

TP115086

ARTERIAL ROADS WITHIN HIGHWAY 427 INDUSTRIAL SECONDARY PLAN AREA (AREA 47) – PART B

MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT

26 JANUARY 2023



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Executive Summary

Study Introduction

The Region of Peel (Region) and the City of Brampton (City), the study proponents, have undertaken a Schedule 'C' Municipal Class Environmental Assessment (Class EA) Phases 3 & 4 study for Arterial Roads within the Highway 427 Industrial Secondary Plan Area (Area 47) to consider a wide range of options for transportation improvements to satisfy future capacity needs.

The City and Region have retained WSP E&I Canada Limited (Formerly Wood Environment & Infrastructure Solutions), to address the requirements of the Class EA for Area 47. This study considered development and commuter demands within Area 47 through provision of new and expansion of existing, arterial roadways. Due to the complexity of the study area and related roadway improvements, the Class EA is divided into two parts, with Part 'A' is being undertaken by the Region and Part 'B' is being undertaken by the City.

The roadways within Part 'A' will be owned and operated by the Region and will include the following:

- Arterial A2 – a new six (6) lane north-south roadway that connects Major Mackenzie Drive to Mayfield Road; and
- Coleraine Drive – an existing roadway which will be widened to four (4) lanes and be upgraded to include curb and gutter and multi-use pathways (MUP).

The roadways within Part 'B' will be owned and operated by the City and will include the following:

- Countryside Drive - an existing roadway which will be widened to four (4) lanes and be upgraded to include curb and gutter and MUP;
- Clarkway Drive – an existing roadway which will have portions widened to four (4) lanes and upgraded to include storm sewers, sidewalks and cycle lanes; and
- East-West Arterial – a new four (4) lane roadway connecting The Gore Road to Arterial A2.

The Environmental Study Report is focused on Part B only. The study examines the need and feasibility for new roadway(s) and improvements to existing arterials to address short-term and long-term issues related to planned future growth, including operational, geometric, capacity, structural and drainage issues for the horizon year of 2031 and 2041.

Engagement and Consultation

The study was initiated in October 2015 and compliant consultation activities were conducted during Phase 3 of the Class EA process for this project, with the Public, Indigenous Nations, Municipal Groups, Technical Agencies, including Utilities, Conservation Authorities and Provincial Government, and Landowner and Developer Groups.

Stakeholders were notified and requested to provide input at the onset and throughout the duration of the Study, at each of two Public Information Centers and at study completion.

City and Region representatives, Indigenous Nations, relevant technical agencies, and Landowner and Developer Groups were also given additional consideration and engagement through direct discussions, correspondence, and meetings.

Existing and Future Conditions

The study area for this Class EA is the Highway 427 Industrial Secondary Plan Area located within the City of Brampton, in the Regional Municipality of Peel. Immediately north of Mayfield Road is the Town of Caledon. The City of Vaughan and Regional Municipality of York are located on the east side of Regional Road 50. The Class EA area of focus includes Countryside Drive, Clarkway Drive and East-West Arterial..

In order to identify constraints and sensitivities, a review of the following components was undertaken:

- Socio-Economic Environment;
- Land Use Planning Initiatives;
- Transportation and Traffic;
- Natural Environment;
- Vegetation and Aesthetic Assessment;
- Stage 1 Archeological Assessment;
- Built Heritage Resources and Cultural Heritage Landscapes;
- Contamination Overview Study;
- Stormwater Management;
- Fluvial Geomorphology;
- Geotechnical Investigation;
- Hydrogeology Investigation; and
- Road Traffic Noise Impact Study.

Development and Evaluation of Alternative Planning Solutions

The evaluation of alternative planning solutions was primarily completed as part of the Area 47 TMP. However, the Project Team revisited and refined the Planning Solutions during the current Study. The Project Team also completed supplementary studies to help inform and support the planning solutions.

In order to meet the requirements of Phase 1 and Phase 2 of the Class EA process, three (3) long term transportation planning alternatives were assessed and evaluated based on 2031 travel demands.

- Alternative Planning Solution 1 - Do Nothing;
- Alternative Planning Solution 2 - As Planned; and
- Alternative Planning Solution 3 - Increased Network Connectivity.

A series of three (3) sub-alternatives were developed for Alternative Planning Solution 3. An evaluation criterion was developed based on four (4) performance indicators: transportation services, policy environment, social, natural and cultural heritage environment and economy. A screenline analysis was also conducted in the westbound and northbound (peak) directions for all Alternative Planning Solutions in order to identify any significant network deficiencies.

Following the specific evaluations, an overall evaluation of the three (3) Alternative Planning Solutions (including the three (3) options associated with Alternative 3) was completed. It was concluded that Alternative 3C was the preliminary preferred Alternative Planning Solution. Based on comments received during a PIC held in June 2012, Alternative 3C was refined and developed into the recommended road network.

Alternative Alignments – New and Existing Roadways and Critical Intersection

During Phases 3 of the Class EA process, alternative design concepts were developed and evaluated using evaluation criteria that was developed to reflect the concerns of various stakeholders, as communicated through consultation. These included high-level alternatives for intersection configurations for the new arterial roadway (East-West Arterial), as well as the critical intersection of Countryside Drive at Regional Road 50.

New Arterial Roadways – East-West Arterial

Running between The Gore Road and Arterial A2, this new four-lane arterial roadway will provide improved east-west connectivity for future development lands located between Countryside Drive and Castlemore Road. A set of four (4) alternative corridor alignments were developed for the East-West Arterial which include keeping SP 47 TMP alignment, shifting to the south, shifting north of the pipeline, or shifting north of the Creek.

Based on the detailed evaluation, the preferred alignment for the new East-West Arterial is Alternative 1 which was previously identified through the Area 47 TMP and follows along the south limit of the TransCanada Pipeline Corridor.

Existing Arterial Roadways: Countryside Drive

Countryside Drive is an existing arterial roadway, and as such, alignment alternatives are limited based on the desire to make use of the existing ROW (and thereby minimize property impacts). Alternatives considered include widening evenly about the existing centerline, widening to the north, widening to the south, or a combination of all three (3) to limit impacts to existing properties, wildlife habitat and structures (hybrid alignment). Additional alternatives were considered for the eastern limit of Countryside Drive due to issues with alignment at the intersection with Regional Road 50.

Based on the detailed evaluation, the preferred alignment for Countryside Drive is Alternative 3 – widen to the south, due to limited impacts to existing residential properties.

Existing Arterial Roadways: Clarkway Drive

Clarkway Drive is an existing collector roadway, and as such, alignment alternatives are limited based on the desire to make use of the existing right-of-way (and thereby minimize property impacts). Alternatives considered include widening evenly about the existing centreline, widening to the east, widening to the west, or a combination of all three to limit impacts to existing creeks, buildings, heritage features, wildlife habitat and structures (hybrid alignment). Critical to evaluation of Clarkway Drive widening alternatives is the relative location of the Clarkway Creek floodplain, as well as the proximity of a heritage properties and cultural heritage landscapes.

Based on the detailed evaluation, the preferred alignment for Clarkway Drive is Alternative 1 – widen evenly about the existing centerline. A more detailed assessment is to be completed at the preliminary design stage to assess the impacts to the Clarkway Creek.

Critical Intersection: Countryside Drive at Regional Road 50

The intersection of Regional Road 50 with Countryside Drive was identified as requiring particular attention, either due to issues with alignment or as a result of inability to provide at least a LOS of 'D' or better by the 2041 planning horizon regardless of implementation of auxiliary lanes or signal timing. The intersection was identified as requiring modification to address issues with alignment.

Under existing conditions, the Countryside Drive at Regional Road 50 intersection is a four (4) leg intersection with Nashville Road continuing to the east in York Region. Of particular importance with respect to the temporary configuration of Regional Road 50 and Countryside Drive / Nashville Road is the less than ideal visibility and requirement for larger sight triangles in the southwest quadrant provided by the skewed approaches and 300 m curve radius. This is a particular issue for those drivers making

northbound right turns onto Nashville Road and, to a lesser degree, those making westbound left turns onto Regional Road 50.

A total of four (4) alternative intersection approach configurations were developed for this critical intersection. Based on the detailed evaluation, Alternative 3 – Curve West of Regional Road 50 with Reduced Design Speed, was determined to be the preferred alternative at this intersection.

Description of Preferred Design

The preferred design for Part B includes the following:

- East-West Arterial (new, four (4)-lane cross-section, City of Brampton);
- Countryside Drive (realignment, four (4)-lane cross-section, City of Brampton); and
- Clarkway Drive (realignment, four (4)-lane cross-section, City of Brampton).

Environmental Issues and Commitments

Natural Environment - Terrestrial Resources

The vegetation communities within the study area have been created by human disturbance and are classified as cultural vegetation types, residential areas, and predominately agricultural fields. Species of conservation concern should be considered as they may be present. However, the severe agricultural landscape limits the candidacy of Significant Wildlife Habitat (SWH), as habitat required to delineate the Significant Wildlife Habitat is not available. The most substantial impact on terrestrial wildlife will be the change from a relatively penetrable landscape to an impenetrable landscape due to the increase in roads. A number of potential impacts related with road infrastructure are identified. Many of the usual impacts associated with a direct loss of flora and fauna are not the case for this study area as the severe agricultural landscape limits the amount of natural area and inherent resiliency. A number of recommended mitigation measures related to erosion and sediment control measures are also suggested.

As for habitat compensation, the NHS contains various ecological components that are important to the City and the Region. The proposed removal of natural features to facilitate the proposed project (that are deemed acceptable to the City / Region and TRCA) is to be totaled, and their compensation included in the Rainbow Creek corridor restoration. The City will conduct further consultation with TRCA during the detail design stage. Additionally, the removal of trees from hedgerows and other areas will require compensation. Compensation is currently estimated to be 4,965 compensation trees which will be further refined in detailed design.

Natural Environment - Aquatic Resources

Possible impacts from the proposed construction and improvements may include the alteration of water levels and the change in the pattern of surface water flow and shallow groundwater movement. Surface water runoff from the proposed roadways may also introduce contaminants. Potential impacts to fish and fish habitat are anticipated to be limited, however several recommendations are made in the report.

Development opportunities and constraints, including stormwater management, will have to be assessed as development proceeds through future Block or Tertiary Planning and associated environmental studies. A monitoring program will be established to ensure that mitigation measures are undertaken. The key impacts to the environment are the short-term impacts that require monitoring during construction. Standard construction practices will need to be complied with, including erosion and sedimentation

control, dust and noise control, protection of existing vegetation, assurance of traffic safety and maintenance of traffic flow without causing unnecessary delays, etc.

The environmental impacts are considered normal impacts associated with roads construction. The established standard construction practices outlined as the mitigating measures will be incorporated in the contract documents. Should unforeseen environmental concerns and/or issues arise during the construction period, the appropriate ministry and agencies will be contacted, and appropriate measures will be taken to mitigate the environmental concerns / issues.

Vegetation and Aesthetic Assessment

A number of streetscape treatment opportunities are outlined for Clarkway Drive, Countryside Drive, and East-West Arterial regarding boulevard trees, wetland/riparian zone restoration, ROW planting, low impact development and streetscape design. Additionally, a Vegetation Assessment will be required, prepared by a certified International Society of Arboriculture arborist. All existing vegetation removed as part of this project should be inventoried. Several mitigation measures during construction and recommendations for the street tree planting and streetscape design are suggested for detailed design.

Archaeological Assessment

Two Stage 1 Archaeological Assessments were undertaken, both of which recommended the need for a Stage 2 Archaeological Assessment required during detailed design.

Built Heritage Resources and Cultural Heritage Landscapes

The Built Heritage Resources and Cultural Heritage impact assessment determined that indirect impacts are anticipated to two (2) properties, 5556 Countryside Drive, and 10089 Clarkway Drive, as a result of minor property acquisition along property frontage to accommodate the widened roadway. Direct impacts are anticipated to four properties: 10955 Clarkway Drive, 10307 Clarkway Drive, Countryside Drive, and Clarkway Drive, since the proposed road widening will result in the removal/disturbance of various heritage attributes at 10955 Clarkway Drive and 10307 Clarkway Drive, and the permanent alternation of the various historical rural roadscape.

A heritage impact assessment (HIA) should be completed for the four properties with anticipated direct impacts at the outset of detailed design.

Contamination Overview Study

The Contamination Overview Study recommended further environmental studies of the high and medium ranked properties directly impacted by project activities to confirm the environmental conditions in support of property acquisitions, environmental due diligence, and management of excess soils and materials. These investigations may include Phase One and Phase Two Environmental Site Assessments. If contamination is identified, mitigation measures may need to be developed and implemented.

Stormwater Management

Stormwater quantity, quality, and erosion criteria for the Study Area are to be provided by the internal development blocks within Area 47. As such, proposed works for the current study are limited to water balance and road reconstruction criteria. In terms of water balance and road reconstruction criteria, the SWMPs relate to the retention (i.e. infiltration) of runoff from the new pavement, and where possible, runoff from the existing pavement; however, current legislation solely relates to the former. Typically, the required retention volumes are dictated by agency standards, and are also often defined in a watershed or subwatershed planning study. It has been determined by that the City's road reconstruction criteria govern the retention volume requirements.

It is directed that detailed evaluation of stormwater management alternatives be evaluated as a component of detailed design. Based on the technical report review, the following Low Impact Development Best Management Practices have been short-listed for stormwater management: Infiltration trenches, Pervious Paves/Pavement, Pervious Pipes, Conventional Underground Storage, and Bioretention Systems. The SWM facilities proposed within the Area 47 development blocks are to be designed to service the City and Region ROWs for the water quantity, quality, and erosion control SWM requirements. Information pertaining to the way that major and minor systems of the City and Region ROWs would be connected to the systems servicing the development blocks has not been made available for the current study. As such, the advantages and disadvantages of the short-listed LID BMPs should be further reviewed and refined when information becomes available, expected at the detailed design stage.

Fluvial Geomorphology

The Fluvial Geomorphology Investigation revealed the need to realign channels due to road widening and construction works. It is recommended that all watercourses require channel realignment as a result of the road widening and construction works, although some more substantive than others. From a fluvial geomorphic perspective, it is recommended that new crossing structures accommodate a minimum span of the largest meander amplitude within the vicinity of the crossing. If this is not achievable from a design perspective, the medium risk span of three times the bankfull width of the channel may be considered, but the design of more robust bed and bank stabilization measures may be required.

At new culvert crossings, it is recommended that the structure be placed at an optimal skew perpendicular to the meander axis to ensure long term channel and bank stability. At bridge crossings, the channel will have to be realigned to pass through the axis of the intersection. At all crossing locations, natural channel design principles will need to be implemented when considering upstream and downstream tie-in points as well as bed and bank treatments.

Geotechnical Investigation

The geotechnical investigation recommends a number of mitigation measures suggested for detailed design, related to pavement design alternatives for the new roads / road widening, foundation design for culverts, slope stability analysis for embankments (where required), roadway cut and fill operations, dewatering requirements, and chemical analyses and disposal requirements of surplus materials in conformance to the MOE Clean-up guidelines for this project.

Hydrogeological Investigation

The hydrogeological investigation recommends a number of mitigation measures suggested for detailed design, including the following:

- Permitting may be required if dewatering rates exceed the thresholds for EASR registration and a PTTW because of surface water, storm water and wetland water influx into excavations.
- Record the amount of water taking during each day of dewatering to ensure the maximum water taking does not exceed the thresholds for EASR registration or a PTTW.
- To be diligent, it is recommended that a private well survey be completed to confirm the location of depth of and water level in water supply wells 4902856, 4902866 and 4905894 near Clarkway Drive.
- Stream diversion may be necessary to install the culverts. Any dewatering system should be designed by a dewatering contractor and should take the stream surface water flow into consideration.
- Use standard erosion and sediment control measures that meet or exceed OPSS to discharge the abstracted water into the adjacent wetlands, streams or other natural surface water body.

- The quality of the water discharged into the adjacent wetlands, streams or other natural surface water body should meet upstream water quality and/or the Ontario Provincial Water Quality Objectives.

Road Traffic Noise Impact Study

A Road Traffic Noise Impact Study was undertaken for both Part A and Part B roadways in accordance with the provincial guidelines (MOE / MTO Protocol) and the Region and City's Noise Policies. Based on the noise modelling results, a noise barrier/mitigation investigation was completed for eight (8) receptors: mitigation consideration was warranted for two (2) receptors in accordance with the MOE / MTO Protocol, two (2) receptors with both the MOE / MTO Protocol and the Region and City's Noise Policies, and four (4) receptors with Region/City Policies only. Three (3) barrier heights were considered in this investigation: 2.4 m, 3 m and 4 m. As per the noise policies, in order to be warranted, the barrier must achieve a minimum 5 dB reduction at a targeted receptor. An objective level of 55 dBA (16-hour Leq) was also considered as per the MOE / MTO Protocol. The investigation results indicated that none of the barriers with lower heights (e.g., 3 m and 2.4 m) can achieve the 5 dB minimum reduction requirement at the target receptors, except Barrier 7 which is expected to provide 7 dB and 5 dB reductions at receptor RD08 with heights of 3 m and 2.4 m, respectively. However, the mitigated future "build" levels at RD08 under both cases would remain above the MOE / MTO Protocol objective level of 55 dBA by at least 3 dBA. As a result, 5 barriers (each 4 m high) were considered feasible and recommended for implementation. The proposed barrier height may be achieved via a combination of earth berm and barrier. The use of earth berm may also require other considerations such as slope requirement and potential effects on nearby properties and/or development lands. Further investigations to verify the noise wall locations and heights are recommended during the detailed design stage. In addition, as the assessed receptors were identified based on existing conditions, should land uses be updated in the future, the mitigation recommendation may require a re-evaluation.

