	Bankfull cross section width: 2.5 m Bankfull cross section depth: 0.3	
7, 8, 10	Yes - Navigable	Canoe/Kayak	SM_EL_SIM_1_5	Ephemeral	Poorly Defined Feature (likely vegetation, groundwater, or topography controlled)	No bankfull cross section	Not identified as Navigable
			SM_EL_SIM_1_9	Ephemeral	Poorly Defined Feature (likely vegetation, groundwater, or topography controlled)	No bankfull cross section	
			SM_EL_SIM_1_10	Ephemeral	Poorly Defined Feature (likely vegetation, groundwater, or topography controlled)	No bankfull cross section	

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5.3 Cultural Environment

5.3.1 Built Heritage Resources and Cultural Heritage Landscapes

The CHAR (2024) identified 48 BHRs and CHLs that are anticipated to be directly adversely impacted by the Project and are recommended for further heritage assessment (refer to **Section 2.5.1.3** for further information). As the Preliminary Design progressed, two additional BHRs were identified as potentially being directly adversely impacted by the Project and are recommended for further heritage assessment.

Where preliminary impact assessment has determined that there are potential direct adverse impacts to a known or potential BHR or CHL and prior to initiating any action that may impact these properties, the following will be considered:

- Research and evaluate properties for CHVI that have not been previously evaluated by MTO. The research and evaluation should be completed by a Qualified Person(s) and recorded in a CHER, unless otherwise specified.
- Complete a heritage impact assessment for all properties that MTO determines to have CHVI and where direct adverse impacts are still anticipated. The assessment should be completed by a Qualified Person(s) and recorded in a HIA, unless otherwise specified. The HIAs will be prepared in accordance with Information Bulletin 3 Heritage Impact Assessments for Provincial Heritage Properties (MCM, 2017).
- In accordance with F.5 of the *Standards and Guidelines for Conservation of Provincial Heritage Properties* (MCM, 2010), if MTO determines that a property is a Provincial Heritage Property of Provincial Significance, MTO will obtain the consent of the Minister of Citizenship and Multiculturalism before removing or demolishing buildings or structures on the property, or before transferring the property from provincial control.

See **Table 5-22** for a description of potential impacts and property specific recommended next steps for each identified BHR and CHL.

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Table 5-22: Summary of Cultural Heritage Preliminary Impact Assessment for Properties Where Further Assessment is Recommended

Feature IDs	Location/Address	Heritage Recognition (March 2023)	Preliminary Impact Assessment	Next Steps/Status
CHL 018	15145 Steeles Avenue	Listed on the Municipal Heritage Register	Direct – significant land disturbance	CHER complete. Not determined to be a Provincial Heritage Property.
CHL 033	7564 Tenth Line West	Designated Part IV. (By-law 857-79) Met Ontario Reg. 9/06	Direct – removal or demolition	No further heritage work required as the property is not directly impacted by the Project.
BHR 037	8526 Tenth Line West	None (Potential)	Direct – removal or demolition	CHER complete. Not determined to be a Provincial Heritage Property.
CHL 046	8656 Winston Churchill Boulevard	Listed on the Municipal Heritage Register	Direct – removal or demolition	CHER complete. Determined to be a Provincial Heritage Property.
CHL 047	8693 Winston Churchill Boulevard	Listed on the Municipal Heritage Register	Direct – removal or demolition	CHER complete. Determined to be a Provincial Heritage Property.
CHL 048	8768 Winston Churchill Boulevard	None (Potential)	Direct – removal or demolition	CHER complete. Determined to be a Provincial Heritage Property.
CHL 049	8836 Winston Churchill Boulevard	None (Potential)	Direct – significant land disturbance	CHER complete. Not determined to be a Provincial Heritage Property.
BHR 253	8509 Tenth Line	None (Potential)	Direct – removal or demolition	CHER complete. Not determined to be a Provincial Heritage Property.
CHL 254	9496 Heritage Road	None (Potential)	Direct – removal or demolition	CHER complete. Determined to be a Provincial Heritage Property.
BHR 071	9673 Heritage Road	Listed on the Municipal Heritage Register	Direct – removal or demolition	CHER complete. Determined to be a Provincial Heritage Property.
BHR 072	2534 Bovaird Drive West	None (Potential)	Direct – removal or demolition	CHER complete. Not determined to be a Provincial Heritage Property.
BHR 073	2591 Bovaird Drive West	Designated Part IV (By-law 160-2004)	Direct – significant land disturbance	CHER complete. Determined to be a Provincial Heritage Property.
BHR 080	709 Mayfield Road	None (Potential)	Direct – removal or demolition	No further heritage work required as minor property acquisition is not anticipated to impact BHR or significantly alter the landscape.
BHR 081	400 Mayfield Road	Listed on the Municipal Heritage Register	Direct – significant land disturbance	CHER complete. Determined to be a Provincial Heritage Property.

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Feature IDs	Location/Address	Heritage Recognition (March 2023)	Preliminary Impact Assessment	Next Steps/Status
BHR 082	12317 Heritage Road	Listed on the Municipal Heritage Register	Direct – removal or demolition	CHER. Not determined to be a Provincial Heritage Property.
BHR 095	12679 Mississauga Road	Listed on the Municipal Heritage Register	Direct – removal or demolition	CHER Completed. Determined to be a Provincial Heritage Property.
BHR 112	12669 Chinguacousy Road	Listed on the Municipal Heritage Register	Direct – significant land disturbance	CHER complete. Determined to be a Provincial Heritage Property.
BHR 113	12710 Chinguacousy Road	Listed on the Municipal Heritage Register	Direct – removal or demolition	CHER complete. Not determined to be a Provincial Heritage Property.
BHR 114	12846 Chinguacousy Road	Listed on the Municipal Heritage Register	Direct – removal or demolition	CHER complete. Determined to be a Provincial Heritage Property.
CHL 121	12960 McLaughlin Road	Listed on the Municipal Heritage Register	Direct – significant land disturbance	CHER complete. Undetermined if it is a Provincial Heritage Property.
CHL 122	13064 McLaughlin Road	Listed on the Municipal Heritage Register	Direct – removal or demolition	CHER complete. Determined to be a Provincial Heritage Property.
CHL 125	13242 Hurontario Street (Highway 10)	Listed on the Municipal Heritage Register	Direct – removal or demolition	CHER complete. Not determined to be a Provincial Heritage Property.
BHR 132	13306 Kennedy Road	Listed on the Municipal Heritage Register	Direct – removal or demolition	CHER complete. Determined to be a Provincial Heritage Property.
BHR 136	12863 Heart Lake Road	Listed on the Municipal Heritage Register	Direct – significant land disturbance	CHER complete. Not determined to be a Provincial Heritage Property.
BHR 148	13301 Dixie Road	Listed on the Municipal Heritage Register	Direct – removal or demolition	CHER complete. Not determined to be a Provincial Heritage Property.
BHR 149	13300 Dixie Road	None (Potential)	Direct – removal or demolition	CHER ongoing.
BHR 155	13278 Bramalea Road	Listed on the Municipal Heritage Register	Direct – removal or demolition	CHER complete. Determined to be a Provincial Heritage Property.
CHL 253	13297 Bramalea Road	Listed on the Municipal Heritage Register	Direct – removal or demolition	CHER complete. Not determined to be a Provincial Heritage Property.
CHL 159	Osage Orange Hedge West side of Torbram Road, north of Old School Road	Designated Part IV By-laws #9924, 99-120	Direct – removal or demolition	CHER complete. Determined to be a Provincial Heritage Property.
BHR 160	13245 Torbram Road	Listed on the Municipal Heritage Register	Direct – removal or demolition	CHER complete. Determined to be a Provincial Heritage Property.

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Feature IDs	Location/Address	Heritage Recognition (March 2023)	Preliminary Impact Assessment	Next Steps/Status
BHR 180	13151 Innis Lake Road	None (Potential)	Direct – removal or demolition	CHER complete. Not determined to be a Provincial Heritage Property.
BHR 186	7171 Healey Road	None (Potential)	Direct – significant land disturbance	CHER ongoing.
BHR 187	6824 Healey Road	Listed on the Municipal Heritage Register	Direct – removal or demolition	CHER complete. Not determined to be a Provincial Heritage Property.
CHL 222	Highway 50, S of Mayfield Road	Designated Part IV (By-law 71-2010)	Direct – removal or demolition (cemetery)	CHER complete. Determined to be a Provincial Heritage Property.
BHR 223	10951 Highway 50	None (Potential)	Direct – removal or demolition	CHER complete. Determined to be a Provincial Heritage Property.
BHR 226	7230 Nashville Road	Listed on the Municipal Heritage Register	Direct – removal or demolition (racetrack only)	CHER complete. Not determined to be a Provincial Heritage Property.
BHR 236	11100 Huntington Road	Listed on the Municipal Heritage Register	Direct – removal or demolition	CHER complete. Not determined to be a Provincial Heritage Property.
BHR 237	11300 Huntington Road	Designated Part IV (By-law 42-88)	Direct – removal or demolition	CHER complete. Determined to be a Provincial Heritage Property.
BHR 238	11363 Huntington Road	None (Potential)	Direct – removal or demolition	CHER complete. Determined to be a Provincial Heritage Property.
CHL 243	11720 Highway 27	None (Potential)	Direct – removal or demolition	CHER complete. Not determined to be a Provincial Heritage Property.
BHR 244	11960 Highway 27	Listed on the Municipal Heritage Register	Direct – significant land disturbance	CHER complete. Determined to be a Provincial Heritage Property.
BHR 250	11870 Kipling Avenue	None (Potential)	Direct – removal or demolition	CHER complete. Not determined to be a Provincial Heritage Property.
BHR 252	12000 Pine Valley Drive	Listed on the Municipal Heritage Register	Direct – removal or demolition	CHER complete. Not determined to be a Provincial Heritage Property.
BHR 257	11880 Weston Road	Listed on the Municipal Heritage Register	Direct – removal or demolition	CHER complete. Determined to be a Provincial Heritage Property.
BHR 258	10961 Cold Creek Road	None (Potential)	Direct – removal or demolition	CHER complete. Not determined to be a Provincial Heritage Property.
CHL 250	16 Mile Creek	None (Potential)	Direct – significant land disturbance	CHER ongoing.
CHL 251	Credit River	None (Potential)	Direct – significant land disturbance	CHER ongoing.

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Feature IDs	Location/Address	Heritage Recognition (March 2023)	Preliminary Impact Assessment	Next Steps/Status
CHL 252	Humber River/Toronto Carrying Place Trail	Canadian Heritage River (Designated 1999)	Direct – significant land disturbance	CHER ongoing.
BHR 169	13256 Airport Road	Listed on the Municipal Heritage Register	Direct – removal or demolition	CHER ongoing.
BHR 185	6859 Healey Road	Listed on the Municipal Heritage Register	Direct – removal or demolition	CHER ongoing.

Note: *CHERs ongoing are anticipated to be completed prior to the final EIAR.*

(a) CHL 120 (12900 McLaughlin Road) was severed from the property at CHL 121 (12960 McLaughlin Road).

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5.3.2 Archaeology

In 2009, a Stage 1 Background Study was completed for 169,800 ha/419,585 acres, early in the planning process that resulted in defining the Highway 413 Route. Based on the background research, mapping of archaeological potential criteria indicators, and the presence of over 800 registered archaeological sites within the area, the Stage 1 background study determined that there was high potential for the recovery of pre- and post-contact Indigenous and 19th-century Euro-Canadian archaeological resources within portions of the Study Area not subject to deep and extensive previous disturbance. As such, Stage 2 archaeological assessment was recommended for only those undisturbed portions of the area.

In 2015, a Stage 1 Background Study was completed for approximately 16,869 ha/41,685 acres (a refined area than what was previously assessed in 2009, which includes the Highway 413 Route). The Stage 1 background research and subsequent property inspection indicated potential for the recovery of pre- and post-contact archaeological resources within portions of the Highway 413 Route not subject to deep and extensive previous disturbance. As such, Stage 2 Property Assessment was recommended for only those undisturbed portions of the Highway 413 Route.

The Stage 2 Property Assessment resulted in the identification of 163 archaeological locations, of which 110 are classified as archaeological isolated findspots or small scatters (90 Pre-Contact Indigenous isolated findspots, nine Pre-Contact Indigenous small scatters, eight 19th-century Euro-Canadian small scatters, two 19th-century Euro-Canadian isolated findspots, and one multicomponent small scatter). Fifty-one archaeological locations were classified as archaeological sites and registered with the MCM (27 19th-century Euro-Canadian, 14 multi-component, and ten Pre-Contact Indigenous sites). Finally, two archaeological locations were determined to be extensions of previously registered archaeological sites. Based on the findings of the Stage 2 Property Assessment, 109 of 110 findspots and small scatters were determined to no longer retain further CHVI and do not require further archaeological assessment, as detailed in Section 4, Table 136 of the Stage 2 Property Assessment (2025) report. Based on the type and quantity of the artifacts recovered from these findspots, and as per the MCM *Standards and Guidelines for Consultant Archaeologists* (Ontario Government, 2011a), 109 findspots were not found to fulfill the criteria for further Stage 3 site-specific archaeological assessment. Archaeological concerns for the findspots and small scatters are considered fully addressed, with exception being given to one findspot. It should be noted that this one findspot does not meet the Provincial standards that require Stage 3 site-specific archaeological assessment, however, the Mississaugas of the Credit First Nation retain interest in the location and have requested further assessment per their review of the Stage 2 Property Assessment report. Therefore, this findspot will also be recommended for further Stage 3 site-specific assessment.

Potential Construction Impacts

During Detail Design, further Stage 2 to 4 archaeological assessments will be undertaken. The need for any avoidance and/or protection of known archaeological sites near or adjacent to the ROW will be assessed and incorporated into the construction documents.

5.4 Summary of Preliminary Design Environmental Impacts, Proposed Mitigation Measures, Monitoring Activities and Commitments to Future Work

The recommended mitigation measures and commitments to future work identified in this section are based on the potential environmental impacts outlined in **Section 5.1** through **Section 5.3**. **Table 5-23** provides a summary of the Preliminary Design environmental impacts that will be considered and mitigation measures and commitments to future work that will be implemented through Detail Design and construction. Mitigation measures include specifications outlined within the following:

- Federal Legislation
  - *Canadian Navigable Waters Act*
  - *Constitution Act, 1982*
  - *Fisheries Act*
  - *Migratory Birds Convention Act, 1994*
  - *Species at Risk Act*
- Ontario Legislation
  - *Endangered Species Act, 2007**
    - O.Reg. 242/08 (General)
  - *Environmental Protection Act*
    - O.Reg. 153/04 (Records of Site Conditions)
    - O.Reg. 347 (General - Waste Management)
    - O.Reg. 406/19 (On-Site and Excess Soil Management)

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- *Invasive Species Act, 2015*

- Ontario Provincial Standard Drawings (OPSD) / Ministry of Transportation Drawings (MTOD)
  - OPSD219.110 Light-Duty, Silt Fence Barrier / MTOD219.110 Sediment Fence Barrier;
  - OPSD219.120 Light-Duty, Fibre Roll Barrier / MTOD219.120 Fibre Roll Barrier;
  - OPSS219.130 Heavy-Duty, Silt Fence Barrier;
  - OPSS219.131 Heavy-Duty, Wire-Backed, Silt Fence Barrier / MTOD219.131 Wire-Backed Sediment Fence Barrier;
  - OPSD219.150 Sandbag Barrier;
  - OPSD219.160 Fibre Roll Grade Breaks;
  - OPSD219.191 Fibre Roll Flow Check Dams;
  - OPSD219.200 Sandbag Flow Check Dam;
  - OPSD219.210 Temporary Rock Flow Check Dam, V-Ditch / MTOD219.210 Rock Flow Check Dam V-Ditch;
  - OPSD219.211 Temporary Rock Flow Check Dam, Flat Bottom Ditch / MTOD219.211 Rock Flow Check Dam Flat Bottom Ditch;
  - OPSD-19.220 Sediment Trap in Ditch;
  - OPSD219.230 Temporary Slope Drain for Sediment Trap / MTOD219.230 Slope Drain for Sediment Trap;
  - OPSD219.231 Temporary Berm Barrier for Slope Drain / MTOD219.231 Berm Barrier for Slope Drain;
  - OPSD219.240 Sediment Trap for Dewatering with Silt Fence;
  - OPSD219.260 Turbidity Curtain;
  - OPSD219.261 Turbidity Curtain, Seam Detail;
  - OPSD220.010 Barrier for Tree Protection;
  - OPSD221.010 Temporary Flow Passage System, Culvert in Watercourse; and
  - OPSD221.020 Temporary Flow Passage System, Pumping and Piping.

- Ontario Provincial Standard Specifications (OPSS)
  - OPSS100 MTO General Conditions of Contract;
  - OPSS180 General Specification for the Management of Excess Materials;
  - OPSS182 General Specification for Environmental Protection for Construction in and Around Waterbodies and On Waterbody Banks;
  - OPSS201 Construction Specification for Clearing, Close Cut Clearing, Grubbing, and Removal of Surface and Piled Boulders;
  - OPSS506 Construction Specification for Dust Suppressants;
  - OPSS517 Construction Specification for Dewatering and Temporary Flow Passage Systems;
  - OPSS760 Construction Specification System for Noise Barrier Systems;
  - OPSS800 Construction Specifications Environmental Landscape Series;
  - OPSS801 Construction Specification for the Protection of Trees;
  - OPSS802 Construction Specification for Topsoil;
  - OPSS803 Construction Specification for Vegetative Cover;
  - OPSS804 Construction Specification for Temporary Erosion Control;
  - OPSS805 Construction Specification for Temporary Sediment Control;
  - OPSS825 Construction Specification for Placement of Aggregates in Waterbodies; and
  - OPSS1005 Material Specification for Aggregates – Waterbody.
- Special Provisions (SP)
  - SP101F23 Amendment to OPSS 182, April 2021 – Timing of In-Water Works, Oversight Requirements, and Measures to Avoid Harm to Fish;
  - SP199S56 Control of Emissions During Structural Work;
  - SP804F02 Amendment to OPSS 804, April 2021 – Timing Constraints for Temporary Erosion Control Measures;

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- SP805F01 Amendment to OPSS 805, November 2020 – Timing Constraints for Temporary Sediment Control Measures;
- SP825S01 Amendment to OPSS 825, November 2019 – Waterbody Aggregate; and
- SP899S02 Requirements for Wildlife Fence.

- Non-Standard Special Provisions (NSSP) (note that additional NSSPs may apply as warranted):
  - NSSP-ENVR0007 Protection of Species at Risk;
  - NSSP-ENVR0011 Requirements for Herbicide Spraying and Mechanical Cutting of Invasive and Noxious Vegetation Species;
  - NSSP-ENVR0012 Selective Clearing and Deferred Grubbing;
  - NSSP-ENVR0013 Advanced Placement of Permanent Cover;
  - NSSP-ENVR0014 Amendment to OPSS 180, November 2016 – Compliance with Ontario Regulation (O.Reg.) 406/19 for On-Site and Excess Soil Management;
  - NSSP-ENVR0015 Requirements for Temporary Erosion Control Measures in Temporary Erosion Control Area;
  - NSSP-ENVR0016 Requirements for Temporary Erosion and Sediment Control in Adaptive Management Area;
  - NSSP-Requirement for Excavation, Removal and Disposal and/or Burial of Invasive and Noxious Vegetation; and
  - NSSP-Operational Constraint – Migratory Bird Protection.

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Table 5-23: Summary of Environmental Impacts, Mitigation Measures and Commitments to Future Work

ID# Category	Issues/Concerns/Potential Effects	Concerned Parties (alphabetical order)	Sub ID# Topic	Mitigation/Protection/Monitoring
Fish and Fish Habitat				
FISH-1.00	General Impacts to Fish and Fish Habitat	Conservation Authorities; DFO; General Public; Indigenous communities; Interest Groups; MECP; and MNR	FISH-1.01	Where feasible, watercourse crossings have been designed to span the 100-year migration limits of each channel, minimizing direct impacts to fish habitat and to maintain fish passage for the life-span of the crossings. For those crossings with Redside Dace Habitat, the crossings were designed where feasible to span the meander belt width plus a 30 m vegetated buffer on either side of the meander belt width, to avoid impacts to the Regulated Habitat / Critical Habitat and maintain fish passage. Piers have been avoided in the wetted channel (or Regulated Habitat / Critical Habitat for watercourses with species at risk), wherever structurally possible. Site-specific mitigation (including channel design that incorporates suitable fish habitat features) will be prepared during Detail Design for all watercourses identified as fish habitat, in consultation with applicable regulators and Indigenous communities. Where works in/near water are determined to likely result in the HADD of fish habitat and require a *Fisheries Act* Authorization, an Offsetting Plan will be developed. The Offsetting Plan will include development of offsetting measures, monitoring plans, and reporting requirements as specified by DFO. Specific details and extent of habitat improvements is directly linked to areas of impact. Required compensation and/or enhancement will be determined during Detail Design, in consultation with applicable regulators and Indigenous communities. For locations not requiring a *Fisheries Act* Authorization, appropriate mitigation measures will be developed and implemented in accordance with MTO's Fisheries BMPs, OPSS, SP, and applicable DFO Standards and Codes of Practice. To further support mitigation efforts, an MTO Fisheries Contract Specialist will be present on-site during all channel realignments, channel reinstatements, and permitted works within sensitive watercourses (e.g., those supporting aquatic SAR habitat). The Fisheries Contract Specialist will be responsible for documenting whether all mitigation and/or offsetting measures are installed and implemented as designed, and to verify compliance and effectiveness. Additional fisheries surveys will also be conducted during Detail Design, if it is determined that existing information is outdated.
FISH-2.00	Near and In-Water Work	Conservation Authorities; DFO; General Public; Indigenous communities; Interest Groups; MECP; and MNR	FISH-2.01	Access Management measures will be developed for applicable watercourse crossings involving culverts, bridges, or other structures where there is potential for disturbance to banks or shorelines. Note that MTO has designed watercourse crossings and piers, where feasible, to avoid in-water piers and to span/avoid sensitive habitats. Additional design considerations (including the placement of bridge piers and abutments, deck drainage, SWM outlets, and grading) will be further investigated during Detail Design to minimize impacts on the valley and fish habitat to the extent feasible. Where applicable, machinery fording of the watercourse shall be limited to a one-time event (i.e., over and back), and only if no alternative crossing method is available. Temporary crossing structures or other practices will be required to cross streams or waterbodies with steep and highly erodible (e.g., dominated by organic materials and silts) banks and beds, or if repeated crossings of a watercourse are required. For fording equipment without a temporary crossing structure, stream bank and bed protection methods (e.g., swamp mats, pads) will be required.

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ID# Category	Issues/Concerns/Potential Effects	Concerned Parties (alphabetical order)	Sub ID# Topic	Mitigation/Protection/Monitoring
FISH-2.00	Near and In-Water Work	Conservation Authorities; DFO; General Public; Indigenous communities; Interest Groups; MECP; and MNR	FISH-2.02	Site-specific isolation plans will be developed for in-water work in both direct and indirect fish habitat watercourses to maintain clean flow around the work area and prevent the release of sediment or other contaminants into the waterbody (as per OPSS804 Construction Specification for Temporary Erosion Control, OPSS805 Construction Specification for Temporary Sediment Control , and OPSS517 Construction Specification for Dewatering and Temporary Flow Passage Systems). The measures could include: ■ Delineation of work zones before work to avoid unintentional intrusions into nearby natural areas; ■ Use of only clean materials free of particle matter for temporary cofferdams; ■ Management of flow withdrawal and discharge to prevent erosion and the release of sediment to a waterbody; ■ Discharge and pumping hoses/pipes fitted with end-of-pipe protection screens to prevent entrainment and impingement of fish following DFO's Interim code of practice: end-of-pipe- fish protection screens for small water intakes in freshwater; ■ Relocation of fish from isolated work zones following conditions of a Licence to Collect Fish from the MNR and/or *Species at Risk Act* permit; and ■ Ensuring work zones are stabilized against high flows at the end of each workday.
FISH-2.00	Near and In-Water Work	Conservation Authorities; DFO; General Public; Indigenous communities; Interest Groups; MECP; and MNR	FISH-2.03	MTO Fisheries BMPs, OPSS, and SP will be incorporated during Detail Design, where appropriate, to meet the highway works design and safety requirements, as determined by a Qualified Person. For example: ■ Activities including work in- or near-water, including dewatering and temporary flow passage systems will be according to OPSS517 Construction Specification for Dewatering and Temporary Flow Passage Systems and OPSS182 General Specification for Environmental Protection for Construction In and Around Waterbodies and On Waterbody Banks; ■ The use of aggregate in waterbodies will be according to OPSS800 Environmental Landscape Series, OPSS825 Construction Specification for Placement of Aggregates in Waterbodies, SP825S01 Amendment to OPSS 825, November 2019 – Waterbody Aggregate, and OPSS1005 Material Specification for Aggregates – Waterbody; ■ The use of equipment in waterbodies and on waterbody banks will be according to OPSS182 General Specification for Environmental Protection for Construction In and Around Waterbodies and On Waterbody Banks; ■ Vehicle maintenance and refueling will be confined to designated areas a minimum of 30 m away from watercourses and wetlands, and all activities will be controlled to prevent entry of petroleum products or other deleterious substances, such as debris, waste, rubble, or concrete material, into the natural environment, as per OPSS182 General Specification for Environmental Protection for Construction In and Around Waterbodies and On Waterbody Banks;

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ID# Category	Issues/Concerns/Potential Effects	Concerned Parties (alphabetical order)	Sub ID# Topic	Mitigation/Protection/Monitoring
FISH-2.00	Near and In-Water Work	Conservation Authorities; DFO; General Public; Indigenous communities; Interest Groups; MECP; and MNR	FISH-2.03	■ Vegetation protection and removal of riparian vegetation will be according to OPSS182 General Specification for Environmental Protection for Construction In and Around Waterbodies and On Waterbody Banks and OPSS803 Construction Specification for Vegetative Cover; ■ The installation, monitoring, maintenance, and removal of temporary erosion and sediment control measures will be according to OPSS182 General Specification for Environmental Protection for Construction In and Around Waterbodies and On Waterbody Banks, OPSS804 Construction Specification for Temporary Erosion Control, OPSS805 Construction Specification for Temporary Sediment Control, and where appropriate, NSSP-ENVR0015 Requirements for Temporary Erosion Control Measures in Temporary Erosion Control Area or NSSP-ENVR0016 Requirements for Temporary Erosion and Sediment Control on Adaptive Management Area; ■ SP804F02 Amendment to OPSS 804, April 2021 – Timing Constraints for Temporary Erosion Control Measures, and SP805F01 Amendment to OPSS 805, November 2020 – Timing Constraints for Temporary Sediment Control Measures; ■ All excess material will be managed according to OPSS180 General Specification for the Management of Excess Materials; and ■ Clearing, close-cut clearing, grubbing, and removal of surface and piled boulders will be according to OPSS201 Construction Specification for Clearing, Close Cut Clearing, Grubbing, and Removal of Surface Piled Boulders. Where feasible and appropriate, specifications for NSSP-ENVR0013 Advanced Placement of Permanent Cover will be investigated and implemented to minimize disturbed areas. Additionally, deferred clearing and grubbing (NSSP-ENVR0012 Selective Clearing and Deferred Grubbing) will be considered in areas where immediate disturbance is not required, to reduce erosion potential and protect sensitive environmental features.
FISH-2.00	Near and In-Water Work	Conservation Authorities; DFO; General Public; Indigenous communities; Interest Groups; MECP; and MNR	FISH-2.04	Measures related to protection of freshwater fish and fish habitat, including the protection of water quality, will be developed during Detail Design and will include BMPs for sediment and erosion control, spill prevention, and water quality monitoring. Measures will be implemented during all phases of construction to prevent sediment-laden runoff from entering watercourses and will be consistent with the guidance outlined in ERS-1.00, and may include: ■ Site-specific plans for each watercourse crossing where work is proposed within 30 m of a watercourse; ■ Perimeter fencing, where feasible, to delineate high-risk areas (e.g., deferred grubbing zones, temporary cover areas, or sensitive environmental features) within near-water construction zones. Fencing will restrict access and protect banks and shoreline integrity, particularly in areas prone to erosion. The use and placement of perimeter fencing will be evaluated during construction planning to avoid interference with active works in/near waterbodies; ■ Organic material barriers (e.g., fibre roll barrier, sediment log, coir rolls) in the drainage and SWM ditches to mitigate sediment transport;

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ID# Category	Issues/Concerns/Potential Effects	Concerned Parties (alphabetical order)	Sub ID# Topic	Mitigation/Protection/Monitoring
FISH-2.00	Near and In-Water Work	Conservation Authorities; DFO; General Public; Indigenous communities; Interest Groups; MECP; and MNR	FISH-2.04	■ Only clean materials free of fine particulate matter placed in the water for temporary construction measures or permanent works; ■ If temporary dewatering is required in or near instream zones, appropriate energy dissipation and settling/filtration measures will be used to prevent erosion or sediment release; ■ No dewatering discharge will be released directly into watercourses. All discharge will be treated in accordance with OPSS517 Construction Specification for Dewatering and Temporary Flow Passage Systems using filtration, sedimentation, or other approved practices based on site-specific conditions and regulatory requirements; ■ Disturbed surfaces fully stabilized and revegetated as soon as possible following completion of the works to prevent increased erosion; ■ Dust control strategies implemented to minimize wind-blown dust as per SP199S56 Control of Emissions During Structural Work and OPSS100 MTO General Conditions of Contract; ■ Materials used or generated during construction (e.g., organics, soil, woody debris, temporary stockpiles, construction debris) stored and managed to prevent release to waterbodies, including maintaining a safe distance (e.g., >30 m) or using isolation measures (robust measures required for watercourses with aquatic species at risk required); ■ Appropriate BMPs for handling hydrocarbons used to reduce environmental risks associated with petroleum products; and ■ Equipment and materials operated, stored, and maintained in a manner and at a distance that prevents entry of any deleterious substance into waterbodies.
FISH-2.00	Near and In-Water Work	Conservation Authorities; DFO; General Public; Indigenous communities; Interest Groups; MECP; and MNR	FISH-2.05	Bridges and culverts have been designed in a manner that can meet the criteria of MTO's Clear Span Bridges BMPs (2025) (where feasible), and MTO's Drainage Design Standards (MTO, 2024), including, but not limited to, WC-7 (Culvert Crossings), WC-8 (Minimum Culvert Size), WC-10 (Culvert Extensions), and WC-12 (Fish Passage Through Culverts), where applicable. These design principles shall be carried forward into Detail Design to ensure consistency with best practices for minimizing impacts to aquatic habitat and maintaining hydraulic connectivity. During Detail Design, opportunities to refine and optimize these crossings will be explored, including alignment with updated standards and site-specific conditions, where applicable.
FISH-2.00	Near and In-Water Work	Conservation Authorities; DFO; General Public; Indigenous communities; Interest Groups; MECP; and MNR	FISH-2.06	Fish protection, including timing of in-water work to protect sensitive life stages/processes of migratory and resident fish, will follow site-specific in-water work timing windows provided by MNR and DFO, MTO's Fisheries BMPs (where applicable), OPSS182 General Specification for Environmental Protection for Construction in and Around Waterbodies and On Waterbody Banks and SP101F23 Amendment to OPSS 182, April 2021 - Timing of In-Water Works, Oversight Requirements, and Measures to Avoid Harm to Fish.

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ID# Category	Issues/Concerns/Potential Effects	Concerned Parties (alphabetical order)	Sub ID# Topic	Mitigation/Protection/Monitoring
FISH-2.00	Near and In-Water Work	Conservation Authorities; DFO; General Public; Indigenous communities; Interest Groups; MECP; and MNR	FISH-2.07	Isolated in-water work areas shall be cleared of fish prior to the commencement of work (using appropriate capture, handling, and release techniques to prevent harm and minimize stress) and released unharmed downstream or away from the construction area (as per OPSS182 General Specification for Environmental Protection for Construction In and Around Waterbodies and On Waterbody Banks). Intakes of pumps and hoses for de-watering of in-water work areas shall be screened to avoid impingement and/or entrainment of fish as per OPSS182 General Specification for Environmental Protection for Construction in and Around Waterbodies and On Waterbody Banks. A Licence to Collect Fish for Scientific Purposes will be obtained in order to conduct a fish salvage prior to any works being conducted. A *Species at Risk Act* permit will be obtained, if required, for relocation of fish in those watercourses known to support federally protected aquatic SAR.
FISH-2.00	Near and In-Water Work	Conservation Authorities; DFO; General Public; Indigenous communities; Interest Groups; MECP; and MNR	FISH-2.08	Whenever possible, machinery shall be operated on land above the high-water level, on ice, from a floating barge, or behind containment measures in a manner that minimizes disturbance to the banks and bed of the waterbody.
FISH-2.00	Near and In-Water Work	Conservation Authorities; DFO; General Public; Indigenous communities; Interest Groups; MECP; and MNR	FISH-2.09	Equipment entering the water or operating on the bank shall be free of fluid leaks, invasive species and noxious weeds. All equipment shall be externally cleaned/degreased to prevent the release of deleterious substances into the water.
FISH-2.00	Near and In-Water Work	Conservation Authorities; DFO; General Public; Indigenous communities; Interest Groups; MECP; and MNR	FISH-2.10	The removal of natural waterbody debris, rocks, and other materials (i.e., woody debris and vegetation) from the high-water level shall be minimized. Where feasible, appropriate in-stream structure and cover for habitat shall be added or re-established in a manner that avoids destabilizing the channel or negatively impacting stream hydraulics. Structure and substrate types shall match previous or adjacent to those removed, altered, or disturbed during construction. This may include salvaging and reinstating existing in-stream structures such as large woody debris, boulders, or aquatic vegetation.

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ID# Category	Issues/Concerns/Potential Effects	Concerned Parties (alphabetical order)	Sub ID# Topic	Mitigation/Protection/Monitoring
FISH-2.00	Near and In-Water Work	Conservation Authorities; DFO; General Public; Indigenous communities; Interest Groups; MECP; and MNR	FISH-2.11	Landscaping measures will be developed during Detail Design to restore riparian vegetation in areas disturbed by construction, including at watercourse crossings. The measures will aim to re-establish vegetation to pre-construction or improved conditions (e.g., planting trees to provide shade and overhead cover for aquatic habitat) and will include interim stabilization techniques such as biodegradable blankets and tackifiers to maintain soil stability until vegetation is established. These measures may include: ■ Designing and installing riparian plantings to avoid or minimize encroachment into or alteration of bank and bed profiles; ■ Reinstating native soils or replacing with suitable planting medium; ■ Salvaging local seed banks root mass/mat salvage, and using vegetation transplant or bioengineering techniques (e.g., live stakes, cuttings); ■ Using native species compatible with site conditions; and ■ Integrating provisional fish cover where feasible.
FISH-3.00	Death of fish or HADD of fish habitat.	Conservation Authorities; DFO; General Public; Indigenous communities; Interest Groups; MECP; and MNR	FISH-3.01	Where MTO Fisheries BMPs are not applicable, all works within 30 m of a watercourse will be assessed using MTO's Pathways of Effects in accordance with Step 4 of the MTO Environmental Guide for Fisheries – Fish Guide (MTO, 2025). Where negative residual effects cannot be avoided or mitigated and there is a likelihood of death of fish or HADD of fish habitat, a review by DFO will be required to determine whether a *Fisheries Act* Authorization is needed, which may include a requirement for offsetting of the impacts. All permits and approvals for works affecting fish and fish habitat will be obtained prior to construction activities that are subject to the approval(s). All construction activities including during and post-construction monitoring will be carried out in accordance with the conditions of the *Fisheries Act* Authorization, or any other permit or approval.
FISH-4.00	Fish passage	Conservation Authorities; DFO; General Public; Indigenous communities; Interest Groups; MECP; and MNR	FISH-4.01	The following mitigation measures will be implemented as part of Detail Design and construction: ■ Design and install new culverts, extensions, and replacements to prevent the creation of barriers to fish movement and to maintain bankfull channel functions and habitat functions to the extent possible as outlined in MTO's Watercrossing Design Standards including, but not limited to, WC-7 (Culvert Crossings), WC-8 (Minimum Culvert Size), WC-10 (Culvert Extensions), and WC-12 (Fish Passage Through Culverts). ■ Where permanent in-water structures are placed in fish habitat, the affected areas below the high-water mark will be naturalized using appropriate measures consistent with OPSS825 Construction Specification for Placement of Aggregates in Waterbodies, SP825S01 Amendment to OPSS 825, November 2019 – Waterbody Aggregate, and OPSS1005 Material Specification for Aggregates – Waterbody.

