

City of Markham

Highway 404 North Collector Roads Municipal Class Environmental Assessment

Environmental Study Report

March 2021

B000801

SUBMITTED BY CIMA CANADA INC.

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1. Introduction and Study Background

1.1. Introduction and Study Area

CIMA Canada Inc. (CIMA) was retained by the City of Markham to undertake a Municipal Class Environmental Assessment (Class EA) Study for the Highway 404 North Collector Roads. The Markham Highway 404 North Planning District Secondary Plan (OPA 149) requires the completion of a Class EA to confirm the final alignment of the new north-south and east-west roads as per the approved OPA 149 Secondary Plan and consequently to confirm the pattern of other roads within this District.

The Highway 404 North Planning District area extends from approximately 400 metres north of 19th Avenue and south to approximately 600 metres north of Elgin Mills Road. Highway 404 defines the western limit while the eastern limit is primarily defined by Woodbine Avenue. The study area is shown in Exhibit 1-1.

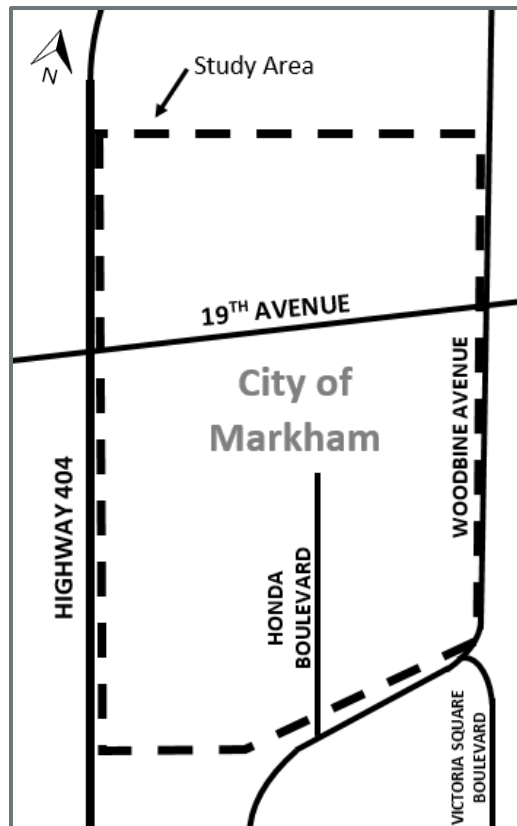


Exhibit 1-1: Study Area

1.2. Municipal Class Environmental Assessment Process

This study follows the Municipal Engineers Association (MEA) Municipal Class Environmental Assessment process for a Schedule C project (October 2000, as amended in 2007, 2011 and 2015).

The Ontario Environmental Assessment Act (2010) guides the process for reviewing the environmental impact of proposed activities. The Act applies to government agencies, conservation authorities, and municipalities. The City of Markham is the proponent in this study and the Municipal Class Environmental Assessment for the Highway 404 North Collector Roads has been completed in accordance with the Ontario Environmental Assessment Act (2010).

Municipal projects that affect the purpose, capacity or function of a roadway, or propose new roadways are subject to the Municipal Engineers Association Municipal Class Environmental Assessment (October 2000, as amended in 2007, 2011 and 2015). The Municipal Class Environmental Assessment (Class EA) is a planning and design process for transportation/transit and water/wastewater infrastructure projects which have a predictable range of impacts that can be mitigated. The Municipal Class EA process is approved by the Ministry of Environment, Conservation and Parks to meet the requirements of the Environmental Assessment Act (2010).

Based on their potential range of impacts, projects are classified under the Municipal Class EA by Schedules:

- Schedule A** Activities have minimal environmental effects. Projects are pre-approved.
- Schedule A+** Activities have minimal environmental effects. Projects are pre-approved so long as the public is advised prior to implementation.
- Schedule B** Activities have some adverse environmental effects. Projects typically involve improvements and minor expansions to existing facilities. These projects proceed through a screening process (Phases 1 and 2 of the Class EA), including consultation with the potentially affected public.
- Schedule C** Activities have some adverse environmental effects. Projects typically involve the construction of new facilities and major expansions to existing facilities. These projects proceed through the full Class EA planning and design process (Phases 1 through 5).

In particular, road widening or extensions with an estimated construction cost of \$2.4M or more are classified as a Schedule C project under the Municipal Class EA. As noted above, Schedule C projects must follow Phases 1 through 5 of the Class EA process:

- Phase 1** Identify the problem or opportunity.
- Phase 2** Identify alternative solutions to address the problem or opportunity.

This Phase will identify and assess the positive and negative effects of alternative planning solutions for the identified problem and/or opportunity, taking into account the natural, social, cultural, and economic environment and input from all agencies and the public.
- Phase 3** Examine alternative methods of implementing the preferred solution.

Phase 3 will identify and assess the positive and negative effects of alternative design concepts for the preferred solution, taking into account the natural, social, cultural, and economic environment and input from all agencies and the public.

Phase 4 Document the rationale for the preferred solution and design concept, and the planning, design and consultation process in an Environmental Study Report for public and agency review.

The Environmental Study Report is placed on the public record for at least 30 calendar days. If any outstanding issues raised by the public or agencies cannot be resolved during this review period, the public and agencies have the right to request the Minister of Environment and Climate Change to order an Individual Environmental Assessment as per Part II of the Ontario Environmental Assessment Act. If no requests for a Part II order are received during the review period, the project will proceed to Phase 5 for implementation.

Phase 5 Complete contract drawings and documents, and proceed to construction, operation and environmental monitoring.

1.2.1. Part II Order

A request may be made to the Ministry of the Environment, Conservation and Parks for an order requiring a higher level of study (i.e. requiring an individual/comprehensive EA approval before being able to proceed), or that conditions be imposed (e.g. require further studies), only on the grounds that the requested order may prevent, mitigate or remedy adverse impacts on constitutionally protected Aboriginal and treaty rights. Requests on other grounds will not be considered. Requests should include the requester contact information and full name for the ministry.

Requests should specify what kind of order is being requested (request for additional conditions or a request for an individual/comprehensive environmental assessment), how an order may prevent, mitigate or remedy those potential adverse impacts, and any information in support of the statements in the request. This will ensure that the ministry is able to efficiently begin reviewing the request.

The request should be sent in writing by mail or by email to:

Minister of the Environment, Conservation and Parks
Ministry of Environment, Conservation and Parks
777 Bay Street, 5th Floor
Toronto ON M7A 2J3
minister.mecp@ontario.ca

and

Director, Environmental Assessment Branch
Ministry of Environment, Conservation and Parks
135 St. Clair Ave. W, 1st Floor
Toronto ON, M4V 1P5
EABDirector@ontario.ca

Requests should also be sent to the City of Markham by mail or by email.

1.2.2. Climate Change

The Ministry of Environment, Conservation and Parks (MECP) has set expectations for considering climate change in the preparation, execution and documentation of environmental assessment studies. The MECP has developed codes of practice (codes) to provide guidance on key aspects of the environmental assessment process. This guide covers the consideration of:

- the impacts of a project on climate change;
- the impacts of climate change on a project; and
- various means of identifying and minimizing negative impacts during project implementation.

The directions and methods outlined in the MECP guidance complement and support the climate-focused policies of the 2014 Provincial Policy Statement. The 2014 Provincial Policy Statement issued under the Planning Act advises planning authorities of the need to consider development that reduces greenhouse gas emissions and reduces the potential risk of climate change related events like droughts or intense precipitation. A partial listing of applicable policies in the 2014 Provincial Policy Statement include:

- Policies 1.6.2, 1.6.6.7 — Encourage green infrastructure (e.g. permeable surfaces) and strengthen stormwater management requirements
- Policy 1.8 — Require the consideration of energy conservation and efficiency, reduced greenhouse gas emissions and climate change adaptation (e.g. tree cover for shade and for carbon sequestration)
- Policy 3.1.3 — Requires consideration of the potential impacts of climate change that may increase the risk associated with natural hazards (e.g. flooding due to severe weather)

The potential impacts on climate change have been considered and documented throughout the study as documented in Sections 5.2 and 6 in accordance with the MECP guidelines.

Consideration for how the preferred alternative is expected to perform with regard to climate change is discussed in Section 6.

1.3. Study Approach and Organization

Exhibit 1-2 demonstrates the process for a Schedule C project under the Municipal Class EA. This study approach begins with a thorough understanding of the problem being addressed followed by assessing the alternative solutions and alternative design concepts. The approach is organized around study phases, including Public Information Centres (PICs), stakeholder engagement and participation of technical review/regulatory agencies at study milestones.

The study was organized to ensure meaningful input was gathered from internal and external stakeholders, including review agencies. Exhibit 1-3 illustrates the key stakeholders included in the study.

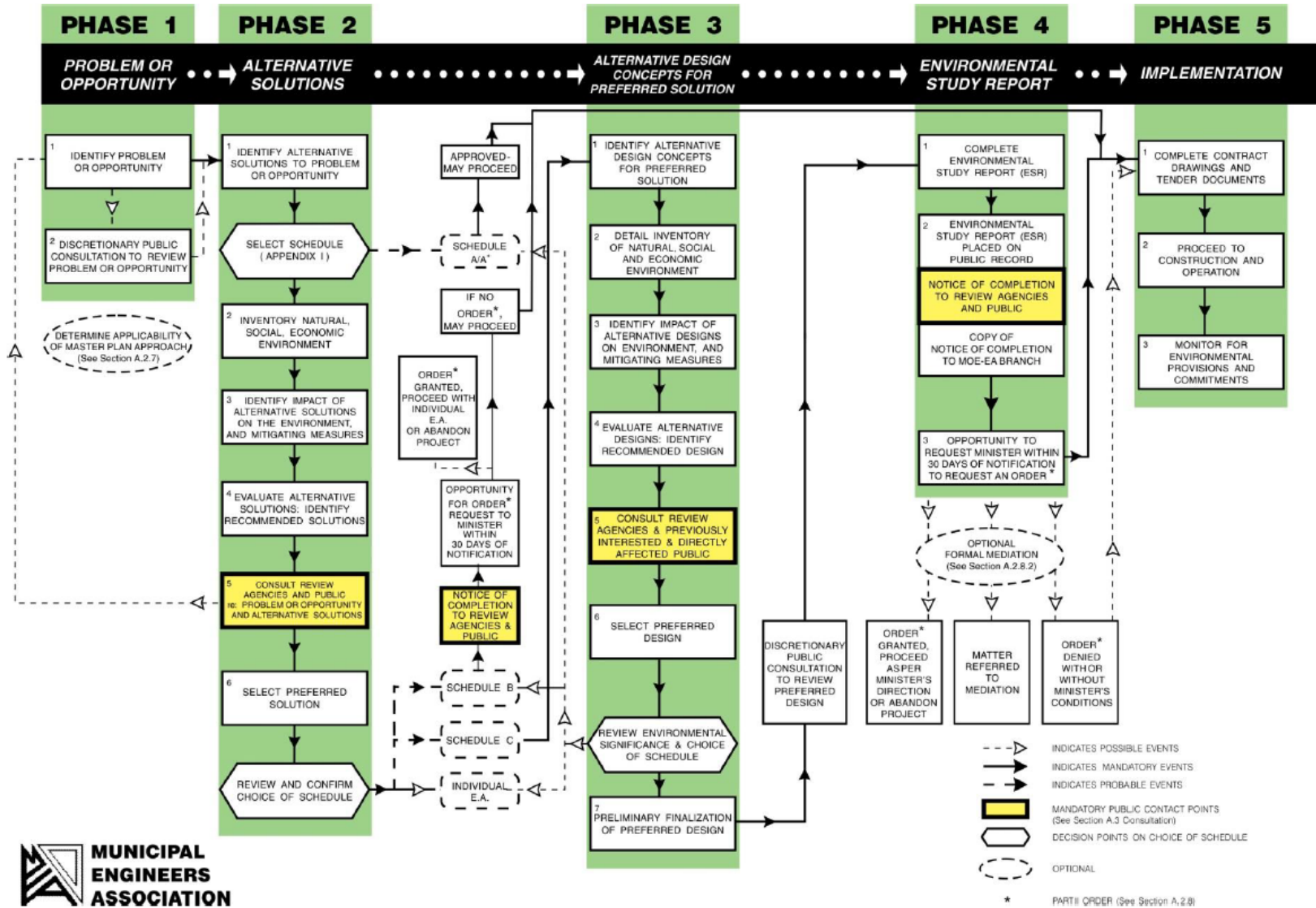


Exhibit 1-2: Municipal Class EA Flow Chart



Exhibit 1-3: Study Organization

1.3.1. Core Project Team

The project team as illustrated in Exhibit 1-4 is comprised of City of Markham senior staff whom are leading the direction of the study.

Exhibit 1-4: Core Project Team

Name	Role
Nehal Azmy	Project Manager
Marija Ilic	Manager, Infrastructure and Capital Works, Engineering Department
Joseph Palmisano	Manager, Transportation Planning

1.3.2. Consultant Team

As outlined in Exhibit 1-5, the consultant team is comprised of CIMA+ as the prime consultant. CIMA+ retained the services of Novus Environmental, The Planning Partnership and Thurber Engineering Limited.

Exhibit 1-5: Consultant Project Team

Member	Role
CIMA Canada Inc. (CIMA)	Project Management EA Process Public Consultation Transportation Planning Transportation and Traffic Analysis Traffic Safety Natural Environment Socio-Economic Environment Active Transportation Stormwater Management and Drainage Utility Coordination Roadway Design
Novus Environmental	Air Quality
Archaeological Research Associates Ltd.	Stage 1 Archaeological Assessment Cultural and Built Heritage Assessment
The Planning Partnership	Land Use
Thurber Engineering Limited	Geotechnical

2. Need and Justification

2.1. Planning and Policy Context

Phase 1 of the Municipal Class EA process involves the identification of the problems and opportunities to be addressed by the study. For this study, this included a review of City of Markham planning policies.

2.1.1. Highway 404 North Planning District

In 2008, the City of Markham approved an Official Plan Amendment and Secondary Plan for the Highway 404 North Planning District (OPA 149). OPA 149 applies to the Highway 404 North Planning District area, which extends from approximately 400 metres north of 19th Avenue and south to approximately 600 metres north of Elgin Mills Road. Highway 404 defines the western limit while the eastern limit is primarily defined by Woodbine Avenue with a small area at the south end located east of Woodbine Avenue, between Woodbine Avenue and a Hydro One transmission corridor, as illustrated in Exhibit 2-1.

Prior to OPA 149, the City of Markham Official Plan designated the land in the Highway 404 North Planning District as Industrial, Urban Residential, Commercial, Hazard Lands, and Transportation and Utilities. The York Region Official Plan designated this land as Urban Area. The primary purpose and effect of OPA 149 was to change the designation of the majority of the lands to Prestige Employment uses and to provide detailed development policies.

OPA 149 also established a proposed layout for the road network within the Highway 404 North Planning District. Since the approval of OPA 149, development in the area has proceeded with the Honda Campus being the first major development along with the Honda Boulevard access road. The Honda lands extend from Highway 404 easterly approximately 440m at their south boundary and approximately 465m at their north boundary. Mobis Parts Canada has constructed a distribution centre on the lands south of Honda. A two-lane access road (Mobis Drive) is located south of the development. Exhibit 2-2 shows the current built conditions with the OPA 149 road network. The location of Honda Boulevard is approximately midway between Highway 404 and Woodbine Avenue and therefore based on the OPA 149 road layout, the collector roads in the east half would no longer be viable or needed. Honda Boulevard is a four-lane urban road with sidewalks on both sides of the road.

2.1.1. Master Environmental Servicing Plan

In 2008, the Master Environmental Servicing Plan (MESP) was prepared for the 404 North Developers Group for OPA 149. The MESP is comprised of an Environmental Evaluation Study, a Master Servicing Study, and a Stormwater Management Master Plan. The MESP was developed in accordance with the requirements of OPA 149, which required “the completion of an EMS that addresses all environmental impacts and mitigating measures. It also takes into consideration the Rouge Park North and Rouge Watershed Plan, prior to any development taking place.



Exhibit 2-1: Highway 404 North Planning District

The purpose of the MESP was to characterize and analyze the natural heritage features and functions within the Planning District, identify developable areas, and identify servicing requirements related to stormwater management, sanitary sewers, water supply, site grading and external servicing requirements. Further, the MESP provides direction and a framework for future study requirements in support of the preparation of Draft Plans of subdivision or Site Plans.

2.1.2. Road Crossing of Highway 404 EA

In 2015, York Region completed a Schedule C Municipal Class Environmental Assessment Study for the road crossing of Highway 404 between Elgin Mills Road and 19th Avenue. The purpose of the study was to determine the location of a future mid-block crossing of Highway 404 (between Elgin Mills Road and 19th Avenue). The recommendation for the crossing is immediately south of the Mobis property where the new Mobis Drive has been constructed. The Region EA also recommends a reconfiguration of the intersection of Honda Boulevard with Mobis Drive to make the mid-block crossing the direct connection to Woodbine Avenue.

2.2. Problem and Opportunity

The road network established in OPA 149 is no longer feasible because of large developments proceeding at the west end of the Planning District (Honda, Mobis and Enbridge). Therefore, a new road network is required to serve the future developments within the Planning District.

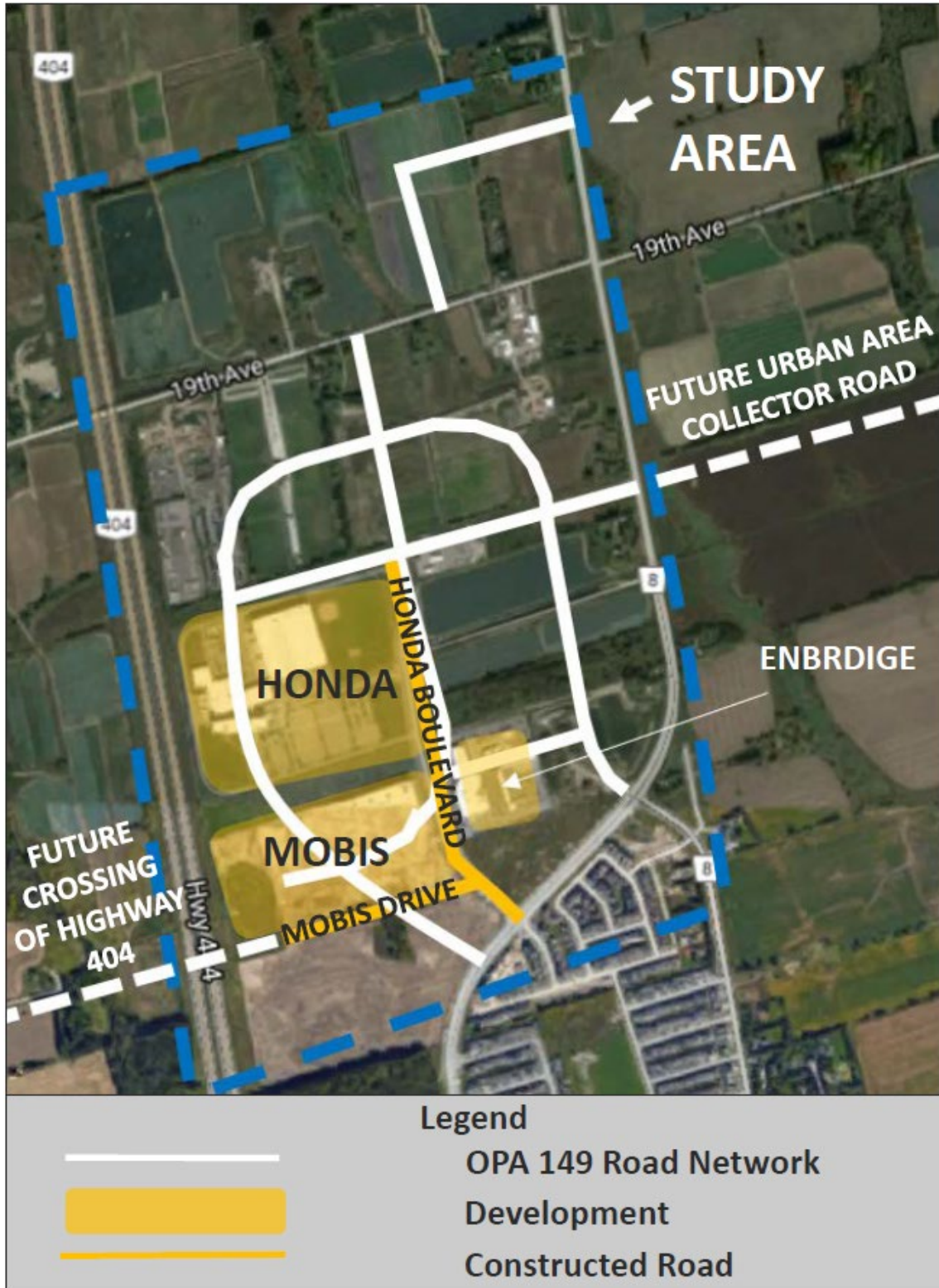


Exhibit 2-2: Existing Features with OPA 149 Network

3. Existing Conditions

3.1. Transportation and Traffic Assessment

A transportation and traffic assessment was conducted to review the existing traffic conditions of the study area. The Transportation and Traffic Assessment Report is provided in Appendix A. Intersection operational analysis was undertaken for the three (3) signalized and unsignalized intersections within the study area using Synchro/SimTraffic 9 software to assess existing conditions. Signal timing plans for the intersection of Woodbine Avenue & Honda Boulevard/Bishop's gate was provided by the Regional Municipality of York (the Region) and used in the existing conditions Synchro model.

The existing 2017 traffic control and lane configuration is illustrated in Exhibit 3-1. Existing 2017 turning movement counts are provided in Exhibit 3-2.

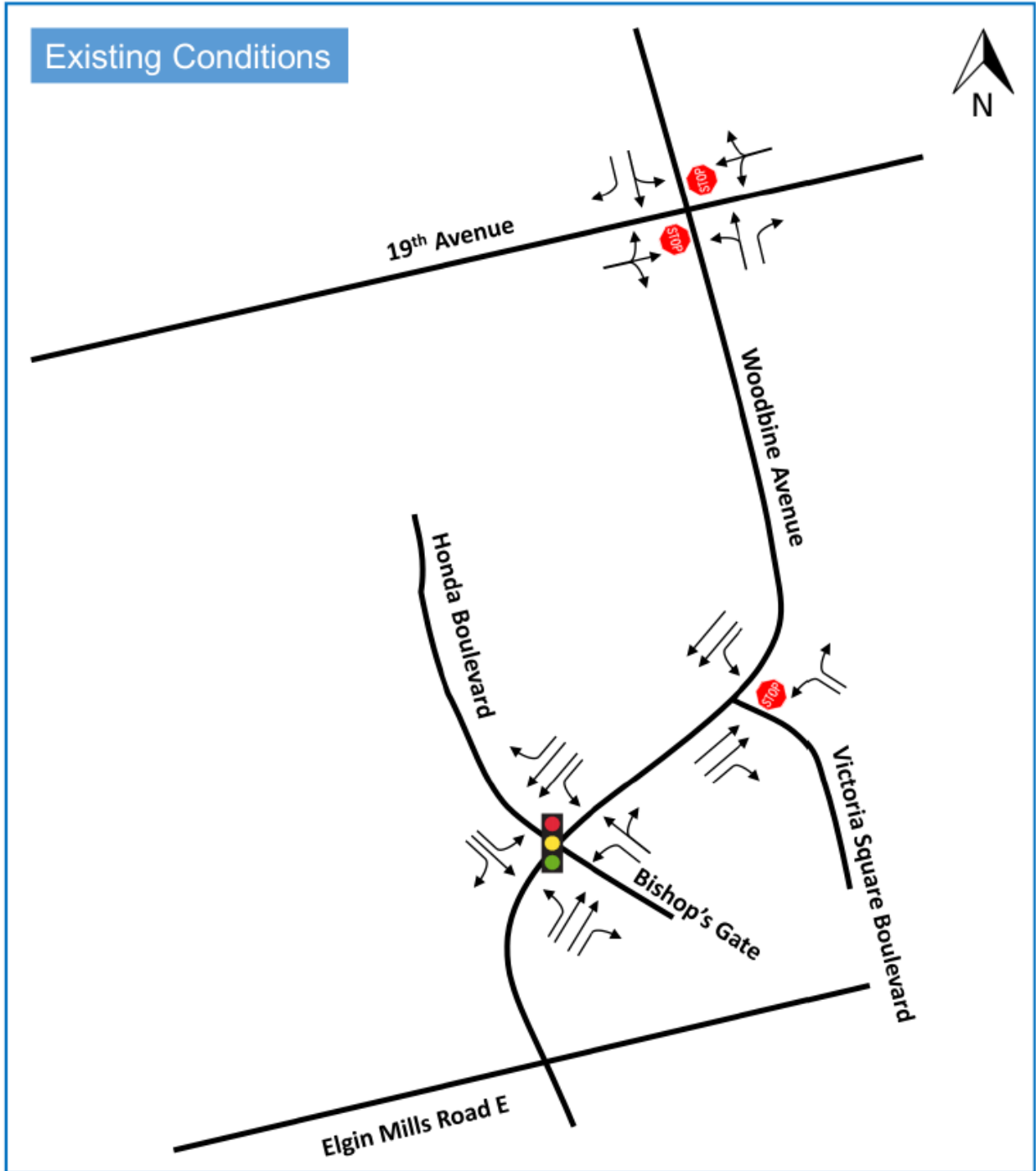


Exhibit 3-1: Existing 2017 Traffic Control/Lane Configuration

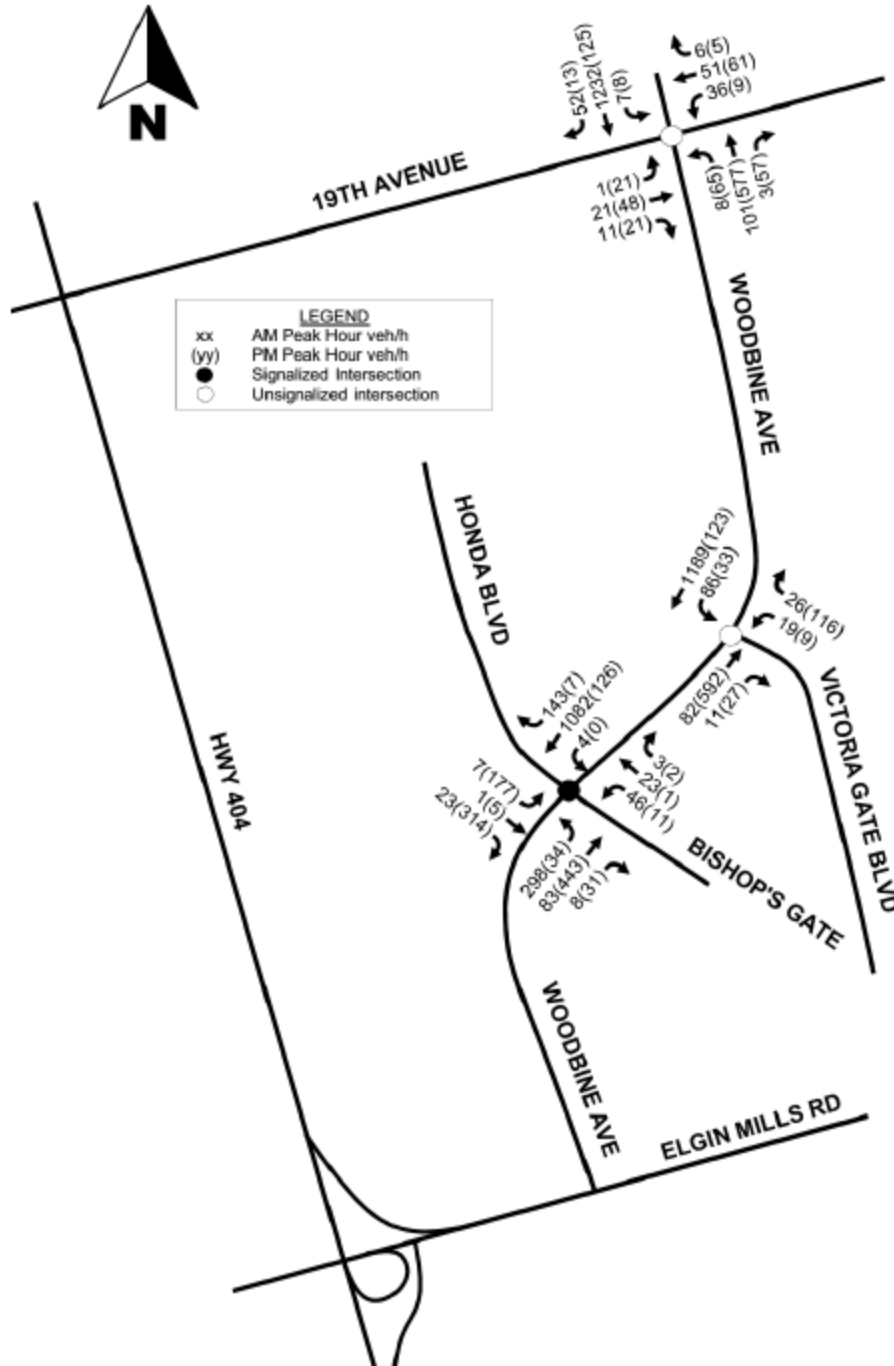


Exhibit 3-2: Existing 2017 Turning Movement Counts

Exhibit 3-3: 2017 Existing Intersection Operations

Legend: AM (PM)						
Direction / Movement	Storage (m)	v/c	Delay (s)	LOS	95% ^{ile} Queue (m)	
Woodbine Avenue & Honda Boulevard/Bishop's Gate (Signalized)						
EB	L	80	0.07 (0.70)	31 (40)	C (D)	6 (51)
	T	-	0.01 (0.01)	30 (27)	C (C)	2 (4)
	R	-	0.02 (0.23)	30 (29)	C (C)	17 (29)
WB	L	15	0.24 (0.24)	29 (25)	C (C)	18 (8)
	T/R	-	0.13 (0.01)	31 (27)	C (C)	16 (4)
NB	L	Continuous	0.86 (0.06)	27 (6)	C (A)	54 (14)
	T/T	-	0.04 (0.23)	4 (7)	A (A)	10 (31)
	R	65	0.01 (0.02)	4 (6)	A (A)	4 (6)
SB	L	45	- (-)	- (-)	- (-)	- (-)
	T/T	-	0.64 (0.08)	14 (10)	B (B)	65 (14)
	R	40	0.13 (0.01)	9 (10)	A (A)	18 (4)
Overall	-	0.83 (0.37)	16 (19)	B (B)	-	
Woodbine Avenue & Victoria Square Boulevard (Stop Controlled)						
WB	L	65	0.08 (0.03)	21 (16)	C (C)	12 (7)
	R	-	0.03 (0.18)	9 (11)	A (B)	16 (16)
NB	T/T	-	0.03 (0.18)	0 (0)	- (-)	- (1)
	R	30	0.01 (0.02)	0 (0)	- (-)	- (1)
SB	L	105	0.06 (0.04)	8 (9)	A (A)	11 (15)
	T/T	-	0.37 (0.04)	0 (0)	- (-)	- (-)
Overall	-	0.93 (0.34)	8 (2)	F (A)	-	
Woodbine Avenue & 19th Avenue (Stop Controlled)						
EB	L/T/R	-	0.24 (0.36)	38 (26)	E (D)	22 (19)
WB	L/T/R	-	0.86 (0.32)	120 (26)	F (D)	61 (18)
NB	L/T	-	0.02 (0.05)	1 (1)	A (A)	20 (18)
	R	15	0.00 (0.04)	0 (0)	- (-)	- (1)
SB	L/T	-	0.00 (0.01)	1 (1)	A (A)	13 (5)
	R	30	0.00 (0.01)	0 (0)	A (-)	3 (1)
Overall	-	0.45 (0.62)	1 (5)	A (B)	-	

The review of existing traffic operations (Exhibit 3-3) indicates that the following movements are operating with long delays, high volume to capacity (v/c) ratios, and or/long queues:

Woodbine Avenue & Honda Boulevard/Bishop's Gate

- Westbound left-turn movement exceeds storage by 1 vehicle during the AM peak hour.

Woodbine Avenue & Victoria Square Boulevard

- Overall intersection operates at a LOS F, v/c ratio of 0.93 during the AM peak hour, however individual movements are all operating at acceptable levels of service without significant delays or queues. This is due to the heavy turning movement volume in combination with the intersection operating under stop control traffic conditions.

Woodbine Avenue & 19th Avenue

- Westbound shared left/through/right-turn operates at LOS F during the AM peak hour, however there is only a maximum queue of 7 vehicles reported.

3.2. Socio-Economic Environment

3.2.1. Land Use

The City of Markham Official Plan (2014) policies and Map 3 – Land Use (Exhibit 3-4) land use designations have been used to establish the land use designations for the Highway 404 North Planning Area as the City is currently updating the Highway 404 North Planning District Secondary Plan (OPA 149). For reference, OPA 149 has been reviewed but the land use designations and terminology for this planning area have changed from the previous Official Plan (1987) to the current Official Plan. In addition, in terms of permitted uses, OPA 149 referred to Official Plan (1987) which has now been replaced with the approved 2014 Official Plan.

The City of Markham Official Plan, Map 3 – Land Use, designates the land within the study area as Business Park Employment, Service Employment, General Employment, Residential Low-Rise, and Mixed Use Low-Rise.

The current employment uses within the Highway 404 North Planning District include the Honda Canada campus (office and training facility) and Enbridge Gas (office and training facility). A warehouse facility in the northwest quadrant of Woodbine Bypass / Honda Boulevard is occupied by Mobis Parts Canada. Lands immediately south of 19th Avenue include industrial uses (an industrial yard/operation just east of Highway 404), Fletcher's Field (a rugby stadium), agricultural uses, as well as utilities such as Hydro One corridor, and TransCanada Pipeline station. Other remaining employment lands with the Highway 404 North Planning District are currently vacant. The residential development, south and east of Woodbine Avenue, is part of the Cathedral Community Planning District. In addition, a restaurant, auto repair, and gas station are located south of Woodbine Avenue and just east of Victoria Square Boulevard.