Monitoring

A monitoring program will be established to ensure that the mitigation measures are undertaken. The key impacts to the environment are the short-term impacts that require monitoring during construction. The construction of this project will be monitored on site by the City to ensure that the Contractor is implementing standard construction practices. This will include erosion and sedimentation control, dust and noise control, protection of existing vegetation, assurance of traffic safety and maintenance of traffic flow without causing unnecessary delays, etc. The overall performance and effectiveness of the environmental mitigating measures specified are to be monitored and assessed during and subsequent to the construction of the project.

The environmental impacts outlined are considered as normal impacts associated with roads construction. The established standard construction practices outlined as the mitigating measures will be incorporated in the contract documents. The Contract Administrator is to ensure that these mitigating measures are undertaken during construction. Should unforeseen environmental concerns and/or issues arise during the construction period, the appropriate ministry and agencies will be contacted, and appropriate measures will be taken to mitigate the environmental concerns / issues.

Commitments to Further Investigations

Commitments to further investigation during the detailed design stage are:

- Utilities coordination and possible sub-surface utility engineering to determine types, location, and depths of the existing and any new facilities;

- Potential utility relocations and/or replacements;
- Detailed stormwater management design and coordination with agencies;
- Landscape design;
- Property acquisition;
- Detailed cost estimate;
- Construction phases / implementation;
- Construction staging & detour;
- Continued consultation with TC Energy and Enbridge Gas will be required during detailed design;
- Continued consultation with York Region Capital Planning and Delivery will be required during detailed design for matching into existing and/or proposed road geometrics of Highway 50 and Major Mackenzie Drive and Countryside Drive and Highway 50;
- Continued consultation with Town of Caledon will be required during detailed design stage for future intersections and/or proposed improvements at Mayfield Road;
- Continued consultation with Peel Region will be required during detailed design, specifically with respect to design at intersections under Regional jurisdiction (e.g., The Gore Rd/E-W Arterial, Mayfield Rd/Clarkway Dr, and Hwy 50/Countryside Dr);
- Further noise assessments required during detailed design to determine noise wall locations and heights; and
- Further geotechnical investigations required during detailed design.

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List of Acronyms

AADT	Annual Average Daily Traffic
AFN	Alderville First Nation
Area 47	Arterial Roads within Highway 427 Industrial Secondary Plan
AT	Active Transportation
Aux	Auxiliary Lane
BRES	Bolton Residential Expansion Study
City	City of Brampton
Class EA	Schedule 'C' Municipal Class Environmental Assessment
CLFN	Curve Lake First Nation
CLI	Stormwater Consolidated Linear Infrastructure
CSA	Canadian Standards Association
CZ	Clear Zone
dB	decibels
dba	A-weighted decibels
DFO	Department of Fisheries and Oceans Canada
e.g.,	Example
EA Act	<i>Environmental Assessment Act</i>
EASR	Environmental Activity and Sector
EB	eastbound
ECA	Environmental Compliance Approval
ESA	Endangered Species Act
ESC	Erosion and Sediment Control
ESR	Environmental Study Report
GGH	Greater Golden Horseshoe
GTA West	Greater Toronto Area Transportation Corridor
GTA	Greater Toronto Area
HFN	Hiawatha First Nation
HIA	Heritage Impact Assessment
HOV	High Occupancy Vehicles
Hwy 427 TMP	Highway 427 Extension Transportation Master Plan
K	Proportion of AADT on a roadway segment or link during the Design Hour, e.g., the hour in which the 30th highest hourly traffic flow of the year takes place.
Km	kilometre
LCFSP	License to Collect Fish for Scientific Purposes

Leq	Equivalent continuous sound pressure level
LID	Low Impact Development
LOS	Level of Service
M	metres
MBCA	Migratory Birds Convention Act
MCM	Ministry of Citizenship and Multiculturalism
MECP	Ministry of the Environment, Conservation and Parks
MESP	Master Environmental Servicing Plan
MNO	Métis Nation of Ontario
MNRF	Ministry of Natural Resources and Forestry
MOE	Ministry of Environment
MSIFN	Mississaugas of Scugog Island First Nation
MTO	Ministry of Transportation
MUP	Multi-Use-Pathway
NB	northbound
NHS	Natural Heritage Systems
OPA	Official Plan Amendment
OPSS	Ontario Provincial Standards and Specifications
OTM	Ontario Traffic Manual
PHT	Peak Hour Traffic
PIC	Public Information Centre
PPS	Provincial Policy Statement
PTTW	Permit to Take Water
Region	Region of Peel
ROW	Right-of-Way
SABE	Settlement Area Boundary Expansion
SAR	Species at Risk
SB	southbound
SP47 TMP	Highway 427 Industrial Secondary Plan Area 47 Transportation Master Plan
SPA	Special Policy Area
TAC	Transportation Association of Canada
TRCA	Toronto and Region Conservation Authority
wsel	Water Service Elevation Level
WSP	WSP E&I Canada Limited
YPBATS	York-Peel Boundary Area Transportation Study
YR	York Region

1.0 Introduction and Background

1.1 Introduction

The City of Brampton (City) has completed a Schedule 'C' Municipal Class Environmental Assessment (Class EA) study for Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47) to consider a wide range of options for transportation improvements to satisfy future capacity needs. This study will consider development and commuter demands with Area 47 through provision of new and expansion of existing, arterial roadways. Due to the complexity of the study area and related roadway improvements, the Class EA is divided into two parts, as illustrated in Figure 1-1; Part 'A' is being undertaken by the Region and Part 'B' is being undertaken by the City of Brampton (City).

The roadways within Part 'A' will be owned and operated by the Region and will include the following:

- Arterial A2 – a new six (6) lane north-south roadway that connects Major Mackenzie Drive to Mayfield Road; and
- Coleraine Drive – an existing roadway which will be widened to four (4) lanes and be upgraded to include curb and gutter and multi-use pathways.

The roadways within Part 'B' will be owned and operated by the City and will include the following:

- Countryside Drive - an existing roadway which will be widened to four (4) lanes and be upgraded to include curb and gutter and multi-use pathways;
- Clarkway Drive – an existing roadway which will have portions widened to four (4) lanes and upgraded to include storm sewers, sidewalks and cycle lanes; and
- East-West Arterial – a new four (4) lane roadway connecting The Gore Road to Arterial A2.

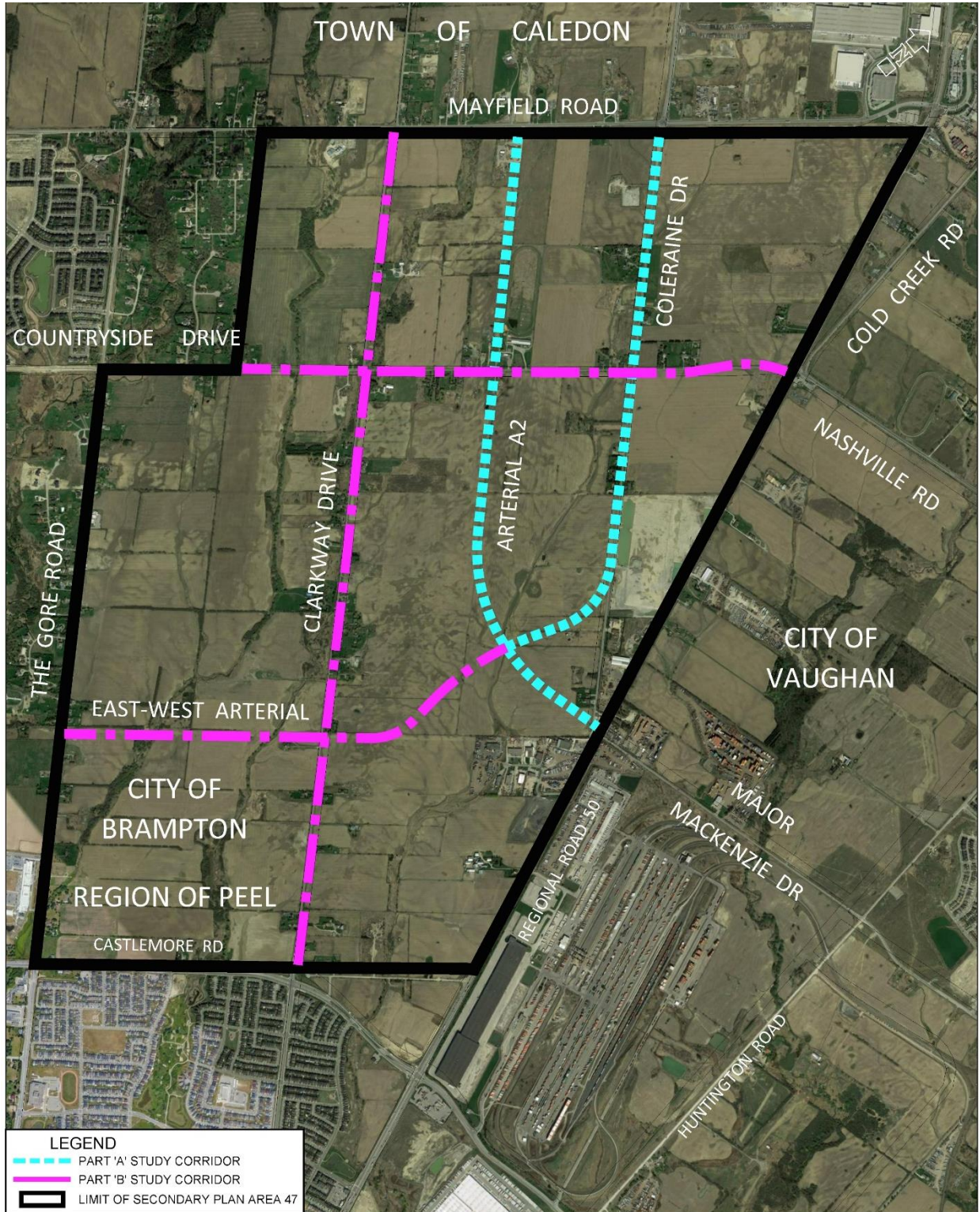


Figure 1-1: Study Area / Key Plan

The City of Brampton is projecting significant growth in Area 47. In order to service this growth, new infrastructure is required to address capacity needs of planned growth and the objectives of protecting established communities and businesses. The study examined the need and feasibility for new roadway(s) and improvements to existing arterials to address short-term and long-term issues related to planned future growth, including operational, geometric, capacity, structural and drainage issues for the horizon year of 2031 and 2041. In order to best address the deficiencies within Area 47, a number of road improvement alternatives are being examined as part of the study, including a future east-west transportation corridor, as well as widening of the roadway, cross-section and intersection improvements. In addition, the impact of such improvements on the social and natural environment will be explored. WSP E&I Canada Limited (Formerly Wood Environment & Infrastructure Solutions), was retained by the Region and City to complete both Part A and Part B studies.

1.2 Environmental Assessment

The Ontario *Environmental Assessment Act* (R.S.O. 1990, c. E.18; EA Act) was put into place to provide for the protection, conservation and wise management of the environment within the province of Ontario. The EA Act applies to all projects being undertaken by provincial, municipal or other public bodies within the province of Ontario (unless explicitly exempted). It defines the environmental assessment works that must be completed prior to commencement of any undertaking, as well as the proponent's duty to consult with all affected and/or interested parties.

No undertaking that falls under the scope of the EA Act is allowed to proceed until such time as the Minister of the Ministry of the Environment, Conservation and Parks (MECP) provides approval of the submitted environmental assessment documentation. This includes resolution of public appeals made in accordance with section 7.2(3) of the EA Act.

1.2.1 Municipal Class Environmental Assessment

The Class EA process is a mechanism by which planning, and approval of municipal infrastructure is provided in an efficient, timely, economical and environmentally responsible manner. It represents a consistent, streamlined and easily understood process for planning and implementing municipal infrastructure projects. Under the EA Act, projects are classified as approved, subject to screening, subject to a Class EA, or subject to a full Environmental Assessment. The Area 47 study is classified as being subject to the Class EA process. It is being conducted according to the requirements outlined in the Municipal Engineers Association document titled *Municipal Class Environmental Assessment (October 2000, as amended in 2007, 2011 & 2015)*.

Consistent with the Class EA, the study approach has been designed to meet the following objectives:

1. Protection of the environment, including natural, social and economic components of the environment.
2. Participation of a broad range of stakeholders in the study process to allow for sharing of ideas, education, testing of creative solutions and developing alternatives.
3. Documentation of the study process in compliance with all phases of the Class EA process.

The Class EA process classifies projects according to their level of complexity and potential environmental impacts. These are termed "Schedules" and are summarized below:

- **Schedules A and A+** includes projects that involve minor modifications to existing facilities. Environmental effects of these projects are generally small; therefore, the projects are considered pre-approved.
- **Schedule B** includes project that involve improvements and minor expansion to existing facilities. There is a potential for some adverse environmental impacts and, therefore, the proponent is required to proceed through a screening process, including consultation with those affected. Schedule B projects are required to proceed through Phases 1, 2 and 5 of the Municipal Class EA process.
- **Schedule C** includes projects that involve construction of new facilities and major expansion of existing facilities. These projects proceed through the environmental assessment planning process outlined in the Municipal Class EA document. These projects are required to fulfill the requirements of all five (5) phases of the Municipal Class EA process.

This study is being completed under the requirements of a Schedule C Municipal Class EA. The following Schedule C trigger, as noted in the Municipal Engineers Association's Municipal Class EA Document (*October 2000, as amended in 2007, 2011 & 2015*), apply to this Project:

- Reconstruction or widening where the reconstructed road or other linear paved facilities (e.g., High Occupancy Vehicles (HOV) lanes) will not be for the same purpose, use, capacity or at the same location (e.g., additional motor vehicle lanes, continuous centre turn lane) (Description 20) and Construction of new roads or other linear paved facilities (e.g. HOV lanes) (Description 21) where the estimated cost is greater than \$2.4 million (*Adjusted for inflation in 2019 to \$2,600,000*).

The following Class EA planning phases apply:

- **Phase 1** – Identify the problem (deficiency) or opportunity.
- **Phase 2** – Identify and evaluate alternative solutions to address the problem or opportunity by taking into consideration the existing environment and establish the preferred solution considering public and review agency input.
- **Phase 3** – Identify Alternative Design Concepts for the preferred solution implementation by taking into consideration the existing environment and establish the preferred design concept by considering public and review agency input.
- **Phase 4** – Document the Environmental Assessment including the design and consultation process in an Environmental Study Report (ESR) for public review.
- **Phase 5** – Complete contract drawings and documents and proceed to construction and operation. Monitor construction for adherence to environmental provisions and commitments. Where special conditions dictate, also monitor the operation of the completed facility.

The Class EA requires notification of, and consultation with, relevant stakeholders. The Project Team have ensured stakeholders are notified early in the planning process and throughout the study. Should stakeholders raise issues that cannot be resolved through discussion, these concerns will be referred to the MECP for resolution. This process is further detailed in Section 1.2.3 and 1.2.4.

A simplified version of the Class EA process for this project is illustrated in Figure 1-2. Requirements of Phases 1 and 2 for the current study were met through completion of the related Transportation Master Plan and Master Environmental Servicing Plan, which is detailed in Section 1.5. Once approved, this Schedule C Class EA will prove that requirements of Phases 3 and 4 of the process was met.

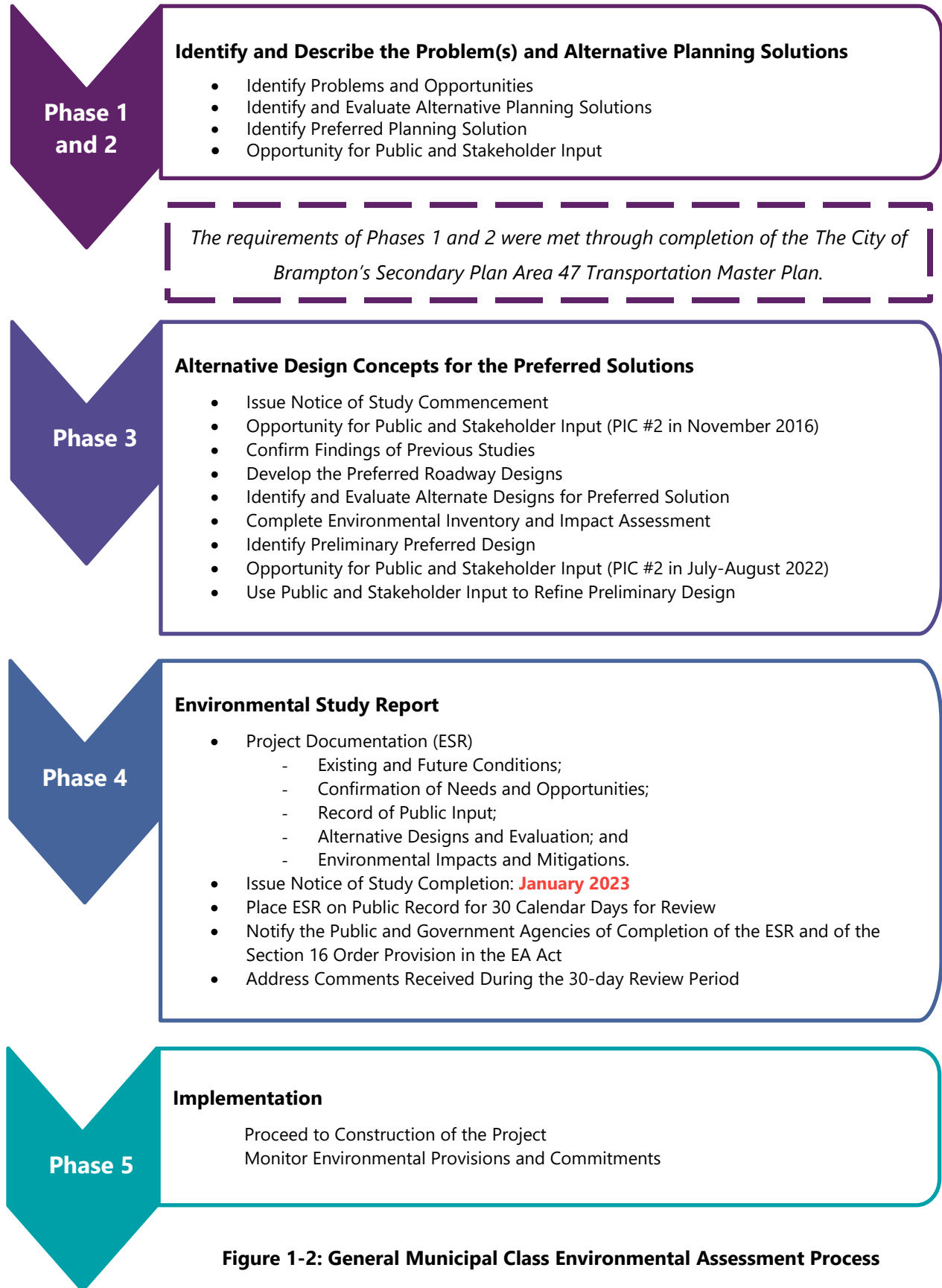


Figure 1-2: General Municipal Class Environmental Assessment Process

1.2.2 Environmental Study Report (ESR)

This ESR documents the rationale for the Project, the background to the Project, existing and future conditions within the study area, the planning, design and consultation process leading to the preferred alternative, anticipated positive and negative impacts and proposed mitigation measures.

