

## Memo

**Project:** The Highway 413 Preliminary Design and Assessment of Environmental Impacts

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**Date:** March 12, 2026

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**From:** Peter Hayes and Emily Stephenson (WSP)

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**To:** Larry Sarris, Jonathan McGarry, Curtis Beyer, Ivana Cekic, Laura Goodman, Jazmyne McConnell (MTO)

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### Highway 413: Erosion and Sedimentation Overview Risk Assessment

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#### 1.0 Introduction

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

The Project is following 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 (Figure 1-1). The highway will have 11 interchanges at municipal roads. Features such as stormwater management ponds, carpool lots, Commercial Vehicle Inspection Facilities, maintenance facilities, and the potential for electric vehicle charging stations have been explored as part of Preliminary Design.

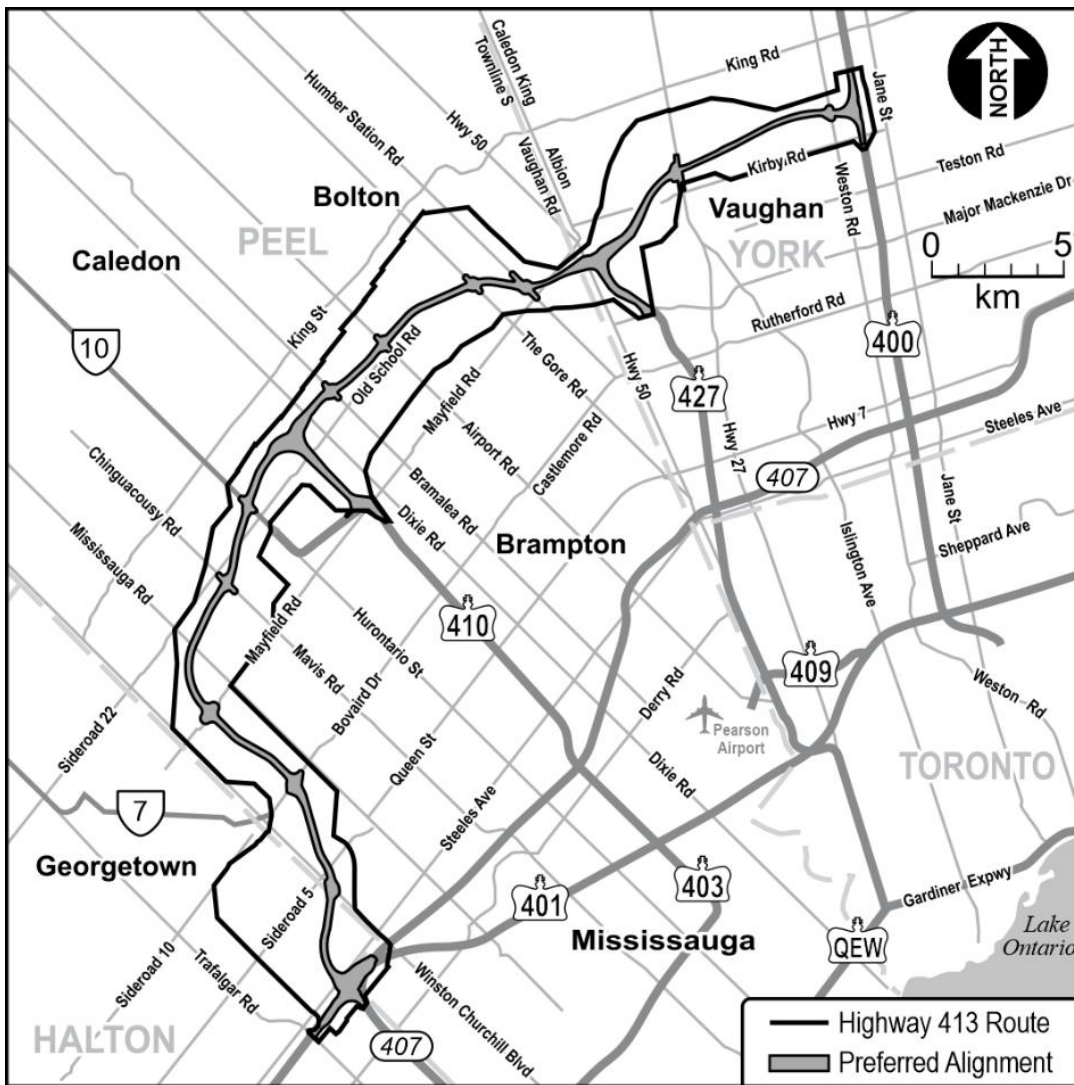
Highway 413 will connect Highway 401 and Highway 407 Express Toll Route in the Regional Municipality of Halton and the Regional Municipality of Peel with Highway 400 in the Regional Municipality of York.

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. A multi-use trail parallel to Highway 413 may be accommodated within the proposed transitway ROW. The ROW is expanded at interchanges and high fills to accommodate ramps to and from the crossing roads, as well as in locations with ancillary highway facilities as mentioned above. 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.

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.

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 kilometres per hour (km/hr).

**Figure 0-1: Highway 413 Route**



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The future Highway 413 is expected to:

- Relieve traffic on local roads and parallel highways;
- Help accommodate travel demand;
- Reduce travel times for commuters and goods movement;
- Reduce the social, environmental, and economic costs of congestion;
- Provide greater connectivity between urban growth centres;
- Provide better connections to residential and employment lands; and
- Provide an alternate route in the event of an incident or road closure on local and regional roads.

In support of the Highway 413 Project, a desktop Erosion and Sedimentation Overview Risk Assessment (ESORA) was conducted and is outlined in this memo.

The Project location (referred to as “the Site” in this report) and Preliminary Design are shown in **Figure 1** attached. The Study Area used for the ESORA was the Focused Analysis Area (FAA), which was expanded to include all areas of the Preliminary Design, plus a 100 m buffer where the design extended beyond the FAA, as shown in **Figure 1**.

Fieldwork was completed in support of the erosion assessment. For details, please refer to the *Highway 413 Transportation Corridor Erosion Fieldwork Summary* dated April 5, 2023, provided under a separate cover.

## 2.0 Site-Setting

### 2.1 CLIMATE

WSP completed a review of historical climate normals data from 1981 to 2010 for the Government of Canada’s Georgetown Wastewater Treatment Plant (WWTP) station, which is located approximately 15 km from the center of the project area. Daily average temperatures ranged from a minimum of -6.3 degrees Celsius (°C) in January to a maximum of 20 °C in July. Monthly precipitation ranged from a minimum of 57.2 millimetres (mm) in March to a maximum of 88.5 mm in November. Annual precipitation is 877.4 mm and approximately five days a year have greater than 25 mm of precipitation and 29 days have greater than 10 mm of precipitation.

### 2.2 LAND USE AND NATURAL FEATURES

The Site is located within three Regional municipalities including the Regional Municipality of Halton (west side of the Site), the Regional Municipality of Peel (central portion of the Site), and the Regional Municipality of York (east side of the Site). Based on recent aerial imagery the Site is a predominantly rural area with agricultural land use, residential houses, and natural areas. Urban areas are adjacent to the Site in several locations. Portions of the Study Area are located within the Greenbelt, mostly areas adjacent to watercourses.

The Study Area includes wooded areas, watercourses, waterbodies, Provincially Significant Wetlands (PSWs), as well as both unevaluated and evaluated wetlands. The Site crosses several named watercourses, including but not limited to East Sixteen Mile Creek, Credit River, Etobicoke Creek, Salt Creek, West Humber River, Humber River, and East Humber River. Natural features are illustrated in **Figures 2.1 through 2.9** attached.

## 2.3 TOPOGRAPHY, PHYSIOGRAPHY, DRAINAGE AND STORMWATER MANAGEMENT

Topography across the Study Area ranges from approximately 189 to 286 metres above sea level (masl), with elevations generally increasing to the northeast. The lowest elevations are located adjacent to watercourse crossings across the Site. Topographic contours are shown in **Figures 2.1 through 2.9**.

Generally, the terrain along the proposed Highway 413 Corridor consists of undulating plains to gently rolling hills, with the exception of the watercourses, including but not limited to the Credit River, West Humber River, Main Humber River, and East Humber River valleys which are incised below the surrounding tableland plains.

The Study Area is located within two tertiary watersheds: the Sixteen Mile Creek - Credit River watershed (west side of the Site) and the Humber River – Don River watershed (central and east side of Site). The watercourses in the Study Area flow south towards Lake Ontario.

As per Chapman and Putnam (1984), the project area is predominately within the Peel Plain physiographic region, along with select area in the South Slope physiographic region (western start of the Site and a small portion in the central/eastern side of the Site).

The South Slope includes ground moraine with irregular knolls and hollows within the Site. Rivers cut through boulder clay and into the shale, with perpendicular shale valley walls. The South Slope contains a variety of soils, developed upon tills which are clayey.

The Peel Plain is a level to undulating tract of clay soils with a gradual and fairly uniform slope towards Lake Ontario. Watercourses have deep cut valleys and are bordered by sandy alluvium.

## 2.4 SURFICIAL AND SUBGRADE GEOLOGY AND GROUNDWATER

Surficial geology mapping classifies the various soil types deposited on the underlying bedrock within the Quaternary period in Southern Ontario.

The surficial geology (Quaternary Geology of Ontario, 2010) in the Study Area includes the following:

- 3 Paleozoic bedrock;
- 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;
- 9A deltaic deposits (sand and gravel);
- 9C coarse-textured glaciolacustrine deposits – foreshore-basinal deposits (sand and gravel);
- 12 older alluvial deposits (clay, silt, sand, and gravel); and
- 19 modern alluvial deposits (clay, silt, sand, and gravel).