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ID# Category	Issues/Concerns/Potential Effects	Concerned Parties (alphabetical order)	Sub ID# Topic	Mitigation/Protection/Monitoring
FISH-4.00	Fish passage	Conservation Authorities; DFO; General Public; Indigenous communities; Interest Groups; MECP; and MNR	FISH-4.01	■ In-stream cover will be designed to replace or reinstate any fish cover removed, altered or disturbed during construction. ■ Culverts will be designed to be countersunk a minimum of 10% below the high-water mark, where necessary to restore and/or maintain fish passage. Design flexibility will be applied in locations that are fully inundated year-round, where embedding may not be required based on site-specific hydraulic and habitat conditions. ■ MNR and DFO timing restrictions for in-water works shall be implemented to protect the sensitive life stages/processes of migratory and resident fish. ■ Culvert debris shall be removed, where applicable. ■ Fish screens shall be used to avoid the entrainment of fish in pumps and hoses as per the DFO Code of Practice for end-of-pipe fish protection screens.
FISH-5.00	Potential presence of aquatic SAR	Conservation Authorities; DFO; General Public; Indigenous communities; Interest Groups; MECP; and MNR	FISH-5.01	Should approvals under the *Endangered Species Act, 2007** and/or the *Species at Risk Act* be required, all construction and post-construction monitoring shall incorporate the conditions and requirements of these approvals.
FISH-5.00	Potential presence of aquatic SAR	Conservation Authorities; DFO; General Public; Indigenous communities; Interest Groups; MECP; and MNR	FISH-5.02	All in-water works within Redside Dace habitat will be planned and executed in accordance with the most current MNR Guidance for Development Activities in Redside Dace Protected Habitat (MNR, 2016), the MTO Environmental Guide for Fisheries BMPs (MTO, 2025), and applicable federal and provincial legislation. In-water works will be restricted to the timing window of July 1 to September 15 for Redside Dace watercourses, unless otherwise directed by regulatory authorities during Detail Design.
FISH-5.00	Potential presence of aquatic SAR	Conservation Authorities; DFO; General Public; Indigenous communities; Interest Groups; MECP; and MNR	FISH-5.03	Prior to construction, refined and site-specific mitigation measures for Redside Dace, Silver Shiner, and American Eel will be developed during Detail Design, in consultation with applicable regulators and Indigenous communities. These measures will also help to address protected habitat (e.g., critical habitat), for applicable SAR, and will include: ■ Adherence to NSSP-ENVR0007 Protection of Species at Risk; ■ Watercourse crossings within Redside Dace Regulated Habitat / Critical Habitat will span the meander belt + a 30 m vegetated buffer on either side, where feasible, to avoid impacting critical habitat that supports health of the species and sub-populations; ■ Implementation of robust in-water work area isolation and sediment control plans to prevent the release of sediment or contaminants; ■ Maintenance of natural flow regimes and water quality through the work area, including measures to avoid erosion and downstream sediment transport; ■ Use of clean materials for temporary works and stabilization of work zones against high flows at the end of each workday; and

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ID# Category	Issues/Concerns/Potential Effects	Concerned Parties (alphabetical order)	Sub ID# Topic	Mitigation/Protection/Monitoring
FISH-5.00	Potential presence of aquatic SAR	Conservation Authorities; DFO; General Public; Indigenous communities; Interest Groups; MECP; and MNR	FISH-5.03	■ Avoidance of direct impacts to the channel and Regulated Habitat / Critical Habitat by employing clear-span bridge designs or similar approaches where feasible. Where federally-listed aquatic SAR or their habitat have been identified (e.g., Redside Dace and Silver Shiner), a review of the proposed works by DFO will be required to determine the need for a permit under the *Species at Risk Act*. Aquatic SAR that are protected provincially but not federally (e.g., American Eel) may require registration or approvals. Regulatory requirements will be confirmed as the Project approaches implementation to verify if adjustments are required, as legislative instruments may be updated. Ongoing communication with MECP and DFO will be maintained throughout the design and construction phases to address any new requirements or site-specific considerations for Redside Dace, Silver Shiner and American Eel. Additional mitigation or adaptive management measures will be implemented as required based on site conditions and regulatory feedback.
FISH-6.00	Impacts to fish associated with dewatering during construction	Conservation Authorities; DFO; General Public; Indigenous communities; Interest Groups; MECP; and MNR	FISH-6.01	The following mitigation measures will be implemented during construction activities to address potential effects to fish and fish habitat associated with dewatering activities: ■ As per OPSS182 General Specification for Environmental Protection for Construction in and Around Waterbodies and On Waterbody Banks, any fish isolated in the work area shall be transferred using appropriate capture, handling and release techniques to prevent harm and minimize stress, including following specific capture and release requirements outlined by the *Species at Risk Act* permits and/or the *Endangered Species Act, 2007** permits/registrations. Release locations will be selected based on species-specific requirements and site conditions, as appropriate; ■ Fish screens will be installed on pumps and hoses to prevent entrainment of fish, in accordance with OPSS182 General Specification for Environmental Protection for Construction In and Around Waterbodies and On Waterbody Banks; ■ Appropriately designed and sited temporary settling basins, filter bags, or equivalent systems shall be used to ensure sediment is filtered out prior to re-entering a waterbody in accordance with OPSS182 General Specification for Environmental Protection for Construction In and Around Waterbodies and On Waterbody Banks and OPSS517 Construction Specification for Dewatering and Temporary Flow Passage Systems; ■ Energy dissipation measures shall be implemented to prevent erosion of the bank or bed during discharge; ■ Isolated in-water work areas must be cleared of fish prior to the commencement of work. A License to Collect Fish for Scientific Purposes shall be obtained prior to the start of any fish relocation works; ■ Where appropriate, fish passage will be restored and/or maintained during construction activities (either within the existing channel or via a temporary flow passage system); and ■ In-water site isolation systems will be designed and implemented in accordance with OPSS517 Construction Specification for Dewatering and Temporary Flow Passage Systems, including provisions for dewatering isolated work areas, temporary flow passage systems (both outside and within a waterbody), discharge protocols, and minimum monitoring requirements.

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FISH-7.00	Potential for oil, gasoline, grease and other deleterious substances from construction equipment, material storage and handling to enter adjacent watercourses	Conservation Authorities; DFO; General Public; Indigenous communities; Interest Groups; MECP; and MNR	FISH-7.01	See FISH-2.04.
FISH-7.00	Potential for oil, gasoline, grease and other deleterious substances from construction equipment, material storage and handling to enter adjacent watercourses	Conservation Authorities; DFO; General Public; Indigenous communities; Interest Groups; MECP; and MNR	FISH-7.02	The Contractor shall be in compliance with the requirements of all the applicable environmental legislation as stated in the Environmental Incident Management Under Legislation Protecting the Environment and Natural Resources in accordance with OPSS100 MTO General Conditions of Contract.
FISH-7.00	Potential for oil, gasoline, grease and other deleterious substances from construction equipment, material storage and handling to enter adjacent watercourses	Conservation Authorities; DFO; General Public; Indigenous communities; Interest Groups; MECP; and MNR	FISH-7.03	Operate, store and maintain (e.g., refuel, lubricate) all equipment, vehicles and associated materials in a manner that prevents the entry of any deleterious substance from entering the waterbody as per OPSS182 General Specification for Environmental Protection for Construction In and Around Waterbodies and On Waterbody Banks. Additionally, any part of equipment entering the waterbody or operating from the bank shall be cleaned, free of invasive species and fluid leaks, and in good working condition.
FISH-8.00	Potential for the spread of invasive species	Conservation Authorities; DFO; General Public; Indigenous communities; Interest Groups; MECP; and MNR	FISH-8.01	The Contractor shall implement BMPs to prevent the introduction/spread of invasive plants, including proper soil management and equipment cleaning protocols, and the Contractor shall follow the guidelines outlined in the MNRs, Invasive Phragmites BMPs, Ontario Ministry of Natural Resources, Peterborough, Ontario. Version 2011. 15p, and the Ontario Invasive Plant Council Clean Equipment Protocol for Industry.
FISH-8.00	Potential for the spread of invasive species	Conservation Authorities; DFO; General Public; Indigenous communities; Interest Groups; MECP; and MNR	FISH-8.01	The Contractor shall remove and dispose of excess soil from areas identified as containing invasive species (e.g., Common Reed), in accordance with MTO contract specifications for the Management of Excess Soils and disposal of invasive and noxious vegetation.

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ID# Category	Issues/Concerns/Potential Effects	Concerned Parties (alphabetical order)	Sub ID# Topic	Mitigation/Protection/Monitoring
Terrestrial Ecosystems				
TERR-1.00	General impacts to terrestrial ecosystems.	Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-1.01	Approaches to managing impacts to terrestrial ecosystems will be developed in consultation with applicable regulators and Indigenous communities prior to any highway works that could affect vegetation and wildlife (including SAR). This approach will be informed by the updated terrestrial ecosystem impact assessment reports and will outline detailed mitigation measures to be implemented during construction and operation.
TERR-2.00	Temporary loss of natural vegetation.	Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-2.01	OPSS to apply as general mitigation during Detail Design and incorporated to meet the highway works design and safety requirements, as determined by a Qualified Person, may include as follows: ■ OPSS201 Construction Specification for Clearing, Close Cut Clearing, Grubbing, and Removal of Surface and Piled Boulders; ■ OPSS801 Construction Specification for the Protection of Trees; ■ OPSS182 General Specification for Environmental Protection for Construction In and Around Waterbodies and On Waterbody Banks and OPSS803 Construction Specification for Vegetative Cover; ■ OPSS804 Construction Specification for Temporary Erosion Control; and ■ OPSS805 Construction Specification for Temporary Sediment Control.
TERR-2.00	Temporary loss of natural vegetation.	Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-2.02	Invasive species management measures will be developed as per TERR-2.03.
TERR-2.00	Temporary loss of natural vegetation.	Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-2.03	Standard Best Practices to prevent and control the spread of invasive plants will be incorporated into the highway works. During construction and operation, invasive species will be managed according to the *Invasive Species Act, 2015* and may include NSSP-ENVR0011 Requirements for Herbicide Spraying and Mechanical Cutting of Invasive and Noxious Vegetation Species. The Project will also adhere to O.Reg. 558/00 General - Waste Management and O.Reg. 406/19 On-Site and Excess Soil Management, in addition to MTO NSSP Requirement for Excavation, Removal and Disposal and/or Burial of Invasive and Noxious Vegetation.
TERR-3.00	Temporary loss of natural vegetation.	Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-3.01	Vegetation removal, grading, and soil compaction shall be minimized where feasible. An offsetting or compensation measures for vegetation removals shall be developed to address residual impacts and support ecological restoration objectives in consultation with applicable regulators and Indigenous communities.

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TERR-3.00	Temporary loss of natural vegetation.	Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-3.02	Where tree removals are required to accommodate the proposed design outside of Ministry-owned lands (e.g., areas of Temporary Limited Interest), a tree inventory will be completed during Detail Design by a certified arborist or Qualified Person. This inventory will identify the number, species, and condition of trees proposed for removal and will inform restoration planning and potential permitting considerations. Although the Project may not be directly subject to municipal by-laws/permitting requirements within Ministry-owned lands, mitigation in these areas will be developed in alignment with the principles of applicable municipal tree protection by-laws for adjacent municipalities. This includes consideration of tree preservation, compensation, and restoration strategies consistent with local standards and expectations.
TERR-3.00	Temporary loss of natural vegetation.	Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-3.03	Wetland boundary delineation will be completed where encroachment into wetlands is anticipated. Where wetland habitat cannot be restored or is permanently impacted by the proposed highway, the Ministry shall discuss wetland compensation efforts, including enhancement of adjacent wetland communities or creation of new wetland habitat, in consultation with applicable regulators and Indigenous communities.
TERR-3.00	Temporary loss of natural vegetation.	Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-3.04	A detailed plant inventory will be completed during future phases of the Project and documented. If regionally rare species are identified within the final limits of work, mitigation measures specific to these species will be considered and implemented. This may include targeted presence/absence surveys following applicable guidelines and protocols to support permitting and approvals for tree SAR (e.g., Black Ash [*Fraxinus nigra*], Butternut [*Juglans cinerea*]). Salvage and Transplantation measures will be developed and will include offsetting or compensation strategies for vegetation removals with applicable regulators and Indigenous communities.
TERR-4.00	Potential for construction fill and sediment runoff to enter vegetation communities	Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-4.01	MTO will incorporate erosion and sediment control BMPs to manage surface water and avoid sedimentation in sensitive vegetation communities, as per OPSS803 Construction Specification for Vegetative Cover, OPSS804 Construction Specification for Temporary Erosion Control and OPSS805 Construction Specification for Temporary Sediment Control. Appropriate designs for drainage and SWM systems have been included in the Preliminary Design to mitigate changes to hydrology and salt, sediment or other contaminant releases (wetlands and watercourses) where feasible. Additional measures that will be considered during Detail Design include: ■ Erosion and Sediment Control (see ERS-1.00) measures will be installed along the construction footprint within 30 m of any Provincially Significant Wetland. In areas where the construction of the highway is expected to intersect a Provincially Significant Wetland, erosion and sediment control measures shall be installed along the limits of work; and ■ Road salt management measures will be developed by MTO during Detail Design that identify salt vulnerable areas (e.g., watercourses and wetlands).

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TERR-4.00	Potential for construction fill and sediment runoff to enter vegetation communities	Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-4.02	All excess material will be managed according to OPSS180 General Specification for the Management of Excess Materials. This may include: ■ Construction material stored within an authorized location, and any soil stockpiles only located within a suitable sediment fenced and protected location ■ If stockpiles of gravel and sandy substrates or the removal of these substrates in the vicinity of turtle habitat are required during the active turtle season (April 1 to October 15), turtle exclusion fencing will be installed in accordance with MECP's Reptile and Amphibian Exclusion Fencing BMPs around stockpiles or area of disturbance prior to April 1. Fencing will be installed immediately after stockpiles are created if after April 1; and ■ Implement Bank Swallow Control measures.
TERR-4.00	Potential for construction fill and sediment runoff to enter vegetation communities	Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-4.03	OPSS and SP to apply as general mitigation during Detail Design and incorporated where appropriate to meet the highway works design and safety requirements, as determined by a Qualified Person, including: ■ OPSS100 MTO General Conditions of Contract; ■ OPSS180 General Specification for the Management of Excess Materials; ■ OPSS182 General Specification for Environmental Protection for Construction In and Around Waterbodies and On Waterbody Banks; ■ OPSS201 Construction Specification for Clearing, Close Cut Clearing, Grubbing, and Removal of Surface and Piled Boulders; ■ OPSS803 Construction Specification for Vegetative Cover, ■ OPSS804 Construction Specification for Temporary Erosion Control; ■ OPSS805 Construction Specification for Temporary Sediment Control; ■ SP804F02 Amendment to OPSS 804, April 2021 – Timing Constraints for Temporary Erosion Control Measures; ■ SP805F01 Amendment to OPSS 805, November 2020 – Timing Constraints for Temporary Sediment Control Measures; and ■ SP199S56 Control of Emissions During Structural Work.
TERR-5.00	Potential for oil, gasoline, grease, emissions, and other materials from construction equipment, material storage, and handling to enter adjacent vegetation communities	Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-5.01	OPSS and SP to apply as general mitigation during Detail Design and incorporated where appropriate to meet the highway works design and safety requirements, as determined by a Qualified Person, include as follows: ■ OPSS100 MTO General Conditions of Contract; ■ OPSS182 General Specification for Environmental Protection for Construction In and Around Waterbodies and On Waterbody Banks; and ■ SP199S56 Control of Emissions During Structural Work.

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TERR-5.00	Potential for oil, gasoline, grease, emissions, and other materials from construction equipment, material storage, and handling to enter adjacent vegetation communities	Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-5.02	The use of BMPs for handling of hydrocarbons as per OPSS182 General Specification for Environmental Protection for Protection in and Around Waterbodies and On Waterbody Banks, the MECP, and the TSSA of the Ministry of Public and Business Service Delivery and Procurement will reduce the potential of environmental adverse effects associated with petroleum product handling and uses. A Spills Prevention and Response Contingency Plan will be prepared and shall include materials, instructions, education, and emergency numbers. The plan shall be kept onsite at all times, communicated to work crews and be properly implemented in the event of accidental spills (Spill Prevention and Response Contingency Plan as per OPSS182 General Specification for Environmental Protection for Construction In and Around Waterbodies and On Waterbody Banks).
TERR-6.00	Potential impacts to wetland hydrology	ECCC; Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-6.01	OPSS to apply as general mitigation during Detail Design and incorporated where appropriate to meet the highway works design and safety requirements, as determined by a Qualified Person, include OPSS517 Construction Specification for Dewatering and Temporary Flow Passage Systems.
TERR-7.00	Potential impacts to terrestrial SAR and wildlife habitat	ECCC; Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-7.01	If impacts to SAR habitat cannot be avoided during Detail Design and should a permit under the *Endangered Species Act, 2007**, and/or the *Species at Risk Act* be required, MTO will submit a request for a permit to MECP and/or ECCC. All construction and post-construction monitoring shall incorporate the conditions and requirements of these approvals.
TERR-7.00	Potential impacts to terrestrial SAR and wildlife habitat	ECCC; Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-7.02	As per OPSS100 MTO General Conditions of Contract / NSSP-ENVR0007 Protection of Species at Risk, construction activities will cease if SAR are encountered within the work area and the MECP will be contacted by a Qualified Person, and no Threatened or Endangered species will be handled or relocated without proper approvals/permits/authorizations from MECP. A Qualified Person experienced in wildlife handling shall be onsite ahead of construction to capture and relocate encountered wildlife to suitable habitat outside of the construction work area in accordance with the Ontario SAR Handling Manual: For *Endangered Species Act, 2007** Authorization Holders (Ontario Ministry of Natural Resources, no date). Detailed plans will be developed during Detail Design for the protection of terrestrial ecosystem features (including wildlife and SAR) such as a Wildlife Handling and Salvage Plan as well as other feature-specific protection and mitigation plans.
TERR-7.00	Potential impacts to terrestrial SAR and wildlife habitat	ECCC; Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-7.03	Where Monarch (*Danaus plexippus*) habitat is present, efforts will be made to avoid removal. If Milkweed species (*Asclepias spp*.) are impacted, re-seeding will be undertaken to restore habitat (also see TERR-11.00).

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TERR-7.00	Potential impacts to terrestrial SAR and wildlife habitat	ECCC; Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-7.04	To support permitting and approvals under applicable provincial and federal legislation (e.g., *Endangered Species Act, 2007**, *Species at Risk Act*), targeted presence/absence surveys will be conducted during future phases of the Project for provincially and federally protected SAR. MTO will also discuss the targeted surveys with applicable regulators and Indigenous communities. These surveys will follow established guidelines and protocols and include the species listed below. In addition, surveys will be conducted to confirm the presence or absence of federally protected SAR habitat. An updated quantification of SAR habitat will be completed to inform permitting requirements and to guide the development of compensation or offsetting strategies for habitat loss. ■ Federally Protected SAR: Presence/absence surveys for federally protected SAR for which no targeted surveys were completed during Preliminary Design (e.g., Eastern Whip-poor-will [*Antrostomus vociferus*], Monarch; see also TERR-8.00 and TERR-11.00, respectively). ■ Grassland Birds: Surveys for Bobolink (*Dolichonyx oryzivorus*) and Eastern Meadowlark (*Sturnella magna*) in suitable open habitats (also see TERR-8.00); ■ Bats: Acoustic monitoring in treed areas and buildings proposed for demolition to detect bat SAR (also see TERR-7.05); ■ Tree Species: Detailed inventories and health assessments for Black Ash and Butternut (also see TERR-7.06 and TERR-7.07); ■ Chimney Swift (*Chaetura pelagica*): Habitat suitability assessments and monitoring of chimney use in buildings proposed for demolition (also see TERR-8.00); ■ Short-eared Owl (*Asio flammeus*): Crepuscular surveys in appropriate open habitats (also see TERR-8.00); and ■ Bank Swallow (*Riparia riparia*): Nest colony surveys in exposed soil banks and other suitable nesting substrates (also see TERR-8.00).
TERR-7.00	Potential impacts to terrestrial SAR and wildlife habitat	ECCC; Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-7.05	Species-specific surveys for bat SAR will be undertaken in areas where tree removal is proposed in suitable SAR habitat, in accordance with the most current protocols available at the time of implementation. MECP will be consulted to determine approval requirements under the *Endangered Species Act, 2007**, and ECCC will be consulted to determine approval requirements under the *Species at Risk Act*.

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TERR-7.00	Potential impacts to terrestrial SAR and wildlife habitat	ECCC; Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-7.06	A detailed plant inventory within the construction area will be completed to confirm whether any additional Butternut, Black Ash or other plant SAR will be affected by the proposed works. ■ For Butternut, a Butternut health assessment may be required if works are located within 25 m of a pure Butternut. If ground disturbance occurs within 25 m or removal of pure or archivable Butternut is necessary, consultation with the MECP and/or authorization under the applicable regulatory legislation will be required. ■ For Black Ash, if impacts are confirmed, the species may be eligible for registration under Ontario Regulation 242/08 – General (O.Reg. 242/08), Section 23.18, provided specific conditions are met. If the Project does not meet the eligibility criteria for registration under the Natural Resources Approval Regulation (NRAR), a permit under the applicable regulatory legislation will be required if removal of healthy Black Ash with a diameter at breast height of 8 cm or greater cannot be avoided prior to any clearing activities. Should approvals under the *Endangered Species Act, 2007**, and/or the *Species at Risk Act* be required, all construction and post-construction monitoring shall incorporate the conditions and requirements of these approvals.
TERR-7.00	Potential impacts to terrestrial SAR and wildlife habitat	ECCC; Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-7.08	To minimize impacts on herpetofauna (reptiles and amphibians) during construction and site preparation, the following mitigation strategies will be implemented: ■ Construction activities within candidate reptile hibernacula and turtle nesting habitats will be scheduled during the active season (April 1 to October 15) to avoid disturbing overwintering individuals if feasible; ■ If work is required within candidate turtle/reptile hibernacula (e.g., wetlands or rockpiles), it will be completed outside the published reptile overwintering period; ■ In-water or dewatering activities will be conducted between April 15 and September 30; ■ If work is required within candidate turtle/reptile hibernacula during the active season or within the published reptile overwintering period, consultation with the regulator (MECP) will be completed to determine best approach; and ■ Turtle overwintering and nesting surveys will be undertaken in areas where impacts are proposed in candidate habitat, following the most current protocols approved by the MECP. Should approvals under the *Endangered Species Act, 2007**, and/or the *Species at Risk Act* be required, all construction and post-construction monitoring shall incorporate the conditions and requirements of these approvals. ■ Turtle exclusion fencing will be installed around gravel and sandy substrate stockpiles or removal zones near turtle habitat during the active season (April 1 to October 15) following MECP (2020) guidance; and ■ Active turtle and snake nests encountered during construction will be buffered and protected under the supervision of a Qualified Person.

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TERR-7.00	Potential impacts to terrestrial SAR and wildlife habitat	ECCC; Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-7.09	To minimize impacts on Western Chorus Frog (*Pseudacris triseriata*) during construction and site preparation, the following mitigation strategies will be implemented: ■ Wildlife exclusion and sediment/erosion control fencing will be installed around work areas within 30 m of confirmed Western Chorus Frog habitat in mid to late April; ■ Temporary construction access routes will avoid crossing confirmed breeding and wintering habitats; ■ Construction activities within terrestrial/dispersal habitat (June 11 to October 1) will be avoided unless exclusion measures are in place. If work is required within terrestrial/dispersal consultation with the regulator (MECP) will be completed to determine best approach; ■ A phased habitat exclusion and amphibian relocation strategy will be developed during Detail Design. This will include one-way anuran fencing and the salvage and relocation of individuals to suitable compensation breeding habitat; and ■ Ground disturbance activities (e.g., clearing, grading) within Western Chorus Frog habitat will be avoided until exclusion and relocation measures are complete, except for erosion and sediment control installation.
TERR-7.00	Potential impacts to terrestrial SAR and wildlife habitat	ECCC; Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-7.10	Avoid changes to hydrology in areas of candidate and confirmed Terrestrial Crayfish habitat to the extent practicable.
TERR-7.00	Potential impacts to terrestrial SAR and wildlife habitat	ECCC; Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-7.11	Also refer to mitigation measures outlined under TERR-8.00.
TERR-8.00	Potential impacts to migratory birds and their habitat	ECCC; Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-8.01	Construction activities will be scheduled to occur outside of the published bird nesting period (e.g., April 1 to August 31) in geographic areas where sensitive migratory bird habitat has been identified in accordance with NSSP Operational Constraint – Migratory Bird Protection, to avoid disturbance to breeding migratory birds, including SAR, and to prevent damage or destruction of their nests. This will be carried out in accordance with the *Migratory Birds Convention Act, 1994*, the *Endangered Species Act, 2007** and the *Species at Risk Act*. It is recommended that regulatory requirements be confirmed as the Project approaches implementation to verify if adjustments are required for the project (e.g., confirmation of applicable legislation at the time permits are sought).

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TERR-8.00	Potential impacts to migratory birds and their habitat	ECCC; Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-8.02	If vegetation removal or building demolition must occur within this period, active nest searches will be conducted by a Qualified Person prior to these activities in accordance with NSSP Operational Constraint – Migratory Bird Protection. These searches will be focused on 'simple habitats' (e.g., mown vegetation) or areas requiring minor vegetation clearing to ensure that no active nests of breeding migratory birds or SAR are destroyed. If birds are observed nesting in, under, or on a structure or building prior to or during rehabilitation or replacement, a Qualified Person will be consulted to determine appropriate steps to reduce impacts and avoid contravention of applicable legislation.
TERR-8.00	Potential impacts to migratory birds and their habitat	ECCC; Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-8.03	Bird exclusion measures (e.g., tarps) will be installed at structures identified for rehabilitation, demolition, or reconstruction prior to the beginning of the published general nesting period, in accordance with the BMPs for Excluding Barn Swallows (*Hirundo rustica*) and Chimney Swifts from Buildings and Structures (MNRF, 2017), if these activities cannot occur outside of the nesting period. Targeted sweeps and surveys for nests of Schedule 1 species, such as Green Heron (*Butorides virescens*), Great Blue Heron (*Ardea Herodias*) and Pileated Woodpecker (*Dryocopus pileatus*), which were identified within the Project Study Area, will be required during Detail Design and/or prior to vegetation removal to determine potential permitting requirements.
TERR-8.00	Potential impacts to migratory birds and their habitat	ECCC; Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-8.04	Should approvals under the *Endangered Species Act, 2007**, and/or the *Species at Risk Act*, or the *Migratory Birds Convention Act, 1994* be required, all construction and post-construction monitoring shall incorporate the conditions and requirements of these approvals.
TERR-9.00	Potential to find wildlife (including SAR) within the work area during construction	Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-9.01	Construction activities will be conducted with full consideration for wildlife and environmental regulations and measures will be implemented to prevent harassment. If wildlife is encountered within the work area, it will be allowed to vacate naturally. A Qualified Person or environmental monitor will assess the significance of any species observed. If the species is identified as a SAR, it must not be handled unless in immediate danger. In such cases, a Qualified Person must contact MTO and the MECP immediately. As per OPSS100 MTO General Conditions of Contract / NSSP-ENVR0007 Protection of Species at Risk, all construction activities will cease upon encountering SAR, and no Threatened or Endangered species may be handled or relocated without proper approvals, permits, or authorizations from the MECP. A Qualified Person experienced in wildlife handling will be present prior to construction to safely capture and relocate wildlife to suitable habitat outside the work area, following the Ontario Species at Risk Handling Manual: For Endangered Species Act Authorization Holders (MNR, no date). For non-SAR species, individuals will be directed away from the construction zone into nearby natural areas, and if uncertain, guidance from a Qualified Person will be sought. Species of Conservation Concern, such as Snapping Turtles (*Chelydra serpentina*), may be relocated by a Qualified Person for the safety of both personnel and the animal. Injured or orphaned animals, as well as amphibians or reptiles unearthed during hibernation, must be transported to an approved wildlife rehabilitation centre or a licensed veterinarian.

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TERR-9.00	Potential to find wildlife (including SAR) within the work area during construction	Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-9.02	Should an injured or orphaned animal be encountered, a Qualified Person will transport the animal to a wildlife rehabilitation centre that is an approved Wildlife Custodian by MNR or a member of the College of Veterinarians. Any amphibians or reptiles unearthed during their hibernation will also be immediately transported to a suitable wildlife rehabilitation centre.
TERR-9.00	Potential to find wildlife (including SAR) within the work area during construction	Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-9.03	Construction activities will be conducted with full consideration for wildlife and environmental regulations and measures will be implemented to prevent harassment. Wildlife incidentally encountered during construction will not knowingly be harmed/harassed and will be allowed to move away from the construction area on its own.
TERR-10.0	Potential for wildlife vehicle collisions.	Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-10.01	During Detail Design, mitigation measures (as well as measures outlined within the MTO Environmental Guide for Mitigating Road Impacts to Wildlife, 2017) will be implemented to mitigate impacts related to wildlife road mortality and movement. These measures may include: ■ In areas of potential disturbance of turtle or snake habitat during construction, exclusion fencing will be installed in accordance with the Reptile and Amphibian Exclusion Fencing BMPs (MECP, 2020). If active turtle or snake nests are encountered, they will be protected and buffered ahead of construction as deemed appropriate by a Qualified Person; ■ As part of Detail Design, impacts related to road mortality and wildlife movement will be mitigated by applying MTO's Environmental Guide for Mitigating Road Impacts to Wildlife, 2017, which includes appropriate sizing and design features for crossing structures at watercourses and other key terrestrial movement corridors, signage and permanent wildlife exclusion fencing in combination with escape features (e.g., jump-outs); ■ Permanent wildlife exclusion fencing will be installed along entire limits of Study Area, including jump-outs as per SP899S02 Requirements for Wildlife Fence; ■ Areas for temporary wildlife exclusion fencing will be identified following agency recommended guidelines, including areas for Western Chorus Frog and confirmed Significant Wildlife Habitat types such as Amphibian Breeding Habitat and Turtle Nesting Areas; ■ Culverts will be designed to have sufficient openness ratios to allow for wildlife passage (0.6 or greater for deer, 0.4 for medium-sized mammals and 0.25 for herpetofauna) wherever practicable. Other recommended characteristics for ecopassages will also be considered; ■ Include natural substrates within culverts structures and if rip-rap must be used, fill the interstitial space with small materials which would provide appropriate footing for wildlife; ■ Provide suitable cover elements adjacent to structures (e.g., retained or planted vegetation) that can facilitate wildlife use of the structures (i.e., cover/shelter on route to structure) while not blocking the structure entrance; ■ Wherever possible, ensure that entrance and exits to the structures are reasonably level (e.g., no major grade changes) to provide an unimpeded view through the structure and habitat beyond;

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TERR-10.0	Potential for wildlife vehicle collisions.	Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-10.01	■ Remove or reduce potential predator perches (i.e., ledges) to the extent possible; ■ Avoid artificial light sources near the entrances/exit of the wildlife passage; ■ Any landscaping and erosion control materials required shall not include materials known to accidentally entrap snakes or fish; and ■ Restore adjacent vegetation areas disturbed for construction access using native species.
TERR-11.0	Removal of potential Monarch habitat	Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-11.01	Limiting vegetation removal to outside of the published monarch nesting period will help to protect monarch while they are present as eggs or larvae on milkweed plants (May 25 to August 15).
TERR-11.0	Removal of potential Monarch habitat	Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-11.02	Inclusion of Milkweed species in the seed species mix for the revegetation of temporary disturbed areas.
TERR-12.00	Potential impacts to culturally significant vegetation species	Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-12.01	A tree end-use process will be considered during Detail Design to identify culturally significant or lumber quality woody debris/timber and the process by which such harvested material will be allocated. Culturally significant and lumber quality trees should be identified through consultation and engagement with Indigenous communities and end use partners. Consultation should include discussions regarding appropriate removal plans for those species identified. Trees identified as lumber quality can be cut into sawlogs or other requested forms to provide access to harvested wood to end use partners.
TERR-13.00	Potential impact of lighting and noise on wildlife	Conservation Authorities; General Public; Indigenous communities; Interest Groups; MECP; and MNR	TERR-13.01	Detail Design will take into consideration potential light and noise impacts on wildlife and their habitats. Measures may include: ■ Avoid installing lighting adjacent to wildlife habitat areas (e.g., woodlands) where practicable unless unavoidable for safety reasons; ■ If feasible, turn off lighting or reduce the number of active lights immediately adjacent to woodlands during published sensitive timing windows; ■ Avoid the use of high-pressure sodium and Light-emitting diode (LED) lights immediately adjacent to woodlands; ■ Incorporate shielded road illumination that focus downward and away from natural areas, where feasible; ■ Consider the use of low-pressure sodium lamps or ultraviolet (UV) filters and employ alternative measures where feasible to reduce the intensity and amount of light reaching natural areas; and ■ Minimizing construction noise near adjacent sensitive wildlife features, if feasible

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Groundwater and Hydrogeology				
GROUND-1.00	Potential effects to groundwater quality and quantity	Conservation Authorities; General Public; Indigenous communities; Interest Groups; Local Municipalities; MECP; and Property Owners	GROUND-1.01	Measures related to protection of groundwater and hydrogeology, including protection of water quality, will include BMPs for sediment and erosion control, spill prevention, and water quality monitoring. MTO will apply current BMPs to minimize impacts by way of adherence to MTO plans and policies, the use of special contract provisions, and contract oversight and monitoring. All identified measures will be implemented for all relevant Project activities and locations where there is potential for impact to groundwater or hydrogeology. No Project works will proceed without the application of these measures, and any deviations must be justified and approved by the contract administrator and documented.
GROUND-1.00	Potential effects to groundwater quality and quantity	Conservation Authorities; General Public; Indigenous communities; Interest Groups; Local Municipalities; MECP; and Property Owners	GROUND-1.02	MTO will incorporate erosion and sediment control BMPs to manage surface water and avoid sedimentation as per OPSS804 Construction Specification for Temporary Erosion Control and OPSS805 Construction Specification for Temporary Sediment Control. Appropriate designs for drainage and SWM system have been included in the Preliminary Design to mitigate changes to hydrology and salt, sediment or other contaminant releases to wetlands and watercourses). Any runoff and dewatering discharge shall be directed away from wetlands and watercourse unless they meet the Provincial Water Quality Objectives. Additional measures that will be considered during Detail Design include: ■ Sediment and Erosion Control measures will be developed during Detail Design based on recommendations from the “Highway 413 Transportation Corridor Erosion and Sedimentation Overview Risk Assessment”; and ■ Road salt management measures will be implemented by MTO during Detail Design that identify salt vulnerable areas (e.g., watercourses and wetlands) and explores using alternative de-icing materials (e.g., sand, beet juice) and application methods to reduce release of salt contaminants into adjacent salt vulnerable areas.
GROUND-1.00	Potential effects to groundwater quality and quantity	Conservation Authorities; General Public; Indigenous communities; Interest Groups; Local Municipalities; MECP; and Property Owners	GROUND-1.03	OPSS and SP shall be applied as general mitigation during Detail Design to meet highway works design and safety requirements. These measures shall be incorporated as determined by a Qualified Person and may include, but are not limited to, erosion and sediment control, species protection, and watercourse management. ■ Removal of riparian vegetation will be according to OPSS182 General Specification for Environmental Protection for Construction In and Around Waterbodies and On Waterbody Banks; ■ The installation, monitoring, maintenance, and removal of temporary erosion and sediment control measures will be according to OPSS182 General Specification for Environmental Protection for Construction In and Around Waterbodies and On Waterbody Banks, OPSS804 Construction Specification for Temporary Erosion Control, SP804F02 Amendment to OPSS 804, April 2021 – Timing Constraints for Temporary Erosion Control Measures, OPSS805 Construction Specification

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GROUND-1.00	Potential effects to groundwater quality and quantity	Conservation Authorities; General Public; Indigenous communities; Interest Groups; Local Municipalities; MECP; and Property Owners	GROUND-1.03	for Temporary Sediment Control, and SP805F01 Amendment to OPSS 805, November 2020 – Timing Constraints for Temporary Sediment Control Measures; ■ Clearing, close-cut clearing, grubbing, and removal of surface and piled boulders will be according to OPSS201 Construction Specification for Clearing, Close Cut Clearing, Grubbing, and Removal of Surface and Piled Boulders; ■ Use of equipment in waterbodies and on waterbody banks will be according to OPSS182 General Specification for Environmental Protection for Construction In and Around Waterbodies and On Waterbody Banks; ■ Dewatering and temporary flow passage systems will be according to OPSS517 Construction Specification for Dewatering and OPSS182 General Specification for Environmental Protection for Construction In and Around Waterbodies and On Waterbody Banks; ■ SP-199S56 Control of Emissions During Structural Work; and ■ Dust control strategies will be implemented to minimize wind-blown dust as per SP199S56 Control of Emissions During Structural Work and OPSS100 MTO General Conditions of Contract.
GROUND-2.00	Potential conflicts with monitoring and private wells	Conservation Authorities; General Public; Interest Group; Local Municipalities; MECP; and Property Owners	GROUND-2.01	If the location of any existing monitoring wells conflicts with Project construction activities or if wells are damaged during construction, the Contractor shall retain a MECP-licensed water well contractor to decommission the affected wells in accordance with applicable regulations. Replacement monitoring wells and/or piezometers shall be installed by a licensed environmental drilling contractor prior to or immediately following decommissioning to ensure continuity of groundwater monitoring.
GROUND-2.00	Potential conflicts with monitoring and private wells	Conservation Authorities; General Public; Interest Group; Local Municipalities; MECP; and Property Owners	GROUND-2.02	Prior to any construction dewatering during Detail Design, an updated well survey will be completed to establish baseline water quality and quantity for all monitoring and residential wells within 500 m of the Preliminary Design. The baseline Study Area will be determined based on hydrogeological assessment and Project-specific factors, in consultation with regulatory authorities, to ensure all wells potentially affected by dewatering are included. Monitoring and sampling of identified wells will occur during and after construction to confirm that water quality and quantity remain consistent with baseline conditions. In addition, notification letters will be sent to all property owners within 500 m of the study limits to invite participation in the well survey and monitoring program. All well surveys and monitoring activities will be subject to property owner consent for access. Any remaining geotechnical investigations will be included in the hydrogeological analysis during Detail Design.
GROUND-3.00	Potential groundwater or drinking water contamination	Conservation Authorities; General Public; Indigenous communities; Interest Groups; Local Municipalities; MECP; and Property Owners	GROUND-3.01	Vehicle maintenance and refueling will be confined to designated areas a minimum of 30 m away from watercourses and wetlands, and all activities will be controlled to prevent entry of petroleum products or other deleterious substances, such as debris, waste, rubble, or concrete material, into the natural environment, as per OPSS182 General Specification for Environmental Protection for Construction In and Around Waterbodies and On Waterbody Banks.