1.2.3 Filing of the ESR

All parties having expressed an interest in the study will be notified by letter, regarding the completion of the project and filing of the ESR. In addition, a Notice of Study Completion will be placed in the local newspaper, the *Brampton Guardian*, *Caledon Enterprise* and *Vaughan Citizen* newspapers, in accordance with the requirements of the Class EA process.

The ESR will be available for public review on the project websites (Region and City) for 30 calendar days starting on January 26, 2023 and ending on February 24, 2023.

A review period of no less than thirty (30) days will be provided, during which comments will be received from stakeholders and agencies. If members of the public, interest groups and/or government agencies feel that their concerns have not been addressed through the Class EA study process, a person or party may request the MECP to make an order for the project to comply with Section 16 of the EA Act (referred to as a Section 16 Order). More information on Section 16 Order requests is provide in Section 1.2.4; however, it is anticipated that all concerns will be resolved through discussion between the City and the concerned party(ies).

1.2.4 Section 16 Order Request Process

The Class EA process provides an opportunity for the public and other stakeholders to appeal the Class EA process undertaken by the Project Team. Under the provisions of Section 16 of the amended *EA Act*, there is an opportunity under the Class EA planning process for the Minister to review the status of a project. Members of the public, interest groups and review agencies may request the MECP for an order requiring a higher level of study (e.g., requiring an individual/comprehensive Environmental Assessment 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. The procedure for dealing with concerns that may result in the Minister, by order, requiring the proponent to comply with Section 16 of the *EA Act* is outlined in the Municipal Class EA document. It is anticipated that all concerns will be resolved through discussion between the City and the concerned party(ies).

The 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. Requests should also include the requester contact information and full name for the ministry.

The request should be sent in writing or by email and copy the City of Brampton:

Minister - Ministry of the Environment, Conservation and Parks
777 Bay Street, 5th Floor

Toronto, ON M7A 2J3
minister.mecp@ontario.ca

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

Project Manager – City of Brampton
2 Wellington Street West
Brampton ON, L6Y 4R2
T: 905-874-5909

1.3 Study Organization

The Project Team consists of staff from the City of Brampton, Region of Peel, WSP E&I Canada Limited (Formerly Wood Environment & Infrastructure Solutions), CIMA+, Parish Aquatic Services, McWilliam & Associates and Moon-Matz Ltd. The proponent of the project is the City of Brampton, as follows:

Proponent (Part 'B'):	City of Brampton Project Manager
Co-Proponent (Part 'A'):	Region of Peel Project Manager
Prime Consultant:	WSP E&I Canada Limited (Formerly Wood Environment & Infrastructure Solutions) Project Manager Environmental Planner Structural Engineer Biologist Water Resources Engineer Consultation Lead Archaeologist Cultural Heritage Specialist Geotechnical Engineer Geoscientist Hydrogeologist Acoustics and Vibration Engineer
Sub Consultants:	CIMA+ Matrix Solutions McWilliam & Associates Moon-Matz Ltd.

1.4 Previous Studies and Adjacent Projects

1.4.1 York - Peel Boundary Area Transportation Study (2002)

The York-Peel Boundary Area Transportation Study (2002) was completed to address transportation issues at the southern limit of the York-Peel inter-regional boundary. The study, which involved the cities of Brampton and Vaughan, and the Town of Caledon, identified a long-term (2031) transportation and transit plan. The primary outcome from the study was the identified need to extend Highway 427 north from its current terminus.

1.4.2 The Gore Road Schedule 'C' Class EA (2006)

A Class EA for the widening of The Gore Road from 300 m north of Castlemore Road to 1,000 m north of Mayfield Road was completed by the Region of Peel in 2006. Recommendations from this Class EA included the widening of The Gore Road from two (2) lanes to four (4) lanes from the south study limit to Mayfield Road, with a generally rural cross-section. The future alignment will be shifted west north of Beamish Court to mitigate impacts to St. Patrick's Church and Cemetery and residential homes north of Mayfield Road. The 2019 update to the Region of Peel Long Range Transportation Plan indicates that the intent to widen The Gore Road from four (4) lanes to six (6) lanes between Castlemore Road and Countryside Drive is no longer required and instead corridor improvements are recommended instead.

1.4.3 Region of Peel Highway 427 Extension Transportation Master Plan (2009)

The Region of Peel Highway 427 Extension Transportation Master Plan (Hwy 427 TMP; 2009) built upon the York-Peel Boundary Area Transportation Study and was completed to identify roadway requirements to serve the future needs of the Region in proximity to the future extension of Highway 427. The study area focused on approximately the same area that is covered under this Class EA, with the exception that it considered development north to Healey Road in Caledon and the residential and industrial development in that area.

The Hwy 427 TMP involved updates to traffic forecasts and identified significant inadequacies in the spacing and capacity of east-west arterials and collectors within the study area. In addition to widening of existing arterial roads, a new arterial road, Alternative A2, was recommended. Arterial A2 is to provide an east-west connection between Mayfield Road and Major Mackenzie Drive at Regional Road 50 to accommodate inter-regional traffic between the Regions of Peel and York. With extension of Highway 427 beyond Major Mackenzie Drive, Arterial A2 is to function as a north-south link to accommodate growth in south Bolton.

Issues with intersections of Regional Road 50 and both Countryside Drive and Coleraine Drive were formally identified within the Hwy 427 TMP study. The Region of Peel road grid is offset approximately 30° from that of the Region of York, resulting in poor east-west arterial alignment at intersections along Regional Road 50. Issues at the intersection of Countryside Drive and Regional Road 50 result from a multi-leg approach (Countryside Drive, Regional Road 50, Nashville Road, Cold Creek Road), as well as the aforementioned 30° skew. The intersection of Coleraine Drive and Regional Road 50 / Major Mackenzie Drive is skewed, with Coleraine Drive and Regional Road 50 intersecting at approximately 60°.

1.4.4 Region of Peel Highway 50 and Mayfield Road Schedule 'C' Class EA (2012)

A Schedule 'C' Class EA was completed for the widening of Regional Road 50 between Castlemore Road / Rutherford Road and Mayfield Road / Albion-Vaughn Road in 2012. Recommendations included the widening of Regional Road 50 to six (6) lanes from Castlemore Road to Mayfield Road, provision of right and left turn auxiliary lanes, implementation of transit priority measures, and provision of enhanced pedestrian facilities (including a MUP on the west side). Mayfield Road is also to be widened to four (4) lanes between Coleraine Drive and Regional Road 50, with a roundabout to be constructed at the intersection of Mayfield Road and Pillsworth Road. The detailed designs for these sections of Regional Road 50 and Mayfield Road are currently being completed.

1.4.5 Highway 427 Industrial Secondary Plan Area 47 Transportation Master Plan (2014)

The Highway 427 Industrial Secondary Plan Area 47 Transportation Master Plan (SP47 TMP, 2014) was completed to assess and recommend the transportation infrastructure required to support the full buildout of Secondary Plan Area 47 by 2031. This included recommendations for road widening and realignment of Coleraine Drive, Clarkway Drive, and Countryside Drive; as well as the construction of the new East-West Arterial and Arterial A2 (as identified within the Peel Hwy 427 TMP). Design and construction of these roadways will require coordination between the City and Region as the major arterials fall under regional jurisdiction. The SP47 TMP-recommended roadway concepts are summarized in Table 1-1 and Figure 1-3.

Table 1-1: SP47 TMP-Recommended Arterial and Collector Road Design Criteria

Roadway	Classification	# of Lanes	ROW (m)	Cycling Facilities		Transit Corridor Type
				Off-Road	On-Road	
Arterial A2 (New)	Major Arterial	6	45-50	X		Secondary
Coleraine Drive	Major Arterial	4	36-45	X		Secondary
Clarkway Drive	Castlemore to Collector Road 'C'	4	31.5	X		Community
	Collector Road 'C' to East-West Arterial	2	30	X		Community
	East-West Arterial to Countryside	2	30	X		Secondary
	Countryside to Mayfield	2	36	X		Secondary
Countryside Drive	Minor Arterial	4	36	X		Secondary
East-West Arterial (New)	Minor Arterial	4	36	X		Secondary

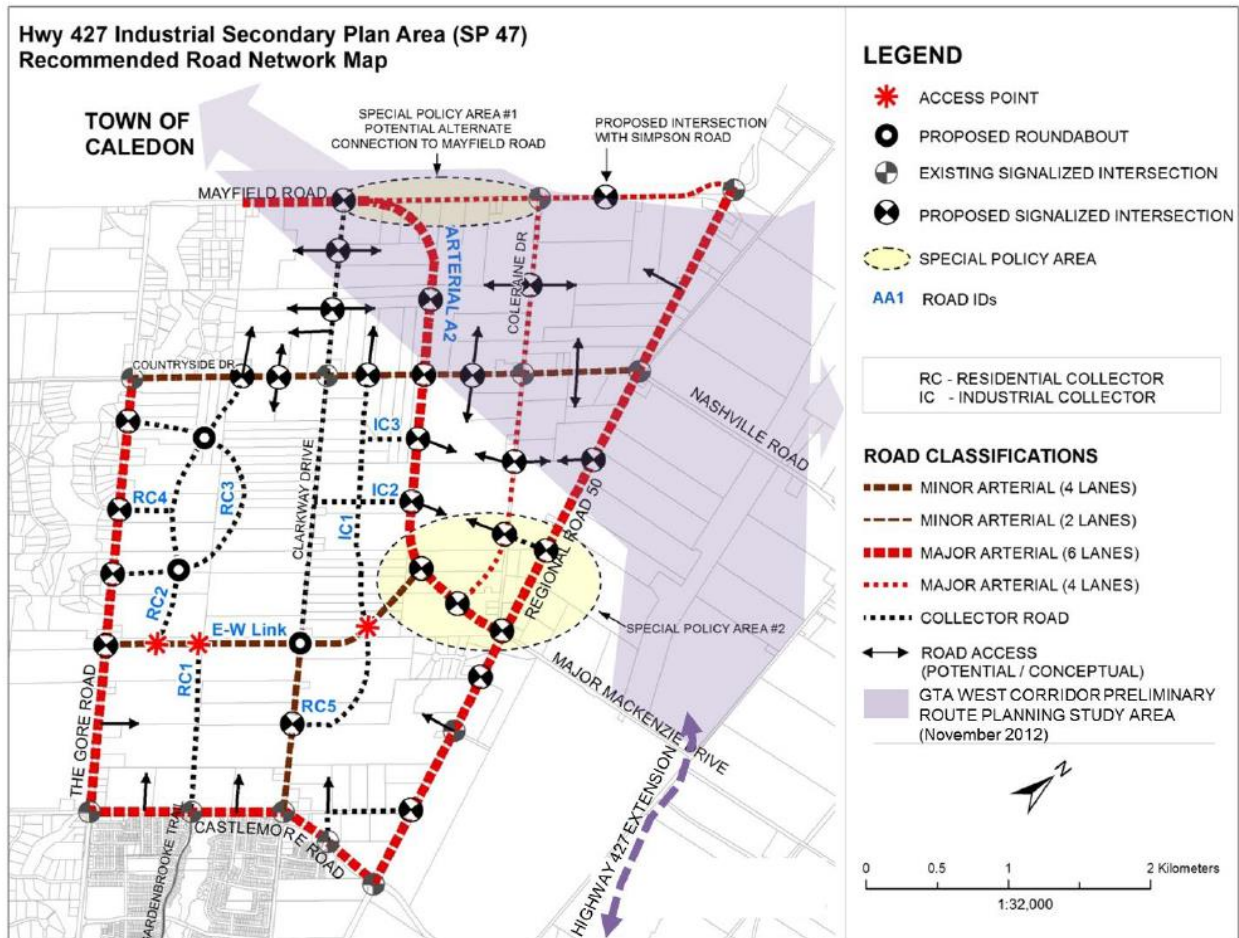


Figure 1-3: SP47 TMP-Recommended Road Network

In addition to the recommended road network, the SP47 TMP provides a set of guidelines that are to shape the planning, design and implementation process. The guiding principles are summarized as follows (HDR, 2014):

- A sustainable and multi-modal transportation network;
- Transportation network planned to minimize impact on the natural and cultural environment;
- Roads designed to consider and accommodate all users: pedestrians, cyclists, transit buses, autos and trucks;
- Integrated transit facility locations with active transportation routes;
- Opportunity for streetscape / landscape enhancements; and
- On-street parking in support of mixed-use, main street areas.

The recommendations made for the East-West Arterial, Clarkway Drive and Countryside Drive are further evaluated and confirmed under this Class EA.

1.4.6 City of Brampton Transportation Master Plan (2015)

The City of Brampton’s Transportation Master Plan (TMP, 2015) was completed to provide a planning vision for implementing the multi-modal transportation system required to support growth within, and adjacent to, the City. Of particular relevance to the current study are infrastructure recommendations, planning horizons and budgets for proposed roadworks. TMP recommended facilities for all roads covered under this Area 47 Class EA include sidewalks on both sides of the roadway; MUP along Arterial A2, Coleraine Drive and East-West Arterial; on-road cycle lanes along Countryside Drive and Clarkway Drive; and infrastructure to support secondary transit corridors. Additionally, Coleraine Drive is identified as a primary regional truck route and both Arterial A2 and East-West Arterial are identified as potential City truck routes. Planning horizons and budgets for the roads covered under this Area 47 Class EA study are provided in Table 1-2.

Table 1-2: Planning Horizon and Budgets for Arterial Roads within Area 47 per Brampton TMP

Roadway		Planning Horizon	Summary of Works	Budget (Millions)
Arterial A2		2021	New four (4) lane roadway between Regional Road 50 and Mayfield Road	\$7.88
Coleraine Drive		2021	Widen to four (4) lanes between Regional Road 50 and Mayfield Road	\$12.44
Clarkway Drive	Castlemore to Countryside	2031	Widen to four (4) lanes	\$16.88
	Countryside to Mayfield	2031	Widen to four (4) lanes	\$9.91
Countryside Drive		2031	Widen to 4 lanes between The Gore Road and RR50	\$23.85
East-West Arterial		2021	New 4 lane roadway between The Gore Road and Arterial A2	\$11.33

1.4.7 Master Environmental Servicing Plan: Highway 427 Industrial Secondary Plan Area and Addendum (2019)

A Master Environmental Servicing Plan (MESP) was prepared for the Highway 427 Industrial Secondary Plan Area in 2016. The plan was completed in two (2) phases: the first established the existing environmental conditions, and the second identified stormwater and natural heritage management strategies related to future development impacts. An addendum to the MESP was released in 2019, focusing on providing an alternative Rainbow Creek restoration and enhancement plan.

1.4.7.1 Existing Environmental Conditions

In addition to cataloguing the existing geology, hydrology, and groundwater at the site, the MESP identified a number of surface water features, wetlands, woodlands, fish and wildlife habitat, and species of flora and fauna.

The MESP identified the need to maintain the following surface water features:

- The Gore Road Tributary;
- Clarkway Tributary;
- Rainbow Creek; and
- Headwater drainage feature three (3) of Clarkway Creek.

The MESP also identified a number of significant flora and fauna within the study area, as well as two (2) unique cultural heritage features. Two (2) Species at Risk (SAR) were identified as having the potential to be present: Bobolink and Barn Swallow. The desire to maintain habitat for endangered and significant flora and fauna species was identified for the following existing features (the location of which are identified in Figure 7.1 of the MESP):

- Three (3) significant woodlots;
- Colonial nesting bird sites;
- Two (2) woodland amphibian breeding ponds; and
- Three (3) dugout agricultural ponds which provide habitat for regionally rare flora.

1.4.7.2 Stormwater and Natural Heritage Management Strategies

The MESP identified a number of impact management strategies to mitigate the effects of development on the natural environment.

Key components of the stormwater management strategy include the following recommendations:

- Use of Low Impact Development (LID) measures for handling stormwater, including the installation of:
 - Bioswales / dry swales;
 - Bioretention systems / rain gardens;
 - Filter (buffer) strips; and
 - Soak away pits/infiltration chambers.
- Provision of stormwater ponds at the end of the drainage network;
- Adequately sized roadway crossing structures over study area streams; and
- Stream restoration and grading works on the Rainbow Creek Tributary.