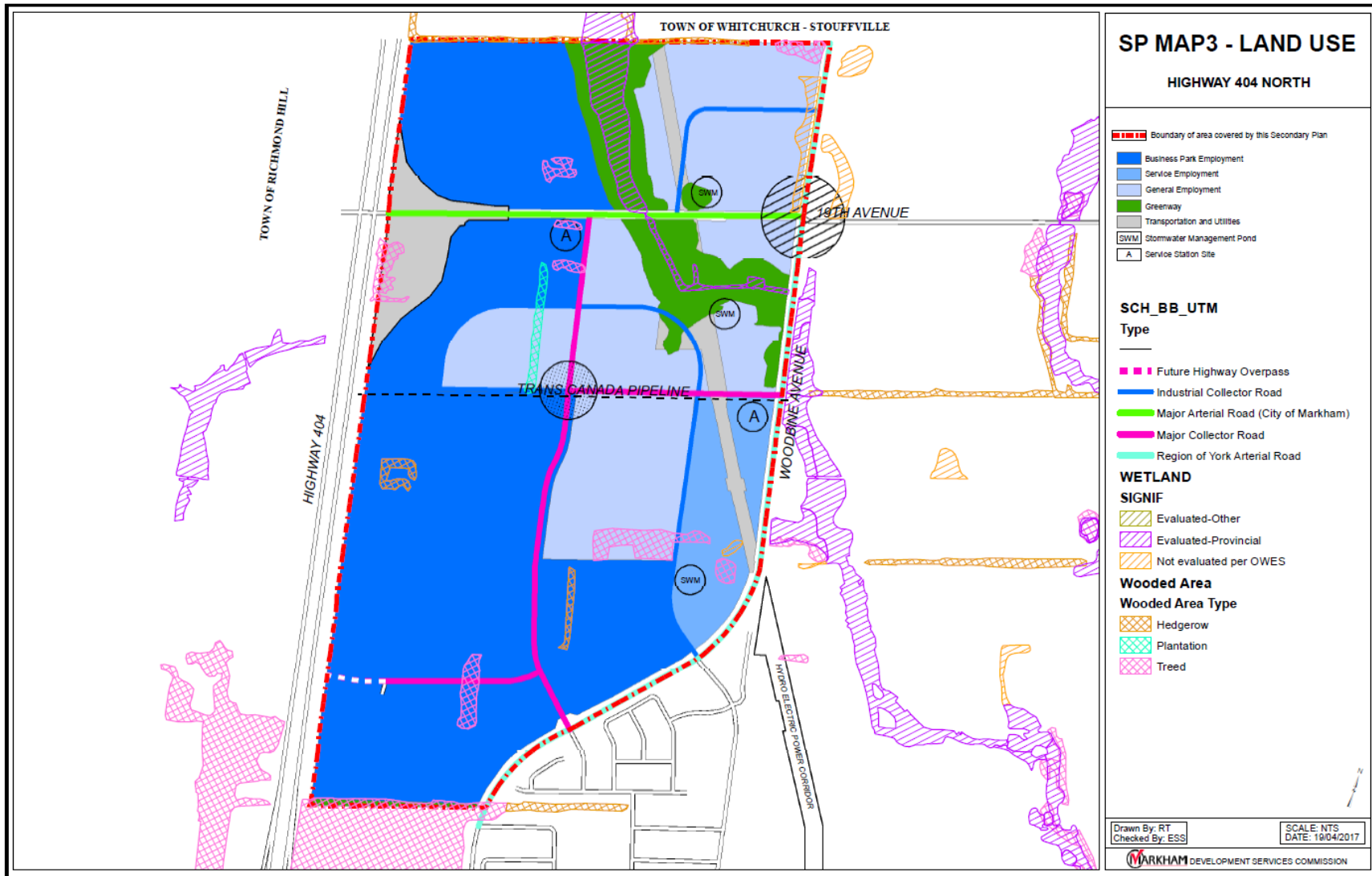


Exhibit 3-4: City of Markham Official Plan, Map 3 – Land Use

3.2.2. City of Markham Expansion – Future Urban Area

The City of Markham will see significant growth and a large proportion of that growth is being directed to the Future Urban Area. The Future Urban Area is directly east of the Highway 404 North Planning District and its future population will need to be considered in the development of the transportation system. Approximately, 675 hectares (1,668 acres) of developable lands are designated for future neighbourhoods and approximately 300 hectares (741 acres) located north of Elgin Mills Road are designated for employment uses. The Future Urban Area is anticipated to have approximately 12,000 residential units with a population of approximately 38,000 persons and approximately 19,000 jobs. The City of Markham is currently undertaking a separate study for the Future Urban Area.

3.3. Natural Environment

A natural heritage assessment was completed for the study area to document known or potential natural heritage features within the study limits. A copy of the Natural Heritage Assessment Report is available as Appendix B.

3.3.1. Watershed and Watercourses

The study area is located within the Rouge River Watershed. This watershed spans 336 km^2 in the Regions of York and Durham, including the City of Toronto, City of Pickering, City of Markham, City of Richmond Hill and Town of Whitchurch-Stouffville. It starts in the Oak Ridges Moraine and flows south towards Lake Ontario (TRCA, 2007). The Provincial Greenbelt Plan (2005) recognizes the Rouge River watershed as an important ecological corridor linking the environmental system of Lake Ontario to the Oak Ridges Moraine. Land use in the Rouge watershed are approximately 40% rural, 35% urban, 24% natural cover and 1% open water (TRCA, 2007).

Within the study area, there is a tributary of Berczy Creek. Berczy Creek is considered a middle tributary in the watershed and with the high rate of urbanization occurring in the area, Berczy Creek is starting to show bank degradation and the surrounding catchment has shown increases to impervious surfaces percentages leading to a greater flood risk (TRCA, 2007). Past measures to help mitigate this increase in flooding included the creation of stormwater ponds, however recent studies are showing that this infrastructure is not adequate to protect the river system from the negative impacts of urbanization and new measures need to control the volume runoff at the source (TRCA, 2007).

3.3.2. Wetland Habitat

A Provincially Significant Wetland (PSW) Complex known as the Bruce & Berczy Creek Wetland Complex is situated within the northern portion of the study area. This designation was made in May 2017 and updated in August 2017. Wetlands units no.14 and 15 are both connected hydraulically to Berczy Creek and consist of palustrine marshes composed mainly of the invasive Reed-canary Grass (*Phalaris arundinacea*). The wetlands are illustrated on the Natural Heritage Systems map in Exhibit 6-22 (Section 6.7). While smaller than 2 hectares, wetland no. 15 which is located in a ditch along the west side of Woodbine Avenue, has been included in the PSW because it is a headwater area for watercourses, it contributes spring base flows, it serves

as groundwater seepage areas that contribute base flows, is hydrologically connected to other wetlands and provides intervening wetland habitat between wetlands two hectares or greater in size that are within the complex or to the north and east of the complex (MNRF, 2017).

This PSW serves as a wildlife movement corridor, with confirmed observations of wildlife moving across the road network between wetlands in the complex and to and from the surrounding uplands. Biodiversity of the PSW includes 452 vascular plant species, 10 reptiles and amphibians, 87 breeding bird species, 9 mammal species and 34 fish species. Wetland No.14 & 15 are considered Redside Dace (*Clinostomus elongatus*) contributing habitat (MNRF, 2017).

3.3.3. Vegetation Community

The study area was surveyed on June 11th and 12th, 2019 to delineate the vegetation communities potentially affected by the road corridors. Vegetation communities were categorized according to the Ecological Land Classification guide for Southern Ontario (MNRF, 2008). The Ecological Land Classifications are shown in Exhibit 6-21 (Section 6.7). Nine vegetation communities were identified:

- Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3). These lands correspond to portions of Wetlands no. 14 and 15 of the Bruce & Berczy Creek Wetland Complex PSW.
- Annual Row Crops (OAGM1). These lands correspond to corn and soy fields.
- Specialty Crops (OAGM3). These lands correspond to fruits and vegetables fields, including strawberries and plants of the Cucurbitaceae family.
- Green Lands – Recreational (CGL_4). These lands correspond to Fletcher’s Field football fields and sports complex.
- Dry - Fresh Graminoid Meadow Ecosite (MEGM3). Two different units are present within the preferred road corridors. The first one corresponds to a windbreak mound located within the 2 OAGM1 units. Species observed on this mound are a mix of Reed-canary Grass, goldenrods (*Solidago* sp.) and Bull thistle (*Cirsium arvense*). The second one corresponds to revegetalized soil piles adjacent to the artificial pond located on Woodbine Bypass.
- Reed Canary Grass Graminoid Meadow Type (MEGM3-8). This unit surrounds Trans Canada Pipeline’s property on Woodbine Avenue.
- Coniferous Plantation (TAGM1). Two different units are present within the preferred road corridors. The first one corresponds to a row of planted White Spruce (*Picea glauca*.) west of Fletcher’s Field. Presence of dead Ash trees were also observed within the row. The second one corresponds to a row of White Spruce and Eastern White Pine (*Pinus strobus*) individuals growing along the OAGM1 fence line.
- Naturalized Deciduous Plantation Ecosite (FODM12). This unit corresponds to a former Little-leaf Linden (*Tilia cordata*) plantation. A few Trembling Aspen (*Populus tremuloides*) individuals are also present as well as 2 mature Red Maple individuals west of the preferred road. The intermediate layer consists mainly of the invasive exotic European and Glossy Buckthorn (*Rhamnus cathartica* and *Rhamnus frangula*), while the herbaceous layer consists of goldenrods and Wood Avens (*Geum urbanum*). This less than 2 hectares

woodlot has a 80-90% density, a 7-12 m height class and its estimated age is around 20 years old.

- Dry – Fresh White Cedar – Poplar Mixed Forest Type (FOMM4-2). This unit correspond to a small woodlot composed mainly of Eastern White Cedar (*Thuja occidentalis*) and Trembling Aspen. European White Poplar (*Populus alba*) and Manitoba Maple (*Acer negundo*) are also present.

3.3.4. Bird Community

No breeding bird survey was conducted as part of the natural heritage assessment. However, biologists observed the following species of birds while on site:

- Multiple Barn Swallow (*Hirundo rustica*) individuals feeding in all ELC units south of the 19th Avenue.
- Eastern Wood-Pewee (*Contopus virens*) - with possible breeding individuals (Singing male(s) present, or breeding calls heard, in suitable nesting habitat in breeding season) in the FODM12.
- Black-billed Cuckoo (*Coccyzus erythrophthalmus*) - with possible breeding individuals (Singing male(s) present, or breeding calls heard, in suitable nesting habitat in breeding season) in the FODM12.
- Red-winged Blackbird (*Agelaius phoeniceus*) – with possible breeding individuals in a small moist cattail area (less than 25 m²) that has formed in the MEGM3 unit adjacent to the artificial pond located on Woodbine Bypass.

Data from the Ontario Bird Atlas and previous studies were also compiled and reviewed. The results are provided in Appendix B.

3.3.5. Species at Risk

A Species at Risk (SAR) screening was completed to evaluate potential for the presence of SAR in the Study Area. SARs were identified by the MNRF (whom were the responsible ministry for species at risk at the time the information was requested), third party data sources, or observed during the field assessment, were included in the screening. Habitat requirements for these species were compared to the habitat available in the Study Area. SAR considered for this report include those species listed under the Provincial *Endangered Species Act* (ESA) (Ontario 2007) and the federal *Species at Risk Act* (SARA) (Canada 2002).

Redside Dace presence has been confirmed by MNRF (MNRF, 2017) in Berczy Creek, although the tributary and ditch being crossed by the proposed road corridors are only contributing habitats; i.e. not occupied habitat. Redside Dace are listed as endangered under the ESA and SARA.

The Natural Heritage Information Centre was also consulted for atlas squares 17PJ2964, 17PJ3064, 17PJ3063 and 17PJ2963. Ministry of Natural Resources and Forestry (MNRF) noted records of Eastern Wood-Pewee (*Contopus virens*) and Wood Thrush (*Hylocichla mustelina*) were found within the study area. Both species are listed as Special Concern under ESA and SARO.

Data from the Ontario Reptile and Amphibian Atlas was compiled for the 10 kilometre by 10 kilometre grid squares 17PJ36 and 17PJ26 that covers the Study Area. A record of Blanding's Turtle (*Emydoidea blandingii*) was noted within the study area and this species of turtles are listed as threatened under SARO and ESA. There are also records of Snapping Turtles (*Chelydra serpentina*) which are listed as Special Concern under SARO. However, the PSW Evaluation Report (MNRF, 2017) identifies that these species were observed and could potentially use PSW ponds that are located outside of the Study Area.

Presence of both Barn Swallow and Eastern Wood-Pewee were confirmed by biologists during the 2019 site visits. Barn Swallow use all ELC units south of 19th Avenue, while the Eastern Wood-Pewee was observed within the FODM12 Naturalized Deciduous Plantation Ecosite unit. No Bank Swallow nests or individuals were observed by biologists within the exposed banks or soil piles present in the preferred road network. No Bobolink or Eastern Meadowlark nests or individuals were observed by biologists within the meadow areas in the preferred road corridors.

Both the Ontario Butterfly atlas and the Background Natural Environmental Report for OPA 149 Highway 404 North Secondary Plan confirmed the presence within the Study Area of the Monarch, a biologists Concern status species under both ESA and SARA. No Monarch were observed by biologists within the preferred road corridors.

No Butternut (*Juglans cinerea*) trees or other flora species at risk were observed by biologists within 25 metres of the preferred road corridors network during the June 2019 site visits.

3.3.6. Natural Heritage System

The Natural Heritage System (NHS) at a site is comprised of the features and functions of the natural landscape that are integral to maintenance and long-term function. This includes Designated Areas, features and habitats protected under regulation and policy, and other important components identified through a Natural Heritage Evaluation.

Provincial Designations

The northwest corner of the study area is located within the Oak Ridges Moraine Boundary and is therefore subject to the Oak Ridges Moraine Conservation Plan (ORMCP) (2002) and the *Oak Ridges Moraine Conservation Act* (2001). The study area is designated as part of the ORMCP as "Countryside". These areas provide an agricultural and rural transition and buffer between the Natural Core Areas and Natural Linkage Areas and the urbanized settlement areas (ORMCP, 2002). In the Oak Ridges Moraine Area, new infrastructure corridors or facilities will only be allowed if they are shown to be necessary and there is no reasonable alternative (Oak Ridges Moraine Conservation Plan 2002).

A small northern section of the study area is located within the Greenbelt and is therefore subject to the Greenbelt Plan (GP) (2005) and the Greenbelt Act, 2005. The study area is designated as part of the GP as "Protected Countryside".

Municipal Planning Designations

The Official Plan of York Region sets the structural and policy framework for growth and development in the Region of York. In the Official Plan, the study area is designated as an Urban Area on Map 2, as well as a Transit Priority Network on Map 11 (York Region, 2016).

In addition to the presence of the Greenbelt, the Oak Ridge Moraine and a PSW within the Study Area, the Regional Official Plan also identifies the presence of 2 other Natural Heritage System Components:

- a Local Municipal Greenlands System along Berczy Creek tributary; and
- Woodlands.

Section **2.2.45** of the Regional Official Plan define *significant woodlands* as those *woodlands* meeting one of the following criteria:

- a. is 0.5 hectares or larger and:
 - i. directly supports *globally* or *provincially rare plants, animals* or *communities* as assigned by the Natural Heritage Information Centre; or,
 - ii. directly supports *threatened* or *endangered species*, with the exception of specimens deemed not requiring protection by the Province (e.g. as is sometimes the case with Butternut); or,
 - iii. is within 30 metres of a provincially significant *wetland* or *wetland* as identified on Map 4, *waterbody, permanent stream* or *intermittent stream*;
- b. is 2 hectares or larger and:
 - i. is located outside of the Urban Area and is within 100 metres of a *Life Science Area of Natural and Scientific Interest*, a provincially significant *wetland* or *wetland* as identified on Map 4, *significant valleyland, Environmentally Significant Area*, or *fish habitat*; or,
 - ii. occurs within the Regional Greenlands System;
- c. is south of the Oak Ridges Moraine and is 4 hectares or larger in size;
- d. is north of the Oak Ridges Moraine and is 10 hectares or larger in size.

As ELC unit FODM12 meets criteria 2.2.45a due to its size (larger than 0.5 hectares) and directly supports the Eastern Wood-Pewee, a species of provincial and federal Special Concern status during breeding season, it meets this definition and must be considered a significant woodland. As per section 2.2.47 of this plan, a vegetation protection zone of no less than 10 metres would be required for this significant woodland.

3.4. Source Water Protection

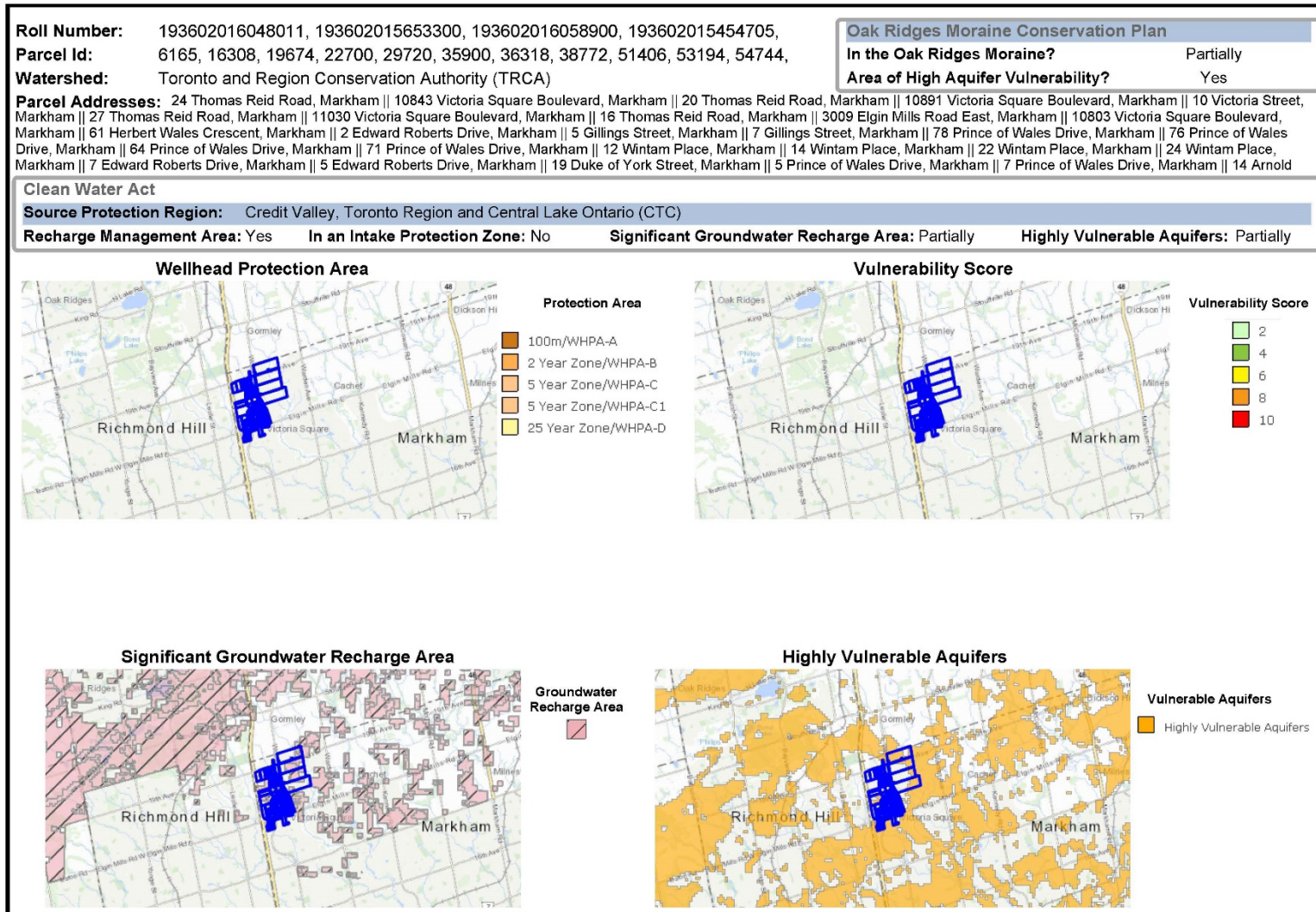
The Clean Water Act (2006) and Ontario Regulation 287/07 establish the legal framework for drinking water source protection. The Municipal Class Environmental Assessment (October 2000, as amended in 2007, 2011 and 2015) requires that proponents identify whether a project is occurring within a source water protection vulnerable area. This includes areas close to a municipal drinking water well or intake. In these areas certain land or water activities, if left unchecked, could pollute the water supply. Toronto and Region Conservation Authority represents the Source Protection Region which govern the study area.

The York Region Source Water Protection online mapping tool was used to identify the plan policies that apply to this study. The results of the online mapping evaluation are provided in Exhibit 3-5.

The study area is located within the Credit Valley, Toronto Region and Central Lake Ontario (CTC) Source Protection Region corresponding with the Toronto and Region Conservation Authority (TRCA) boundary. The site is within a Wellhead Protection Area Q (WHPA-Q). It is also partially within a Highly Vulnerable Aquifer (HVA) and partially within a Significant Groundwater Recharge Area (SGRA).

According to York Region Source Water Protection, Environmental Promotion & Protection, Environmental Services, the following source water policies apply to this study:

- Highly Vulnerable Aquifer
 - Should the proposed major development include bulk fuel ($\geq 2500L$) or bulk chemicals ($\geq 500L$) within the HVA, a Contaminant Management Plan (CMP) will be required prior Site Plan approval, for Water Resources review and approval.
- Recharge Management Area:
 - Please note the study area is located within a Significant Groundwater Recharge Area (SGRA). As such the CTC Source Protection Plan water quantity recharge policy and York Region Official Plan Low Impact Development policy 2.3.41 will apply. The proponent should maximize infiltration at the site using best management practices. The use of the following resource is encouraged: Low Impact Development Stormwater Management Planning and Design Guide by Credit Valley Conservation Authority. The contact person for this requirement is Quentin Hanchard at TRCA.



For more information, email us at sourcewaterprotection@york.ca or call 1-877-464-9675 x75139
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 Image courtesy of NASA, Earthstar Geographics SIO, © 2015
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Exhibit 3-5: Source Water Protection Report

3.5. Tree Inventory

A tree inventory was conducted for the study area to review the trees potential impacted by the project. A site visit was conducted on July 23 and August 15, 2019 to complete the inventory and assessment. The detailed observations made concerning tree species, size, and condition are included in the tree inventory and assessment table in the Arborist Report in Appendix C.

A total of 309 individual tree groups were surveyed within the right-of-way. Certain tree species are protected under the Ontario Endangered Species Act, 2007 (e.g., butternut), however, no species at risk were found on site at the time of inspection.

3.6. Cultural Environment

3.6.1. Stage 1 Archaeological Assessment

A Stage 1 Archaeological Assessment was conducted to establish the archaeological potential within the study area. A copy of the Stage 1 Archaeological Assessment Report is provided in Appendix D. The assessment included background research and modelling and presents conclusions and recommendations pertaining to archaeological concerns within the assessed lands.

The Stage 1 assessment determined that the study area comprised a mixture of areas of archaeological potential, areas of no archaeological potential and previously assessed lands of no further concern. Archaeological Research Associates Ltd. recommends that all identified areas of archaeological potential that could be impacted by the project be subject to a Stage 2 property assessment.

Areas related to the preferred network are discussed in Section 6.2.

3.6.2. Cultural and Built Heritage Assessment

A Built Heritage and Cultural Heritage Landscape Assessment was conducted for the study area. The purpose of the assessment was to identify and evaluate the built and cultural heritage resources within the study area that may be impacted by the proposed collector roads. A copy of the Built Heritage and Cultural Heritage Landscape Assessment Report can be found in Appendix E.

A survey of the study area was conducted, and all potential cultural heritage resources noted were evaluated against the criteria of Ontario Regulation 9/06. Of those, the following properties were identified within the study area as having potential cultural heritage value or interest:

- 2780 19th Avenue (BHR 1)
- 11288 Woodbine Avenue (BHR 2)
- 11251 Woodbine Avenue (BHR 3)
- 3010 19th Avenue (BHR 4)
- 11139 Victoria Square Boulevard (formerly Woodbine Avenue) (BHR 5)
- 1751 19th Avenue (formerly 1767 19th Avenue) (BHR 6)

The following cultural heritage landscapes were identified, both are beyond the study area for this project:

- 11670 Woodbine Avenue (CHL 1) (Town of Whitchurch-Stouffville)
- 11715 Leslie Street (CHL 2) (City of Richmond Hill)

The impact of the recommended collector road network on the built heritage resources and cultural heritage landscapers are discussed in Section 6.4.

3.7. Drainage and Stormwater Management

A Drainage and Stormwater Management Assessment was conducted for the study corridor to assess the existing drainage conditions and stormwater management (SWM) within the study area that will be impacted by the proposed project. The drainage characteristics of the site depend on many factors, including the topography, local land use and the type of native soil. A copy of the Drainage and Stormwater Management Report is available in Appendix F.

3.7.1. Soils

Soil groups in the area were taken from the Ontario Soil Survey Complex. The hydraulic soil groups found in the study area range from B to C. Hydraulic soil groups B and C are predominantly silty loam, loam and sandy clay loam. They have moderate to low infiltration rates. The soils map for the area can be seen in Appendix F.

3.7.2. Stormwater Management and Drainage

Most of the study area drains to a tributary of Berczy Creek, with small portions on the east end of the study area draining to a tributary of the Rouge River. Depending on the phase of development and present land owner development objectives, it is possible for the final proposed SWM ponds to be built without the implementation of interim ponds.

There are plans for two additional interim ponds, which would eventually be moved/upgraded to the proposed permanent ponds. The ponds existing, interim and proposed drainage areas were assessed separately due to their complex nature.

Drainage from a small area (approximately 1.35 ha) located in the south west portion of the study area drains to the south to the existing woodlot in the West Cathedral Community and is ultimately tributary to the East Branch of Carlton Creek.

3.7.3. Existing Storm Water Management Ponds

Currently two of the ponds that have been planned have been implemented. These ponds are the Interim SWM Pond B3 and SWM Pond L1.

Interim Pond B3 provides quantity and quality controls for the central portion of the study area, approximately 70 ha. The land use tributary to the pond is industrial parkland, unimproved area and some residential and community amenity uses south of Woodbine Avenue.

SWM Pond L1 provides quantity and quality controls for the western portion of the study area, approximately 27 ha, draining into a Tributary of the Rouge River. The proposed land use tributary to Pond L1 is primarily industrial park land.

The remaining land in the study area drains through overland flow and storm ditches into Berczy Creek or the Rouge River. The existing conditions drainage mosaics are illustrated in Exhibit 3-6.

3.7.4. Existing Roadway Conditions

Currently a small section of Honda Boulevard on the western side of the study area drains to SWM Pond L1, along with an access road along Mobis Parts Canada Corp. The remaining majority of Honda Boulevard, as well as Woodbine Avenue within the study area drains to SWM Pond B3.

19th Avenue drains uncontrolled in multiple directions. The western portion of the roadway drains to the Rouge River, while the central portion drains directly to Berczy Creek and the eastern portion drains through a series of storm ditches into Berczy Creek.

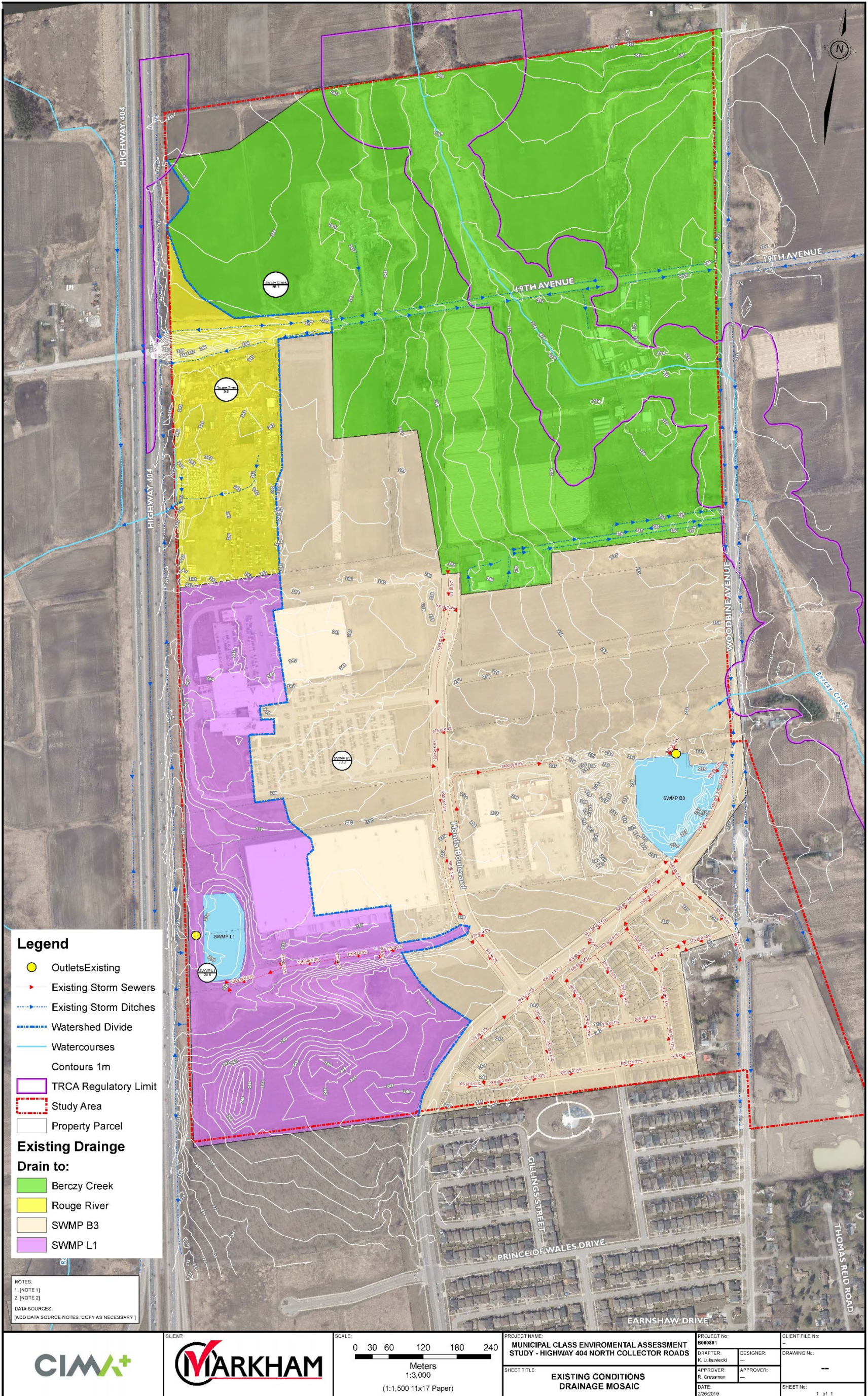


Exhibit 3-6: Existing Conditions Drainage

3.8. Utilities

As the majority of the study area is vacant land, the only major utilities present with the planning precinct are Hydro One, TransCanada and Enbridge. There is a 30 metre wide Hydro One transmission corridor that passes through the study area. The corridor consists of registered and statutory easements. The Hydro One corridor is illustrated in Exhibit 3-7.

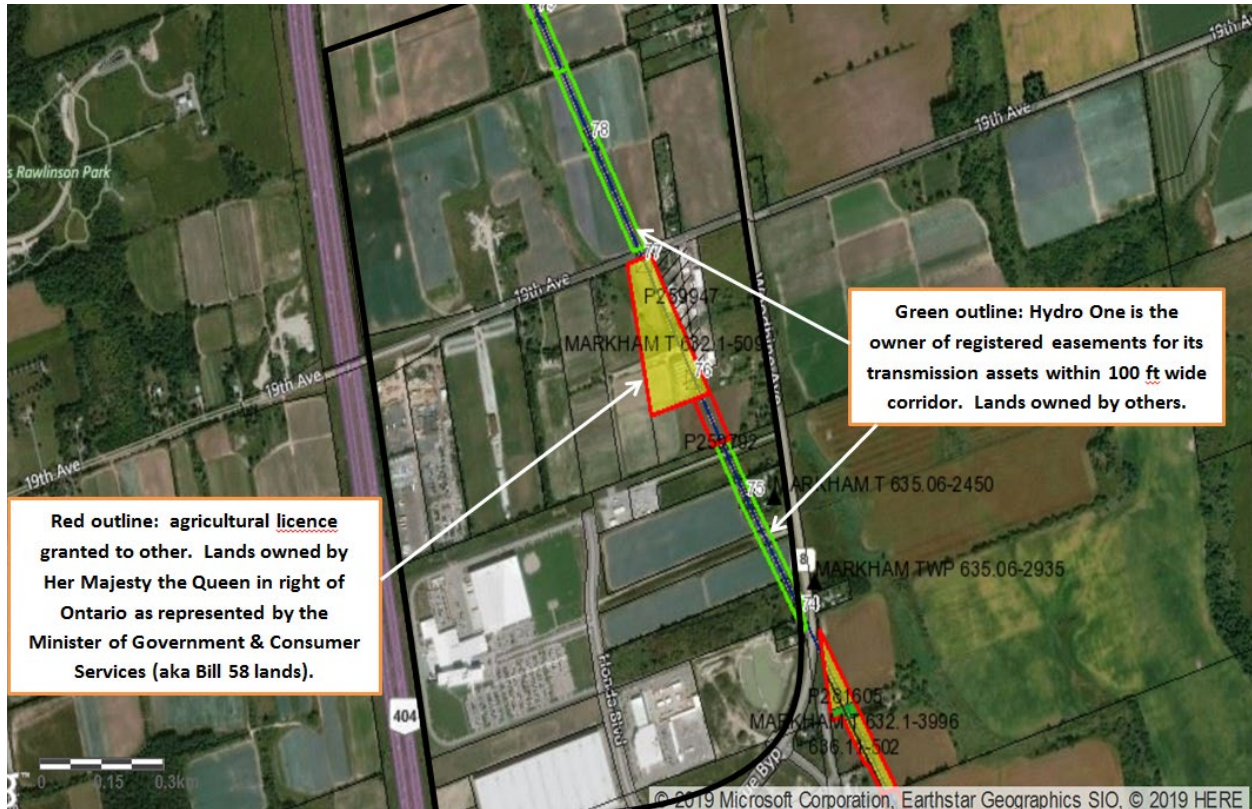


Exhibit 3-7: Hydro One Corridor

Aerial telephone is present along 19th Avenue and is located on the local hydro poles. Buried Bell facilities are also present on the south side of 19th Avenue.

The TC Energy and Enbridge gas lines are generally perpendicular to the termination of Honda Boulevard at the north end of the road.