The surficial geology is shown in **Figures 2.1 through 2.9**.

Two geological model cross sections were created on the Oak Ridges Moraine Groundwater Program (ORMGP) database. Cross sections were generated for the Humber River / Don River watershed at Kirby Road and for the Sixteen Mile Creek / Credit River watershed at Heritage Road; as these areas had the steepest slopes across the Site. The stratigraphic units encountered were as follow:

Heritage Road, Credit River:

- Undifferentiated upper sediment;
- Halton Till;
- Upper Newmarket Till;
- Inter-Newmarket Sediment;
- Lower Newmarket Till; and
- Bedrock (with elevation of approximately 175 masl).

The groundwater elevation was approximately 188 masl on this cross section.

Kirby Road, East Humber River:

- Undifferentiated upper sediment;
- Halton Till;
- Oak Ridge Moraine;
- Lower Newmarket Till;
- Thorncliffe Formation; and
- Bedrock (with elevation of approximately 140 masl).

The groundwater elevation was approximately 212 masl on this cross section.

Bedrock includes the Queenston Formation (shale, limestone, dolostone and siltstone) on the west side of the Site and Georgian Bay Formation; Blue Mountain Formation; Billings Formation; Collingwood Member; Eastview Member (shale, limestone, dolostone, siltstone) on the east side of the Site as per the OGS (2011).

### 3.0 Assessment of Erosion and Sedimentation Risk

To complete the erosion and sedimentation risk assessment for the Site, WSP prepared mapping to illustrate surficial geology, topographic contours, and natural features, as shown in the **Figures 2.1 through 2.9**. The Site was divided into five polygons (A through E, from west to east) of similar characteristics including geology, topography and natural features.

The MTO Environmental Guide for Erosion and Sediment Control During Construction of Highway Projects (2015) was used to assess erodibility. Each polygon was assessed based on the Guide’s Hierarchy of Soil Erodibility (**Table 1**), which classifies various soil types (surficial geology mapping) as low, medium or high soil erodibility and the Guide’s Erosion Potential Associated with Slope Length, Slope Gradient and Slope Erodibility Rating (**Table 2**), which defines the erosion potential associated with the various polygons based on the soil erodibility from **Table 1** and the slope gradient and length (approximated based on the topography of the polygons).

The results of the assessment are provided in **Appendix A** and are shown in **Figures 2.1 through 2.9**.

**Table 1: Hierarchy of Soil Erodibility**

Erodibility Classification	Soil Type	Soil Erodibility
<b>Most</b>	Silt	High
	Silty Loam	High

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Erodibility Classification	Soil Type	Soil Erodibility
	Loam	High
	Silty Sand	High
	Sandy Loam	Medium
	Silty Clay Loam	Medium
	Sandy Clay Loam	Medium
	Silty Clay	Medium
	Sandy Clay	Low
	Clay	Low
	Heavy Clay	Low
	Loamy Sand	Low
	Sand	Low
	Poorly Graded Gravel	Low
<b>Least</b>	Well-Graded Gravel	Low

Reference: MTO Environmental Guide for Erosion and Sediment Control During Construction of Highway Projects (2015)

**Table 2: Erosion Potential Associated with Slope Length, Slope Gradient and Slope Erodibility Rating**

Slope Gradient	Soil Erodibility	Slope Length	
		<70 m	>70 m
0-10%	Low	Low	Low
	Medium	Low	Moderate
	High	Moderate	High
10-20%	Low	Low	Moderate
	Medium	Moderate	High
	High	High	High
>20%	Low	Moderate	Moderate
	Medium	High	High
	High	High	High

Reference: MTO Environmental Guide for Erosion and Sediment Control During Construction of Highway Projects (2015)

An individual assessment of each polygon for **Table 1** and **Table 2** is provided in **Appendix A**.

Polygon A (**Figures 2.1 and 2.2**) is located at the west end of the Site, south 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. The East Sixteen Mile Creek is located on the west edge of the polygon and some PSW are located on the northern side of the polygon. Several additional watercourses, an unevaluated wetland, and a waterbody are also located within the polygon. Construction activities will include, but not be limited to, the new road alignment and connections to existing roadways. Localized areas of greater concern should be evaluated and addressed in the detailed Erosion and Sediment Control Plan (ESCP).

Polygon B (**Figure 2.2**) is located at the Credit River and is interpreted to have high erosion potential and high rate / consequence. The area consists predominately of a mix of sand, gravel, and alluvium (silt, clay, sand and gravel), and has a steep slope down to the Credit River. PSWs are located along the river and adjacent lands, such as the Levi's Creek Wetland Complex and the Churchville-Norval Wetland Complex. The polygon also includes Levi's Creek, various watercourses, and a portion of the Greenbelt. Construction will include, but not be limited to, the new road alignment and connections to existing roadways.

Polygon C (**Figures 2.2 to 2.6**) is located in the central portion of the Site, between the Credit River and West Humber River, and is interpreted to have moderate erosion potential and moderate rate / consequence. The area is predominantly composed of silt-clay till with some ground surface slopes. Several watercourses cross this polygon, including Etobicoke Creek and Salt Creek, with some watercourse crossings featuring steep valley slopes. PSWs and evaluated wetlands are located throughout the polygon, including the Huttonville Creek & Area Wetland Complex, Etobicoke Creek Headwaters II Wetland Complex, Etobicoke Creek Headwaters Wetland Complex, Campbells' Cross Wetland Complex, and the Heart Lake Wetland Complex. The polygon also contains various watercourses, unevaluated wetlands including adjacent to the West Humber River and the Humber River, waterbodies, and areas of the Greenbelt. The Heart Lake Forest & Bog Brampton Buried Esker Area of Natural and Scientific Interest (ANSI) is located directly southwest of the polygon, near Etobicoke Creek. Construction will include, but not be limited to, the new road alignment and connections to existing roadways. Localized areas of greater concern should be evaluated and addressed in the detailed ESCP.

Polygon D (**Figures 2.6 to 2.9**) is located at the West Humber River, Main Humber River, and East Humber River, and is interpreted to have high erosion potential and high rate / consequence. The area is predominately silt and clay and has steep slopes down to the West Humber River, Main Humber River, and East Humber River. Some PSWs are present along the East Humber River, including the East Humber River Wetland Complex. The polygon also includes several watercourses, various unevaluated wetlands including adjacent to the West Humber River and Main Humber River, various waterbodies, and areas of the Greenbelt. The Gooseville Moraine ANSI is located directly north of the West Humber River at the edge of the polygon and the Humber River Valley-Kleinburg ANSI is located south of the polygon, along the East Humber River. Construction will include, but not be limited to, the new road alignment and connections to existing roadways.

Polygon E (**Figure 2.9**) is located at the east end of the Site, east of the Main 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. The East Humber River is located on the north edge of the polygon and PSWs are located throughout the polygon, including the East Humber River Wetland Complex. The polygon also includes several watercourses, unevaluated wetlands and waterbodies, and areas of the Greenbelt. The Strange Till Plain ANSI is located north of the polygon, near the East Humber River. Construction will include, but not be limited to, the new road alignment and connections to existing roadways. Localized areas of greater concern should be evaluated and addressed in the detailed ESCP.

#### **4.0 Erosion and Sediment Control**

Based on an assessment of the existing conditions at the Site and the anticipated work to be completed, WSP recommends as a minimum the following Ontario Provincial Standard Specifications

(OPSS) for erosion and sediment control during construction (Ontario MTO Technical Publications, 2023).

Erosion and Sediment Control shall be further developed during Detail Design. These recommendations to be considered during Detail Design.

#### OPSS

- 1 OPSS Prov. 100: MTO General Conditions of Contract;
- 2 OPSS Prov. 180: Management of Excess Materials;
- 3 OPSS Prov. 182: Environmental Protection for Waterbodies and on Waterbody Banks;
- 4 OPSS Prov. 801: Protection of Trees;
- 5 OPSS Muni. 802: Topsoil;
- 6 OPSS Prov. 803: Vegetative Cover;
- 7 OPSS Prov. 804: Temporary Erosion Control;
- 8 OPSS Prov. 805: Temporary Sediment Control;
- 9 OPSS Prov. 517: Dewatering; and
- 10 Standard Special Provision (SSP) 101F23 Amendments to OPSS 182, April 2020 – Timing of In-Water Works, Oversight Requirements, and Measures to Avoid Harm to Fish.

In addition, WSP considers that the following Ontario Provincial Standard Drawings (OPSD) applicable to this project (Ontario MTO Technical Publications, 2023):

#### Perimeter Sediment Control Best Management Practices (BMP)

- 1 OPSD 219.110 Light-Duty, Silt Fence Barrier / MTO Standard Drawing (MTOD) 219.110 Sediment Fence Barrier;
- 2 OPSD 219.120 Light Duty, Fibre Roll Barrier / MTOD 219.120 Fibre Roll Barrier;
- 3 OPSD 219.130 Heavy Duty Silt Fence Barrier;
- 4 OPSD 219.131 Heavy Duty Wire Backed Silt Fence Barrier / MTOD 219.131 Wire-Backed Sediment Fence Barrier;
- 5 OPSD 219.150 Sandbag Barrier;
- 6 OPSD 219.160 Fibre Roll Grade Breaks; and
- 7 WSP has prepared a diagram for a double-heavy duty row of silt fence with straw bales in between. This installation is recommended to be used where a high level of perimeter sediment control protection is required adjacent to an environmentally sensitive feature, such as a watercourse, riparian zone, or wetland. It is also recommended at the base of slopes, because this silt fence configuration is more sturdy and robust as compared to a single silt fence installation. A diagram of this BMP is provided in **Appendix B**. This BMP is recommended to be used as a perimeter sediment control in the following situations:
  - a To protect all watercourses deemed as fish habitat;
  - b To protect all designated wetland areas;
  - c To protect adjacent woodlots, valley lands, meadows, agricultural fields, and private properties, where the slope from the work Site is downward towards such areas (for slopes greater than 10%, which are also more than 10 metres long, and / or more than two metres high relative to the Site perimeter);
  - d Around soil stockpiles, if soil is to be stockpiled at the work Site perimeter; and
  - e This BMP must be carefully designed to also include gaps with check dams and sediment basins, where concentrated flow of water leaves the work Site.