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GROUND-3.00	Potential groundwater or drinking water contamination	Conservation Authorities; General Public; Indigenous communities; Interest Groups; Local Municipalities; MECP; and Property Owners	GROUND-3.02	Prior to any construction or alteration activities, impacts to existing licensed drinking water systems will be identified, and the appropriate licensees will be engaged to assess potential effects and determine permitting requirements. During Detail Design, the nature and extent of work will be reviewed to confirm whether a Drinking Water Works Permit and/or a Schedule C Authorization to Alter the Drinking Water System is required under the *Safe Drinking Water Act, 2002* and Ontario Regulation 170/03 – Drinking Water Systems) (O.Reg. 170/03). All necessary permits and authorizations will be obtained before commencing work to ensure compliance and protection of public drinking water supplies.
Fluvial Geomorphology				
FLUVIAL-1.00	Potential effects to channel form and function	Conservation Authorities; DFO; Indigenous communities; and MNR	FLUVIAL-1.01	During Preliminary Design of highway crossings, guidance from MNR and Conservation Authorities on fluvial geomorphology (MNR 2002, 2016; TRCA 2004, 2015; CVC 2015, 2019; CH 2020) was considered to minimize impacts on infrastructure and natural channel processes. These documents will continue to inform Detail Design, with recommendations incorporated as appropriate by a Qualified Person to meet highway design and safety requirements. Key measures include: ■ Crossing structures will be designed to preserve the natural channel form and function, including bed morphology and planform, to support ongoing sediment transport, flow conveyance, and channel adjustment processes; ■ Abutments, piers and other bridge components will be located outside of the 100-year local erosion hazard. If piers are necessary within the meander belt of the watercourse, their foundations will be designed assuming they will be in contact with the watercourse channel in future, taking into consideration the base elevation of the channel and an allowance for channel downcutting over time; ■ Crossings will span the Meander Belt Width for unconfined watercourses, where feasible – or at minimum, the bankfull width plus an erosion allowance (100-year rate) to accommodate natural channel migration and adjustment over the bridge/structure's lifespan. For confined systems, span the toe erosion allowance; ■ Crossings will be placed perpendicular to flow and over straight channel sections to minimize disruption to channel planform and reduce erosion risk at inlets/outlets. For small, stable, ephemeral watercourses (drainage area <1 km²), crossing size will be determined by hydraulic requirements. In CVC jurisdiction, openings will be at least three times the bankfull width for channels <4 m wide; ■ Watercourse crossings will be placed perpendicular to flow over relatively straight sections of channel planform; ■ The length of channel enclosure will be minimized, and substantial realignment avoided where possible. Where realignment is necessary, Natural Channel Design principles will be applied to maintain bankfull dimensions, planform, and floodplain connectivity, and to minimize loss of channel length; and ■ Preference will be given to open-bottom crossings to maintain bed continuity and natural substrate, supporting bedload transport and minimizing grade control effects that can disrupt channel processes, where practicable.

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FLUVIAL-1.00	Potential effects to channel form and function	Conservation Authorities; DFO; Indigenous communities; and MNR	FLUVIAL-1.02	The Preliminary Design for the channel realignments was developed with input from the fluvial geomorphology analysis and natural environment assessment. The watercourse alignments and grading for these realignments will be further developed in Detail Design.
FLUVIAL-2.00	Bedload transport and sediment dynamics	Conservation Authorities; DFO; and MNR	FLUVIAL-2.01	■ Structures will be sized and embedded (where applicable) to allow for the natural transport of bedload and sediment, preventing upstream deposition or downstream scour. ■ Any disturbed channel bed or banks will be re-stabilized to pre-construction (or better) conditions using native or waterbody-appropriate materials, in accordance with OPSS182 General Specification for Environmental Protection for Construction In and Around Waterbodies and On Waterbody Banks, OPSS825 Construction Specification for Placement of Aggregates in Waterbodies, SP825S01 Amendment to OPSS 825, November 2019 – Waterbody Aggregate, OPSS1005 Material Specification for Aggregates – Waterbody, and OPSS804 Construction Specification for Temporary Erosion Control. Erosion protection will be applied only where necessary, as excessive armoring can disrupt geomorphic processes. ■ For unconfined watercourses, design will account for lateral migration and erosion potential over the bridge/structure's design life. For confined systems, toe erosion will be considered.
FLUVIAL-3.00	Erosion and sediment control	Conservation Authorities; DFO; and Indigenous communities; and MNR	FLUVIAL-3.01	■ Erosion and sediment controls will be implemented to isolate the construction zone, manage drainage and stormwater runoff, and prevent sediment migration to adjacent waterbodies during all project phases; ■ Removal of riparian vegetation will be minimized to maintain bank stability and reduce erosion risk. Where vegetation is removed, appropriate stabilization and revegetation will be undertaken; and ■ In-water work isolation measures will be developed to maintain clean flow around work areas and prevent sediment release.
Erosion and Sedimentation				
ERS-1.00	Impacts due to erosion and sedimentation	Conservation Authorities; DFO; Indigenous communities; and MNR	ERS-1.01	MTO's Environmental Guide for Erosion and Sediment Control during Construction of Highway Projects (2015) (as amended), along with applicable OPSSs, OPSDs, and SPs will be applied as BMPs during Detail Design. These measures will be incorporated into all relevant documentation to meet the highway works design and safety requirements, as determined by a Qualified Person. Additionally, MTO will produce an Erosion and Sediment Control Plan within the Detail Design and Construction stage. It is noted that an update to the ESC Guide is anticipated in spring/summer 2026; therefore, regulatory requirements and guidance will be confirmed prior to implementation to ensure alignment with the most current standards. Examples of BMPs include: ■ OPSS100 MTO General Conditions of Contract; ■ OPSS180 General Specification for the Management of Excess Materials;

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ERS-1.00	Impacts due to erosion and sedimentation	Conservation Authorities; DFO; Indigenous communities; and MNR	ERS-1.01	■ OPSS182 General Specification for Environmental Protection for Construction In and Around Waterbodies and On Waterbody Banks / SP101F23 Amendment to OPSS 192, April 2021 – Timing of In-Water Works, Oversight Requirements, and Measures to Avoid Harm to Fish; ■ OPSS801 Construction Specification for the Protection of Trees; ■ OPSS802 Construction Specification for Topsoil; ■ OPSS803 Construction Specification for Vegetative Cover; ■ OPSS804 Construction Specification for Temporary Erosion Control / SP804F02 Amendment to OPSS 804, April 2021 – Timing Constraints for Temporary Erosion Control Measures; ■ OPSS805 Construction Specification for Temporary Erosion and Sediment Control Measures / SP805F01 Amendment to OPSS 805, November 2020 – Timing Constraints for Temporary Sediment Control Measures; ■ OPSS517 Construction Specification for Dewatering and Temporary Flow Passage Systems; ■ OPSD219.110 Light-Duty, Silt Fence Barrier) / MTOD219.110 Sediment Fence Barrier; ■ OPSD219.120 Light-Duty, Fibre Roll Barrier / MTOD219.120 Fibre Roll Barrier; ■ OPSS219.130 Heavy-Duty, Silt Fence Barrier; ■ OPSS219.131 Heavy-Duty, Wire-Backed, Silt Fence Barrier / MTOD219.131 Wire-Backed Sediment Fence Barrier; ■ OPSD219.150 Sandbag Barrier; ■ OPSD219.160 Fibre Roll Grade Breaks; ■ OPSD219.191 Fibre Roll Flow Check Dams; ■ OPSD219.200 Sandbag Flow Check Dam; ■ OPSD219.210 Temporary Rock Flow Check Dam, V-Ditch / MTOD219.210 Rock Flow Check Dam V-Ditch; ■ OPSD219.211 Temporary Rock Flow Check Dam, Flat Bottom Ditch / MTOD219.211 Rock Flow Check Dam Flat Bottom Ditch; ■ OPSD219.220 Sediment Trap in Ditch; ■ OPSD219.230 Temporary Slope Drain for Sediment Trap / MTOD219.230 Slope Drain for Sediment Trap; ■ OPSD219.231 Temporary Berm Barrier for Slope Drain / MTOD219.231 Berm Barrier for Slope Drain; ■ OPSD219.240 Sediment Trap for Dewatering with Silt Fence; ■ OPSD219.260 Turbidity Curtain; ■ OPSD219.261 Turbidity Curtain, Seam Detail; ■ OPSD221.010 Temporary Flow Passage System, Culvert in Watercourse;

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ERS-1.00	Impacts due to erosion and sedimentation	Conservation Authorities; DFO; Indigenous communities; and MNR	ERS-1.01	■ OPSD221.020 Temporary Flow Passage System, Pumping and Piping; ■ OPSD220.010 Barrier for Tree Protection; ■ NSSP-ENVR0012 Selective Clearing and Deferred Grubbing; ■ NSSP-ENVR0013 Advanced Placement of Permanent Cover; ■ NSSP-ENVR0015 Requirements for Temporary Erosion Control Measures in Temporary Erosion Control Area; and ■ NSSP-ENVR0016 Requirements for Temporary Erosion and Sediment Control on Adaptive Management Area.
Land Use				
LANDUSE-1.00	Property impacts	Business Owners; General Public; Local Municipalities; and Property Owners	LANDUSE-1.01	MTO will limit impacts to private properties, such as impacts to driveways and property access to only what is required for the Project. Potential property impacts have been investigated as part of Preliminary Design and will be further confirmed during Detail Design. Where avoidance is not possible, mitigation strategies will be developed to minimize disruption and maintain access to affected properties.
LANDUSE-2.00	Impacts to businesses and residents	Business Owners; General Public; Local Municipalities; and Property Owners	LANDUSE-2.01	MTO will create a Traffic Management Plan prior to construction to minimize impacts to local traffic and allow access for the movement of oversized agricultural equipment. MTO will engage with applicable concerned parties during Detail Design and construction regarding traffic staging, detours, and other potential temporary traffic impacts.
Agriculture				
AGR-1.00	Impacts to agricultural activities (existing and future) relating to the loss, fragmentation, severance, or land-locking of agricultural lands/operations.	General Public; OMAFA; and Property Owners	AGR-1.01	The Preliminary Design avoided or reduced impacts to agricultural lands by minimizing the Project footprint, locating the corridor along lot lines to reduce parcel severance, and avoiding agricultural operations, where feasible. During Detail Design, MTO will further refine the Project design and explore localized adjustments to further reduce impacts and avoid agricultural operations. Where impacts cannot be avoided, MTO will limit them to what is required for the highway and will engage in discussions regarding compensation at fair market value for any losses incurred.
AGR-2.00	The loss of investments in structures and land improvements, including tile drainage and irrigation	General Public; OMAFA; and Property Owners	AGR-2.01	During Detail Design, MTO will further refine the corridor to avoid or reduce impacts to agricultural lands wherever practicable. This will include a commitment to restoring any affected irrigation and tile drainage systems to maintain agricultural productivity. The process and outcomes of these refinements will be documented, and all reasonable opportunities to minimize impacts to agricultural lands will be actively pursued and incorporated into the final design, in consultation with affected landowners and relevant concerned parties.

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AGR-3.00	The loss of use of groundwater wells	General Public; OMAFA; and Property Owners	AGR-3.01	Surface and/or groundwater monitoring will be conducted in areas where agricultural operations make use of surface or groundwater as part of their normal farm practices. The specific locations, parameters, and frequency of monitoring will be confirmed during Detail Design by a Qualified Person (e.g., hydrogeologist or environmental engineer), in consultation with the client and relevant regulatory authorities (e.g., MECP) and based on site-specific conditions and applicable regulatory or permit requirements. If monitoring identifies any potential groundwater disruption, new wells or alternative water access will be provided as required to maintain agricultural water supply.
AGR-4.00	Changes to soil drainage and SWM	General Public; OMAFA; and Property Owners	AGR-4.01	See SWM-1.0 through SWM-5.0.
AGR-5.00	Disruption to surrounding farm operations	General Public; OMAFA; and Property Owners	AGR-5.01	See LANDUSE-2.01.
AGR-6.00	Effects of noise, vibration, dust, and salt	General Public; OMAFA; and Property Owners	AGR-6.01	■ Construction activities will implement salt management measures, including application methods to reduce release of salt contaminants into adjacent salt vulnerable areas (e.g., agricultural lands). ■ Dust control strategies will be implemented to minimize wind-blown dust as per SP199S56 Control of Emissions During Structural Work and OPSS100 MTO General Conditions of Contract. ■ Additional design measures may be considered to reduce remaining potential visual impacts and sounds during Detail Design, including plantings/vegetation to function as screens and buffers.
AGR-7.00	Effects of light pollution	General Public; OMAFA; and Property Owners	AGR-7.01	Detail Design will include mitigation measures relating to light impacts (including light impacts to agricultural lands - i.e., livestock and crops). An example of mitigation measures includes: ■ Avoid installing lighting adjacent to agricultural areas where practicable unless unavoidable for safety reasons; ■ Incorporate shielded road illumination that focus downward and away from agricultural lands, where feasible; and ■ Consider the use of low-pressure sodium lamps or UV filters and employ alternative measures, where feasible, to reduce the intensity and amount of light reaching agricultural lands.
AGR-8.00	Trespassing and vandalism	General Public; OMAFA; and Property Owners	AGR-8.01	Fencing will be installed along the highway ROW to clearly delineate boundaries and reduce the potential for trespassing and vandalism between different types and intensities of land uses. Where appropriate, additional measures such as berms and vegetated buffers (e.g., such as using deciduous and coniferous plants with foliage from base to crown) will be incorporated to further reduce trespassing risk and to capture dust, salt spray, and de-icing compound drift.

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Landscape				
LANDSC-1.00	Green spaces, storm water, natural habitats, and cultural heritage along corridor	Conservation Authorities; General Public; Indigenous communities; Interest Groups; Local Municipalities; and Property Owners	LANDSC-1.01	Building on the CVP and Landscape Plan developed during Preliminary Design, a detailed Landscape Plan will be developed during Detail Design in consultation with applicable agencies and regulators, to avoid or reduce impacts to the landscape.
LANDSC-1.00	Green spaces, storm water, natural habitats, and cultural heritage along corridor	Conservation Authorities; General Public; Indigenous communities; Interest Groups; Local Municipalities; and Property Owners	LANDSC-1.02	OPSS and SP will apply as general mitigation during Detail Design and incorporated where appropriate to meet the highway works design and safety requirements, as determined by a Qualified Person, will include as follows: ■ Removal of riparian vegetation according to OPSS182 General Specification for Environmental Protection for Construction In and Around Waterbodies and On Waterbody Banks; ■ The installation, monitoring, maintenance, and removal of temporary erosion and sediment control measures according to OPSS182 General Specification for Environmental Protection for Construction In and Around Waterbodies and On Waterbody Banks, OPSS804 Construction Specification for Temporary Erosion Control, SP804F02 Amendment to OPSS 804, April 2021 – Timing Constraints for Temporary Erosion Control Measures, OPSS805 Construction Specification for Temporary Sediment Control, and SP805F01 Amendment to OPSS 805, November 2020 – Timing Constraints for Temporary Sediment Control Measures; ■ Vegetation protection and rehabilitation according to OPSS182 General Specification for Environmental Protection for Construction in and Around Waterbodies and On Waterbody Banks, OPSS803 Construction Specification for Vegetative Cover, as well as the Ontario Invasive Plant Council Clean Equipment Protocol for Industry; ■ All excess material will be managed according to OPSS180 General Specification for the Management of Excess Materials; ■ Clearing, close-cut clearing, grubbing, and removal of surface and piled boulders according to OPSS201 Construction Specification for Clearing, Close Cut Clearing, Grubbing, and Removal of Surface and Piled Boulders; ■ Vegetation removals according to OPSS801 Construction Specification for the Protection of Trees; ■ Use of equipment in waterbodies and on waterbody banks according to OPSS182 General Specification for Environmental Protection for Construction In and Around Waterbodies and On Waterbody Banks; ■ Dewatering and temporary flow passage systems according to OPSS517 Construction Specification for Dewatering and Temporary Flow Passage Systems and OPSS182 General Specification for Environmental Protection for Construction In and Around Waterbodies and On Waterbody Banks; ■ SP199S56 Control of Emissions During Structural Work;

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LANDSC-1.00	Green spaces, storm water, natural habitats, and cultural heritage along corridor	Conservation Authorities; General Public; Indigenous communities; Interest Groups; Local Municipalities; and Property Owners	LANDSC-1.02	■ Vehicle maintenance and refueling confined to designated areas a minimum of 30 m away from watercourses and wetlands, and all activities controlled to prevent entry of petroleum products or other deleterious substances, such as debris, waste, rubble, or concrete material, into the natural environment, as per OPSS182 General Specification for Environmental Protection for Construction In and Around Waterbodies and On Waterbody Banks; ■ A Spills Management Plan prepared and shall include materials, instructions, education, and emergency numbers. The plan shall be kept onsite at all times, communicated to work crews and be properly implemented in the event of accidental spills (Spill Prevention and Response Contingency Plan as per OPSS182 General Specification for Environmental Protection for Construction In and Around Waterbodies and On Waterbody Banks; ■ Dust control strategies implemented to minimize wind-blown dust as per SP199S56 Control of Emissions During Structural Work and OPSS100 MTO General Conditions of Contract; ■ Vegetation removal, grading and soil compaction completed according to OPSS201 Construction Specification for Clearing, Close Cut Clearing, Grubbing, and Removal of Surface and Piled Boulders; ■ Tree protection measures according to OPSS801 Construction Specification for the Protection of Trees; ■ Although MTO is not required to obtain municipal permits for vegetation removals outside the ROW, municipal laws regarding forest conservation have been considered. The Regional Municipality of Halton, the Regional Municipality of Peel, and the Regional Municipality of York will be consulted to discuss avoidance and mitigation of tree removals to the extent possible; and ■ Consideration of OPSS760 Construction Specification System for Noise Barrier Systems.
Noise and Vibration				
NOISE-1.00	Impacts to acoustic environment	General Public; Indigenous communities; Local Municipalities; MECP; Property Owners	NOISE-1.01	A Noise Assessment was completed in accordance with the MTO Environmental Guide for Noise (MTO, 2022). The Ministry will implement noise mitigation measures as recommended in the noise assessment to address future traffic noise. One noise barrier has been recommended for construction as part of the Project, located along the east side of the northbound lanes of the Highway 427 extension, north of the interchange at Major Mackenzie Drive. OPSS, NSSP, and other applicable specifications will be applied during Detail Design to guide implementation of noise mitigation measures.
NOISE-1.00	Impacts to acoustic environment	General Public; Indigenous communities; Local Municipalities; MECP; Property Owners	NOISE-1.02	BMPs and OPSS will apply as general mitigation during Detail Design and implemented to meet the highway works design and safety requirements, as determined by a Qualified Person, including as follows: ■ OPSS100 MTO General Conditions of Contract; ■ OPSS760 Construction Specification System for Noise Barrier Systems; and ■ The potential for noise emissions from maintenance yards and commercial vehicle inspection facilities will be assessed in accordance with the noise guidelines set out by MECP in NPC-300 during the Detail Design stage of the project when the facilities are designed.

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NOISE-1.00	Impacts to acoustic environment	General Public; Indigenous communities; Local Municipalities; MECP; Property Owners	NOISE-1.02	Where practicable, municipal by-laws (e.g., time-of-day limitations) will be considered. A Stakeholder Communication and Complaint Process, along with a Construction Monitoring Program, will be developed and implemented in accordance with MTO requirements to validate complaints and minimize off-site effects. In the presence of persistent noise complaints, and subject to the results of a field investigation, alternative construction practices and/or equipment should be considered to reduce noise impacts. These may include measures such as minimizing idling, implementing on-site speed limits, using alternative backup warning systems, maintaining equipment in good working order, and adjusting the number or timing of equipment operations, where feasible.
Air Quality				
AQ-1.00	Air quality during construction	General Public; Indigenous communities; Local Municipalities; MECP; and Property Owners	AQ-1.01	During Detail Design, mitigation measures will be developed based on Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities (Cheminfo, 2005) and the MECP Technical Bulletin: Management Approaches for Industrial Fugitive Dust Sources (2017), where feasible. Measures will include minimizing idling time, enforcing on-site speed limits, limiting equipment use to maintain schedule efficiency, implementing regular equipment maintenance, applying dust control (e.g., cleaning paved areas, using suppressants on unpaved surfaces, wind fencing, and covering stockpiles), and stabilizing disturbed surfaces promptly.
AQ-1.00	Air quality during construction	General Public; Indigenous communities; Local Municipalities; MECP; and Property Owners	AQ-1.02	OPSS and SP will apply as general mitigation during Detail Design to meet the highway works design and safety requirements. This may include as follows: ■ OPSS100 MTO General Conditions of Contract; ■ OPSS506 Construction Specification for Dust Suppressants; and ■ SP199S56 Control of Emissions During Structural Work.
AQ-1.00	Air quality during construction	General Public; Indigenous communities; Local Municipalities; MECP; and Property Owners	AQ-1.03	A Stakeholder Communication and Complaint Process will be developed per MTO requirements.
AQ-2.00	Air quality during operation	General Public; Indigenous communities; Local Municipalities; MECP; and Property Owners	AQ-2.01	To support air quality management during operation, MTO will apply mitigation measures including: ■ Consulting with municipalities to ensure awareness of the Highway 413 Project and to ensure consideration of reasonable setback distances from roadways during future residential development to reduce exposure to traffic-related pollutants; ■ Integrating roadside vegetative barriers, where appropriate, during Detail Design to improve pollutant dispersion and enhance near-road air quality; ■ Considering congestion mitigation and traffic flow improvements such as ramp metering, real-time traffic monitoring, and HOV lanes to reduce vehicle emission; and ■ Applying maintenance practices that support air quality objectives, including regular inspection and upkeep of vegetative buffers and traffic management systems.

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ID# Category	Issues/Concerns/Potential Effects	Concerned Parties (alphabetical order)	Sub ID# Topic	Mitigation/Protection/Monitoring
Waste and Contaminated Property				
WCP-1.00	Potential to encounter contaminated soils during construction	General Public; Indigenous communities; Local Municipalities; and MECP	WCP-1.01	During Detail Design, refined mitigation measures will be developed in consultation with a Qualified Person describing detailed mitigation measures to be implemented during construction and operation for the management of waste and excess materials. Additionally, the Project will comply with Ontario Regulation 406/19 – On-Site and Excess Soil Management (O.Reg. 406/19).
WCP-1.00	Potential to encounter contaminated soils during construction	General Public; Indigenous communities; Local Municipalities; and MECP	WCP-1.02	If impacted soils are encountered during construction, the Contractor must notify the Qualified Person and MTO. The suitability of re-using that soil must be determined before re-using it in accordance with O.Reg. 406/19. If excavated soil is deemed unsuitable for backfill operations due to environmental conditions, the Contractor shall proceed to remove it from the site for off-site management.
WCP-1.00	Potential to encounter contaminated soils during construction	General Public; Indigenous communities; Local Municipalities; and MECP	WCP-1.03	All sampling and decontamination procedures, laboratory analytical methods, and protocols and procedures will be consistent with those established by MECP, as documented in Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario (MECP, 1996).
WCP-3.00	Soil excavation, salvage, handling and storage	General Public; Indigenous communities; Local Municipalities; and MECP	WCP-3.01	If contaminated soils are encountered during construction, the Contractor must notify the Qualified Person and MTO. The suitability of reusing the soil must be determined prior to reuse, as required, in accordance with O.Reg. 406/19 (On-Site and Excess Soil Management Regulation), Ontario Regulation 153/04 – Records of Site Conditions (O.Reg. 153/04), and Ontario Regulation 347 (General – Waste Management (O.Reg. 347). If the soil is deemed unsuitable for backfill due to environmental conditions, it shall be removed for off-site management.
WCP-3.00	Soil excavation, salvage, handling and storage	General Public; Indigenous communities; Local Municipalities; and MECP	WCP-3.02	OPSS and SP will apply general mitigation during Detail Design to meet the highway works design and safety requirements, as determined by a Qualified Person. This may include as follows: ■ OPSS180 General Specification for the Management of Excess Materials; ■ NSSP-ENVR0014 Amendment to OPSS 180, November 2016 – Compliance with Ontario Regulation (O.Reg.) 406/19 for On-Site and Excess Soil Management; ■ OPSS802 Construction Specification for Topsoil; ■ OPSS803 Construction Specification for Vegetative Cover; ■ OPSS506 Construction Specification for Dust Suppressants; and ■ SP199S56 Control of Emissions During Structural Work.
WCP-3.00	Soil excavation, salvage, handling and storage	General Public; Indigenous communities; Local Municipalities; and MECP	WCP-3.01	See ERS-1.01.

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Climate Change				
CC-1.00	Construction and operational climate-related impacts	ECCC; General Public; Indigenous communities; Interest Groups; and MECP	CC-1.01	Mitigation measures to address potential climate change impacts will be implemented during Detail Design. These measures could include: ■ Limiting the requirement of naturalized land to only that which is required to construct the Project, including that which is required to appropriately stage construction. Re-naturalizing (e.g., re-sodding, vegetation, and shrub and tree planting, etc.) of staging areas immediately following construction phase end; ■ Sourcing sustainably manufactured materials (i.e., low-carbon concrete) and using recycled materials as opposed to energy-intensive materials such as concrete and asphalt (if feasible); ■ Avoiding the excessive transportation of materials by choosing local/regional materials, as well as materials sourced or processed on site; ■ Properly maintaining vehicles and other internal combustion engines used on site (pumps, generators, etc.) to ensure engines are operating as designed with optimal emissions. Minimizing on-site vehicle idling during construction activities and implementing a vehicle maximum idling policy while on site; ■ Use of reclaimed materials in the roadway, for example aggregate for use in new hot mix asphalt and road base, subbase or shoulders; ■ Extended life-cycle materials (ASTM 1010 or Corrosion Resistant Steel) to minimize rehabilitation requirements. Additionally, requires bridges will be designed with climate change in considerations in mind according to the CSA S6 Canadian Highway Bridge Design code; ■ Precast concrete pavement and rapid set concrete for concrete repairs to minimize congestion; ■ Minimizing double handling of materials and the associated trucks required for hauling is typically desired by contractors to reduce costs, this also has the benefit of reducing fuel requirements and emissions; ■ Maintenance and operational policies and procedures that will consider climate change impacts (e.g., snow clearing practices, rutting, potholes), will be implemented; ■ Retaining soil system walls or mechanically stabilized earth rather than concrete retaining walls; ■ An emergency response plan will be in place to address the impacts associated with extreme weather events; ■ Employing a plan for carbon neutral modes of material disposal and/or recycling programs where possible and feasible; and ■ Encouraging reuse of available material for future Projects to reduce future material production emissions (e.g., recycling of concrete components into new concrete construction).

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Socio-Economic Conditions				
SOCIOEC-1.00	Socio-economic impacts related to urban sprawl	Business Owners; General Public; Indigenous communities; Interest Groups; Local Municipalities; and Property Owners	SOCIOEC-1.01	To mitigate the impact of the Project on green spaces and urban sprawl, the Project will establish landscaping across the corridor, where feasible, in consultation with local governments and concerned parties.
SOCIOEC-2.00	Socio-economic impacts related to farmlands	Business Owners; General Public; Indigenous communities; Interest Groups; Local Municipalities; and Property Owners	SOCIOEC-2.01	Efforts were undertaken during Preliminary Design to minimize the impacts of the Project by designing the Highway 413 ROW to reduce the Project footprint and preserve as much prime agricultural land as feasible. During the property acquisition process, MTO will compensate property owners for land acquired for the Project and will engage with farmers to address any operational impacts resulting from the Project.
SOCIOEC-3.00	Impacts to terrestrial natural heritage features	General Public; Indigenous communities; Interest Groups; and Local Municipalities	SOCIOEC-3.01	The loss, degradation, or fragmentation of terrestrial natural heritage features (e.g., woodlands, wetlands, meadows, and wildlife habitat) can result in social impacts to communities. Terrestrial natural heritage features provide ecosystem services, contribute to local character and sense of place, as well as support recreational opportunities, cultural practices, and overall community well-being. In order to avoid and/or mitigate potential impacts to terrestrial natural heritage features, MTO will adhere to the mitigation measures outlined in TERR-1.00 through TERR-13.00.
SOCIOEC-4.00	Impacts to aquatic natural heritage features	General Public; Indigenous communities; Interest Groups; and Local Municipalities	SOCIOEC-4.01	Impacts to aquatic natural heritage features (e.g., watercourses, wetlands, and fish habitat) can also result in social impacts to communities. Healthy aquatic ecosystems provide clean water supply, flood regulation, and opportunities for recreational activities (e.g., fishing, boating, and swimming). In order to avoid/or mitigate potential impacts to aquatic natural heritage features, MTO will adhere to the mitigation measures outlined within FISH-1.00 through FISH-8.00. All works in freshwater environments will follow MTO's Fisheries BMPs and as applicable, DFO Standards and Codes of Practice (DFO, 2019). To mitigate these potential impacts to the natural environment, during Detail Design, measures will be developed, as required, in consultation with applicable regulators that could affect aquatic natural heritage features, including SAR. Any environmental permits and/or authorizations will be obtained during Detail Design.
SOCIOEC-5.00	Impacts to social cohesion	General Public; Indigenous communities; Interest Groups; and Local Municipalities	SOCIOEC-5.01	Mitigation recommendations may include: ■ Traffic conditions in the Highway 413 Corridor, and in the arterial roads that feed into and out from the corridor, should be optimized to allow for free-flowing traffic as much as possible; ■ Consider how to work with municipal partners, relevant concerned parties, and Indigenous communities to ensure that land-use planning promotes transit and active transportation use and reduces the risk of induced demand; MTO is encouraged to consider HOV lanes to promote car-pooling, which will improve social cohesion; and ■ Focus on discussing identified mitigation measures with Indigenous communities, relevant concerned parties and municipalities.

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SOCIOEC-5.00	Impacts to social cohesion	General Public; Indigenous communities; Interest Groups; and Local Municipalities	SOCIOEC-5.02	Carpool lot configuration is carried forward to Detail Design at each proposed transit station along Highway 413, with the potential to include bus transit interface. In Detail Design, considerations for enhancements to user safety will be considered which could include, but is not limited to, lighting, transit hub details, cameras, etc.
SOCIOEC-5.00	Impacts to social cohesion	General Public; Indigenous communities; Interest Groups; and Local Municipalities	SOCIOEC-5.03	Provisions for EV charging stations at the carpool lots are not precluded by the Preliminary Design and can be incorporated as required at each location. The needs and requirements for EV charging stations can be assessed and incorporated in Detail Design.
SOCIOEC-6.00	Impacts to business and employment	Business Owners; General Public; Indigenous communities; Interest Groups; Local Municipalities; and Property Owners	SOCIOEC-6.01	To support local and regional municipalities to enhance their own economic development objectives the Project will: ■ Request that contractors and their supply chain companies seek opportunities to hire and procure locally, including from Indigenous businesses in alignment with the Indigenous Procurement Policy (IPP); and ■ Make trades schools and other educational institutions aware of job opportunities associated with Project construction, with targeted outreach to Indigenous training organizations where feasible.
SOCIOEC-7.00	Impacts to travel times	General Public; Indigenous communities; Interest Groups; and Local Municipalities	SOCIOEC-7.01	MTO will create a Traffic Management Plan prior to construction to minimize impacts to local traffic, where feasible. MTO will engage with relevant concerned parties during Detail Design and construction regarding traffic staging, detours, and other potential temporary traffic impacts.
SOCIOEC-8.00	Impacts to Indigenous cultural practices	Indigenous communities	SOCIOEC-8.01	MTO will continue to consult with Indigenous communities in Detail Design to better understand potential impacts to the exercise of rights and the development of mitigation measures, or accommodation as appropriate. MTO will continue to consult and engage with Indigenous communities during subsequent phases of the Project.
SOCIOEC-9.00	Impacts to landowners	General Public; Local Municipalities; and Property Owners	SOCIOEC-9.01	MTO will continue consultation with impacted landowners as the Project transitions from Preliminary Design to Detail Design. As part of its ongoing business practices, MTO will also undertake public consultation and coordination to support Detail Design and Construction of the Highway 413 Project, as required or as deemed appropriate.
Human Health				
HH-1.00	Impacts to human health	General Public; Indigenous communities; Interest Groups; Local Health Authorities; Local Municipalities; and MECP	HH-1.01	Refer to AQ-1.00, AQ-2.00, CC-1.00.