4. Alternative Solutions

Based on the future collector road network needs previously established and the network presented in OPA 149 that is no longer feasible, five corridors were developed for new collector roads within the Planning District. The corridors were established to accommodate the new development and future land uses in the Planning District:

- Corridor A/B: Collector Road North of 19th Avenue
- Corridor C: Honda Boulevard Extension
- Corridor D: East-West Collector Road
- Corridor E: Victoria Square Boulevard Extension
- Corridor F: Collector Road from Victoria Square Boulevard Extension (Corridor E) to Honda Boulevard Extension (Corridor C)

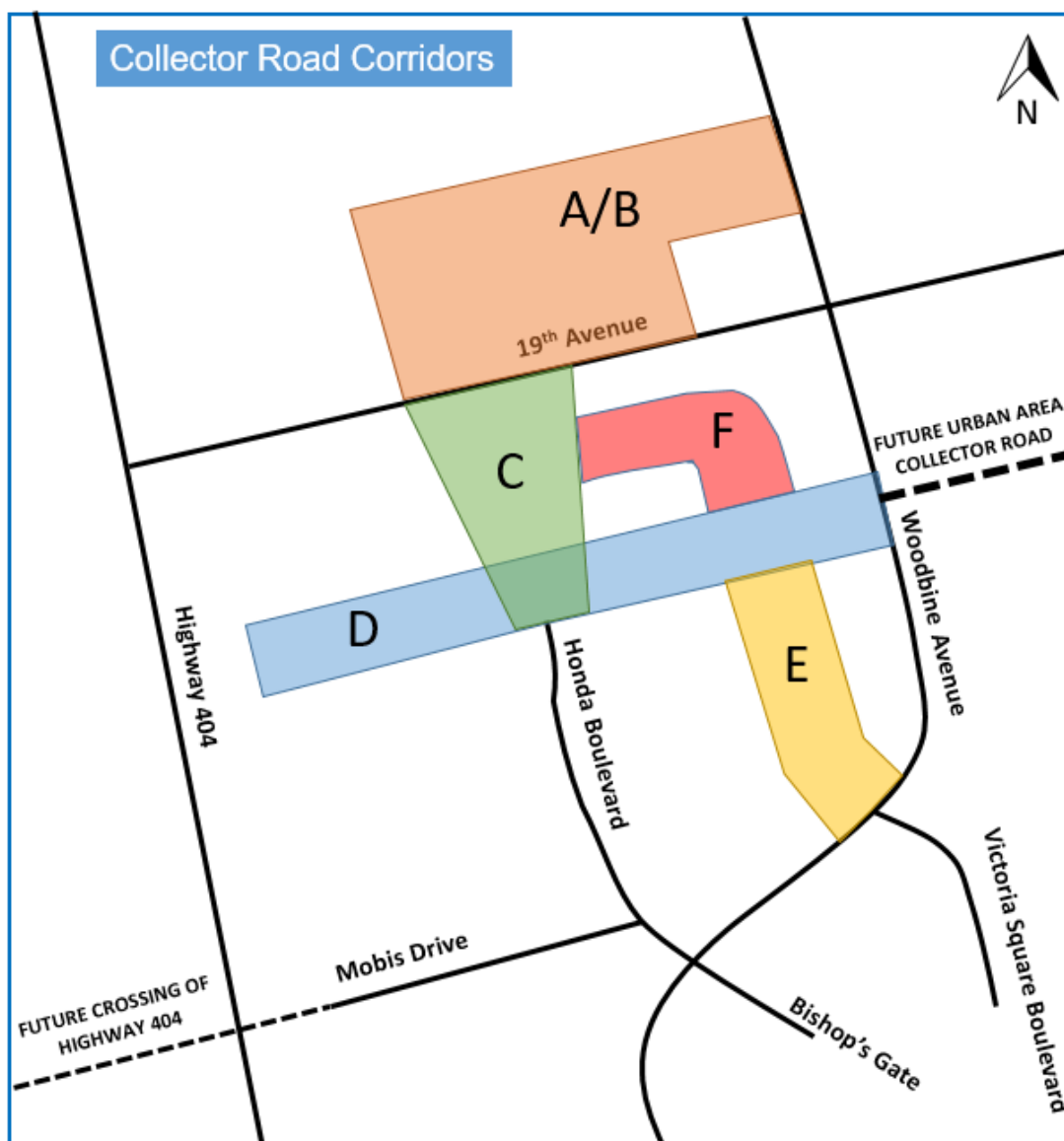


Exhibit 4-1: Collector Road Corridors

Given that the developable lands within the Planning District are projected for larger parcel development, Corridor F was not carried forward as an alternative solution in order to maximize parcel size and development flexibility within the District.

To assess the alternative solutions from a transportation/traffic perspective, two alternative road networks were examined for this Class EA study:

- Alternative Network #1 (Exhibit 4-1)
- Alternative Network #2 (Exhibit 4-2)

Alternative Network #1

Alternative Network #1 is comprised of three new collector roads within the following corridors:

- **Corridor A/B:** New ring road intersecting with Woodbine Avenue in the east and 19th Avenue in the south.
- **Corridor C:** The northerly extension of Honda Boulevard to 19th Avenue
- **Corridor D:** New east-west road intersecting with the existing termination of Honda Boulevard in the west and the new north-south road in the east.

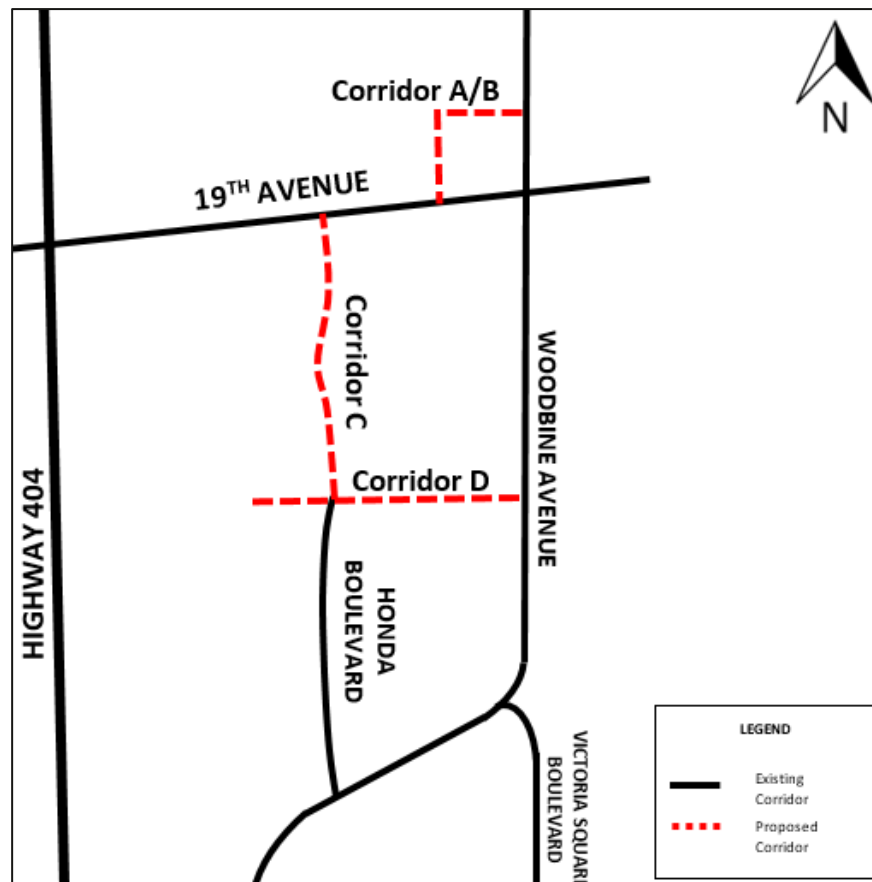


Exhibit 4-1: Alternative Network #1

Alternative Network #1 provides a continuous alternative north-south route for traffic between Woodbine Avenue and 19th Avenue and an east-west route to serve the development parcels in the Planning District.

This network also provides access to development parcels north of 19th Avenue.

Future traffic forecasts for the 10-year horizon (2027) indicate that Alternative Network #1 can accommodate the increase in traffic volume resulting from 50% build-out of the employment lands in the study area. With improvements at the intersection of Woodbine Avenue and Victoria Square Boulevard, this network can accommodate the 20-year horizon (2037) traffic volumes under 100% build-out of the developable lands

Alternative Network #2

Alternative Network #2 is comprised of four new collector roads within the following corridors:

- **Corridor A/B:** New ring road intersecting with Woodbine Avenue in the east and 19th Avenue in the south.
- **Corridor C:** The northerly extension of Honda Boulevard to 19th Avenue
- **Corridor D:** New east-west road intersecting with the existing termination of Honda Boulevard in the west and the new north-south road in the east.
- **Corridor E:** New north-south road intersecting with Victoria Square Boulevard in the south and terminating in-line with the existing Honda Boulevard in the north.

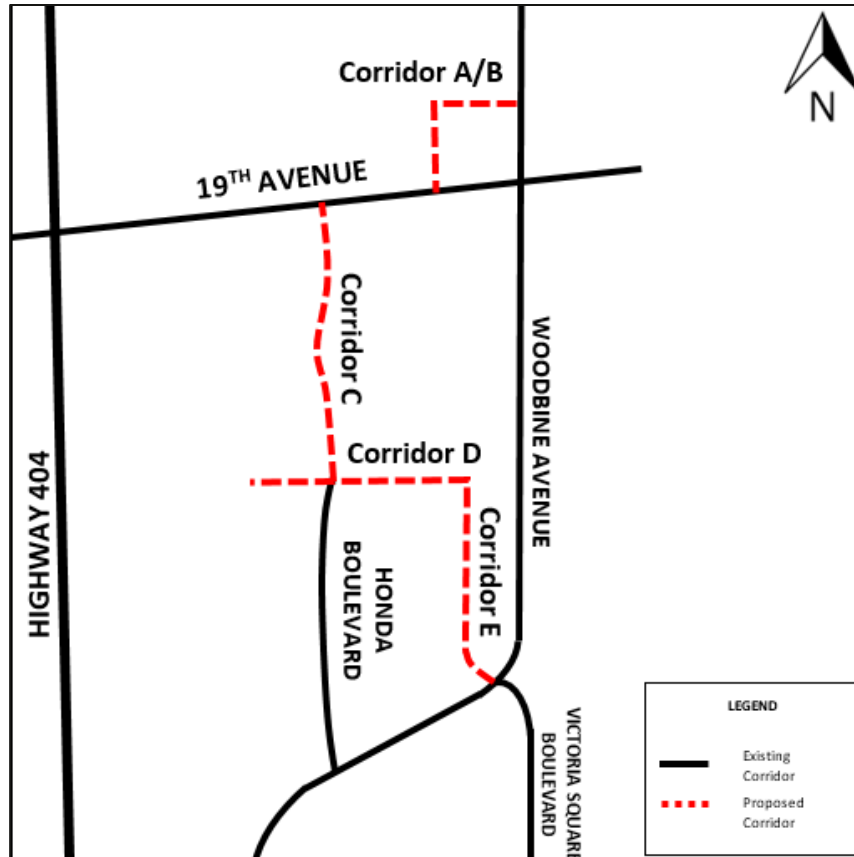


Exhibit 4-2: Alternative Network #2

Alternative Network #2 also provides a continuous alternative north-south route for traffic between Woodbine Avenue and 19th Avenue and an east-west route to serve the development parcels in the Planning District. Additionally, this network segments the east end of the study area into smaller parcels and provides internal access via Corridor E.

This network also provides access to development parcels north 19th Avenue.

Future traffic forecasts for the 10-year horizon (2027) indicate that Alternative Network #2 can accommodate the increase in traffic volume resulting from 50% build-out of the employment lands in the study area. With improvements at the intersection of Honda Boulevard and Victoria Square Boulevard, this network can accommodate the 20-year horizon (2037) traffic volumes under 100% build-out of the developable lands.













4.1. Analysis and Evaluation of Alternative Solutions

The alternative solutions discussed above were assessed based on their advantages and disadvantages. The networks were also evaluated to determine the recommended solution as illustrated in Exhibit 4-3.

The key problems and opportunities being considered as part of this study are largely related to land use and network connectivity and as such these are the key factors in the analysis and evaluation of alternative solutions.

The main difference between the alternative road networks is the number of internal collector roads and the size of the development parcels as both networks effectively address the long term needs. As there is a natural heritage feature present within the study area, the impact on the natural environment is also considered in the determination of the preferred solution.

Exhibit 4-3: Analysis and Evaluation of Alternative Solutions

TECHNICAL CRITERIA	Do Nothing	Alternative Network # 1	Alternative Network #2
Land Use	Development parcels remain large with access only permitted on Honda Boulevard. Does not provide improved access to the developable lands in the Planning District. 	Only provides for large development parcels between Honda Boulevard and Woodbine Avenue with access onto Honda Boulevard or the new east-west collector road. Access to lands fronting on Woodbine Avenue would be from the collector road network. Alternative Network #1 would limit development potential as properties that back onto Woodbine Avenue can only get access from Honda Boulevard/Corridor C, limiting opportunities for small parcel development. Provides access to development parcels north of 19th Avenue with collector road. 	Provides for smaller development parcels between Honda Boulevard and Woodbine Avenue with access from Corridor 'E'. Access to lands fronting on Woodbine Avenue would be from the collector road network. Alternative Network #2 would provide more flexibility for development as properties that back onto Woodbine Avenue can have frontages on Corridor E, allowing for large or small parcel development. Provides access to development parcels north of 19th Avenue with collector road. 
Network Connectivity	Does not improve network connectivity through the Planning District. Honda Boulevard and Mobis Drive remain the only internal access roads. 	Provides three new internal access roads serving the Planning District which connect directly into the arterial road network (19th Avenue and Woodbine Avenue). 	Provides four new internal access roads serving the Planning District which connect directly into the arterial road network (19th Avenue and Woodbine Avenue). 
Natural Environment	No impact to natural heritage features. 	Alternative Network #1 has potential to impact the Berczy Creek tributary north of 19th Avenue. No impact to the significant woodlot between Honda Boulevard and Woodbine Avenue. No impact to the area of significant wildlife habitat. Potential to impact areas with observed barn swallows. 	Alternative Network #2 has potential to impact the Berczy Creek tributary north of 19th Avenue. Impact to the significant woodlot between Honda Boulevard and Woodbine Avenue and the area of significant wildlife habitat. A mitigated right-of-way in this area can reduce total impact. Potential to impact areas with observed barn swallows. 
Cultural Heritage	No impact to cultural heritage features in the study area. 	No impact to cultural heritage features in the study area. 	No impact to cultural heritage features in the study area. 
Recommendation	Not Carried Forward	Not Carried Forward	Carried Forward

Based on the analysis and evaluation of alternative planning solutions, Alternative Network #2 was selected as the recommended solution, subject to public and agency review, because it would:

- Establish five major parcels for development south of 19th Avenue with access onto Honda Boulevard, the new east-west collector road or the Victoria Square Boulevard extension.
- Provide access to development parcels north of 19th Avenue.
- Provide four new internal access roads serving the Planning District which connect directly into the larger road network (19th Avenue and Woodbine Avenue).
- Potentially impact the Berczy Creek tributary north of 19th Avenue, however this impact can be avoided based on the alignment of Corridor 'A/B'.
- Impact to the significant woodlot between Honda Boulevard and Woodbine Avenue and the area of significant wildlife habitat can be mitigated with a reduced right-of-way in this area.

4.2. Phase 1 and 2 Consultation

4.2.1. Notice of Study Commencement

The Notice of Study Commencement was prepared to inform the public and agencies of the initiation of the Class EA study. The Notice was advertised in the Markham Economist and Markham Sun on November 9 and 16, 2017. The Notice was emailed or mailed to 30 agency representatives and 274 property owners within the study limits on November 14, 2017. A covering letter was provided with the Notice to agencies. A copy of the Notice, agency letters and the list of agency representatives is included in Appendix G.

4.2.2. Notice of Public Information Centre No. 1

The Notice of Public Information Centre No. 1 was prepared to inform the public and agencies of the opportunity to review the project and provide input. The Notice was advertised in the Markham Economist and Markham Sun on May 31 and June 7, 2018. The Notice was emailed or mailed to 30 agency representatives and 274 property owners within the study limits on May 31, 2018. A covering letter was provided with the Notice to agencies. A copy of the Notice, agency letters and the list of agency representatives is included in Appendix H.

The Notice of Public Information Centre No. 1 outlined the purpose of the meeting and identified the time, date, and location for the PIC. The Notice invited public comments on the study by either attending the PIC or contacting the project team.

4.2.3. Public Information Centre No. 1

Public Information Centre (PIC) No. 1 was held on June 13, 2018 from 7:00 PM to 9:00 PM at the Victoria Square Community Centre at 2929 Elgin Mills Road E. The PIC was held in an open-house format where the public was invited to review display boards, ask questions, and discuss comments with the project team. The display boards described the following:

- Welcome and Introduction
- Purpose of Public Information Centre No. 1
- Background and Study Area
- Planning and Policy Context
 - Highway 404 North Planning District (OPA 149)
 - Master Environmental Servicing Plan
 - Road Crossing of Highway 404 EA
 - Summary
- Existing Conditions
 - Natural Environment
- Transportation
 - Existing Conditions
 - Land Use and Trip Generation
 - Future Conditions with Development
- Problem and Opportunity Statement
- Alternative Solutions
- Analysis and Evaluation of Alternative Solutions
- Consideration of Design Concepts
- Next Steps

A sign-in sheet and comment sheets were provided to record attendance and obtain written comments. A copy of the PIC material is included in Appendix H. Seventeen (17) people signed into the PIC and three (3) comments were received through comment sheets and email correspondence.

The following general comments were submitted and noted by the project team during the PIC:

- Preference for Alternative Solution #2
- Concerns regarding pedestrian safety on Woodbine Avenue
- Impacts during construction

The PIC was an opportunity to hear comments from the public on the existing conditions, problems identified within the study area and alternative planning solutions. All comments received were reviewed by the project team and considered in the selection of the preferred solution.

4.2.4. Agency Correspondence

The following agencies were identified in Phase 1 as having interest in this study:

- Ministry of Transportation
- Toronto and Region Conservation Authority
- York Region
- Town of Whittchurch-Stouffville
- Infrastructure Ontario
- Ministry of Environment, Conservation and Parks

- Ministry of Natural Resources and Forestry
- TC Energy

All agencies were contacted with each of the study notices. Responses and additional correspondence with each of the agencies is provided in Appendix J. Additional discussion on meetings with review agencies is provided in Section 5.4.

4.2.5. Indigenous Communities Consultation

The following Indigenous Communities were notified of the commencement of this study and also notified at key study milestones:

- Alderville First Nation
- Beausoleil First Nation
- Chippewas of Georgina Island
- Chippewas of Rama First Nation
- Curve Lake First Nation
- Hiawatha First Nation
- Mississaugas of the Scugog Island First Nation
- Metis Nation of Ontario

Exhibit 4-4 outlines the consultation completed with Indigenous Communities throughout the study.

Exhibit 4-4: Indigenous Communities Consultation Summary

CONTACT	CONULTATION DATE	ACTION
NOTICE OF STUDY COMMENCEMENT		
Alderville First Nation Contact: Mr. Dave Simpson	November, 14, 2017	Notice mailed.
Beausoleil First Nation Contact: Chief Mary McCue-King	November, 14, 2017	Notice mailed.
Chippewas of Georgina Island Contact: Ms. Janice Taylor	November, 14, 2017	Notice mailed.
Chippewas of Rama First Nation Contact: Ms. Cathy Edney	November, 14, 2017	Notice mailed.
Curve Lake First Nation Contact: Ms. Melissa Dokis	November, 14, 2017	Notice mailed.
Hiawatha First Nation Contact: Chief Laurie Carr	November, 14, 2017	Notice mailed.
Mississaugas of the Scugog Island First Nation Contact: Chief Tracy Gauthier	November, 14, 2017	Notice mailed.
Metis Nation of Ontario Contact: Metis Consultation Unit	November, 14, 2017	Notice mailed.

CONTACT	CONSULTATION DATE	ACTION
PUBLIC INFORMATION CENTRE NO. 1		
Alderville First Nation Contact: Mr. Dave Simpson	May 31, 2018	Notice mailed.
Beausoleil First Nation Contact: Chief Mary McCue-King	May 31, 2018	Notice mailed.
Chippewas of Georgina Island Contact: Ms. Janice Taylor	May 31, 2018	Notice mailed.
Chippewas of Rama First Nation Contact: Ms. Cathy Edney	May 31, 2018	Notice mailed.
Curve Lake First Nation Contact: Ms. Melissa Dokis	May 31, 2018	Notice mailed.
Hiawatha First Nation Contact: Chief Laurie Carr	May 31, 2018	Notice mailed.
Mississaugas of the Scugog Island First Nation Contact: Chief Kelly LaRocca Contact: Dave Mowat	May 31, 2018	Notice mailed.
Metis Nation of Ontario Contact: Metis Consultation Unit	May 31, 2018	Notice mailed.
PUBLIC INFORMATION CENTRE NO. 2		
Alderville First Nation Contact: Mr. Dave Simpson	April 11, 2019	Notice mailed.
Beausoleil First Nation Contact: Chief Mary McCue-King	April 11, 2019	Notice mailed.
Chippewas of Georgina Island Contact: Ms. Janice Taylor	April 11, 2019	Notice mailed.
Chippewas of Rama First Nation Contact: Ms. Cathy Edney	April 11, 2019	Notice mailed.
Curve Lake First Nation Contact: Ms. Melissa Dokis	April 11, 2019	Notice mailed.
Hiawatha First Nation Contact: Chief Laurie Carr	April 11, 2019	Notice mailed.
Mississaugas of the Scugog Island First Nation Contact: Chief Kelly LaRocca Contact: Dave Mowat	April 11, 2019	Notice mailed.
Metis Nation of Ontario Contact: Metis Consultation Unit	April 11, 2019	Notice mailed.

CONTACT	CONSULTATION DATE	ACTION
OTHER COMMUNICATIONS		
Mississaugas of the Scugog Island First Nation Contact: Dave Mowat	December 14, 2017	Reply form receive requesting Dave Mowat and Chief Kelly LaRocca be the contacts for this study. Both contacts added to study mailing list. Request to be informed of the archaeology process.
Chippewas of Rama First Nation Contact: Ms. Cathy Edney	June 8, 2018	Letter noting that at this time Chippewas of Rama First Nation has no input regarding the study but would like to remain updated moving forward. No action required.

Individual correspondence records for Indigenous Communities are included in Appendix J.

4.3. Preferred Solution

Based on the positive feedback and support for the preliminary recommended solution received at PIC #1, Alternative Network #2 was selected as the preferred solution.

5. Alternative Design Concepts

Following the confirmation of the preferred solution, alternative alignments for the recommended collector roads were developed in each of the corridors. The following alignments were developed (Exhibit 5-1):

- Road A
- Road B1 / Road B2
- Road C1 / Road C2
- Road D
- Road E1 / Road E2

5.1. Development of Alternative Design Concepts

As discussed in Section 3, the following features are present within the study area which constrain the collector road alignments:

- A Provincially Significant Wetland Complex named the “Bruce & Berczy Creek Wetland Complex” crosses the north end of the Study Area.
- Redside Dace habitat (species at risk) downstream of study area
- A structure would be required for Road B1/B2 to cross the wetland north of 19th Avenue
- A TransCanada Pipeline corridor is present across the study area north of Honda Boulevard
 - 2 crossings would be required (Road C and Road E)
- A woodlot is present at the south end of study area

Based on the above and feedback received from Toronto and Region Conservation Authority (TRCA) (Section 5.4.1) and stakeholders, Road B1/B2 was not carried forward for further assessment because of the significant impacts of crossing the Berczy tributary.

5.2. Analysis and Evaluation of Alternative Design Concepts

Each of the road alignments were assessed using factors in the following groupings:

- Natural Environment
- Social Environment
- Climate Change
- Technical (including cost)

Collector roads with multiple alignment options (i.e. Road C1/C2 and E1/E2) were evaluated against one another to determine the preferred alignment.

The following provides an overview of the analysis and evaluation of alternative designs that led to the determination of the preliminary recommended collector road network. The detailed analysis and evaluation tables are provided in Exhibit 5-2 through Exhibit 5-9 and Appendix I.



Exhibit 5-1: Alternative Design Concepts

Exhibit 5-2: Analysis of Alternative Design Concepts

TECHNICAL CRITERIA	Do Nothing	Road A	Road B1	Road B2	Road C1	Road C2	Road D	Road E1	Road E2
Natural Environment									
Provincially Significant Wetlands (PSW)	No impact.	Impact and permanent loss of a portion of the Bruce and Berczy Creek Provincially Significant Wetland complex.	Impact and permanent loss of a portion of the Bruce and Berczy Creek Provincially Significant Wetland complex. Requires a bridge to span the full TRCA flood line (approx. 130m - 170 m buffer around PSW).	Impact and permanent loss of a portion of the Bruce and Berczy Creek Provincially Significant Wetland complex. Requires a bridge to span the full TRCA flood line (approx. 130m - 170 m buffer around PSW).	Within 120m of the PSW. Potential impact to a portion of the Bruce and Berczy Creek Provincially Significant Wetland complex.	Directly adjacent to the PSW. Potential impact and loss of habitat associated with the Bruce and Berczy Creek Provincially Significant Wetland complex.	Directly adjacent to the PSW. Potential impact and loss of habitat associated with the Bruce and Berczy Creek Provincially Significant Wetland complex.	No impact anticipated.	No impact anticipated.
Watercourses / Aquatic Habitat	No impact.	No impact.	Enclosing a section of Berczy Creek creating a reduction of riparian and aquatic habitat. Increase in disturbance regimes and contaminant source from road run-off. Potential impacts to local fish populations.	Enclosing a section of Berczy Creek creating a reduction of riparian and aquatic habitat. Increase in disturbance regimes and contaminant source from road run-off. Potential impacts to local fish populations.	No impact anticipated.	Within 30 m of the Berczy Creek watercourse. Potential impacts to aquatic habitat quality and local fish populations.	Within 30 m of the Berczy Creek watercourse. Potential impacts to aquatic habitat quality and local fish populations.	No impact anticipated.	No impact anticipated.
Terrestrial Features	No impact.	Terrestrial lands (agricultural fields) will be impacted.	Terrestrial lands (agricultural fields) will be impacted.	Terrestrial lands (agricultural fields) will be impacted.	Terrestrial lands (agricultural fields and some adjacent trees on commercial / industrial lands) will be impacted.	Terrestrial lands (agricultural fields) will be impacted.	Terrestrial lands including agricultural fields and naturalized hedgerows will be impacted.	Terrestrial lands including agricultural fields, naturalized meadows, naturalized hedgerows, forested lands, and shoreline of Storm Water Management Pond will be impacted.	Terrestrial lands including agricultural fields, naturalized meadows, naturalized hedgerows and forested lands will be impacted.
Stormwater Management	No impact.	Stormwater management for individual parcels to be the responsibility of developers.							





























TECHNICAL CRITERIA	Do Nothing	Road A	Road B1	Road B2	Road C1	Road C2	Road D	Road E1	Road E2
Social									
Ability to Accommodate Future Development	Development parcels remain large with access only permitted on Honda Boulevard. Low level of ability to accommodate future development as access is only permitted on Honda Boulevard.	Allows for small and large parcel development north of 19 th Avenue with access onto Road A.	Allows for small and large parcel development north of 19 th Avenue with access onto Road B1.	Allows for small and large parcel development north of 19 th Avenue with access onto Road B2.	Allows for small and large parcel development east and west of Road C1.	Allows for small and large parcel development east and west of Road C2. Horizontal curvature of road segments one parcel into a nonlinear area.	Allows for small and large parcel development north of the existing Honda Boulevard with access onto Road D.	Allows for large and small parcel development in the south end of the study area with access onto Road E1. Segments the existing large parcels of land. Maintains a smaller parcel on the west side for development.	Allows for large and small parcel development in the south end of the study area with access onto Road E2. Maintains a larger parcel on the west side for development.
Accessibility to Future Development Blocks	Does not provide improved access to the developable lands in the Planning District.	Provides access to development parcels north of 19th Avenue and east of Berczy Creek from both Woodbine Avenue and 19th Avenue.	Provides access to development parcels north of 19th Avenue from both Woodbine Avenue and 19th Avenue.	Provides access to development parcels north of 19th Avenue from both Woodbine Avenue and 19th Avenue.	Provides access to development parcels east and west of Road C1.	Provides access to development parcels east and west of Road C2.	Provides access to development parcels north of the existing Honda Boulevard.	Provides an alternative access point (rather than Honda Boulevard) for parcels in the south end of the study area.	Provides an alternative access point (rather than Honda Boulevard) for parcels in the south end of the study area.
Archaeological and Cultural Heritage	No impact.	No direct impact to archaeological or cultural heritage features.	No direct impact to archaeological or cultural heritage features.	No direct impact to archaeological or cultural heritage features.	No direct impact to archaeological or cultural heritage features.	No direct impact to archaeological or cultural heritage features.	No direct impact to archaeological or cultural heritage features.	No direct impact to archaeological or cultural heritage features.	No direct impact to archaeological or cultural heritage features.
Air Quality	No impact.	No significant negative impacts on local air quality anticipated.	No significant negative impacts on local air quality anticipated.	No significant negative impacts on local air quality anticipated.	No significant negative impacts on local air quality anticipated.	No significant negative impacts on local air quality anticipated.	No significant negative impacts on local air quality anticipated.	No significant negative impacts on local air quality anticipated.	No significant negative impacts on local air quality anticipated.
Climate Change									
Climate Change Mitigation	No opportunities for climate change mitigation.	The proposed collector roads will help to reduce idling that is currently experienced in the study area. Thus, the project will not materially contribute towards climate change.							
Climate Change Adaptation	No opportunities to consider climate change adaptation.	Opportunity to consider future flood conditions in the sizing of the proposed stormwater facilities (by developers).							

TECHNICAL CRITERIA	Do Nothing	Road A	Road B1	Road B2	Road C1	Road C2	Road D	Road E1	Road E2
Technical									
Network Connectivity/ Efficiency	No internal road network provided.	Does not provide a continuous north-south connection between 19th Avenue and Woodbine Avenue in the north to Woodbine Avenue in the south.	Provides a continuous north-south route with the potential to connect to Road C1 or C2 if implemented, connecting 19th Avenue and Woodbine Avenue in the north to Woodbine Avenue in the south.	Provides a continuous north-south route with the potential to connect to Road C1 or C2 if implemented, connecting 19th Avenue and Woodbine Avenue in the north to Woodbine Avenue in the south.	Provides a continuous north-south route connecting 19th Avenue to Woodbine Avenue in the south. Aligns with Road B1 or B2, if implemented.	Provides a continuous north-south route connecting 19th Avenue to Woodbine Avenue in the south. Does not directly align with Road B1 or B2, if implemented.	Provides a new east-west route from Woodbine Avenue to Honda Boulevard.	Provides an alternative north-south connection from Road D (if implemented) to Woodbine Avenue.	Provides an alternative north-south connection from Road D (if implemented) to Woodbine Avenue.
Distance to Future 19th Avenue Interchange	N/A	630 m	370 m	370 m	370 m	440 m	N/A	N/A	N/A
Distance to Other Proposed Collector Roads	N/A	260 m to Road B1/B2 and C1.	260 m to Road A.	260 m to Road A.	260 m to Road A.	190 m to Road A.	N/A	N/A	N/A

TECHNICAL CRITERIA	Do Nothing	Road A	Road B1	Road B2	Road C1	Road C2	Road D	Road E1	Road E2
Ability to Align with Future Urban Area (FUA) Plans	No impact to FUA plans.	No impact to FUA plans.	No impact to FUA plans.	No impact to FUA plans.	No impact to FUA plans.	No impact to FUA plans.	Maintain provision for future connection to FUA.	No impact to FUA plans.	No impact to FUA plans.
Constructability	No impact.	Land for the collector road is currently undeveloped. Minimal construction disturbance anticipated.	Land for the collector road is currently undeveloped. Impact at the creek crossing can be mitigated. Minimal construction disturbance anticipated.	Land for the collector road is currently undeveloped. Impact at the creek crossing can be mitigated. Minimal construction disturbance anticipated.	Land for the collector road is currently undeveloped. Minimal construction disturbance anticipated.	Land for the collector road is currently undeveloped. Minimal construction disturbance anticipated.	Land for the collector road is currently undeveloped. Minimal construction disturbance anticipated.	Land for the collector road is currently undeveloped. Minimal construction disturbance anticipated.	Land for the collector road is currently undeveloped. Minimal construction disturbance anticipated.
Compliance with Design Standards	No impact.	Compliant with City of Markham design standards.	Compliant with City of Markham design standards.	Compliant with City of Markham design standards.	Compliant with City of Markham design standards.	Compliant with City of Markham design standards.	Compliant with City of Markham design standards.	Compliant with City of Markham design standards.	Compliant with City of Markham design standards.
Utilities and Municipal Infrastructure	No impact.	No utilities or municipal infrastructure impacted. Servicing to be arranged by developers.	No utilities or municipal infrastructure impacted. Servicing to be arranged by developers.	No utilities or municipal infrastructure impacted. Servicing to be arranged by developers.	No utilities or municipal infrastructure impacted. Servicing to be arranged by developers.	No utilities or municipal infrastructure impacted. Servicing to be arranged by developers.	Coordination with Hydro One and Enbridge required. Servicing to be arranged by developers.	No utilities or municipal infrastructure impacted. Servicing to be arranged by developers.	No utilities or municipal infrastructure impacted. Servicing to be arranged by developers.

Highest Benefit	Fairly High Benefit	Moderate Benefit	Fairly Low Benefit	Least Benefit

Exhibit 5-3: Evaluation of Alternative Design Concepts A, B1 and B2

TECHNICAL CRITERIA	Do Nothing	Road A	Road B1	Road B2
Natural Environment				
Provincially Significant Wetlands (PSW)	No impact. 	Impact and permanent loss of a portion of the Bruce and Berczy Creek Provincially Significant Wetland complex. 	Impact and permanent loss of a portion of the Bruce and Berczy Creek Provincially Significant Wetland complex. Requires a bridge to span the full TRCA flood line (approx. 130m - 170 m buffer around PSW). 	Impact and permanent loss of a portion of the Bruce and Berczy Creek Provincially Significant Wetland complex. Requires a bridge to span the full TRCA flood line (approx. 130m - 170 m buffer around PSW). 
Watercourses / aquatic habitat	No impact. 	No impact. Minor infringement to flood line (can be mitigated). 	Enclosing a section of Berczy Creek creating a reduction of riparian and aquatic habitat. Increase in disturbance regimes and contaminant source from road run-off. Potential impacts to local fish populations. 	Enclosing a section of Berczy Creek creating a reduction of riparian and aquatic habitat. Increase in disturbance regimes and contaminant source from road run-off. Potential impacts to local fish populations. 
Terrestrial features	No impact. 	Terrestrial lands (agricultural fields) will be impacted (less than B1 or B2). No significant features impacted. 	Terrestrial lands (agricultural fields) will be impacted. No significant features impacted. 	Terrestrial lands (agricultural fields) will be impacted. No significant feature impacted. 
Stormwater Management	No impact. 	Stormwater management for individual parcels to be the responsibility of developers. 		
Social				
Ability to Accommodate Future Development	Development parcels remain large with access only permitted on Honda Boulevard. Low level of ability to accommodate future development as access is only permitted on Honda Boulevard. 	Allows for small and large parcel development north of 19 th Avenue with access onto Road A. 	Allows for small and large parcel development north of 19 th Avenue with access onto Road B1. 	Allows for small and large parcel development north of 19 th Avenue with access onto Road B2. 
Accessibility to Future Development Blocks	Does not provide improved access to the developable lands in the Planning District. 	Provides partial access to development parcels north of 19th Avenue and east of Berczy Creek from both Woodbine Avenue and 19th Avenue. 	Provides access to development parcels north of 19th Avenue from both Woodbine Avenue and 19th Avenue. 	Provides access to development parcels north of 19th Avenue from both Woodbine Avenue and 19th Avenue. 
Archaeological and Cultural Heritage	No impact.	No direct impact to archaeological or cultural heritage features.	No direct impact to archaeological or cultural heritage features.	No direct impact to archaeological or cultural heritage features.
Air Quality	No impact. 	Air quality effects will be similar for all alternatives as significant sources exist as Highway 404 and Woodbine Avenue. 		
Climate Change				
Climate Change Mitigation	No opportunities for climate change mitigation. 	The proposed collector roads will help to reduce idling that is currently experienced in the study area. Thus, the project will not materially contribute towards climate change. 		
Climate Change Adaptation	No opportunities to consider climate change adaptation. 	Opportunity to consider future flood conditions in the sizing of the proposed stormwater facilities (by developers). 		