The final recommendations for erosion and sediment control fencing should be reviewed with the project ecologists to determine Site specific wildlife fencing (e.g. snake deterrence / exclusion fencing) during Detail Design.

#### Check Dams, Drainage and Stormwater Management, and Sedimentation Basin BMP

- 1 OPSD 219.191 Fibre Roll Flow Check Dam;
- 2 OPSD 219.200 Sandbag Flow Check;
- 3 OPSD 219.210 Temporary Rock Flow Check, V-Ditch / MTOD 219.210 Rock Flow Check Dam V-Ditch;
- 4 OPSD 219.211 Temporary Rock Flow Check, Flat Bottom Ditch or Channel / MTOD 219.211 Rock Flow Check Dam Flat Bottom Ditch;
- 5 OPSD 219.220 Sediment Trap in Ditch;
- 6 OPSD 219.230 Temporary Slope Drain for Sediment Trap / MTOD 219.230 Slope Drain for Sediment Trap;
- 7 OPSD 219.231 Temporary Berm Barrier for Slope Drain / MTOD 219.231 Berm Barrier for Slope Drain; and
- 8 OPSD 219.240 Sediment Trap for Dewatering.

#### In-Water Works BMP

- 1 OPSD 219.260 Turbidity Curtain;
- 2 OPSD 219.261 Turbidity Curtain, Seam Detail;
- 3 OPSD 221.010 Temporary Water Passage System – Culvert in Watercourse;
- 4 OPSD 221.020 Temporary Water Passage System – Pumping and Piping; and
- 5 Specific in-water works will need to be designed, which are not depicted through OPSD, and such measures may include:
  - a In-water working platforms;
  - b Cofferdams;
  - c Dewatering cofferdams and excavations within a watercourse setting;
  - d Shoreline protection;
  - e Temporary access bridges between in-water working platforms and the mainland; and
  - f Placement of earth fill and shoreline protection materials within the watercourse.

#### Tree Protection BMP

- 1 OPSD 220.010 Barrier for Tree Protection.

#### Erosion and Sediment Control BMP

MTO's Environmental Guide for Erosion and Sediment Control during Construction of Highway Projects (2015) provides fact sheets and supporting drawings for 37 erosion and sediment control BMP as follows:

- 1 BMP #1: Topsoiling;
- 2 BMP #2: Seeding;
- 3 BMP #3: Mulching;
- 4 BMP #4: Hydroseeding - Hydromulching;
- 5 BMP #5: Sodding and Sod Buffer Strips;
- 6 BMP #6: Riparian Zone Preservation;

- 7 BMP #7: Riprap/Riverstone Armouring;
- 8 BMP #8: Gabions;
- 9 BMP #9: Aggregate Cover (Granular B);
- 10 BMP #10: Stabilized Worksite Entrance: gravel area at construction access road entrances to paved roads; the contractor needs to ensure that vehicles leaving the Site are clean with respect to mud and debris. Due to space limitations, the contractor may need to make a smaller vehicle washing station than this BMP depicts;
- 11 BMP #11: Rolled Erosion Control Products (RECP);
- 12 BMP #12: Plastic Sheeting (on highly troublesome steep slopes);
- 13 BMP #13: Cellular Confinement System (plastic honeycombs to stabilize topsoil on a slope);
- 14 BMP #14: Chemical Stabilization;
- 15 BMP #15: Slope Texturing / Grading (cat-tracking);
- 16 BMP #16: Slope Flattening;
- 17 BMP #17: Slope Serration (cutting 'benches' in higher, steeper slopes, especially shale cuts);
- 18 BMP #18: Slope Drains;
- 19 BMP #19: Groundwater Control (through weeping tiles);
- 20 BMP #20: Synthetic Permeable Barrier (i.e. filter log check dam);
- 21 BMP #21: Silt Fence Barrier;
- 23 BMP #23: Berm (Earth Dyke) Barrier;
- 24 BMP #24: Brush or Rock Berm;
- 25 BMP #25: Sand Bag Barrier;
- 26 BMP #26: Check Dam (rock, sandbag, log, straw bales; and silt fence);
- 27 BMP #27: Fibre Rolls / Wattles (fascines);
- 28 BMP #28: Diversion Ditch;
- 29 BMP #29: Temporary Stream Diversion (flume, pumping system, or temporary channel);
- 30 BMP #30: Cofferdams;
- 31 BMP #31: Energy Dissipators;
- 32 BMP #32: Turbidity Curtains;
- 33 BMP #33: Drain Inlet Sediment Barrier;
- 34 BMP #34: Continuous Berm (i.e. filter logs);
- 35 BMP #35: Sediment Traps for Dewatering; and
- 37 BMP #37: Pumped Silt Control System (filter bags for dewatering discharge water).

## 5.0 Conclusions and Recommendations

The three ESCP approaches as per MTO Guidance are briefly described as follows:

- Approach 1: BMP – the Consultant recommends BMP on contract drawings; and the Contractor installs, maintains and removes the BMPs;
- Approach 2: ESCP – the Consultant prepares drawings, a Non-Standard Special Provision (NSSP) and a technical memo; and the Contractor implements the ESCP; and
- Approach 3: Two Part ESCP Main and Supplemental – the Consultant prepares drawings, a NSSP and a technical memo; and the Contractor prepares a supplemental ESCP to address construction methods.

Given that this construction involves constructing a new roadway and the high consequences of adverse effects of uncontrolled erosion and resultant sedimentation because of the very close proximity to PSWs and watercourses, WSP recommends Approach 3: Two-Part Main and Supplemental Erosion and Sediment Control Plan be completed in Detail Design prior to construction.

This approach is recommended as it incorporates the Contractor's thought and preparation of a supplemental ESCP prior to the start of construction.

Geotechnical, recent aerial photographs, hydrology, information on fish and fish habitat and terrestrial habitats and water surface water uses should be reviewed as a part of the ESCP.

All erosion and sediment control measures are to be inspected and maintained by the Contract Administrator to ensure they are functioning as intended throughout the construction period and until such time that construction is complete and disturbed areas have been stabilized. All erosion and sediment control measures that are failing must be repaired / replaced by the Contractor as soon as possible as identified in OPSS 182 and OPSS 805. All erosion and sediment control measures that are non-biodegradable should be removed from the Site when work is complete, and the Site is stabilized.

Additionally, dust control strategies should be implemented to minimize wind-blown dust.

A qualified ecologist and aquatic biologist should evaluate the erosion and sediment control plan and determine if additional and specific measures are needed for wildlife protection. Although Site perimeter controls (silt fence, safety fencing, etc.) may also function to some degree as wildlife exclusion fencing, further evaluations are required as follows:

- Identify areas where temporary wildlife exclusion fencing is needed, with respect to species of concern, along with recommended or required wildlife exclusion strategies for such;
- Specific measures and activities needed to search for any Species at Risk (SAR) or other species of concern in work areas, along with strategies to exclude them from the work area throughout the construction program; and
- With respect to any work in designated wetlands, a qualified geomorphologist, ecologist, and aquatic biologist, should be retained to develop watercourse restoration plans and / or creek realignments as necessary, and provide oversight during construction.

## **6.0 WSP Statement of Qualifications and Limitations**

WSP prepared this report solely for the use of the intended recipient, Ontario Ministry of Transportation, in accordance with the professional services agreement between the parties. The report is intended to be used in its entirety. No excerpts may be taken to be representative of the findings in the assessment.

The conclusions presented in this report are based on work performed by trained, professional and technical staff, in accordance with their reasonable interpretation of current and accepted engineering and scientific practices at the time the work was performed.

The content and opinions contained in the present report are based on the observations and/or information available to WSP at the time of preparation, using investigation techniques and engineering analysis methods consistent with those ordinarily exercised by WSP and other engineering/scientific practitioners working under similar conditions, and subject to the same time, financial and physical constraints applicable to this Project.

WSP disclaims any obligation to update this report if, after the date of this report, any conditions appear to differ significantly from those presented in this report, however, WSP reserves the right to amend or supplement this report based on additional information, documentation or evidence.

WSP makes no other representations whatsoever concerning the legal significance of its findings.

The intended recipient is solely responsible for the disclosure of any information contained in this report. If a third party makes use of, relies on, or makes decisions in accordance with this report, said third party is solely responsible for such use, reliance or decisions. WSP does not accept responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken by said third party based on this report.

WSP has provided services to the intended recipient in accordance with the professional services agreement between the parties and in a manner consistent with that degree of care, skill and diligence normally provided by members of the same profession performing the same or comparable services in respect of Projects of a similar nature in similar circumstances. It is understood and agreed by WSP and the recipient of this report that WSP provides no warranty, express or implied, of any kind. Without limiting the generality of the foregoing, it is agreed and understood by WSP and the recipient of this report that WSP makes no representation or warranty whatsoever as to the sufficiency of its scope of work for the purpose sought by the recipient of this report.

In preparing this report, WSP has relied in good faith on information provided by others, as noted in the report. WSP has reasonably assumed that the information provided is correct and WSP is not responsible for the accuracy or completeness of such information.