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HH-2.00	Levels of physical activity and addition of active transportation networks	General Public; Indigenous communities; Interest Groups; Local Municipalities; and MECP	HH-2.01	MTO will consider, together with the respective municipalities, how the use of MUPs or pedestrian bridges accessible by users of all abilities in different sections of the corridor may be further enhanced to accommodate the needs of those with disabilities.
HH-3.00	Human health impacts related to noise levels	General Public; Indigenous communities; Interest Groups; Local Health Authorities; Local Municipalities; and MECP	HH-3.01	See NOISE-1.00.
HH-4.00	Climate change	General Public; Indigenous communities; Interest Groups; Local Municipalities; and MECP	HH-4.01	See CC-1.01.
HH-5.00	Traffic congestion and delay	General Public; Indigenous communities; Interest Groups; Local Municipalities; and MECP	HH-5.01	See LANDUSE-2.01.
HH-6.00	Traffic-related safety	General Public; Indigenous communities; Interest Groups; Local Health Authorities; Local Municipalities; and MECP	HH-6.01	See LANDUSE-2.01.
HH-7.00	Access to neighbourhood resources, including access to emergency response	General Public; Indigenous communities; Interest Groups; Local Health Authorities; Local Municipalities; and MECP	HH-7.01	MTO will apply the following mitigation measures to avoid or reduce impacts relating to access to neighbourhood resources, including: ■ MTO may work with local municipalities to identify areas that may benefit from specific resources, should the Highway 413 Project bisect a neighbourhood and limit access to resources (e.g., community centre, park, grocery stores, etc.); ■ MTO will work with municipal partners and relevant concerned parties to ensure that land-use planning promotes transit and active transportation use and reduces the risk of induced demand; and ■ Where feasible, consider ways to limit impact to green spaces, such as parks, that are used by communities.
HH-7.00	Access to neighbourhood resources, including access to emergency response	General Public; Indigenous communities; Interest Groups; Local Health Authorities; Local Municipalities; and MECP	HH-7.02	See ENG-2.03.

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HH-8.00	Food security, including access to local healthy food sources	General Public; Indigenous communities; Interest Groups; Local Health Authorities; Local Municipalities; and MECP	HH-8.01	Design measures considered during Preliminary Design included designing the corridor to avoid or reduce impacts to agricultural lands (e.g., impact the smallest footprint and fewest agricultural operations, and locating the corridor along lot lines, where feasible, to reduce the chance of severing parcels). Additional design measures to be considered in Detail Design include localized design refinements to further reduce footprint impacts and/or avoid agricultural operations, if feasible.
HH-9.00	Potential impacts to Indigenous cultural practices (e.g., harvesting activities)	General Public; Indigenous communities; and Interest Groups	HH-10.01	Design measures considered during Preliminary Design included efforts to avoid or reduce impacts to terrestrial and aquatic resources and landscapes (See TERR-1.00 through TERR-13.00 and FISH-1.00 through FISH-8.00). During Detail Design, localized refinements will be considered to reduce the footprint, where feasible to further reduce potential impacts to harvesting activities. If avoidance is not possible, a salvage plan will be developed to identify and implement appropriate salvage opportunities (e.g., seed harvesting, plant relocation) prior to major construction.
HH-10.00	Mental health and wellness	General Public; Indigenous communities; Interest Groups; Local Health Authorities; Local Municipalities; and MECP	HH-11.01	See NOISE-1.00.
HH-11.00	Human trafficking	General Public; Indigenous communities; Interest Groups; Local Health Authorities; Local Municipalities; and MECP	HH-12.01	In alignment with Ontario's Anti-Human Trafficking Strategy (2025) and the province's response to the Final Report into Missing and Murdered Indigenous Women and Girls, MTO will implement design and operational measures to enhance safety and reduce risks of human trafficking along Highway 413. These measures may include improved lighting, enhanced visibility, installation of security cameras, and posting of the Canadian Human Trafficking Hotline number at transportation hubs such as rest areas, where appropriate.
HH-11.00	Human trafficking	General Public; Indigenous communities; Interest Groups; Local Health Authorities; Local Municipalities; and MECP	HH-12.02	See SOCIOEC-5.02.
Snowdrift				
SNOW-1.00	Drifting snow on highway from wind driven events causing winter road hazard	General Public; Local Municipalities; and MTO	SNOW-1.01	Design measures considered during Preliminary Design included designing the corridor to avoid or reduce impacts from drifting snow. During Detail Design, MTO will continue to utilize best-practice design guideline considerations for new roadway design from a snow perspective to reduce the potential for problematic snow drifting and poor visibility conditions associated with wind-blown snow, as practicable. Design measures may include: ■ Keep roadways elevated preferably 1-2 m above the surrounding terrain, where possible; ■ If possible, keep batter slopes shallow;

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SNOW-1.00	Drifting snow on highway from wind driven events causing winter road hazard	General Public; Local Municipalities; and MTO	SNOW-1.01	■ Where screens or hedgerows are intended adjacent to the proposed highway, a setback distance of approximately 15 times the height between the feature and the edge of the road is recommended. If this is not feasible, strategies such as ditches or multiple rows of coniferous trees may be considered to trap snow; ■ Where possible, avoid berms adjacent to the proposed highway, as they act as a wind barrier and are likely to propagate snow formations over the road. A ditch between a berm and the proposed highway is a positive countermeasure for snow capture where berms may not be set back at a sufficient distance; ■ It is recommended that wooded areas within a 3 km radius from the proposed highway be retained for snow control. However, it is noted that MTO's jurisdiction and control will be limited to the highway ROW; ■ Where plantings or other snow barriers are intended near the proposed highway (reforestation zones, enhanced landscape, wetland/riparian zones) and the prescribed setback distance is prohibitive for other design constraints, ditches between the plantings and the roadway may be considered for improved snow capture. Otherwise, increased snow removal efforts may be required in these areas; ■ Considering an elevated road profile with shallow batter slopes and/or snow barriers at an appropriate setback distance; ■ Increasing the density of existing winter vegetation and/or eliminating gaps between winter vegetation with screens or additional planting; ■ Wetland and/or forest restoration opportunities may be beneficial for blowing snow and snow drift control; ■ At strategic locations on the highway route, place signs of the potential risk of snow drifting to provide further driver awareness of potential adverse conditions; ■ Placing road delineation poles in snowdrift areas for providing increased visibility of pavement edges in snowdrift locations; ■ Implement variable speed signage as a "recommend" or "advisory" based on weather and road conditions; ■ Using sensor technology that includes meteorological, pavement and snow particle sensors for snow drifting measurements for warning of changing condition during snowstorms and wind dive events; and ■ Consider the use of high-resolution Numerical Weather Prediction data to support snowdrift forecasting and inform maintenance planning, subject to feasibility and operational assessment.

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Navigable Waters				
NAV-1.00	Potential to impact navigable waters	General Public; Indigenous Communities; and TC	NAV-1.01	MTO will continue to avoid and minimize potential impacts to navigable waters by following the requirements of the *Canadian Navigable Waters Act* throughout Detail Design. This included ongoing consultation and engagement with Transport Canada, Indigenous communities, and the public. All watercourse crossings have been screened for navigability using Transport Canada's Navigability Assessment Framework, identifying 20 potentially navigable reaches and three possibly navigable ones. Further assessment will occur during Detail Design, including any additional watercourses identified through consultation or ongoing design refinement. Where feasible, MTO will design watercourse crossings to maintain navigable channels and avoid in-water structures that could obstruct vessel passage. For all watercourse crossings identified as navigable or potentially navigable, MTO will maintain navigation and user safety throughout all Project phases by: ■ Providing advance public notice of any works that may affect navigation, including timelines, detour information, and safety advisories; ■ Installing clear signage at affected watercourses during construction to inform users of changes, hazards, or alternative routes; ■ For temporary construction activities (such as cofferdams or temporary crossings), maintaining navigation or providing safe detours, with clear signage and communication to waterway users; and ■ After construction, verifying that navigation is not impeded and implementing any required restoration or adaptive measures to ensure continued navigability.
NAV-1.00	Potential to impact navigable waters	General Public; Indigenous Communities; and TC	NAV-1.02	For navigable waterways not listed on the *Canadian Navigable Waters Act* Schedule, a screening process was undertaken during Preliminary Design to gather information on past, current, and potential future navigation uses to inform permitting during Detail Design. Navigational requirements will continue to be refined as additional field data and PTE become available. This data will help identify potential impediments to navigation, such as blockages, narrow structures, or changes in bankfull width or depth. MTO will continue working to avoid and minimize impacts to navigation in accordance with *Canadian Navigable Waters Act* processes throughout Detail Design.
Built Heritage Resources and Cultural Heritage Landscapes				
BHCH-1.00	Potential Impact to a built heritage resource or cultural heritage landscape	MCM and MTO	BHCH-1.01	Properties identified as having potential CHVI and anticipated direct adverse impacts will require further evaluation, requiring the completion of a CHER by a Qualified Person(s).
BHCH-1.00	Potential Impact to a built heritage resource or cultural heritage landscape	MCM and MTO	BHCH-1.02	During Detail Design, a HIA will be prepared for any property determined by MTO to have CHVI and where direct adverse impacts are anticipated. The HIA will identify and assess potential impacts resulting from the Project and recommend alternatives and mitigation measures to conserve the property's CHVI. It will be completed by a Qualified Person(s) in accordance with Information Bulletin #3: Heritage Impact Assessments for Provincial Heritage Properties (MCM, 2017).

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BHCH-1.00	Potential Impact to a built heritage resource or cultural heritage landscape	MCM and MTO	BHCH-1.03	In accordance with Provision F.5 of the Standards and Guidelines for Conservation of Provincial Heritage Properties (2010), if MTO determines that a property is a Provincial Heritage Property of Provincial Significance, MTO will obtain the consent of the Minister of Citizenship and Multiculturalism prior to removing or demolishing any buildings or structures on the property, or before transferring the property from provincial control.
BHCH-1.00	Potential Impact to a built heritage resource or cultural heritage landscape	MCM and MTO	BHCH-1.04	Construction activities will be planned and undertaken to avoid impacts, including but not limited to: ■ Informing construction crews of the location of known and potential BHRs and CHLs; ■ Confining construction related activities to the proposed ROW; and ■ Establishing no-go zones and procedures to avoid impacts.
BHCH-1.00	Potential Impact to a built heritage resource or cultural heritage landscape	MCM and MTO	BHCH-1.05	Should a construction vibration assessment determine that the structure(s) or landscape features within the known and potential BHRs and CHLs are subject to potential adverse impacts due to vibration, mitigation measures will be developed and implemented to reduce vibration impacts related to construction.
Archaeology				
ARCH-1.00	Potential impact to an archaeology resource, as identified in the Stage 2 Property Assessment	Indigenous communities; MCM; and MTO	ARCH-1.01	Continuation of Stage 2 property assessment and/or Stage 3 site-specific archaeological assessment according to the Standards and Guidelines for Consultant Archaeologists (Ontario Government, 2011) and the *Ontario Heritage Act* will be completed for those specific archaeological sites, where Stage 2 fieldwork was deemed incomplete by a licensed archaeologist or findings of the Stage 2 assessment required Stage 3 site-specific assessments. Sites determined to require Stage 4 mitigations will be addressed in the future.
ARCH-1.00	Potential impact to an archaeology resource, as identified in the Stage 2 Property Assessment	Indigenous communities; MCM; and MTO	ARCH-1.02	A marine archaeological checklist will be completed during Detail Design, to determine whether a marine archaeological assessment is required for impacted riverbed and shorelines.
ARCH-1.00	Potential impact to an archaeology resource, as identified in the Stage 2 Property Assessment	Indigenous communities; MCM; and MTO	ARCH-1.03	For any proposed clearing of land to advance Detail Design investigations where ground disturbance is required (e.g., geotechnical investigations, subsurface utility engineering, contamination studies) in areas that have not yet been cleared of archaeological concerns, a strategy, if not already in existence, will be developed in coordination with MTO.
ARCH-1.00	Potential impact to an archaeology resource, as identified in the Stage 2 Property Assessment	Indigenous communities; MCM; and MTO	ARCH-1.04	Should Indigenous communities express interest in participating in the continuation of the Stage 2 and Stage 3 archaeological assessments to be conducted as part of the Project, an invitation will be extended for representatives of those communities to join the archaeological team during fieldwork as CFLs. Communities that have participated to date through CFL roles will continue to be invited to participate in future archaeological assessments.

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ARCH-1.00	Potential impact to an archaeology resource, as identified in the Stage 2 Property Assessment	Indigenous communities; MCM; and MTO	ARCH-1.05	In accordance with F.5 of the Standards and Guidelines for Conservation of Provincial Heritage Properties (MCM, 2010) and the *Ontario Heritage Act*, if MTO determines that a property is a Provincial Heritage Property of Provincial Significance, MTO will obtain the consent of the MCM before removing or demolishing buildings or structures on the property, or before transferring the property from provincial control.
Stormwater Management				
SWM-1.00	General SWM	Conservation Authorities; DFO; Indigenous communities; Local Municipalities; and MECP	SWM-1.01	To reduce the potential impacts of the proposed works, a treatment train approach will be applied across the Highway 413 Corridor, utilizing a combination of source, conveyance, and end-of-pipe practices. Stormwater management ponds have been implemented throughout the corridor to provide water quality and quantity control, in alignment with BMPs and site-specific drainage and SWM requirements MTO has identified and will implement a range of SWM practices as part of the Project, including: ■ Utilization of dry linear facilities for quantity control; ■ Use of vegetated grassed swales for quality treatment and quantity control; ■ Utilization of specialized SWM features such as oil and grit separators for enhanced water quality treatment; and ■ Consideration of design refinements to mitigate thermal impacts on receiving watercourses (e.g., outlet modifications, shading strategies, or other thermal control measures, where feasible).
SWM-1.00	General SWM	Conservation Authorities; DFO; Indigenous communities; Local Municipalities; and MECP	SWM-1.02	Wet ponds will be designed during Detail Design and will and include the following mitigation measures: ■ A permanent pool of water; ■ Extended detention volume, where water will be stored and gradually released through a controlled outlet; ■ Flood storage volume to store water during larger storm events to attenuate peak flow rates to the pre-development levels; ■ An overflow spillway to safely pass the regional storm event; ■ Landscaped areas around the pond to promote evapotranspiration; ■ Consideration of provision of pond liners during the Detail Design stage to prevent leaching of contaminated water into groundwater system; and ■ Further assessment during Detail Design phase for the pond outfalls to evaluate the erosion threshold of each watercourse.

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SWM-1.00	General SWM	Conservation Authorities; DFO; Indigenous communities; Local Municipalities; and MECP	SWM-1.03	Pond locations will be further reviewed with sizing and locations confirmed in the Detail Design phase. Additional considerations for environmental mitigations are to be considered as well, including meadow marsh attributes and habitat enhancements for SAR in the corridor.
SWM-1.00	General SWM	Conservation Authorities; DFO; Indigenous communities; Local Municipalities; and MECP	SWM-1.04	Culvert upstream and downstream invert elevations were determined from the preliminary grading design and existing watercourse elevations. Culvert lengths and sizing were confirmed from technical requirements for the crossing, including highway profile and ditch grading, hydraulic requirements, fluvial geomorphology considerations, and environmental constraints. Hydraulic analysis will be further reviewed and refined in Detail Design.
SWM-2.00	Erosion and sediment control	Conservation Authorities; DFO; Indigenous communities; Local Municipalities; and MECP	SWM-2.01	Flat bottom swales will be implemented along the east, west, north, and south side of the proposed highway and associated ramps. The bottom width is selected based on the available land and grading constraints to maintain the swale within the MTO ROW. In addition, in areas where swales are in the proximity of wetlands, they were designed as shallow as possible to minimize adverse impacts to ground water levels in the wetlands.
SWM-2.00	Erosion and sediment control	Conservation Authorities; DFO; Indigenous communities; Local Municipalities; and MECP	SWM-2.02	MTO Design Criteria for erosion and sedimentation control will be implemented within the SWM system to prevent suspended material from being carried into watercourses. The proposed SWM Plan includes a treatment train featuring flat-bottomed grassed swales with check dams, dry ponds, and wet ponds. Stormwater runoff from the highway surface will be collected, treated, and directed through vegetated swales equipped with check dams. These swales will run along both sides of the highway and in the median between the eastbound and westbound lanes. Their purpose is to reduce flow velocities, trap sediments, and promote infiltration and evapotranspiration. The inclusion of check dams will help retain runoff on-site along the entire corridor. Furthermore, the proposed SWM detention facilities will incorporate extended detention storage volumes capable of holding runoff from a 25 mm storm event for over 24 hours, enhancing erosion control. Overall, the planned treatment train combining grassed swales and detention ponds will create an effective system for water quality management and erosion control.
SWM-2.00	Erosion and sediment control	Conservation Authorities; DFO; Indigenous communities; Local Municipalities; and MECP	SWM-2.03	See ERS-1.01.
SWM-3.00	Grass Swales	Conservation Authorities; DFO; Indigenous communities; Local Municipalities; and MECP	SWM-3.01	For larger contributing drainage and SWM areas with no downstream SWM controls, swales may be converted into enhanced grass swales or bio swales, as needed, to provide additional quality controls.

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ID# Category	Issues/Concerns/Potential Effects	Concerned Parties (alphabetical order)	Sub ID# Topic	Mitigation/Protection/Monitoring
SWM-3.00	Grass Swales	Conservation Authorities; DFO; Indigenous communities; Local Municipalities; and MECP	SWM-3.02	Grass swales will be implemented on both sides of highway, ramp, interchange loops and in the middle in the open median under the initial highway layout. These ditches/swales will be designed as flat bottom with check dams and will collect, treat, attenuate, and convey storm runoff generated at highway surfaces. Hydraulic design of these swales will be caried out in Detail Design.
SWM-4.00	Quality control	Conservation Authorities; DFO; Indigenous communities; Local Municipalities; and MECP	SWM-4.01	The MECP SWM Planning and Design Manual (2003) and MTO Highway Drainage Design Standards requirements will be achieved through existing and proposed SWM facilities, including wet ponds for outlets with catchments greater than 10 ha and dry ponds for more minor outlets. Grassed swales with check dams will also provide quality control for smaller catchments (<5 ha).
SWM-4.00	Quality control	Conservation Authorities; DFO; Indigenous communities; Local Municipalities; and MECP	SWM-4.02	Flat bottom ditches will be implemented for water quality control and space to incorporate check dams to reduce velocities where required. Additionally, flat bottom grassed swales will be implemented to reduced flow velocities and to promote sedimentation.
SWM-4.00	Quality control	Conservation Authorities; DFO; Indigenous communities; Local Municipalities; and MECP	SWM-4.03	Stormwater management measures, including appropriate maintenance, relocation, modification, and construction of SWM ponds, where applicable, will be implemented to control the post-developed peak flows to pre-development peak flows to pre-development levels for all storms up to and including the 100-year storm (i.e., 2-, 5-, 10-, 25-, 50-, and 100-year storms) for all watercourses within the Study Area.
SWM-5.00	Water balance	Conservation Authorities; DFO; Indigenous communities; Local Municipalities; and MECP	SWM-5.01	Annual rainfall within the highway corridor will be effectively captured and managed by checking dams at regular intervals along the ditches, which will provide additional infiltration potential by retaining small volumes of water back during every rainfall event. These pockets of water at regular intervals along the swales will increase infiltration and evapotranspiration and significantly reduce runoff potential during small rainfall events of 5 mm or less.
SWM-6.00	Watercourse crossings	Conservation Authorities; DFO; Indigenous communities; Local Municipalities; and MECP	SWM-6.01	The TRCA Crossing Guideline for Valley and Stream Corridors (September 2015) will be used as a general reference during Detail Design for any crossing of regulated watercourses within TRCA's jurisdiction. The TRCA SWM Criteria document (August 2012) will also be used as a general reference during Detail Design to ensure that TRCA SWM requirements are considered in the surface water design.
Engineering/Design				
ENG-1.00	Road Crossings	Local Municipalities MTO	ENG-1.01	Design elements for crossing roads have been confirmed with the Regional and local municipalities throughout the Preliminary Design process, in consideration of their Transportation Master Plans and/or approved EA for planned improvements. Cross-sections for the approaches and structures were determined as part of Preliminary Design, and the transition between the MTO and municipal ROW at the limits of the Preliminary Design will be confirmed in Detail Design with the municipalities based on the timing of their roadway improvements, and subject to cost-sharing.
ENG-2.00	Construction Staging, Access, and Safety Considerations	General Public and MTO	ENG-2.01	Fencing will be installed along the new ROW, unless specific constraints do not allow (i.e., watercourse crossings locations).

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ID# Category	Issues/Concerns/Potential Effects	Concerned Parties (alphabetical order)	Sub ID# Topic	Mitigation/Protection/Monitoring
ENG-2.00	Construction Staging, Access, and Safety Considerations	General Public and MTO	ENG-2.02	Construction staging and access will be further examined during Detail Design. A Construction Staging Plan will be developed to manage temporary impacts to access, and construction of the corridor will be phased in consideration of design requirements, traffic management (including staging, detours, and closures), adjacent municipal projects, stakeholder collaboration and consultation, utility relocations, permits, and funding.
ENG-2.00	Construction Staging, Access, and Safety Considerations	General Public and MTO	ENG-2.03	The Preliminary Design includes traffic signals at each ramp terminal intersection based on warrants completed. During Detail Design, traffic signals will be designed in accordance with the *Accessibility for Ontarians with Disabilities Act, 2005* and will include vehicle detection, emergency vehicle pre-emption and traffic signal interconnection.
ENG-3.00	Lighting/Illumination	General Public and MTO	ENG-3.01	The Preliminary Design includes illumination, where warranted, within the Project limits. Confirmation of illumination warrants and lighting type, either conventional or high mast, will be verified during Detail Design.
ENG-4.00	General Design Considerations	Local Municipalities; MTO; and Utility Companies	ENG-4.01	The Preliminary Design for foundations for each structure is included in the structural design drawings. During Detail Design, further geotechnical investigations will be undertaken to review and refine both the foundation and pavement designs.
ENG-4.00	General Design Considerations	Local Municipalities; MTO; and Utility Companies	ENG-4.02	Further coordination with utility companies and municipalities will be ongoing throughout Detail Design to initiate relocations or identify protection measures for utilities in conflict with the Project.

Notes:

% = percent; 2SLGBTQ+ = Two-Spirit, Lesbian, Gay, Bisexual, Transgender, Queer, and other related sexual and gender diverse identities; ASTM = American Society for Testing and Materials; BH = built heritage; CHER = Cultural Heritage Evaluation Reports; CHL = cultural heritage landscapes; *DFO* = Fisheries and Oceans Canada; EASR = Environmental Activity and Sector Registry; ECCC = Environment and Climate Change Canada; EV = electric vehicle; GTA = Greater Toronto Area; *HADD* = harmful alteration, disruption, or destruction; HOV = high-occupancy vehicle; IPP = Indigenous Procurement Policy; km = kilometres; m = metres; MCM = Ministry of Citizenship and Multiculturalism; *MECP* = Ministry of Environment, Conservation and Parks; MMAH = Ministry of Municipal Affairs and Housing; MMIWG = Murdered Indigenous Women and Girls; MNR = Ministry of Natural Resources; MTO = Ministry of Transportation; MTOD = Ministry of Transportation Drawings; MUP = multi-use pathway; NOAA = National Oceanic Atmosphere Administration; NPSS = Non-Standard Special Provisions; OMAFA = Ministry of Agriculture, Food and Agri-business; OPSD = Ontario Provincial Standard Drawing; OPSS = Ontario Provincial Standards Specifications; O.Reg. = Ontario Regulation; *ROW* = right-of-way; *SAR* = Species at Risk; SP = Special Provision; TC = Transport Canada; TRCA = Toronto and Region Conservation Authority; TSSA = Technical Standards and Safety Authority; UV = ultraviolet; WC = Watercourse Crossing.

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6. List of Provincial, Federal or Other Authorizations

In accordance with Section 6(2)(13) of the *Highway 413 Act*, *2024*, the purpose of this chapter is to provide a list of provincial, federal or other authorizations that may be required for the Project based on the Preliminary Design.

Table 6-1 provides a breakdown of anticipated authorizations by federal and provincial jurisdictions that may be required for the Project to proceed to Detail Design and construction. This list may be updated as the Project progresses into Detail Design.

6.1 Assessment of Effects of the Project on Areas of Federal Jurisdiction

6.1.1 Memorandum of Understanding

A Memorandum of Understanding was established as an administrative framework to facilitate the Parties' (both Canada and Ontario, including the MTO, MECP, DFO, ECCC, and Impact Assessment Agency of Canada [IAAC]) collaboration on the assessment of effects of the Highway 413 Project on areas of federal jurisdiction. The Parties have been working together to participate in discussions to identify threats, appropriate measures to avoid, and lessen impacts on federally listed SAR and their critical habitat.

6.1.2 Bilateral Federal-Provincial Working Group

The Bilateral Federal-Provincial Working Group, co-chaired by MTO and IAAC, includes delegated senior officials at MTO, MECP, DFO, ECCC, and IAAC. The Bilateral Federal-Provincial Working Group meets on a regular basis, as set out in a terms of reference, to oversee, discuss, and work to resolve issues under Canada's responsibility in respect of the Project.

The Bilateral Federal-Provincial Working Group has and continues to oversee the formation and conduct of technical groups made up of individuals with expertise in areas of federal jurisdiction to support the assessment of effects, identification of mitigation measures and measures to avoid or lessen effects on fish and fish habitat, listed species and their critical habitat, and/ or discussions concerning any required authorizations. These technical groups have and continue to seek concurrence from the Bilateral Federal-Provincial Working Group on a collaborative approach to evaluating and avoiding potential impacts in areas of federal jurisdiction, for example fish and fish habitat, migratory birds, federal SAR, and their critical habitat.

The Bilateral Federal-Provincial Working Group will undertake a comprehensive review and discussion of applicable content outlined in this chapter during Detail Design.

More information on the roles and responsibilities of the Bilateral Federal-Provincial Working Group, and the provisions of the Memorandum of Understanding can be found in the Canada-Ontario Memorandum of Understanding on the Assessment of Effects in Areas of Federal Jurisdiction of the Highway 413 Project.

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Table 6-1: Summary of Potential Provincial, Federal or Other Authorizations Required for the Project

Governing Authority	Legislation/Permit Type	Description	Anticipated Authorization Timeline	Applicable Project Components
Federal				
Fisheries and Oceans Canada (DFO)	*Fisheries Act* Authorization *Species at Risk Act* (SARA) Permit	The Project will be assessed to determine if there is potential for project activities to result in the death of fish or a HADD of fish habitat, including SAR, and/ or impact Indigenous communities' ability to exercise rights. If the assessment indicates that a HADD is likely, the design will be reviewed and modified, where feasible, to avoid or minimize impacts. If impacts cannot be fully avoided, an authorization under the *Fisheries Act* will be required. DFO has expressed interest in the following aspects of the Project in relation to fisheries: ■ Construction methods and details for all phases (construction, operation, maintenance), including engineering drawings; ■ Information on watershed, wetlands, waterbodies near the construction footprint; and ■ Indigenous consultation and engagement, in accordance with federal requirements (as described in **Chapter 7**). Potential SARA permit requirements will be reviewed during Detail Design relative to known species in the context of the most current list of regulated species and results of updated field work. The Bilateral Federal-Provincial Working and Technical Groups will further address and discuss the contents of this section during Detail Design.	Detail Design	■ Should the Project have the potential to result in the death of fish or HADD of fish habitat, DFO review will be required to determine the need for an authorization under the *Fisheries Act*; and ■ All in- and near-water works.

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Governing Authority	Legislation/Permit Type	Description	Anticipated Authorization Timeline	Applicable Project Components
Environment and Climate Change (ECCC)	*Species at Risk Act* (SARA) Permit	Potential SARA permit requirements will be reviewed during Detail Design relative to known species in the context of the most current list of regulated species and results of updated field work. The Bilateral Federal-Provincial Working and Technical Groups will further address and discuss the contents of this section during Detail Design.	Detail Design	■ Should the Project have the potential to affect listed species, any part of their habitat or residences under the SARA; and ■ Applicable to all Project components.
Environment and Climate Change Canada (ECCC)	Migratory Birds Regulations, 2022 (MBR), Migratory Bird Damage or Danger Permit	Potential permit requirements will be reviewed during Detail Design relative to known species in the context of the most current list of regulated species and results of updated field work. The nests of 18 species (listed in Schedule 1 of the regulations), whose nests are reused by migratory birds, continue to have year-round nest protection, unless they have been shown to be abandoned. 'Relocation Permit for Migratory Birds, Eggs and Nests' as per the MBR may be required if the Project impacts species under Schedule 1 of the MBR.	Detail Design	■ Should the Project have the potential to affect Migratory Birds, their habitat or residences under the MBR; and ■ Applicable to all Project components where tree or vegetation clearing is required.
Canadian Wildlife Service (CWS)	Migratory Birds Regulations, 2022 (MBR), Migratory Bird Damage or Danger Permit	Potential permit requirements will be reviewed during Detail Design relative to known species in the context of the most current list of regulated species and results of updated field work. The nests of 18 species (listed in Schedule 1 of the regulations), whose nests are reused by migratory birds, continue to have year-round nest protection, unless they have been shown to be abandoned. 'Relocation Permit for Migratory Birds, Eggs and Nests' as per the MBR may be required if the Project impacts species under Schedule 1 of the MBR.	Detail Design	■ Should the Project have the potential to affect Migratory Birds, their habitat or residences under the MBR; and ■ Applicable to all Project components where tree or vegetation clearing is required.

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Governing Authority	Legislation/Permit Type	Description	Anticipated Authorization Timeline	Applicable Project Components
Transport Canada (TC)	*Canadian Navigable Waters Act* (CNWA) Notice	For navigable waterways, the CNWA requires that proponents issue a public notice and provide information about proposed works (except for specified minor works that require deposit of information and publication of a public notice) on all navigable waters. For Major Works, whether on Scheduled or Non-Scheduled navigable waterways, a permit from TC may be required under the CNWA. There are currently no waterways that are listed under the CNWA's Schedule within the Highway 413 Preliminary Design ROW. For navigable waterways not on the Schedule, a screening process has been undertaken to collect sufficient information about past, current and future navigation uses during Preliminary Design to inform permitting during Detail Design. During Detail Design, if approval and/or permits are required, the appropriate approval package will be submitted to TC.	Detail Design	■ Applicable to bridge work associated with relevant watercourses.
Canada Energy Regulator (CER)	*Canadian Energy Regulator Act*	The CER regulates pipelines that cross provincial, territorial, or national boundaries. The prescribed area, sometimes called the safety zone, is a strip of land measuring 30 m extending out perpendicularly in both directions from the centreline of the pipe. In the prescribed area, one must take extra precautions and get written consent from the pipeline company (or receive an Order issued by the CER Commission) before doing certain activities.	Detail Design	■ Applicable to all Project components involving construction near pipelines; ■ Below ground construction activity within the prescribed area; and ■ Written consent required.

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Governing Authority	Legislation/Permit Type	Description	Anticipated Authorization Timeline	Applicable Project Components
Provincial				
Ministry of Labour, Immigration, Training and Skills Development (MLITSD)	*Occupational Health and Safety Act* (OHSA) and Ontario Regulation (O.Reg) 278/05, O.Reg. 490/09, Section 30 of the OHSA, Designated Substance Surveys	Applicability to be determined pending Detail Design: ■ Identification of buildings that would have to be demolished as part of the Project; ■ Identification of structures such as culverts that may be removed, replaced, or disposed of as part of the Project; ■ Assessment under O.Reg. 490/09 to determine potential worker exposure to designated substances; and ■ Compliance with OHSA Section 30, requiring owners to provide a list of designated substances to constructors and contractors prior to work commencement. Designated Substance Surveys are to be completed by competent persons.	Detail Design	■ May be required to identify actual and/ or presumed designated substances within building materials that may be affected during the Project; and ■ Applicable to Project components that include the demolition, replacement or disposal of materials that may contain designated substances, and where worker exposure is possible.
Ministry of the Environment, Conservation and Parks (MECP)	*Environmental Protection Act* (EPA), O.Reg. 63/16, O.Reg. 245/11, Environmental Activity and Sector Registry (EASR)	Pending Detail Design, further consultation with MECP will occur. If registration is required, the appropriate EASR submission will be completed. ■ EASR registration is required for temporary water takings for construction dewatering if the combined daily volume of groundwater and stormwater taken is greater than 50,000 L/day, in accordance with O.Reg. 63/16; ■ Registration must include information on water-taking locations, estimated volumes, and mitigation measures to protect water quality and quantity; and ■ The process for submitting an EASR registration is governed by O.Reg. 245/11.	Detail Design	■ Required if temporary water takings for construction dewatering exceed 50,000 L/day; ■ Applicable to all Project components where dewatering is required; and ■ Registration information must remain current for the duration of the activity.

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Governing Authority	Legislation/Permit Type	Description	Anticipated Authorization Timeline	Applicable Project Components
Ministry of the Environment, Conservation and Parks (MECP)	*Environmental Protection Act* (EPA), Environmental Compliance Approval (ECA) for Industrial Sewage	Industrial sewage works are any works involving the collection, transmission, treatment or disposal of sewage generated from industrial activities. This could include projects to handle storm runoff, domestic sewage and process sewage from industrial sites. An ECA for Industrial Sewage may be required if changes to existing sewers, SWM facilities and stormwater pumping stations are required for the Project. This may either require an amendment to an existing ECA(s) or a new ECA.	Detail Design	■ Applicable to all Project components involving SWM, sewage works, or industrial sewage discharge that require an ECA under the EPA; and ■ When an ECA application is submitted, it must be posted on the Environmental Registry of Ontario (ERO) for 30-45 days for public comment, as determined by MECP.
Ministry of the Environment, Conservation and Parks (MECP)	*Safe Drinking Water Act, 2002*, O.Reg. 170/03, Drinking Water Works Permit (DWWP) and Schedule C Authorization to Alter a Drinking Water System	Impacts to existing licensed operation systems will be identified, and the appropriate licensees will be engaged to determine potential impacts to the existing drinking water system to determine permitting requirements. Depending on the nature of the work required, which will be identified in Detail Design, a DWWP and/or a Schedule C Authorization to Alter the Drinking Water System may be required.	Detail Design	■ Applicable to Project components that interact with existing or planned drinking water systems; ■ Consultation with the licence owner required; and ■ May be required to alter a drinking water system.
Ministry of the Environment, Conservation and Parks (MECP)	*Environmental Protection Act* (EPA), O.Reg. 245/11, O.Reg. 63/16, O.Reg. 137/25, EASR for construction dewatering	An EASR may be required for water takings. ■ EASR registration is required for temporary water takings for construction dewatering if the combined daily volume of groundwater and stormwater exceeds 50,000 L/day, in accordance with O.Reg. 63/16. ■ Registration must include information on water-taking locations, estimated volumes, and mitigation measures. ■ The process for submitting an EASR registration is governed by O.Reg. 245/11; and ■ Compliance with O.Reg. 137/25 is required where SWM works are involved.	Detail Design	■ Required if temporary water takings of groundwater and stormwater for the purpose of construction dewatering have volumes estimated to be greater than 50,000 L/day in accordance with O.Reg 63/16; ■ Applicable to all Project components where dewatering is required; and ■ Registration information must remain current for the duration of the activity.