TECHNICAL CRITERIA	Do Nothing	Road A	Road B1	Road B2
Technical				
Network Connectivity/ Efficiency	No internal road network provided. 	Does not provide a continuous north-south connection between 19th Avenue and Woodbine Avenue in the north to Woodbine Avenue in the south. 	Provides a continuous north-south route with the potential to connect to Road C1 or C2 if implemented, connecting 19th Avenue and Woodbine Avenue in the north to Woodbine Avenue in the south. 	Provides a continuous north-south route with the potential to connect to Road C1 or C2 if implemented, connecting 19th Avenue and Woodbine Avenue in the north to Woodbine Avenue in the south.
Distance to Future 19 th Avenue Interchange	N/A	630 m 	370 m 	370 m
Distance to Other Proposed Collector Roads	N/A	260 m to Road B1/B2 and C1. 	260 m to Road A. 	260 m to Road A.
Ability to Align with Future Urban Area (FUA) Plans	No impact to FUA plans. 	No impact to FUA plans. 	No impact to FUA plans. 	No impact to FUA plans.
Constructability	No impact. 	Land for the collector road is currently undeveloped. Minimal construction disturbance anticipated. 	Land for the collector road is currently undeveloped. Impact at the creek crossing can be mitigated. Minimal construction disturbance anticipated. 	Land for the collector road is currently undeveloped. Impact at the creek crossing can be mitigated. Minimal construction disturbance anticipated.
Cost	No impact. 	Moderate cost to cross portion of PSW at Woodbine intersection. 	Significant cost to cross Berczy creek. 	Significant cost to cross Berczy creek.
Compliance with Design Standards	No impact. 	Compliant with City of Markham design standards. 	Compliant with City of Markham design standards. 	Compliant with City of Markham design standards.
Utilities and Municipal Infrastructure	No impact. 	No utilities or municipal infrastructure impacted. Servicing to be completed by developers. 	No utilities or municipal infrastructure impacted. Servicing to be completed by developers. 	No utilities or municipal infrastructure impacted. Servicing to be completed by developers.
Recommendation				
Summary	Development parcels remain large with access only permitted from 19th Avenue or Woodbine Avenue. Low level of ability to accommodate future development without collector roads. Does not provide improved access to the developable lands in the Planning district.	Impact and permanent loss of a portion of the Bruce and Berczy Creek Provincially Significant Wetland complex. However, no crossing structure required. No impact to watercourses or aquatic habitat. Does not provide a continuous north-south connection between 19th Avenue and Woodbine Avenue in the north to Woodbine Avenue in the south.	Impact and permanent loss of a portion of the Bruce and Berczy Creek Provincially Significant Wetland complex. Significant crossing structure required. Potential impact to watercourses or aquatic habitat. Significant cost premium to provide crossing of Berczy Creek tributary. Provides a continuous north-south connection between 19th Avenue and Woodbine Avenue in the north to Woodbine Avenue in the south.	Impact and permanent loss of a portion of the Bruce and Berczy Creek Provincially Significant Wetland complex. Significant crossing structure required. Potential impact to watercourses or aquatic habitat. Significant cost premium to provide crossing of Berczy Creek tributary. Provides a continuous north-south connection between 19th Avenue and Woodbine Avenue in the north to Woodbine Avenue in the south.
Recommendation	Not recommended	Recommended	Not recommended	Not recommended

Exhibit 5-4: Evaluation of Alternative Design Concepts C1 and C2

TECHNICAL CRITERIA	Do Nothing	Road C1	Road C2
Natural Environment			
Provincially Significant Wetlands (PSW)	No impact. ●	Within 120m of the PSW. Potential impact to a portion of the Bruce and Berczy Creek Provincially Significant Wetland complex. ◐	Directly adjacent to the PSW. Potential impact and loss of habitat associated with the Bruce and Berczy Creek Provincially Significant Wetland complex. ○
Watercourses / Aquatic Habitat	No impact. ●	No impact anticipated. ●	Within 30 m of the Berczy Creek watercourse. Potential impacts to aquatic habitat quality and local fish populations. ◐
Terrestrial features	No impact. ●	Terrestrial lands (agricultural fields and some adjacent trees on commercial / industrial lands) will be impacted. No significant features affected. ○	Terrestrial lands (agricultural fields) will be impacted. No significant features affected. ○
Stormwater Management	No impact. ●	Stormwater management for individual parcels to be the responsibility of developers. ●	
Social			
Ability to Accommodate Future Development	Development parcels remain large with access only permitted on Honda Boulevard. Low level of ability to accommodate future development as access is only permitted on Honda Boulevard. ○	Allows for small and large parcel development east and west of Road C1. ●	Allows for small and large parcel development east and west of Road C2. ●
Accessibility to Future Development Blocks	Does not provide improved access to the developable lands in the Planning District. ○	Provides access to development parcels east and west of Road C1. ●	Provides access to development parcels east and west of Road C2. ●
Archaeological and Cultural Heritage	No impact. ●	No direct impact to archaeological or cultural heritage features. ●	No direct impact to archaeological or cultural heritage features. ●
Air Quality	No impact. ●	Air quality effects will be similar for all alternatives as significant sources exist as Highway 404 and Woodbine Avenue. ●	
Climate Change			
Climate Change Mitigation	No opportunities for climate change mitigation. ○	The proposed collector roads will help to reduce idling that is currently experienced in the study area. Thus, the project will not materially contribute towards climate change. ●	
Climate Change Adaptation	No opportunities to consider climate change adaptation. ○	Opportunity to consider future flood conditions in the sizing of the proposed stormwater facilities (by developers). ●	
Technical			
Network Connectivity/ Efficiency	No internal road network provided. ○	Provides a continuous north-south route connecting 19th Avenue to Woodbine Avenue in the south. Aligns with Road B1 or B2, if implemented. ●	Provides a continuous north-south route connecting 19th Avenue to Woodbine Avenue in the south. Does not directly align with Road B1 or B2, if implemented. ◐

TECHNICAL CRITERIA	Do Nothing	Road C1	Road C2
Distance to Future 19 th Avenue Interchange	N/A	370 m ●	440 m ●
Distance to Other Proposed Collector Roads	N/A	260 m to Road A. ●	190 m to Road A. ●
Ability to Align with Future Urban Area (FUA) Plans	No impact to FUA plans. ●	No impact to FUA plans. ●	No impact to FUA plans. ●
Constructability	No impact. ●	Land for the collector road is currently undeveloped. Minimal construction disturbance anticipated. ●	Land for the collector road is currently undeveloped. Minimal construction disturbance anticipated. ●
Cost	No impact. ●	Similar construction costs for C1 and C2. ○	Similar construction costs for C1 and C2. ○
Compliance with Design Standards	No impact. ●	Compliant with City of Markham design standards. ●	Compliant with City of Markham design standards. ●
Utilities and Municipal Infrastructure	No impact. ●	No utilities or municipal infrastructure impacted. Servicing to be arranged by developers. ●	No utilities or municipal infrastructure impacted. Servicing to be arranged by developers. ●
Recommendation			
Summary	<p>Development parcels remain large with access only permitted on Honda Boulevard. Low level of ability to accommodate future development as access is only permitted on Honda Boulevard.</p> <p>Does not provide improved access to the developable lands in the Planning district.</p>	<p>Within 120m of the PSW. Potential impact to a portion of the Bruce and Berczy Creek Provincially Significant Wetland complex.</p> <p>No impact to Berczy Creek watercourse anticipated.</p> <p>Allows for small and large parcel development east and west of Road C1.</p> <p>Allows for small and large parcel development east and west of Road C1.</p>	<p>Directly adjacent to the PSW. Potential impact and loss of habitat associated with the Bruce and Berczy Creek Provincially Significant Wetland complex.</p> <p>Within 30 m of the Berczy Creek watercourse. Potential impacts to aquatic habitat quality and local fish populations.</p> <p>Allows for small and large parcel development east and west of Road C2.</p> <p>Horizontal curvature of road segments one parcel into a nonlinear area (City of Markham property).</p> <p>Provides a continuous north-south route connecting 19th Avenue to Woodbine Avenue in the south.</p> <p>Does not directly align with Road B1 or B2, if implemented.</p>
Recommendation	Not recommended	Recommended	Not recommended

Exhibit 5-5: Evaluation of Alternative Design Concepts E1 and E2

TECHNICAL CRITERIA	Do Nothing	Road E1	Road E2
Natural Environment			
Provincially Significant Wetlands (PSW)	No impact. ●	No impact anticipated. ●	No impact anticipated. ●
Watercourses / Aquatic Habitat	No impact. ●	No impact anticipated. ●	No impact anticipated. ●
Terrestrial features	No impact. ●	Terrestrial lands including agricultural fields, naturalized meadows, naturalized hedgerows, forested lands, and shoreline of Storm Water Management Pond will be impacted. ○	Terrestrial lands including agricultural fields, naturalized meadows, naturalized hedgerows and forested lands will be impacted. ○
Stormwater Management	No impact. ●	Stormwater management for individual parcels to be the responsibility of developers. ●	
Social			
Ability to Accommodate Future Development	Development parcels remain large with access only permitted on Honda Boulevard. Low level of ability to accommodate future development as access is only permitted on Honda Boulevard. ○	Allows for large and small parcel development in the south end of the study area with access onto Road E1. Segments the existing large parcels of land. Provides for a larger development block on west side. ●	Allows for large and small parcel development in the south end of the study area with access onto Road E2. Segments the existing large parcels of land. Provides for a smaller development block on west side. ●
Accessibility to Future Development Blocks	Does not provide improved access to the developable lands in the Planning District. ○	Provides an alternative access point (rather than Honda Boulevard) for parcels in the south end of the study area. ●	Provides an alternative access point (rather than Honda Boulevard) for parcels in the south end of the study area. ●
Archaeological and Cultural Heritage	No impact.	No direct impact to archaeological or cultural heritage features.	No direct impact to archaeological or cultural heritage features.
Air Quality	No impact. ●	Air quality effects will be similar for all alternatives as significant sources exist as Highway 404 and Woodbine Avenue. ●	
Climate Change			
Climate Change Mitigation	No opportunities for climate change mitigation. ○	The proposed collector roads will help to reduce idling that is currently experienced in the study area. Thus, the project will not materially contribute towards climate change. ●	
Climate Change Adaptation	No opportunities to consider climate change adaptation. ○	Opportunity to consider future flood conditions in the sizing of the proposed stormwater facilities (by developers). ●	
Technical			
Network Connectivity/ Efficiency	No internal road network provided. ○	Provides an alternative north-south connection from Road D (if implemented) to Woodbine Avenue. ●	Provides an alternative north-south connection from Road D (if implemented) to Woodbine Avenue. ●
Distance to Future 19 th Avenue Interchange	N/A	N/A	N/A
Distance to Other Proposed Collector Roads	N/A	N/A	N/A
Ability to Align with Future Urban Area (FUA) Plans	No impact to FUA plans. ●	No impact to FUA plans. ●	No impact to FUA plans. ●

TECHNICAL CRITERIA	Do Nothing	Road E1	Road E2
Constructability	No impact. 	Land for the collector road is currently undeveloped. Minimal construction disturbance anticipated. 	Land for the collector road is currently undeveloped. Minimal construction disturbance anticipated.
Cost	No impact. 	Similar costs for E1 and E2. 	Similar costs for E1 and E2.
Compliance with Design Standards	No impact. 	Compliant with City of Markham design standards. 	Compliant with City of Markham design standards.
Utilities and Municipal Infrastructure	No impact. 	No utilities or municipal infrastructure impacted. Servicing to be arranged by developers. 	No utilities or municipal infrastructure impacted. Servicing to be arranged by developers.
Recommendation			
Summary	Development parcels remain large with access only permitted on Honda Boulevard. Low level of ability to accommodate future development as access is only permitted on Honda Boulevard. Does not provide improved access to the developable lands in the Planning district.	Allows for large and small parcel development in the south end of the study area with access onto Road E1. Segments the existing large parcels of land. Provides for a larger development block on west side. Provides an alternative access point (rather than Honda Boulevard) for parcels in the south end of the study area.	Allows for large and small parcel development in the south end of the study area with access onto Road E2. Segments the existing large parcels of land. Provides for a smaller development block on west side. Provides an alternative access point (rather than Honda Boulevard) for parcels in the south end of the study area.
Recommendation	Not recommended	Recommended	Not recommended

Road A

Main features of Road A (Exhibit 5-6) include the following:

- Potential impact to a portion of the Bruce and Berczy Creek Provincially Significant Wetland (PSW) complex however impact is expected to be minimal with appropriate mitigation measures
- Allows for small and large parcel development north of 19th Avenue with access onto Road A
- Provides adequate offset from Road C1/C2

Based on the above, Road A was carried forward as part of the preliminary recommended network.



Exhibit 5-6: Preliminary Recommended Collector Road A Alignment

Road C1/C2

Main features of Road C1 and C2 (Exhibit 5-7) include the following:

- Both Road C1/C2 have the potential to impact the PSW however impacts are expected to be minimal with appropriate mitigation
- Both roads allow for small and large parcel development east and west of Road C1/C2
- Provides a continuous north-south collector road connecting 19th Avenue to Woodbine Avenue (Honda Boulevard extension)
- Both alignments provide sufficient offset from Highway 404 for a future signalized intersection with 19th Avenue

Main differences between Road C1 and Road C2:

- A north leg of the intersection is not possible with Road C2
- Road C2 is directly adjacent to the PSW and therefore has a higher potential for impact compared to Road C1

Therefore, Road C1 was carried forward as part of the preliminary recommended network.



Exhibit 5-7: Preliminary Recommended Collector Road C1 Alignment

Road D

Main features of Road D (Exhibit 5-8) include the following:

- Allows for small and large parcel development north of the existing Honda Boulevard with access onto Road D
- Road D right-of-way is directly adjacent to a TransCanada Pipeline right-of-way.
- A northerly shift of the intersection with Road D and Woodbine Avenue was considered in order to minimize impact to the wetland
- This shift would result in a fragmentation of the properties along Road D which is undesirable (creates undevelopable parcels between Road D and the TransCanada corridor)
- The proposed alignment maintains provision for future connection to FUA on the east side of Woodbine Avenue

Therefore, Road D was carried forward as part of the preliminary recommended network.



Exhibit 5-8: Preliminary Recommended Collector Road D Alignment

Road E1/E2

Main features of Road E1 and E2 (Exhibit 5-9) include the following:

- Both alignments allow for large and small parcel development in the south end of the study area with access onto Road E1.
- Both alignments pass through the east end of a woodlot that has been identified as a significant woodlot. The designation is discussed in Section 3.3.

Main differences between Road E1 and Road E2:

- Road E1 provides for larger development parcels on the west side compared to Road E2
- E1 passes through the woodlot the furthest east, maintaining the largest area of the woodlot to the west (Exhibit 5-10).

Therefore, Road E1 was carried forward as part of the preliminary recommended network.



Exhibit 5-9: Preliminary Recommended Collector Road E1 Alignment

Exhibit 5-10: Road E1 and Road E2 Parcel Size

Collector Road	Area of Significant Woodland Impacted (m ²)	Remaining Parcel Size (m ²)	
		West	East
E1	1,940	23,735	14,926
E2	1,995	21,913	16,755

5.3. Technically Preferred Network Alternative Design Concept

In summary, based on the analysis and evaluation of alternative road alignments, the preferred collector road network was selected to be a combination of the following:

- Road A
- Road C1
- Road D
- Road E1

Road B was not carried forward because of the impact to the Berczy Creek tributary/PSW and the high cost associated with providing a structure to span the regulation area.

Road A crosses a small portion of the PSW however impact is expected to be minimal with appropriate mitigation measures.

An access from 19th Avenue is provided in place of Road B for the land parcels north of 19th Avenue and west of the tributary.

Road C1 provides less impact to the PSW compared to Road C2.

Road E1 provides for larger development parcels on the west side compared to Road E2, and E1 has less fragmentation to the woodlot than E2.

5.4. Phase 2 Consultation

5.4.1. Toronto and Region Conservation Authority

A meeting with the Toronto and Region Conservation Authority (TRCA) was held on November 26, 2018 in advance of Public Information Centre No. 2 to review the alternative road network alignments and receive TRCA feedback. Collector Roads A, B1, B2, C1, C2, D, E1 and E2 were presented to TRCA for discussion purposes. TRCA noted that the wetland north of 19th Avenue is a Provincially Significant Wetland (PSW). The TRCA Regulation Limit extends 120 metres around the PSW and any road crossing would be required to span the full flood limit. A copy of the detailed meeting minutes are available in Appendix J.

5.4.2. Ministry of Transportation

A meeting with the Ministry of Transportation (MTO) was held on November 29, 2018 to review the alternative road network alignments and receive MTO feedback in advance of PIC No. 2. MTO noted that the proposed alignments provide sufficient offset from MTO's infrastructure and potential future infrastructure. A copy of the detailed meeting minutes are available in Appendix J.

5.4.3. Property Owners

Meetings with property owners were held on March 5 and 6, 2019. The purpose of the meetings was to invite property owners impacted by the proposed collector roads to review the preliminary recommended plan in advance of Public Information Centre #2 and discuss the property requirements for the road network. Based on the feedback received at the meeting, no property owners objected to the preliminary recommended plan and the recommendation was taken to PIC #2.

5.4.4. Notice of Public Information Centre No. 2

The Notice of Public Information Centre No. 2 was prepared to inform the public and agencies of the opportunity to review the project and provide input. The Notice was advertised in the Markham Economist and Markham Sun on Thursday April 11 and April 18, 2019. The Notice was emailed or mailed to 33 agency representatives and 279 property owners within the study limits on April 11, 2019. A copy of the Notice and the list of agency representatives is included in Appendix A.

The Notice of Public Information Centre No. 2 outlined the purpose of the meeting and identified the time, date, and location for the PIC. The Notice invited public comments on the study by either attending the PIC or contacting the project team.

5.4.5. Public Information Centre No. 2

The PIC was held on April 24, 2019 from 7:00 PM to 9:00 PM at the Victoria Square Community Centre at 2929 Elgin Mills Road E. The PIC was held in an open-house format where the public was invited to review display boards, ask questions, and discuss comments with the project team. The display boards described the following:

- Welcome and Introduction
- Purpose of Public Information Centre No. 2
- Background and Study Area
- Planning and Policy Context
- Study Process and Schedule
- Summary of PIC No. 1
- Alternative Design Concepts
- Study Area Constraints
- Analysis and Evaluation of Alternative Designs
 - Road A
 - Road C1/C2
 - Road D
 - Road E1/E2

- Preliminary Recommended Collector Road Network
- Stormwater Management
- Road Design Elements
- Next Steps

A sign-in sheet and comment sheets were provided to record attendance and obtain written comments. A copy of the PIC material is included in Appendix H. Eleven (11) people signed into the PIC and 1 comment sheet was received at the meeting.

General support by the public/attendees for the preliminary preferred alternative was noted by the project team during the PIC. The single comment sheet received indicated a preference for a multi-use trail within the active transportation buffer to serve bicycles in the study area.

There was discussion amongst land owners that attended the PIC about the potential to extend Road A northerly to the Town of Whitchurch-Stouffville and City of Markham boundary line. The project team noted that the Town of Whitchurch-Stouffville was consulted prior to PIC #2 regarding the preliminary recommended plan and the proposed collector road alignments and no comments from the Town were received.

The PIC was an opportunity to hear comments from the public on the preliminary preferred design. All comments received were reviewed by the project team and considered in the confirmation of the preferred design.

5.4.6. Meeting with TC Energy

Meetings were held with TC Energy to review the potential effects of the road alignments on TC Energy's pipelines. TC Energy provided guidelines to be followed for the implementation of infrastructure adjacent to the pipeline corridor. As a result of these meetings and reviews by TC Energy, an offset of 7m was provided between the north property line of TC Energy and the south property line for Road D. TC Energy indicated that the 3.0m AT (multiuse path) would be acceptable within the 7m offset.

During the meetings it was noted that there were constraints with the location of Road D that would not allow the ROW to be shifted further to the north, or for the vertical alignment / profile to be lowered. This has resulted in a fill requirement, particularly in proximity to the intersection of Road E. With a proposed 2m fill a 2:1 side slope would encroach onto TC Energy's property. An engineered wall, similar to a Filtrex Reinforced Living Wall, would allow for a steeper slope (1:1). This wall will be designed during detailed design.

The crossing of Road E may require an Engineering Assessment for the crossing. TC Energy noted that this requirement would be at the cost to the City. Typically, the assessment is required when the additional fill over the pipes exceeds 2m. The need for an Engineering Assessment will be reassessed at detailed design, however a cost for the works has been included in the cost estimate for Road E.

5.5. Preferred Design Concept

Following feedback received from the public and agencies, the preliminary recommended collector road network was confirmed to be the preferred design concept.

6. Description of the Recommended Plan

6.1. Roadway Geometry

6.1.1. Design Criteria

The preliminary design for the collector roads are based on design criteria outlined in Exhibit 6-1.

Exhibit 6-1 : Design Criteria

Design Criteria	Standard	Road A	Road B	Road C	Road D	Road E
Road Classification	-	Industrial/Commercial Collector Road (MR12)				
Design Speed	60 km/h	60 km/h	60 km/h	60 km/h	60 km/h	60 km/h
Posted Speed	50 - 60 km/h	50 km/h	50 km/h	50 km/h	50 km/h	50 km/h
Right-of-Way Width	23.5 m	24.5 m	24.5 m	32.0 m	19.0 m	24.5 m
Pavement Width	11.5 m	12.5 m	12.5 m	19.5 m	11.5 m	12.5 m
Boulevard Width (includes AT Path)	6.0 m	6.0 m	6.0 m	6.0 m	6.0 m	6.0 m
Minimum Horizontal Radius	150 m	115 m	-	-	-	180 m
Minimum Grade	0.7%	1.0%	0.57%	0.5%	0.46%	0.5%
Maximum Grade	6.0%	1.8%	0.57%	1.11%	1.79%	1.0%
Vertical Curves	Min Crest k = 10 Min Sag k = 10	Crest k = 30 Sag k = 18	-	Crest k = 20	Crest k = 20 Sag k = 50	Crest k = 50 Sag k = 23

6.1.2. Profile and Alignment

The proposed profile and alignment for each of the collector roads is provided on the preliminary design plates in Exhibit 6-2 through Exhibit 6-10. An overall plan illustrating the recommended collector road alignments is provided in Exhibit 6-11.

The profile of Road A provides opportunity for wetland flow and animal passage. Sizing of the culverts will be determined at detailed design. The profile of Woodbine Avenue at the intersection with Road A will be adjusted to accommodate the recommended intersection improvements. The proposed profile for Woodbine Avenue is illustrated in Exhibit 6-12.

Opportunity for wildlife passage at Road E1 would exist at the south end of the woodlot. Further consideration will occur at the time of detailed design.

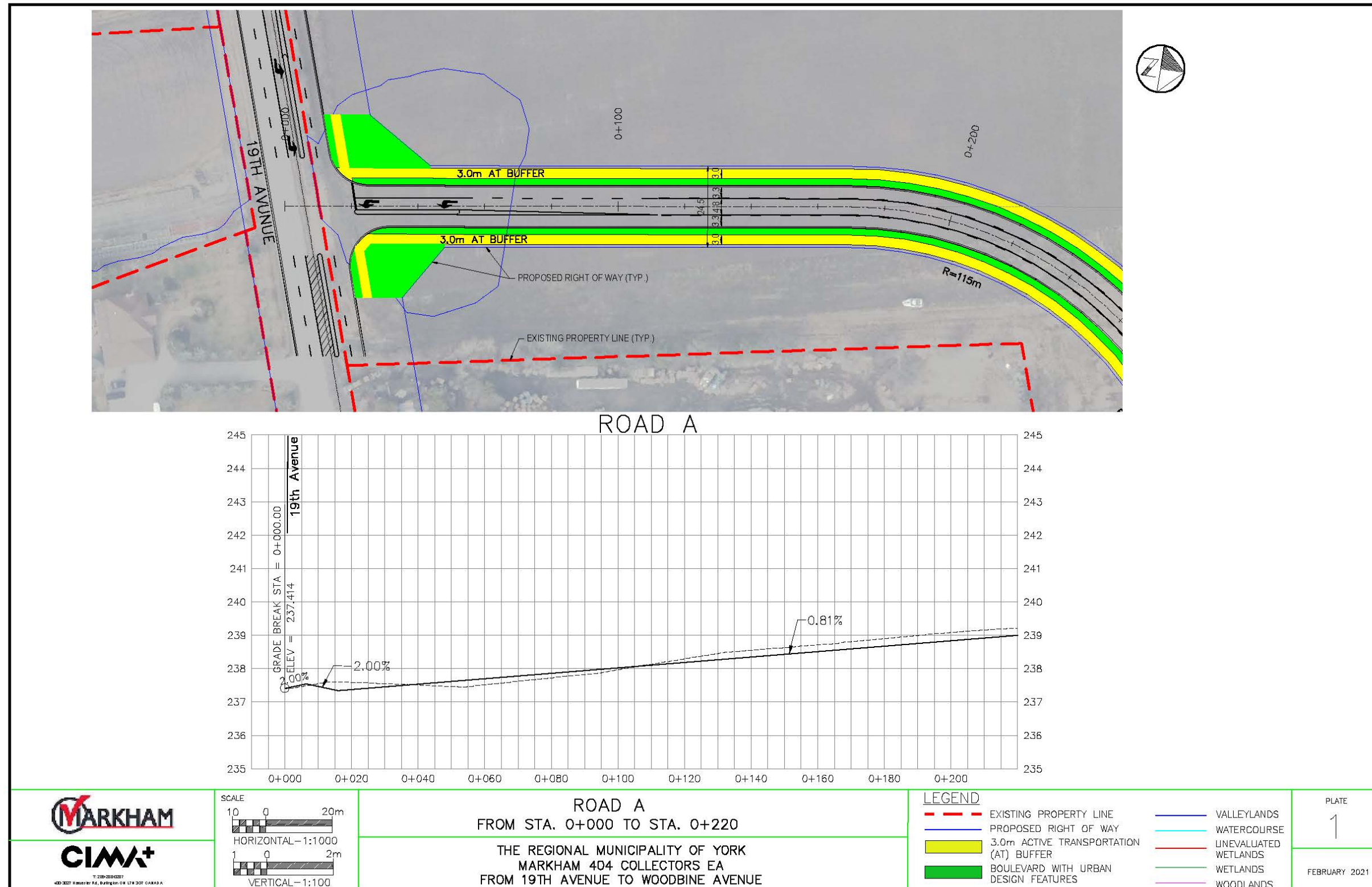


Exhibit 6-2: Preliminary Design Plate Road A Station 0+000 to Station 0+220

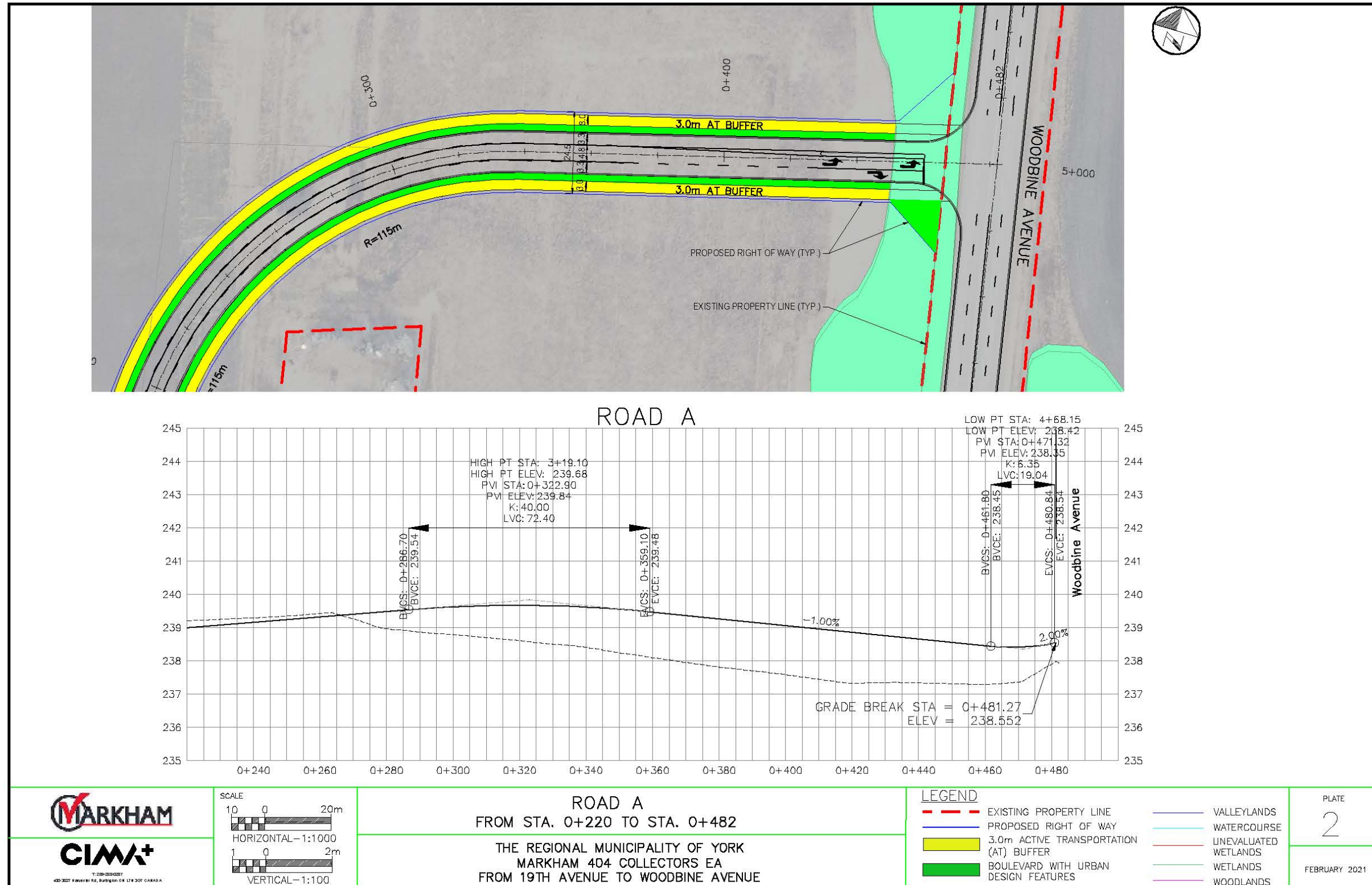


Exhibit 6-3: Preliminary Design Plate Road A Station 0+220 to Station 0+482

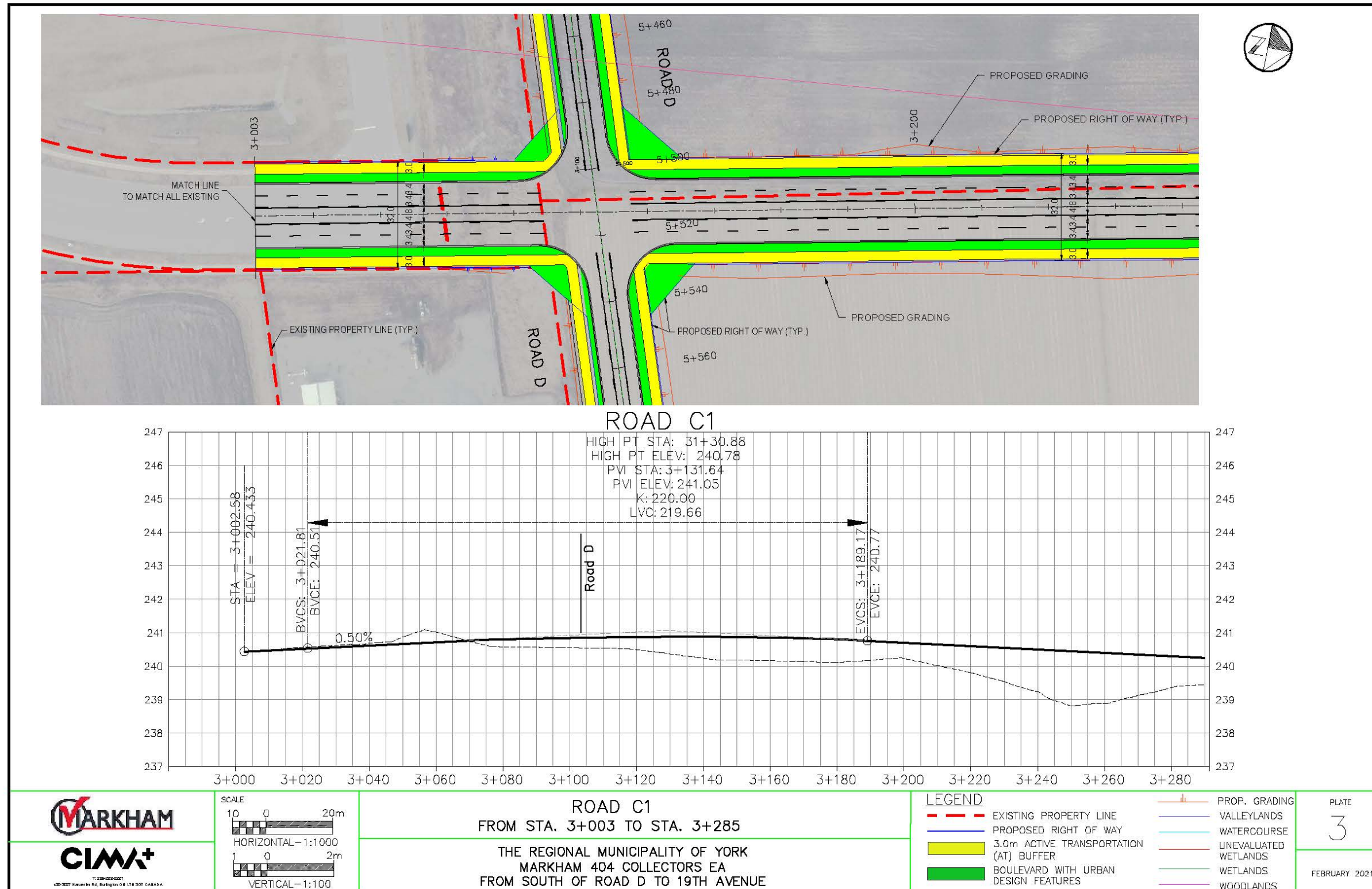


Exhibit 6-4: Preliminary Design Plate Road C1 Station 3+003 to Station 3+285

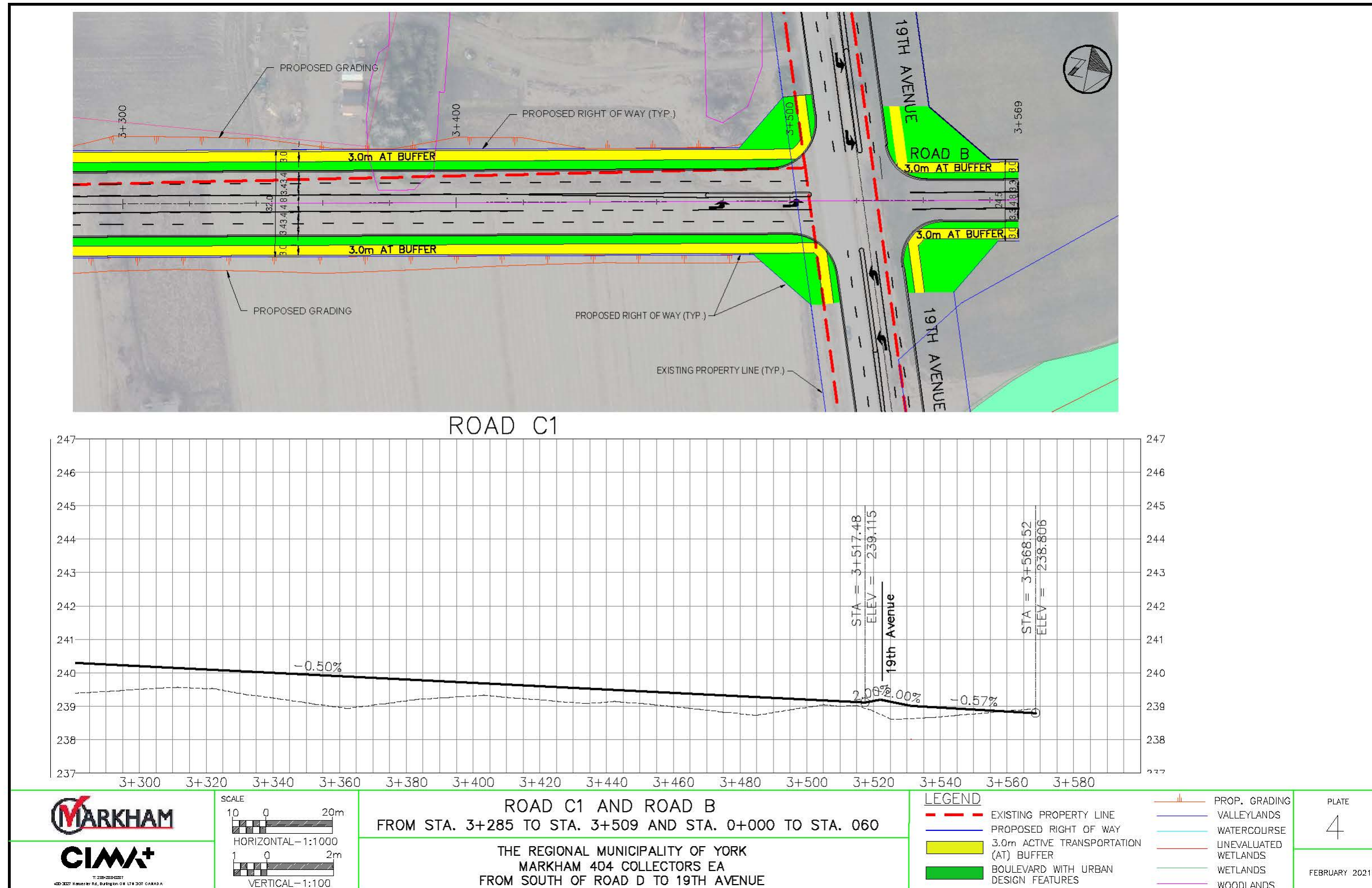


Exhibit 6-5: Preliminary Design Plate Road C1 and B Station 3+285 to Station 3+509