Benchmark and elevations used in this report are primarily to establish relative elevation differences between the specific testing and/or sampling locations and should not be used for other purposes, such as grading, excavating, construction, planning, development, etc.

Design recommendations given in this report are applicable only to the Project and areas as described in the text and then only if constructed in accordance with the details stated in this report. The comments made in this report on potential construction issues and possible methods are intended only for the guidance of the designer. The number of testing and/or sampling locations may not be sufficient to determine all the factors that may affect construction methods and costs. We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time.

This limitations statement is considered an integral part of this report.

All of which is respectfully submitted.

Emily Stephenson, B.Sc., P.Geo.  
Hydrogeologist

Peter Hayes, P.Geo.  
Senior Hydrogeologist / Environmental Specialist

#### ATTACHMENTS

Figure 1: Site Location

Figures 2.1 through 2.9: Erosion and Sediment Overview Risk

Appendix A: Erosion Potential and Consequences Assessment Summary

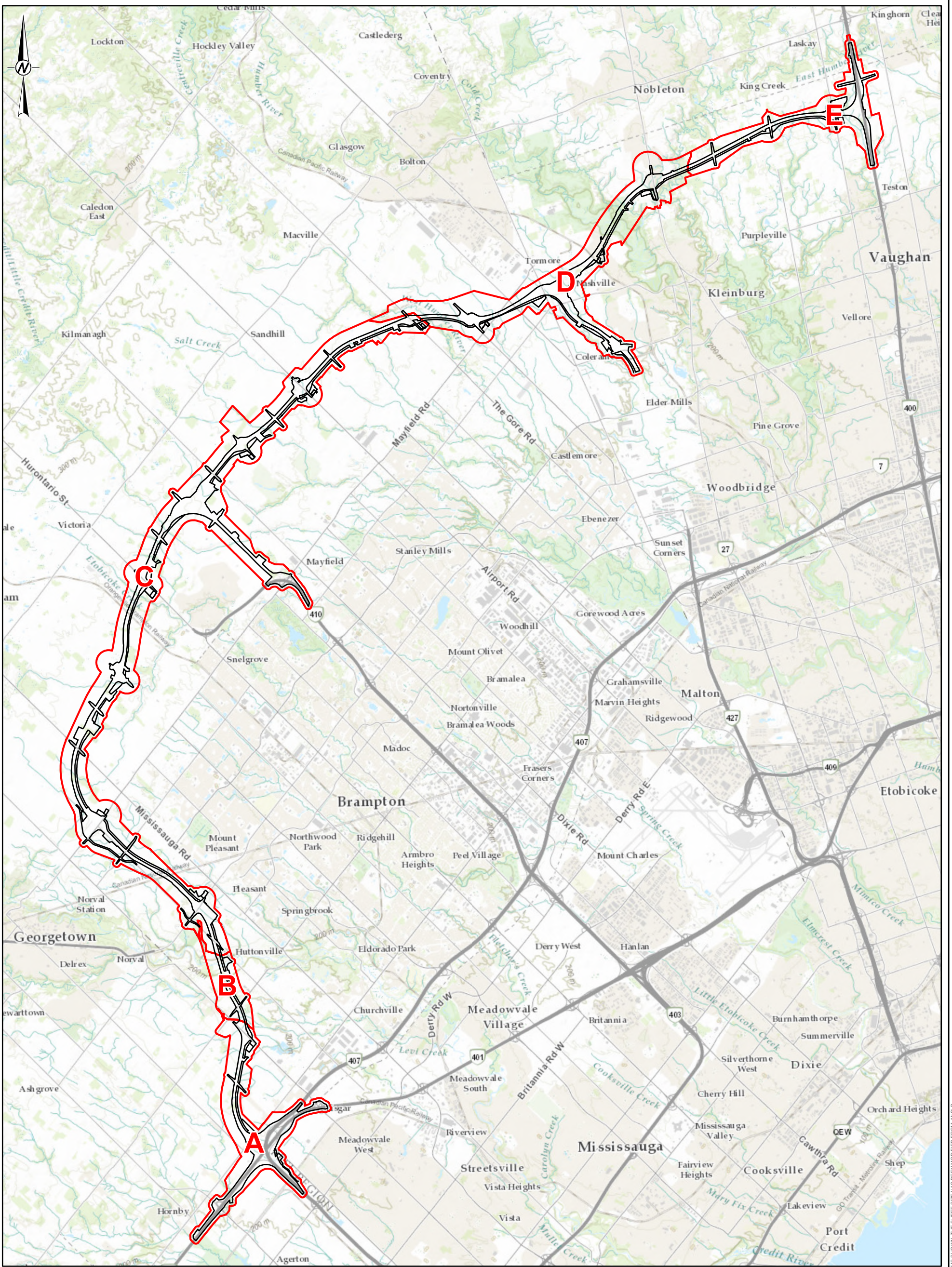
Appendix B: Diagram for a double-heavy duty row of silt fence with straw bales between

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- Oak Ridges Moraine Groundwater Program (ORMGP) database. URL: oakridgewaters.ca
- Ontario Geological Survey 2010. Surficial Geology of Southern Ontario; Ontario Geological Survey, Miscellaneous Release--Data 128-REV.
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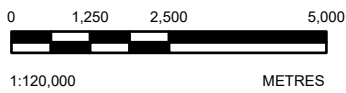
# Figures





- LEGEND**
- PRELIMINARY DESIGN
  - FOCUSED STUDY AREA

DRAFT



**NOTE(S)**  
1. ALL LOCATIONS ARE APPROXIMATE

**REFERENCE(S)**  
1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO  
2. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N

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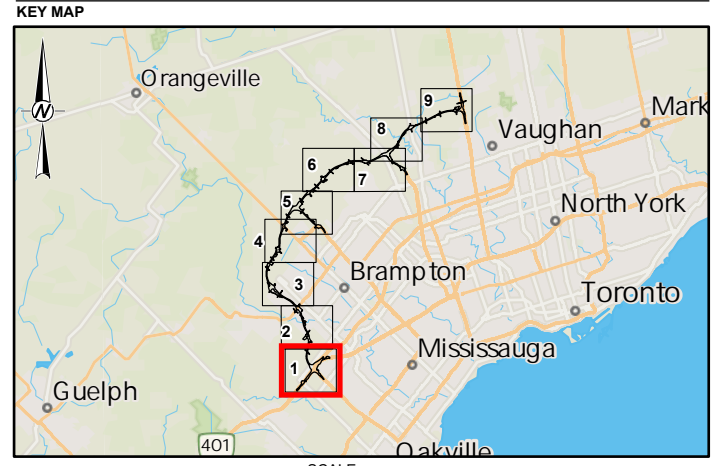
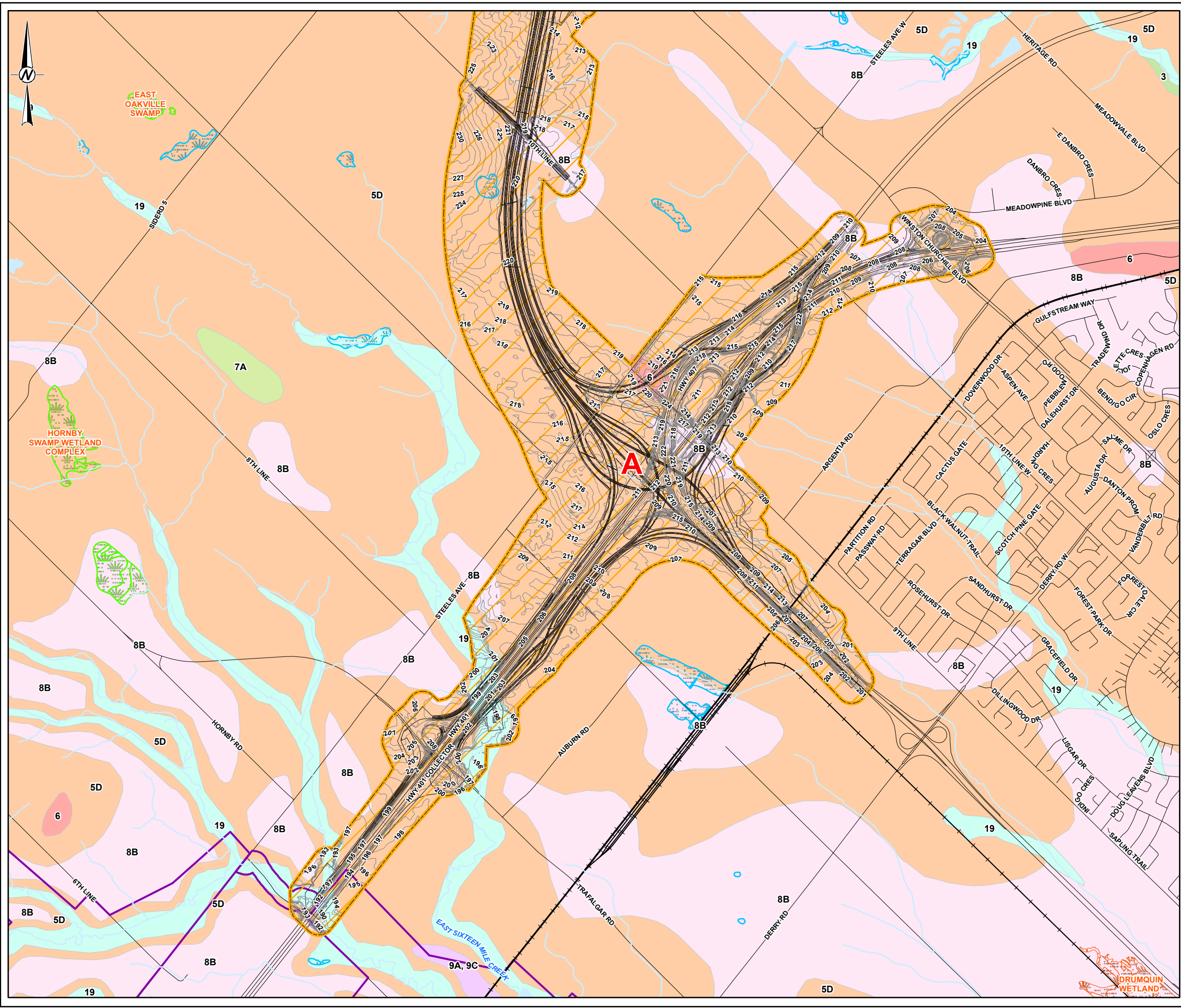
PROJECT  
**THE HIGHWAY 413 PRELIMINARY DESIGN AND ASSESSMENT OF ENVIRONMENTAL IMPACTS**