Additional recommended mitigation measures of particular relevance to the preliminary design phase of the arterial road network include the following:

- Planting of salt-tolerant species along the edges of parking lots and roads to mitigate the effects of salt spray and runoff on existing natural vegetation.
- Ensure consistency with the City of Brampton's Woodlot Edge Management (724) and Woodlot Protection (725) design guidelines.
- Low mast lighting, directed downward or shielded is recommended.
- Road Crossings:
 - As much as possible, future road crossings should make use of existing crossings where they do not conflict with other sensitive features (e.g., significant flora, etc.);
 - Road crossings should avoid significant and/or sensitive aquatic habitat, including riparian wetlands;

- To the extent possible, road crossings should be located within watercourse reaches subject to previous disturbances and/or those where the disturbance or removal of riparian vegetation can be minimized;
- Crossing structures should be perpendicular to the watercourse and should not be placed where the stream meanders;
- Crossing structures should be perpendicular to the valley / watercourse corridor and should not be placed where stability and erosion hazards could be increased;
- If culverts are used, they should be either open-bottomed or embedded a minimum of 20% with material similar to adjacent segments lining the bed; and
- Crossings should be wide enough to allow for small wildlife passage during dry weather flow conditions. A minimum span of two (2) times the bankfull width is recommended.
- East-West linkages:
 - Existing tableland woodland between Gore Road and Clarkway Tributaries (approximately 380 metre (m) south of Countryside Drive) is to be enhanced to ensure continued wildlife movement between corridors (not impacted by proposed arterial road network); and
 - Opportunities for enhancement of wildlife corridor along the existing TransCanada Pipelines Limited lands should be investigated.

1.4.8 Major Mackenzie Drive Construction (2021)

Major Mackenzie Drive was widened to six (6) lanes between Highway 400 and Regional Road 50 through a series of four (4) construction phases – the first three (3) of which were completed in 2016. Phase 4, which includes the segment between the Canadian Pacific Railway tracks and Regional Road 50, was coordinated with extension of Highway 427 from Highway 7 to Major Mackenzie Drive. Work on this section of Major Mackenzie Drive included realignment of the roadway to accommodate an interchange, with construction completed in 2021. In addition to the widening, improvements to the roadway will include provision of sidewalks, a MUP, storm sewers, street lighting and landscaped medians.

1.4.9 Ministry of Transportation Highway 427 Extension (Completed)

The Ministry of Transportation (MTO) completed the extension of Highway 427 from its current terminus at Highway 7 north to Major Mackenzie Drive (a distance of 6.6 kilometre (km)). The extension addresses issues related to the highway's current terminus, access to the Canadian Pacific Rail Vaughan Inter-Modal Terminal (east of Regional Road 50 between Rutherford Road and Major Mackenzie Drive) and inter-regional traffic at the York-Peel boundary. The extended highway will include six (6) lanes north to Rutherford Road and four (4) lanes north to Major Mackenzie Drive, including a free flow ramp for westbound traffic. Protection for a dedicated Transitway, and three (3) transit stations, is provided along the west side of the extension.

Extension of Highway 427 to Major Mackenzie Drive alleviates pressure on Highway 7 but will result in the need for additional westbound capacity through the Area 47 study area. Significant impacts are anticipated at the Major Mackenzie Drive / Regional Road 50 / Coleraine Drive intersection. The new extension officially opened in September 2021.

1.4.10 Greater Toronto Area Transportation Corridor / Highway 413 (Ongoing)

The Greater Toronto Area Transportation Corridor (GTA West) Environmental Assessment study, also known as Highway 413 was initiated in 2007 by the MTO to address anticipated demand for improved

routing and connectivity, greater economic vitality and reduced commute times for the fastest growing urban region in Canada – the Greater Golden Horseshoe (GGH). To partially address the needs of the anticipated growth in the GGH, the GTA West project proposes a new transportation corridor that will feature a new 400 series highway, a Transitway and potential goods movement priority features. The route planning study area locates the east-west transportation corridor primarily south of the greenbelt, from a connection at Highway 400, between Kirby Road and King Road, to a connection at Highway 401 near the Highway 401 / 407 ETR interchange.

Highway 413 will extend from Highway 400, between King Road and Kirby Road, to the 401/407 Express Toll Route interchange near Mississauga, Milton and Halton Hills.

1.4.11 Mayfield Road (Regional Road 14) Schedule 'C' Class EAs

Two (2) Schedule 'C' Class EAs have been completed for the section of Mayfield Road adjacent to the study area: one between Airport Road and Coleraine Drive, and another as part of the Regional Road 50 Class EA summarized in Section 1.4.8. The Class EA completed for the section of Mayfield Road between Airport Road and Coleraine Drive recommends a staged widening to four (4) lanes with a 6.0 m continuous two-way left-turn lane and semi-urban cross-section by 2017, and then further widening to six (6) lanes with a 6.0 m continuous two-way left-turn lane and urban cross-section by 2031. Widening of the Mayfield Road / Coleraine Drive intersection is addressed within the Mayfield Road Class EA; however, widening of the Mayfield Road / Clarkway Drive intersection is not. A 3.0 m wide MUP is to be constructed along the south side of the roadway, adjacent to the study area of Part A and Part B. Widening of the Mayfield Road / Coleraine Drive intersection Class EA was completed prior to commencement of the current Area 47 Class EA.

1.5 Confirmation of Completion of Phases 1 and 2 of Municipal Class Environmental Assessment

In accordance with the Municipal Class Environmental Assessment process, the following tasks are required for completion under Phases 1 and 2 of the process:

- Phase 1:** Identify the problem (deficiency) or opportunity.
- Phase 2:** Identify alternative solutions to address the problem or opportunity by taking into consideration the existing environment and establish the preferred solution taking into account public and review agency input. At this point, determine the appropriate Schedule for the undertaking and document decisions in a Project File for Schedule B projects, or proceed through [Phases 3-5] for Schedule C Projects.

1.5.1 Works Done to Meet the Requirements of Phase 1

The need to provide higher level of service (LOS) and capacity, as well as improved connectivity through Secondary Plan Area 47 – particularly following extension of Highway 427 to Major Mackenzie Drive, has been thoroughly documented in several previously completed studies. These earlier studies include the *Region of Peel Highway 427 Extension Area Transportation Master Plan (2009)*, the *City of Brampton Transportation and Transit Master Plan (2009)* and the *Highway 427 Industrial Secondary Plan Area 47 Transportation Master Plan (2014)*. These studies, particularly the *Region of Peel Highway 427 Extension*

Area Transportation Master Plan, meet the requirements of Phase 1 of the Municipal Class Environmental Assessment process.

1.5.2 Works Done to Meet the Requirements of Phase 2

Phase 2 of the Municipal Class Environmental Assessment process is completed to ensure that due-diligence efforts will be expended to identify alternative solutions that minimize impacts to both the natural and human environments. It is completed through a series of steps, as outlined below:

- Step 1** Identification of alternative solutions to the problem.
- Step 2** Preparation of a physical description of the area where the project is to occur, and a general inventory of the natural, social and economic environments.
- Step 3** Identification of the net positive and negative effects of each of the alternatives developed in Step 1, including potential mitigating measures.
- Step 4** Evaluation of all reasonable alternative solutions identified in Step 1, taking into consideration the environmental and other factors identified in Steps 2 and 3. Identification of the preliminary preferred alternative solution.
- Step 5** Mandatory consultation with review agencies and the public to solicit comment and input.
- Step 6** Selection or confirmation of the preferred solution.

For Industrial Secondary Plan Area 47, Phase 2 of the Municipal Class EA process was completed in conjunction with the *Planning Act*. As such, much of the requirements were addressed during completion of the SP47 TMP. Phase 2 requirements and the associated sections of the SP47 TMP are summarized in Table 1-3.

Table 1-3: Summary of Previous Studies that Addressed the Phase 2 EA Requirements

Required Component	SP47 TMP Reference and Summary of Content / Action
Step 1	Section 5 – Development of Planning Alternatives A total of three (3) planning alternatives were evaluated: Do nothing; As planned in the Brampton Transportation Master Plan; and Increased network connectivity.
Step 2	Section 3 – Existing Conditions The following studies were completed: Master Environmental Servicing Study Cultural Heritage Study
Step 3	Section 6 – Evaluation of Transportation Alternatives The section provides an evaluation of the three (3) alternative solutions in terms of transportation service, environmental policy, natural and cultural environment and economic environment.
Step 4	Section 6 – Evaluation of Transportation Alternatives The section provides an evaluation of the three (3) alternative solutions in terms of transportation service, environmental policy, natural and cultural environment and economic environment.
Step 5	Section 1.6 – Environmental Assessment Process and Consultations

	Consultation was completed through a notice of study commencement, stakeholder workshop and a public open house.
Step 6	Section 7 – Recommended Transportation System Details of the recommended solution are provided. Recommended environmental impact mitigation measures are summarized in the associated Master Environmental Servicing Study.

Since completion of the SP47 TMP, and in support of changes in legislature which reflect the recommendations of the Truth and Reconciliation Commission of Canada, more comprehensive consultation with Canada’s First Nations is required than was previously completed. This additional consultation is included within the scope of the current Class EA study.

1.6 Problem and Opportunity Statement

1.6.1 Problem Being Addressed

The Regions of Peel and York are some of the most rapidly developing areas of the GTA, partially as a result of the planned extension of Highway 427 (to Major Mackenzie Drive by 2017) and the proposed GTA West Transportation Corridor within their boundaries. By 2041, the Region of Peel’s population is projected to grow by 35.3%, while Region of York is expected to grow by 49.1% (Hemson Consulting, 2012). Employment projections follow similar trajectories, with growth in Peel projected at 30.2% and growth in York expected at 46.8% (Hemson Consulting, 2012). To accommodate the expected growth, the Regions, and their constituent municipalities, are actively planning and building a robust transportation network that will serve the anticipated population and employment growth.

The Highway 427 Industrial Secondary Plan Area is strategically located at the York / Peel Boundary and in close proximity to the future convergence point of three (3) of the most important transportation / goods movement corridors within the GGH – Highway 427, GTA West, and the Canadian National (CN) Rail Line. At full buildout, this area will provide housing and employment for almost 50,000 people, as well as essential connections between the major transportation corridors and the municipalities of Brampton, Vaughan and Caledon. Comprehensive planning, design and integration of the Area 47 arterial roads network is essential for efficient inter-regional goods movement and ensuring that regional population and employment growth projections are met.

1.6.2 Problem and Opportunity Statement

Area 47 is projected to be home to an estimated 31,120 residents and support 8,130 jobs by 2041. Additional transportation capacity is required in response to travel demand and mobility needs of future residents, employees and businesses within Area 47.

The Hwy 427 TMP first identified the need to provide enhanced inter-regional connectivity (Arterial A2) and capacity through the study area in response to the extension of Highway 427 to Major Mackenzie Drive. Required operational and safety improvements to the intersections along the York-Peel Regional boundary (Regional Road 50) were also identified by this study. The City of Brampton SP47 TMP further built upon the Regional study, identifying the need for increased east-west connectivity, as well as increased capacity for arterial roads within the study area.

Based on the results of previously completed studies, review of existing field conditions and updated traffic assessment the following problems / opportunities are identified:

- Provide enhanced inter-regional connectivity;
- Provide access to proposed development;
- Address anticipated capacity issues resulting from extension of Highway 427 to Major Mackenzie Drive, as well as development of the study area;
- Improve roadway geometrics to meet or exceed City and Regional standards;
- Provide pedestrian and cycling facilities;
- Improve traffic, pedestrian and cyclist safety;
- Improve intersection safety and operations;
- Improve watercourse crossings to enhance hydraulics, stream function and fisheries and wildlife passage;
- Address structural deficiency; and
- Improve pavement conditions.

2.0 Engagement and Consultation Summary

2.1 Consultation Schedule

The study was initiated in October 2015. Comments received from stakeholders and the written responses from the Project Team are contained in Appendix A and Appendix C. Appendix A-C includes comments received on both Part A and Part B reports of the studies. Due to the overlaps in the studies and interconnected nature of the comments received, Part A comments have been included in the appendix for reference and context purposes. Project consultation milestones follow in Table 2-1.

Table 2-1: Consultation Schedule

Consultation Event	Date
Start-up Meeting with City of Brampton	October 6, 2015
Notice of Commencement published in newspaper (Brampton Guardian, Caledon Enterprise and Vaughan Citizen) and mailed to review agencies and affected public.	Mailed on December 8, 2015 December 10 and 17, 2015
Technical Agency Meeting #1 with Ministry of Natural Resources and Forestry and Toronto and Region Conservation Authority.	January 14, 2016
Municipal Group Meeting #1 City of Vaughan, Ministry of Transportation (Highway 427 Extension), Town of Caledon and Region of York.	February 17, 2016
Municipal Group Meeting #2 City of Vaughan, Ministry of Transportation (Highway 427 Extension), City of Brampton, Town of Caledon and Region of York.	October 24, 2016
Technical Agency Meeting #2 with Hydro One Brampton, Bell Canada and Toronto and Region Conservation Authority.	November 2, 2016
Stakeholder Group Meeting #1.	November 17, 2016
Notice of Public Information Centre #1 advertised in newspaper (Brampton Guardian, Caledon Enterprise and Vaughan Citizen) and mailed to review agencies and affected public.	Mailed on November 7, 2016 December 10 and 17, 2016
Public Information Centre #1.	November 24, 2016
Technical Agency/Municipal Group Meeting #3 with MTO, Toronto and Region Conservation Authority, City of Vaughan and York Region.	December 3, 2021
Technical Agency Meeting #4 with TRCA.	December 13, 2021
Stakeholder Group Meeting #2.	December 14, 2021
Notice of Public Information Centre #2 published in newspaper (Brampton Guardian, Caledon Enterprise and Vaughan Citizen) and mailed to review agencies and affected public.	Mailed on July 28, 2022
Public Information Centre #2.	July 28, 2022 to August 25, 2022
Notice of Completion published in newspapers (Brampton Guardian, Caledon Enterprise and Vaughan Citizen) and mailed to review agencies and affected public.	January 26, 2023

2.1.1 Notice of Study Commencement

A Notice of Study Commencement, detailing the study area, summarizing the objectives of the study and requesting comments, was submitted to relevant property owners, agencies, stakeholders, and organizations by mail on December 8, 2015. In addition, a Notice of Study Commencement was published in the Brampton Guardian, Caledon Enterprise and Vaughan Citizen newspapers on December 10 and 17, 2015, by the City of Brampton. Copies of the newspaper advertisement, as well as letters to stakeholders and agencies, are contained in Appendix A.

2.1.2 Study Mailing List

A Project Mailing List was generated by WSP. Additional contacts were added by request, including through completion of comment forms at public meetings. To respect privacy laws, the mailing list is not provided in the appendix.

2.2 Agency Consultation

2.2.1 Technical Agency Meetings

Members of utility groups, provincial and federal agencies were offered the opportunity to be a participant of the project Technical Agency Committee. Individuals who volunteered to participate met with the Project Team twice throughout the duration of the study to solicit feedback on key aspects of the study. The format of the meetings will consist of presentations and roundtable discussions. Table 2-2 presents the agency representatives invited to the Technical Agency Committee meetings:

Table 2-2: Technical Agency Meeting Participations

Type	Agency
Utilities	TransCanada Pipelines Limited
	Bell Canada Municipal Operations Centre
	Hydro One Networks Inc.
	Enbridge Gas Distribution
	Rogers Communication
	Cogeco Cable Inc.
	Telus Network
Conservation Authorities	Toronto and Region Conservation Authority
Provincial Government	Ministry of Natural Resources and Forestry

2.2.1.1 Technical Agency Meeting #1

The first Technical Agency Meeting was held on January 14, 2016, at the City of Brampton’s Flower City Community Campus. The purpose of the meeting was to introduce the project, provide an overview of the Class EA process and to obtain initial comments from the agencies. Key items discussed included the City of Brampton’s MESP, TMP and SAR. Details of the specific concerns and opportunities discussed in the meeting are recorded in Appendix C.

2.2.1.2 Technical Agency Meeting #2

The second Technical Agency Meeting was held on November 2, 2016, at the City of Brampton's Flower City Community Campus. The purpose of the meeting was to provide a project overview and status, present Public Information Centre #1 presentation information and review agency comments and recommendations. Details of the specific concerns and opportunities discussed in the meeting are recorded in Appendix C.

2.2.2 Municipal Group Meetings

Staff of local municipalities (City of Brampton, City of Vaughan, Region of Peel, Town of Caledon and York Region) were offered the opportunity to be a participant of the project Municipal Group Committee (Municipal Group). Individuals who volunteered to participate met with the Project Team twice throughout the duration of the study to solicit feedback on key aspects of the project. Although not a representative of a local municipality, the MTO offered to participate as a member of the Municipal Group. The format of the meetings will consist of presentations and roundtable discussions.

2.2.2.1 Municipal Group Meeting #1

The first Municipal Group Meeting was held on February 17, 2016, at the City of Brampton's Flower City Community Campus. The purpose of the meeting was to introduce the project, provide an overview of the Class EA process and to receive input from the participants regarding proposed development and transportation plans that may influence Area 47. Key items discussed included adjacent transportation projects, adjacent development, and coordination of design criteria and roadway connections. Details of the specific concerns and opportunities discussed in the meeting are recorded in Appendix C.

2.2.2.2 Municipal Group Meeting #2

The second Municipal Group Meeting was held on October 24, 2016, at the City of Brampton's Flower City Community Campus. The purpose of the meeting was to provide an updated about the study, present the Public Information Centre (PIC) material, including traffic modelling results, proposed alternative alignment and alternative cross-section and provide an update on the 427 extension and GTA West. Details of the specific concerns and opportunities discussed in the meeting are recorded in Appendix C.

2.2.2.3 York Region Consultation

York Region was consulted during this Class EA, primarily regarding the interim at-grade intersection being proposed at Arterial A2 / Regional Road 50. Further details regarding this consultation is included in the Part A ESR.

2.2.2.4 Caledon Consultation

During their review of the Draft ESR for Part A, the Town expressed concerns related to the proposed alignment of Arterial Road A2 at Mayfield Road, specifically regarding how the T-intersection configuration would operate under 2051 conditions. Significant employment and population growth is planned to 2051 for South Bolton, immediately north of the study area, as recently demonstrated through the Town's Bolton Residential Expansion Study (BRES) and the Region's Settlement Area Boundary Expansion (SABE) Study (2022) for the 2051 Official Plan review.