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Governing Authority	Legislation/Permit Type	Description	Anticipated Authorization Timeline	Applicable Project Components
Ministry of the Environment, Conservation and Parks (MECP)	*Environmental Protection Act* (EPA), O.Reg. 406/19, On-site and Excess Soil Management	Applicability to be determined during Detail Design. ■ Approval and/or permits may be required under O.Reg. 406/19 to address excess soil management requirements; ■ Volume, quality and soil condition to be determined as part of the construction planning process; ■ Management guidelines to be completed and outline sampling, monitoring, handling and documentation requirements; and ■ Management of Excess Soils to be completed under the supervision of a Qualified Person as defined in O.Reg 406/19.	Detail Design	■ Applicable to Project components that generate excess soil or require on-site soil management during construction; and ■ Registration of the work may be required on the Resource Productivity and Recovery Authority Registry.
Ministry of the Environment, Conservation and Parks (MECP)	*Environmental Protection Act* (EPA), O.Reg. 153/04, Record of Site Condition (RSC) / Certificate of Property Use (CPU)	A RSC/CPU may be required based on change in land use. Assessment includes: ■ Identification of contamination through investigative drilling and soil sampling; ■ Risk assessments to identify required risk management measures; and ■ The development of remediation plans.	Detail Design	■ Records of Site Condition to be filed with MECP as required under the EPA and O.Reg.153/04. Certificate of Property Use may be issued by MECP in accordance with the EPA and O.Reg. 153/04; ■ Applicable to properties that require a change to a more sensitive land use (e.g., Industrial/Commercial/Community to Residential/Parkland/ Institutional); and ■ RSCs and CPUs must be posted on the ERO for public comment.

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Governing Authority	Legislation/Permit Type	Description	Anticipated Authorization Timeline	Applicable Project Components
Ministry of the Environment, Conservation and Parks (MECP)	*Endangered Species Act, 2007** The *Species Conservation Act, 2025* (SCA, 2025) was enacted as part of Bill 5 (*Protect Ontario by Unleashing our Economy Act*, *2025*), and will replace the *Endangered Species Act* once it comes into force. At the time of writing this draft EIAR, the *Endangered Species Act, 2007** is still in force. It is recommended that regulatory requirements be confirmed as the Project approaches implementation to verify if adjustments are required (e.g., confirmation of applicable legislation at the time permits are sought).	The Project has undergone existing conditions investigations and preliminary impact assessments to determine the protection and conservation of species, while also considering social and economic factors. Considering SAR, the provincial government will have discretion to decide which at-risk species receive legal protection, as species will be categorized as either “registerable” or requiring a “permit”. Not every species classified as endangered or threatened by the Committee on the Status of Species at Risk Ontario (COSSARO) is required to be listed and categorized.	Detail Design	■ Registration and/or permits required for project components that affect SAR; and ■ Applicable to all Project components.
Ministry of Citizenship and Multiculturalism (MCM)	*Ontario Heritage Act*, Part VI Standards and Guidelines for Consultant Archaeologists (MCM, 2011) Archaeology Assessment Terms and conditions for archaeological licences Project Information Form	The Stage 1 Background Study and Property Inspection (April 2015) was accepted by MCM (formerly the Ministry of Tourism, Culture and Sport) on June 1, 2015. Upon confirmation that Stage 2, 3, and 4 (as applicable) archaeology assessment reports have met fieldwork and licensing requirements, MCM will issue a letter confirming their entry into the Ontario Public Register of Archaeological Reports. It should be noted that at the time of production of this document, the Stage 2 Property Assessment report has not been reviewed and accepted by the MCM, and therefore recommendations may be subject to change. Any comments arising from the review will be documented for resolution during Detail Design.	Detail Design	■ Applicable to all Project components involving ground disturbance; and ■ Applicable to all Project components involving disturbance in or around marine environments.

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Governing Authority	Legislation/Permit Type	Description	Anticipated Authorization Timeline	Applicable Project Components
Ministry of Citizenship and Multiculturalism (MCM)	*Ontario Heritage Act*, Part III.1 Standards and Guidelines for Conservation of Provincial Heritage Properties (MCM, 2010) Minister's Consent	The Standards and Guidelines for Conservation of Provincial Heritage Properties, issued under this Part of the *Ontario Heritage Act*, generally apply to all properties owned or controlled by MTO. As required under Provision F.5 of the Standards and Guidelines for Conservation of Provincial Heritage Properties, MTO will obtain consent of the Minister of Citizenship and Multiculturalism for the demolition or removal of any buildings or structures on a Provincial Heritage Property Provincial Significance (PHPPS) or for transfer of the property, in whole or in part, out of provincial control. The Minister may grant or refuse consent, and if granting consent, may do so with or without conditions, where the Minister is of the opinion that the removal, demolition or transfer is the best option after all alternatives have been considered by the ministry or prescribed public body requesting consent.	Detail Design	■ Applicable to all Project components that may require demolition, removal, or transfer out of provincial control associated with PHPPS.
Ministry of the Environment, Conservation and Parks (MECP)	*Environmental Protection Act* (EPA), O.Reg. 419/05; Environmental Noise Guidelines – Stationary and Transportation Sources – Approval and Planning (NPC-300) ECA for Air/Noise	In general, the *Environmental Protection Act* requires projects that discharge contaminants (which includes sound, vibration and heat), or alter the process, manner or rate of such discharge, into any part of the natural environment other than water to do some in accordance with an ECA. ■ An ECA for Air/Noise may be required pending Detail Design. ECAs include requirements to assess, mitigate and monitor potential adverse effects on local air quality and noise and vibration levels due to project activities.	Detail Design	■ Possibly applicable to construction of the highway; proposed transitway stations; maintenance facilities and commercial vehicle inspection facilities; and ■ When an application for an ECA is made, it must be posted on the ERO for 30-45 days for public comment, as determined by MECP.

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Governing Authority	Legislation/Permit Type	Description	Anticipated Authorization Timeline	Applicable Project Components
Ministry of the Environment, Conservation and Parks (MECP)	*Environmental Protection Act* (EPA), O.Reg. 1/17 EASR for Air/Noise	Pending Detail Design, prescribed activities outlined in O.Reg.1/17 must be registered on EASR. ■ EASR registration requires the completion of modeling to demonstrate compliance with air, noise and/or vibration criteria. Generally, if activities related to a facility or equipment are prescribed by regulation for the purposes of the EASR, an ECA is not required. Instead, the activity must be registered on EASR by filing information related to eligibility criteria described in O.Reg. 1/17.	Detail Design	■ Potentially applicable to proposed transitway stations; maintenance facilities and commercial vehicle inspection facilities.

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7. Indigenous Consultation and Engagement

7.1 Overview of Indigenous Consultation and Engagement Process

MTO has a duty to consult, and where appropriate, accommodate Indigenous communities when contemplating actions that have the potential to adversely impact their credibly asserted or established Aboriginal and/or treaty rights. MTO has been consulting Indigenous communities about the Highway 413 Project to gain an understanding of the Project's potential adverse impacts on credibly asserted or established Aboriginal and/or treaty rights. MTO is also engaging Indigenous communities who are interested in the Preliminary Design of the Project. In addition, the *Highway 413 Act, 2024* sets out the process for assessing potential environmental impacts of the Project.

MTO is currently consulting the following Indigenous communities for the Project:

- Alderville First Nation;
- Beausoleil First Nation;
- Chippewas of Georgina Island First Nation;
- Chippewas of Rama First Nation;
- Curve Lake First Nation;
- Hiawatha First Nation;
- Huron Wendat Nation (also known as "Wendat Nation" or "Council of the Wendat Nation");
- Kawartha Nishnawbe;
- Mississaugas of Scugog Island First Nation;
- Mississaugas of the Credit First Nation;
- Oneida Nation of the Thames; and
- Six Nations Community
  - Six Nations of the Grand River's Elected Council ("Six Nations of the Grand River")
  - Haudenosaunee Confederacy Chiefs Council.

MTO is also engaging the Métis Nation of Ontario (MNO) on an interest-basis.

Consultation with potentially impacted Indigenous communities and engagement with Indigenous communities on an interest-basis will continue beyond the Preliminary Design, and into the Detail Design phase of the Project.

Consistent with the requirements of the *Highway 413 Act, 2024*, this chapter summarizes the consultation and engagement between MTO and the Indigenous communities undertaken since November 1, 2012 for the Planning and Preliminary Design phase of the Project.

7.1.1 Previous Indigenous Consultation and Engagement on the Highway 413 Project (2007-2012)

The planning and design process for the Project (formerly known as the GTA West Transportation Corridor Study) commenced in 2007 with the development of the previously required Terms of Reference which provided the framework for preparing the comprehensive EA (formerly known as the individual EA under the *Environmental Assessment Act*). The consultation requirements outlined in the comprehensive EA were adhered to. The first stage of the former EA resulted in the TDS which was completed in 2012. During this time, consultation and engagement was undertaken through project notices, information sharing, and regular meetings with Indigenous communities. Project progress updates were provided during consultation and engagement meetings, and Indigenous community input on study results was gathered.

The Project is now following the requirements of the *Highway 413 Act, 2024*. The considerable work undertaken to advance the Project since 2007, including technical studies and consultation and engagement, were carried forward as part of the *Highway 413 Act, 2024* process.

7.1.2 Indigenous Consultation and Engagement Approach During the Development of Preliminary Design

Prior to the *Highway 413 Act, 2024* coming into force, the approach to consultation and engagement with Indigenous communities followed the consultation requirements outlined in the Terms of Reference. Information was shared with Indigenous communities through project notices, meetings, and sharing reports and studies; and consultation and engagement opportunities were provided throughout the Preliminary Design phase of the Project and particularly surrounding project milestones.

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7.1.2.1 Highway 413 Indigenous Consultation Plan

In accordance with the *Highway 413 Act, 2024*, an Indigenous Consultation Plan ('the Highway 413 ICP') for the Project was circulated to Indigenous communities which builds upon the consultation and engagement process undertaken for Preliminary Design. The Highway 413 ICP set out MTO's plans for consultation and engagement with Indigenous communities for the Preliminary Design of the Project. For clarity, MTO will continue to consult and engage with Indigenous communities on the Project during subsequent project phases.

The Highway 413 ICP outlined consultation and engagement methods used for the Project and identified anticipated project milestones and timelines up to completion of Preliminary Design. The following principles were identified in the Highway 413 ICP and applied when undertaking consultation and engagement with Indigenous communities:

- Consultation will be conducted in a respectful manner, in good faith, and with integrity; and with the intention of fostering relationships based on mutual respect, understanding, and trust.
- MTO is committed to consulting, and where appropriate, accommodating Indigenous communities who have credibly asserted or established Aboriginal and/or treaty rights that have the potential to be adversely impacted by the Project.
- MTO is committed to identifying opportunities for potentially impacted communities to participate in the study process.
- MTO is committed to sharing information with Indigenous communities to facilitate meaningful input into the Project. Input may be provided at any time during this process. Structured opportunities for input will occur at key study stages to help facilitate meaningful consultation and engagement. Information about these opportunities will be provided to the communities as early as reasonably possible.
- MTO will consider input provided by Indigenous communities through consultation with an open mind and in a respectful manner, consistent with the honour of the Crown.
- MTO will review available consultation protocols from potentially impacted Indigenous communities and will consider how to incorporate elements of those protocols into any individual consultation plan developed with an Indigenous community.
- The Highway 413 ICP will be flexible in responding to new issues that may arise as the study proceeds.
- MTO will continue to consult and engage with Indigenous communities during the Detail Design phase.

In January 2024, the Highway 413 ICP was circulated to the list of communities identified in **Section 7.1**. MTO and some of these Indigenous communities have developed community-specific consultation plans for the Project. Additional information regarding the consultation and engagement methods and activities from November 1, 2012 onwards is provided in **Table 7-1**.

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Table 7-1: Indigenous Consultation and Engagement Methods and Activities from November 1, 2012 Onwards

Method	Description	Summary
Notification	Notification of project updates, including study milestones, reports, and advertisement of PICs and separate meetings with Indigenous communities that reflect the PIC content customized to the community.	See **Table 7-2** for a list of project notices sent to Indigenous communities.
Information Sharing	Sharing updates at project milestones and sharing relevant studies and reports. This included additional project information such as the results of studies and/or fieldwork, requests for review and comments, and identification of opportunities for involvement in the Project's planning as appropriate. MTO also considered information provided by Indigenous communities regarding the Project, including as related to interests in economic opportunities related to the Project.	See **Section 7.1.2.3** for a list of information sharing activities.
Meetings	Meetings and/or workshops with Indigenous communities, as appropriate and upon request. Meetings and/or workshops included discussion of project updates, project milestones and reports, potential impacts on rights and potential mitigation, opportunities for involvement, opportunities for presentations, etc. Frequency of meetings and discussion topics were mutually determined by each community and MTO.	Regular meeting series to discuss the Project were established with: ■ Mississaugas of the Credit First Nation ■ Six Nations of the Grand River ■ Williams Treaties First Nations – Alderville First Nation – Beausoleil First Nation – Chippewas of Georgina Island First Nation – Chippewas of Rama First Nation – Curve Lake First Nation – Hiawatha First Nation – Mississaugas of Scugog Island First Nation See **Table 7-3** for a list of project meeting dates and a summary of topics discussed with Indigenous communities
Fieldwork Observation	Offers, where appropriate and requested, for Indigenous community representatives to participate as CFLs (which are also sometimes referred to as monitors or community monitors) on archaeological or environmental fieldwork to facilitate information sharing between MTO and the Indigenous community.	The following Indigenous communities provided representatives who participated as CFLs in project fieldwork in 2022 and 2023: ■ Haudenosaunee Confederacy Chiefs Council as represented by the Haudenosaunee Development Institute ■ Huron Wendat Nation ■ Mississaugas of the Credit First Nation ■ Six Nations of the Grand River
Capacity Funding	Capacity funding as appropriate to facilitate participation in the consultation process.	Meetings to discuss community capacity and/or capacity funding were offered to all Indigenous communities that expressed an interest in participating in the consultation process.

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Method	Description	Summary
Individual Indigenous Consultation Plan	Upon request, individual consultation plans were jointly prepared by the Indigenous community and MTO to reflect specific community interests and consultation needs.	Individual project consultation plans were jointly prepared with: ■ Huron Wendat Nation (Individual Indigenous consultation plan under development) ■ Mississaugas of the Credit First Nation ■ Six Nations of the Grand River ■ Williams Treaties First Nations (Individual Indigenous consultation plan under development)
Website and Individual Information Sharing Platforms	The Project Website is being maintained by MTO's Service Provider throughout the course of the Project. The Project Website provided contact information and project information including timelines, upcoming public engagement opportunities, background information, and reports. Upon request, MTO and individual Indigenous communities also established community-specific SharePoint sites for information sharing purposes.	Individual Project SharePoint Sites were created for: ■ Haudenosaunee Confederacy Chiefs Council as represented by Haudenosaunee Development Institute ■ Huron Wendat Nation ■ Kawartha Nishnawbe ■ Mississaugas of the Credit First Nation ■ Oneida Nation of the Thames ■ Six Nations of the Grand River ■ Williams Treaties First Nations
Documentation	MTO maintained documentation of consultation and engagement activities throughout the project process, including discussions and requests for review. This includes identifying concerns raised by Indigenous communities and how those concerns have been addressed.	See **Section 7.1.2.5** for a summary of concerns raised by Indigenous communities and MTO's response(s) for how those concerns have been or will be addressed.

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7.1.2.2 Project Notices sent to Indigenous Communities

Table 7-2 provides an overview of the notices and letters that were sent to Indigenous communities as part of the Project since November 1, 2012. See **Chapter 8** for a description of Project Notices and materials including those materials prepared for PICs. There have been changes in the legislative framework and key terms applicable to the Project, including the name and stages associated with the project work. Project Notices are presented as they were drafted and shared at the time.

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Table 7-2: Project Notices sent to Indigenous Communities since November 1, 2012

Project Notice	Date	Recipient Indigenous Community
Notice of Study Commencement	February 2014	■ Alderville First Nation ■ Beausoleil First Nation ■ Chippewas of Georgina Island First Nation ■ Chippewas of Rama First Nation ■ Curve Lake First Nation ■ Haudenosaunee Confederacy Chiefs Council/Haudenosaunee Development Institute ■ Hiawatha First Nation ■ Huron Wendat Nation ■ Kawartha Nishnawbe ■ Métis Nation of Ontario ■ Mississaugas of Scugog Island First Nation ■ Mississaugas of the Credit First Nation ■ Six Nations of the Grand River
Notice of PIC #1 This notice was also published in 'Turtle Island News' and 'Two Row Times' newspapers	November 2014	■ Alderville First Nation ■ Beausoleil First Nation ■ Chippewas of Georgina Island First Nation ■ Chippewas of Rama First Nation ■ Curve Lake First Nation ■ Haudenosaunee Confederacy Chiefs Council/Haudenosaunee Development Institute ■ Hiawatha First Nation ■ Huron Wendat Nation ■ Kawartha Nishnawbe ■ Métis Nation of Ontario; ■ Mississaugas of Scugog Island First Nation ■ Mississaugas of the Credit First Nation ■ Six Nations of the Grand River
2015 Focused Analysis Area Fact Sheet	June 2015	■ Alderville First Nation ■ Beausoleil First Nation ■ Chippewas of Georgina Island First Nation ■ Chippewas of Rama First Nation ■ Curve Lake First Nation ■ Haudenosaunee Confederacy Chiefs Council/Haudenosaunee Development Institute ■ Hiawatha First Nation

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Project Notice	Date	Recipient Indigenous Community
2015 Focused Analysis Area Fact Sheet	June 2015	■ Huron Wendat Nation ■ Kawartha Nishnawbe ■ Métis Nation of Ontario ■ Mississaugas of Scugog Island First Nation ■ Mississaugas of the Credit First Nation
Study Suspension Notice	December 2015	■ Kawartha Nishnawbe ■ Métis Nation of Ontario
Notice of Study Area Protection	February 2018	■ Alderville First Nation ■ Beausoleil First Nation ■ Chippewas of Georgina Island First Nation ■ Chippewas of Rama First Nation ■ Curve Lake First Nation ■ Haudenosaunee Confederacy Chiefs Council/Haudenosaunee Development Institute ■ Hiawatha First Nation ■ Huron Wendat Nation ■ Kawartha Nishnawbe ■ Métis Nation of Ontario ■ Mississaugas of Scugog Island First Nation ■ Mississaugas of the Credit First Nation
GTA West Study Resumption Bulletin	June 2019	■ Alderville First Nation ■ Beausoleil First Nation ■ Chippewas of Georgina Island First Nation ■ Chippewas of Rama First Nation ■ Curve Lake First Nation ■ Haudenosaunee Confederacy Chiefs Council/Haudenosaunee Development Institute ■ Hiawatha First Nation ■ Huron Wendat Nation ■ Kawartha Nishnawbe ■ Métis Nation of Ontario ■ Mississaugas of Scugog Island First Nation ■ Mississaugas of the Credit First Nation ■ Six Nations of the Grand River
Notice of PIC #2 and Community Value Planning Meeting #1	September 2019	■ Alderville First Nation ■ Beausoleil First Nation

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Project Notice	Date	Recipient Indigenous Community
This notice was also published in 'Turtle Island News' and 'Two Row Times' newspapers	September 2019	■ Chippewas of Georgina Island First Nation ■ Chippewas of Rama First Nation ■ Curve Lake First Nation ■ Haudenosaunee Confederacy Chiefs Council/Haudenosaunee Development Institute ■ Hiawatha First Nation ■ Huron Wendat Nation ■ Kawartha Nishnawbe ■ Métis Nation of Ontario ■ Mississaugas of Scugog Island First Nation ■ Mississaugas of the Credit First Nation ■ Six Nations of the Grand River
Notice of Engagement Options with Indigenous Communities During the COVID-19 Pandemic	June 2020	■ Alderville First Nation ■ Beausoleil First Nation ■ Chippewas of Georgina Island First Nation ■ Chippewas of Rama First Nation ■ Curve Lake First Nation ■ Haudenosaunee Confederacy Chiefs Council/Haudenosaunee Development Institute ■ Hiawatha First Nation ■ Kawartha Nishnawbe ■ Mississaugas of Scugog Island First Nation ■ Mississaugas of the Credit First Nation
Preferred Alignment and 2020 Focused Analysis Area Bulletin	August 2020	■ Alderville First Nation ■ Beausoleil First Nation ■ Chippewas of Georgina Island First Nation ■ Chippewas of Rama First Nation ■ Curve Lake First Nation ■ Haudenosaunee Confederacy Chiefs Council/Haudenosaunee Development Institute ■ Hiawatha First Nation ■ Huron Wendat Nation ■ Kawartha Nishnawbe ■ Métis Nation of Ontario ■ Mississaugas of Scugog Island First Nation ■ Mississaugas of the Credit First Nation ■ Six Nations of the Grand River
Invitation to Community Value Plan Meeting #2	September 2020	■ Mississaugas of the Credit First Nation

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Project Notice	Date	Recipient Indigenous Community
Notice of Community Engagement Webinar #1 This notice was also published in 'Turtle Island News' and 'Two Row Times' newspapers	July 2021	■ Alderville First Nation ■ Beausoleil First Nation ■ Chippewas of Georgina Island First Nation ■ Chippewas of Rama First Nation ■ Curve Lake First Nation ■ Haudenosaunee Confederacy Chiefs Council/Haudenosaunee Development Institute ■ Hiawatha First Nation ■ Huron Wendat Nation ■ Kawartha Nishnawbe ■ Mississaugas of Scugog Island First Nation ■ Mississaugas of the Credit First Nation ■ Oneida Nation of the Thames ■ Six Nations of the Grand River
Invitation to Community Engagement Webinar #1 This notice was also published in 'Turtle Island News' and 'Two Row Times' newspapers	July 2021	■ Alderville First Nation
Notice of Community Engagement Webinar #2 This notice was also published in 'Turtle Island News' and 'Two Row Times' newspapers	September/October 2021	■ Haudenosaunee Confederacy Chiefs Council/Haudenosaunee Development Institute ■ Kawartha Nishnawbe
Invitation to Community Engagement Webinar #2 This notice was also published in 'Turtle Island News' and 'Two Row Times' newspapers	September/December 2021	■ Haudenosaunee Confederacy Chiefs Council/Haudenosaunee Development Institute ■ Kawartha Nishnawbe ■ Huron Wendat Nation
Invitation to Federal Impact Assessment Process Meeting	September 2021	■ Alderville First Nation
Notice of PIC #3 This notice was also published in 'Turtle Island News' and 'Two Row Times' newspapers	November 22 & 23, 2021	■ Alderville First Nation ■ Beausoleil First Nation ■ Chippewas of Georgina Island First Nation ■ Chippewas of Rama First Nation ■ Curve Lake First Nation ■ Haudenosaunee Confederacy Chiefs Council/Haudenosaunee Development Institute ■ Hiawatha First Nation ■ Huron Wendat Nation ■ Kawartha Nishnawbe ■ Métis Nation of Ontario ■ Mississaugas of the Credit First Nation

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Project Notice	Date	Recipient Indigenous Community
Notice of PIC #3	November 22 & 23, 2021	■ Kawartha Nishnawbe ■ Métis Nation of Ontario ■ Mississaugas of the Credit First Nation ■ Six Nations of the Grand River
Notice of PIC #4 This notice was also published in 'Turtle Island News' and 'Two Row Times' newspapers	September 7 and 8, 2023	■ Alderville First Nation ■ Beausoleil First Nation ■ Chippewas of Georgina Island First Nation ■ Chippewas of Rama First Nation ■ Curve Lake First Nation ■ Haudenosaunee Confederacy Chiefs Council/Haudenosaunee Development Institute ■ Hiawatha First Nation ■ Huron Wendat Nation ■ Kawartha Nishnawbe ■ Mississaugas of Scugog Island First Nation ■ Mississaugas of the Credit First Nation ■ Oneida Nation of the Thames ■ Six Nations of the Grand River
2024 Draft Focused Analysis Area Refinement Bulletin	December 9, 2024	■ Alderville First Nation ■ Beausoleil First Nation ■ Chippewas of Georgina Island First Nation ■ Chippewas of Rama First Nation ■ Curve Lake First Nation ■ Haudenosaunee Confederacy Chiefs Council/Haudenosaunee Development Institute ■ Hiawatha First Nation ■ Huron Wendat Nation ■ Kawartha Nishnawbe ■ Mississaugas of Scugog Island First Nation ■ Mississaugas of the Credit First Nation ■ Oneida Nation of the Thames ■ Six Nations of the Grand River

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Project Notice	Date	Recipient Indigenous Community
Notice of Draft EIAR	December 1, 2025	■ Alderville First Nation ■ Beausoleil First Nation ■ Chippewas of Georgina Island First Nation ■ Chippewas of Rama First Nation ■ Curve Lake First Nation ■ Haudenosaunee Confederacy Chiefs Council/Haudenosaunee Development Institute ■ Hiawatha First Nation ■ Huron Wendat Nation ■ Kawartha Nishnawbe ■ Mississaugas of Scugog Island First Nation ■ Mississaugas of the Credit First Nation ■ Oneida Nation of the Thames ■ Six Nations of the Grand River
Notice of Final EIAR	DATE TBD	■ Alderville First Nation ■ Beausoleil First Nation ■ Chippewas of Georgina Island First Nation ■ Chippewas of Rama First Nation ■ Curve Lake First Nation ■ Haudenosaunee Confederacy Chiefs Council/Haudenosaunee Development Institute ■ Hiawatha First Nation ■ Huron Wendat Nation ■ Kawartha Nishnawbe ■ Mississaugas of Scugog Island First Nation ■ Mississaugas of the Credit First Nation ■ Oneida Nation of the Thames ■ Six Nations of the Grand River

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7.1.2.3 Summary of Information Shared with Indigenous Communities

Table 7-3 provides an overview of the information shared with Indigenous communities as part of the Project since November 1, 2012. There have been changes in the legislative framework and key terms applicable to the Project, including the name and stages associated with the project work. Information is presented as drafted and shared at the time.

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Table 7-3: Information Shared with Indigenous Communities

Information	Date	Indigenous Community Recipient
Public Information Centre #1 Materials	December 2014	■ Alderville First Nation ■ Kawartha Nishnawbe ■ Huron Wendat Nation ■ Haudenosaunee Confederacy Chiefs Council/Haudenosaunee Development Institute ■ Mississaugas of the Credit First Nation ■ Mississaugas of Scugog Island First Nation
Stage 1 Archaeological Assessment Report	January 26, 2015	■ Huron Wendat Nation
Stage 1 Archaeological Assessment Report	February 26, 2015	■ Mississaugas of the Credit First Nation
Stage 1 Archaeological Assessment Report	May 8, 2015	■ Mississaugas of Scugog Island First Nation ■ Six Nations of the Grand River
Public Information Centre #2 Materials	October 2019	■ Alderville First Nation ■ Beausoleil First Nation ■ Chippewas of Georgina Island First Nation ■ Chippewas of Rama First Nation ■ Curve Lake First Nation ■ Haudenosaunee Confederacy Chiefs Council/Haudenosaunee Development Institute ■ Hiawatha First Nation
Stage 1 Archaeological Assessment Report and Fieldwork Memos	August 6, 2021	■ Six Nations of the Grand River
Information Package including Study Overview, Preferred Route, Focused Analysis Area, and Impact Assessment Process Overview	September 20, 2021	■ Alderville First Nation ■ Beausoleil First Nation ■ Chippewas of Georgina Island First Nation ■ Chippewas of Rama First Nation ■ Curve Lake First Nation ■ Haudenosaunee Confederacy Chiefs Council/Haudenosaunee Development Institute ■ Hiawatha First Nation ■ Huron Wendat Nation
Information Package including Study Overview, Preferred Route, Focused Analysis Area, and Impact Assessment Process Overview	October 12, 2021	■ Métis Nation of Ontario

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Information	Date	Indigenous Community Recipient
Impact Assessment Act Process Information Package	November 4, 2021	■ Alderville First Nation ■ Beausoleil First Nation ■ Chippewas of Rama First Nation ■ Curve Lake First Nation ■ Hiawatha First Nation ■ Huron Wendat Nation ■ Kawartha Nishnawbe
Information Package with Study Update	November 9, 2021	■ Métis Nation of Ontario
Stage 1 Archaeological Assessment Report and Fieldwork Memos	November 16, 2021	■ Mississaugas of Scugog Island First Nation
Stage 1 Archaeological Assessment Report and Fieldwork Memos	December 2, 2021	■ Huron Wendat Nation ■ Kawartha Nishnawbe
Public Information Centre #3 Materials	December 2021	■ Curve Lake First Nation
Draft Initial Project Description	January 11, 2022	■ Mississaugas of Scugog Island First Nation
Information Package Including Environmental Summaries, Reports, and 2021 PIC materials	February 2, 2022	■ Alderville First Nation ■ Chippewas of Georgina Island First Nation ■ Chippewas of Rama First Nation ■ Curve Lake First Nation ■ Hiawatha First Nation ■ Métis Nation of Ontario
Information Package Including Environmental Summaries, Reports, and 2021 PIC materials	February 22, 2022	■ Beausoleil First Nation ■ Chippewas of Rama First Nation
Initial Project Description (IPD) Cover Sheet & Partial Draft Initial Project Description (prepared under the now set-aside Impact Assessment Act)	March 24, 2022	■ Hiawatha First Nation ■ Kawartha Nishnawbe ■ Six Nations of the Grand River
IPD Cover Sheet & Partial Draft Initial Project Description (prepared under the now set-aside Impact Assessment Act)	April 21, 2022	■ Mississaugas of Scugog Island First Nation
IPD Cover Sheet & Partial Draft Initial Project Description (prepared under the now set-aside Impact Assessment Act)	May 10, 2022	■ Mississaugas of the Credit First Nation
Stage 1 Archaeological Assessment & Stage 2 Archaeological Assessment Fieldwork Update	July 6, 2022	■ Hiawatha First Nation

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Information	Date	Indigenous Community Recipient
Draft Initial Project Description Chapters (prepared under the now set-aside Impact Assessment Act)	October 5, 2022	■ Six Nations of the Grand River
Draft Initial Project Description Outline (prepared under the now set-aside Impact Assessment Act)	October 7, 2022	■ Alderville First Nation ■ Chippewas of Georgina Island First Nation ■ Chippewas of Rama First Nation ■ Curve Lake First Nation ■ Hiawatha First Nation ■ Kawartha Nishnawbe
Draft Initial Project Description Outline (prepared under the now set-aside Impact Assessment Act)	October 18, 2022	■ Haudenosaunee Confederacy Chiefs Council/Haudenosaunee Development Institute
Draft Initial Project Description Chapters (prepared under the now set-aside Impact Assessment Act)	October 24, 2022	■ Six Nations of the Grand River
Draft Initial Project Description Chapters (prepared under the now set-aside Impact Assessment Act)	November 10, 2022	■ Six Nations of the Grand River
Overview of Draft Initial Project Description Chapters and Cumulative Effects Framework	January 6, 2023	■ Alderville First Nation ■ Beausoleil First Nation ■ Chippewas of Georgina Island First Nation ■ Chippewas of Rama First Nation ■ Curve Lake First Nation ■ Hiawatha First Nation ■ Mississaugas of Scugog Island First Nation ■ Mississaugas of the Credit First Nation
Information Package with 2020-2022 Species List, Cumulative Effects Factsheet	January 26, 2023	■ Six Nations of the Grand River
Information Package with Impact Assessment Act Information, Cumulative Effects Factsheet, and 2020 Fieldwork Memos.	January 31, 2023	■ Chippewas of Rama First Nation
Gender-based Analysis Plus Factsheet	January 31, 2023	■ Six Nations of the Grand River
Draft Initial Project Description Chapters, Cumulative Effects Framework, and CFL Information	March 24, 2023	■ Huron Wendat Nation

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Information	Date	Indigenous Community Recipient
Draft Initial Project Description Update Information	March 24, 2023	■ Métis Nation of Ontario
Information Package on Draft Initial Project Description Chapters and Cumulative Effects Framework	March 24, 2023	■ Kawartha Nishnawbe
Project Report Schedule	March 27, 2023	■ Six Nations of the Grand River
Fieldwork Memos	April 12, 2023	■ Six Nations of the Grand River
Draft Initial Project Description Chapters, Plain Language Summary, Cumulative Effects Framework, Species List, Schedule, and CFL Information	April 14, 2023	■ Alderville First Nation ■ Beausoleil First Nation ■ Chippewas of Georgina Island First Nation ■ Chippewas of Rama First Nation ■ Mississaugas of Scugog Island First Nation
2022 Fieldwork Memos and Mapping Files, Gender Based Analysis Plus Factsheet, Human Health Factsheet, 2020-2022 Species List	April 14, 2023	■ Chippewas of Rama First Nation
Draft Initial Project Description	April 14, 2023	■ Six Nations of the Grand River
Draft Initial Project Description Chapters, Fieldwork Memos, Gender Based Analysis Plus Factsheet, Human Health Factsheet, 2020-2022 Species List	April 17, 2023	■ Mississaugas of the Credit First Nation
Draft Initial Project Description Chapters	May 11, 2023	■ Six Nations of the Grand River
2020 Fieldwork Memos	June 12, 2023	■ Six Nations of the Grand River
MTO Mitigation Examples	July 11, 2023	■ Six Nations of the Grand River
Summary of Initial Project Description Chapters and Fieldwork Memos	July 12, 2023	■ Mississaugas of the Credit First Nation
Information Package with Summary of Initial Project Description Chapters, Initial Project Description Plain Language Summary, and Fieldwork Memos	July 12, 2023	■ Kawartha Nishnawbe

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Information	Date	Indigenous Community Recipient
Draft Initial Project Description	July 13 and 28, 2023	■ Alderville First Nation ■ Beausoleil First Nation ■ Chippewas of Georgina Island First Nation ■ Chippewas of Rama First Nation ■ Curve Lake First Nation ■ Hiawatha First Nation ■ Huron Wendat Nation ■ Kawartha Nishnawbe ■ Mississaugas of Scugog Island First Nation ■ Mississaugas of the Credit First Nation ■ Oneida of the Thames ■ Six Nations of the Grand River
Navigable Waters Mapping	July 31, 2023	■ Six Nations of the Grand River
Modeling Factsheet	August 11, 2023	■ Six Nations of the Grand River
Public Information Centre #4 Materials	October 2023	■ Oneida Nation of the Thames
Draft Agricultural Existing Conditions Report, Draft Human Health Implications Scoping Report	December 11, 2023	■ Six Nations of the Grand River
Navigable Waters Information	January 10, 2024	■ Six Nations of the Grand River
Draft Agricultural Existing Conditions Report, Draft Human Health Implications Scoping Report, Navigable Waters Information	January 25, 2024	■ Mississaugas of the Credit First Nation
Draft Regional Air Pollutant Burden Analysis Report, Major Crossing Structures Evaluation Criteria	February 15, 2024	■ Six Nations of the Grand River
Draft Regional Air Pollutant Burden Analysis Report, Major Crossing Structures Evaluation Criteria	February 23, 2024	■ Mississaugas of the Credit First Nation
'Batch 1' - Technical Reports: ■ Agricultural Impact Assessment Report ■ Cultural Heritage Assessment Report ■ Cultural Heritage Evaluation Reports (Sixteen Mile Creek, Credit River, Humber River / Toronto Carrying Place Trail)	May 21, 2025	■ Alderville First Nation ■ Beausoleil First Nation ■ Chippewas of Georgina Island First Nation ■ Chippewas of Rama First Nation ■ Curve Lake First Nation ■ Haudenosaunee Confederacy Chiefs Council/Haudenosaunee Development Institute ■ Hiawatha First Nation

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Information	Date	Indigenous Community Recipient
■ Fish and Fish Habitat Impact Assessment Report ■ Major River Crossing Evaluation Tables ■ Stage 2 Archaeological Assessment Report ■ Terrestrial Ecosystems Impact Assessment Report		■ Huron Wendat Nation ■ Kawartha Nishnawbe ■ Mississaugas of Scugog Island First Nation ■ Mississaugas of the Credit First Nation ■ Oneida Nation of the Thames ■ Six Nations of the Grand River
Partial 'Batch 2' - Technical Reports: ■ Erosion and Sediment Overview Risk Memo ■ Fluvial Geomorphological Assessment Report ■ Hydrogeological Report ■ Regional Air Quality Burden Analysis Report	July 28, 2025	■ Alderville First Nation ■ Beausoleil First Nation ■ Chippewas of Georgina Island First Nation ■ Chippewas of Rama First Nation ■ Curve Lake First Nation ■ Hiawatha First Nation ■ Mississaugas of Scugog Island First Nation ■ Mississaugas of the Credit First Nation
Partial 'Batch 2' - Technical Reports: ■ Erosion and Sediment Overview Risk Memo ■ Fluvial Geomorphological Assessment Report ■ Hydrogeological Report ■ Regional Air Quality Burden Analysis Report	August 19, 2025	■ Six Nations of the Grand River
Partial 'Batch 2' - Technical Report: ■ Climate Change Analysis Report	September 11, 2025	■ Mississaugas of the Credit First Nation
Shadow Effects Assessment Report	September 23, 2025	■ Mississaugas of the Credit First Nation ■ Six Nations of the Grand River
Partial 'Batch 2' - Technical Report: ■ Climate Change Analysis Report	October 3, 2025	■ Alderville First Nation ■ Beausoleil First Nation ■ Chippewas of Georgina Island First Nation ■ Chippewas of Rama First Nation ■ Curve Lake First Nation ■ Hiawatha First Nation ■ Mississaugas of Scugog Island First Nation

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Information	Date	Indigenous Community Recipient
Batch 2 Technical Reports: ■ Major River Crossing Design Report ■ Watercourse Crossing Design Memo ■ Erosion and Sediment Overview Risk Memo ■ Hydrogeological Report ■ Fluvial Geomorphological Assessment Report ■ Community Well Being Report (Part A:Socio-economics and Part B: Human Health) ■ Drainage and Stormwater Management Reports ■ Air Quality Technical Report ■ Regional Air Quality Burden Analysis Report ■ Noise Report ■ Climate Change Assessment Report	October 28, 2025	■ Alderville First Nation ■ Beausoleil First Nation ■ Chippewas of Georgina Island First Nation ■ Chippewas of Rama First Nation ■ Curve Lake First Nation ■ Haudenosaunee Confederacy Chiefs Council/Haudenosaunee Development Institute ■ Hiawatha First Nation ■ Huron Wendat Nation ■ Kawartha Nishnawbe ■ Mississaugas of Scugog Island First Nation ■ Mississaugas of the Credit First Nation ■ Oneida Nation of the Thames ■ Six Nations of the Grand River
Draft EIAR	TBD	■ Alderville First Nation ■ Beausoleil First Nation ■ Chippewas of Georgina Island First Nation ■ Chippewas of Rama First Nation ■ Curve Lake First Nation ■ Haudenosaunee Confederacy Chiefs Council/Haudenosaunee Development Institute ■ Hiawatha First Nation ■ Huron Wendat Nation ■ Kawartha Nishnawbe ■ Mississaugas of Scugog Island First Nation ■ Mississaugas of the Credit First Nation ■ Oneida Nation of the Thames ■ Six Nations of the Grand River

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Information	Date	Indigenous Community Recipient
Final EIAR	TBD	■ Alderville First Nation ■ Beausoleil First Nation ■ Chippewas of Georgina Island First Nation ■ Chippewas of Rama First Nation ■ Curve Lake First Nation ■ Haudenosaunee Confederacy Chiefs Council/Haudenosaunee Development Institute ■ Hiawatha First Nation ■ Huron Wendat Nation ■ Kawartha Nishnawbe ■ Mississaugas of Scugog Island First Nation ■ Mississaugas of the Credit First Nation ■ Oneida Nation of the Thames ■ Six Nations of the Grand River

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7.1.2.4 Summary of Meetings with Indigenous Communities

MTO has been meeting regularly with Indigenous communities that are being consulted or engaged on the Project. **Table 7-4** provides a list of meeting dates since November 1, 2012 to the end of Preliminary Design, and includes a summary of meeting topics. Over the course of consultation and engagement, MTO has offered to meet at all project milestones and information sharing opportunities.