TITLE  
**STUDY AREA**

CONSULTANT	YYYY-MM-DD	2025-10-09
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	PREPARED	AR
	REVIEWED	---
	APPROVED	---



PROJECT NO. 14M-00321-01	CONTROL 0009	REV. A	FIGURE 1
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**LEGEND**

- ROADWAY
- 1 M TOPOGRAPHIC CONTOURS
- PRELIMINARY DESIGN
- WATERCOURSE
- RAILWAY
- FOCUSED STUDY AREA
- GREENBELT
- UNEVALUATED WETLAND
- EVALUATED WETLAND (NO SIGNIFICANCE)
- PROVINCIALY 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  
1:25,000 METRES

**DRAFT**

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PROJECT  
**THE HIGHWAY 413 PRELIMINARY DESIGN AND ASSESSMENT OF ENVIRONMENTAL IMPACTS**

TITLE  
**TOPOGRAPHY, NATURAL FEATURES & SURFICIAL GEOLOGY**

CONSULTANT

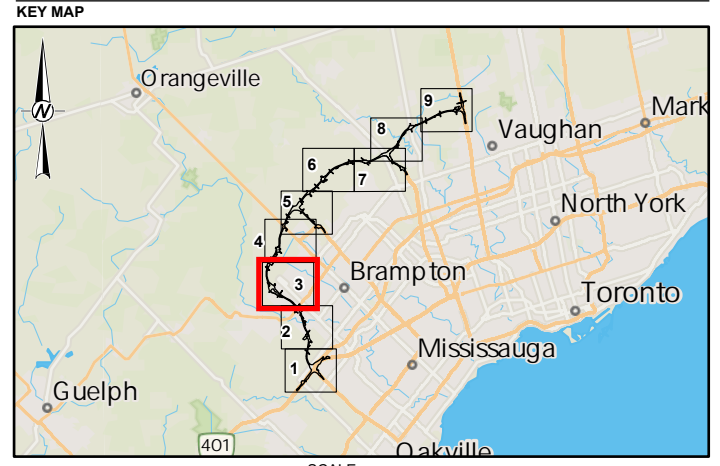
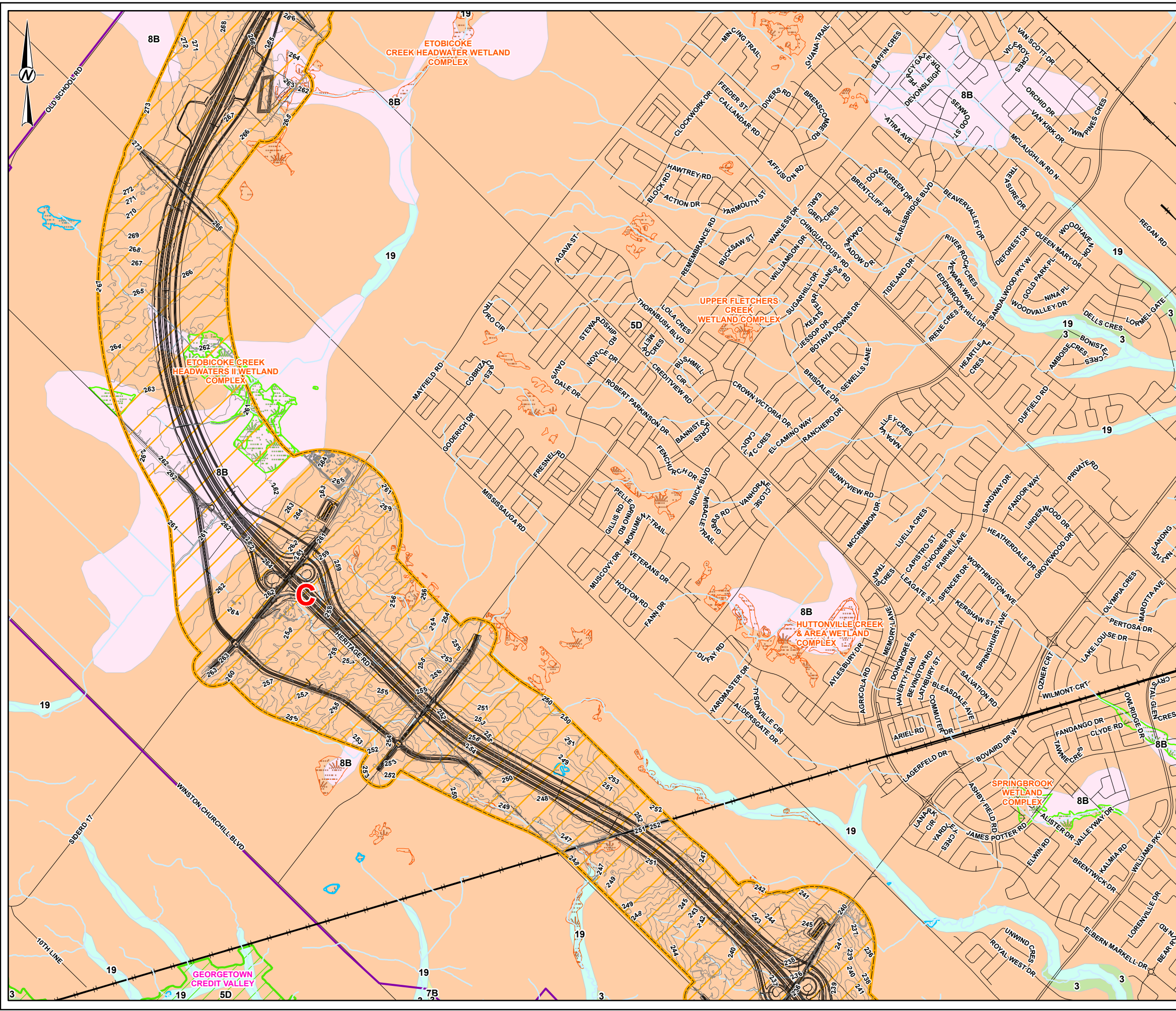
YYYY-MM-DD	2025-10-09
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APPROVED	---

PROJECT NO. 14M-00321-01 CONTROL 0009 REV. A FIGURE 2.1

**wsp**

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**LEGEND**

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- 1 M TOPOGRAPHIC CONTOURS
- PRELIMINARY DESIGN
- WATERCOURSE
- RAILWAY
- ANSI
- FOCUSED STUDY AREA
- GREENBELT
- UNEVALUATED WETLAND
- EVALUATED WETLAND (NO SIGNIFICANCE)
- PROVINCIALY 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