Additional traffic analysis for the A2 and Mayfield Road intersection was completed by CIMA+ based on the latest available land use forecasting data developed for the SABE Study (including BRES), dated September 2021. The results showed that the A2 and Mayfield Road intersection is expected to generally perform at an acceptable level of service by 2051. The Region will confirm these results and recommendations through subsequent stages of this project and its upcoming Transportation Master Plan (TMP), in consultation with the Town. The upcoming TMP will assess the traffic operations at the intersections of Mayfield Road with Humber Station Road, Coleraine Drive, and Arterial Road A2.

2.2.3 Joint Technical Agency and Municipal Group Meeting

A virtual joint Technical Agency and Municipal Group Meeting was held on December 3, 2021. The purpose of the meeting was to:

- Provide an update on the status of the study;
- Provide an overview of the study's schedule moving forward;
- Discuss the process used to evaluate alternatives and arrive at preliminary preferred solutions;
- Detail elements of the preliminarily preferred design; and
- Solicit input on any design concerns ahead of taking the preliminary preferred design to the Stakeholders Group on December 14, 2021.

Table 2-3 presents the agency and municipal group representatives invited to the meeting and their attendance, including the number of attendees in brackets. The meeting invite was sent out on November 30, 2021.

Table 2-3: Agency / Municipal Group Meeting Participations

Type	Agency	Attendance
Utilities	TC Energy	√ (2)
Conservation Authorities	Toronto and Region Conservation Authority	
	Ministry of Natural Resources and Forestry	
Provincial Government	Ministry of Transportation	√ (4)
	Regional Municipality of Peel	√ (14)
Regional	Regional Municipality of York	√ (1)
	City of Vaughan	√ (1)
Municipal	City of Brampton	√ (6)
	Town of Caledon	√ (1)

The format of the meetings will consist of presentations and roundtable discussions. A separate meeting was held specifically with TRCA on December 13, 2021. Details of the specific concerns and opportunities discussed in the meeting are recorded in the Appendix C.

2.2.4 Toronto and Region Conservation Authority (TRCA) Meeting

2.2.4.1 Toronto and Region Conservation Authority Meeting #1

A meeting was held with the TRCA on May 4, 2017, to review the proposed alternatives for Special Policy Area 2 and proposed crossing alternatives for the Rainbow Creek Natural Heritage System (NHS). Details of the specific concerns and opportunities discussed in the meeting are recorded in Appendix C.

2.2.4.2 Toronto and Region Conservation Authority Meeting #2

A meeting was held with the TRCA on May 11, 2017, to introduce the Project, review the hydraulic model for Rainbow Creek, including plans, profiles and cross-sections, review catchment boundaries, drainage areas and impervious coverages for new developments, review rating curves for stormwater ponds within planned developments and review the planned approach and scheduling. Details of the specific concerns and opportunities discussed in the meeting are recorded in Appendix C.

2.2.4.3 Toronto and Region Conservation Authority Meeting #3

A meeting was held with the TRCA on February 14, 2018 to provide a Project update, provide a status update of the MESP Addendum and Hydraulic Model and the Humber River Watershed Model Update, review the level of accuracy associated with use of the currently available models for completion of the Highway 427 Industrial Secondary Plan Area 47 Arterial Roads Class EA, review anticipated timelines for receipt of approved models and timelines for completion of the Class EA. Details of the specific concerns and opportunities discussed in the meeting are recorded in Appendix C.

2.2.4.4 Toronto and Region Conservation Authority Meeting #4

A meeting was held with the TRCA on November 16, 2018, to provide an update on the Block Plans, including the appeal process and timelines. Details of the specific concerns and opportunities discussed in the meeting are recorded in Appendix C.

2.2.4.5 Toronto and Region Conservation Authority Meeting #5

A workshop was organized on April 16, 2019, with TRCA to discuss the Rainbow Creek Crossing and determine the preferred design. The workshop presented an overview of the project and timelines, reviewed the preliminary preferred design solution, discussed any potential design concerns and established the preferred alternative design, with associated principles. Details of the specific concerns and opportunities discussed in the meeting are recorded in Appendix C.

2.2.4.6 Toronto and Region Conservation Authority Meeting #6

A meeting was held with the TRCA on August 15, 2022, to discuss the Gore Road and Clarkway Tributaries, specifically the flood limits and the crossing span recommendations. During the meeting, the Project Team explained that a 35 m span is preferred due to feasibility and cost reasons. It was also discussed that developers have agreed to this span size.

Further consultation will be required with TRCA during detailed design.

2.3 Stakeholder Consultation

2.3.1 Stakeholder Group

Adjacent landowners, businesses owners and developers identified as project stakeholders were offered the opportunity to participate in the project Stakeholder Group. Individuals who volunteered to participate met with the Project Team twice throughout the duration of the project. These meetings were

open to the public and any interested person(s) was invited to attend without identifying themselves as a formal member.

These meetings will provide a smaller forum for discussion and dialogue between the Project Team and stakeholders with specific interests and those that may be directly affected.

2.3.1.1 Stakeholder Group Meeting #1

The Stakeholder Group Meeting #1 was held on November 17, 2016, at the Cardinal Ambrozic Catholic Secondary School. The purpose of the meeting was to present the results of technical studies completed to date, solicit feedback on preliminary alignment alternatives, and identify any design or environmental issues. Details of the specific concerns and opportunities discussed in the meeting are recorded in Appendix C.

2.3.1.2 Stakeholder Group Meeting #2

The virtual Stakeholder Group Meeting #2 was held on November 14, 2021. The purpose of the meeting was to provide an update on the status of the study, provide an overview of the study's schedule moving forward, discuss the process used to evaluate alternative road improvements and arrive at preliminary preferred design, detail elements of the current design and identify issues relevant to the study. Details of the specific concerns and opportunities discussed in the meeting are recorded in Appendix C.

2.3.2 Landowner and Developer Group Meetings

The following meetings were held with interested landowner and developer groups. Details of the specific concerns and opportunities discussed in the meetings are recorded in Appendix A.

- February 7, 2017: Review and discuss comments submitted by Blocks 47-1 and 47-2 Landowners Groups.
- March 11, 2017: Review the proposed alternatives for Special Policy Area 2, including a potential grade-separation of Arterial A2 / Regional Road 50, as well as Special Policy Area 1. Alternative alignments for Countryside Drive at Regional Road 50 were also reviewed.
- September 9, 2019: Review the updated schedule and discuss the feasibility of developer' proposal to advance land development.
- February 7, 2017: Review and discuss comments submitted from the Blocks 47-1 and 47-2 Landowners Groups.
- February 10, 2017: Review and discuss potential alternative alignments and crossings of the Rainbow Creek corridor in Special Policy Area 2.
- October 6, 2017: Review the status of the Block Plans.

2.4 Utilities Consultation

Utility companies were contacted during the Notice of Commencement and invited to participate in the Technical Agency Meeting. The initial email was sent on May 25, 2016, to MTS Allstream, Bell Canada Municipal Operations Centre (Telecon), Cogeco Cable Solutions, Enbridge Gas Distribution Inc., Enbridge Pipelines Inc., Hydro One Brampton, Hydro One Telecom, Rogers, Telus and TransCanada Pipeline. Responses are summarized in Table 2-4.

Table 2-4: Utilities Responses

Utility Company	Response
MTS Allstream	No existing plant within the study area
Bell Canada Municipal Operations Centre (Telecon)	Existing and/or proposed Bell Canada underground plant
Enbridge Gas Distribution Inc.	Existing Enbridge infrastructure within the study area
Enbridge Pipelines Inc.	No existing assets within the study area
Hydro One Brampton	Existing Hydro One Brampton infrastructure within the study area
Hydro One Telecom	No existing plant within the study area Existing overhead on Hydro poles along Castlemore Road, The Gore Road and Mayfield Road
Telus	No existing fibers within the study area
TransCanada Pipeline	Pipeline intersects with East-West Arterial

Based on the responses, there are various utilities present within the study area and further consultation and coordination will be required during detailed design to confirm conflicts and determine any required relocations. Information received from utilities can be found in Appendix C.

2.5 Public Consultation

2.5.1 Public Information Centre #1

The Region and City held a joint Public Information Centre (PIC) for Part A and Part B on November 24, 2016 from 6:30 pm to 8:30 pm at Cardinal Ambrozic Catholic Secondary School, Cafeteria (10 Castle Oaks Crossing, Brampton, ON L6P 3A2). Notification of the PIC was sent to stakeholders, local residents and agencies by mail on November 7, 2016 and advertised in the Brampton Guardian on November 10, 2016. Information was also available on the City’s website – www.brampton.ca/SP47EA

The session included a series of 31 poster boards displayed around the room detailing the progress of the project, initial findings of background studies, alternatives being considered, and next steps in the study. Study Team members were on hand to guide attendees through the information, discuss the study and answer questions. Attendees were encouraged to sign-in and complete a Comment Form. There were 31 attendees that signed into the PIC and five (5) completed comment forms returned. Responses to comments received were prepared and mailed to all recipients. Completed comment forms and responses can be found in Appendix A.

All information presented at the PIC was posted to the City’s project webpage on November 29, 2016, including:

- Notice of PIC # 1 Meeting;
- Comment Forms;
- Display Boards; and
- Constraint and alternative alignment mapping.

Details of this PIC are presented in Appendix A.

2.5.2 Public Information Centre #2

Public Information Centre (PIC) No. 2 was held virtually (on the City's website – [City of Brampton | Roads and Traffic | Arterial Roads within Area 47](#)) from July 28, 2022 to August 25, 2022. Notification of the PIC was sent to stakeholders, interested local residents and agencies by email on July 28, 2022. Refer to Appendix A for a copy of the notice. Information regarding the PIC was also advertised on City of Brampton project website.

The PIC was a 14 minute, 35 second video recording, presenting information related to progress of the project, proposed design, alternative preferred solutions being considered, and next steps in the study. The following additional documents were also posted on the Project website:

- Notice of PIC #2 (2022-07-28);
- PIC #2 Comment Form (closed);
- PIC #2 Display Boards;
- YouTube Video;
- Clarkway Drive - Recommended Cross-Section;
- Countryside Drive - Recommended Cross-Section;
- E-W Arterial - Recommended Cross-Section;
- Detailed Evaluation of Alignments (Clarkway Drive, Countryside Drive, E-W Arterial);
- Clarkway Drive Plan & Profile;
- Countryside Drive Plan & Profile; and
- E-W Arterial Plan & Profile.

Comment Forms were provided to promote the opportunity of providing input / comments by members of the public and agencies. A summary of the comments and responses is included in Appendix A. The public was encouraged to provide feedback on the project by submitting their comments via mail, website or email. All comments were requested to be returned by August 25th, 2022. Four (4) comments were received from the website and seven (7) comments were received via email.

Details of this PIC are presented in Appendix A.

2.6 Indigenous Engagement

Indigenous engagement is a key component of the Class EA process. The MECP delegated the procedural aspects of the duty to consult to the Region of Peel and the City of Brampton in its response to the Notice of Commencement on December 23, 2015. Copies of all Indigenous engagement documents can be found in Appendix B.

2.6.1 Identification of Indigenous Communities

In consultation with the MECP, the City of Brampton sought direction on the identification of Indigenous communities that may have an interest in the study. A list of potentially interested Indigenous Nations was prepared based on knowledge of the area and past projects and provided to the MECP on March 14, 2016. It was confirmed over the phone on March 18, 2016, with MECP that engagement should proceed with the Mississaugas of the Credit First Nation (MCFN; formerly known as Mississaugas of the New Credit First Nation), Six Nations of the Grand River (SNGR), Haudenosaunee Development Institute (HDI), and Métis Nation of Ontario (MNO).

Following understood consultation protocols with these Indigenous groups, WSP shared community-specific letters, a plain language project summary and Notice of Commencement with MCFN, SNGR, HDI, and MNO on March 23, 2016. WSP followed up by phone with each community to determine each community's interest. This included:

- MCFN: March 29, 2016, phone call and arrangement for a meeting for April 20, 2016.
- SNGR: March 29, 2016, phone call and message left; April 1, 2016, phone call and message left with follow-up email; May 26, 2016, phone call where the community identified an interest in being kept informed.
- HDI: March 29, 2016, phone call and message left; March 30, 2016, phone call and arrangement for a meeting on April 18, 2016.
- MNO: March 29, 2016, phone call and message left; April 1, 2016, phone call and message left with follow-up email.

A discussion was held with the MECP's Aboriginal Advisor on March 29, 2016, to discuss additional Indigenous groups that the City identified. MECP identified that the list appears to be a historic list from the Federal government, which does not consider the specific location or technical aspects of the Project. The list was shared by email with the MECP on March 29, 2016. The MECP responded on April 4, 2016, and identified that the additional Indigenous Nations that should be engaged included: Alderville First Nation (AFN), Curve Lake First Nation (CLFN), Hiawatha First Nation (HFN), Mississaugas of Scugog Island First Nation (MSIFN), and Métis Nation of Ontario (including Credit River Métis Council).

Following understood consultation protocols with these Indigenous groups, WSP shared community-specific letters, a plain language project summary and Notice of Commencement with AFN, CLFN, HFN, and MSIFN on April 22, 2016. Following MNO consultation protocols, engagement with Credit River Métis Council was conducted through MNO in the March distribution.

WSP followed up by phone with each community to determine each community's interest. This included:

- AFN: May 26, 2016, phone call during which the community identified that the Project is not within the community's area (traditional territory) and that they do not need to be consulted.
- CLFN: May 4, 2016, phone call during which the community identified that they do not believe they have any specific concerns, but expect to be notified of any archaeological findings, receive copies of archaeological reports, and be notified if changes to the Project occur or if environmental impacts are identified.
- HFN: April 26, 2016, response letter received acknowledging that the study area falls within HFN's Traditional and Treaty Territories; that the Project is deemed to have little, if any impact on their territories; and requested to be contacted in the event of any Project updates, archeological findings, and/or environmental impacts that may occur.
- MSIFN: May 4, 2016, phone call during which the community identified that the Project falls within their Traditional and Treaty Territories; however, they will defer to MCFN regarding archaeology and expressed interest in the potential impacts to the environment, and as such would like to be kept informed.

2.6.1.1 Mississaugas of the Credit First Nation

WSP contacted MCFN on March 23, 2016, by email to share a letter, Project Summary and the Notice of Commencement. WSP followed up with MCFN by phone on March 29, 2016, during which a meeting date

of April 20, 2016, was proposed to further discuss the potential implications of the Project. This meeting was later postponed until April 28, 2016.

During the April 28, 2016, meeting, the City and WSP shared details about the Project. MCFN requested that two (2) of their Field Liaison Representatives to be on location whenever fieldwork is taking place within its traditional territory.

MCFN shared a copy of their draft agreement for inclusion of Field Liaison Representatives with the City on April 29, 2016. The City reviewed the agreement and an agreement for inclusion of Field Liaison Representatives was reached on September 12, 2016.

On January 24, 2017, MCFN contacted the City to request a meeting. WSP followed up with MCFN by phone on January 26, 2017. On February 2, 2017, WSP shared information about the current status of the Project, including a link to the PIC No. 1 boards as well as the meeting notes from the April 2016 meeting.

WSP contacted MCFN on December 16, 2021, and followed-up on January 27, 2022 to provide an update on the Study, a summary of consultation completed to date and the archaeology reports completed to date.

WSP contacted MCFN on July 28, 2022 to share information related to PIC No.2. MCFN identified no comments or concerns on the PIC No.2 material. Further consultation will occur with MCFN during detailed design.

2.6.1.2 Six Nations of the Grand River

WSP contacted SNGR on March 23, 2016, by email to share a letter, Project Summary and the Notice of Commencement. WSP followed up with SNGR by phone on March 29 and April 1, 2016, and by email on April 1, 2016.

WSP reached out again on May 26, 2016 and discussed the Project. As a follow-up to that discussion, WSP sent an email to confirm the discussion that SNGR wish to be kept informed, requested copies of Stage 1 Archaeological Assessment and asked for advanced notice of any further archaeological work (Stage 2 and higher).

WSP contacted SNGR on December 16, 2021, and followed-up on January 27, 2022, to provide an update on the Study, a summary of consultation completed to date and the archaeology reports completed to date. SNGR responded on January 28, 2022, noting no issues with the archaeology studies, however identified interest in the overall project.

WSP contacted SNGR on July 28, 2022 to share information related to PIC No.2. Further consultation will occur with SNGR during detailed design.

2.6.1.3 Haudenosaunee Development Institute

WSP contacted HDI on March 23, 2016 by email to share a letter, Project Summary and the Notice of Commencement. Meetings with HDI were held on April 18, 2016, with the City of Brampton and April 26, 2016 with Peel Region. On April 19, 2016, HDI sent WSP an application for Consideration and Engagement for Development. After this was signed, WSP sent HDI the Environmental and Archaeological Monitors Agreement on September 12, 2016. In January, HDI proposed some additional conditions to the

document which the City of Brampton agreed to. A new agreement was drafted and signed by HDI on May 11, 2017.

WSP contacted HDI on December 16, 2021, to provide an update on the Study, a summary of consultation completed to date and the archaeology reports completed to date. HDI responded on January 7, 2022, accepting the invitation for a site visit, providing the monitoring agreement for the next phase and identifying interest in minimal weekly inspection visits to observe Erosion and Sediment Control (ESC) measures, vegetation removal, work near watercourses, and any wildlife sweeps that may occur. The Project Team and HDI agreed to have a meeting to discuss HDI's interests. This meeting occurred on February 3, 2022, and minutes were provided on February 16, 2022. It was agreed upon during the meeting to conduct the site visit during detailed design and construction, and document HDI's interests as commitments in the ESR. HDI also requested funding for the review of the ESR and HDI forwarded the application to review to the Project Team on February 8, 2022. The City identified that a new agreement will not be signed at this time and instead requested HDI to provide a list of reports that they are interested in reviewing and associated fees. On February 24, 2022, HDI requested a copy of the original agreement to review and understand if it is applicable to Municipal Class EAs.