MTO has met with the following communities, with the number of meetings varying by community, since November 1, 2012:

- Alderville First Nation: 8 meetings
- Beausoleil First Nation: 3 meetings
- Chippewas of Georgina Island First Nation: 5 meetings
- Chippewas of Rama First Nation: 9 meetings
- Curve Lake First Nation: 9 meetings
- Haudenosaunee Confederacy Chiefs Council as represented by Haudenosaunee Development Institute: 4 meetings
- Hiawatha First Nation: 10 meetings
- Huron Wendat Nation: 12 meetings
- Kawartha Nishnawbe: 3 meetings
- Métis Nation of Ontario: 3 meetings
- Mississaugas of Scugog Island First Nation: 12 meetings
- Mississaugas of the Credit First Nation: 16 meetings
- Six Nations of the Grand River: 39 meetings

MTO has offered to meet but has not met with Oneida Nation of the Thames.

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Table 7-4: Summary of Meetings with Indigenous Communities since November 1, 2012

Indigenous Community	Meeting Date	Summary of Meeting Purpose/Topic
Mississaugas of the Credit First Nation	October 16, 2013	Meeting to discuss the Environmental Assessment (EA) process and to determine Mississaugas of the Credit First Nation's interest and capacity to participate in consultation process.
Six Nations of the Grand River	October 6, 2014	Meeting to provide an update on archaeological investigations, consultation framework, and upcoming PIC #1.
Mississaugas of the Credit First Nation	February 24, 2015	Meeting to discuss the EA process and consultation approach.
Métis Nation of Ontario	March 21, 2015	Meeting to provide an overview of the Project.
Huron Wendat Nation	April 27, 2015	Meeting to discuss the study and consultation plan.
Six Nations of the Grand River	May 1, 2015	Meeting to discuss the consultation plan and archaeological assessment.
Mississaugas of the Credit First Nation	August 11, 2015	Meeting to discuss the EA process, environmental conditions report, Stage 1 Archaeological Assessment, and route alternatives.
Métis Nation of Ontario	August 12, 2015	Meeting to discuss Stage 2 EA study, existing conditions, Stage 1 Archaeological Assessment, evaluation of route alternatives, and next steps.
Mississaugas of Scugog Island First Nation	August 13, 2015	Meeting to discuss the study, existing conditions, Stage 1 Archaeological Assessment, evaluation of route alternatives, and next steps.
Huron Wendat Nation	August 28, 2015	Meeting to discuss the study, existing conditions, Stage 1 Archaeological Assessment, evaluation of route alternatives, and next steps.
Six Nations of the Grand River	August 31, 2015	Meeting to discuss environmental existing conditions, Stage 1 Archaeological Assessment, and short list of route alternatives.
Six Nations of the Grand River	September 18, 2019	Meeting to discuss Stage 1 Archaeological Assessment.
Mississaugas of the Credit First Nation	October 23, 2019	Meeting to discuss the now set-aside impact assessment study, technically preferred route, FAA, existing environmental conditions, Stage 1 Archaeological Assessment, community value planning, and commemoration.
Huron Wendat Nation	November 14, 2019	Meeting to discuss EA Study, FAA, Stage 1 Archaeological Assessment, community value planning, commemorative installation strategy process.
Six Nations of the Grand River	January 8, 2020	Meeting to discuss draft technically preferred route, FAA, existing environmental conditions, Stage 1 Archaeological Assessment, community value planning, and commemorative installation strategy process.
Mississaugas of the Credit First Nation	June 23, 2020	Meeting to discuss the now set-aside impact assessment study, technically preferred route, FAA, existing environmental conditions, Stage 1 Archaeological Assessment, community value planning, and commemorative installation strategy process.
Huron Wendat Nation	September 10, 2020	Meeting to discuss the EA study, preferred route, FAA changes made since PIC #2, community value planning, commemorative installation strategy process, and next steps.

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Indigenous Community	Meeting Date	Summary of Meeting Purpose/Topic
Mississaugas of the Credit First Nation	November 2, 2020	Meeting to discuss the previous Stage 2 EA study, preferred route, FAA changes made since PIC #2, community value planning, and commemorative installation strategy process.
Mississaugas of the Credit First Nation	June 9, 2021	Meeting to discuss the now set-aside impact assessment designation, overview of summaries of fieldwork completed for phase 1 investigations and upcoming field investigations, and the community value planning process.
Six Nations of the Grand River	June 22, 2021	Meeting to discuss the now-set aside impact assessment designation, summaries of field investigations, and the community value planning process.
Alderville First Nation	July 9, 2021	Meeting to discuss Preliminary Design and environmental assessment study.
Six Nations of the Grand River	August 17, 2021	Meeting to discuss capacity, traffic modelling, and the now-set aside impact assessment consultation process.
Six Nations of the Grand River	September 22, 2021	Meeting to discuss the archaeological study and archaeology work.
Six Nations of the Grand River	October 12, 2021	Meeting to discuss the now-set aside impact assessment process and Six Nation of the Grand River's participation in the process, opportunities for engagement, and ways MTO can support meaningful engagement in the impact assessment process.
Mississaugas of the Credit First Nation	October 13, 2021	Meeting to discuss the now set-aside impact assessment process and 2020 fieldwork.
Mississaugas of Scugog Island First Nation	October 20, 2021	Meeting to discuss an overview of the Stage 2 EA study and now-set aside impact assessment process, upcoming milestones, and how MTO can support meaningful engagement.
Kawartha Nishnawbe	October 27, 2021	Meeting to provide a study overview and gauge Kawartha Nishnawbe's interest in participating in the now-set aside impact assessment process.
Huron Wendat Nation	October 29, 2021	Meeting to discuss the now-set aside impact assessment study, impact assessment process, Indigenous community participation in the impact assessment, upcoming milestones, and opportunities for engagement, and how MTO can support meaningful engagement.
Mississaugas of Scugog Island First Nation	November 17, 2021	Meeting to discuss the Stage 2 EA study, 2020 fieldwork memos, Stage 1 Archaeological Assessment, and table of contents for the IPD.
Six Nations of the Grand River	November 22, 2021	Meeting with Chief and Council to discuss now-set aside impact assessment process, Six Nation of the Grand River's interest in participation, and opportunities for meaningful engagement.
Haudenosaunee Confederacy Chiefs Council as represented by Haudenosaunee Development Institute	November 23, 2021	Meeting to discuss now-set aside impact assessment process, Haudenosaunee Confederacy Chiefs Council's interest in participating in the Project, opportunities for engagement and participation, and how MTO can support meaningful engagement.
Huron Wendat Nation	December 3, 2021	Meeting to discuss 2021 PIC displays and draft IPD tables of contents.
Six Nations of the Grand River	December 7, 2021	Meeting to discuss impact assessment process, environmental memos, and PIC #3 presentation boards.
Mississaugas of Scugog Island First Nation	December 13, 2021	Meeting to review December 2021 PIC displays.
Kawartha Nishnawbe	December 17, 2021	Meeting to discuss the now-set aside impact assessment overview process.

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Indigenous Community	Meeting Date	Summary of Meeting Purpose/Topic
Six Nations of the Grand River	February 1, 2022	Meeting to discuss Stage 1 Archaeology Assessment Report, table of contents for draft IPD, and PIC #3 displays.
Hiawatha First Nation	February 15, 2022	Meeting to discuss now-set aside impact assessment process, Stage 1 Archaeology Assessment Report, and 2020 fieldwork summary memos.
Six Nations of the Grand River	March 15, 2022	Meeting to discuss IPD's gender-based analysis plus (GBA+) and the IPD review process.
Hiawatha First Nation	March 15, 2022	Meeting to discuss draft IPD table of contents, PIC #3 display materials, and IPD's GBA+.
Six Nations of the Grand River	April 8, 2022	Meeting to discuss the following IPD sections: GBA+, health impact analysis assessment, socio-economic assessment, cultural heritage and archaeology mapping, and the IPD review process.
Mississaugas of Scugog Island First Nation	April 13, 2022	Meeting to review Mississauga of Scugog Island First Nation's background, GBA+, human health impact assessment, socioeconomic impact assessment, cultural heritage and archaeology mapping.
Mississaugas of the Credit First Nation	May 2, 2022	Meeting to discuss the now set-aside impact assessment process, PIC #3 displays, draft table of contents for the initial project description prepared under the *Impact Assessment Act*, GBA+, and human health impact assessment.
Six Nations of the Grand River	July 5, 2022	Meeting to discuss the IPD review schedule and environmental and archaeology field work updates.
Curve Lake First Nation	July 12, 2022	Meeting to discuss now-set aside impact assessment process, fieldwork 2020 memos for cultural heritage and archaeology, and the Stage 1 Archaeology Assessment Report.
Six Nations of the Grand River	August 24, 2022	Meeting to discuss IPD outline, review schedule, and chapter overview.
Huron Wendat Nation	September 8, 2022	Meeting to discuss draft IPD outline, review schedule for the IPD and work plan, and overview of IPD chapters.
Six Nations of the Grand River	September 14, 2022	Meeting to discuss IPD review schedule, overview of chapters, cumulative effects framework and accommodation.
Chippewas of Rama First Nation	October 8, 2022	Meeting to provide an overview of the Project activities and the history of the Project.
Métis Nation of Ontario	October 13, 2022	Meeting to discuss the Project, including the history of the Project.
Six Nations of the Grand River	October 31, 2022	Meeting to discuss IPD's chapter on cumulative effects.
Six Nations of the Grand River	November 16, 2022	Meeting to discuss draft IPD chapter 14, and issues related to terrestrial investigations.
Huron Wendat Nation	November 30, 2022	Meeting to discuss impacts on archaeology, cumulative effects, and construction monitoring.
Chippewas of Rama First Nation	December 8, 2022	Meeting to discuss ongoing field investigations, the Project IAAC designation, SAR, the now-set aside impact assessment process, and the IPD Table of Contents.
Six Nations of the Grand River	December 14, 2022	Meeting to discuss draft IPD Chapters and Table 4-2 summary of First Nations consultation and engagement.
Six Nations of the Grand River	January 18, 2023	Meeting to discuss updates with respect to the cumulative effects framework, fieldwork and archaeology, and the species list.
Six Nations of the Grand River	February 8, 2023	Meeting to discuss socio-economic IPD chapter and the process for collecting baseline data.

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Indigenous Community	Meeting Date	Summary of Meeting Purpose/Topic
Chippewas of Rama First Nation	February 16, 2023	Meeting to provide an overview of the history of the Project and ongoing field investigations.
Six Nations of the Grand River	February 23, 2023	Meeting to discuss modelling data.
Six Nations of the Grand River	March 8, 2023	Meeting to discuss draft IPD chapter 18 'Regulatory Requirements', plain language summary structure and layout, revised species at risk list reflecting Indigenous perspective, and modifications to environmental field investigations plan.
Six Nations of the Grand River	March 27, 2023	Meeting to discuss community capacity.
■ Curve Lake First Nation ■ Hiawatha First Nation	April 11, 2023	Meeting to discuss CFL participation and project consultation.
Six Nations of the Grand River	April 12, 2023	Meeting to discuss draft IPD chapters, potential effects of the Project and potential environmental changes on federal land/land outside Canada.
Six Nations of the Grand River	May 11, 2023	Meeting to discuss potential effects of the Project, and past MTO wildlife crossing projects.
Six Nations of the Grand River	June 14, 2023	Meeting to discuss draft IPD chapters, potential effects on Indigenous groups and people, IPD plain language summary, and changes and additions to IPD chapters.
Six Nations of the Grand River	July 12, 2023	Meeting to discuss community profile, 2007-2012 consultation and engagement summary, navigable waters, overview of the draft IPD.
■ Alderville First Nation ■ Curve Lake First Nation ■ Chippewas of Rama First Nation ■ Hiawatha First Nation ■ Mississaugas of Scugog Island First Nation	July 13, 2023	Meeting to discuss draft IPD chapter overview and content outline, and plain language summary.
Six Nations of the Grand River	August 9, 2023	Meeting to discuss feedback on draft IPD and outstanding action items.
Six Nations of the Grand River	September 13, 2023	Meeting to discuss traffic modelling with MTO's System Analysis and Forecasting Office.
Six Nations of the Grand River	October 11, 2023	Meeting to discuss MTO environmental standards and policies for projects.
Huron Wendat Nation	July 13, 2023	Meeting to discuss the IPD and the now-set aside impact assessment process.
■ Alderville First Nation ■ Curve Lake First Nation ■ Hiawatha First Nation ■ Mississaugas of Scugog Island First Nation	January 13, 2025	Meeting to provide project updates including an overview of the *Highway 413 Act, 2024* including early works projects, and to discuss community capacity and ICP.
Mississaugas of the Credit First Nation	January 24, 2025	Meeting to provide project updates including an overview of the *Highway 413 Act, 2024* including early works projects, and to discuss community capacity and ICP.
Mississaugas of the Credit First Nation	March 25, 2025	Meeting to discuss community capacity.

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Indigenous Community	Meeting Date	Summary of Meeting Purpose/Topic
Huron Wendat Nation	April 2, 2025	Meeting to discuss community capacity.
Chippewas of Georgina Island First Nation	April 14, 2025	Meeting to provide project updates including an overview of the *Highway 413 Act, 2024* including early works projects, and to discuss community capacity and ICP.
Six Nations of the Grand River	April 15, 2025	Meeting to provide project updates including an overview of the *Highway 413 Act, 2024* including Early Works projects, and to discuss community capacity and ICP.
Mississaugas of the Credit First Nation	April 23, 2025	Meeting to provide Highway 413 project updates including terrestrial, aquatic, and major river crossings work.
■ Alderville First Nation Beausoleil First Nation Chippewas of Rama First Nation ■ Curve Lake First Nation ■ Hiawatha First Nation ■ Mississaugas of Scugog Island First Nation	April 24, 2025	Meeting to discuss community capacity.
Six Nations of the Grand River	May 2, 2025	Meeting to discuss community capacity and community-specific Consultation Plan.
Mississaugas of the Credit First Nation	May 22, 2025	Meeting to provide project updates and an overview of the cultural heritage assessment and evaluation work, and community-specific Consultation Plan.
■ Alderville First Nation ■ Beausoleil First Nation ■ Chippewas of Rama First Nation ■ Chippewas of Georgina Island First Nation ■ Curve Lake First Nation ■ Hiawatha First Nation Mississaugas of Scugog Island First Nation	June 9, 2025	Meeting to discuss project updates, a community-specific Consultation Plan, and overview the Terrestrial Ecosystem Impact Assessment Report, Fish and Fish Habitat Impact Assessment, and Major River Crossings.
Six Nations of the Grand River	June 17, 2025	Meeting to provide updates on the Project and an overview of the project decision making framework.
■ Alderville First Nation Beausoleil First Nation Chippewas of Rama First Nation ■ Chippewas of Georgina Island First Nation ■ Curve Lake First Nation ■ Hiawatha First Nation ■ Mississaugas of Scugog Island First Nation	July 14, 2025	Meeting to provide project updates and overview the Cultural Heritage Assessment Report and Evaluation Report.
Six Nations of the Grand River	July 15, 2025	Meeting to discuss progress and next steps for community capacity and the community-specific Consultation Plan.
Mississaugas of the Credit First Nation	July 17, 2025	Meeting to discuss Mississauga of the Credit First Nation's comments provided on technical reports.

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Indigenous Community	Meeting Date	Summary of Meeting Purpose/Topic
■ Alderville First Nation ■ Chippewas of Rama First Nation ■ Chippewas of Georgina Island First Nation ■ Curve Lake First Nation Hiawatha First Nation ■ Mississaugas of Scugog Island First Nation	August 11, 2025	Meeting to provide updates on the Project, including community capacity.
Haudenosaunee Confederacy Chiefs Council as represented by Haudenosaunee Development Institute	August 14, 2025	Meeting to provide an overview of the Project.
Six Nations of the Grand River	August 17, 2025	Meeting to provide updates on the Project, including an overview of the Cultural Heritage Report and Major River Crossings Evaluation Tables, and the introduction of a mapping exercise.
Mississaugas of the Credit First Nation	August 21, 2025	Meeting to provide project updates and overview the Socio-economic Technical Report and watercourse crossing design work.
■ Alderville First Nation ■ Chippewas of Rama First Nation ■ Chippewas of Georgina Island First Nation ■ Curve Lake First Nation ■ Hiawatha First Nation ■ Mississaugas of Scugog Island First Nation	September 9, 2025	Meeting to provide an overview of the Socio-Economic Technical Report and project updates.
Six Nations of the Grand River	September 16, 2025	Workshop to review mapping of environmental and cultural features at Highway 413.
Mississaugas of the Credit First Nation	September 18, 2025	Meeting to provide project updates and discuss community-specific Consultation Plan.
Huron Wendat Nation	September 19, 2025	Meeting to discuss community capacity and the community-specific Consultation Plan.
Haudenosaunee Confederacy Chiefs Council as represented by Haudenosaunee Development Institute	September 19, 2025	Meeting to provide a project overview including *Highway 413 Act, 2024* and early works projects, community capacity, and a community-specific Consultation Plan.
Kawartha Nishnawbe	September 22, 2025	Meeting to provide a project overview and understand Kawartha Nishnawbe's interest and community interest and capacity to participate in project consultation.

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7.1.2.5 Indigenous Communities and MTO Responses

Since November 1, 2012, Indigenous communities have participated in the consultation and engagement process and have shared concerns in respect of the Project. Concerns include those that were submitted in writing including those in response to a request for comment or in response to a Project Notice, and those expressed verbally to MTO in project meetings. **Table 7-5** summarizes concerns by key themes and identifies MTO responses. The Theme of Concern is provided in alphabetical order.

The concerns listed below are not comprehensive or exhaustive but articulate common concerns MTO heard during meetings or through written comments from Indigenous communities. The table does not identify which communities raised particular concerns. There have been changes in the legislative framework and key terms applicable to the Project, including the name and stages associated with the project work. Concerns and responses are presented as they were drafted and shared at the time.

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Table 7-5: Summary of Indigenous Community Concerns Raised and MTO Responses

Theme of Concern	Summary of Concern Raised	Summary of MTO Response
Air Quality and Climate Change	Concern over impacts to air quality and climate change from cumulative development	As part of the Preliminary Design and assessment of environmental impacts for the Project, the following reports have been completed: **Air Quality Technical Report** The technical report predicts air pollutant concentrations (µg/m³) at receptor locations using modelling. It evaluates pollution levels for the project completion year and for future years based on updated traffic modelling. **Regional Air Quality Burden Assessment Report** An inventory that quantifies the net increase/decrease of air pollutants and GHG emissions from the Project (additional tonnes PM/year, for example). **Climate Change Assessment Report** A report that assesses the Project's expected GHG emissions and its impacts on carbon sinks. It also evaluates the resilience or vulnerability of the Project to changing climatic conditions. See **Chapter 5** for more information on impact mitigation commitments that will be carried forward into Detail Design.
Built Environment	Concern over tolling of the Highway; interest in making use of Highway 407 to alleviate congestion Highway 413 is intended to relieve	There are no plans for the Project to be tolled.
Built Environment/ Cumulative Effects	Cumulative effects of development in traditional territory (e.g., loss of ability to harvest in the area)	MTO is considering how to approach potential cumulative effects in the Detail Design phase of the Project.
Community Well-Being	Impacts to human health and social well-being, including potential human trafficking implications from a new transportation corridor. Interest in long-term monitoring of outcomes and mitigation effectiveness	MTO is studying the potential positive and negative natural, social, economic, and health effects on the communities in the vicinity of the proposed route. These studies will provide estimates of the extent of these effects and outline mitigation measures. As part of Preliminary Design and the assessment of environmental impacts, the following reports were completed: **Socioeconomic Conditions Report:** A report examining the social and economic factors that exist in the project area and the influence of the Project on these factors and recommends mitigation measures. **Human Health Implications:** An adapted method for a broad assessment of positive and negative health-related impacts of transportation projects.

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Theme of Concern	Summary of Concern Raised	Summary of MTO Response
Community Well-Being	Impacts to human health and social well-being, including potential human trafficking implications from a new transportation corridor. Interest in long-term monitoring of outcomes and mitigation effectiveness	The Ministry of Children, Community, and Social Services is the Ontario ministry responsible for the government-wide strategy to address human trafficking. MTO supports the implementation of this strategy and undertakes several initiatives to ensure safe transportation options, services, and infrastructure, including in vulnerable communities; and delivering learning sessions and developing training about human trafficking. MTO will implement aspects of Ontario's Anti-Human Trafficking Strategy and Pathways to Safety in the Project during Detail Design. See **Chapter 5** for more information on impact mitigation commitments that will be carried forward into Detail Design.
Community Well-Being	Concern over any use of Census data to represent Indigenous populations due to inaccuracy	MTO acknowledges there are limitations in using Census data to represent Indigenous communities. Technical reports that use Census data have acknowledged the limitations.
Consultation Process	Concerns with capacity to participate in the Project consultation process, including with respect to review timelines amid competing priorities	Capacity funding was provided to Indigenous communities to support participation in the consultation process for the Project. In community-specific consultation plans, MTO developed review timelines that aimed to meet both the needs of the Indigenous community and the Project and provided flexibility where operationally feasible. MTO also shared technical reports as completed to allow more time for review.
Consultation Process	Concern over changes in legislative framework since project commencement in 2007 to present day	Legislative framework changes including the *Highway 413 Act*, *2024* have not impacted MTO's commitment to a meaningful consultation process or its obligations towards Indigenous communities in relation to the Duty to Consult. MTO will continue to consult with Indigenous communities by meeting directly with communities to understand their interests and concerns, and by sharing study notices and draft reports. Consultation will continue into Detail Design.
Consultation Process	Interest in/request for accommodation to communities for impacts from the Project	Through the consultation process, MTO will seek opportunities to develop accommodation measures that reflect input from Indigenous communities as appropriate. MTO has also offered to develop community-specific consultation Plans to address concerns about the consultation process and to meet the specific interests or needs of each Indigenous community. Consultation will continue into Detail Design.

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Theme of Concern	Summary of Concern Raised	Summary of MTO Response
Consultation Process	Interest in providing Indigenous communities with opportunities for providing 'consent' for the Project in the consultation process	Offered to develop individual consultation plans and continues to be open to working with Indigenous communities on how MTO can keep them informed and how best to facilitate their input on the Project. MTO has collaboratively developed community-specific consultation plans where requested that capture the details of how the Indigenous community will be consulted, including timeframes. MTO will take into consideration all input from Indigenous communities, and where possible, incorporate such input or suggestions, as it considers and balances all input received, in addition to the engineering and technical considerations and feasibility.
Cultural Heritage	Impacts to Indigenous burial sites and cultural resources along historical routes	MTO is open to working with communities and is committed to following the Standards and Guidelines for Consultant Archaeologists. See **Chapter 5** for more information on impact mitigation commitments that will be carried forward into Detail Design.
Cultural Heritage	Interest in observing in archaeology work	Indigenous communities were provided with the opportunity to observe archaeological and environmental fieldwork over the course of Preliminary Design.
Cultural Heritage	Interest in Indigenous commemorative installations related to the Project	MTO is committed to exploring and discussing the preparation of an Indigenous Commemorative Installation Strategy to appropriately reflect Indigenous presence, and history and culture in the project area. See **Chapter 5** for more information on impact mitigation commitments that will be carried forward into Detail Design.
Cultural Heritage	Concern over the list of communities being consulted	Ontario, as the Crown, has a constitutional duty to consult with Indigenous communities where it contemplates decisions or actions that may adversely impact credibly asserted or established Aboriginal or treaty rights. Ontario is committed to meeting its duty to consult with Indigenous communities.
Economic Development	Interest in economic development and participation opportunities	MTO has outlined economic development and participation opportunities within the Project as part of community-specific consultation plans.

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Theme of Concern	Summary of Concern Raised	Summary of MTO Response
Fish and Fish Habitat	Impacts to fish and fish habitat components, including at water course crossings at cold water systems, species at risk, and culturally significant or valued species. Interest in innovative mitigation.	MTO is committed to continuing to develop innovative mitigation measures in consultation with Indigenous communities during the Detail Design phase of the Project. A Fish and Fish Habitat Impact Assessment Report was prepared as part of this project and documents the existing conditions fish and fish habitat components for those watercourses crossed by the highway alignment that support fish and fish habitat, both directly and indirectly. The report also recognizes the preliminary proposed works and potential impacts to fish and fish habitat based on Preliminary Design, as well as associated mitigation measures to minimize these impacts. It includes data collection from background resources, Indigenous communities, and agency consultation, as well as field investigations conducted from 2020 to 2023. In order to minimize potential impacts on fish and fish habitat, design considerations have included (but are not limited to): ■ Spanning major valley crossings to minimize infilling of the valley features; ■ Spanning the meander belt plus 30 m riparian buffer, where feasible and practical, on Redside Dace Occupied and Recovery habitat features; ■ Minimizing the number of crossings through the highway corridor by realigning sections of channel that would require a number of crossings in a relatively short section of the watercourse (i.e., at the interchanges); ■ Ensuring roadside drainage remains separate from watercourse features that support fish directly/indirectly; ■ Designing crossings following MTO's Drainage design standards, specifically for protection of flow and fish habitat; and ■ Considering minor channel tie ins at crossing locations to short the lengths of highway culverts, also considering head and wingwalls. The assessment of potential impacts is based on the Preliminary Design and may change as the works are finalized in Detail Design, at which time the impact assessment may be updated. See **Chapter 5** for more information on impact mitigation commitments that will be carried forward into Detail Design and **Chapter 6** for a list of potential provincial, federal, or other authorizations required for the Project.
Project Purpose	Questioning of the need for the Project and/or opposition to the Project	MTO acknowledges some communities oppose the Project.
Project Purpose	Interest in the route selection process and modeling	MTO held dedicated sessions on modelling data and the route selection process with interested Indigenous communities.

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Theme of Concern	Summary of Concern Raised	Summary of MTO Response
Terrestrial Ecosystems	Impacts to terrestrial environmental components including species at risk, culturally significant or valued species, wetlands, woodlots, invasive species, and overall ecosystem connectivity.	The terrestrial ecosystems impact assessment includes an assessment of vegetation and vegetation communities, wildlife and wildlife habitat, species at risk and designated natural areas, and the management of invasive species. The assessment makes recommendations related to the terrestrial environmental components. Invasive species management measures will be developed using Standard Best Practices to prevent and control the spread of invasive plants and will be incorporated into project works. Measures applied will be compliant with relevant legislation and regulations. Wetland boundary delineation will be completed where encroachment into wetlands is anticipated. Where wetland habitat cannot be restored or is permanently impacted by the proposed highway, the Ministry shall discuss wetland compensation efforts, including enhancement of adjacent wetland communities or creation of new wetland habitat, in consultation with applicable regulators and Indigenous communities. A detailed plant inventory will be completed during future phases of the Project and documented. If regionally rare species are identified within the final limits of work, mitigation measures specific to these species will be considered and implemented. This may include targeted presence/absence surveys following applicable guidelines and protocols to support permitting and approvals for tree SAR (e.g., Black Ash [*Fraxinus nigra*], Butternut [*Juglans cinerea*]). Salvage and Transplantation measures will be developed and will include offsetting or compensation strategies for vegetation removals. To support permitting and approvals under applicable provincial and federal legislation (e.g., *Endangered Species Act, 2007**, *Species at Risk Act* [2002]), targeted presence/absence surveys will be conducted during future phases of the Project for provincially and federally protected SAR. These surveys will follow established guidelines and protocols and include the species listed below. In addition, surveys will be conducted to confirm the presence or absence of federally protected SAR habitat. An updated quantification of SAR habitat will be completed to inform permitting requirements and to guide the development of compensation or offsetting strategies for habitat loss.

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Theme of Concern	Summary of Concern Raised	Summary of MTO Response
Terrestrial Ecosystems	Impacts to terrestrial environmental components including species at risk, culturally significant or valued species, wetlands, woodlots, invasive species, and overall ecosystem connectivity.	With respect to ecosystem connectivity, the Preliminary Design of bridges/structures and drainage and SWM culverts has considered maintenance of suitable wildlife passage and has been informed by agency consultation and engagement and guidance documents; this process has been completed through an iterative, collaborative approach between the ecological, drainage and SWM and engineering teams, which will continue into Detail Design. Key locations where the design will seek to maintain and/or funnel wildlife movement include specific SAR habitats (e.g., Western Chorus Frog) and the following major riparian valley corridors of the Study Area which act as regional and local landscape level linkages: Levi Creek, Credit River, West Humber River, Robinson Creek, Main Humber River and East Humber River. Culverts will be designed to have sufficient openness ratios to allow for wildlife passage (0.6 or greater for deer, 0.4 for medium-sized mammals and 0.25 for herpetofauna) wherever practicable. Other recommended characteristics for ecopassages will also be considered. See **Chapter 5** for more information on impact mitigation commitments that will be carried forward into Detail Design.
Terrestrial Ecosystems	Concern over impacts to the Greenbelt	The Greenbelt Plan acknowledges the necessity of building infrastructure and allows for existing, expanded, or new infrastructure in the Greenbelt if the infrastructure serves the significant population growth expected in southern Ontario. The Guideline for Planning and Design of the GTA West Corridor (now Highway 413*)* Through the Greenbelt (2013) or the Greenbelt Guideline, was prepared with input from the GTAG. The Greenbelt Guideline's planning and design principles were used during the planning and preliminary design phase and will continue to be incorporated and referenced throughout Detail Design and implementation. See **Chapter 3** for more information on design considerations in the Greenbelt.
Terrestrial Ecosystems	Interest in innovative mitigation measures	MTO is committed to continuing to develop innovative mitigation measures in consultation with Indigenous communities during the Detail Design phase of the Project. See **Chapter 5** for more information on impact mitigation commitments that will be carried forward into Detail Design.

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7.2 Draft Environmental Impact Assessment Report Comment Period

In accordance with the *Highway 413 Act, 2024*, notice of the draft EIAR has been given to every Indigenous community that is listed in the Indigenous consultation plan prepared under Section 4 of the *Highway 413 Act, 2024*. The draft EIAR has been made available to Indigenous communities for review on the Project Website, through direct delivery, and electronic transfer and e-mail. The draft EIAR is available for comment from December 1, 2025 to January 6, 2026.

A summary of concerns raised during the review of the draft EIAR along with a summary of how concerns have been considered will be summarized in the final EIAR.

7.3 Final Environmental Impact Assessment Report

Upon completion of the draft EIAR, the updated EIAR will be finalized in accordance with the *Highway 413 Act, 2024* and will be distributed to Indigenous communities.

7.3.1 Continuing Indigenous Consultation and Engagement on the Highway 413 Project

MTO will continue to consult and engage with Indigenous communities during subsequent phases of the Project. MTO remains committed to fulfilling the duty to consult, and where appropriate accommodate, Indigenous communities consistent with section 35 of the *Constitution Act, 1982*. Please see **Chapter 10** for further details on the Project's next steps.

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8. Consultation and Engagement

8.1 Overview of Consultation and Engagement Process

This chapter summarizes the consultation and engagement activities undertaken after November 1, 2012 with government agencies, municipalities, advisory groups, key stakeholders, and the broader public. Consultation and engagement was undertaken at key project milestones to provide progress updates and opportunities to review, submit comments and share feedback for consideration by MTO. This chapter also summarizes comments and concerns submitted by members of the public and actions taken by MTO to respond to concerns. Consistent with the requirements of the *Highway 413 Act, 2024*, this information is summarized in the Record of Consultation and Engagement which is provided in **Appendix A** of this report.

Please refer to **Chapter 7** for a summary of engagement and consultation with Indigenous communities undertaken after November 1, 2012 for the Preliminary Design phase of the Project.