**DRAFT**

**NOTE(S)**

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**REFERENCE(S)**

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MTO

**PROJECT**  
THE HIGHWAY 413 PRELIMINARY DESIGN AND ASSESSMENT OF ENVIRONMENTAL IMPACTS

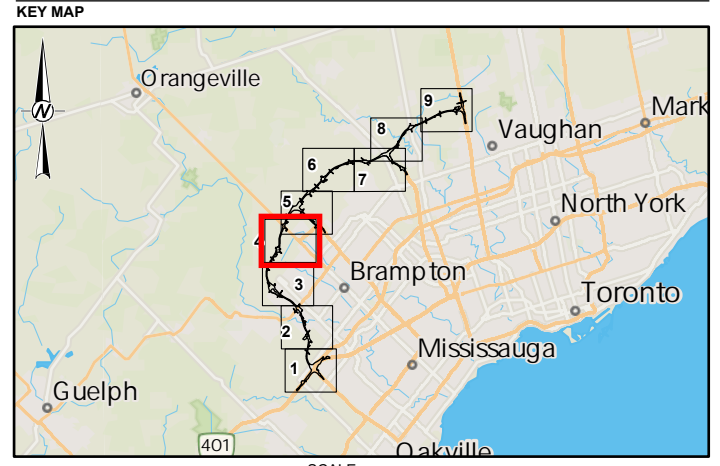
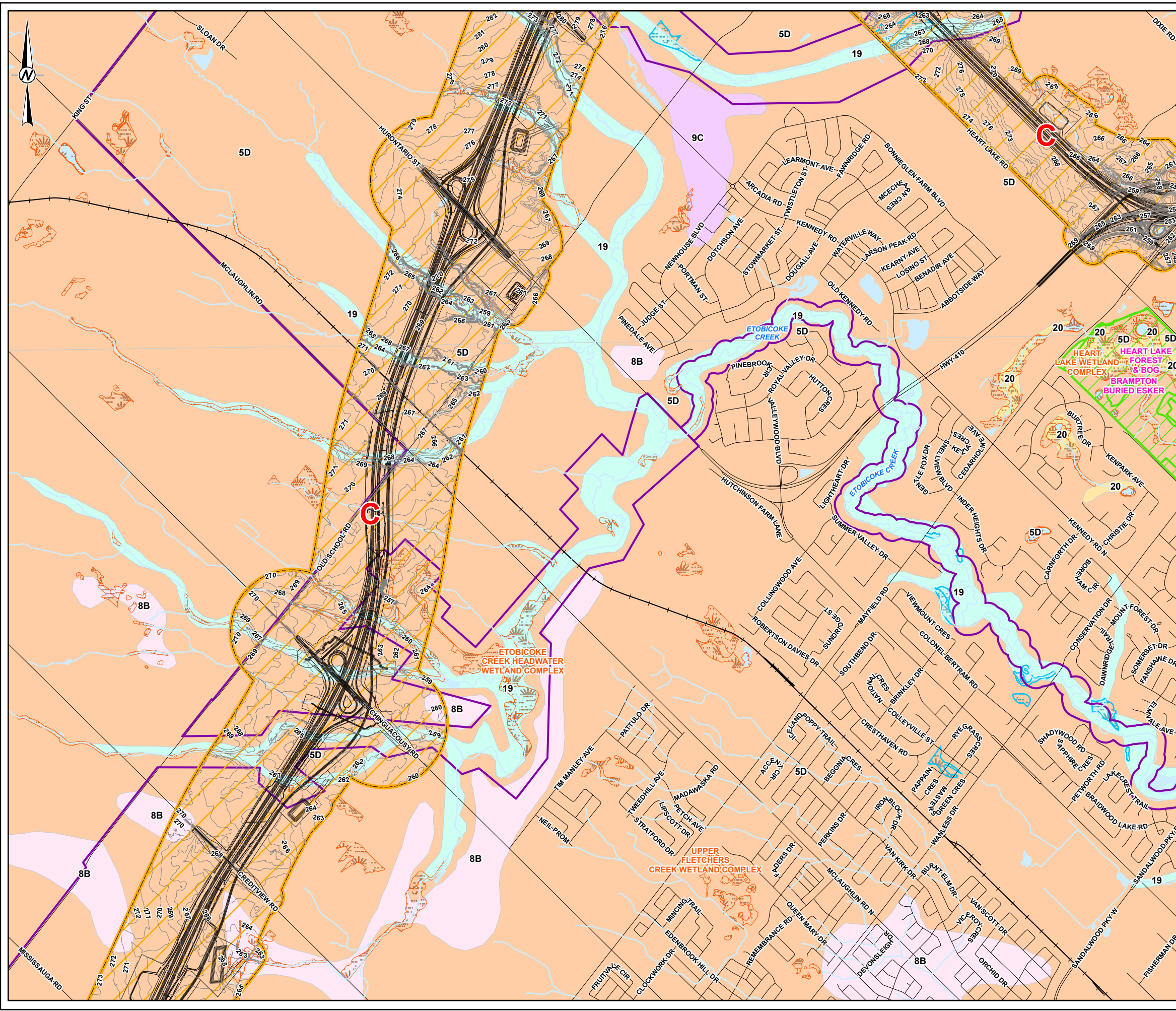
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**TOPOGRAPHY, NATURAL FEATURES & SURFICIAL GEOLOGY**

**CONSULTANT**

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REVIEWED	---
APPROVED	---

**PROJECT NO.** 14M-00321-01      **CONTROL** 0009      **REV.** A      **FIGURE** 2.3

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- 1 M TOPOGRAPHIC CONTOURS
- PRELIMINARY DESIGN
- WATERCOURSE
- RAILWAY
- ANSI
- FOCUSED STUDY AREA
- GREENBELT
- UNEVALUATED WETLAND
- PROVINCIAL SIGNIFICANT WETLAND (PSW)
- WATERBODY

**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)

0 250 500 1,000  
1:25,000 METRES

**DRAFT**

**NOTE(S)**

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**REFERENCE(S)**

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THE HIGHWAY 413 PRELIMINARY DESIGN AND ASSESSMENT OF ENVIRONMENTAL IMPACTS

**TITLE**  
TOPOGRAPHY, NATURAL FEATURES & SURFICIAL GEOLOGY

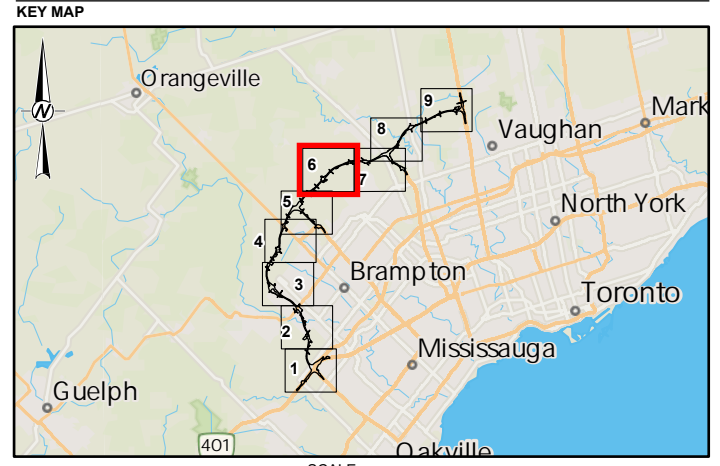
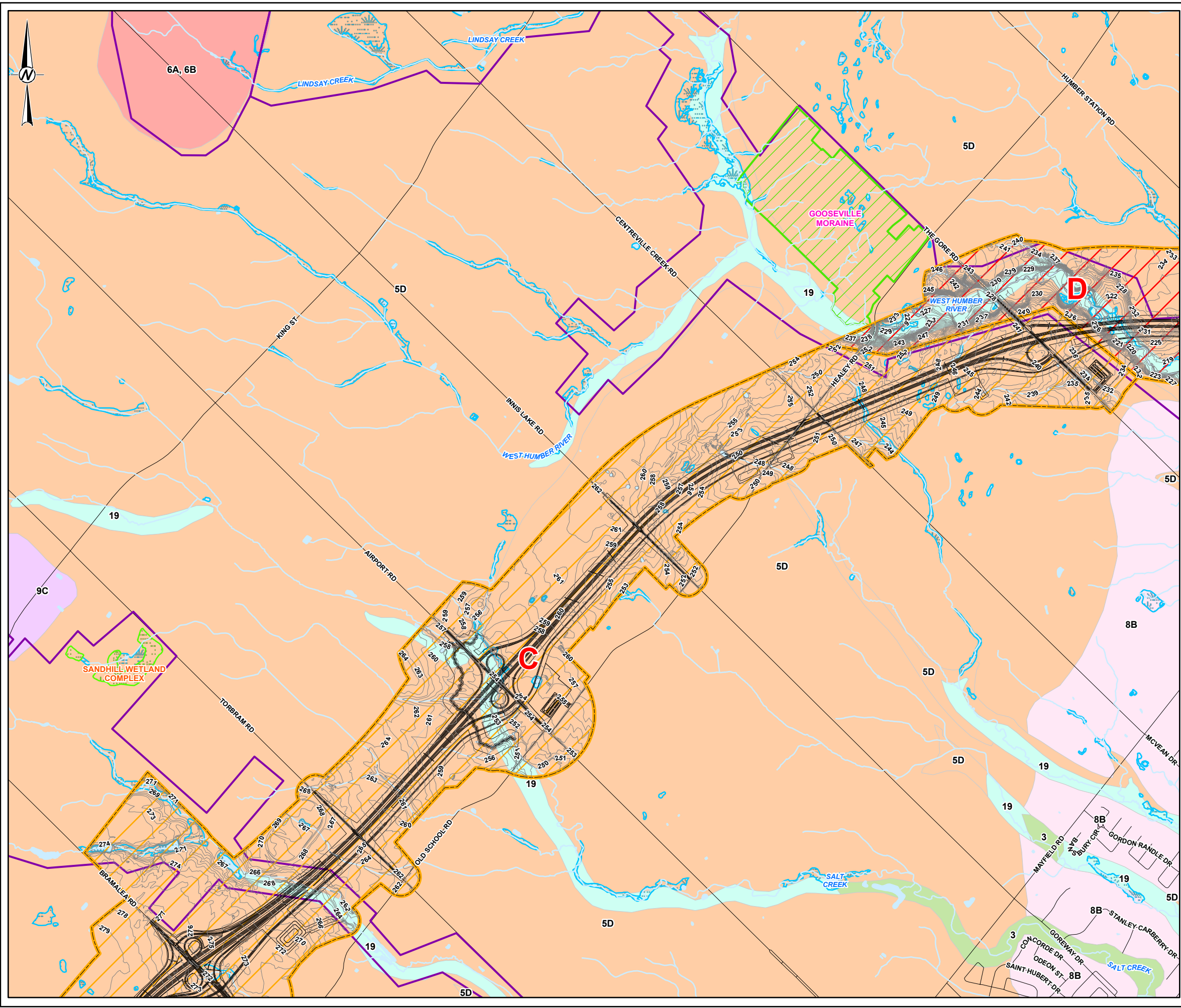
**CONSULTANT**

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REVIEWED	---
APPROVED	---

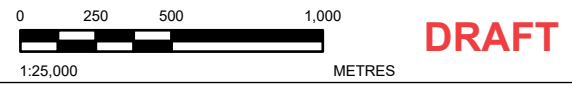
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- LEGEND**
- ROADWAY
  - 1 M TOPOGRAPHIC CONTOURS
  - PRELIMINARY DESIGN
  - WATERCOURSE
  - ANSI
  - FOCUSED STUDY AREA
  - GREENBELT
  - UNEVALUATED WETLAND
  - EVALUATED WETLAND (NO SIGNIFICANCE)
  - WATERBODY
- EROSION PONTENTIAL AND CONSEQUENCE**
- MODERATE
  - HIGH
- SURFICIAL GEOLOGY**
- 3: PALEOZOIC BEDROCK
  - 5D: GLACIOLACUSTRINE-DERIVED SILTY TO CLAYEY TILL
  - 6: ICE-CONTACT STRATIFIED DEPOSITS (SAND AND GRAVEL)
  - 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)