WSP contacted HDI on July 28, 2022 to share information related to PIC No.2. Further consultation will occur with HDI during detailed design.

2.6.1.4 Curve Lake First Nation

WSP contacted CLFN on April 22, 2016, by email to share a letter, Project Summary and the Notice of Commencement. WSP reached out by phone on May 4, 2016, and was informed that CLFN had not received the email. Information was shared over the phone and CLFN identified that they do not believe they have any specific concerns. CLFN notes a letter would be forthcoming but that their expectations are to be notified of any archaeological findings as well as sharing of archaeological reports. They also requested to be notified if changes to the project occur or if environmental impacts are identified. As part of the Part A Draft ESR circulation, CLFN noted on June 9, 2022 that the project is located outside of the Williams Treaty First Nations territory, and as such falls outside the scope of the consultation requirements. CLFN recommended consulting the appropriate rights holders in the project area.

2.6.1.5 Hiawatha First Nation

WSP contacted HFN on April 22, 2016, by email to share a letter, Project Summary and the Notice of Commencement. A response was received on April 26, 2016, acknowledging that the study area falls within HFN's Traditional and Treaty Territories. They also recognized that the proposed project is deemed to have little, if any impact on their territories. HFN requested to be contacted in the event of any project updates, archeological findings, and/or environmental impacts that may occur. If archeological artifacts are found during the process, HFN requires a trained archeological liaison to be present at the site and a report forwarded to them once completed. In addition, any maps pertaining to the project should be forwarded to HFN in a shape file.

WSP contacted HFN on July 28, 2022 to share information related to PIC No.2. Further consultation will occur with HFN during detailed design.

2.6.1.6 Mississaugas of Scugog Island First Nation

WSP contacted MSIFN on April 22, 2016, by email to share a letter, Project Summary and the Notice of Commencement. On May 4, 2016, WSP reached out by phone and left a message for MSIFN. A response was received on May 17, 2016, acknowledging that the study area falls within MSIFN's Traditional and Treaty Territories; however, they will defer to MCFN regarding archaeology and expressed interest in the potential impacts to the environment. MSIFN would like to be kept updated regarding potential environmental impacts to the area. WSP followed up with MSIFN on May 26, 2016, by email to acknowledge receipt of the MSIFN interests.

WSP contacted MSIFN on July 28, 2022 to share information related to PIC No.2. Further consultation will occur with MSIFN during detailed design.

3.0 Existing and Future Conditions

3.1 Study Area

The study area for this Class EA is the Highway 427 Industrial Secondary Plan Area located within the City of Brampton, in the Regional Municipality of Peel. Immediately north of Mayfield Road is the Town of Caledon. The City of Vaughan and Regional Municipality of York are located on the east side of Regional Road 50. The Class EA area of focus includes Countryside Drive, Clarkway Drive and East-West Arterial (ref. Figure 1-1: Study Area / Key Plan).

3.2 Socio-Economic Environment

The following sections provide a summary of the existing and planned land use within the study area.

3.2.1 Population and Employment

While Secondary Plan Area 47 currently hosts less than 100 households and 300 jobs, development plans for the area will significantly change this condition over the next 25 years. Population and employment forecasts for Area 47, as well as Brampton as a whole, are summarized in Table 3-1 below.

Table 3-1: Area 47 and the City of Brampton Population and Employment Forecasts to 2041

Horizon Year	Population Forecasts		Employment Forecasts	
	Area 47	Brampton	Area 47	Brampton
2021	360	698,200	90	210,500
2031	31,030	863,720	7,640	276,430
2041	31,120	930,730	8,130	314,910

The City’s Area 47 TMP (2014) identifies 2010 residents and 400 jobs within Area 47, and that the population of this area will reach full build out in approximately 2031 with 31,030 persons and 7,640 jobs.

3.2.2 Existing Land Use

Within the study area, the land use is primarily agricultural and rural residential with some industrial and commercial land use concentrated at the intersection of Coleraine Drive, Regional Road 50 and Major Mackenzie Drive. South and west of the study area, land use is predominately residential with many open space areas associated with Rainbow Creek, the Clarkway and Gore Road tributaries, and the West Humber River. Land use north and east of the study area is predominately agricultural and rural residential. Light industrial / commercial land use fronts Mayfield Road between Coleraine Drive and Regional Road 50 and the Canadian National Railway rail yard is located immediately east of Regional Road 50 between Major Mackenzie Drive and Castlemore Road.

Within the study area, the existing land use contiguous to the proposed East-West Arterial, Clarkway Drive and Countryside Drive is primarily rural. The proposed intersection of East-West Arterial with Arterial A2 is immediately northwest of the industrial and commercial land use concentrated at the intersection of Coleraine Drive, Regional Road 50 and Major Mackenzie Drive.

3.2.3 Existing Land Use Designation

The City of Brampton's 2006 Official Plan September 2015 Office Consolidation (Schedule A) designates general land use within the study area. The study area is identified as a Special Study Area and Corridor Protection Area, with lands designated as industrial and residential east and west of Clarkway Drive, respectively, and open space along the tributaries traversing the study area. The 2015 City's Official Plan identifies a significant increase in population and employment over the next 15 years (planning horizon of 2031).

Schedule B and B1 of the City's 2015 Official Plan consolidation classifies East-West Arterial from The Gore Road to Arterial A2, Clarkway Drive from Castlemore Road to Mayfield Road, and Countryside Drive from west of Clarkway Drive to Regional Road 50 as minor arterial roads with a 36 m right-of-way (ROW).

3.2.4 Future Land Use

Future land use within Area 47 was proposed by the City of Brampton through an Official Plan Amendment (OPA) for Area 47. Land use within the study area was proposed based on planning studies undertaken for the Highway 427 Industrial Secondary Planning Area (Area 47) (e.g., Retail and Institutional Land Use Study 2012 and Employment Maximization Study 2012). The network of arterial and collector roads identified builds upon the City's Transportation and Transit Master Plan, the joint municipal Peel-Highway 427 Extension Area Transportation Master Plan Study and analysis undertaken as part of the Area 47 Transportation Master Plan and is generally consistent with the Growth Plan Conformity Amendment (OPA 43).

The proposed land use of the amendment for the Highway 427 Industrial Secondary Plan Area refines the official plan and contains the level of detail that is generally representative of a secondary plan land use schedule. The land use designations proposed within the OPA include:

- Residential (low, medium, executive);
- Employment;
- Commercial;
- Institutional;
- Natural Heritage System; and
- Recreational Open Space and other.

The land use identifies the proposed East-West Arterial within residential designated lands. Low to medium density housing is proposed south of East-West Arterial and primarily low-density housing is proposed north of the roadway. Prestige industrial employment lands are shown north of the East-West Arterial where the roadway is proposed to intersect Arterial A2. Proposed land use adjacent to Clarkway Drive is primarily low-density housing and valley land where the roadway intersects / parallels the Clarkway Tributary. The southernmost portion of Clarkway Drive is the proposed Clarkway Drive Mixed Use (Residential / Retail) Collector Road 'C'. Countryside Drive traverses multiple proposed land uses, including executive and low density residential, valley lands of three (3) tributaries, and prestige industrial, business park and logistic warehouse/transportation employment designated land uses.

Further land use refinements will be necessary for consistency with other road projects identified (e.g., limit of the Corridor Protection Area for the GTA West Corridor). Land use compatibility has been undertaken by the City and documented in the 2015 Highway 427 Industrial Secondary Plan Area

Community Design Framework Document for the purpose of informing the future block plan review process.

3.2.4.1 Proposed Development Plans

Several developments are proposed within the study area and are currently under review by the City of Brampton Planning and Development department. All of these developments fall under Block Plan 47-1, 47-2 and 47-3.

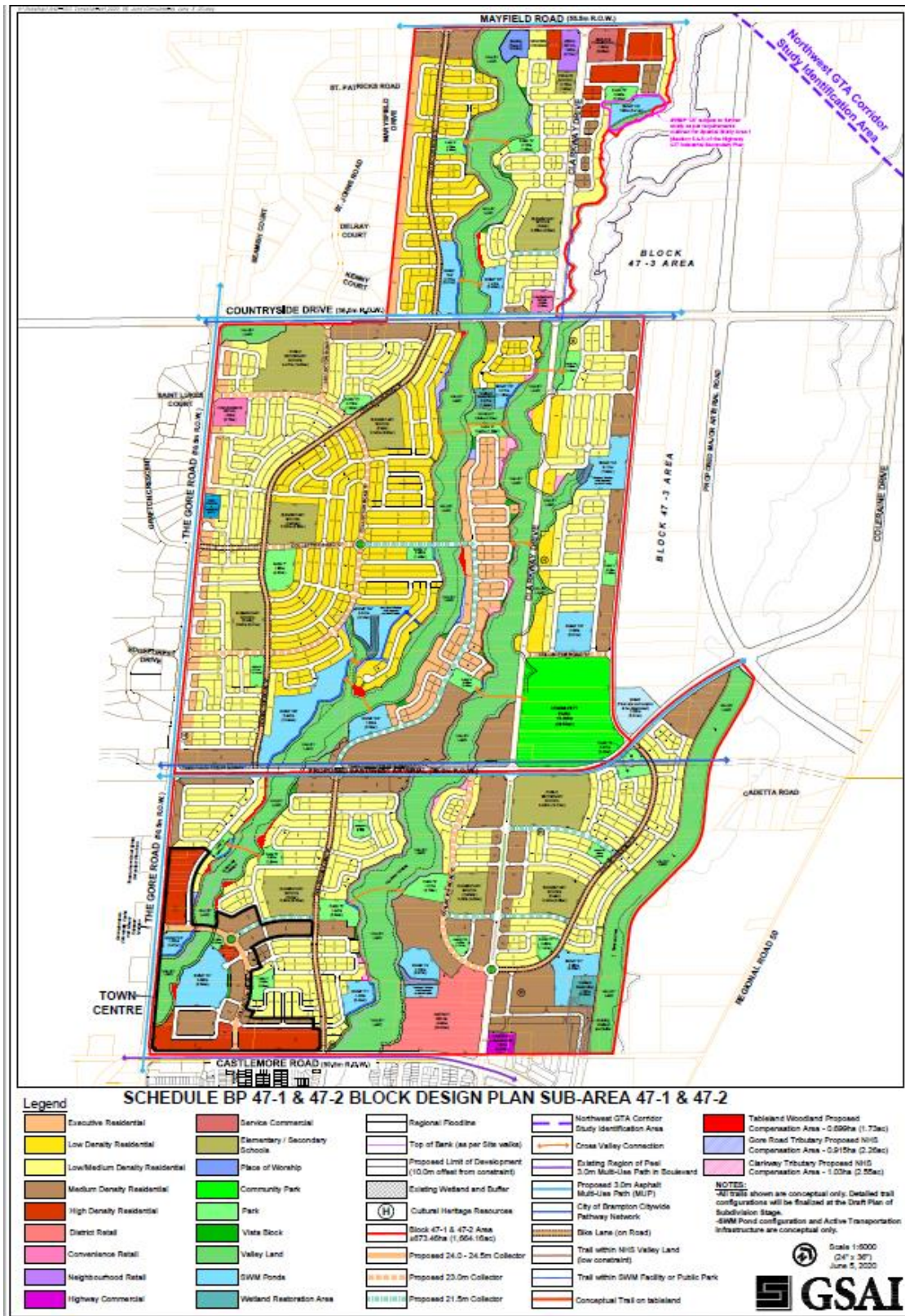


Figure 3-1: 47-1 and 47-2 Block Design Plan

3.3 Land Use Planning Initiatives

The following provincial planning documents were reviewed to determine their applicability to the study area:

- Provincial Policy Statement (2020);
- The Growth Plan for the Greater Golden Horseshoe (2020); and
- Region of Peel (2021) and City of Brampton Official Plans (2015).

These policies were reviewed to ensure the study is in line with the policies contained within them.

3.3.1 Provincial Policy Statement (2020)

The Provincial Policy Statement (PPS) provides for appropriate development while protecting resources of provincial interest, public health and safety, and the quality of the natural and built environment. The PPS supports improved land use planning and management, which contributes to a more effective and efficient land use planning system. Relevant policies from the PPS that support potential improvements to Area 47 is identified in Table 3-2.

Table 3-2: Policies from the Provincial Policy Statement Relevant to the Study

Section	Policies Relevant to the Study
Section 1.1	
Subsection 1.1.1	<p>"Healthy, livable and safe communities are sustained by:</p> <ul style="list-style-type: none"> f. Improving accessibility for persons with disabilities and older persons by addressing land use barriers which restrict their full participation in society. g. Ensuring that necessary infrastructure public service facilities are or will be available to meet current and projected needs. h. Promoting development and land use patterns that conserve biodiversity and i. Preparing for the regional and local impacts of a changing climate."
Section 1.6 - Infrastructure and Public Service Facilities	
Subsection 1.6.1	"Infrastructure and public service facilities shall be provided in an efficient manner that prepares for the impacts of a changing climate while accommodating projected needs."
Subsection 1.6.1	<p>"Planning for infrastructure and public service facilities shall be coordinated and integrated with land use planning so that they are:</p> <ul style="list-style-type: none"> a. Financially viable over their life cycle, which may be demonstrated through asset management planning; and, b. Available to meet current and projected needs."
Subsection 1.6.2	"Planning authorities should promote green infrastructure to complement infrastructure."
Subsection 1.6.3	<p>"Before consideration is given to developing new infrastructure and public service facilities:</p> <ul style="list-style-type: none"> a. The use of existing infrastructure and public service facilities should be optimized; and, b. Opportunities for adaptive re-use should be considered, wherever feasible."
Subsection 1.6.4	"Infrastructure and public service facilities should be strategically located to support the effective and efficient delivery of emergency management services, and to ensure the protection of public health and safety in accordance with the policies in Section 3.0: Protecting Public Health and Safety."
Subsection 1.6.5	"Public service facilities should be co-located in community hubs, where appropriate, to promote cost-effectiveness and facilitate service integration, access to transit and active transportation."
Section 1.6.7 - Transportation Systems	
Subsection 1.6.7.1	"Transportation systems should be provided which are safe, energy efficient, facilitate the movement of people and goods, and are appropriate to address projected needs."

Section	Policies Relevant to the Study
Subsection 1.6.7.2	“Efficient use shall be made of existing and planned infrastructure, including through the use of transportation demand management strategies, where feasible.”
Subsection 1.6.7.3	“As part of a multimodal transportation system, connectivity within and among transportation systems and modes should be maintained and, where possible, improved including connections which cross jurisdictional boundaries.”
Subsection 1.6.7.4	“A land use pattern, density and mix of uses should be promoted that minimize the length and number of vehicle trips and support current and future use of transit and active transportation.”
Section 1.6.8 Transportation and Infrastructure Corridors	
Subsection 1.6.8.1	“Planning authorities shall plan for and protect corridors and rights-of-way for infrastructure, including transportation, transit and electricity generation facilities and transmission systems to meet current and projected needs.”
Subsection 1.6.8.2	“Major goods movement facilities and corridors shall be protected for the long term.”
Subsection 1.6.8.3	“Planning authorities shall not permit development in planned corridors that could preclude or negatively affect the use of the corridor for the purpose(s) for which it was identified.” “New development proposed on adjacent lands to existing or planned corridors and transportation facilities should be compatible with, and supportive of, the long-term purposes of the corridor and should be designed to avoid, mitigate or minimize negative impacts on and from the corridor and transportation facilities.”

The proposed improvements discussed in this report are consistent with policies included in the PPS.

3.3.2 A Place to Grow: Growth Plan for the Greater Golden Horseshoe (2020)

The A Place to Grow: Growth Plan for the Greater Golden Horseshoe was prepared and approved under the *Places to Grow Act, 2005* and replaces the Growth Plan for the Greater Golden Horseshoe, 2017. The Plan provides a framework for implementing Ontario’s vision for building stronger, prosperous communities by managing growth in the region and provides a long-term framework for where and how the region will grow. The Growth Plan envisions an integrated transportation network which will allow people to easily travel within and between urban centres throughout the region. Automobiles are anticipated to be one of a variety of effective choices for transportation, along with transit and active transportation, in order to create an efficient urban transportation system.

3.3.3 Region of Peel Official Plan (Office Consolidation 2021)

The Regional Official Plan provides direction to the Region of Peel in terms of land use policies, sustainable development framework and long-term regional strategic policy framework for growth. The goals of the plan are the following:

- “To create healthy and sustainable regional communities for those living and working in Peel which is characterized by physical, mental, economic and social well-being; minimized crime, hunger and homelessness; a recognition and preservation of the region’s natural and cultural heritage; and an emphasis on the importance of Peel’s future as a caring community”;
- “To recognize, respect, preserve, restore and enhance the importance of ecosystem features, functions and linkages, and enhance the environmental well-being of air, water, land resources and living organisms”;

- “To recognize the importance of a vital, competitive and diverse economy and a sound tax base, and manage and stage growth and development in accordance with the financial goals and overall fiscal sustainability of the Region”; and
- “To support growth and development which takes place in a sustainable manner, and which integrates the environmental, social, economic and cultural responsibilities of the Region and the Province”.

The study is consistent with the Region of Peel Official Plan as the road improvements will not be occurring in a key natural heritage feature area or hydrologically sensitive area. The improvements will also protect any existing natural features and will not negatively impact the environment. The road improvements are undertaken in order to support future growth and development within the Region of Peel, which will ultimately contribute to a competitive and diverse economy.

3.3.4 2006 City of Brampton Official Plan (Office Consolidation 2015)

The City of Brampton Official Plan provides direction for land use, development and infrastructure decisions for issues such as land use, built form, transportation and the environment.