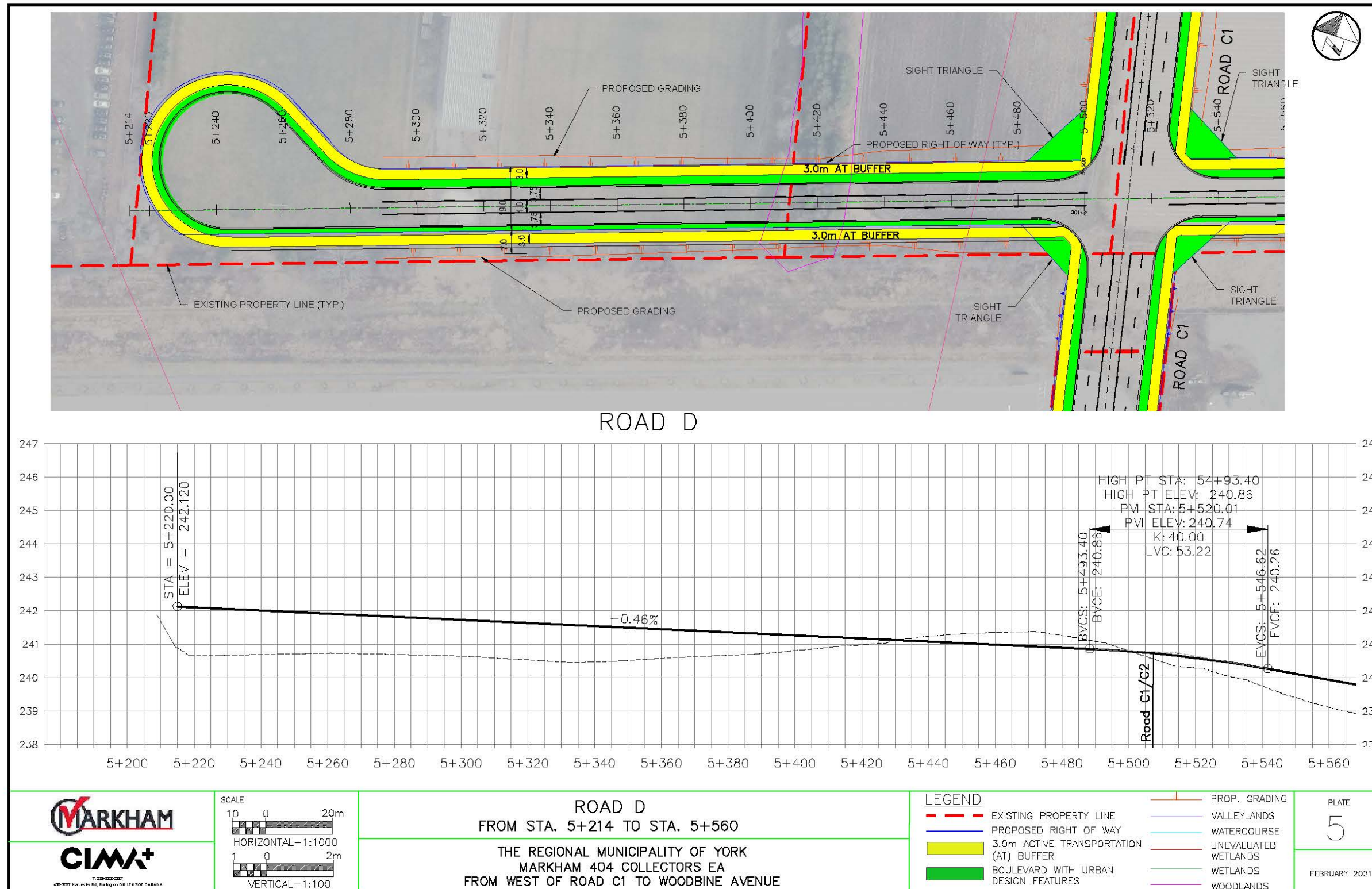


Exhibit 6-6: Preliminary Design Plate Road D Station 5+214 to Station 5+560



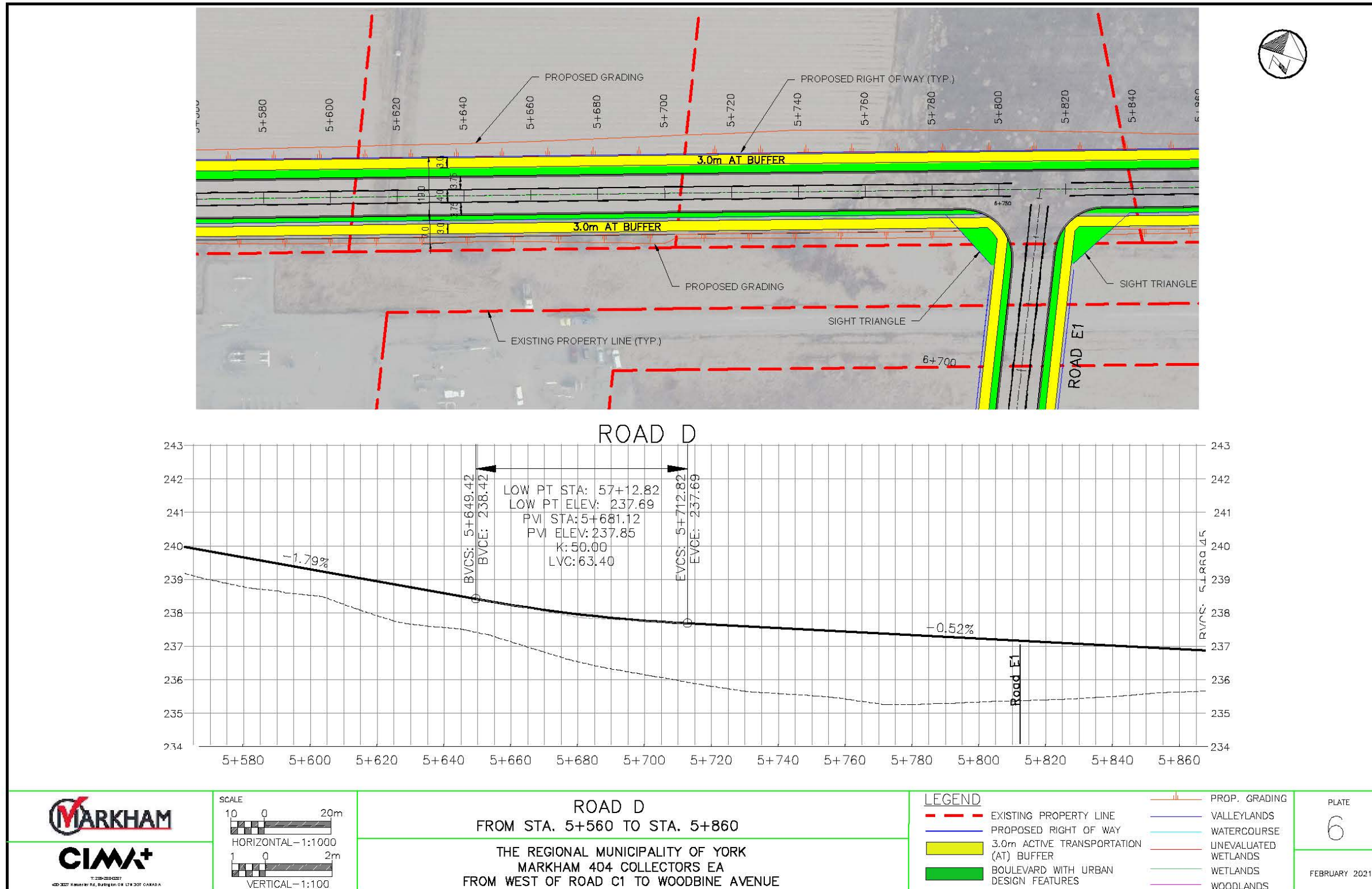


Exhibit 6-7: Preliminary Design Plate Road D Station 5+560 to Station 5+860

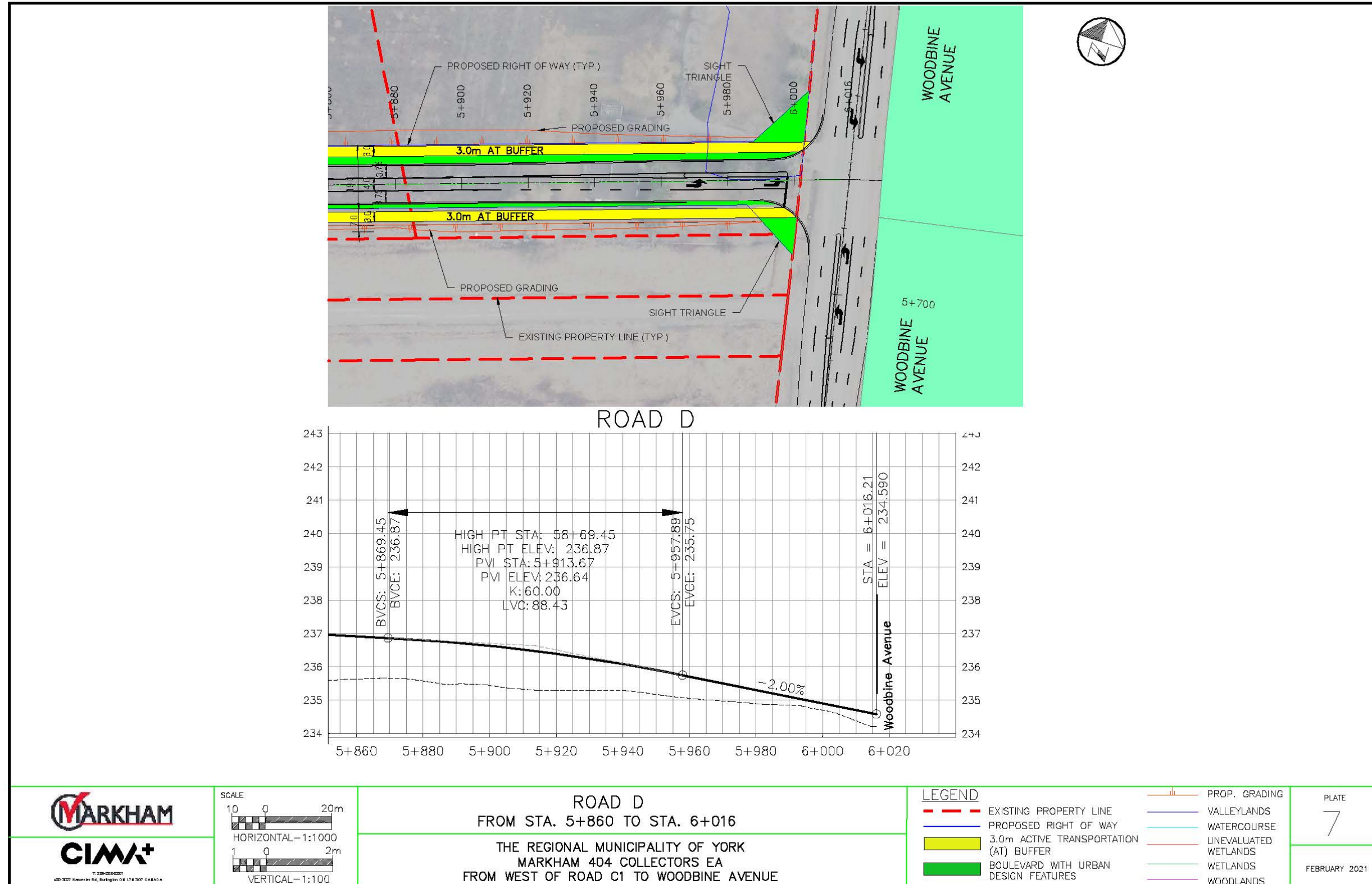
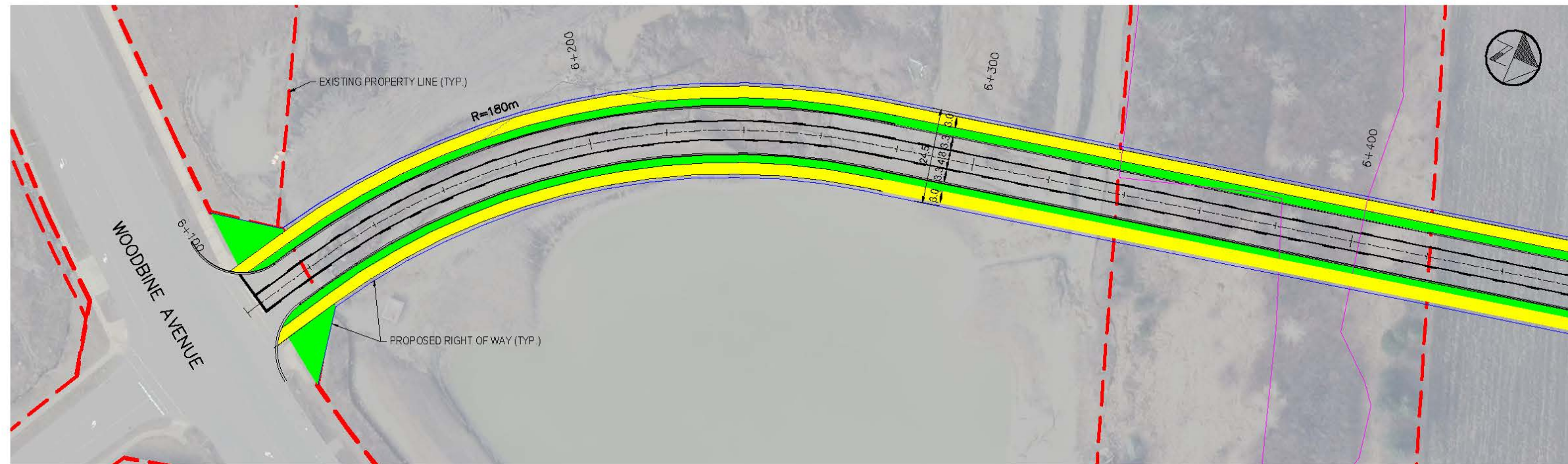
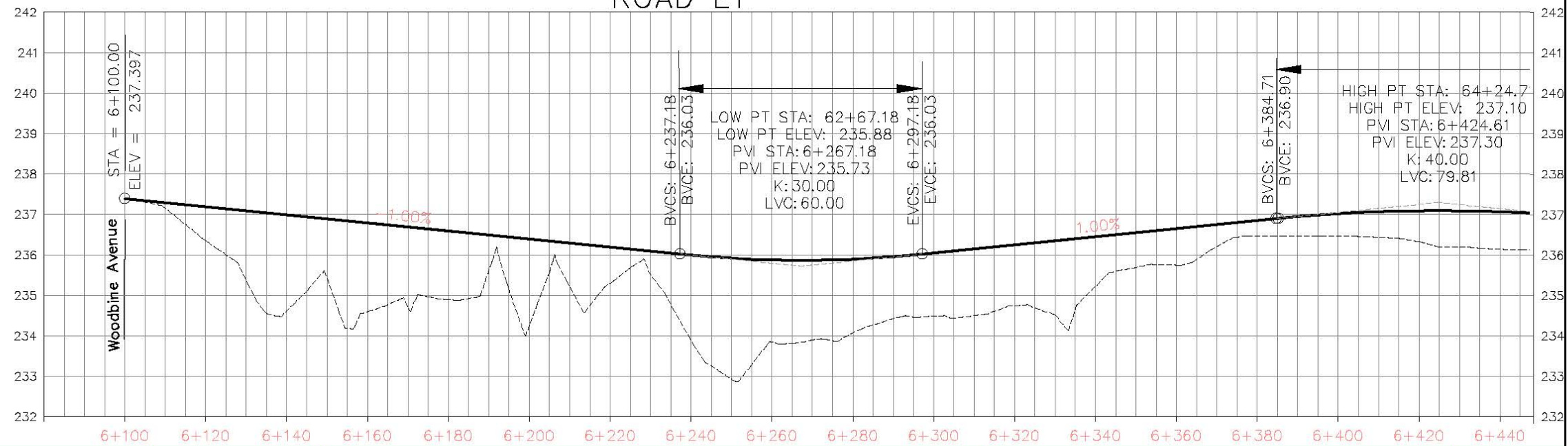


Exhibit 6-8: Preliminary Design Plate Road D Station 5+860 to Station 6+016



ROAD E1



 	<p>SCALE</p> <p>10 0 20m</p> <p>HORIZONTAL-1:1000</p> <p>1 0 2m</p> <p>VERTICAL-1:100</p>	<p>ROAD E1</p> <p>FROM STA. 6+100 TO STA. 6+445</p> <p>THE REGIONAL MUNICIPALITY OF YORK</p> <p>MARKHAM 404 COLLECTORS EA</p> <p>FROM WOODBINE AVENUE TO ROAD D</p>		<p>LEGEND</p> <ul style="list-style-type: none"> --- EXISTING PROPERTY LINE --- PROPOSED RIGHT OF WAY 3.0m ACTIVE TRANSPORTATION (AT) BUFFER BOULEVARD WITH URBAN DESIGN FEATURES VALLEYLANDS WATERCOURSE UNEVALUATED WETLANDS WETLANDS WOODLANDS 	<p>PLATE</p> <p style="text-align: center;">8</p> <p>FEBRUARY 2021</p>

Exhibit 6-9: Preliminary Design Plate Road E1 Station 6+100 to Station 6+445

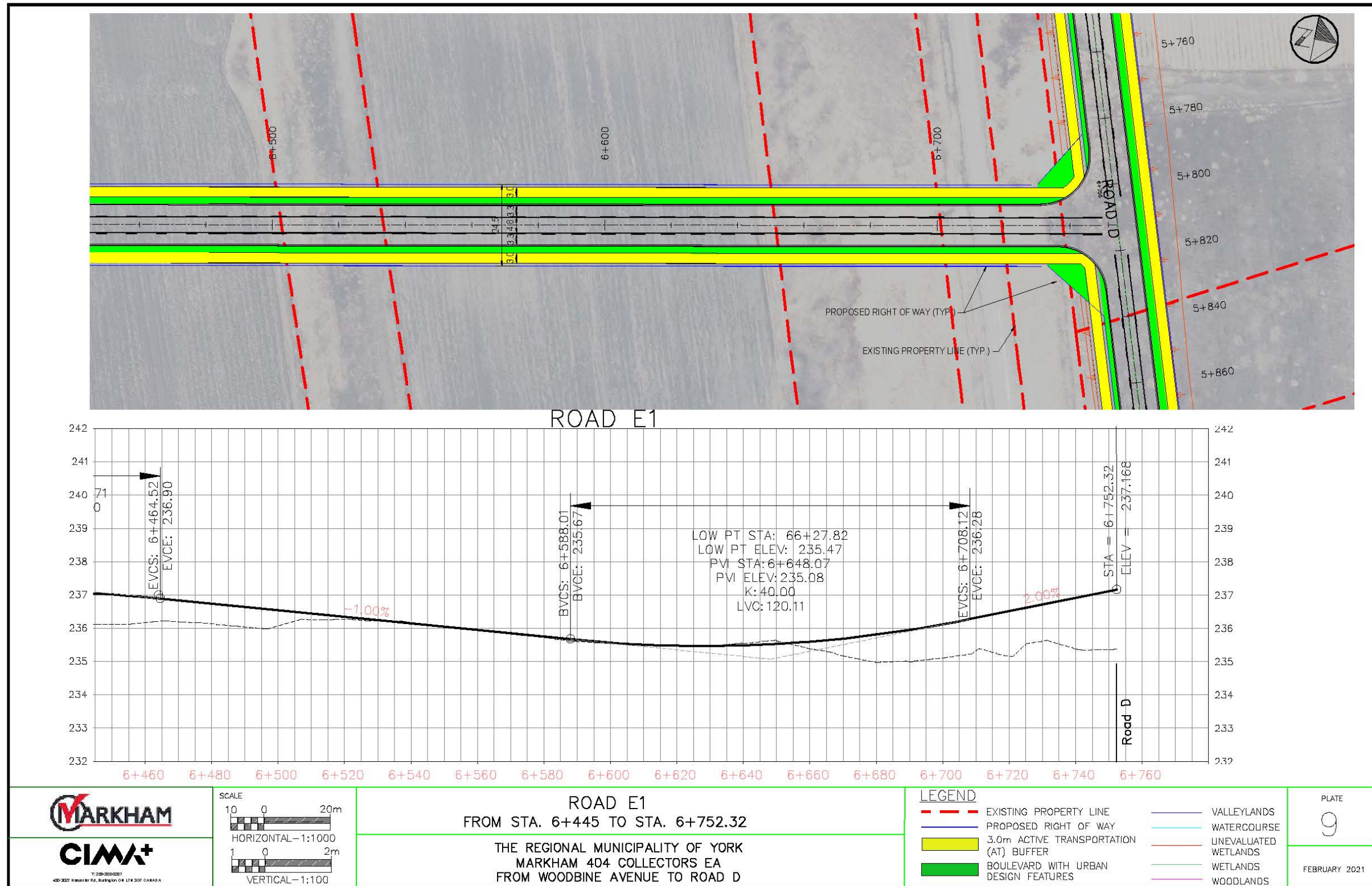
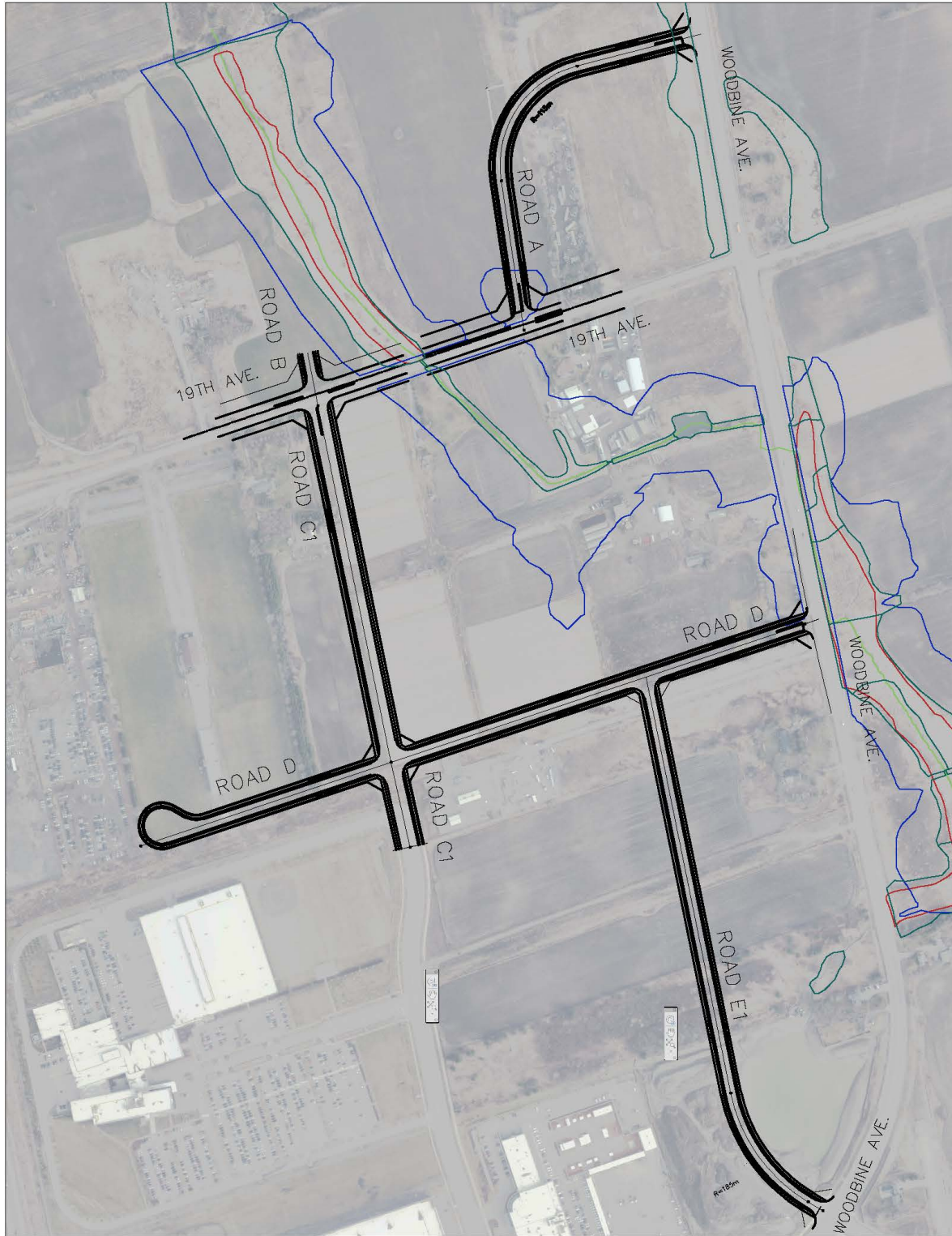


Exhibit 6-10: Preliminary Design Plate Road E1 Station 6+445 to Station 6+750



LEGENDS: REGULATION LIMIT, UNEVALUATED WET LAND, WATERCOURSE, WATERCOURSE
 MARKHAM 404 COLLECTORS EA
 ROAD PLANS

Exhibit 6-11: Recommended Collector Road Alignments

Woodbine PROFILE

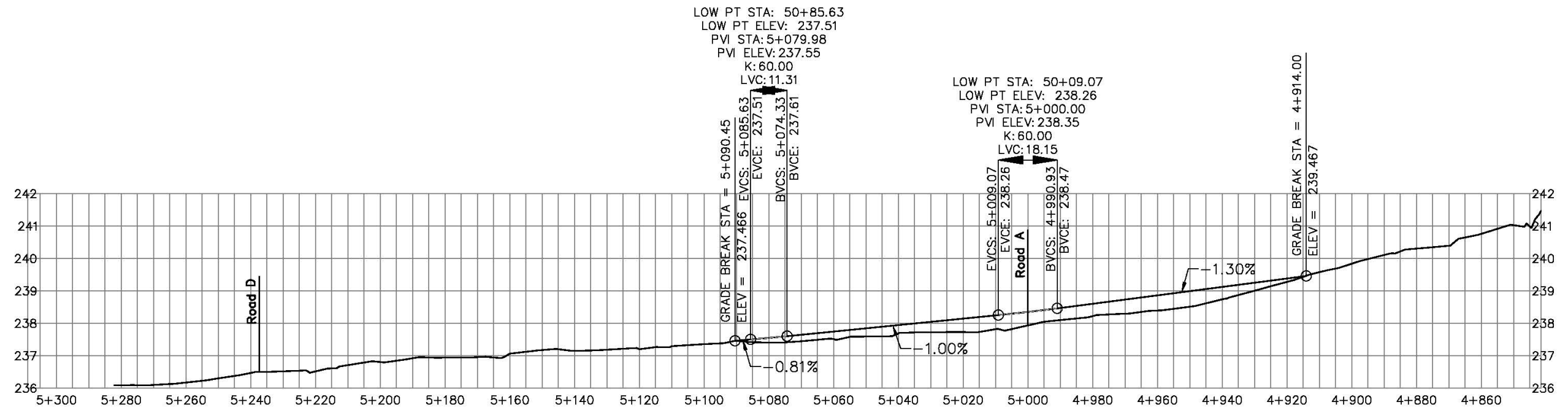


Exhibit 6-12: Woodbine Avenue Profile

6.1.3. Typical Cross Sections

The typical cross-section for Collector Road A, D and E1 is illustrated in Exhibit 6-13. The typical cross-section for Collector Road C1 is illustrated in Exhibit 6-15.

The cross-section for Collector Road A and E1 includes the following features:

- 24.5 metre right-of-way
- Two through lanes, one per direction (3.75 metres each)
- A centre-two-way left-turn lane (5.0 metres)
- 3.0 metre active transportation (AT) buffer on both sides

Options to reduce the Road E right-of-way in the vicinity of the significant woodlot will be investigated at detailed design. This will include consideration for reducing the centre two-way left-turn lane to 3.5 metres at this location and removal of the boulevards on the outside of the active transportation pathway. This would reduce the right-of-way at the woodlot from 24.5 metres to 23.0 metres.