**DRAFT**

**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  
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PROJECT  
**THE HIGHWAY 413 PRELIMINARY DESIGN AND ASSESSMENT OF ENVIRONMENTAL IMPACTS**

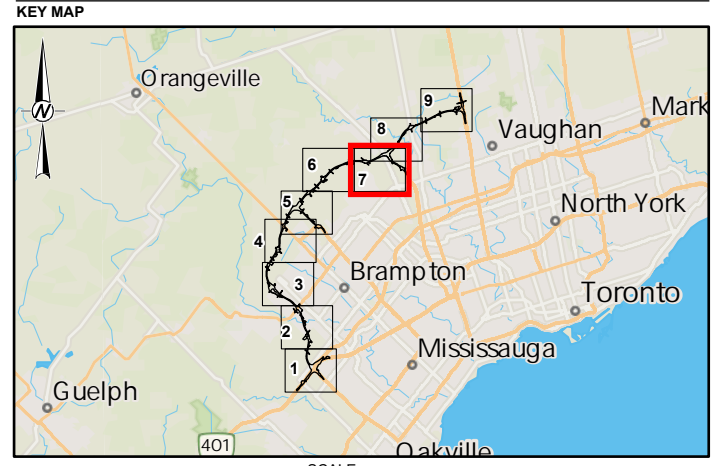
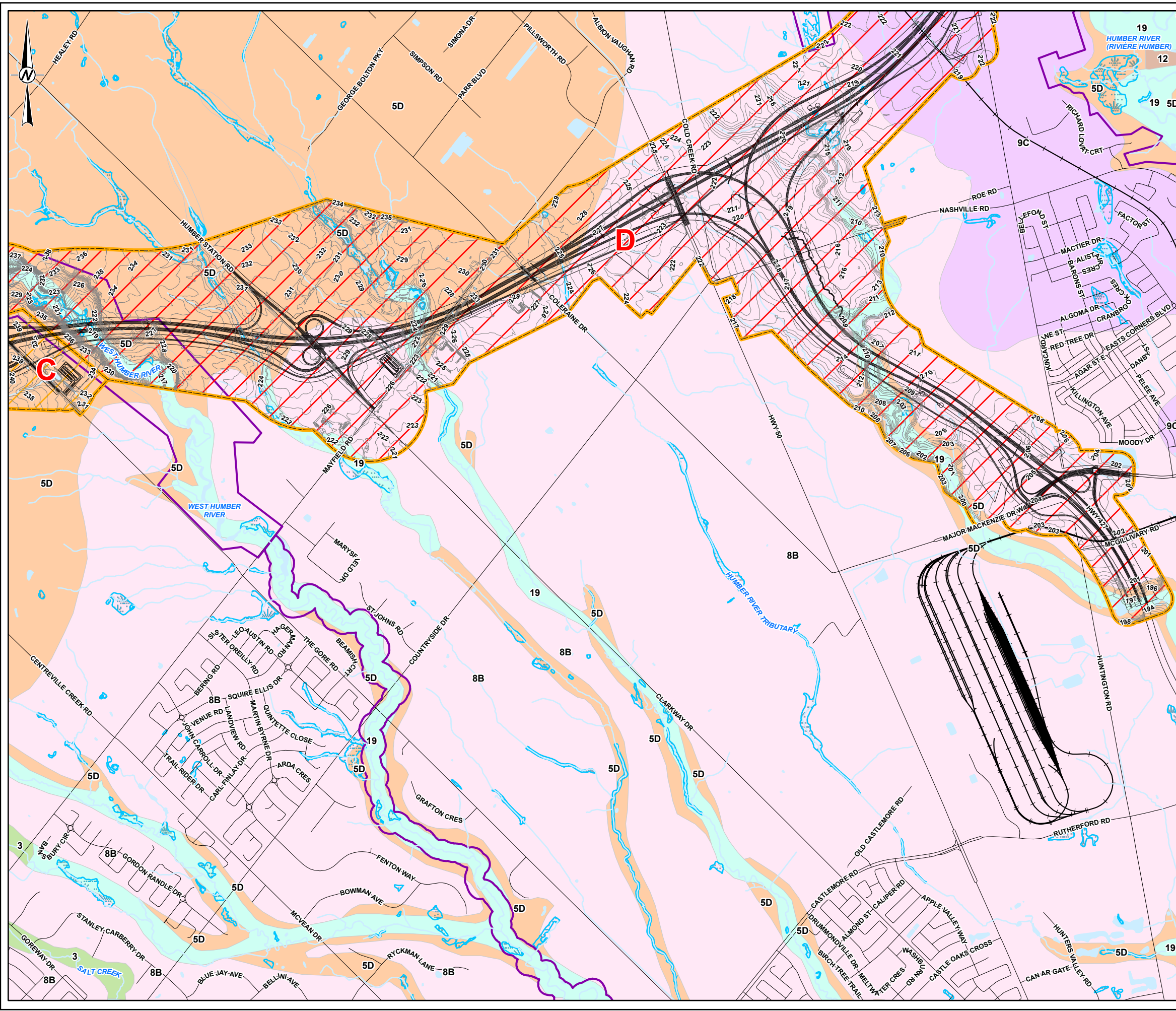
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PROJECT NO. 14M-00321-01	CONTROL 0009	REV. A	FIGURE 2.6
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**LEGEND**

- ROADWAY
- 1 M TOPOGRAPHIC CONTOURS
- PRELIMINARY DESIGN
- WATERCOURSE
- RAILWAY
- FOCUSED STUDY AREA
- GREENBELT
- UNEVALUATED WETLAND
- WATERBODY

**EROSION PONTENTIAL AND CONSEQUENCE**

- MODERATE
- HIGH

**SURFICIAL GEOLOGY**

- 3: PALEOZOIC BEDROCK
- 5D: GLACIOLACUSTRINE-DERIVED SILTY TO CLAYEY TILL
- 8B: INTERBEDDED FLOW TILL, RAINOUT DEPOSITS AND SILT AND CLAY
- 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)

0 250 500 1,000  
1:25,000 METRES

**DRAFT**

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PROJECT  
THE HIGHWAY 413 PRELIMINARY DESIGN AND ASSESSMENT OF ENVIRONMENTAL IMPACTS

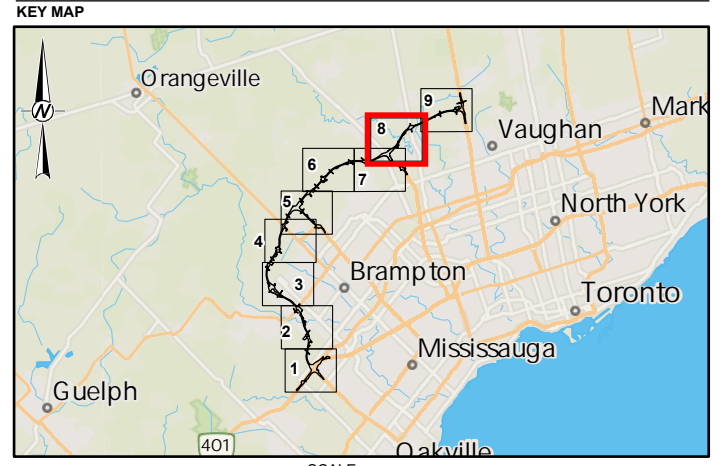
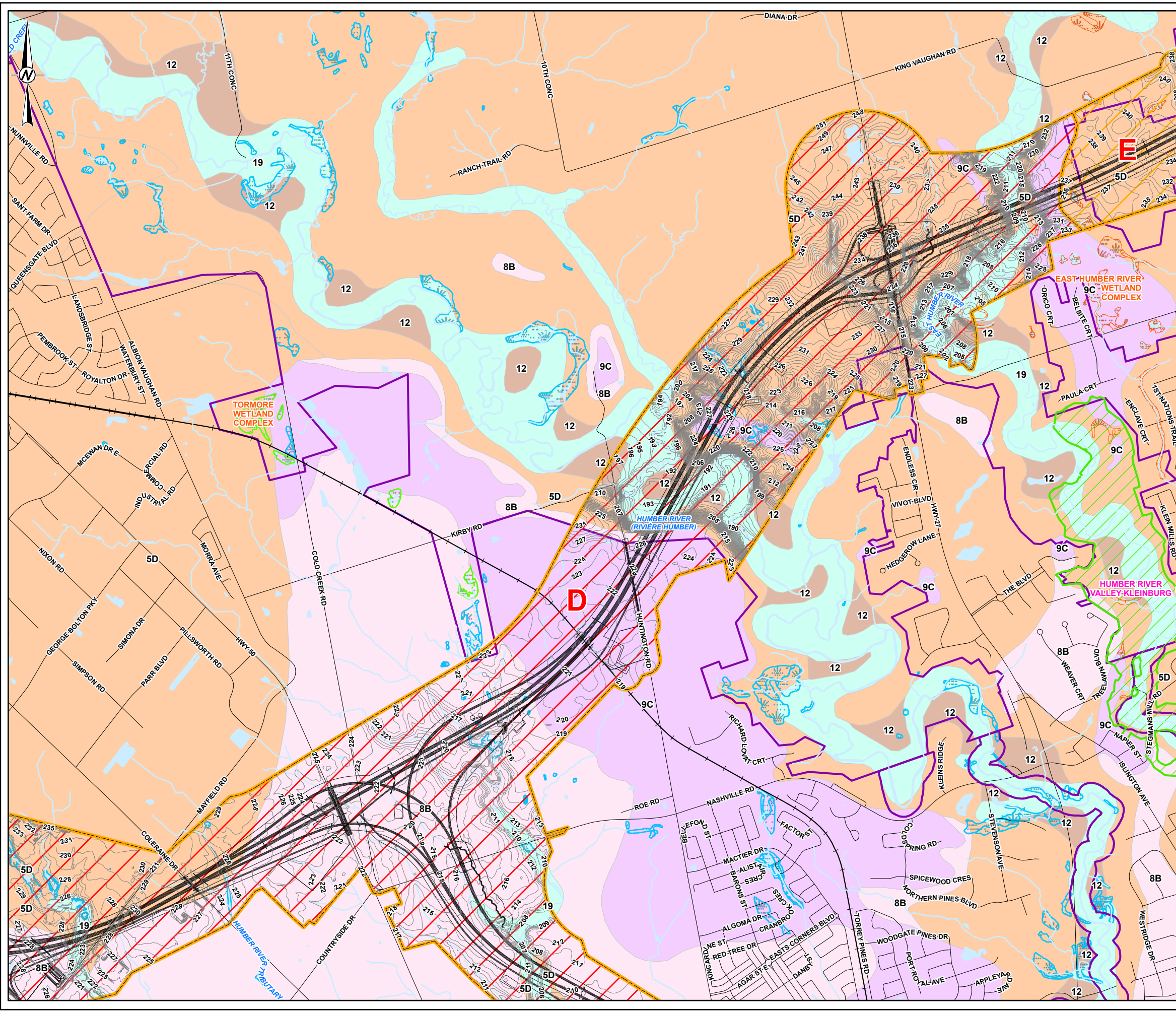
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PROJECT NO. 14M-00321-01 CONTROL 0009 REV. A FIGURE 2.7