The Official Plan sets out the following objectives for the transportation system:

- “a) To develop a balanced, integrated and accessible multi-modal transportation system which provides for the safe, economic and efficient movement of people, including persons with disabilities, as well as goods and services”;
- “b) To ensure the provision of adequate and accessible road, transit, pedestrian and bicycle links within Brampton and between Brampton and adjacent municipalities”;
- “c) To promote the development of an efficient transportation system and land use patterns that foster strong live-work relationships and encourage greater use of public transit”;
- “d) To promote a high standard of environmental management and aesthetic quality in the routing, design and construction of transportation and associated structures, including green infrastructure and stormwater management practices in the right-of-way of new and retrofitted existing roads”; and,
- “e) To work cooperatively with the Region of Peel, neighbouring municipalities and other regional municipalities, the Province and its agencies (e.g. Metrolinx) to develop an integrated transportation plan”.

Relevant policies:

- 4.5.1.7: “The City shall undertake new road construction and road improvements and widening with regard to environmental health, including conserving natural heritage features and linkages, and avoiding, minimizing and mitigating impacts to natural areas and functions.”
- 4.5.1.8: “The City shall undertake new road construction and road improvements and widening with regard to human health by incorporating opportunities for active transportation including cycling and walking.”

The study is consistent with the City of Brampton Official Plan as the road improvements are in align with the objectives and the relevant policies. The study takes into account natural heritage features, with consideration to avoid or mitigate impact on natural areas and provide appropriate stormwater management features. The study also provides opportunities for active transportation, through the

inclusion of a MUP. Overall, the road improvements proposed will aid in creating an efficient transportation system within the City of Brampton.

3.4 Transportation and Traffic

The following sections outline the existing transportation network within the study area. Further details can be found in Appendix D.

3.4.1 Existing Roadway Network

Roads within Area 47 currently consist of a network of Region of Peel urban arterials (at the boundaries) and City of Brampton rural collectors (within the study area).

Regional roads include: Regional Road 14 - Mayfield Road (north boundary), Regional Road 50 (east boundary), and Regional Road 8 – The Gore Road (west boundary). Regional Road 73 – Castlemore Road (south boundary) is currently under the jurisdiction of the City of Brampton. All of these roadways have been the subject of recent Schedule 'C' Class EAs related to road widening. The remaining roads within the study area currently fall under the jurisdiction of the City of Brampton, and are the subject of the current EA. They are described in more detail below.

3.4.1.1 Countryside Drive

Countryside Drive is a two-lane roadway with a rural cross-section that runs from west of The Gore Road to the intersection of Regional Road 50 / Nashville Road in the east. Existing lane widths range from 3.4 m to 3.6 m, with narrow gravel shoulders. The posted speed limit is 70 km/h.

Identified issues include: a poorly aligned intersection with Regional Road 50 / Nashville Road, lack of AODA-compliant pedestrian facilities, some non-recoverable side-slopes, and issues with sight distances, grades and roadside safety at the intersection with Clarkway Drive.



Figure 3-2: Countryside Drive, East of Clarkway Drive

3.4.1.2 Clarkway Drive

Within the study area, Clarkway Drive is a two-lane roadway with a rural cross section that runs from north of Mayfield Road to south of Castlemore Road. Existing lane widths range from 3.1 m to 3.8 m with narrow gravel shoulders. The posted speed limit is 70 km/h.

Identified issues include: lack of AODA-compliant pedestrian facilities, some non-recoverable side-slopes, and issues with sight distances, grades and roadside safety at the intersection with Countryside Drive, and close proximity of Clarkway Tributary to the existing road alignment (Figure 3-3).



Figure 3-3: Clarkway Drive and Clarkway Tributary

3.4.2 Existing Active Transportation and Public Transit

There are currently no active transportation facilities or transit routes operating on the roadways covered under this study. Some parts of the study area include a gravel shoulder.

The following routes operate along the perimeter of the study area:

- Route 36 (Queen Street East, Gardenbrooke Trail, Squire Ellis Drive) runs along The Gore Road;
- Route 35 (Queen Street East, Castlemore Road, Brampton Civic Hospital) along Castlemore Road and a small part of the Gore Road; and
- Route 50 (Humber College, The Gore Road, Gore Meadows Community Centre) runs along Castlemore Road and a small part of the Gore Road.

Provision of transportation facilities that support all users through increased modal share and active transportation were identified as key components of both Brampton's TMP Update (2015) and the Highway 427 Industrial Secondary Plan TMP.

On-road cycling facilities are recommended for Clarkway Drive and Countryside Drive. Off-road multi-use pathway facilities are recommended for the East-West Arterial (HDR, 2014). The suitability for on-road cycling facilities will be evaluated as part of the current study. In accordance with regional and city standards, sidewalks are to be constructed where MUP are not also offered. Cycling and pedestrian facilities are to provide both active transportation and connectivity to the TMP recommended transit facilities. Cycling facility types and routing as proposed in the Highway 427 Industrial Secondary Plan TMP are illustrated in Figure 3-4.

All arterial roadways covered under the current study are to support Secondary Corridor transit services. It is anticipated that Community GO Shuttle service will also operate on the East-West Arterial, Arterial A2 south of East-West Arterial, and Clarkway Drive north of Countryside Drive. Transit facility types and routing as proposed in the Area 47 TMP are illustrated in Figure 3-5. It should be noted that the headways identified in the exhibit may change in future.

The actual transit service design for the community, including service levels to be provided, will be further refined through Brampton Transit's long range strategic planning process, and the Annual Transit Service Plan process. The timing of implementation of services in the development will be dependent on the pace of development and the completion of the necessary infrastructure required to support regular transit operations.

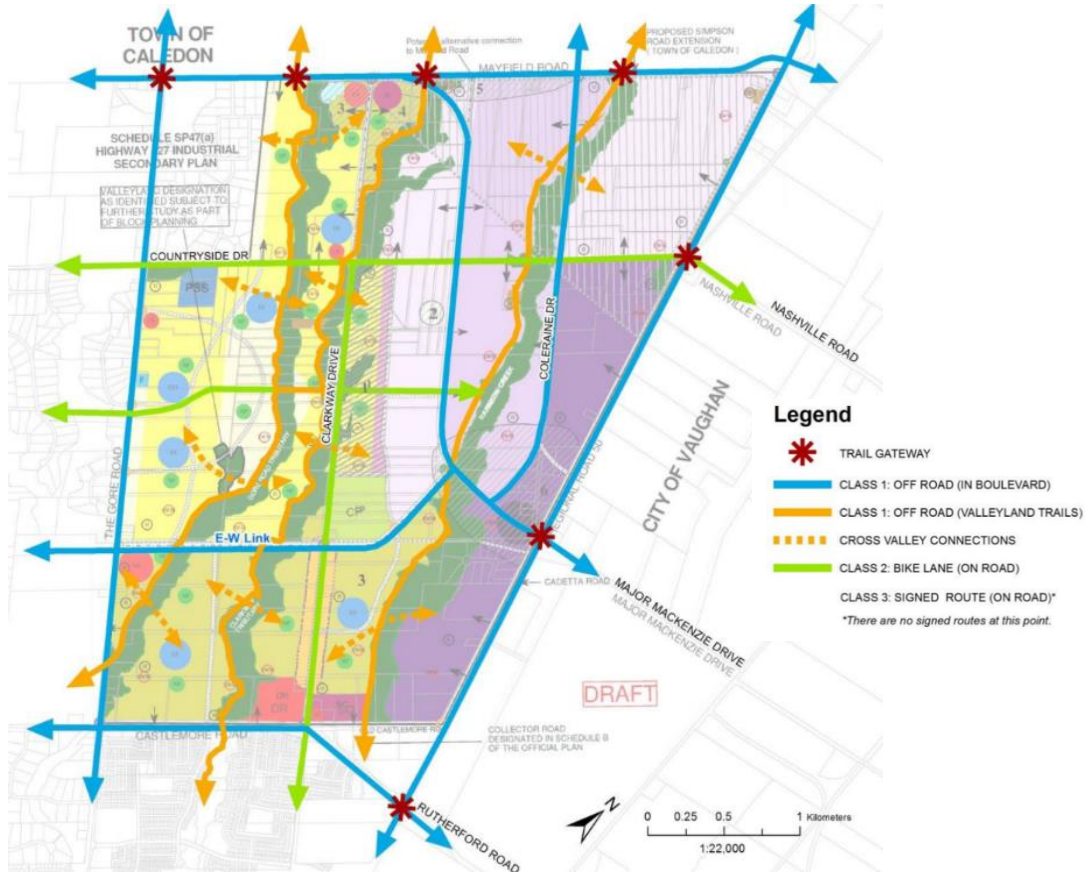


Figure 3-4: Area 47 TMP - Proposed Cycling Facilities within Secondary Plan Area 47

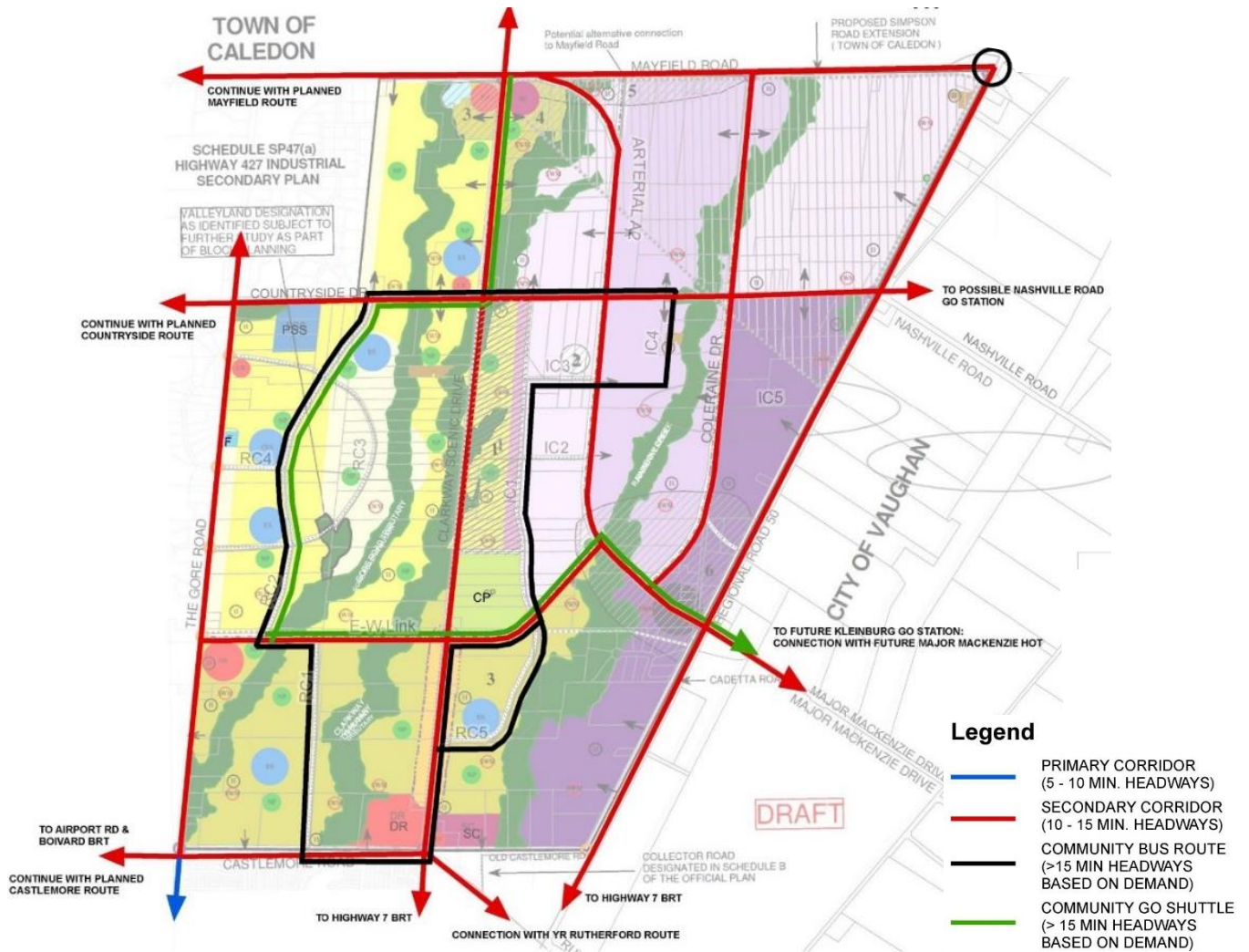


Figure 3-5: Area 47 TMP - Proposed Transit Facilities within Secondary Plan Area 47

3.4.3 Existing Traffic Conditions

All existing intersections with Regional Roads (study area boundaries) are signalized; all other intersections within the study area are currently stop controlled. Existing intersection configurations are summarized in Table 3-3.

Table 3-3: Existing Intersection Configurations.

Intersection North-South at East-West	Control Type		Lane Configuration by Approach							
	Signal	Stop Sign	East		West		North		South	
			Thru	Aux	Thru	Aux	Thru	Aux	Thru	Aux
The Gore Road at Countryside Drive	✓		2		2		2	Left	2	Left

Intersection North-South at East-West	Control Type		Lane Configuration by Approach								
	Signal	Stop Sign	East		West		North		South		
			Thru	Aux	Thru	Aux	Thru	Aux	Thru	Aux	
Clarkway Drive at Countryside Drive		✓ 2-Way	2		2			2		2	
Coleraine Drive at Countryside Drive		✓ 4-Way	2		2			2		2	
Regional Road 50 at Countryside Drive	✓		2		2	Right		4	Left / Right	4	Left
Clarkway Drive at Mayfield Road		✓ 2-Way	2		2			2		2	
Clarkway Drive at Castlemore Road	✓										

3.4.4 Future Traffic Conditions

It should be noted that the SP47 TMP study states that intersection operations documented in the TMP study report were preliminary in nature. As such, the traffic study completed as part of the TMP was not sufficient to recommend intersection configurations.

3.5 Natural Environment

A Natural Environment Assessment was undertaken for Part B roadways only to consider impacts to the aquatic and terrestrial resources. Further details can be found in Appendix E.

A MESP was originally issued in 2016, followed by an addendum in 2019 focusing on the Rainbow Creek realignment and restoration. The MESP is one of several studies undertaken to support the secondary planning process for Area 47. The purpose of the MESP was to investigate and inventory the natural resources which could potentially be impacted by future urban development and to identify constraints and opportunities. The findings were used to develop a comprehensive Management Plan, consisting of appropriate stormwater management and natural heritage strategies to protect the natural environment.

3.5.1 Terrestrial Resources

3.5.1.1 Ecological Land Classification

The majority of the land use within the study area includes residential areas, agricultural fields, and cultural meadows. Many of the vegetation communities are created by human disturbance and are classified as cultural. The most significant vegetation communities are fragments of the woodland / forest. These fragments of forest, plantation and cultural woodland often buffer the watercourses throughout the terrestrial study areas and are a relatively significant feature in the study area landscape, given that the area is characterized by a high degree of agriculture and development.

From secondary source research, there are a total of 286 plant species in Area 47. Of those, there are 137 species (48%) that are not native to Ontario. WSP investigations documented 84 plants species within the

study area, with 44 (52%) not native to Ontario. While there is a somewhat even split in overall percentage, non-native species far outweigh native species in terms of coverage and biomass.

Anthropogenic lands comprise a total of 23.8% of the overall study area. In the Part 'B' Study Corridor, roads compromise 4.6% of the area, and residential properties comprise 19.2% of the study area. The roads are strictly anthropogenic in nature and provide a minor or negative function for the habitat of native species or landscape linkages between natural habitats. Residential properties are highly anthropogenic in nature, as they often had gardens with landscape mixes of native and exotic species, which provide minor function in native species habitat or landscape linkages between natural habitats on their own.

Agricultural lands were prevalent throughout the entire study area, comprising a total of 64.9% of the study area. Identified agricultural communities within the study area include active fields of corn, soybeans, wheat, and hay. No pasture lands, or grasslands kept short due to animal grazing or mowing were found. Hedgerows comprise 0.7% of the study area and were generally adjacent to residential properties or between agricultural fields. Despite their anthropogenic nature, these communities can host wildlife and at times provide landscape linkages between natural habitats.

Dry – Moist Old Field meadows result from, or are maintained by, cultural or anthropogenic-based disturbances. In the study area it is often pasture or agricultural fields left to go fallow. This community type is characterized by $\leq 25\%$ tree and shrub cover. Across the study area, cultural meadows comprised 6.6% of the land cover. This community was dominated by grasses and Tall Goldenrod, with occurrences of Manitoba Maple, willow species, and European Buckthorn in the sub-canopy and canopy layers.

Two types of coniferous plantations were observed in the Part 'B' Study Corridor during the field investigation, making up less than a percent of the study area: Coniferous Plantation, and White Pine Coniferous Plantation. The polygon classified as White Pine Coniferous Plantation was designated as a Significant Woodland, occurring within the study area between Clarkway Drive and Gore Road Tributary. In agrarian areas such as this, where existing tree vegetation is greatly diminished, it is important to preserve the fragments of habitat that remain. It is not expected that this community will be impacted by the project. Despite the anthropogenic origin and monoculture nature of this community type, they can provide habitat for edge species (e.g., Raccoons and Brown-Headed Cowbirds). Depending on the size and shape of the stand, these woodlots can also support forest interior species.

One polygon in the Part 'B' Study Corridor consisting of Mineral Cultural Savannah Ecosite was identified just northeast of the intersection of Clarkway and Countryside Drives (0.8%), and a complex along the Clarkway Tributary has areas of Hawthorn Cultural Savannah Type (0.8%). Cultural savannahs are characterized by 25 to 35% tree cover. The Mineral Cultural Savannah community was a mix of European Buckthorn, Hawthorn species, Manitoba Maple, Green Ash, Willow species, Black Walnut, Spruce, and Pine species. The ground cover was composed of grasses and Tall Goldenrod.

One area of cultural thicket ($\leq 25\%$ tree cover and $> 25\%$ shrub cover) was identified, comprising 0.3% of the study area. This specific community is primarily populated by grasses, European Buckthorn, and Willow species, with some Black Walnut. Three polygons of Mineral Cultural Ecosite were identified in the study area, dominated by mature communities of European Buckthorn, Willow Species, Green Ash, and Manitoba Maple. The ground cover in all of these communities was a similar composition to the cultural meadow observed onsite.