8.1.1 Previous Consultation and Engagement on the Highway 413 Project

The planning and design process for the Highway 413 Project (formerly known as the GTA West Transportation Corridor) commenced in 2007 with the development of the Terms of Reference which provided the framework for preparing the comprehensive EA. The consultation and engagement requirements outlined in the comprehensive EA process (formerly known as an individual environmental assessment) were adhered to. The Project is now following the requirements of the *Highway 413 Act, 2024*. The considerable work undertaken to advance the Project since 2007, including technical studies and consultation and engagement, were carried forward to meet the requirements of this Act.

The first stage of the former EA process spanned 2007 to 2012, featured multiple rounds of consultation and engagement, and resulted in the TDS. During that time, MTO hosted a series of PICs and public consultation sessions and engaged in regular meetings with municipalities and agencies at key milestones. Project progress updates were provided during consultation and engagement opportunities and community input on emerging findings and alternatives were gathered. The completed GTA West Corridor Environmental Study: Transportation Development Strategy Report (2012) is publicly available and includes a full record of consultation conducted during this phase.

During the development of the Preliminary Design, undertaken after November 1, 2012, the Project followed this previously established consultation and engagement framework – hosting PICs, advisory group meetings, key stakeholder engagements and community outreach – to help inform and refine the design details of the Project. This indicates a continuous thread of stakeholder understanding and influence, from initial planning through to the design phase.

8.1.2 Consultation and Engagement Approach During the Development of Preliminary Design

Consultation and engagement is an integral part of the development of the Preliminary Design phase. It provides an opportunity for two-way communication between MTO and interested persons. Consultation activities provide a forum for concerns to be raised and considered by the ministry early in the decision-making process, including those related to design, the environment, and community issues.

The consultation and engagement approach for the Project considers consultation objectives and methods, communication strategies, and documentation mechanisms. This approach guides MTO in their efforts to consult with the public and stakeholders as well as respond to interests and concerns.

The consultation and engagement approach includes the following objectives:

- Notify stakeholders (public and external Regulatory Agencies, etc.) of the intention to carry out the Project;
- Use appropriate notification methods to reach the range of stakeholders;
- Consult with directly affected stakeholders;
- Provide timely opportunities for stakeholder input;
- Use all reasonable efforts to resolve questions and concerns that may arise,
- Constructively address input during the Project;
- Show how input received has been considered for the Project; and
- Comply with the consultation and engagement requirements of the *Highway 413 Act*, *2024*.

To meet the objectives noted above, MTO has been:

- Maintaining a Project Contact List of interested stakeholders;

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- Providing stakeholders with access to Project information in a timely manner, which enables them to provide input and participate in a meaningful way;
- Engaging the broader community and considering all input and differing points of view;
- Promoting a cooperative and productive consultation environment that recognizes the value of dialogue and accepts that everyone may not agree with every decision;
- Proactively engaging in consultation to address issues as they arise;
- Being responsive and flexible in the consultation approach to accommodate stakeholders' needs through addition, or modification, of consultation opportunities and forums; and
- Maintaining a Project Website, Project Email, and Project Telephone Number:
  - Project Website (www.highway413.ca).
  - Project Email (project_team@highway413.ca).
  - Project Telephone Number (1-877-522-6916) (toll-free).

Throughout the consultation and engagement process for the Preliminary Design, MTO received over 9,000 comments from the public, via the Project Email or Project Telephone Number. This is in addition to the comments received by MTO at various community, agency, and stakeholder meetings and the four rounds of PICs.

It is worth noting that, although the *Highway 413 Act, 2024*, applies to all activities after November 1, 2012, there were no consultation and engagement activities until the release of the Notice of Study Commencement in February of 2014. As such, all consultation and engagement activities recorded in this Chapter begin after that date and continue up to the publication of the draft EIAR.

8.1.3 Project Contact List

MTO maintains a Project Contact List including federal and provincial regulatory agencies, municipalities, advisory groups, key stakeholders and the broader public. To date, this list has been contacted in the following ways:

- Emails via Project Email address (Project_team@highway413.ca);
- Mailings/notifications (via physical mail or email);
- Newspaper advertisements;
- Distributions of brochure notifications (copy of the Ontario Government Notice) through Canada Post Neighbourhood Mail to relevant residences and businesses;
- Meetings and correspondence with municipalities;
- Correspondence with technical stakeholders, local community groups and property owners;
- Invitations to consultation and engagement events; and
- Virtual consultation and engagement activities:
  - As a result of the public health measures linked to COVID-19 in 2020, 2021 and 2022 that restricted large in-person gatherings, MTO held virtual consultation and engagement events (e.g., meetings with technical stakeholders and virtual PICs) by leveraging various platforms (i.e., Microsoft Teams/Zoom/the Project Website). As members of the public and other stakeholders became familiar with virtual engagement platforms and methods, MTO continued to offer virtual consultation and engagement events throughout the Project. Virtual engagement platforms can provide the opportunity to address accessibility needs as they arise or offer flexibility to those who cannot attend in person due to childcare needs, work requirements, transportation barriers etc.

8.1.4 Record of Consultation and Engagement

MTO is responsible for maintaining a Record of Consultation and Engagement related to the Project which includes the following:

- Notification materials distributed throughout the Project;
- Records of Meetings;
- PIC materials and Summary Reports; and
- A summary of consultation and correspondence with external agencies (including provincial ministries and agencies, federal departments, and conservation authorities), municipalities, and members of the public.

This Record of Consultation and Engagement is provided in **Appendix A** of this Report:

- **Appendix A-1** contains a summary of all public comments and concerns as well as MTO responses since 2012. All personal information related to members of the public has been redacted in accordance with the *Freedom of Information and Protection of Privacy Act.*

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- **Appendix A-2** contains the key notice materials prepared from the Notice of Study Commencement until the publication of the draft EIAR.
- **Appendix A-3** contains a summary of meetings held with agencies, municipalities, interest groups, and other stakeholders from the Notice of Study Commencement until the publication of the draft EIAR.
- **Appendix A-4** contains the reports summarizing each of the four PICs held between November 2014 and October 2023.

8.1.5 Feedback from Consultation and Engagement

Feedback from various consultation and engagement opportunities was an important part of the Preliminary Design process. This chapter and **Appendix A-1** and **Appendix A-3** include information on the feedback received and MTO's response at the time.

For more detailed discussion on how the consultation and engagement process has informed and influenced the Preliminary Design of the Project, please refer to **Chapter 3**.

8.2 Project Notices

Table 8-1 provides an overview of the notices and letters that were prepared and distributed to the Project Contact List and posted in newspapers and on the Project website as part of the Preliminary Design phase. Copies of all notices and letters are provided in **Appendix A-2** of this Report.

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Table 8-1: Summary of Project Notices and Letters

Consultation Methods	Notice/Letter Purpose	Additional Details	Notices
Project Website	To provide an ongoing opportunity for the public and stakeholders to review up-to-date Project information, download reports and project materials, and to contact MTO. The website has and continues to be well-used throughout the lifespan of the Project and is routinely used for comments, contact list additions, and questions.	Key Project Notices and Bulletins can be found on the Project Website.	Please visit: https://highway413.ca/en/background-and-reports/
Notices, Letters & Reports (via Contact List)	The Highway 413 Project Contact List that was started at the beginning of the Project in 2007 continues to be maintained. The list contains contact information for municipal, provincial, and federal representatives, area interest groups (ratepayers associations, environmental groups, agricultural groups, etc.) and interested stakeholders that submitted requests through the Project Website (webform), e-mail, fax, phone or letter, as well as individuals or groups that signed in at engagement events, indicating an interest in receiving updates about the Project and its milestones. Notices and letters were provided to the contact list with information about project milestones, invitations to events, and/or requests for PTE. Communications that are sent to the contact list include a reminder that people can ask to be removed from the list at any time.	Copies of all notices and letters are provided in **Appendix A-2** of this Report.	■ Notice of Study Commencement (English) (February 2014); ■ Notice of Study Commencement (French) (February 2014); ■ Introductory Community Workshops Invitation Letter (April 2014); ■ Notice of Community Workshop #1 Postponement (May 2014); ■ Invitation to Truck Priority Systems Workshop (May 2014); ■ Invitation to Rescheduled Community Workshop #1 (July and August 2014); ■ Notice of PIC #1 (English/French) (November 2014); ■ Permission to Enter Letter for 2015 Field Investigations (March 2015); ■ Invitation to Community Workshop #2 (May 2015); ■ 2015 Focused Analysis Area Fact Sheet (June 2015); ■ Study Suspension Notice (December 2015); ■ Notice of Study Area Protection (February 2018); ■ GTA West Study Resumption Bulletin (June 2019); ■ Notice of PIC #2 (English/French) and Community Value Plan Meeting #1 (September 2019); ■ Phase 1 Permission to Enter Letter (February 2020); ■ Notice of Engagement Options with Indigenous Communities During the COVID-19 Pandemic (June 2020); ■ Preferred Alignment and 2020 Focused Analysis Area Bulletin (August 2020); ■ Invitation to Community Value Plan Meeting #2 (English) (September 2020); ■ Phase 2 Permission to Enter Letter (October 2020); ■ Invitation to Community Value Plan Meeting #3 (English) (April 2021); ■ Notice of Community Engagement Webinar #1 (English/French) (July 2021);

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Consultation Methods	Notice/Letter Purpose	Additional Details	Notices
Notices, Letters & Reports (via Contact List)	The Highway 413 Project Contact List that was started at the beginning of the Project in 2007 continues to be maintained. The list contains contact information for municipal, provincial, and federal representatives, area interest groups (ratepayers associations, environmental groups, agricultural groups, etc.) and interested stakeholders that submitted requests through the Project Website (webform), e-mail, fax, phone or letter, as well as individuals or groups that signed in at engagement events, indicating an interest in receiving updates about the Project and its milestones. Notices and letters were provided to the contact list with information about project milestones, invitations to events, and/or requests for PTE. Communications that are sent to the contact list include a reminder that people can ask to be removed from the list at any time.	Copies of all notices and letters are provided in **Appendix A-2** of this Report.	■ Invitation to Community Engagement Webinar #1 (English) (July 2021); ■ Notice of Community Engagement Webinar #2 (English/French) (September 2021); ■ Invitation to Community Engagement Webinar #2 (English) (September 2021); ■ Invitation to Federal Impact Assessment Process Meeting (September 2021); ■ Notice of PIC #3 (English/French) (December 2021); ■ Phase 2 Round 2 Permission to Enter Letter (February 2022); ■ Phase 3 Permission to Enter Factsheet (December 2022); ■ Phase 3 Permission to Enter Letter (May 2023); ■ Notice of PIC #4 (English/French) (September 2023); ■ Notice of Navigable Waterways Survey (French/English) (January 2024); ■ Notice of Cumulative Effects Framework Survey (French/English) (October 2024); ■ 2024 Draft Focused Analysis Area Bulletin (French/English) (November 2024); ■ Invitation to the Highway 413 Landowner Information Session (January 2025); ■ Phase 4 Permission to Enter Letter (April 2025); ■ Invitation to the Highway 413 Landowner Meetings (April and May 2025); ■ 2025 Focused Analysis Area Bulletin (French/English) (May 2025); ■ Notice of Highway 413 Early Works (French/English) (September 2025) ■ Notice of Draft Environmental Impact Assessment Report (December 1, 2025; and ■ Notice of Final Environmental Impact Assessment Report (TBD).

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Consultation Methods	Notice/Letter Purpose	Additional Details	Notices
Newspaper Notices	Newspaper notices announcing each round of PICs and engagement webinars were published in newspapers with circulation along the Highway 413 Route. The notices provided an update on the Project's progress, notification of the dates and locations of respective PICs, a key map for context and contact information for MTO.	Notices announcing PICs and engagement webinars were published in as many active newspapers within the Highway 413 Route as possible; however, not every newspaper published a notice every time. See more information on select newspaper notices in individual PIC Summary Reports in **Appendix A-4**.	Newspapers: ■ Toronto Star; ■ The Guelph Mercury (until January 2016); ■ Mississauga News; ■ Brampton Guardian; ■ (Bolton) Caledon Enterprise; ■ Vaughan Citizen; ■ Guelph Tribune (Guelph Mercury Tribune after January 2016); ■ Georgetown Acton Independent Free Press; ■ Milton Canadian Champion; ■ Caledon Citizen; ■ King Township Sentinel; ■ Erin Advocate; ■ Le Metropolitan (French); ■ L'Express, formerly L'Express de Toronto (French); ■ Turtle Island News; and ■ Two Row Times.

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8.2.1 Permission to Enter

To facilitate the development of the Preliminary Design for the Project, PTE was sought for properties where field investigations were required. Field investigations were conducted to inventory existing environmental and engineering conditions within and surrounding the Highway 413 Route. PTE grants MTO temporary access to private property with the consent of the property owner(s) to conduct these investigations. Properties were identified and contact information for the property owners was collected from property ownership and land registry databases by MTO. The following contact methods were utilized as required to solicit PTE from property owners:

- Emails were sent to property owners using email addresses collected by MTO;
- A Permission to Enter Package, which included a Permission to Enter Notice, Permission to Enter Form, and Permission to Enter Fact Sheet, were sent to property owners using mailing addresses, and/or email addresses collected by MTO;
- Phone calls were made using telephone numbers collected by MTO;
- Internet searches (e.g., Google, Canada Post, Canada411.com) were undertaken to find missing contact information (mailing addresses, email addresses, telephone numbers) and above listed contact methods were also utilized with the new information;
- Municipalities were consulted to obtain revised/updated contact information (e.g., property addresses) and above listed contact methods were utilized with the new information;
- Hand-delivered Permission to Enter Packages were distributed by MTO in accordance with government restrictions and relevant health and safety plans to properties with physical structures who had not responded to previous contact attempts; and
- *Public Transportation and Highway Improvement Act* Section 6 letters were distributed to secure access to properties where PTE was not obtained, for essential fieldwork needed to deliver the Project.

8.2.2 Landowner Notification

Once the Preliminary Design was available, MTO distributed Property Owner Notification letters to all landowners with properties anticipated to be impacted by the Project. These letters were sent between April 25, 2025 and May 20, 2025 to landowners with valid mailing addresses. Maps were included with the letter to supplement the information provided about MTO's property acquisition process and the invitation to engage with MTO to learn more.

Please refer to **Section 8.4.7** for more details on consultation with potentially impacted and identified landowners.

8.2.3 Focused Analysis Area Notification

During the development of the Highway 413 Preliminary Design, MTO developed the Focused Analysis Area to inform stakeholders about which properties were within the Project's area of interest. As the Preliminary Design progressed, the Focused Analysis Area was refined and each contact on the Project Contact List was notified of the revision as well as the rationale for any changes. Refinements to the Focused Analysis Area and subsequent notifications were shared in May 2015, August 2020, November 2024, and May 2025.

8.2.4 Waterways Navigation and Usage Communication and Letters

To further understand navigability of waterways and usage within the Highway 413 Route, input was sought from Indigenous communities and members of the public to confirm past, present, or potential future uses of waterways. One way feedback was collected was through a Navigable Waterways Survey. The Survey was open on the Project website for a 30-day comment period (July 2024 – August 2024) to gain feedback from project stakeholders on the use of waterways within the Study Area. 57 public survey submissions were received via the Project website.

In addition to the online survey, MTO continues to consult and engage with Indigenous communities whose Aboriginal and/or treaty rights may be adversely affected by the Highway 413 Project.

8.3 Municipal, Elected Officials, and Regulatory Agency Consultation

8.3.1 Engagement with Municipalities and Elected Officials

8.3.1.1 Overview

Since 2012, numerous meetings and presentations have been made to staff and elected officials of the regional and local municipalities located in proximity to and interested in the Project. A summary of these groups and meetings held to date is presented below. The lists below identify a selection of key meetings and are not exhaustive, as MTO met regularly with municipal elected officials and staff both formally and informally throughout the development of the Preliminary Design. Summaries for a selection of these meetings can be found in **Appendix A-3**.

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8.3.1.2 Meetings and Presentations to Municipal Councils, Committees, or Staff

Municipal councils, committees, and staff from the following regions and municipalities were engaged throughout the Project at key milestones:

- Halton Region;
- Town of Halton Hills;
- Town of Milton;
- Peel Region;
- City of Mississauga;
- City of Brampton;
- Town of Caledon;
- York Region;
- King Township; and
- City of Vaughan.

The following is a list of key presentations or meetings held with municipal or regional committees councils, or staff that occurred throughout the development of the Preliminary Design:

- Peel Region Council (February 13, 2014);
- Peel Region, City of Brampton and Town of Caledon (August 11, 2014);
- Halton Region and Town of Halton Hills (August 13, 2014);
- York Region and City of Vaughan (August 18, 2014);
- Halton Region Planning and Public Works Committee (February 18, 2015);
- Town of Halton Hills Council (March 3, 2015);
- York Region Council (March 5, 2015);
- City of Vaughan Priorities and Key Initiatives Committee (March 10, 2015);
- Town of Caledon Council (March 10, 2015);
- Peel Region Council (March 26, 2015);
- City of Brampton Planning and Infrastructure Committee (March 30, 2015);
- Halton Region, Town of Halton Hills, Town of Milton, and City of Mississauga (March 31, 2015);
- York Region, City of Vaughan, and Township of King (March 31, 2015);
- Peel Region, City of Brampton, and Town of Caledon (April 1, 2015);
- Peel Region, York Region, City of Vaughan, and City of Brampton – Highway 50 / Mayfield Road / Coleraine Drive Interchanges Working Meeting (May 12, 2015);
- Town of Caledon – Highway 50 / Mayfield Road / Coleraine Drive Interchanges Working Meeting (May 20, 2015);
- Halton-Peel – Working Group Meeting (June 24, 2015);
- York-Vaughan-King – Working Group Meeting (June 29, 2015);
- Caledon-Peel – Highway 410 Alternatives Meeting (August 14, 2015);
- York Region, City of Vaughan, and HDR – North Vaughan Transportation Master Plan (September 8, 2015);
- Follow-Up Municipal Meeting Regarding Interchanges (October 16, 2015);
- Halton Region Council (October 16, 2019);
- Peel Region, City of Brampton, and Town of Caledon – Discuss option for Coleraine Drive Interchange (October 17, 2019);
- Peel Region Council (October 24, 2019);
- Town of Halton Hills Planning, Public Works and Transportation Committee (October 29, 2019);
- Township of King Council (November 4, 2019);
- York Region Council (November 7, 2019);
- City of Vaughan Council (November 12, 2019);
- Town of Caledon Council (November 19, 2019);
- Town of Caledon, City of Brampton, and Peel Region – Coleraine Drive Interchange Alternatives Meeting (November 28, 2019);

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- York Region and City of Vaughan – To discuss Section 8 (May 8, 2020);
- Town of Caledon – Discussing options for the Highway 410 extension (May 22, 2020);
- Peel Region - Discuss Bovaird Drive Project from West of Heritage Road to Mississauga Road (June 9, 2020);
- York Region and City of Vaughan – Meeting to discuss Pine Valley Drive (June 10, 2020);
- Town of Caledon Council (July 7, 2020);
- City of Mississauga – Preliminary Design Meeting (November 30, 2020);
- City of Brampton – Meeting to discuss Heritage Heights Boulevard Concept (December 8, 2020);
- York Region and City of Vaughan – Design Speed Meetings (December 11 and 17, 2020);
- Town of Halton Hills Council (December 14, 2020);
- Peel Region SP47 – Meetings about A2 Road Alignment (January 27, 2021, and February 5, 2021);
- York Region Council (March 18, 2021);
- Peel Region – Meeting about Bovaird Drive (May 4, 2022);
- Peel Region and City of Brampton – Meeting about Coleraine Drive Treatment (May 26, 2021);
- City of Brampton – Meeting about Financial Drive (July 13, 2022);
- Peel Region – Meeting about Humber Station Road (August 24, 2022);
- City of Vaughan Committee of the Whole – Project and federal Impact Assessment Process Update (November 20, 2021);
- City of Mississauga General Committee – Project and federal Impact Assessment Process Update (December 1, 2021);
- York Region Committee of Whole – Project and federal Impact Assessment Process Update (January 13, 2022);
- Halton Region and Halton Hills – Project update and coordination meeting (January 14, 2022)
- Town of Halton Hills Council – Project and federal Impact Assessment Process Update (January 17, 2022);
- Halton Region Council – Project and federal Impact Assessment Process Update (January 19, 2022);
- Township of King Council – Project and federal Impact Assessment Process Update (January 24, 2022);
- Peel Region Council – Project and federal Impact Assessment Process Update (January 27, 2022);
- Town of Caledon – Coordination meeting regarding Triangle Lands feasibility study (April 12, 2023);
- Halton Region – Coordination meeting regarding Premier Gateway wastewater servicing; (August 3, 2023)
- Town of Halton Hills Council – Project Update (November 20, 2023);
- City of Mississauga General Committee – Project Update (January 10, 2024);
- York Region Council - Highway 413 Transportation Corridor Public Information Centre and Preliminary Design Project Update (March 21, 2024);
- City of Vaughan and Region of York – Coordination meeting regarding Block 34 transportation improvements (May 23, 2024);
- Town of Caledon – Coordination meeting regarding George Bolton Pkwy extension (April 7, 2025);
- Peel Region – Coordination meeting with Airport Rd widening team (April 3, 2025);
- Peel Region – Coordination meeting with Victoria Feedermain's team (July 22, 2025);
- City of Brampton – Coordination meeting with Heritage Heights team (August 21, 2025);
- Peel Region – Coordination meeting with Mayfield Rd Widening team (August 22, 2025);
- Peel Region – Coordination meeting with Flow South Caledon Program team (September 17, 2025)

8.3.1.3 Municipal Advisory Group

A MAG was formed during the early stages of the Project and included representatives from all municipalities in the Highway 413 Route. The MAG provided input from a municipal and regional perspective and was a forum for the discussion of local planning and technical issues. Members

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include staff from Halton, Peel, and York Regions, as well as the municipalities of the Town of Halton Hills, Town of Milton, City of Brampton, City of Mississauga, Town of Caledon, City of Vaughan and the Township of King.

- MAG #1 (June 16, 2014) – to provide an overview of the Project background, process, and schedule, and review the overall consultation program and key study issues;
- MAG #2 (November 7, 2014) – to gain feedback on the short list of alignment alternatives and provide details of the upcoming PIC;
- MAG #3 (May 11, 2015) – to discuss the approach for evaluating the short list of alignment alternative and discuss trade-offs in the west, central, and east sections of the Highway 413 Route;
- MAG #4 (November 13, 2019) – to discuss the evaluation of short-listed alignment and interchange location alternatives, Technically Preferred Alignment, and 2019 Focused Analysis Area, as well as to discuss potential issues to inform the Preliminary Design of the Technically Preferred Alignment;
- MAG #5 (July 2023) - to discuss key design features; and
- MAG #6 (November 2024) – to provide an update on the draft Preliminary Design.

8.3.1.4 Municipal Executive Advisory Group

The Municipal Executive Advisory Group (MEAG) is a forum for the discussion of broad, strategic, and inter-regional transportation issues. Members include senior staff from Halton, Peel, and York Regions, as well as Metrolinx. Two MEAG meetings were held during the development of the Preliminary Design. They included:

- MEAG #1 (September 24, 2014) – to provide an overview of the Project background, process, and schedule, to review the long list of alignment alternatives, and to discuss means of coordination with municipal planning initiatives; and
- MEAG #2 (October 9, 2019) – to review the rationale for the draft Technically Preferred Alignment and interchange locations, the draft Focused Analysis Area, information on the proposed transitway and the screening of the goods movement features.

8.3.1.5 Municipal Workshops

The following Municipal Workshops on the development of the Preliminary Design have been held with the identified regions or municipalities. The workshops provided opportunities to share design updates and ensure the Preliminary Design accurately reflected existing and planned municipal infrastructure such as lane widths, posted speed limits, and active transportation infrastructure.

Preliminary Design Municipal Workshop #1

- York Region, City of Vaughan, and Township of King (October 21, 2020);
- Halton Region and Town of Halton Hills (October 22, 2020); and
- Peel Region, City of Brampton, Town of Caledon, and City of Mississauga (October 28, 2020).

Preliminary Design Municipal Workshop #2

- Halton Region and Town of Halton Hills (February 22, 2021);
- York Region, City of Vaughan, and Township of King (February 24, 2021);
- Town of Caledon and Peel Region (February 26, 2021);
- City of Brampton (March 31, 2021); and
- Town of Caledon (April 7, 2021).

Preliminary Design Municipal Workshop #3

- York Region, City of Vaughan and Township of King (June 22, 2021);
- Halton Region and Town of Halton Hills (June 23, 2021);
- Peel Region, Town of Caledon, and City of Mississauga (June 23, 2021); and
- City of Brampton (June 25, 2021).

Federal Impact Assessment Municipal Workshops

- Peel Region, Town of Caledon, and City of Mississauga (November 9, 2021);
- Halton Region and Town of Halton Hills (November 12, 2021);
- York Region, City of Vaughan and Township of King (November 15, 2021); and
- City of Brampton (November 17, 2021).

Preliminary Design and Initial Project Description Municipal Workshops

- Halton Region, Town of Halton Hills and Town of Milton (July 25, 2023);
- York Region, City of Vaughan and Township of King (July 26, 2023);

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- Peel Region, Town of Caledon, City of Brampton and City of Mississauga (August 3, 2023); and
- Peel Region, Town of Caledon, City of Brampton and City of Mississauga (August 23, 2023).

Draft Preliminary Design Municipal Workshops

- Halton Region, Town of Halton Hills, Town of Milton, City of Mississauga (June 18, 2025);
- York Region, City of Vaughan (June 19, 2025);
- Peel Region, City of Brampton (June 26, 2025);
- Peel Region, Town of Caledon (July 2, 2025); and
- Township of King (July 4, 2025).

Additional meetings between MTO and municipal representatives have occurred on a semi-regular basis to provide regular project updates and ensure alignment between municipal and provincial priorities.

8.3.2 Engagement with Regulatory Agencies

MTO also engaged with regulatory agencies with a legislative mandate or interest in the Project through an advisory group, individual meetings, and a Bilateral Federal-Provincial Working Group. A summary of these various meetings and engagements is below.

8.3.2.1 Regulatory Agency Advisory Group

A RAAG was established, which included representatives from relevant provincial ministries, agencies, and federal departments. The working group was a forum to discuss local planning, environmental and technical issues.

Five RAAG meetings were held during the development of the Preliminary Design. They included:

- RAAG #1 (June 16, 2014) – to provide an overview of the Project background, process, and schedule, and review the overall consultation program and key study issues;
- RAAG #2 (November 7, 2014) – to gain feedback on the preliminary short list of alignment alternatives and provide details on the upcoming PIC;
- RAAG #3 (May 11, 2015) – to discuss the approach for evaluating the short list of alignment alternatives and discuss trade-offs in the west, central, and east sections of the Highway 413 Route;
- RAAG #4 (November 13, 2019) – to discuss the evaluation of short-listed alignment and interchange location alternatives, Technically Preferred Alignment, and 2019 Focused Analysis Area, as well as to discuss potential issues to inform the Preliminary Design of the Technically Preferred Alignment; and
- RAAG #5 (December 5, 2024) - to provide an update on the draft Preliminary Design.

8.3.2.2 Other Agency Meetings

In addition to the RAAG meetings, MTO met regularly with agencies, such as provincial ministries and conservation authorities to provide Project updates and discuss the development of the Preliminary Design, including:

- City of Brampton staff, North-West Brampton Heritage Heights Landowner Group, and Credit Valley Conservation (March 24, 2014);
- Ministry of Municipal Affairs and Housing (April 30, 2014);
- Combined Meetings with the Canadian Environmental Assessment Agency and Ministry of Environment Conservation and Parks (May 27, 2014);
- North West Brampton Area 47 – Working Group Meeting (June 13, 2014);
- Combined Environmental Discipline Working Group Meetings with Ministry of Natural Resources and Forestry, Toronto and Region Conservation Authority, Credit Valley Conservation Authority, and Conservation Halton (August 26, 2014);
- Ministry of Agriculture, Food and Rural Affairs (August 27, 2014);
- Combined Meetings with the Canadian Environmental Assessment Agency and Ministry of Environment Conservation and Parks (November 14, 2014);
- Toronto and Region Conservation Authority (April 24, 2015);
- Environment and Climate Change Canada regarding the Ecological Gifts (EcoGift) Program (June 15, 2015);
- Toronto and Region Conservation Authority (June 19, 2015);
- Credit Valley Conservation Authority (July 23, 2015);
- Conservation Halton (August 4, 2015);
- Ministry of Agriculture, Food and Rural Affairs (August 19, 2015);

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- Combined Environmental Discipline Working Group Meetings with Ministry of Natural Resources and Forestry, Toronto and Region Conservation Authority, and Credit Valley Conservation Authority (August 21, 2015);
- Conservation Halton (August 25, 2015);
- Combined Meetings with Ministry of Natural Resources and Forestry and the Ministry of Environment Conservation and Parks (Species at Risk Branch) (January 9, 2020);
- Ministry of the Environment, Conservation and Parks (Environmental Assessment Branch) (January 24, 2020);
- Toronto and Region Conservation Authority (January 24, 2020);
- Combined Environmental Discipline Working Group Meetings with Ministry of Natural Resources and Forestry, Toronto and Region Conservation Authority, Credit Valley Conservation Authority, Conservation Halton, and Fisheries and Oceans Canada (January 30, 2020);
- Ministry of Natural Resources and Forestry, Ministry of Environment Conservation and Parks, Ministry of Agriculture, Food and Rural Affairs, and Toronto and Region Conservation Authority (May 21, 2020);
- Conservation Halton (September 30, 2020);
- Toronto and Region Conservation Authority (October 6, 2020);
- Ministry of Agriculture, Food and Rural Affairs (October 22, 2020);
- Credit Valley Conservation Authority (December 10, 2020);
- Toronto and Region Conservation Authority (March 4, 2021);
- Toronto and Region Conservation Authority (March 22, 2021);
- Toronto and Region Conservation Authority (March 26, 2021);
- Ministry of Natural Resources and Forestry and Ministry of Environment Conservation and Parks (April 9, 2021);
- Toronto and Region Conservation Authority (April 14, 2021);
- Toronto and Region Conservation Authority (April 27, 2021);
- Ministry of Agriculture, Food and Rural Affairs (May 5, 2021);
- Environment and Climate Change Canada (Canadian Wildlife Services Branch) and the Impact Assessment Agency of Canada (June 29, 2021);
- Combined Meetings with Ministry of Natural Resources and Forestry and the Ministry of Environment Conservation and Parks (Species at Risk Branch) (August 6, 2021);
- Ministry of Heritage, Sport, Tourism and Culture Industries (October 12, 2021);
- Toronto and Region Conservation Authority (December 13, 2021);
- Ministry of the Environment, Conservation and Parks (Species at Risk Branch) (March 3, 2022);
- Ministry of the Environment, Conservation and Parks (Environmental Assessment Branch) (May 18, 2022);
- Credit Valley Conservation Authority (June 13, 2022);
- Toronto and Region Conservation Authority (June 13, 2022);
- Ministry of Agriculture, Food and Rural Affairs (July 26, 2022);
- Ministry of the Environment, Conservation and Parks (Species at Risk Branch) (September 14, 2022);
- Toronto and Region Conservation Authority (October 17, 2022);
- Fisheries and Oceans Canada, Credit Valley Conservation Authority, Toronto and Region Conservation Authority and Ministry of Environment Conservation and Parks (December 7, 2022);
- Credit Valley Conservation Authority (December 12, 2022);
- Conservation Halton (December 15, 2022);
- Fisheries and Oceans Canada (February 1, 2023);
- Ministry of Agriculture, Food and Rural Affairs and Ministry of Natural Resources (July 31, 2023);
- Toronto and Region Conservation Authority and Credit Valley Conservation Authority (November 6, 2023);
- Fisheries and Oceans Canada (January 8, 2024);

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- Ministry of Agriculture, Food and Rural Affairs (March 6, 2024);
- Toronto and Region Conservation Authority (July 28, 2025); and
- Ministry of Energy and Mines (regular working meetings to coordinate the Highway 413 Project with the Northwest GTA Transmission Corridor Identification Study).

Please note, the above list is not exhaustive, and additional meetings were held in 2023 and beyond.

8.3.2.3 Bilateral Federal-Provincial Working Group

In 2021, the Highway 413 Project was designated under the federal *Impact Assessment Act* (IAA). In October 2023, the Supreme Court of Canada released an opinion that the IAA, as it applies to designated projects, was unconstitutional. On April 15, 2024, the Federal Court granted a consent order to set aside the Highway 413 Project's designation under the IAA. As such, the Highway 413 Project was no longer subject to the federal IAA process. Note, the Project is following the requirements of the *Highway 413 Act, 2024* (see **Section 1.3** for further details).

In 2024, the Governments of Canada and Ontario signed a Memorandum of Understanding and established a Bilateral Federal-Provincial Working Group governed by a Terms of Reference with the objective of leveraging expertise to assess environmental effects within federal jurisdiction. The Bilateral Federal-Provincial Working Group consists of senior leaders from both levels of government and serves to contemplate potential adverse effects within federal jurisdiction by helping to identify and recommend appropriate measures to avoid or minimize environmental impacts in areas of federal jurisdiction. These are potential effects to species at risk, fisheries, and migratory birds. This collaboration ensures that both governments contribute to the assessment and mitigation of adverse effects within federal jurisdiction. Meetings of the Bilateral Federal-Provincial Working Group are on-going.

8.4 Public and Stakeholder Consultation

8.4.1 Overview

The following section provides information on the engagement undertaken with the public during the development of the Preliminary Design, including the Project Website community workshops and webinars, advisory group meetings, property owner meetings, and PICs.

8.4.2 Project Website

The MTO maintains a Project Website to provide a continuously available source of detailed information about the Highway 413 Project throughout the development of the Preliminary Design. The website includes project information and provides accessible opportunities to learn about Highway 413.

8.4.2.1 Project Website

MTO launched the Highway 413 Project Website (available in both French and English) — https://highway413.ca/ — as a core element of the public consultation approach, allowing MTO to share information with the public throughout the development of the Preliminary Design. Information shared on the website over the years has included project updates; mapping; an overview of the Project, including information related to the process and timeline of the work; the project benefits; the environmental considerations; the PTE process; and information about the consultation activities undertaken throughout the process. Since 2023, the Project Website has included an interactive map which enables users to zoom in on an aerial photographic base, to examine the Preliminary Design in more detail in the context of environmental and land use features.

The Consultation section of the website briefly describes MTO's consultation approach for the Project and includes an extensive record of public consultation meetings and the information shared at those events.

The Project Website has been a significant source of public input. The website contains a Contact Us section with a fillable form where questions, comments, concerns and requests to be added to the Project Contact List can be shared with MTO. This section also shares a Project Email, Project Telephone Number, and option for media inquiries. Approximately 9,000 comments have been received through the Project Website, Project Email Address or Project Telephone Number since 2012. A summary of this correspondence and MTO responses is available in **Appendix A-1**.

8.4.3 Community Advisory Group

To assist MTO as the Project progressed, a CAG was formed to provide ongoing advice and relay valuable input on community perspectives.

The CAG was comprised of 19 to 31 members of the community and organizations interested in or potentially affected by the Project, including residents and stakeholders representing the municipalities within the Highway 413 Route, environmental and conservation Non-Governmental Organizations (NGOs), business and agricultural sectors, and others.

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Three CAG Meetings were held during the development of the Preliminary Design. They included:

- CAG #1 (October 28, 2014) – to provide a Project overview and update, and gain feedback on the short list of alignment alternatives;
- CAG # 2 (May 7, 2015) – to discuss the approach of evaluating the short list of alignment alternatives and discuss the trade-offs in the west, central, and east sections of the Highway 413 Route; and
- CAG #3 (November 14, 2019) – to provide an overview of the evaluation of the short-listed alignment and interchange location alternatives, Technically Preferred Alignment, and 2019 Focused Analysis Area, and to discuss potential issues to inform the Technically Preferred Alignment.