The cross-section for Collector Road D includes the following features:

- 19.0 metre right-of-way
- Two through lanes, one per direction (3.75 metres each)
- A centre-two-way left-turn lane (4.0 metres)
- 3.0 metre active transportation (AT) buffer on both sides

The cross-section for Collector Road C1 includes the following features (to align with the existing Honda Boulevard):

- 32.0 metre right-of-way
- Four through lanes, two per direction (two 3.75 metre lanes, two 3.50 metre lanes)
- A centre-two-way left-turn lane (5.0 metres)
- 3.0 metre active transportation buffer on both sides

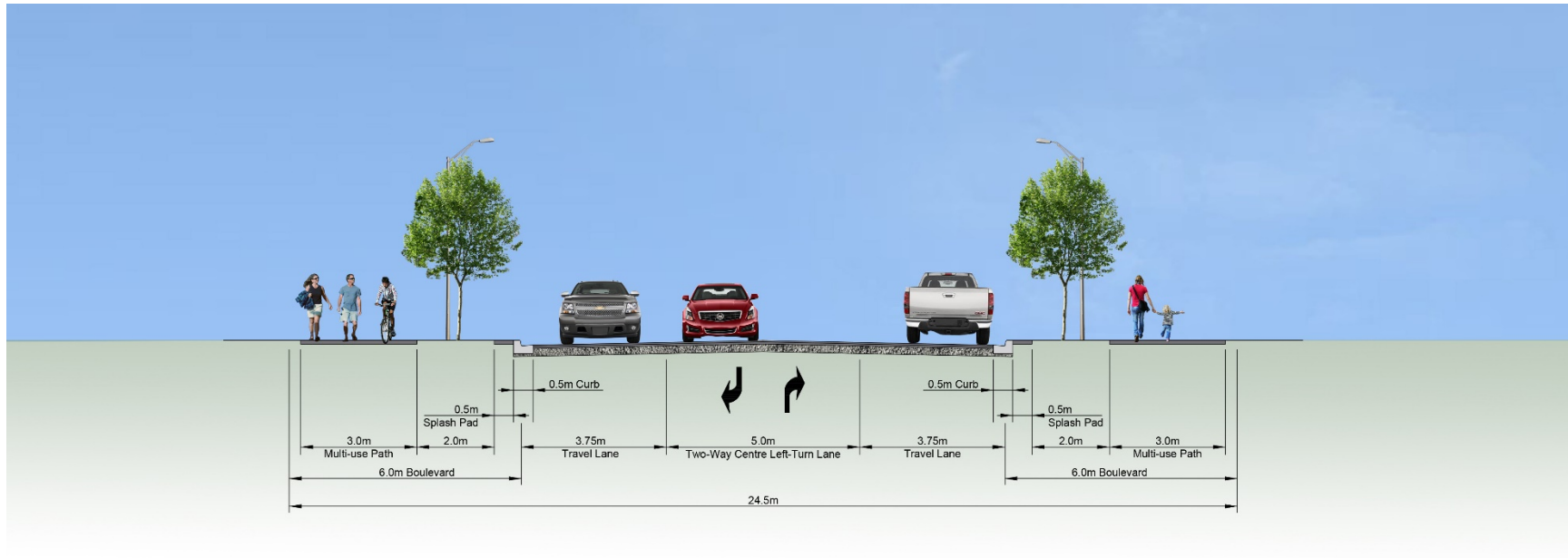


Exhibit 6-13: Roads A and E1 Typical Cross-Section

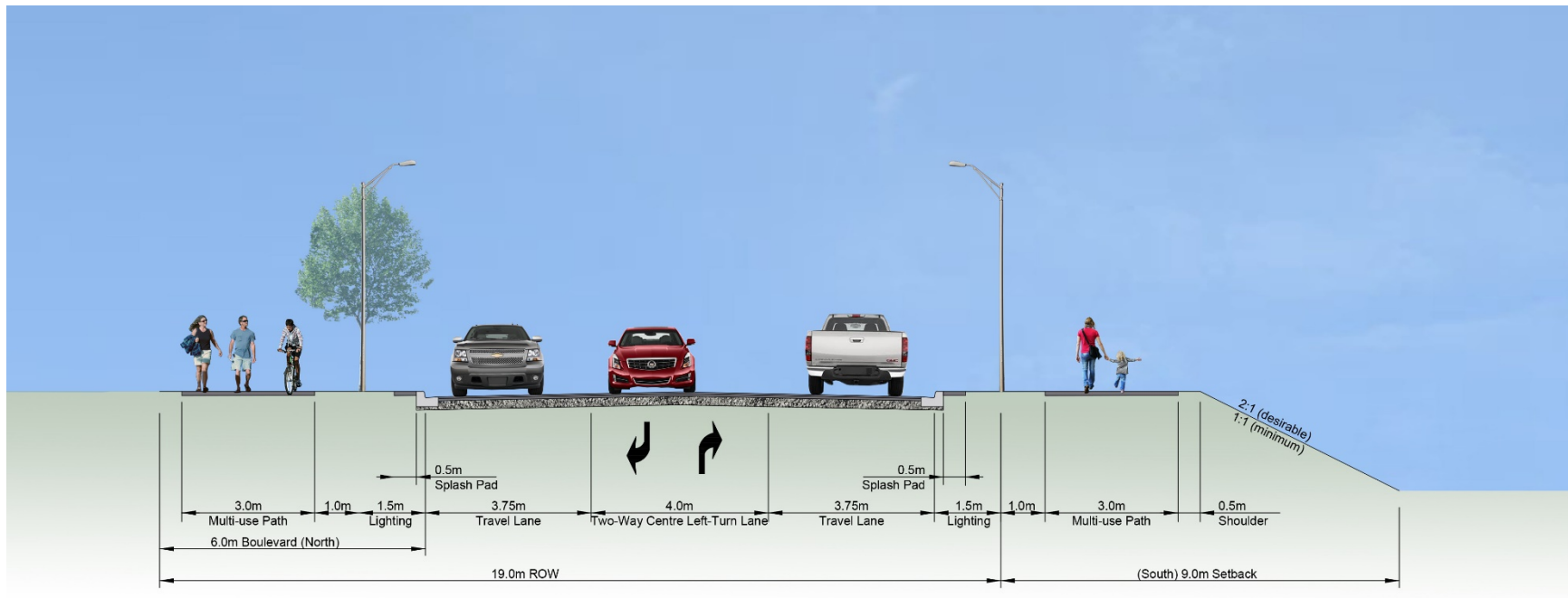


Exhibit 6-14: Road D Typical Section (Modified)

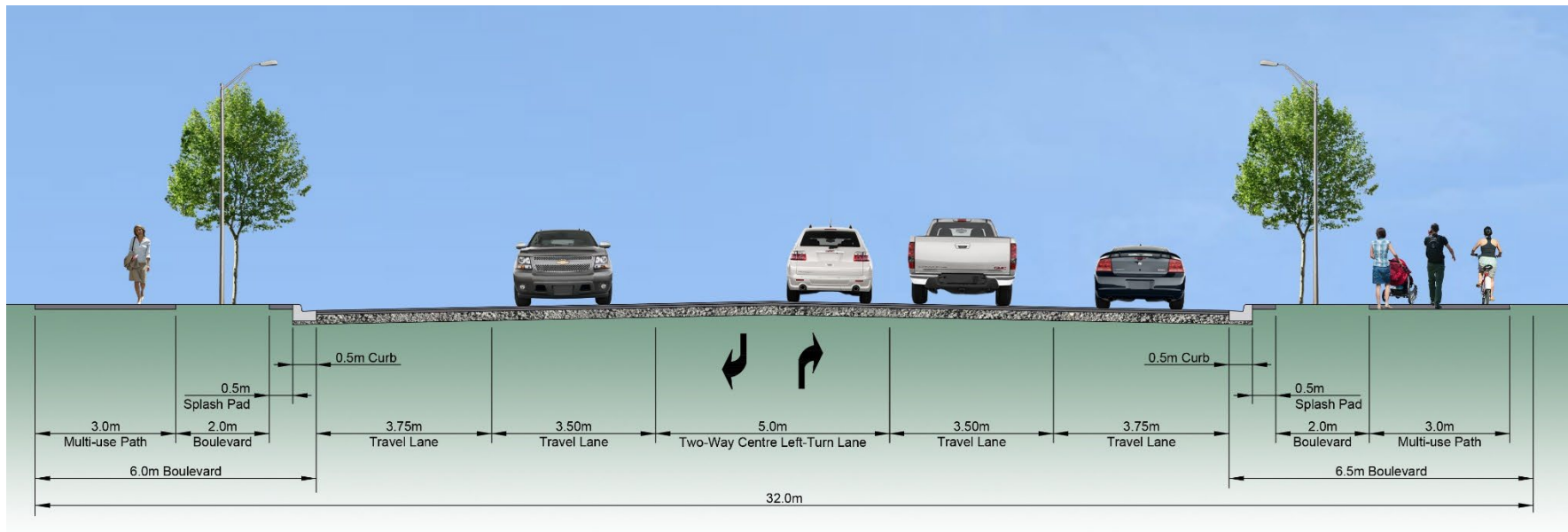


Exhibit 6-15: Road C Typical Cross-Section

6.1.4. Active Transportation

A 3.0 metre active transportation buffer will be provided on both sides of the recommended collector roads. The active transportation buffer will serve both pedestrians and cyclists.

6.1.5. Intersections

Based on the York Region future plans, the recommended plan was developed with the assumption that Woodbine Avenue and 19th Avenue will be 4-lanes in the future. The intersections of the recommended collector roads with these roads have been developed based on being four lanes.

Exclusive left-turn lanes are provided on Collector Roads A, C1 (onto 19th Avenue only) and D. Median islands are also recommended at these locations.

6.2. Tree Impacts

The most typical construction damage to trees is root damage from compaction and severance. While the dripline of a tree's canopy is typically thought to be associated with the root area, the root zones can actually extend significantly beyond the dripline of the tree, where space is available, sometimes up to 2 or 3 times the height of the tree.

A total of 8 trees are expected to be injured, mostly due to proposed grading through tree protection zones (TPZ) as required for the roadway construction.

A total of 34 individual trees are expected to require removal due to conflict with construction zones along the roadway (trees #32-33, 94-96, 138-147, 152-159, 166-170, 177-178, 180, 194, 208 and 210). Tree groupings C, J and K will require complete removal and tree groupings F, M, N, O and P will require partial removal for the roadway completion. The tree assessment and tree inventory mapping is available in Appendix C.

Mitigation measures for tree protection are provided in Section 7.

6.3. Archaeology

As discussed in Section 3.6.1, a Stage 1 Archeological Assessment was conducted to assess the archaeological potential within the study area. The results of the assessment indicated that the study area comprised a mixture of areas of archaeological potential, areas of no archaeological potential and previously assessed lands of no further concern. Exhibit 6-16 illustrates the parcels that are recommended for Stage 2 property assessment and the type of assessment required. Commitments to further work and requirements for the Stage 2 Archaeological Assessment are discussed in Section 7.

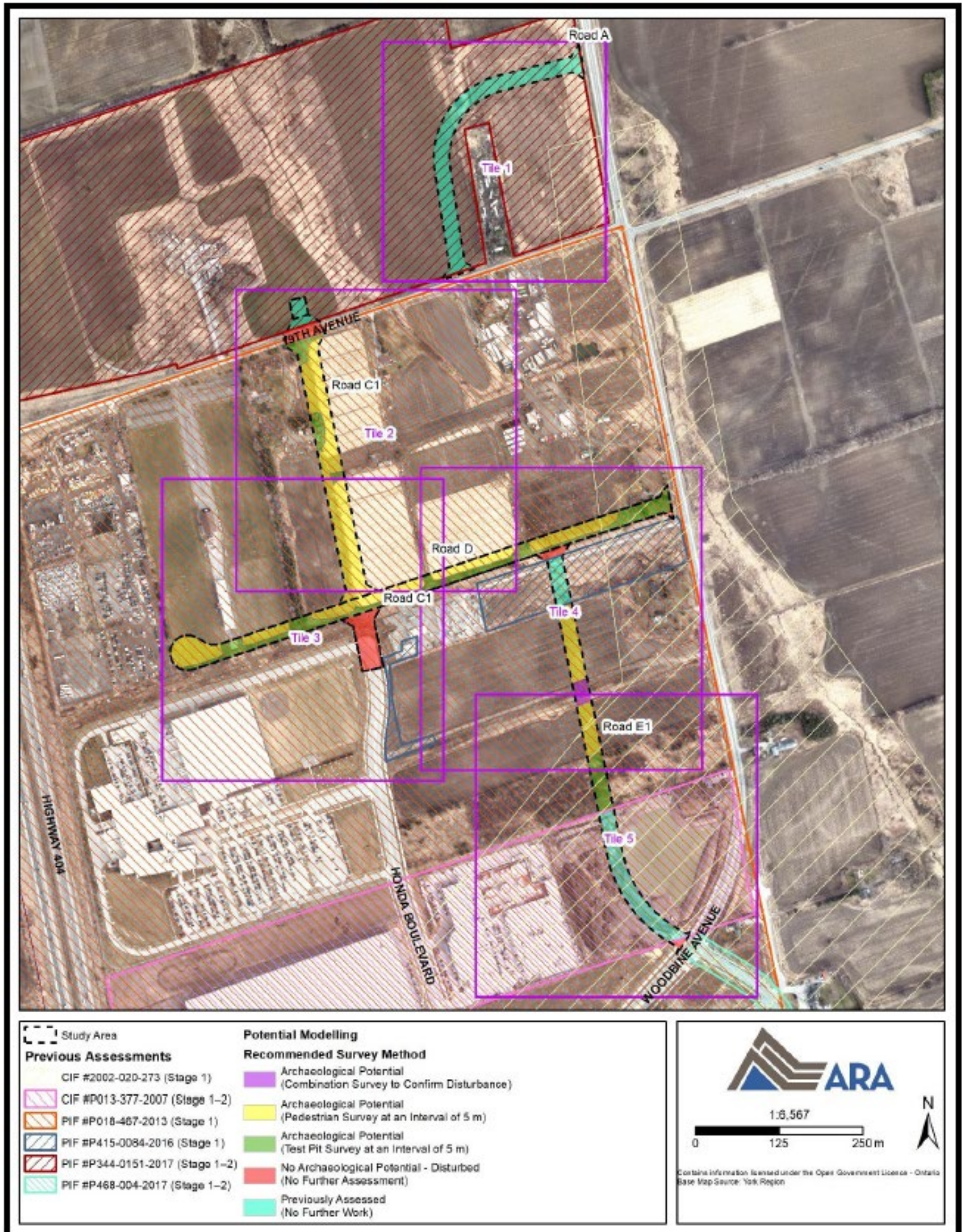


Exhibit 6-16: Stage 1 Archaeological Assessment Recommendations for Further Work

6.4. Cultural and Built Heritage

As discussed in Section 3.6.2, a Built Heritage and Cultural Heritage Landscape assessment was conducted for the study area and built heritage resources (BHRs) and cultural heritage landscapes (CHLs) were identified within the study area. Exhibit 6-17 illustrates the location of the BHRs and CHLs in relation to the recommended collector road network.

Although Roads A and B cross into 2780 19th Avenue (BHR 1), they are located a distance away from the heritage attributes (345 m and 104 m, respectively) and no direct impacts are anticipated. The heritage attributes of BHR 1 will not be isolated from their surroundings by Road A as the house is oriented toward 19th Avenue. Road B crosses into BHR 1 at 19th Avenue and may impact the setback of the house from the road. It is anticipated that the local roads in this area will be designed to mitigate impact to this house.

Road E1 crosses into 11288 Woodbine Avenue (BHR 2) 120 m from the barn (heritage attribute) on the property. As such, no direct impacts to heritage attributes are anticipated. The heritage attributes of BHR 2 will also not be isolated from their surroundings by Road E1 as the barn is oriented toward Woodbine Avenue.

Construction activities have the potential to create vibrations that could impact built heritage resources located in close proximity to the project location. The proposed project infrastructure (Road B) comes closest to BHR 1, within 104 m which is a sufficient buffer likely to mitigate construction vibrations.

BHR 2, BHR 3 and CHL 1 include mature vegetation as a heritage attribute. If mature trees are to be impacted /removed during the project activities, this may result in minor alterations to the established rural residential /agricultural setting and specifically to the character of the historic properties located at 11288 Woodbine Avenue (BHR 2), 11251 Woodbine Avenue (BHR 3) and 11670 Woodbine Avenue (CHL 1).

Mitigation strategies to address the identified potential adverse impacts are discussed in Section 7.

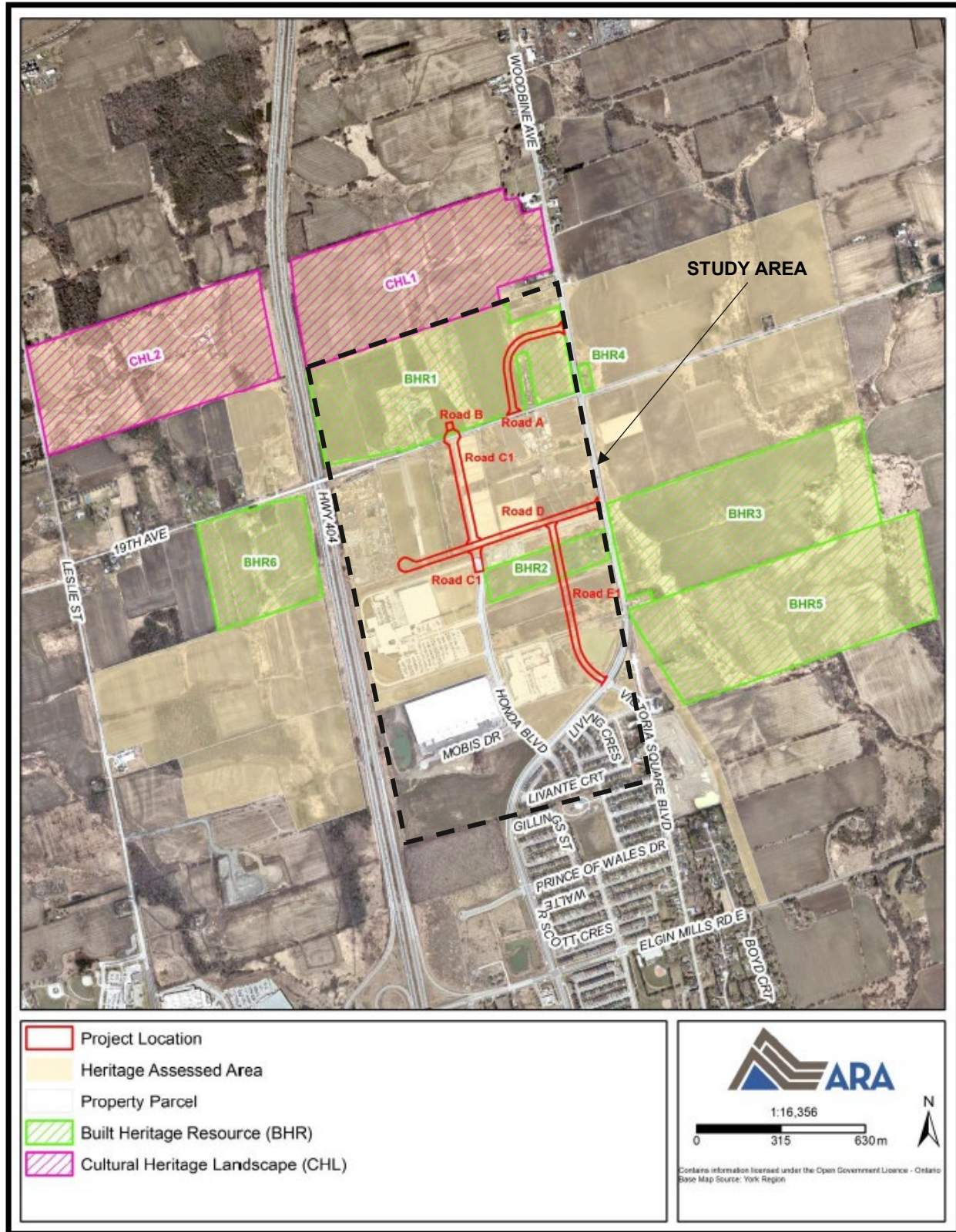


Exhibit 6-17: Impact to Built Heritage Resources and Cultural Heritage Landscapes

6.5. Air Quality

An Air Quality Assessment was conducted for the study area to assess the impacts of the recommended collector roads on local air quality and nearby sensitive receptors. The study also included an assessment of total greenhouse (GHG) emissions due to the project, and an overview of construction impacts. A copy of the Air Quality Assessment Report is provided in Appendix K.

Land uses which are defined as sensitive receptors for evaluating potential air quality effects are:

- Health care facilities
- Senior citizens' residences or long-term care facilities
- Child care facilities
- Educational facilities
- Places of worship
- Residential dwellings

Fourteen sensitive receptors were evaluated to represent worst-case impacts surrounding the project area. Most receptors represent residential properties. Victoria Square Public School, was also included as a sensitive receptor. The receptor locations are identified in Exhibit 6-18 through Exhibit 6-20.



Exhibit 6-18: Receptor Locations R1-R7 Within the Study Area

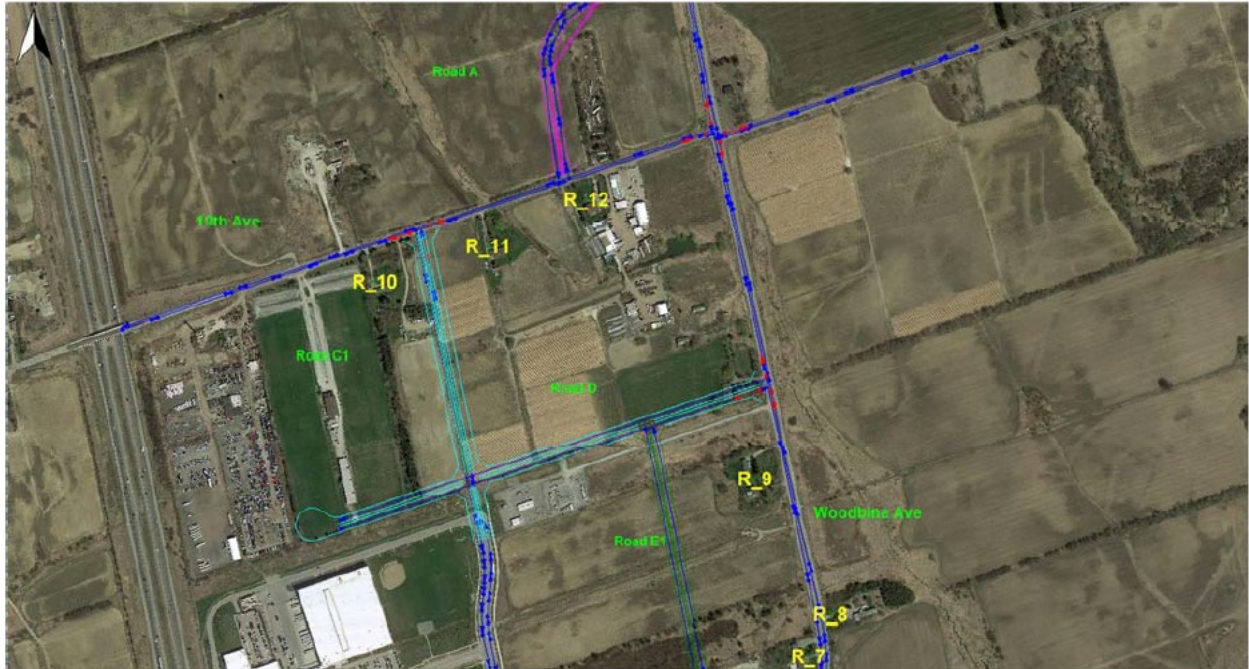


Exhibit 6-19: Receptor Locations R7-R12 Within the Study Area



Exhibit 6-20: Receptor Locations R10-R14 Within the Study Area

The potential impact of the proposed project infrastructure on local air quality has been assessed. The following conclusions and recommendations are a result of this assessment:

- The maximum combined concentrations for the future build scenario were all below their respective MECP guidelines or CAAQS, with the exception of annual PM2.5, 24-hr PM10, 24-hr TSP and annual benzene. Note that for each of these contaminants, background concentrations alone exceeded the guidelines.
- Frequency Analysis determined that there were no additional days on which exceedances of PM10 or TSP occurred in 2037 Future Build scenarios in comparison to the 2017 Existing scenario. For both PM10 and TSP, exceedances of the guideline occurred less than 1% of the time.
- Mitigation measures are not warranted, due to the small number of days which are expected to exceed the guideline.
- Total GHG emissions in the study area were predicted and compared to the provincial, sector and Canada-wide targets. Overall, the contributions from the project account for less than 0.004% of the province target and sector target.

Mitigation measures for the reduction of air emissions during construction are discussed in Section 7.

6.6. Geotechnical

A preliminary geotechnical investigation was undertaken for the study area to obtain surface information along the recommended collector road corridors and to provide preliminary recommendations regarding pavement structure design, subgrade preparation and municipal services installation. The Geotechnical Report is provided in Appendix L.

Based on the borehole data obtained during the preliminary investigation, development of the roadway infrastructure is expected to be straightforward from a geotechnical perspective. Assuming adequate drainage of the pavement materials, the pavement structure recommended for Woodbine Avenue is as follows (sections of Woodbine Avenue and 19th Avenue will be reconstructed at the intersections with the new roadways):

HL1:	50 mm
HDBC (2 lifts):	140 mm
OPSS Granular A Base:	150 mm
OPSS Granular B Type I Subbase:	500 mm

The minimum pavement structure specified by the City of Markham’s Design Criteria for Collector and Industrial Roads is considered adequate for 19th Avenue and the internal roads:

HL3:	50 mm
HL8 (2 lifts)	100 mm
OPSS Granular A Base:	150 mm
OPSS Granular B Type I Subbase:	450 mm

All Hot Mix Asphalt (HMA) materials should meet the requirements of OPSS.MUNI 310, OPSS.MUNI 1150 and City of Markham/York Region Specifications as applicable, and be compacted to at least 91 percent of the MRD for HDBC and 92 percent of MRD for the other mixes. The recommended asphalt cement grade is PG 64-28 for Woodbine Avenue and 58-28 for the remaining roads, in conformance with OPSS.MUNI.1101. Aggregates for the asphalt mixes should be in accordance with OPSS.MUNI.1003. Recycled Asphalt Pavement (RAP) material should not be used in HL1 and HDBC asphalt mixes.

Pavement subgrade preparation should include removal of the pavement structure (on existing roads) and surficial vegetation, topsoil, organic or compressible material. Grading to the new top of subgrade should match or exceed the thickness of the existing pavement to maintain lateral drainage at the top of subgrade. The exposed subgrade should be compacted and proof-rolled with a heavy roller and examined to identify areas of unstable subgrade. Any soft/wet areas identified shall be subexcavated and replaced with approved material within 2% of Optimum Moisture Content (OMC), and compacted to at least 98% of Standard Proctor Maximum Dry Density (SPMDD).

Bulk fill used to raise the road grade should be constructed as engineered fill, consisting of approved inorganic material, placed in maximum 200 mm thick lifts, within 2% of OMC, and compacted to at least 98% of SPMDD. Standard side slopes of 2H:1V or flatter should be suitable for embankment construction. Exposed embankment surfaces should be provided with a vegetation cover or otherwise protected against erosion in accordance with OPSS.MUNI 804.

The top of the compacted subgrade should be graded smooth with a minimum crossfall of 3% towards side ditches or subdrains. Continuity of drainage should be maintained at transitions from existing pavement to new pavement.

6.7. Hydrogeology

The purpose of the Hydrogeological Assessment was to conduct a desktop review of the geological and hydrogeological conditions in the EA study area and to discuss the potential impacts of the proposed collector road construction, and possible utility installations, on groundwater users and receptors including a preliminary discussion of potential mitigation measures. The assessment included a review of publicly available mapping and databases, as well as the results of the associated geotechnical investigation and Contaminant Overview Study that were carried out by Thurber. The report is included as Appendix M.

The project area is located within the physiographic region known as the Peel Plain. The Peel Plain is characterized by a surficial till sheet which generally consists of silty clay to clayey silt, with occasional sand to silt zones. The till is locally modified by a veneer of clay. Bedrock is expected to exist at a depth in the order of 100 m. The general topography of this region consists of level to gently rolling terrain (bevelled till plains), sloping gradually south and east. The study area is comprised of rural farmlands and commercial properties with residential subdivisions present south of the site. The Oak Ridges Moraine is located approximately 2.5 km north-west of the Study Area.

The surficial geology in the EA Study Area as indicated in Ontario Geological Survey mapping consists predominantly of coarse-textured glaciolacustrine deposits of sand and gravel with minor silt and clay, fine-textured glaciolacustrine deposits of silt and clay with minor sand and

gravel, and various till units. The predominant bedrock of the Study Area consists of shale, limestone, dolostone and siltstone of the Georgian Bay Formation, typically at depths greater than 100 metres. Maps are included in Appendix M.

The Oak Ridges Moraine north-west of the Study Area is an area of significant groundwater recharge due to the relatively permeable soils located there. The Oak Ridges Aquifer Complex (ORAC) is an aquifer that underlies the Study Area under a relatively thin layer of Halton Till. A regional geological cross-section of the area and general site location is provided on Drawing 1819-2 in Appendix M. The ORAC may be under artesian conditions in some areas, indicating that the water level in the confined ORAC may be higher than ground surface. This groundwater pressure exerts uplift on the overlying till. Excavations into the till reduce the downward resistance and could result in basal heave, boiling, or blow-out if uplift exceeds the resistance. This condition will need to be evaluated during later design stages.

6.7.1. Desktop Well Review

A search of the MECP well records indicated that there are 105 wells within the 500 m search buffer. The location of the well records is provided in an Appendix(C) in Appendix M. A summary of the well records is provided in Appendix M. The most common use of the wells identified was domestic; however, many were reported as not used or for monitoring. Refer to Appendix M for additional well record data.

6.7.2. ANSIs and Local Surface Water Features

A tributary of Berczy Creek is located at the north-east portion of the Study Area. Upper reaches of the Rouge River are located west of the Study Area, within the 500 m buffer. Two storm water management ponds (SWMPs) are located within the Study Area, and additional SWMPs are located within the buffer zone.

6.7.3. Summary of Hydrogeological Conditions

The geotechnical investigation (Appendix L) included five boreholes to a depth of approximately 5.2 m and confirmed that the soils within this depth consisted of a topsoil layer over compact to very dense sandy silt till. Groundwater levels measured in piezometers during the geotechnical investigation indicated that groundwater was located at depths of 0.5 to 3.1m, suggesting that shallow excavations are likely to encounter groundwater within the till, although the anticipated flow rate through the till may be low given that only one out of five boreholes had measurable water levels upon completion of drilling.

Along 19th Avenue the coarser soil was located 5 to 8 m below ground surface, suggesting that deeper investigation with the study area may encounter coarser soils, potentially including the ORAC.

The Study Area is located within a Wellhead Protection Area Q1 and Q2, which is of lesser concern compared to Wellhead Protection Areas in the vicinity of municipal wells.

The well record search indicated that domestic well records were located in the Study Area. Several rural residences are located within the Study Area and may be obtaining drinking water

from groundwater wells. These residences may also have septic tile beds on their properties to release treated wastewater.

6.7.4. Potential Hydrogeological Impacts of Groundwater on Project

From a hydrogeological perspective, groundwater is a concern to the Project in two ways. First, groundwater may enter excavations that are required for construction, which could result in saturated to flooded ground conditions that would interfere with construction of proposed structures, compaction of granular materials and affect the stability of excavation walls. Second, potentially artesian groundwater conditions in the underlying Oak Ridges Aquifer Complex may create the risk that excavations into the overlying till result in basal heave, boiling or blow-out.

Once the construction details are known in greater detail and once detailed investigations have been completed, including identification of the till/ORAC interface elevation and ORAC groundwater pressure, it will be necessary to estimate safety factors for basal heave, and to estimate the peak water taking rate. The GeoCRES report for 19th Avenue suggested this interface in that area may be at a depth of approximately 5 to 8 m; however, the silty sand was not confirmed as being part of the ORAC.

With respect to basal heave, safety factors can be estimated based on anticipated excavation depths, till thickness, and groundwater pressure. If the safety factors are below minimum recommended levels, either redesign may be necessary to limit the depth of excavation or estimation of the water taking rate required to depressurize the ORAC to an appropriate level will be required.

The peak water taking rate will need to be estimated, which will include any ORAC depressurization, groundwater flow through the surficial soils, and appropriate safety factors and rainfall allowances will be required. If detailed investigation finds that there are some shallow coarse soil units, these would increase the water taking rate. If the investigation finds that the till/ORAC interface is relatively shallow and/or there is a particularly high groundwater pressure, this would also increase the water taking rate.

It is recommended to estimate the hydraulic conductivity of the till and ORAC based on future in-situ testing. Based on the soil descriptions and the grain size analyses, the sandy silt, some clay to clayey till may potentially have a hydraulic conductivity in the range of approximately 10^{-8} to 10^{-6} m/s. The hydraulic conductivity of the Oak Ridges Aquifer Complex may potentially be in the range of approximately 10^{-6} to 10^{-4} m/s based on prior investigations of the aquifer.

If the detailed investigation indicates that dewatering is required, then the estimated budgeted peak flow rate will determine the type of water taking permission that is required.

If the budgeted peak water taking rate is greater than 50,000 litres per day (LPD) but less than 400,000 LPD, then registration on the Environmental Activity and Sector Registry is required, and a Water Taking Plan and Water Discharge Plan are required. If the flow rate exceeds 400,000 LPD, then a Category 3 PTTW must be applied for and obtained from MECP; the application must include a Hydrogeological Study in accordance with permit requirements. The project must be considered as a whole, as opposed to subdividing the project into shorter sections to reduce the water taking rate below a target threshold. Water that is removed from excavations for dewatering must be discharged or disposed of in accordance with current regulations, whether to the natural environment or to a sewer system. The Water Discharge

Plan in the case of an EASR registration or the PTTW and associated Hydrogeological Study will specify conditions on the discharge of the groundwater to the environment.

Groundwater quality testing will be required during detailed investigation to provide a basic understanding of the groundwater quality with respect to potential discharge criteria. It is possible that sediment or naturally occurring minerals could impact water quality. The possibility of water contaminated by anthropogenic sources also exists given the Potentially Contaminating Activities that were identified in the Contaminant Overview Study. Groundwater quality observed during construction may vary from that identified in an investigation. Treatment of the water may be required in advance of disposal, along with sufficient sediment and erosion control measures.

6.7.5. Potential Impacts of Project

Assuming dewatering is required for construction, the removal of groundwater from the subsurface could negatively impact external receptors. The primary issues of concern include potential impacts to existing groundwater users, impacts to surface water such as creeks and wetlands, induced settlement of structures or migration of contaminated groundwater. These are discussed in greater detail below.

The detailed investigation will provide the field data necessary to estimate the radius of influence from assumed dewatering conditions. However, for preliminary purposes, dewatering from excavations in sandy silt till may have a radius of influence of potentially 10 to 30 metres while depressurization of the ORAC may result in a radius of influence of potentially 30 to 100 metres.

Impacts to Existing Groundwater Users

The records indicate that wells in the area are used for potable water supply, thus assessment of potential impact to existing groundwater users is required. It is recognized that a number of the wells indicated in the well records as for potable use are no longer in use. However, a door-to-door well survey, if one has not been completed to date, is recommended to ascertain actual usage conditions, including confirmation of well depth, and to identify wells that may be in use but for which well records were not created, subject to willing participation from residents.

Impacts to Surface Water

A tributary to Berczy Creek is located within the Study Area, and an upper reach of the Rouge River is located west of the Study Area. In addition, several areas were indicated as Provincially Significant Wetlands. The possibility that construction dewatering could decrease availability of water to the wetlands, creeks, and water bodies needs to be considered. The method of impact would be through removal of groundwater resulting in decreased release to surface water. At a preliminary level, the likelihood of a significant impact appears to be low due to the low anticipated hydraulic conductivity of the till. The scope of work herein does not address surface water taking or permitting. However, the possibility of groundwater seeps feeding surface water features from connection to the ORAC may also be considered. Another potential impact of the dewatering process is the discharge of poor-quality water that ultimately reaches surface water

and could impact the natural environment. The potential for sediment-laden water, with associated naturally occurring metals, as well as sulphate and chloride, are the primary concerns notwithstanding other sources of contamination that may be identified.

Other Potential Impacts

There may be other potential impacts from construction dewatering. One potential impact is ground settlement caused by the lowering of the groundwater table whereby there is an increase in the effective stress of the soil that may induce settlement and impact the integrity of the above-ground and below ground structures in the Study Area. Factors such as the anticipated amount of drawdown, radius of influence of dewatering, and soil composition may affect the degree of impact to structures. Given the findings of the preliminary Geotechnical Investigation that a dense to very dense sandy silt till is pervasive across the Study Area as observed in the boreholes, the likelihood of an impact due to settlement appears low at this preliminary stage.

Another potential impact of dewatering activities is the possibility for the migration of contaminated groundwater if there is any. As water is extracted from the subsurface at an excavation, groundwater will move from other areas to enter the newly created depression in the groundwater table. If a contaminant source is nearby, this could accelerate or create the movement of contaminated groundwater towards the excavation. Groundwater quality sampling in a detailed investigation would provide additional insight into this possibility.

Potential Mitigation Measures

Potential impacts of groundwater on construction of the Project, and potential impacts of the project on external entities were identified. Mitigation measures that may be considered to reduce the risk and uncertainty related to those impacts are discussed herein at a preliminary level, subject to the completion of detailed investigation and analysis.