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**LEGEND**

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

**EROSION PONTENTIAL AND CONSEQUENCE**

- MODERATE
- HIGH

**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)
- 12: OLDER ALLUVIAL DEPOSITS (CLAY, SILT, SAND, GRAVEL AND ORGANICS)
- 19: MODERN ALLUVIAL DEPOSITS (CLAY, SILT, SAND, GRAVEL AND ORGANICS)

0 250 500 1,000 METRES

**DRAFT**

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PROJECT  
THE HIGHWAY 43 PRELIMINARY DESIGN AND ASSESSMENT OF ENVIRONMENTAL IMPACTS

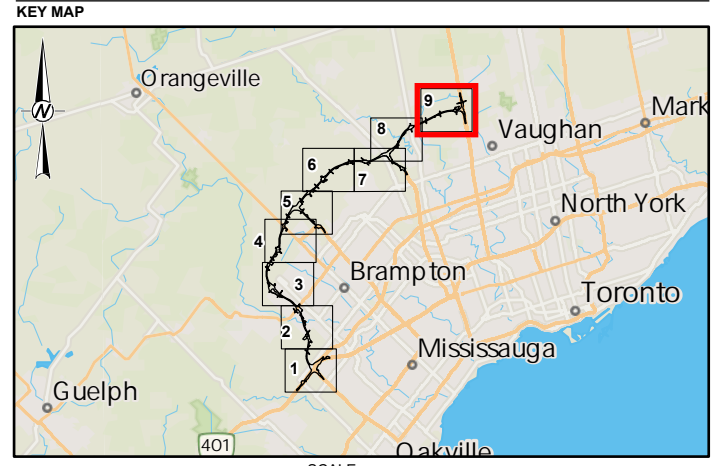
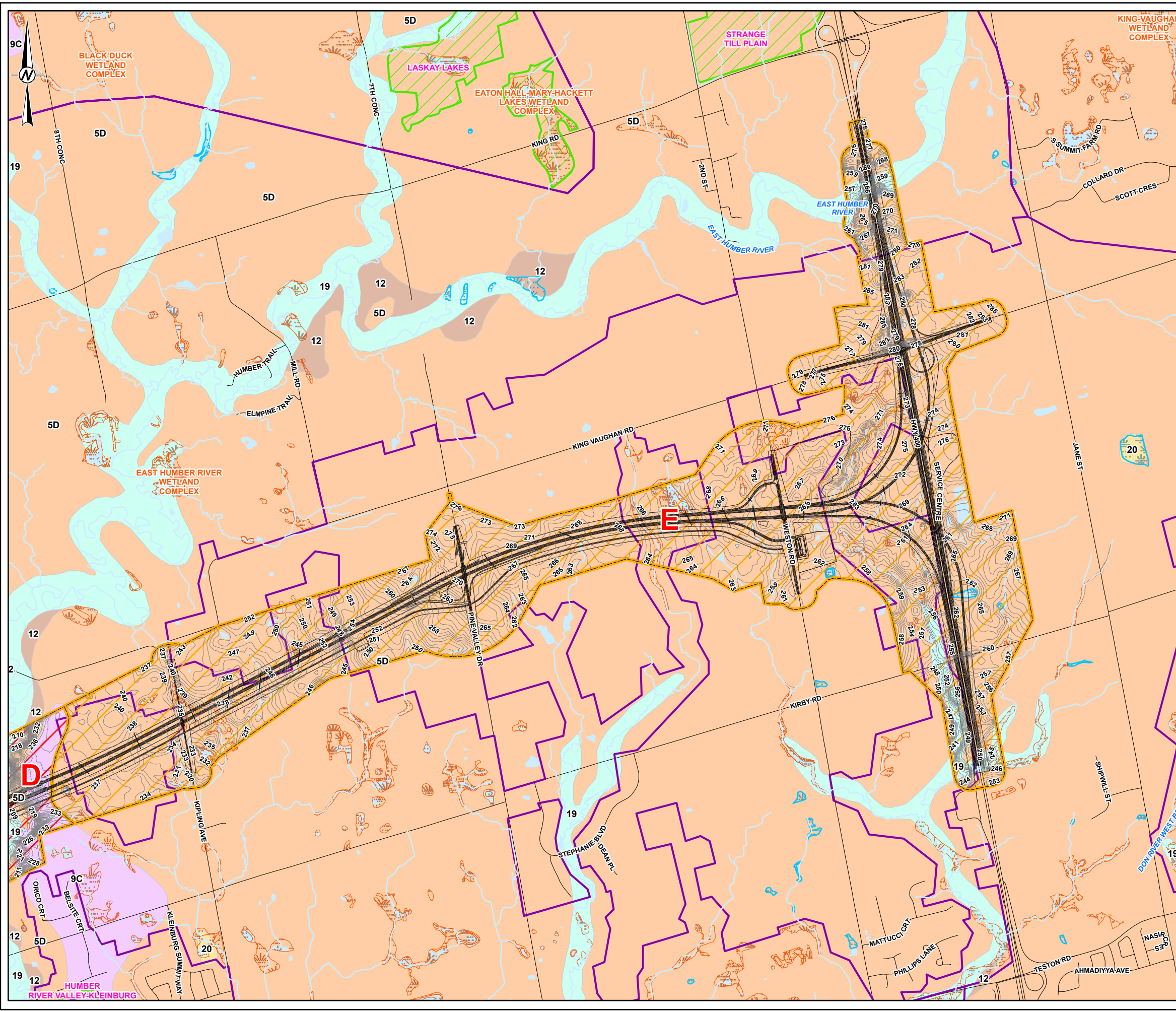
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**LEGEND**

- ROADWAY
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- PRELIMINARY DESIGN
- WATERCOURSE
- ANSI
- FOCUSED STUDY AREA
- GREENBELT
- UNEVALUATED WETLAND
- PROVINCIALY SIGNIFICANT WETLAND (PSW)
- WATERBODY

**EROSION PONTENTIAL AND CONSEQUENCE**

- MODERATE
- HIGH

**SURFICIAL GEOLOGY**

- 5D: GLACIOLACUSTRINE-DERIVED SILTY TO CLAYEY TILL
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0 250 500 1,000 METRES

**DRAFT**

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TITLE  
**TOPOGRAPHY, NATURAL FEATURES & SURFICIAL GEOLOGY**

CONSULTANT

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PROJECT NO. 14M-00321-01 CONTROL 0009 REV. A FIGURE 2.9

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# A

## Erosion Potential and Consequence Assessment Summary



Polygon	Figures	Land Use (e.g. residential, commercial, etc.)	Natural Features (wetlands, waterbodies, watercourses)	Surficial Geology	Soil Erodibility (Low, Medium, High based on Table 5.1)	Topography (range of contours)	Slope Length (<70m or >70m)	Slope Gradient (0-10%,10-20%,>20%)	Erosion Potential (Low, Moderate, High based on Table 5.2)	Risk / Consequence (Low, Moderate, High)
A	2.1 / 2.2	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	<70m	0-20%	Moderate	Moderate
B	2.2	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	<70m	0-20%, >20%	High	High
C	2.2 / 2.3 / 2.4 / 2.5 / 2.6	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	<70m	0-20%	Moderate	Moderate
D	2.6 / 2.7 / 2.8 / 2.9	Rural Area, predominately agricultural with rural residential houses	West Humber River, tributaries to West Humber River, Humber River, Tributaries to the 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	<70m	0-20%, >20%	High	High
E	2.8 / 2.9	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	<70m	0-20%	Moderate	Moderate

# B

## Diagram for a Double-Heavy Duty Row of Silt Fence with Straw Bales Between





## Double Heavy Duty Silt Fence with Straw Bale Barrier In-Between

### Notes:

Details regarding construction of the heavy-duty wire-backed silt fences as per OPSD 219.130.

Details regarding construction of the light-duty straw bale barrier as per OPSD 219.100.