In addition to dedicated CAG meetings, these stakeholders continued to be engaged through the Project's ongoing public consultation activities, including invitations to PICs and notice of Project Website updates etc.

8.4.4 Greenbelt Transportation Advisory Group

The GTAG included representation from environmental interest groups, environmental ministries, and other Greenbelt experts. Members were asked to share information regarding key environmental and agricultural features, discuss potential impacts to sensitive features within the Greenbelt, and discuss and generate mitigation strategies to be used. At the first Community Workshop and at PIC #1, information on the GTAG was provided and stakeholders interested in joining the GTAG were encouraged to apply for membership.

Three dedicated GTAG meetings were held during the development of the Preliminary Design, including:

- GTAG #1 (October 29, 2014) – to present a Project overview and status update, and to gain feedback on the short list of alignment alternatives within the Greenbelt;
- GTAG #2 (May 7, 2015) – to discuss the approach for evaluating the short list of alignment alternatives, and to discuss trade-offs in the west, central and east sections of the Highway 413 Route; and
- GTAG #3 (November 14, 2019) – to provide an overview of the evaluation of the short-listed alignment and interchange location alternatives, the Technically Preferred Alignment, and 2019 Focused Analysis Area. Also, to discuss the application of the *Guideline for Planning and Design of the GTA West Corridor* (now Highway 413) *through the Greenbelt*.

In addition to dedicated GTAG meetings, these stakeholders continued to be engaged through the Project's ongoing public consultation activities, including invitations to PICs and notice of Project Website updates etc.

8.4.5 Transportation Service Providers

MTO consulted with Transportation Service Providers (municipal transit providers, Metrolinx, 407 ETR, CPKC Rail and CN Rail) and other transportation stakeholders including the Ontario Trucking Association, University of Toronto Department of Civil Engineering, and APPS Transport Group. The purpose of these discussions was to better understand people and goods movement within the Highway 413 Route and to obtain relevant information about current and future transportation demands and transit requirements that could inform the Preliminary Design.

Stakeholders were consulted via letter, e-questionnaire, face-to-face interviews and/or through one-on-one phone interviews.

8.4.6 Utility Providers

MTO consulted with various utility providers and representatives (including Acronym Solutions Inc. Alectra, Bell, Enbridge, Hydro One, Ontario One Call Rogers, and TC Energy) to inform the development of the Preliminary Design and to better understand how construction staging and various utility relocation or expansion could be addressed. Discussions between MTO and utility staff representatives will continue through Detail Design, and the planning of construction activities.

8.4.7 Landowner Engagement

MTO has been informing and consulting with landowners throughout the development of the Preliminary Design through updates to the Project Website, Project Email and Project Telephone Number, community meetings and PICs. To assist landowners who were anticipated to be directly impacted by the Highway 413, several property specific consultation events were held. The purpose of these events was to provide information about the MTO property acquisition process, help attendees understand how their properties might be affected, explain how to access further details, and outline how to engage in property purchase discussions with MTO.

Three landowner engagement events were held during the development of Preliminary Design, including:

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- A Virtual Landowner Information Session (January 28, 2025) - to provide an overview of the Highway 413 Project, the MTO Property Acquisition Process, and outline next steps for impacted landowners;
- In-Person Landowner Meetings (May 12, 2025, May 14, 2025, and May 15, 2025) - to provide the opportunity for impacted landowners to meet with MTO to understand impacts to their property and understand property acquisition timelines; and
- Virtual Landowner Meetings (June 10, 2025, and June 12, 2025) - to provide the opportunity for impacted landowners to meet with MTO to understand impacts to their property and understand property acquisition timelines.

Consultation with impacted landowners will continue as the Project proceeds to Detail Design.

8.4.8 Community Workshops

Several Community Workshops were held at key milestones for stakeholders to provide input on the direction and findings of the Project, and presented opportunities for MTO to gain a sense of the broader community reaction to the Project. Together, stakeholders and MTO discussed how issues might be addressed as the Project progressed.

- Community Workshop #1 was held in Woodbridge, the City of Mississauga, the City of Brampton, and the Town of Caledon on July 24, 2014, July 29, 2014, August 13, 2014, and August 14, 2014, respectively. Attendees were invited to visit workstations to learn about the Project, share information with MTO, and participate in interactive activities. The stations included information on how to apply for membership in CAG and GTAG, the criteria and methodology for generating alignments and interchanges, and interactive activities such as providing input on existing features within the Highway 413 Route to be considered in the development of the interchange alternatives as well as providing input on where the alignment should be located.
- Community Workshop #2 was held in Woodbridge, Georgetown (two sessions), and the Town of Caledon (two sessions) on June 18, 2015, June 22, 2015, and June 25, 2015, respectively. The focus of this workshop was to update the community on work completed since PIC #1 including refinements to alignment alternatives, interchange locations, and the Focused Analysis Area. MTO sought input from the community on issues and trade-offs associated with the alignment alternatives and potential interchange locations, and the approach to undertaking the evaluation and selection of alignments.

8.4.9 Community Engagement Webinars

Community Engagement Webinars (CEWs) were conducted as the Preliminary Design progressed to inform the public and stakeholders about the Project. These sessions were held virtually, as the COVID-19 pandemic precluded in-person events.

These webinars offered an opportunity to gain a deeper understanding of the Project and have questions answered using virtual, accessible engagement techniques. For example, questions were solicited from the public prior to the Webinar and polling questions were posed during the presentation, with results being shared instantaneously on the screen.

- CEW #1 was hosted on July 28, 2021, to provide an update on the Project, followed by a question-and-answer period where expert panelists from a variety of disciplines were in attendance to answer questions. Prior to the webinar taking place, MTO identified frequently asked questions that had been received through the Project Telephone Number, webforms from the Contact Us page on the Project Website, and Project Email. Members of the public were also invited to submit questions prior to the event. Frequently asked questions were answered at the outset of the CEW #1 presentation. This was followed by a Project update and Question and Answer session. On the week of August 9, 2021, the CEW #1 presentation slides and video recording were published on the Project Website under the Consultation page for public viewing.
- CEW #2 was hosted on September 29, 2021, and followed the same format as the July session starting with responses to the top three frequently asked questions, a project update, followed by a question-and-answer period with panelists from a variety of disciplines. During the week of October 4, 2021, the CEW #2 presentation slides and video recording were published on the Project Website under the Consultation page for public viewing.

8.4.10 Community Value Plan Meetings

A CVP has been developed using public input and design recommendations to identify opportunities for landscaping enhancement and to propose protection and restoration measures for existing landscape features impacted by the Project. The CVP is focused on how best to implement the Project in the most context-sensitive manner.

Three CVP meetings were held during the development of Preliminary Design. They included:

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- Meeting #1 was held during PIC #2 (York Region, Halton Region, and Peel Region, on September 19, 2019, September 26, 2019, and October 3, 2019, respectively). Its purpose was to introduce the concept and opportunities of a CVP, provide an overview of the CVP process, gather information about the cultural, social, historical and environmental features that should be considered in the CVP, and invite individuals to apply to participate in CVP meetings.
- Meeting #2 was held virtually on November 3, 2020. Its purpose was to start developing the CVP "toolkit" by reviewing examples of design elements for the themes identified at CVP Meeting #1.
- Meeting #3 was held virtually on May 20, 2021. Its purpose was to present the draft CVP, including plans and design elements that illustrate the application of the plan.

The CVP can be found in **Appendix C** and will continue to evolve through ongoing consultation activities with interested stakeholders and members of the public, engagement with Indigenous communities, and review of the EIAR.

8.4.11 Public Information Centres

Since 2014, the Highway 413 Project has held four rounds of PICs — in 2014, 2019, 2021, and 2023 — each reflecting the evolving nature of the Project and the feedback received. These PICs served as critical touchpoints between MTO and the public.

The earliest PICs had a knowledge-seeking focus, with the goal of gathering local knowledge and identifying community values, and understanding the potential impacts of various alignment and design options. As the Project advanced, the focus shifted toward knowledge sharing, with the most recent PICs presenting how local input directly influenced design decisions and demonstrating what the future highway will look like.

Over time, the themes and concerns raised by the public evolved. Early input was centred around alignment selection, land use, and environmental considerations. Later, PICs addressed specific design features, mitigation measures, and community impacts. The PIC process has become a key tool in building transparency, ensuring accountability, and maintaining an open line of dialogue with the communities along the corridor.

The Project Website includes a Consultation landing page [Highway 413 - Consultation], which provides display materials and summary reports related to each of the four rounds of PICs held during the development of the Preliminary Design. These are summarized below.

There have been changes in the legislative framework and key terms applicable to the Project, including the name and stages associated with the project work. Presentation materials and responses to public inquiries are presented as they were drafted and shared at the time.

8.4.11.1 Public Information Centre #1

PIC #1 was held in Halton Region, York Region, and Peel Region on November 27, 2014, December 2, 2014, and December 4, 2014, respectively. MTO presented project background and process information which included an overview of the existing conditions around the Highway 413 Route; the process of screening the long list of alignment alternatives to a short list and the factors and criteria used in this process; and the Focused Analysis Area. The public was also given the opportunity to comment on maps and displays depicting information collected to date about the Highway 413 alignment. The material displayed was the same at each of the three venues for PIC #1 and can be found in the PIC #1 Summary Report in **Appendix A-4**.

8.4.11.1.1 Engagement Materials

Primary notification of the PIC was delivered through newspaper ads, notices (regular and electronic), brochures, updates on the Project Website, and posts shared through the Project Twitter (now 'X') account.

Newspaper Ads (November 2014)

An Ontario Government Notice (Notice of Public Information Centre #1) was placed in the following English and French newspapers:

- Brampton Guardian;
- Caledon Citizen;
- Caledon Enterprise (Bolton);
- Erin Advocate;
- Georgetown Acton Independent Free Press.
- Guelph Mercury;
- Guelph Tribune;
- King Weekly Sentinel;
- Milton Canadian Champion;

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- Mississauga News;
- Toronto Le Métropolitain (Brampton) (French);
- Toronto Star;
- Turtle Island News;
- Two Row Times; and
- Vaughan Citizen.

Notices

Over 2,800 contacts on the Highway 413 Project Contact List were notified of the PIC, including members of the public, individuals from interest groups, municipalities, agencies, utility companies, and businesses; and members of the Highway 413 advisory groups (Community Advisory Group, Greenbelt Transportation Advisory Group, Municipal Advisory Group, Regulatory Agency Advisory Group, Municipal Executive Advisory Group). Members of Parliament and Members of Provincial Parliament were also notified. These notifications were via regular mail and/or email.

Indigenous communities were notified by regular mail, including packages containing an overview of the material presented at PIC #1 and an invitation to attend a preview session in advance of the public sessions.

Brochure Delivery

Over 15,800 brochures containing the Notice of PIC #1 (English and French) were delivered via Canada Post's unaddressed admail service to all postal walks within the Highway 413 Route during the weeks of November 17, 2014, and November 24, 2014.

Project Website

The time, location and purpose of each PIC event were posted on the Consultation landing page of the Project Website in advance of the PICs. The PIC display materials were made available for download on the Project Website following the event.

In addition to the PIC display material, stakeholders were guided and encouraged to complete a poll/questionnaire to obtain information about respondent's demographics, key concerns, and plans to use Highway 413.

Twitter (now X)

Notification of the PIC was shared through the Project Twitter (now 'X') account twice in November 2014. The tweets referred followers to the Project Website for details.

8.4.11.1.2 Summary of Feedback Received and Response

A total of 738 members of the public signed the visitors' register for the three PIC #1 events, including elected officials from the Town of Caledon, the Town of Halton Hills, and the Township of King. Several additional members of the public attended but declined to sign in. No attendees identified themselves as representatives or members of Indigenous communities. Representatives from the Caledon Citizen, Burlington Gazette, and Vaughan Citizen (York Region Media Group) attended the PIC.

Based on feedback received, seven key themes emerged:

1. **Diverse Views regarding the Need for the Project** – Comments reflected both support and opposition for undertaking the Project, including differing opinions on the need for Highway 413.
2. **Alignment and Interchange Preferences** – Stakeholders expressed support for and opposition to specific alignment alternatives and interchange locations, with some recommending minimizing the number of interchanges to limit local development impacts.
3. **Land Use and Environmental Protection** – Concerns were raised about protecting agricultural and Greenbelt lands, along with the suggestion to bypass sensitive areas and minimize impacts on existing land use.
4. **Transit and Transportation Priorities** – Feedback included both support for and opposition to the proposed transitway and strong support for prioritizing goods movement.
5. **Process Transparency and Decision-Making** – There was interest in the evaluation methodology for alignments, timing of decisions, and some desire for MTO to expedite next steps.
6. **Property and Expropriation Concerns** – Comments included questions about expropriation, land impacts within the Focused Analysis Area, and the amount of land being retained or released.
7. **Stakeholder Engagement** – There was general interest in participating in advisory groups and staying informed about the Project schedule and public consultation activities.

The responses to comments received at PIC #1 are summarized in **Appendix A-1. Appendix A-4** of this report provides a full copy of the Public Information Centre #1 Summary Report.

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As noted previously, since PIC #1 there have been changes in the legislative framework and terminology applicable to the Project, including the name and stages associated with the Project. The material in the appendices contains the PIC information, materials and MTO responses to public inquiries as they were drafted and shared at the time.

For a detailed discussion on how the public consultation process has informed and influenced the Preliminary Design of the Project, please refer to **Chapter 3**.

8.4.11.2 Public Information Centre #2

PIC #2 was held in York Region, Halton Region, and Peel Region on September 19, 2019, September 26, 2019, and October 3, 2019, respectively. The purpose of this PIC was to provide an update on the project's progress, present the assessment and evaluation process for alignment and interchange alternatives, and identify the Draft Technically Preferred Alignment and Preferred Interchange Locations, the 2019 Focused Analysis Area, and the CVP process. As part of this PIC, the first CVP meeting was held to gather public input on the future design of the new multi-modal transportation corridor. The material displayed was the same at each of the three venues for PIC #2 and can be found in the PIC #2 Summary Report in **Appendix A-4**.

8.4.11.2.1 Engagement Materials

Promotion of the PIC was primarily delivered through newspaper ads, notices (regular and electronic), brochures, updates on the Project Website, and posts on the Project Twitter (now X) account.

Newspaper Ads (September 2019)

An Ontario Government Notice (Notice of Public Information Centre #2) was placed in the following English and French Newspapers.

- Brampton Guardian;
- Caledon Citizen;
- Caledon Enterprise (Bolton);
- Erin Advocate;
- Georgetown Acton Independent Free Press;
- Guelph Tribune;
- King Township Sentinel;
- Milton Canadian Champion;
- Mississauga le Métropolitain (French);
- Mississauga News;
- Toronto L'Express (French);
- Toronto Star;
- Turtle Island News;
- Two Row Times; and
- Vaughan Citizen.

Notices

Over 3,550 contacts on the Highway 413 Project Contact List were notified of the PIC, including members of the public, individuals from interest groups, municipalities, agencies, utility companies, and businesses; and members of the Highway 413 advisory groups (Community Advisory Group, Greenbelt Transportation Advisory Group, Municipal Advisory Group, Regulatory Agency Advisory Group, Municipal Executive Advisory Group). Members of Parliament and Members of Provincial Parliament were also notified. These notifications were via regular mail and/or email.

Indigenous communities were notified by regular mail, including an invitation to attend a preview session in advance of the public sessions.

Brochure Delivery

A total of 30,705 brochures containing the Notice of PIC #2 (English and French), were delivered via Canada Post's unaddressed admail service to all postal walks within the Highway 413 Route during the weeks of August 26, 2019, and September 2, 2019.

Project Website

The time, location and purpose of each PIC event were posted on the Consultation landing page of the Project Website on August 28, 2019. The PIC display materials were made available for download on the Project Website on September 20, 2019, following the first night of PIC #2.

Twitter (now X)

Notification of PIC #2 was shared through the Project Twitter (now "X") account twice in September 2019. The tweets referred followers to the Project Website for further details.

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8.4.11.2.2 Summary of Feedback Received and Response

A total of 979 members of the public signed the visitor's register for the PIC #2 events, including elected officials from the City of Vaughan, Town of Caledon, the Town of Halton Hills, and the Township of King. Additionally, the Members of Provincial Parliament (or their representatives) for the ridings of Wellington - Halton Hills and Vaughan - Woodbridge attended PIC #2. Several additional members of the public attended but declined to sign in. No attendees identified themselves as representatives or members of Indigenous communities. No media representatives identified themselves at the PIC #2 events.

Based on feedback received, six key themes emerged:

1. **Support or Opposition for the Alignment** - Varied opinions on the Draft Technically Preferred Alignment, with both support and opposition expressed.
2. **Urgency and Planning** - Some requests to expedite the environmental assessment process and begin construction quickly. Suggestions to secure extra land now to avoid future ROW expansions.
3. **Traffic and Alignment Concerns** - Concerns about traffic on connecting roads like Mayfield Road, Highway 400, Highway 401, Coleraine Drive, and Weston Road. Proposals for extending the corridor west to Guelph, east past Highway 400, and closer to Highway 9 in the north.
4. **Environmental and Property Impacts** - Concerns about noise, air quality, and other impacts on nearby property owners, with inquiries about mitigation measures. Mixed feelings about the impact on these lands, with some prioritizing their protection and others concerned about their ability to support food production and ecosystem services.
5. **Support for Transit and Goods Movement** - Support for the proposed transitway, with requests for connections to other mass transit, inclusion of an active transportation system, and accommodation for both buses and trucks. Support for goods movement priority features, particularly truck-only lanes.
6. **Process and Information Requests** - Questions about land acquisition, the PTE process, possibility of tolling, and the scope of a separate electricity transmission study. Requests for digital mapping of the Draft Technically Preferred Alignment to understand impacts and coordinate works.

The responses to comments received at PIC #2 are summarized in **Appendix A-1. Appendix A-4** provides a full copy of the Public Information Centre #2 Summary Report.

As noted previously, since PIC #2 there have been changes in the legislative framework and terminology applicable to the Project, including the name and stages associated with the Project work. The material in the appendices contains the PIC information, materials, and MTO responses to public inquiries as they were drafted and shared at the time.

For a detailed discussion on how the public consultation process has informed and influenced the Preliminary Design of the Project, please refer to **Chapter 3**.

8.4.11.3 Public Information Centre #3

PIC #3 was held for Peel Region, York Region, and Halton Region on December 7, 2021, December 9, 2021, and December 14, 2021, respectively. The health and safety of the public and Highway 413 team members were prioritized during the COVID-19 pandemic, and due to the gathering restrictions, PIC #3 was conducted online via Zoom, with an option to join by telephone. The content for each session was similar but focused to address issues in each regional municipality.

Although the federal IAA has since been amended and no longer applies to the Highway 413 Project, the purpose of PIC #3 was to review the Impact Assessment process applicable at the time, discuss the technical studies being added to the Project, and obtain feedback on MTO's understanding of the socio-economic contexts of communities and the key issues raised by stakeholders and Indigenous communities. Notwithstanding the federal designation being set aside, most of the studies continued as planned or were adapted to reflect the revised process. However, some were not continued as they were no longer required.

The virtual format for PIC #3 comprised of an interactive presentation by MTO followed by a live question-and-answer (Q&A) session where attendees could privately type their questions into the Zoom chat box. To maintain privacy, names and comments were not publicly displayed. Instead, MTO read the questions aloud and provided the response.

8.4.11.3.1 Engagement Materials

Primary notification of the PIC was delivered through newspaper ads, notices (regular and electronic), brochures, and updates on the Project Website.

Newspaper Ads (November 2021)

An Ontario Government Notice (Notice of Public Information Centre #3) was placed in the following English and French newspapers.

- Brampton Guardian;
- Caledon Citizen;
- Caledon Enterprise;

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- Erin Advocate/Orangeville Banner;
- Georgetown/Acton Independent Free Press;
- Guelph Tribune;
- King Township Sentinel;
- Milton Canadian Champion;
- Mississauga News;
- Toronto L'Express (French);
- Toronto Star;
- Turtle Island News;
- Two Row Times; and
- Vaughan Citizen.

Notices

Approximately 6,500 contacts on the Highway 413 Project Contact List were notified of the PIC, including members of the public, individuals from interest groups, municipalities, agencies, utility companies and businesses, and members of the Highway 413 advisory groups (Community Advisory Group, Greenbelt Transportation Advisory Group, Municipal Advisory Group, Regulatory Agency Advisory Group, Municipal Executive Advisory Group) and the CVP meetings. Members of Parliament and Members of Provincial Parliament were also notified. These notifications were via regular mail and/or email.

Indigenous communities were notified by regular mail, including an invitation to each community to hold a separate virtual meeting to review the information.

Brochure Delivery

More than 28,300 brochures containing the Notice of Public Information Centre #3 (English and French) were delivered via Canada Post's unaddressed admail service to all postal walks within the Highway 413 Route during the week of November 16, 2021.

Project Website

Information on how to register for PIC #3 with a Zoom link was provided on the Project Website, including how to request accommodations (if required).

A PIC #3 comment sheet containing the following interactive questions that were to be asked during the PIC #3 events was also made available on the Project Website:

1. Are there any other statistics or data that you feel has important implications to the Highway 413 Project?
2. What issues have we not identified that are important to you?
3. Are there any studies that you think are missing?
4. What do you believe is most essential to focus on within these additional studies?

The comment sheet offered an alternative way for public participation if someone could not attend the livestreamed event or use the chat function in Zoom. Although no comment sheets were received, MTO received around 40 emails with comments and questions prior to the PIC #3 events.

The presentation materials from each of the PIC #3 regional events were made available for viewing and download on the Project Website on December 20, 2021. Recordings of the events were uploaded to the Project Website on January 24, 2022.

8.4.11.3.2 Summary of Feedback Received and Response

The Peel Region PIC #3 event was held on December 7, 2021. A total of 368 people registered for the PIC and 182 unique users logged into the event. In total, 510 comments or questions were submitted through the Q&A box. The socio-economic context presented at this event was specific to Peel Region, which includes the City of Mississauga, the City of Brampton, and the Town of Caledon.

The York Region PIC #3 event was held on December 9, 2021. A total of 172 people registered for the PIC and 89 unique users logged into the event. In total, 214 comments or questions were submitted through the Q&A box. The socio-economic context presented at this event was specific to York Region, which includes the City of Vaughan and the Township of King.

The Halton Region PIC #3 event was held on December 14, 2021. A total of 356 people registered for the PIC and 154 unique users logged into the event. In total, 397 comments or questions were submitted through the Q&A box. The socio-economic context presented at this event was specific to Halton Region, which includes the Town of Halton Hills and the Town of Milton.

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The following 10 themes emerged from the feedback and comments received during the Q&A sessions:

1. **Climate Change and Greenhouse Gas Emissions (GHG)** - Questions about how climate change and GHG emissions for construction and operation will be assessed and considered and how this contributes to Canada's climate goals.
2. **Provincial/Federal EA** - Questions on the specific studies and processes that will take place as part of the federal and provincial EA processes, and how feasible it is to conduct the assessment during the COVID-19 pandemic.
3. **Natural Environment and Species at Risk** - Questions about how MTO will address concerns that building the Project will have detrimental impacts on the natural environment.
4. **Induced Demand/Traffic Studies** - Comments and questions regarding traffic studies and how to mitigate bottleneck issues that might arise at interchanges.
5. **Socio-Economic Environment** - Questions and comments focused on how diverse groups are being considered in the Project, and how recent commuter trends such as working remotely were incorporated into the Project. Another focus was the target commute times considered for the Project, with the observation made that workers commuting into Toronto seem unlikely to benefit.
6. **Urban Sprawl** - Comments and concerns about how the Project may contribute to urban sprawl and how the province will address development in the surrounding area.
7. **Need For the Project** - Questions and concerns about the need and rationale for the Project.
8. **Project Cost** - Further information was requested on the cost of conducting the EA study, construction and operation of the Project, funding of the Project, and if Highway 413 would be tolled or privatized.
9. **Agriculture** - Requests for more information on the impacts to farmland due to the Project, especially with the growing concerns of food security and food prices.
10. **Highway and Transitway Design** - Requests for more detail on the highway design, such as type of intersections, number of lanes, soil management/disposal, and how noise evaluation where warranted is determined.

The responses to comments received at PIC #3 are summarized in **Appendix A-1. Appendix A-4** provides a full copy of the Public Information Centre #3 Summary Report.

As noted previously, since PIC #3 there have been changes in the legislative framework and terminology applicable to the Project, including the name and stages associated with the Project work. The material in the appendices contains the PIC information, materials and MTO responses to public inquiries as they were drafted and shared at the time.

For a detailed discussion on how the public consultation process has informed and influenced the Preliminary Design of the Project, please refer to **Chapter 3**.

8.4.11.4 Public Information Centre #4

PIC #4 was held for York Region, Halton Region, and Peel Region on September 28, October 3, and October 5, 2023, respectively. To provide broad access to the PIC event, PIC #4 was conducted online via Zoom, with an option to join by telephone. The content for each session was similar but focused to address issues in each regional municipality.

The purpose of PIC #4 was to present the Preliminary Design and address questions from impacted communities, with a focus on providing context about the purpose of the Project, and specific updates about land use, design refinements, environmental impact assessment investigations, and next steps relating to project documentation.

The virtual format for PIC #4 featured an interactive presentation by MTO, with pauses to answer questions on the discussed topics. Each event included a live Q&A session where attendees could submit their questions via Zoom. To maintain privacy, names and comments were not displayed publicly; instead, MTO read the questions aloud and provided a response. Due to the high volume of questions, the most frequently asked questions were addressed publicly, and all comments were documented and responded to in writing following the meeting.

To gather additional feedback and address misinformation about the Highway 413 Project, MTO asked polling questions to understand the local community's concerns and interests. The polling questions included:

- What percentage of land designated for Highway 413 is located within the Greenbelt? (Select percentage range).
- Which part of the design is of most interest to you? (Select all that apply).
- Tell us which of the following topics are of most interest to you and you would like to know more about? (Select all that apply).

Responses to these questions were displayed in real time to help MTO understand how the public interprets the Project and where additional information and resources may be necessary. MTO also answered pre-submitted and live questions after each poll, ensuring a mix of both types were addressed.

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8.4.11.4.1 Engagement Materials

Primary notification of PIC #4 was delivered through newspaper ads, notices (regular and electronic), brochures, and updates on the Project Website.

Newspaper Ads (September 2023):

An Ontario Government Notice (Notice of Public Information Centre #4) was placed in the following English and French newspapers.

- Brampton Guardian;
- Caledon Citizen;
- Caledon Enterprise;
- Georgetown / Acton Independent Free Press;
- Mississauga Le Métropolitain (French).
- Toronto L'Express (French); and
- Vaughan Citizen.

Notices

Approximately 6,500 contacts on the Highway 413 Project Contact List were notified of the PIC, including members of the public, individuals from interest groups, municipalities, agencies, utility companies and businesses, and members of the Highway 413 advisory groups (Municipal Advisory Group, Regulatory Agency Advisory Group). Members of Parliament and Members of Provincial Parliament were also notified. These notifications were via regular mail and/or email.

Indigenous communities were notified by regular mail, including an invitation to each community to hold a separate virtual meeting to review the information.

Brochure Delivery

More than 28,300 brochures containing the Notice of PIC #4 (English and French) were delivered via Canada Post's unaddressed admail service to all postal walks within the Highway 413 Route during the week of September 4, 2023.

Project Website

Information on how to register for PIC #4 with a Zoom link was provided on the Project Website, including how to request accommodation (if required). A PIC #4 comment sheet was also made available on the Project Website, providing stakeholders the opportunity to submit questions that were addressed during the PIC #4. The comment sheet also offered an alternative way for public participation if someone could not attend the livestreamed event or use the chat function in Zoom. MTO received a total of 96 comment sheets for the York Region PIC, 98 comment sheets for the Halton Region PIC, and 162 comment sheets for the Peel Region PIC.

To support dynamic engagement, MTO also introduced the Highway 413 interactive map, available on the Project Website. This map allows stakeholders and the public to view the alignment layered on a dynamic map so that users can zoom into locations of interest.

The presentation materials and recordings for each of the PIC #4 regional events were made available for viewing and download on the Project Website on October 16, 2023.

8.4.11.4.2 Summary of Feedback Received and Response

The York Region PIC #4 event was held on September 28, 2023. A total of 149 stakeholders registered for the PIC and 111 attended. In total, 54 comments or questions were submitted through the Q&A box.

The Halton Region PIC #4 event was held on October 3, 2023. A total of 240 stakeholders registered for the PIC and 148 attended. In total, 70 comments or questions were submitted through the Q&A box.

The Peel Region PIC #4 event was held on October 5, 2023. A total of 344 stakeholders registered for the PIC and 223 attended. In total, 134 written comments or questions were submitted through the Q&A box.

The following 12 themes emerged from the feedback and comments received during the Q&A session:

1. **Climate Change and Greenhouse Gas Emissions**: Questions about how climate change and GHG emissions for construction and operation will be assessed and considered and how this contributes to Canada's climate goals.
2. **Provincial/Federal EA:** Questions on the specific studies and processes that will take place as part of the federal and provincial EA processes.
3. **Natural Environment and Species at Risk:** Questions about how MTO will address impacts to natural environment, species at risk and the Greenbelt.
4. **Highway Design:** Requests for more detail on the highway design, including how the highway will interact with existing roads.

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5. **Transitway Design:** Requests for more information on how the proposed transitway and other public transit initiatives work with the Project.
6. **Interchange Design:** Requests for more information on which roads will have interchanges.
7. **Congestion/Traffic Flow:** Questions and concerns regarding the effect Highway 413 will have on traffic in the surrounding road network, and potential travel time savings.
8. **Socio-Economics:** Questions about how the Project will impact the socio-economic and physical health of the surrounding communities.
9. **Need For the Project:** Questions and concerns about the need and rationale for the highway.
10. **Property Impacts:** Questions regarding when the Focused Analysis Area would be released for development and impacts to landowners within Highway 413 Route.
11. **Project Cost:** Questions about the estimated cost of the environmental assessment process, construction of the Project and the maintenance of Highway 413.
12. **Project Consultation:** Questions about how MTO is consulting members of the public, Indigenous communities, municipal stakeholders, and conservation authorities.

The responses to comments received at PIC #4 are summarized in **Appendix A-1. Appendix A-4** provides a full copy of the Public Information Centre #4 Summary Report.

As noted previously, since PIC #4 there have been changes in the legislative framework and terminology applicable to the Project, including the name and stages associated with the Project work. The material in the appendices contains the PIC information, materials and MTO responses to public inquiries as they were drafted and shared at the time.

For a detailed discussion on how the consultation and engagement process has informed and influenced the Preliminary Design of the Project, please refer to **Chapter 3**.

8.5 Draft Environmental Impact Assessment Report Comment Period

In accordance with the *Highway 413 Act*, *2024* the draft EIAR was made available to the public, members of the Project Contact list, federal and provincial agencies, municipal representatives, Indigenous communities, and other interested persons for comment from December 1, 2025 to January 6, 2026.

Correspondence received during the review of the draft EIAR along with MTO responses and any actions taken will be summarized in the final EIAR.

8.6 Final Environmental Impact Assessment Report

Upon completion of consultation and engagement on the draft EIAR, MTO will revise **Chapter 8 Consultation and Engagement** of the draft EIAR to include a summary of concerns raised by the public, key stakeholders, and government partners; a description of what actions may be undertaken with respect to the concerns raised; and include a description of any changes to **Chapter 8** as a result of addressing these concerns.

The final EIAR will then be issued in accordance with the *Highway 413 Act*, *2024* and published on the Project Website.

8.6.1 Continuing Consultation and Engagement on the Highway 413 Project

As part of ongoing, regular business practices, MTO will undertake consultation and engagement coordination for the Highway 413 Project to support Detail Design and Construction, as required or as MTO deems appropriate.

For information on engagement and consultation with Indigenous communities, please refer to **Chapter 7**.

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9. Significant Changes

A “significant change” to the Highway 413 Project is defined in Section 1 of the *Highway 413 Act*, *2024* as:

a. a change to the alignment for Highway 413 and extensions of Highway 410 and Highway 427 to connect them to Highway 413, as shown on the maps and drawings of the Ministry’s preliminary design in the final environmental impact assessment report published under subsection 8 (4), as may be amended by any final addendum published under subsection 9 (8),
b. the addition of or a change to the location of a parking facility, stormwater management pond, commercial vehicle inspection facility or maintenance yard,
c. the addition of a bridge, interchange, intersection or roundabout,
d. the addition of one or more lanes,
e. a change to how or whether the Ministry will mitigate impacts on the environment, except,
    i. where the change is required to comply with a provincial or federal Act, a regulation made under such an Act or an order, permit, approval or other instrument issued under such an Act, or
    ii. as prescribed, or
f. a prescribed type of change.

Should a significant change to the Project be required, an addendum to the final Environmental Impact Assessment Report will be prepared in accordance with Section 9 of the *Highway 413 Act, 2024*, which details the process to be undertaken as follows:

9 (1) The Minister shall carry out the following steps with respect to a significant change:

1. Undertake any studies of the environment in relation to the significant change that the Minister considers appropriate.
2. Assess any impacts of the significant change on the environment.
3. Identify how the Ministry will mitigate any negative impacts identified in the assessment under paragraph 2.
4. Prepare a draft addendum to the final environmental impact assessment report and a final addendum in accordance with this section.

All steps outlined in the *Highway 413 Act*, *2024* pertaining to the significant change process will be followed, as appropriate.

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10. Next Steps

Key project milestones and activities anticipated following the completion of the draft EIAR include, but are not limited to:

- Continued consultation and engagement with:
  - Indigenous communities; and
  - Interested persons and stakeholders;
- Final EIAR: Anticipated Spring 2026; and
- Begin Detail Design and construction, subject to funding and approvals.

Throughout all subsequent phases of the Project, MTO will continue consulting and engaging Indigenous communities consistent with Section 35 of the *Constitution Act, 1982.*

Comments on the draft EIAR can be provided to the MTO as listed below by December 21, 2025:

- Project Website: (www.highway413.ca);
- Project Email: (project_team@highway413.ca); and
- Project Telephone Number: (1-877-522-6916).

Concerns raised during the comment period of the draft EIAR by Indigenous communities, interested persons, and stakeholders, will be summarized in the final EIAR. A description of what the Ministry did to respond to these concerns will also be included. The final EIAR will be prepared and filed in accordance with Section 8 of the *Highway 413 Act, 2024*.

Detail Design and Construction

Detail Design refines the work completed during Preliminary Design and further develops that work to a more comprehensive technical level. Any significant changes required to the Project will be documented in accordance with the *Highway 413 Act, 2024*.

During Detail Design and construction, commitments made in the final EIAR will be implemented, including but not limited to:

- Obtaining required permits and approvals (please refer to **Chapter 6**);
- Continuing consultation and engagement with Indigenous communities, interested persons and stakeholders; and
- Finalizing the highway design elements developed during the Preliminary Design phase.

During Detail Design there may be future requirements for additional work, such as surveying; testing for soil conditions; environmental studies; determining exact construction material requirements; developing the design for the final implementation of the highway; and drafting construction documents for the purpose of building the new highway, interchanges, bridges, etc.

As of the publication of this draft EIAR, options and timelines for phasing the delivery of Detail Design and construction of the Highway 413 Project are being explored.

The timing and duration of highway construction depends on numerous factors, including size and complexity of the project, funding availability, procurement method, and timing of environmental clearances and permits, as well as property acquisition. During Detail Design, further consultation and engagement, studies, and permitting will be undertaken as required. During construction, monitoring will be undertaken to ensure mitigation measures are functioning as designed, as the Project remains subject to legislation governing impacts to the environment.

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