Mitigation of Impacts of Groundwater on Project

The uncertainty regarding the amount of water that may be required to be extracted from the subsurface can be reduced through physical investigations and testing, as well as analysis. In addition to standard geotechnical investigation, drilling, sampling, and monitoring well installation with water level measurements, testing can be conducted to collect more relevant information. This includes single-well response tests, or slug tests, to estimate the hydraulic conductivity of the soil at the screened well interval, groundwater quality testing to assess potential treatment requirements, and, if required based on future findings, pumping tests to provide a more thorough estimate of the hydraulic conductivity of a zone of soil as well as storage characteristics. It is recommended that the ORAC/till interface and the groundwater level in the ORAC be determined in several locations, in particular where the deepest excavations are anticipated, to assess the possibility of basal heave.

Once a detailed field investigation has been conducted, estimates of water taking rates can be made and the anticipated permitting requirements can be applied for, whether that corresponds to EASR registration or a PTTW. Discharge agreements or approvals, if required, can also be

applied for and tender documents can present a more accurate view of construction dewatering and discharge requirements.

At locations where large dewatering rates are anticipated for surface soil dewatering or confined aquifer depressurization and/or where surface watercourses exist, the following mitigative measures may be considered for design and construction of the proposed structures:

- Revise designs to reduce the depth of excavation required;
- Utilize construction staging to limit the excavation extents at a given point in time;
- Install cofferdams to cut off flow from wetlands/water bodies; and
- Utilize additional measures as determined from examination of the detailed design and detailed investigation findings.

Mitigation of Impacts to Existing Groundwater Users

A door-to-door survey of private water wells is an important step in mitigating the risk of affecting private water wells. This would help to confirm actual well existence and usage in the area, and would allow the determination of well depth, water level, and baseline water quality where permitted. This is subject to well owner participation. The detailed investigation and analysis will provide a more accurate estimate of the radius of influence of dewatering than what has been provided at this preliminary stage, and the wells that are located within or close to the radius of influence would be identified. Long term monitoring of private wells, where permitted, would be recommended for wells within and close to the radius of influence of dewatering. Monitoring should commence in advance of construction to establish baseline conditions, and the use of dataloggers may be warranted in addition to manual water level measurements. Monitoring would continue during and following the end of construction in the area.

Identification of at-risk wells and monitoring help to protect people and organizations that rely on the groundwater. Once impacts are identified, or have commenced, there may be options to alter the construction approach, or in some cases a water supply may need to be provided to those affected. Monitoring can also help to protect the interests of stakeholders from potential claims. Where necessary, the monitoring of wells installed for construction may be required, to either provide advance notice of impact or in cases where permission to monitor private wells is not obtained.

Mitigation of Impacts to Surface Water

The primary potential impact to surface water is from the discharge of water that is of poor quality, or from erosion caused by poorly controlled discharge flow. The Water Taking Plan and Water Discharge Plan in the case of an EASR registration or the Hydrogeological Study in the case of a Category 3 PTTW would identify operating conditions, monitoring requirements, and a contingency plan in terms of the taking and discharging of water. A PTTW may stipulate additional terms and conditions that must be followed. Water taking and discharge must be conducted in accordance with all applicable regulations. The operational conditions may include performance criteria that need to be met, such as maintaining the water taking rate below the permitted value, and target concentrations for particular parameters in the discharge, such as a total suspended solids (TSS) limit and other parameters (e.g. PWQO limits). Discharge to land

surface is typically required to be at least 30 metres from a receiving water body such as a creek. Water taking or discharge within the area regulated by TRCA will require discussions with TRCA and applicable permits. Confirmation of the status of the mapped Provincially Significant Wetlands with the Ministry of Natural Resources and Forestry will be required, and any applicable permits will be required. Additional terms and conditions may be applicable based on the jurisdiction of these entities. Reductions of flows to surface water from groundwater, including potential seeps from the underlying ORAC, were also identified as a potential concern. Surface water / groundwater interactions will need to be considered in design of structures at all surface water crossings where there is a potential for impact. One potential mitigation measure that could be considered if there would be an unacceptable flow reduction would be to ensure that water that is removed for dewatering is returned to land surface that drains to the given surface water feature, ensuring that erosion and sediment control measures and any required treatment provides for acceptable water quality.

If dewatering is required, a monitoring plan may be developed, which would recommend tasks to be completed at indicated frequencies. These may include visual inspections of the discharge location and water quality, measurements of turbidity, measurements of water quality parameters to ensure compliance with discharge requirements and recording of water taking volumes.

A contingency plan may also be developed, if dewatering is required, which would provide recommended actions, or a series of actions, to initiate when an operating condition or monitored parameter is not in compliance with the project requirements.

Mitigation of Other Potential Impacts

At this preliminary stage, the likelihood of unacceptable settlement risk due to dewatering appears to be low based on soil conditions observed to date. The detailed geotechnical and hydrogeological investigations would identify the potential for settlement of structures in greater detail. While unlikely at this stage, an outcome of that detailed analysis may be to conduct a pre-condition survey whereby the condition of structures prior to the construction project is assessed. If required, this provides a documented understanding of the characteristics of key structures which can be surveyed again during and following construction. In addition, operational constraints to the dewatering and construction methods can be considered.

Groundwater levels at wells located between dewatering areas and key structures can also be monitored, and trigger values can be determined with a contingency plan, if required. To mitigate the risk for the migration of contaminated groundwater, if any, the subsurface soil and groundwater quality conditions can be assessed in boreholes advanced near potentially contaminated activities identified in the Contaminant Overview Study during the detailed investigation. Further, if risks are identified and dewatering may be expected to cause the migration of impacted groundwater, additional water level and water quality sampling and testing could be performed.

6.8. Natural Environment

The vegetation communities being affected by the preferred road corridors are illustrated in Exhibit 6-21. The preferred road network will cross Wetland no. 15 of the PSW as shown in

Exhibit 6-22. Mitigation measures have been developed to avoid, minimize or mitigate the project impact on this designated area. The mitigation measures are further discussed in Section 7.

As discussed in Section 6.1.2, Road A and Road E1 provide opportunities for wildlife passage. The right-of-way of Road E1 has also been reduced in the vicinity of the significant woodlot in order to mitigate impact.

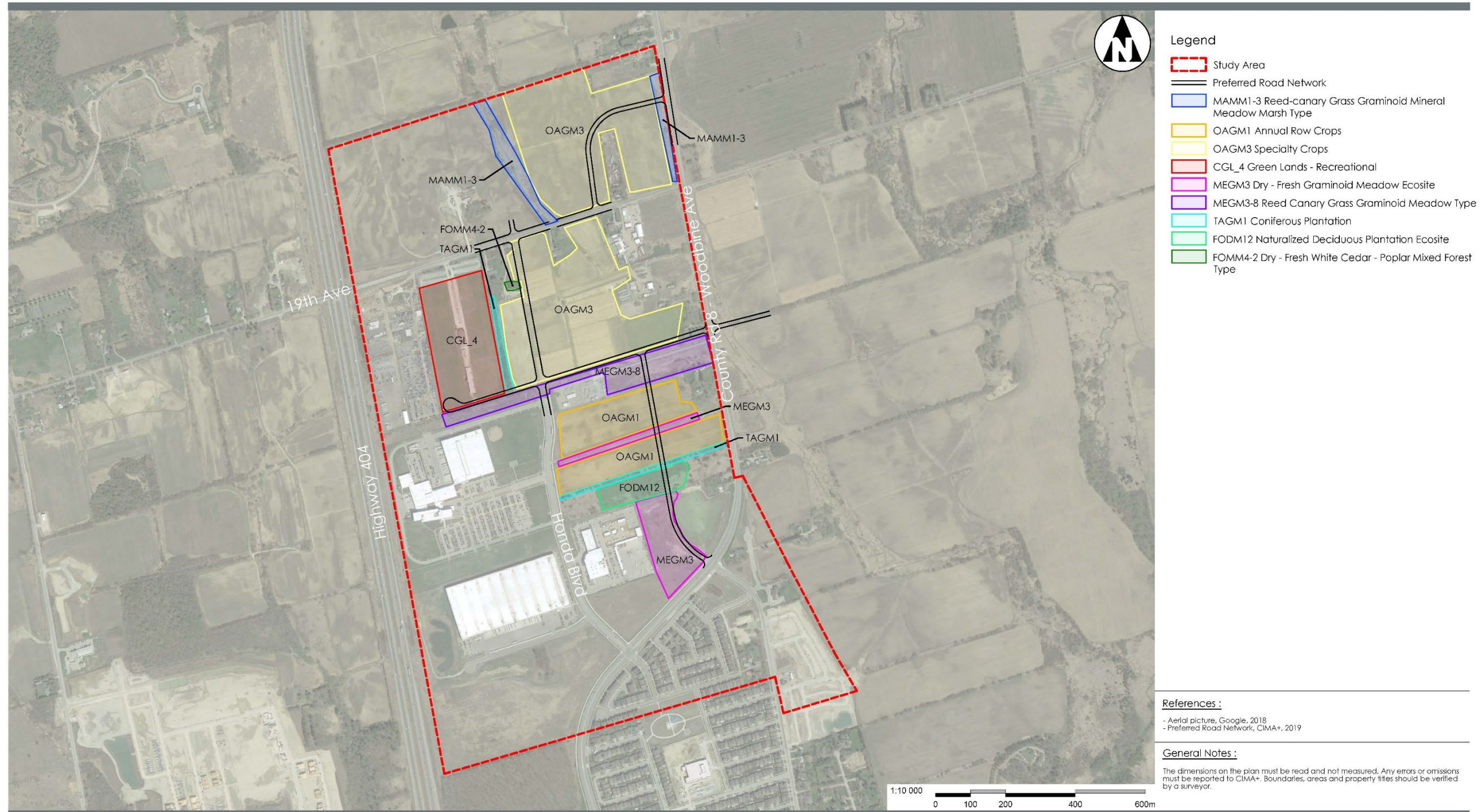


Figure 1- Ecological Land Classification

404 Collectors EA - City of Markham, ON
 City of Markham

Ref. # : B000801

Drawn by: V. Fauvel-Benoît
 Design by: V. Bédard
 Verified by: N. Bertrand



Revision 01 - Issued for Natural Environment Report - August 7, 2019

Exhibit 6-21: Ecological Land Classification – Proposed Road Network Impacts

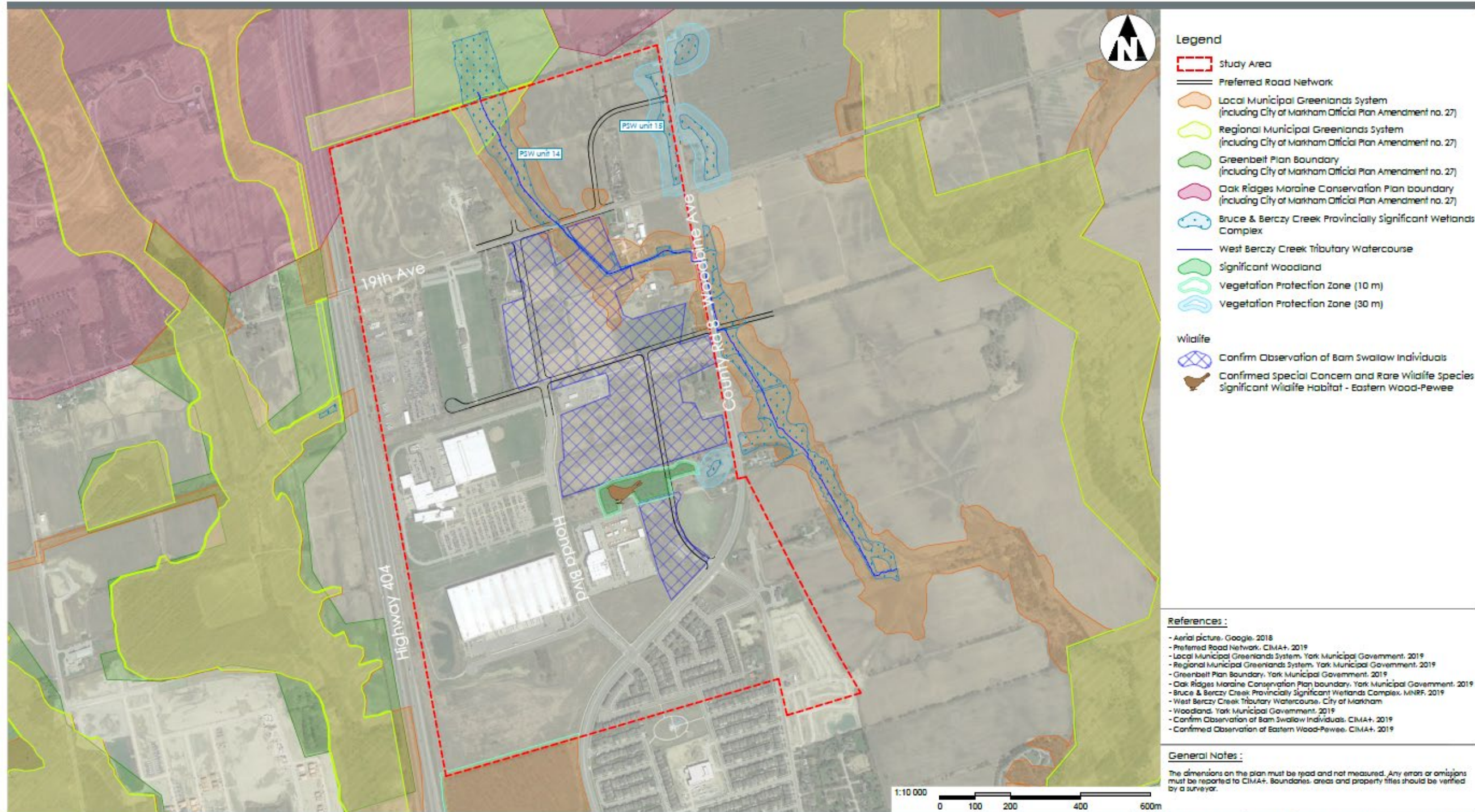


Figure 2 - Natural Heritages Systems

404 Collectors EA - City of Markham, ON
 City of Markham

Ref. # : B000801

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Drawn by: V. Fauvel-Benoit
 Design by: V. Bédard
 Verified by: N. Bertrand
 Revision 03 - Issued for Natural Environment Report - February 26th, 2020



Exhibit 6-22: Natural Heritage Systems – Proposed Road Network Impacts

6.9. Contamination

Thurber Engineering Ltd. (Thurber) was retained to prepare a Contamination Overview Study (COS) in support of the Highway 404 North Collector Roads Environmental Assessment (EA) Study. The report is included as Appendix N.

For the purpose of this COS, the “Site” consists of a network of linear sections of land that are aligned in north-south and east-west directions (i.e. “Site Alignments”) within an area that is generally used for agricultural, parkland, commercial/industrial or community purposes. The purpose of the COS was to identify evidence of actual and/or potential contamination along the Site Alignments and at adjacent properties within the Study Area which may pose implications on the management of materials generated during the proposed construction works. The Study Area for the COS was considered to include surrounding properties within a 250 metre buffer from the Site Alignments.

Based on the review and evaluation of information obtained through the COS, PCAs at 11 locations were identified at the Site or within the Study Area that are considered to be contributors to APECs on the Site Alignments.

The identified on-Site PCA contributors generally included the application of pesticides from current and past agricultural activities, existing/suspected fill materials, application of de-icing salts, and possible vehicle fluid releases. Off-Site PCA contributors included a gas station with underground storage tanks and vehicle repair/service garage; a private fuel outlet with above ground storage tanks; releases of diesel (220 L), coolant (10 L), and transformer oil (unknown quantity); possible assembly and manufacturing of vehicles/vehicle parts; a natural-gas meter station and transmission pipelines; the storage of vehicles, trucks, equipment, and materials; suspected application of pesticides to surrounding agricultural fields; and, waste generators (including PCBs).

The contaminants of potential concern for the corresponding PCAs contributing to APECs included metals and inorganics, petroleum hydrocarbons (PHCs), benzene, toluene, ethylbenzene and xylenes (BTEX), polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs), and organochlorine (OC) pesticides. A subsurface investigation involving sampling and analysis of soil and groundwater within the excavation depths for the proposed construction works would be required to confirm or refute the potential for contamination from the identified PCAs and associated APECs on the Site.

6.10. Drainage and Stormwater Management

The recommended collector road network differs from the network recommended in OPA 149. The recommended roadway network establishes five major parcels for development south of 19th Avenue with access onto Honda Boulevard, the new east-west collector road (Road D) or Road E1. This provides four new internal access roadways serving the planning district which connect directly into the larger road network (19 Avenue and Woodbine Avenue). The proposed network also provides access to development parcels north of 19th Avenue.

Based on the recommended roadway network, there will be an incremental decrease in the amount of roadway within the study area, and an increase in the amount of commercial/industrial available land from the OPA 149 plan. Any consequential changes to SWM will be assessed during detailed design.

6.10.1. Future Land Use

Future land use is detailed in the City of Markham Official Plan. The entire area, other than a 9-ha area designated for Berczy Creek and associated valley land, will be urbanized. The total impervious based on this land use will be approximately 60%.

6.10.2. Interim Storm Water Management Ponds

Depending on the phase of development and present landowner development objectives, it is possible for final proposed ponds to be built without the implementation of interim ponds. If interim ponds are implemented, it is possible that they will be moved and upgraded to their final design, or that they will remain, and any downstream development will need to provide their own quantity and quality controls.

The location of stormwater management ponds within this report and on the attached figures is based on preliminary planning studies. During detailed design of any stormwater management ponds, care should be taken to ensure that their footprint avoid sensitive features and their associated buffers.

It is possible that landowners of the locations of the final proposed ponds may not be prepared for development prior to those upstream of their site. If it is not possible to go directly to final SWM ponds, the interim design includes the implementation of two more interim ponds, both to the north of 19th Avenue within the study area.

Interim Pond B1 is located at the north west of the intersection of Woodbine Avenue and 19th Avenue. The SWM pond receives the stormwater runoff from an approximate 17.5 ha area to the east of Berczy creek and west of Woodbine Avenue.

Interim Pond B2 is located to the north of 19th Avenue and to the west of Berczy Creek. The stormwater management pond receives the stormwater runoff from an approximate 15 ha area to the east of Highway 404 and west of Berczy Creek.

The two existing ponds, B3 and L1, remain the same as in existing conditions. The drainage mosaics for the interim conditions are illustrated on Exhibit 6-23.

6.10.3. Proposed Storm Water Management Ponds

With the implementation of the proposed collector road network, the drainage areas for the proposed conditions vary from the existing and interim design. The following describes the proposed final designs assuming the interim stormwater management ponds had been implemented and will be upgraded to ultimate conditions.

The implementation of a fourth SWM pond, B4, to the south east of the study area will capture and treat the runoff from the residential area to the south of the study area. There will be no impacts to SWM pond B4 or L1 from the proposed work, therefore no analysis was done on these ponds.

Interim SWM Pond B1 will be moved from the north west corner of 19th Avenue and Woodbine Avenue to the south west corner. Its drainage area will increase to approximately 20 ha.

Interim SWM Pond B2 will be moved from north of 19th Avenue to the north west corner of Woodbine Avenue and Proposed Road D (reference Appendix F). Its drainage area will increase to approximately 43 ha.

Interim SWM Pond B3 will generally remain in the same location. Its shape will change, and its drainage area will decrease to approximately 66 ha, with the lost drainage area now directed to SWM Pond B2.

The overall recommended plan drainage mosaic for the proposed conditions is illustrated in Exhibit 6-24.

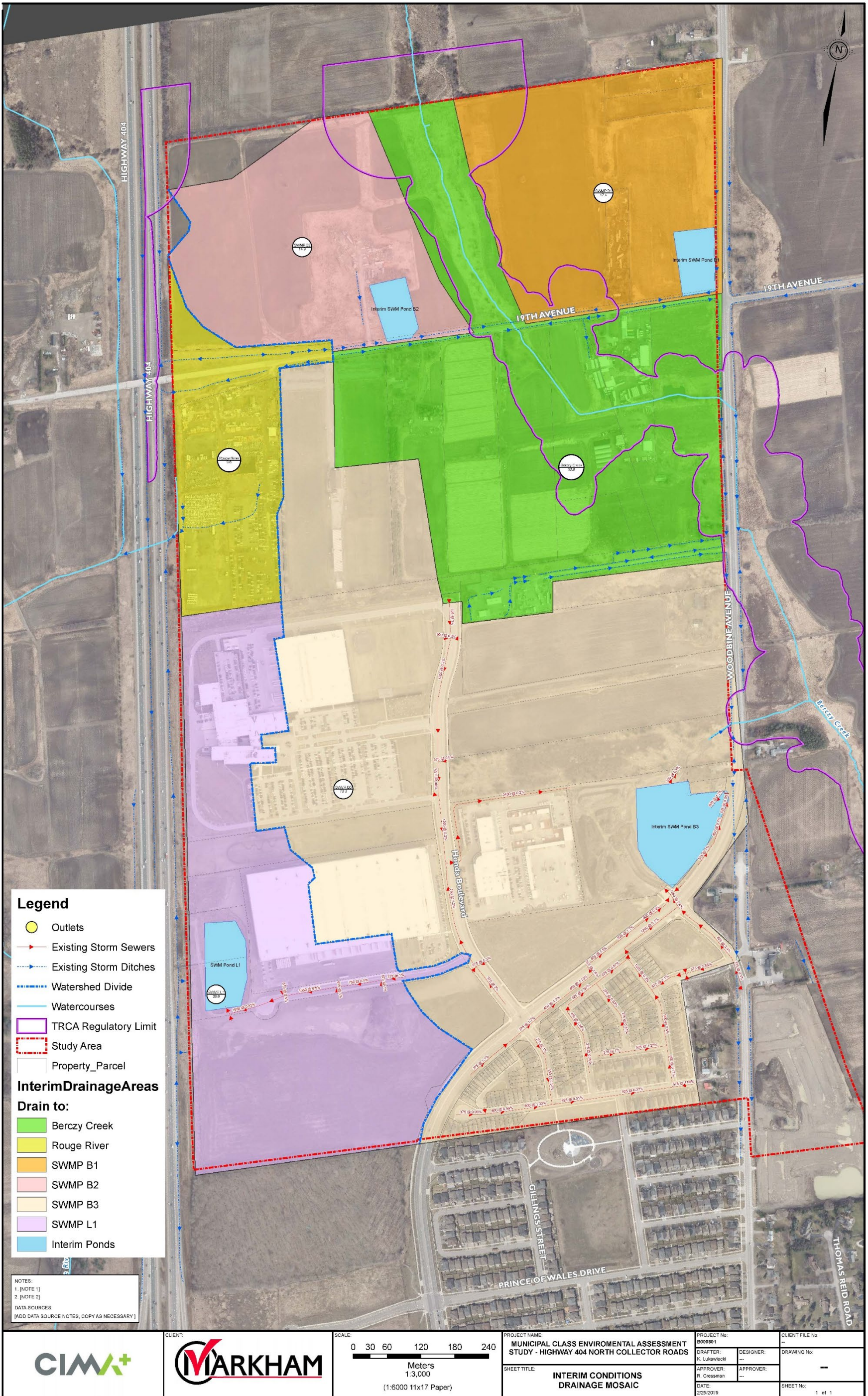
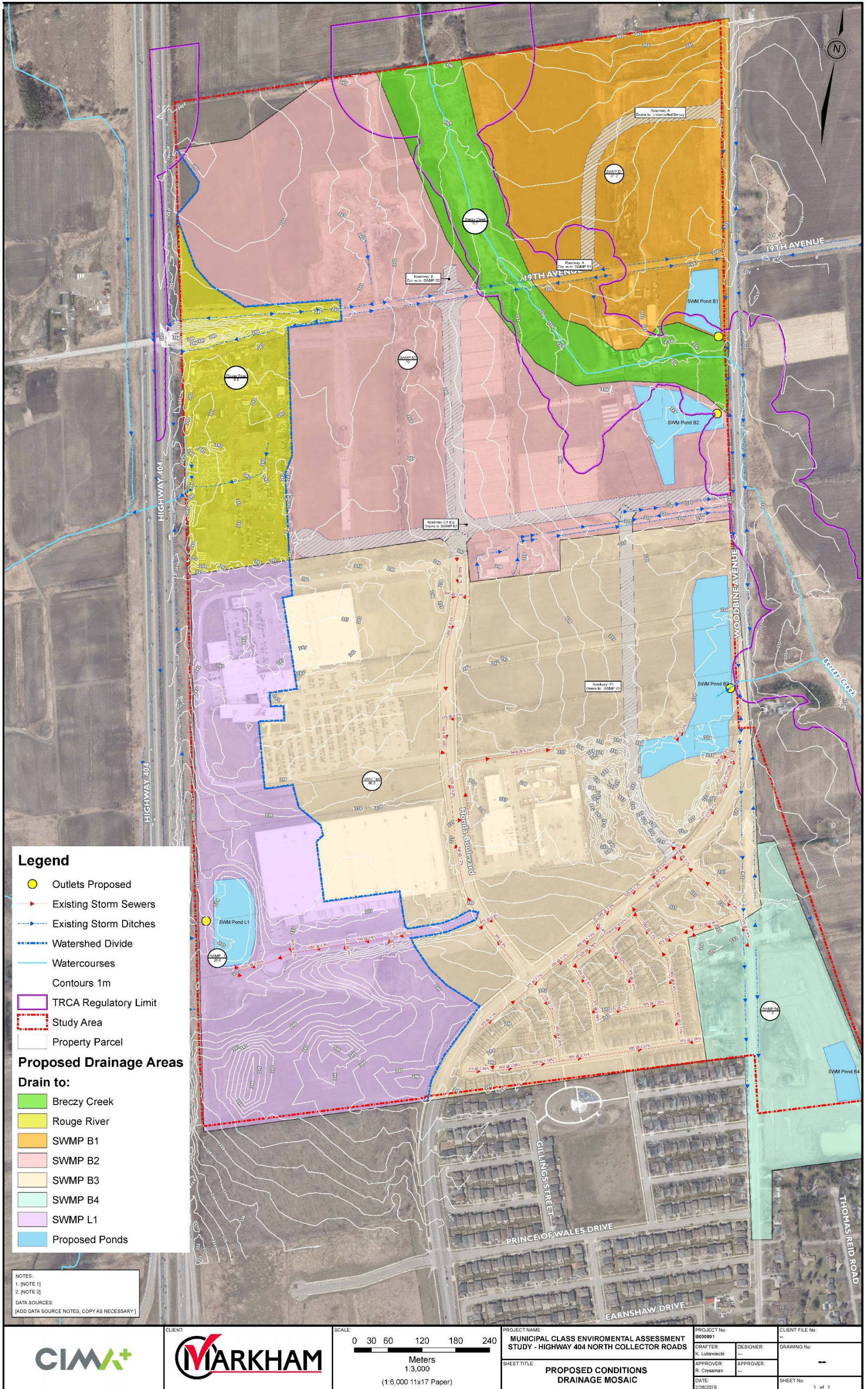


Exhibit 6-23: Interim Condition Drainage



Legend

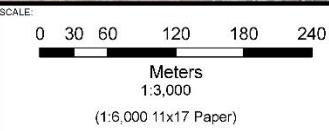
- Outlets Proposed
- ▶ Existing Storm Sewers
- ▶ Existing Storm Ditches
- Watershed Divide
- Watercourses
- Contours 1m
- TRCA Regulatory Limit
- Study Area
- Property Parcel

Proposed Drainage Areas

Drain to:

- Breczy Creek
- Rouge River
- SWMP B1
- SWMP B2
- SWMP B3
- SWMP B4
- SWMP L1
- Proposed Ponds

NOTES:
 1. [NOTE 1]
 2. [NOTE 2]
 DATA SOURCES:
 [ADD DATA SOURCE NOTES, COPY AS NECESSARY]



PROJECT NAME:
**MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT
 STUDY - HIGHWAY 404 NORTH COLLECTOR ROADS**

SHEET TITLE:
**PROPOSED CONDITIONS
 DRAINAGE MOSAIC**

PROJECT No: B000891	CLIENT FILE No: --
DRAFTER: K. Lukawiecki	DESIGNER: --
APPROVER: R. Cressman	APPROVER: --
DATE: 2/28/2019	SHEET No: 1 of 1

Exhibit 6-24: Drainage for Recommended Plan

6.10.4. Recommended Network Conditions

Multiple roadways have been proposed for the study area. The roadway drainage for the recommended collector road network is illustrated in Exhibit 6-25.

- Proposed roadway E1 has a Right of Way (ROW) of approximately 1.56 ha. Storm drainage will be conveyed via storm sewers south into the proposed SWM Pond B3.
- Proposed roadways D, C1 and B have a ROW of approximately 3.43 ha. Storm drainage will be conveyed via storm sewers south east into the proposed SWM Pond B2.
- Proposed roadway A drains in two directions. The western portion of the roadway ROW, 0.81 ha, drains south via storm sewers to proposed SWM Pond B1. The eastern portion of the roadway ROW, 0.32 ha, drains uncontrolled to Berczy Creek via storm sewers. It may be necessary to include an Oil and Grit Separator (OGS) at the outlet of the uncontrolled flow to ensure that the runoff meets necessary quality control standards.

Exhibit 6-25: Recommended Plan Roadway Drainage

Roadway	Area (ha)	Draining To
A (Controlled)	0.81	SWMP B1
A (Uncontrolled)	0.32	Berczy Creek
C1 & D	3.30	SWMP B2
E1	1.56	SWMP B3

When SCS Consulting Group created the Master Drainage Plan and completed the preliminary design and sizing of the SWM ponds, they accounted for a certain area of internal roadway at a specified percentage of impervious draining to the ponds. Exhibit 6-26 shows the difference between the area of roadway and percentage of impervious of the roads the SCS Master Drainage Plan accounted for vs those planned under the MCEA.

Exhibit 6-26: Difference Between Master Drainage Plan and Recommended Plan

Pond	SCS SWMMP Roadway Area (ha)	Class EA Roadway Area (ha)	Difference (ha)
B1	0.65	0.81	+ 0.16
B2	5.92	3.43	- 2.49
B3	5.49	3.79*	- 1.70
Total	12.06	-8.03	- 4.03

*Includes proposed roadway E1 and existing portion of Honda Boulevard that drains to SWM pond B3

Note: There are no changes to ponds L1 or B4

Assuming that the excess land that will no longer be used for internal roadways will be used for commercial or industrial area and based on the % impervious values used in the SCS SWMMP, there will be an overall increase to the amount of impervious land draining to the SWM ponds.

Between previously designed and proposed roadway’s, overall there are only minor variances to the amount of roadway runoff that needs to be treated, which can be considered during detailed design of the SWM ponds.

6.10.5. Preliminary OGS Sizing

For the portion of Collector Road A that drains uncontrolled into Berczy Creek, it is recommended that an OGS unit be used to provide Level 1 (80% TSS removal) water quality treatment for the runoff. Preliminary sizing details the requirement of a Hydroworks Hydroguard Model # HG 4 or equivalent to provide the necessary water quality treatment for the runoff.

It is the TRCA’s position that a standalone OGS unit cannot provide more that 50% TSS removal. ETV particle distribution was used to calculate OGS unit sizing, therefore it was anticipated that the TRCA would credit the full 80% TSS removal. A treatment train approach utilizing low impact development such as a bioswale to increase the water quality of the roadway runoff was also considered. However, City of Markham Low Impact Development (LID) guidelines does not support LIDs in the right-of-way.

6.10.6. Climate Change Considerations

A review of intensity-duration-frequency (IDF) parameters based on MTO’s Lookup Curves was completed to assess the impact of climate change on drainage and SWM infrastructure. Future IDF parameters based on MTO Lookup Curve Year 2085 compared to 2010 predicts a maximum increase of 17% and 8%, respectively for the 2-year and 100-year design intensity.

To mitigate the potential impacts from climate change, during detailed design the computed capacity of storm sewers should be designed such that the peak flow is less than 80% of the pipe flowing full. This will provide resilience for the drainage infrastructure under predicted future conditions.

6.11. Utilities

As discussed in Section 3.8, there is a 30 metre wide Hydro One transmission corridor within the study area. The corridor consist of registered and statutory easements. It is anticipated that the proposed collector roads will cross the transmission corridor in two locations, the registered easement north of 19th Avenue for Collector Road A and the statutory easement at the location of Collector Road D (directly north of the TransCanada pipeline). No impacts to the existing hydro towers are anticipated. Further consultation with Hydro One will be conducted during detailed design to confirm impacts and obtain final approvals.

No impact to the existing TC Energy or Enbridge gas lines are anticipated. Further consultation with TC Energy will be conducted during detailed design to ensure that their concerns that were raised during the Class EA process can be addressed.

6.12. Property Requirements

The property requirements for the collector roads are summarized in Exhibit 6-27. The additional property required for grading can be acquired through land purchase or a construction easement.

Exhibit 6-27: Property Requirements

Collector Road	Property	Right-of-Way Requirement (m ²)	Grading Requirement (m ²)
Road A	-	-	-
Road B	-	-	-
Road C	2787 19 th Avenue	3,725	900
	180 Honda Boulevard	2,740	260
Road D	2743 19 th Avenue	6,890	370
	2787 19 th Avenue	3,080	250
	2825 19 th Avenue	2,740	430
	11358 Woodbine Avenue	7,225	1,130
	Hydro Corridor	1,220	200
Road E	11160 Woodbine Avenue	5,415	2,115
	1099490 Ontario Inc.	2,025	350
	Unknown Address	2,015	210
	180 Honda Boulevard	750	145
	559975 Ontario Inc	2,890	190
	Unknown Address	450	100
	Unknown Address	1,860	210

6.13. Preliminary Cost Estimate

The preliminary cost estimates for the collector roads are provided in Exhibit 6-28 through Exhibit 6-32. The cost estimates are exclusive of property costs.

Exhibit 6-28: Road A Cost Estimate

Item	Description	Unit	Estimated Quantity	Unit Cost	Total Cost
1	Clearing and Grubbing	ha	2.19075	\$250,000	\$547,688
2	Stripping (100mm)	m ³	2190.75	\$30	\$65,723
3	Earth Borrow	m ³	20900	\$30.00	\$627,000
4	Earth Excavation	m ³	150	\$30.00	\$4,500
5	Surface Course Hot Mix (40 mm)	t	659	\$115.00	\$75,829
6	Base Course Hot Mix (120 mm)	t	1978	\$105.00	\$207,706
7	Granular A (150 mm)	m ³	2697.48	\$30.00	\$80,924
8	Granular B (450 mm)	m ³	8092.44	\$25.00	\$202,311
9	3.0M AT buffer	m	1270	\$300.00	\$381,000
10	Concrete Median	m ²	0	\$75.00	\$0
11	Concrete Curb & Gutter	m	1270	\$70.00	\$88,900
12	Subdrain	m	1270	\$25.00	\$31,750
13	Catch Basin	each	32	\$4,500.00	\$144,000
14	Storm Sewer	m	635	\$750.00	\$476,250
15	Lateral Pipe	m	192	\$500.00	\$96,000
16	Storm Manhole	each	7	\$8,000.00	\$56,000
21	Top Soil, sod, and seed	m ²	3620	\$11.50	\$41,630
22	Illumination	each	16	\$4,000	\$64,000
23	Culvert (allowance)	m	1	\$200,000	\$200,000
24	Traffic Signal	each	1	\$200,000	\$200,000
Sub-Total Construction Cost					\$2,343,411
Minor Items (20% of Construction Cost)					\$468,682
Contaminated Soils and Sub Excavation (2%)					\$46,868
Estimated Engineering - Civil, Geo, etc. (15%)					\$351,512
Total Construction Cost					\$3,250,000
Notes	Property cost is not included. Total construction cost rounded.				

Exhibit 6-29: Road B Cost Estimate

Item	Description	Unit	Estimated Quantity	Unit Cost	Total Cost
1	Clearing and Grubbing	ha	0.1380	\$250,000	\$34,500
2	Stripping (100mm)	m ³	138	\$30	\$4,140
3	Earth Borrow	m ³	880	\$30.00	\$26,400
4	Earth Excavation	m ³	50	\$30.00	\$1,500
5	Surface Course Hot Mix (40 mm)	t	42	\$115.00	\$4,777
6	Base Course Hot Mix (120 mm)	t	125	\$105.00	\$13,084
7	Granular A (150 mm)	m ³	169.92	\$30.00	\$5,098
8	Granular B (450 mm)	m ³	509.76	\$25.00	\$12,744
9	3.0M AT buffer	m	80	\$300.00	\$24,000
10	Concrete Median	m ²	0	\$75.00	\$0
11	Concrete Curb & Gutter	m	90	\$70.00	\$6,300
12	Subdrain	m	90	\$25.00	\$2,250
13	Catch Basin	each	2	\$4,500.00	\$9,000
14	Storm Sewer	m	80	\$750.00	\$60,000
15	Lateral Pipe	m	12	\$500.00	\$6,000
16	Storm Manhole	each	0	\$8,000.00	\$0
21	Top Soil, sod, and seed	m ²	230	\$11.50	\$2,645
22	Illumination	each	2	\$4,000	\$8,000
23	Culvert	m	0	\$125.00	\$0
24	Traffic Signal	each	0	\$200,000	\$0
Sub-Total Construction Cost					\$220,437
Minor Items (20% of Construction Cost)					\$44,087
Contaminated Soils and Sub Excavation (2%)					\$4,409
Estimated Engineering - Civil, Geo, etc. (15%)					\$33,066
Total Construction Cost					\$310,000
Notes	Property cost is not included. Total construction cost rounded.				

Exhibit 6-30: Road C Cost Estimate

Item	Description	Unit	Estimated Quantity	Unit Cost	Total Cost
1	Clearing and Grubbing	ha	2.184	\$250,000	\$546,000
2	Stripping (100mm)	m ³	2184	\$30	\$65,520
3	Earth Borrow	m ³	9550	\$30.00	\$286,500
4	Earth Excavation	m ³	350	\$30.00	\$10,500
5	Surface Course Hot Mix (40 mm)	t	837	\$115.00	\$96,302
6	Base Course Hot Mix (120 mm)	t	2512	\$105.00	\$263,784
7	Granular A (150 mm)	m ³	3425.76	\$30.00	\$102,773
8	Granular B (450 mm)	m ³	10277.3	\$25.00	\$256,932
9	3.0M AT buffer	m	1040	\$300.00	\$312,000
10	Concrete Median	m ²	80	\$75.00	\$6,000
11	Concrete Curb & Gutter	m	1050	\$70.00	\$73,500
12	Subdrain	m	1050	\$25.00	\$26,250
13	Catch Basin	each	26	\$4,500.00	\$117,000
14	Storm Sewer	m	520	\$750.00	\$390,000
15	Lateral Pipe	m	156	\$500.00	\$78,000
16	Storm Manhole	each	6	\$8,000.00	\$48,000
21	Top Soil, sod, and seed	m ²	3300	\$11.50	\$37,950
22	Illumination	each	14	\$4,000	\$56,000
23	Culvert	m	0	\$125.00	\$0
24	Traffic Signal	each	1	\$200,000	\$200,000
Sub-Total Construction Cost					\$2,973,010
Minor Items (20% of Construction Cost)					\$594,602
Contaminated Soils and Sub Excavation (2%)					\$59,460
Estimated Engineering - Civil, Geo, etc. (15%)					\$445,952
Total Construction Cost					\$4,110,000
Notes	Property cost is not included. Total construction cost rounded.				

Exhibit 6-31: Road D Cost Estimate

Item	Description	Unit	Estimated Quantity	Unit Cost	Total Cost
1	Clearing and Grubbing	ha	2.7255	\$250,000	\$681,375
2	Stripping (100mm)	m ³	2725.5	\$30	\$81,765
3	Earth Borrow	m ³	23100	\$30.00	\$693,000
4	Earth Excavation	m ³	150	\$30.00	\$4,500
5	Surface Course Hot Mix (40 mm)	t	820	\$115.00	\$94,339
6	Base Course Hot Mix (120 mm)	t	2461	\$105.00	\$258,406
7	Granular A (150 mm)	m ³	3355.92	\$30.00	\$100,678
8	Granular B (450 mm)	m ³	10067.8	\$25.00	\$251,694
9	3.0M AT buffer	m	1580	\$300.00	\$474,000
10	Concrete Median	m ²	40	\$75.00	\$3,000
11	Concrete Curb & Gutter	m	1720	\$70.00	\$120,400
12	Subdrain	m	1720	\$25.00	\$43,000
13	Catch Basin	each	40	\$4,500.00	\$180,000
14	Storm Sewer	m	790	\$750.00	\$592,500
15	Lateral Pipe	m	240	\$500.00	\$120,000
16	Storm Manhole	each	9	\$8,000.00	\$72,000
21	Top Soil, sod, and seed	m ²	4500	\$11.50	\$51,750
22	Illumination	each	20	\$4,000	\$80,000
23	Culvert	m	0	\$125.00	\$0
24	Traffic Signal	each	2	\$200,000	\$400,000
Sub-Total Construction Cost					\$4,302,406
Minor Items (20% of Construction Cost)					\$860,481
Contaminated Soils and Sub Excavation (2%)					\$86,048
Estimated Engineering - Civil, Geo, etc. (15%)					\$645,361
Total Construction Cost					\$5,940,000
Notes	Property cost is not included. Total construction cost rounded.				

Exhibit 6-32: Road E Cost Estimate

Item	Description	Unit	Estimated Quantity	Unit Cost	Total Cost
1	Clearing and Grubbing	m ²	21907.5	\$25.00	\$547,688
2	Stripping (100mm)	m ³	2190.75	\$30	\$65,723
3	Earth Borrow	m ³	20900	\$30.00	\$627,000
4	Earth Excavation	m ³	150	\$30.00	\$4,500
5	Surface Course Hot Mix (40 mm)	t	659	\$115.00	\$75,829
6	Base Course Hot Mix (120 mm)	t	1978	\$105.00	\$207,706
7	Granular A (150 mm)	m ³	2697.48	\$30.00	\$80,924
8	Granular B (450 mm)	m ³	8092.44	\$25.00	\$202,311
9	3.0M AT buffer	m	1270	\$300.00	\$381,000
10	Concrete Median	m ²	0	\$75.00	\$0
11	Concrete Curb & Gutter	m	1270	\$70.00	\$88,900
12	Subdrain	m	1270	\$25.00	\$31,750
13	Catch Basin	each	32	\$4,500.00	\$144,000
14	Storm Sewer	m	635	\$750.00	\$476,250
15	Lateral Pipe	m	192	\$500.00	\$96,000
16	Storm Manhole	each	7	\$8,000.00	\$56,000
21	Top Soil, sod, and seed	m ²	3620	\$11.50	\$41,630
22	Illumination	each	16	\$4,000	\$64,000
23	Culvert	m	0	\$125.00	\$0
24	Traffic Signal	each	1	\$200,000	\$200,000
Sub-Total Construction Cost					\$3,391,211
Minor Items (20% of Construction Cost)					\$678,242
Allowance for Engineering Assessment at Pipeline Crossing					\$6,000,000
Contaminated Soils and Sub Excavation (2%)					\$67,824
Estimated Engineering - Civil, Geo, etc. (15%)					\$508,682
Total Construction Cost					\$10,680,000
Notes	Property cost is not included. Total construction cost rounded.				

7. Mitigation and Commitments to Further Work

In consultation with agencies, the preliminary preferred design has mitigated negative impacts to the environment where possible. Comments from Toronto and Region Conservation Authority were received and incorporated into the preferred design. Where impacts cannot be entirely avoided, mitigation measures and commitments for detailed design and construction have been developed to minimize or avoid impacts (Exhibit 7-1).

Exhibit 7-1: Mitigation and Commitments to Further Work

Category	Agency	Commitment
Natural Environment – Bruce & Berczy Creek Provincially Significant Wetland Complex	Toronto and Region Conservation Authority Ministry of Natural Resources and Forestry	<ul style="list-style-type: none"> ● In-water work will only be conducted during the recommended construction timing window of July 1st to Sept 15th. This will ensure that Redside Dace and their habitat downstream are protected during the sensitive spawning period, as well as ensuring that the stream has stabilized, and the riparian habitat is established before the winter months. Once construction is completed, the riparian habitat must be restored using native species. ● Construction will be undertaken during periods when the channel is dry or with minimal flow. Although flows may be absent, contingency plans will be established to address potential flows resulting from unanticipated storm events. ● Work will be planned so that the duration of in-water work is kept to a minimum. ● An Erosion and Sediment Control Plan (ESCP) will be designed to meet the above objectives by incorporating measures such as the following: <ul style="list-style-type: none"> ○ Appropriate sediment controls will be in place and measures taken to prevent sediment from exceeding 25 mg/L above background level during construction. ○ Erosion will be prevented by limiting the size of disturbed areas through such measures as: <ul style="list-style-type: none"> ▪ Phasing grading and infrastructure installation; ▪ Minimizing nonessential clearing and grading; and ▪ Retaining existing vegetation. ▪ Erosion will be minimized through measures including: ▪ Minimizing the time that any area is exposed to erosion;

		<ul style="list-style-type: none"> ▪ Focusing construction during a time of year when flows are minimal (e.g., summer) will help mitigate against potential erosion; ▪ Any surface left exposed would have the soil stabilized (e.g., erosion control blankets, lockdown netting, seeding, spraying, utilization of methods to roughen the surface); ▪ Minimize the slope length and gradient of disturbed areas; and ▪ Store/stockpile soil outside of direct Redside Dace habitat and at least 30 m away from indirect Redside Dace habitat. <ul style="list-style-type: none"> ○ Sediment from the construction site will be captured through measures including: <ul style="list-style-type: none"> ▪ A multi-barrier approach to prevent sediment entering the stream; ▪ Effective sediment and erosion ponds (i.e., appropriate structure, size and type required for site); ▪ Methods to trap sediment (i.e., filter berms, sediment traps, vegetation, etc.); and ▪ Monitor and maintain sediment and erosion controls at all times to ensure they are effective as well as monitor the receiving stream to ensure erosion and sediment controls are working effectively. Regular site meetings between the site inspector and contractors will ensure sediment and erosion controls are being emphasized and minor changes to improve effectiveness are being completed, as needed. ▪ Exposed soil will be graded to a stable angle and revegetated in a manner that prevents erosion. ▪ Slopes of culverts will mimic the natural stream bed. ▪ Materials moved during construction activities will not be stockpiled where they can adversely affect drainage patterns and be a minimum of 30 m from the watercourse.
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		<ul style="list-style-type: none">• Utilities near the ditch will be located either over or under streams to avoid impact to Redside Dace habitat. Utilities should be planned to be built in conjunction with new or replacement road crossings as part of the planning process.• That the thermal management threshold of 24 ° C be applied to the design of all new stormwater management facilities where outfalls empty into Redside Dace habitat, in either occupied reaches or supporting upstream reaches. Thermal targets should also be applied to the cumulative contributions of multiple stormwater facilities at the subcatchment level (TRCA, 2010).• Subsurface investigations should be undertaken to confirm the need and extent of dewatering to construct footings, to ensure groundwater resources are not impacted.• Design an Option B stream crossing as per TRCA Crossings Guideline for Valley and Stream Corridors. These structures are expected to provide some level of connectivity for wildlife, provided the crossing design includes other important elements such as appropriate spacing between openings, adequate size, substrate, lighting condition, fencing considerations as outlined in Appendix 2C of the Guideline. The crossing shall be designed to ensure wildlife movement is maintained, specifically for amphibian species. Consideration shall be given for an appropriate culvert size and design to maintain wildlife movement during the detail design stage.• During the pre-construction phase, vegetation clearing will occur which will result in the loss of individual trees in the landscape. It is recommended that grading and sloped be minimized to retain as many trees as possible, and that a forest edge management plan be developed along the FODM12 community.• Opportunities for restoration and enhancement of natural features will be reviewed at detailed design. A restoration plan will be required to
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		<p>address areas of temporary impact. Furthermore, restoration and enhancement of the significant woodland and wetlands is recommended to mitigate losses associated with unavoidable impacts.</p> <ul style="list-style-type: none"> ● During detailed design, all efforts will be made to ensure that there is no release of sediment or other deleterious substance to the watercourse or other natural features. ● The final design and alignment of stormwater management ponds will be located outside of natural features, their associated buffers, and TRCA’s regulatory limits.
<p>Natural Environment – Significant Wildlife Habitat and Species at Risk, Wildlife and Migratory Birds</p>	<p>Toronto and Region Conservation Authority Ministry of Natural Resources and Forestry</p>	<ul style="list-style-type: none"> ● Workers will be provided with information on identifying Species at Risk and Species of Special Concern. If an unexpected rare plant or animal species is encountered, construction activities will be halted, and the MECP will be contacted to provide advice on additional mitigation measures or permits which may be required. ● Vegetation removal/clearing and site preparation for construction will occur before March 1st or after October 31st to protect habitat of amphibians, reptiles, butterflies, mammals and migratory birds (including the Special Concern Eastern Wood-Pewee) during critical life stages, and comply with provincial and federal legislation; ● Any wildlife incidentally encountered during construction will not be knowingly harmed; ● Nesting migratory birds will be protected in accordance with the Migratory Birds Convention Act, 1994; <ul style="list-style-type: none"> ○ The Proponent/Contractor will not destroy active nests (i.e. nests with eggs or young birds), or wound or kill birds, of species protected under the Migratory Birds Convention Act, 1994 and/or regulations under the Act; ○ If a nesting migratory bird or nest containing eggs or young of migratory birds are identified within the study area

		<p>adjacent lands, all activities will stop and the Canadian Wildlife Services of Environment and Climate Change Canada will be contacted to discuss mitigation measures;</p> <ul style="list-style-type: none"> ○ Any nest found will be protected with a buffer zone determined by a setback distance appropriate to the species, the intensity of the disturbance and the surrounding habitat until the young have naturally and permanently left the vicinity of the nest; ○ The Contractor will ensure that the work site is kept clean and that no garbage or food scraps that could attract animals or alter their behaviour are left behind; ○ The Contractor will ensure that all debris and solid waste left on site, as well as temporary fencing and signs are removed after completion of the works; <ul style="list-style-type: none"> ● When possible, work should be completed during daylight hours. If nighttime lights are used, they will be installed so as to illuminate the work area only to minimize impacts to nighttime activities of wildlife; and ● Existing access roads will be used as much as possible and speed limits will be clearly posted on site access and construction roads to minimize the potential for wildlife road mortality. ● All efforts should be made during construction to ensure that there is no release of sediment or other deleterious substance to the watercourse or other natural features. ● The profile of Road A at the Woodbine Avenue intersection allows for bank-to-blank clearance of the wetland area. A 3-cell concrete box culvert can be provided to accommodate wildlife passage. Details of the type of wildlife crossing at the intersection will be investigated and refined at detailed design. ● The wildlife crossing for Road E1 will be located at the southern limit of the woodlot due to the profile
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		<p>of Road E1. The size and location of the wildlife crossing culvert for Road E1 will be investigated and refined during detailed design.</p> <ul style="list-style-type: none"> • The aquatic/terrestrial crossings will be intended for small and medium species in the study area.
<p>Natural Environment – Trees and woodlands</p>	<p>Toronto and Region Conservation Authority Ministry of Natural Resources and Forestry</p>	<ul style="list-style-type: none"> • Cutting of vegetation will be limited to that which interferes with the proposed works and movement of machinery. • Construction vehicles will have designated access routes from and to the construction area. • All trees susceptible to being damaged and/or within 2 m of equipment in operation, excavation activities and the installation of structures will have protectors installed (e.g. protective fencing) at the dripline of the tree to ensure the protection of the critical root zone. • All vegetation or tree debris that may fall or enter any waterbodies must be removed immediately with as little disturbance as possible. • Trees or shrub clippings, branches, or log pieces that show signs of disease or pests must be appropriately disposed of following all federal, provincial, and municipal regulations in order to minimize spread of the disease or pests (e.g. Dutch elm disease, emerald ash borer, etc.). Healthy material will be collected and composted on-site, where possible. • Materials will be stored within temporary storage areas outside of the dripline of any trees, where feasible. • The movement of vehicles and machinery will be restricted to the work areas and designated access points. • During the pre-construction phase, vegetation clearing will occur which will result in the loss of individual trees in the landscape. It is recommended that grading and sloped be minimized to retain as many trees as possible, as well as edge plantings during the post construction phase to protect the remnant woodlands.

		<ul style="list-style-type: none">● To protect trees, grade changes and construction activities that could cause soil compaction should be kept away from trees as much as possible. If roots will be damaged by excavation equipment, it is better to cut roots cleanly with sharp pruning tools rather than allow them to be torn by large equipment. Clean cuts will help to minimize decay and entry points for disease. If branches are likely to hang in the way of passing equipment, the branches should be pruned by a qualified arborist to avoid tearing and undue injury to the tree.● Where possible, hand dig areas closest to each tree to prevent any unnecessary tearing or pulling of roots. Removal of roots that are greater than 2.5 centimetres in diameter or roots that are injured or diseased should be performed as follows:<ul style="list-style-type: none">○ All roots that require pruning or removal shall be cut cleanly with sharp hand tools, by an ISA Certified Arborist or under direct supervision of an ISA Certified Arborist.○ Directional Root Pruning (DRP) is the recommended technique and should be employed during hand excavation around tree roots. Preserve the root bark ridge (similar in structure to the branch bark ridge). With DRP, objectionable and severely injured roots are properly cut to a lateral root that is growing downward or in a favorable direction.○ Avoid prolonged exposure of tree roots during construction - keep any exposed roots moist with water, burlap wrap or mulching material if exposed for longer than 4 hours.○ Equipment should not be left idling where exhaust could burn foliage.● The purpose of the tree protection zone is to prevent physical damage, soil compaction, root damage, and soil contamination during construction. Workers and all equipment necessary to complete the works shall not enter or
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		<p>disturb the tree protection zone. In order to prevent any damage, the following recommendations are offered:</p> <ul style="list-style-type: none"> ○ Tree protection fence to be installed as per detail in Appendix C. ○ During construction it should be ensured that no equipment, supplies, fill or waste be placed within the tree protection zone. ○ Tree protection shall be maintained in good condition at all times during construction. ○ Tree protection fencing to remain until all construction activities have been completed. ○ Follow the City of Markham recommended TPZ's per Tree Permit Requirements, dated July 10, 2019. <ul style="list-style-type: none"> ● During detailed design, a landscaping plan will be developed. Plantings within the vicinity of a few of the sensitive receptors identified in the Air Quality Assessment will be provided. ● Since the land is designated as 'Business Park Employment, it is preferable to protect for a minimum 3.5 m centre turn lane along Road E1 at the woodlot. Access opportunities to the adjacent lands and compensation requirement of woodland removals as a result of development will be investigated at detailed design stage. Compensation and restoration will be provided for the woodlot to ensure no overall negative impact to the Ecoregion 7E Significant Wildlife Habitat, ● Options to improve the relationship of Road E1 with forest community FODM12 will be reviewed at detailed design. Options include maximizing the width of the landscaped/planting zone and using a 'naturalized' landscaping treatment within the right-of-way ● Options to reduce the impacts of Road E to the woodlot by reducing the right-of-way at this area will be investigated at the detailed design phase. Options include reducing the centre two-way left-turn lane to 3.5 metres at this location. This will
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		<p>reduce the right-of-way at the woodlot from 24.5 metres to 23.0 metres</p> <ul style="list-style-type: none"> Basal area for the impacted woodland area will be determined during detailed design once the final road footprint has been confirmed.
<p>Natural Environment – Invasive Plant Species</p>	<p>Toronto and Region Conservation Authority Ministry of Natural Resources and Forestry</p>	<ul style="list-style-type: none"> As multiple invasive plant species have been observed within the Study Area (ex. Garlic Mustard, Reed-canary Grass, Purple Loosestrife, Buckthorn, etc.) an Invasive Plant Species Management Plan must be design by an environmental professional before the start of the work. This plan will include the location of all exotic invasive plant species individuals/colonies within the work area, as well as required management and disposal measures to be implemented by the contractor. When available, these management and disposal measures will be based on the Ontario Invasive Plant Council Best Practices. To prevent the spread of invasive species, the Clean Equipment Protocol for Industry will be followed for the cleaning of all equipment being used on the work site. Worker boots must also be clean of soils and plant parts before arriving and leaving the site.
<p>Source Water Protection</p>	<p>Toronto and Region Conservation Authority York Region</p>	<ul style="list-style-type: none"> Should the proposed major development include bulk fuel ($\geq 2500L$) or bulk chemicals ($\geq 500L$) within the HVA, a Contaminant Management Plan (CMP) will be required prior Site Plan approval, for Water Resources review and approval. Please note the study area is located within a Significant Groundwater Recharge Area (SGRA). As such the CTC Source Protection Plan water quantity recharge policy and York Region Official Plan Low Impact Development policy 2.3.41 will apply. The proponent should maximize infiltration at the site using best management practices. The use of the following resource is encouraged: Low Impact Development Stormwater Management Planning and Design Guide by Credit Valley

		<p>Conservation Authority. The contact person for this requirement is Quentin Hanchard at TRCA.</p>
<p>Stormwater Management</p>	<p>Ministry of Environment, Conservation and Parks Toronto and Region Conservation Authority</p>	<ul style="list-style-type: none"> ● To mitigate the potential impacts from climate change, during detailed design the computed capacity of storm sewers should be designed such that the peak flow is less than 80% of the pipe flowing full. This will provide resilience for the drainage infrastructure under predicted future conditions. ● Depending on the phase of development and present landowner development objectives, it is possible for final proposed ponds to be built without the implementation of interim ponds. If interim ponds are implemented, it is possible that they will be moved and upgraded to their final design, or that they will remain, and any downstream development will need to provide their own quantity and quality controls. ● The location of stormwater management ponds identified within this study is based on preliminary planning studies. During detailed design of any stormwater management ponds, care should be taken to ensure that their footprint avoid sensitive features, their associated buffers and TRCA’s regulatory limits. ● Low Impact Development measures will be considered in the development of the precinct as a whole and a stormwater management plan for the collector roads will be incorporated with the overall precinct development plan.
<p>Utilities</p>	<p>TransCanada (TC Engery)</p>	<ul style="list-style-type: none"> ● Written consent must be obtained from TransCanada prior to undertaking the following activities: <ul style="list-style-type: none"> ○ Constructing or installing a facility across, on, along or under a TransCanada pipeline right-of-way. ○ Conducting a ground disturbance (excavation or digging) on TransCanada’s pipeline right-of-way or within 30 metres if the centerline of TransCanada’s pipe (the “Prescribed Area”); ○ Driving a vehicle, mobile equipment or machinery across a TransCanada pipeline right-of-way outside the travelled portion of a highway or public road; and ○ Using and explosives within 300 metres of TransCanada’s pipeline right-of-way ● The following guidance shall be reviewed during detailed design regarding crossings. While exceptions might be made once an assessment

		<p>has been completed, adhering to the guidance will assist in efforts to process applications expeditiously.</p> <ul style="list-style-type: none"> ○ The crossing shall occur as close as possible to 90 degrees. ○ The crossing shall not occur at a bend in a TransCanada pipeline. ○ A highway or private road shall be constructed so that the travelled surface is no less than 1.5 metres above the top of the pipeline. ○ The bottom of the ditches adjacent to roads should not be less than 1.4 metres above the top of the pipeline. ○ Minimum cover for railway crossings (below base of rail) is 3.05 metres for uncased pipe. <ul style="list-style-type: none"> ● Further consultation with TC Energy will be conducted during detailed design to establish appropriate pipe protection during construction.
	Hydro One	<ul style="list-style-type: none"> ● Consultation with Hydro One shall be conducted during detailed design to confirm impacts and obtain final approvals.
Air Quality	Ministry of Environment, Conservation and Parks	<ul style="list-style-type: none"> ● Follow the best management practices for reducing emissions during construction activities in the Environment Canada “Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities” document to reduce any air quality impacts that may occur. ● Non-chloride dust suppressants shall be used. ● Since the removal or movement of soils may be required, appropriate tests to determine contaminant levels from previous land uses or dumping will be undertaken. If the soils are contaminated, it will be disposed of consistent with Part XV.1 of the Environmental Protection Act (EPA) and Ontario Regulation 153/04, Records of Site Condition. The ministry’s York Durham District Office will be consulted for further consultation if contaminated sites are present. ● Activities involving the management of excess soil should be completed in accordance with the MOECC’s current guidance document titled “Management of Excess Soil – A Guide for Best Management Practices” (2014) available online (http://www.ontario.ca/document/management-excess-soil-guide-best-management-practices).

<p>Noise</p>	<p>Ministry of Environment, Conservation and Parks</p>	<ul style="list-style-type: none"> ● The proposed works and noise levels emitted by all equipment and machinery will be in compliance with the applicable municipal Noise Control By-law. ● Speed limits shall be respected and the speed of vehicles on the work site shall be limited. ● Motorized equipment and other noisy equipment will be equipped with mufflers, acoustic enclosures or other noise-control devices. ● Any powered equipment will be shut off when not in use. ● Nearby residents will be advised of construction schedules, specifically for work that generates specific nuisances.
<p>Archaeology</p>	<p>Ministry of Tourism, Culture and Sport</p>	<ul style="list-style-type: none"> ● A Stage 2 Archaeological Assessment shall be conducted for portions of the study area as shown in Exhibit 6-16. ● The agricultural fields throughout Road C1, the northern section of Road D and the central sections of Road E1 must be assessed using the pedestrian survey method at an interval of 5 m. All ground surfaces must be recently ploughed (typically within the month prior to assessment), weathered by one heavy rainfall or several light rains, and provide at least 80% visibility. If archaeological materials are encountered, the transect interval must be decreased to at least 1 m and a close inspection of the ground must be conducted over a minimum of a 20 m radius around the find. This interval must be continued until the full extent of the scatter has been defined ● The grassed and treed areas within the northern section of Road C1, the southern edge and eastern portion of Road D as well as the southcentral section of Road E1 must be assessed using the test pit survey method. A survey interval of 5 m will be required due to the proximity of the lands to the identified features of archaeological potential. Given the likelihood that the remaining area of potential in the central portion of Road E1 has been impacted by past construction activities, a combination of visual inspection and test pit survey should be utilized to confirm the extents of any disturbed areas in

		<p>accordance with Section 2.1.8 of the S&Gs (MTC 2011:38). This will allow for the empirical evaluation of the integrity of the soils and the depth of any past disturbances. If disturbance cannot be confirmed, then a test pit survey interval of 5 m must be maintained.</p> <ul style="list-style-type: none"> • Regardless of the survey method employed, each test pit must be excavated into at least the first 5 cm of subsoil, and the resultant pits must be examined for stratigraphy, potential features and/or evidence of fill. The soil from each test pit must be screened through mesh with an aperture of no greater than 6 mm and examined for archaeological materials. If archaeological materials are encountered, all PTPs must be documented and intensification may be required. • Given that there are still outstanding archaeological concerns within the subject lands, no ground alterations or development of any kind may occur within the assessed area until the Stage 2 assessment is complete
<p>Cultural and Built Heritage</p>	<p>Ministry of Tourism, Culture and Sport</p>	<ul style="list-style-type: none"> • During the detailed design phases, cultural heritage resources will be avoided where possible and any construction staging areas will be located on lands located well away from the BHR s and CHLs • The study area includes a rural landscape with vegetation windbreaks. Therefore, installation of vegetation buffers similar to existing windbreaks will be considered to be compatible with the local character and to screen the roads from BHRs and CHLs, particularly the heritage attributes of BHRs 1 and 2. Other screening options (i.e., fencing or noise barrier s) may also be feasible. • During the detailed design, the removal of mature trees will be avoided, where possible. For any trees that cannot be saved during construction, the 2:1 replacement of similar trees will be examined as per tree protection best practices. • The selection and placement of any tree plantings as well as proposed streetscaping/placemaking elements will be sympathetic to the identified BHR s and CHLs • There is the potential for indirect impacts to BHR 1 (2780 19th Avenue) from Road B that crosses into the property at 19th Avenue that may impact the house's

		<p>setting, specifically its setback from the road. As such, a Heritage Impact Assessment will be conducted in the detailed design phase to address any potential impacts to the property.</p> <ul style="list-style-type: none"> • The City of Markham and/or Regional Municipality of York shall complete additional Heritage Impact Assessment report for BHR 2 (11288 Woodbine Avenue) during detailed design to confirm the anticipated impacts outlined in this report. • Public consultation will be considered during detailed design to support additional potential cultural heritage resources being identified. These potential cultural heritage resources should be reviewed by a qualified heritage consultant to: 1) determine their cultural heritage value or interest, evaluate potential project impacts, and 3) suggest strategies for future conservation of any candidate cultural heritage resources.
<p>Spills Management</p>	<p>Ministry of Environment, Conservation and Parks</p>	<ul style="list-style-type: none"> • All spills must be reported to the MECP Spills Action Centre (1-800-268-6060) where a spill discharges to air, land or water, is in excess of normal usage, has escaped its means of containment, or has been combined with other products affecting its chemical stability which could cause an adverse effect (i.e. negative impact on health, environment or property). • Spill response materials will be available wherever hazardous materials are used or stored. These spill response materials will be suitable in type and quantity to the type and quantity of hazardous materials being used at that location. • All Contractors and their staff must be trained on how to use the spill material and equipment. • All used absorbent material must be disposed of in accordance with applicable regulatory requirements. • Spills must be contained and cleaned up in accordance with all federal, provincial, and local regulatory requirements.
<p>Construction Monitoring</p>	<p>City of Markham</p>	<ul style="list-style-type: none"> • Mitigation measures shall be implemented and maintained through on-site inspections by the city of Markham staff who will ensure that the natural, social and economic environments are not impacted by the construction activities and/or that impacts are minimized. The inspection staff will also ensure that

		<p>items such as sedimentation controls and appropriate signage are maintained throughout construction.</p> <ul style="list-style-type: none"> • Appropriate signage shall be implemented to identify detour routes at the time of temporary roadway/sidewalk closure.
Property	City of Markham	<ul style="list-style-type: none"> • An agreement will be established with the Developer's Group to compensate for the property required for the collector roads. • Accesses to businesses and industries will be maintained during construction.
Post-EA Approvals/Permits	Ministry of Environment, Conservation and Parks	<ul style="list-style-type: none"> • The following permits and approvals will be obtained: <ul style="list-style-type: none"> ○ Permit under the Endangered Species Act – it is recommended that the proponent contact the MECP's Species at Risk Branch during detailed design for consultation on whether a permit is required for the project (SARontario@ontario.ca). ○ Permit to Take Water or EASR ○ Environmental Compliance Approval for municipally owned stormwater management infrastructure
Geotechnical	Toronto and Region Conservation Authority	<ul style="list-style-type: none"> • Further geotechnical study will be conducted in support of the proposed undertaking to provide the detailed geotechnical design recommendations for the various components of the proposed undertaking. • The retaining walls, abutments and wing walls shall be designed by qualified engineer using geotechnical information. The global stability should be also checked for the walls to confirm that a minimum safety factor of 1.50 is met against global instability. • In the event that the works require the ground improvement (e.g. preloading), the ground improvement is required to be designed by geotechnical engineer. The extent of the additional disturbed zone during the implementation of the ground improvement is required to be determined in both site plan and cross-sections. All necessary provisions for the design and implementation are required to be presented on the drawings along with supporting design documents. • The culverts shall be designed by qualified engineer(s) using the geotechnical information. Suitable foundation is required for the culverts as per the ground condition.

	<ul style="list-style-type: none"> • The cross-sections shall be provided along the alignment in adequate intervals and the critical locations, which shows the proposed grade with respect to the existing ground. The cross-section should be extended enough to show all the features and slopes/banks where exist. The extent of the proposed grading should be also shown on the site plan along the alignment. • The proposed embankments shall be studied and designed by geotechnical engineer. The stability assessment is required for the embankments to ensure that a minimum safety factor of 1.50 is achieved. • The proposed cuts should be studied by geotechnical engineer. Stability assessment is required to confirm that the proposed side slopes for the cuts satisfy a minimum safety factor of 1.50. • All engineering drawings for the retaining walls, abutments and wing walls, culverts, crossings, stabilization works, embankments and cuts should be prepared showing all necessary details and specifications and submitted as signed and sealed by Licensed Professional Engineer. • Where the work is in proximity of the banks/slopes, the construction methodology and sequencing should be presented to ensure that the surrounding ground/bank/slope is not adversely impacted during the construction. • Where there is trenchless installation for the infrastructures below the watercourse, the pertinent geotechnical studies should be conducted to provide the required site characterization. The trenchless installation should be designed by specialty consultant or contractor using the geotechnical information and recommendations. The adequate cover from the bottom of the watercourse should be determined as per the design. The cross-sections and site plan showing the alignment and entry and exit pits/shafts and the cover from the bottom of the watercourse and other infrastructures should be also submitted in support of the proposed undertaking. The design should also ensure that the proposed trenchless installation does not cause the inadvertent return of drilling fluid (frac-out) or excess settlement on the ground along the alignment. Further, the shafts
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		<p>or pits required for the proposed trenchless installation should be properly stabilized by the means of shoring or other techniques. The details of such stabilization should be also prepared by qualified engineer and submitted as signed and sealed by Licensed Professional Engineer.</p> <ul style="list-style-type: none">• Groundwater quality testing will be required during detailed design to provide a basic understanding of the groundwater quality with respect to potential discharge criteria.• If dewatering is required, a monitoring plan may be developed, which would recommend tasks to be completed at indicated frequencies.• If dewatering is required, a monitoring plan may be developed, which would recommend tasks to be completed at indicated frequencies.• Detailed geotechnical and hydrogeological investigations will be completed at detailed design.
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A

Appendix A



B

Appendix B



C

Appendix C



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