Two areas of open water were identified in the Part 'B' Study Corridor. The first is a reach of the Clarkway Tributary running through a vegetation complex on the west side of Clarkway Drive, south of Countryside Drive. The other was a small pond adjacent to the Gore Road Tributary. Other areas of open water may be present on residential properties, but these have been classified within the Residential community as they were often small and not always confirmed.

3.5.1.2 Tree Inventory

The tree inventory documented a total of 547 trees greater than 10 cm Diameter at Breast Height in the study area. Many of the trees were in fair to good condition. No tree SAR were identified during the field visits. Species composition ranged from native to non-native species, or cultivar species. There is a total of 488 trees that will need to be removed to accommodate construction. Trees listed as injured are outside the project footprint, but the construction footprint is still within the minimum Tree Protection Zone for the individual tree. A total of 20 trees, mostly private, may be injured by construction activities. Tree protection measures have been identified, but it is the design builder's responsibility to update the inventory and report as needed. A Tree Protection Zone must be established. Trees to be protected will follow the City of Brampton Landscape Specifications and Temporary Tree Protection Fencing Guide.

3.5.1.3 Breeding Bird Surveys

A total of 116 bird species were documented in the secondary source review as having records within the study area. During the breeding bird point count survey, a total of 46 of the 116 secondary source species were identified within the study area. Two (2) additional birds were recorded: a Broad-winged Hawk and Caspian Tern were both observed flying over the study area during WSP investigations. Almost all bird species recorded within the applicable Ontario Breeding Bird Atlas 10 km grid squares are provincially (sub-national) ranked S5 (very common, demonstrably secure), or S4 (common, apparently secure). One (1) species, Acadian Flycatcher, is ranked S2S3B. One Caspian Tern (S3B, vulnerable breeding population) was observed flying over an agricultural field within the Part 'B' Study Corridor. The lone Caspian Tern observation is not mapped, as there is no evidence of breeding, and it is not documented in any secondary sources.

Barn Swallow is listed as Threatened under the Endangered Species Act (ESA), and therefore is provided individual and habitat protection. There were 19 individual Barn Swallows recorded at 13 breeding bird survey locations. Three (3) bird nests were observed under the bridge structure crossing GT4 of The Gore Road Tributary, which can likely be attributed to Cliff Swallow (S4B) and not Barn Swallow.

Bobolink is listed as Threatened under the ESA and therefore is afforded individual and habitat protection. A male Bobolink was recorded singing at a single breeding bird survey location within the Part 'B' Study Corridor. There has been significant changes to land use since the time of field investigations conducted in 2016: the transformation of fallow fields to active agricultural lands has resulted in a notable decline of Bobolink and Eastern Meadowlark habitat. Consequently, observations of Bobolink were much lower during WSP investigations, and Eastern Meadowlark was not observed. Many species documented in Secondary Source Review may no longer occur as they have not been seen since 2007.

3.5.1.4 Mammals, Amphibians, Reptiles and Invertebrates

In total, 42 species of mammals were found to have habitat ranges overlapping the study area. Most mammal ranges recorded within the applicable atlas's are for species that are provincially ranked S5 (very

common, demonstrably secure), S4 (common, apparently secure), or SNA (not applicable for conservation activities). Four (4) mammal species are listed as provincially vulnerable or species of conservation concern; all four (4) species are bats – Eastern Small-footed Myotis, Northern Myotis, Tri-coloured Bat, and Little Brown Myotis. Little Brown Myotis, and potentially other Myotis species, use the habitat in the study area regularly. While a Tri-coloured Bat was recorded, the species does not appear to use the habitat regularly.

Eight (8) reptiles and 11 amphibian species have habitat ranges that overlap with the study area. The majority of reptile and amphibian species recorded within the applicable area are provincially ranked S5, S4, or SNA. Four herptile species are listed as provincially vulnerable or species of conservation concern: Western Chorus Frog, Blanding's Turtle, Northern Map Turtle, and Snapping Turtle. Snapping Turtle was observed on the road near a small pond on a residential property within the Part 'B' Study Corridor. Still, it is possible Snapping Turtle could use the study area for certain life stages (e.g., nesting). Several areas were also identified as possible amphibian breeding pools. These breeding pools are not located with the ROW of the proposed road works. No reptile or amphibian species were observed during investigations.

Two (2) invertebrate species were documented in the MESP, Monarch Butterfly and a Chimney Crayfish species. Monarch Butterfly is listed as S2N, S4B, meaning non-breeding Monarch are imperiled, while breeding Monarch are apparently secure. Monarch is also listed as a Special Concern in the ESA. Currently, no individual or habitat protection is offered to Monarch Butterflies under the ESA. In addition to the chimney crayfish findings in the MESP, investigations found two (2) crayfish chimneys and a crayfish moulted exoskeleton near crossing GT2 during the August 2017 aquatic field investigations. Subsequent year records indicate that crayfish are currently utilizing the area. The two crayfish identified in investigations, Devil Crayfish and the Digger Crayfish, are provincially vulnerable but not listed under the ESA. A third species, the Calico Crayfish, is aquatic but may create terrestrial burrows and is apparently secure. While Terrestrial Crayfish Habitat is Significant Wildlife Habitat, the agricultural fields in the study area are not considered SWH. Additionally, if provincially vulnerable species are present, habitat may be regarded as SWH under Special Concern and Rare Wildlife Species SWH.

3.5.2 Aquatic Resources

The proposed project includes 20 drainage feature crossings (two of which are associated with both Part 'A' and Part 'B' Study Corridors, one drainage feature parallel to Clarkway Drive, and one watercourse realignment. The aquatic ecosystem conditions, as observed during the 2016 and 2017 field investigations, are summarized below.

3.5.2.1 Fish Habitat Assessments

The study area has been heavily influenced by human activity. It is characterized primarily by agricultural and rural areas with a small area of industrial land located centrally at the north of the study area, directly adjacent to Coleraine Drive. As such, many of the drainage features where crossings are located or proposed are ephemeral drainage swales providing indirect or no fish habitat.

3.5.2.2 Gore Road Tributary

All five (5) of the Gore Road Tributary crossings occur within the study area (GT1, GT2, GT3, GT4, and GT5). The flow velocities and water levels were low during the site visit, and there is some potential for water

levels to further decrease during seasonally dry periods, which would create seasonal barriers to fish passage.

The GT1 crossing is located nearest the intersection of the proposed East-West Arterial Roadway and the Gore Road. This watercourse was dry at the time of the 2017 field visit and is a roadside drainage ditch conveying runoff from rainfall events.

The GT2 watercourse crossing is located on the tributary directly east of GT1. The watercourse exhibited minimal amounts of water and no flow in 2017; it is considered intermittent, with seasonal flows present. A pond is found in the residential property located immediately north of the proposed crossing. This pond likely contributes to seasonal flows within the downstream reach. Some small-pooled areas of standing water were evidence downstream of the pond within the agricultural field. Cyprinids were observed within the pooled areas. From the residential pond upstream, the tributary continues for approximately 88 m before out-letting into the roadside ditch just south of Crossing GT1. This watercourse is likely impacted by agricultural practices, with the poorly defined channel impacted by agricultural tillage. A large amount of algae was evident (covering approximately 70% of water surface). Algae is likely prolific within the area due to the runoff of nutrients from agricultural practices and lawn herbicides/pesticides used within nearby areas. Some organic food waste was also observed in the area. Two (2) crayfish chimneys were observed alongside the watercourse, which could be created by burrowing crayfish inhabiting the area. A crayfish exoskeleton was also observed in close vicinity to the watercourse, indicating current use of the area by this species.

The watercourse for GT3 was almost completely dry, with no flow at the time of the 2017 site visit aside from a few small areas where water pooled in deeper, shaded areas of the channel. GT3 is an intermittent watercourse with seasonal flows. Cyprinids were found contained in the pooled areas, ranging in size and depth.

Near the project, the watercourse associated with GT4 flows through a relatively well-defined valley. The habitat characteristics of this tributary are largely uniform throughout the aquatic study area, exhibiting 90-100% flats as well as a short riffle downstream of the ROW. Surrounding land use is characterized by riparian habitat directly adjacent to the stream and agricultural fields outside of the stream corridor.

The GT5 feature acts as a drainage swale from nearby agricultural areas and does not provide habitat to fish. The crossing structure is an existing corrugated steel pipe. Water was not present at this crossing during field investigations, and this drainage feature is ephemeral.

3.5.2.3 Clarkway Tributary

Four (4) Clarkway Tributary crossings occur within the study area. Of these crossings, only CT8 is associated with the main branch of Clarkway Tributary. Each of the other crossings are associated with independent drainage features originating in adjacent agricultural fields and converging with the main branch. The watercourse drains primarily through natural creek valleys but has been channelized and straightened at some locations, presumably to accommodate the surrounding agricultural and rural residential land use.

No fisheries limitations were observed within the direct fish habitat of the main branch of Clarkway Tributary. Crossing CT8 was found to have direct fish habitat.

Due to the proximity of the watercourse to the existing roadway, it is anticipated that channel realignment may be required to accommodate the road widening works. Several driveway bridge structures are present within this reach, which connect residential houses to Clarkway Drive.

3.5.2.4 Rainbow Creek Tributary

The Rainbow Creek Tributary is an agricultural swale for much of its length. The headwaters of the creek originate north of Mayfield Road in the Town of Caledon. It flows southwest through the Part 'A' Study Corridor in an undefined valley with a wide floodplain reach extending from Mayfield Road to Coleraine Drive, then southward adjacent to Countryside Drive.

Rainbow Creek Tributary is primarily defined as ephemeral within the study area and provides indirect fish habitats at crossings RB1, RB2, and RB3, and no habitat at RB4.

3.5.2.5 Robinson Creek Tributary

Robinson Creek is comprised of two tributaries originating in agricultural fields north of Countryside Drive and flow south, converging approximately 200m south of Major Mackenzie Drive and flowing into a pond on the east side of Huntington Road, which ultimately drains into the Humber River south of Highway 407. Robinson Creek unnamed tributaries do not provide fish habitat.

3.5.2.6 Fish Sampling

Secondary source information was reviewed for fish and fish habitat pertaining to watercourses within the study area. The historic fisheries community information is gathered to the study area; however, the recorded presence of a specific species must be viewed in conjunction with existing aquatic habitat conditions (e.g., watercourses that are now dry or ephemeral cannot be expected to support the same fisheries community that may have in the past). A total of 10 species of fish were identified in the study area, all either S5 (very common, demonstrably secure), or S4 (common, apparently secure).

3.6 Vegetation and Aesthetic Assessment

The Highway 427 Industrial Secondary Plan Area is largely a productive agricultural area, planted predominantly in forage and grain crops. Remnants of windrows and residual patches of riparian forest frame expansive fields. Aging farm structures punctuate open fields from time to time, underscoring the overall rural character. Residential sites are adjacent to the few major arteries and follow a traditional site layout of windbreaks and sod yards surrounding structures, composed of a mix of evergreens and large deciduous trees. Along with wind rows and riparian zone remnants, these sites represent the bulk of discernable "forested" patches. The topography is considerably flat at the Southern portion of the site where views are expansive. As one moves North, the terrain becomes more rolling and articulated, at times limiting views and giving a slight sense of enclosure. Roadsides are mostly defined by immediately adjacent agricultural land where soils are worked annually. This continuous disturbance creates an edge of grasses and forbs containing several species of Asters, Goldenrods, and the occasional ragweed. Other areas show the establishment of various shrubs, likely dispersed by animals and wind. The three (3) main riparian corridors add significant character to the area. They create noticeable topographic and vegetative variation and provide habitat for the multitude of bird species animating the skyline throughout the day. Further details can be found in Appendix F.

3.7 Archaeology

Two (2) separate Stage 1 Archaeological Assessments were completed for the entire study (Part A and Part B) areas due to the updated to the preferred alignments as the study progressed. The first Stage 1 Archaeological Assessment was completed in 2017, receiving final Ministry of Tourism, Culture, and Sport approval on June 12, 2018, and entered into the Ontario Public Register of Archaeological Reports. The second Stage 1 Archaeological Assessment was completed in 2020, receiving final Ministry of Tourism, Culture, and Sport approval on November 5, 2020, and entered into the Ontario Public Register of Archaeological Reports.

3.7.1 2018 Stage 1 Archaeological Assessment

The 2018 Stage 1 Archaeological Assessment addressed a total of 269.1 hectares, of which 227.2 hectares (84%) was deemed to have archaeological potential. The balance (41.83 hectares) was observed to have had archaeological potential removed by previous road work and the footprints of buildings (residential, industrial, and commercial).

3.7.2 2020 Stage 1 Archaeological Assessment

In 2020, another Stage 1 Archaeological Assessment was completed that indicated that the study area has general archaeological potential and warrants Stage 2 property assessment for the following reasons:

1. Natural water sources are located within 300 m of Areas 2 to 4 (Refer to Appendix G for figures), including a tributary of the Humber River;
2. Areas 1, 2, and 4 (Refer to Appendix G for figures) are located within historical roadways as shown in the 1859 and 1877 historical atlas mapping;
3. A schoolhouse is depicted within 100 m of Area 1 (Refer to Appendix G for figures) as depicted in the 1859 Tremaine map;
4. A homestead / orchard is depicted within 100 m of Areas 1, 2, and 3 (Refer to Appendix G for figures) as depicted in the 1877 historical atlas map; and
5. Eight (8) registered archaeological sites are located within a 1 km radius of the study area, two (2) of which are located within 250 m of Areas 1 and 4 (Refer to Appendix G for figures).

The Stage 1 archaeological assessment of the additional lands determined that 0.3 ha (18%) of the study area is disturbed. The remaining 1.4 ha (82%) of the study area retains archaeological potential and requires a Stage 2 archaeological assessment using either pedestrian or test pit surveys at 5 m intervals. Further details can be found in Appendix G.

3.8 Built Heritage Resources and Cultural Heritage Landscapes

Through background research, information gathering, and a field review, an inventory of built heritage resources and cultural heritage landscapes within, and adjacent to the study area was compiled. Two (2) properties, 10955 Clarkway Drive and the 10300 The Gore Road, are designated under Part IV of the *Ontario Heritage Act* for their cultural heritage value. Ten (10) properties are listed on the City of Brampton Municipal Register of Cultural Heritage, and three resources were identified during the original field review in 2016. Further details can be found in Appendix H.

3.9 Contamination Overview Study

A Contamination Overview Study was undertaken for both Part A and Part B roadways in order to identify and review properties / areas within study area with actual or potential site contamination that may impact the development of the study area and to identify appropriate future environmental work and mitigation measures to be implemented during preliminary design, detail design, and construction phases of the Project. 36 properties were identified as having a “high” potential for soil and groundwater contamination. Ten (10) properties within the study area have been identified as having “medium” potential for soil and groundwater contamination. In addition to the properties rated as high or medium, there were 13 spill records which represent 13 locations in the study area which has significant historical spills and are also considered as having “high” potential for contamination. Further details can be found in Appendix I.

3.10 Stormwater Management

The Part B study area is located within the Humber River Watershed and contributes drainage to both the West Humber and Main Humber subwatersheds. In the context of the West Humber watershed, the study area is located within the headwaters. There are two (2) tributaries that drain through the Part B study area, namely the Gore Road Tributary and the Clarkway Tributary.

The existing land uses are predominantly agricultural, with a dispersion of pasture land and low-density residential. The soil type encountered throughout the study area is dominated by imperfectly drained stone-free clays, underlain by silty sand. Under existing conditions, approximately 27.6 ha of existing ROW contributes stormwater runoff to the subject watercourses. The existing ROWs consist of rural cross-sections with ditches. Overland drainage from external lands enters the ROWs at various points and is conveyed by existing ditches to the watercourse receivers (i.e., Gore Road Tributary and the Clarkway Tributary). Further details can be found in Appendix J.

3.11 Fluvial Geomorphology

The fluvial geomorphology investigation characterized by the existing conditions of the area watercourses with respect to channel form, function, and stability to understand their interactions with road crossings. The proposed works will modify and/or create eight (8) watercourse crossings within the Part B Study Corridor: The Gore Road Tributary, Clarkway Tributary, and Rainbow Tributary. These activities require a fluvial geomorphic assessment of all proposed and existing watercourse crossings to mitigate the impact to watercourses and inform the design of crossing structures and road designs. The assessment specifically involved desktop and historical assessment (delineation of reaches, assess lateral migration potential of channel); Field investigation to characterize geometry and document existing fluvial geomorphics; Conditions and channel stability within the vicinity of the road crossings; Meander belt width analysis; and Risk-based assessment of watercourse crossings.

Watercourse crossings in the study area predominantly consist of channels that have been highly impacted by agricultural practices. Several watercourses upstream of their respective crossings have been historically straightened or impacted, making it difficult to quantify rates of lateral channel migration. Rapid geomorphic assessment reveals the majority of watercourses are transitional or stressed, primarily due to channel widening or aggradation. It is anticipated that the replacement and redesign of new crossing structures will locally reduce channel instability by conveying higher flows through wider culverts

and/or stabilize these watercourse crossings with implementation of natural channel design methods. Further details can be found in Appendix K.

3.12 Geotechnical Investigation

The study area is within the physiographic region identified as Peel Plain. The Peel Plain covers an area of about 300 square miles and extends towards the northeast from the Niagara Escarpment through the central portions of York, Peel, and Halton municipalities. The Peel Plain consists of a till, containing shale and limestone fragments, that was originally deposited within a glacial lake basin (Lake Peel). The study area is the northern part of the Peel Plain that contains a beveled till plain consisting of fine-medium sand, and laminated silt and clay. Based on Quaternary Geology, Bolton, Southern Ontario, the study area consists of Lacustrine-Wildfield Till Complex of stratified or non-stratified silt loam, silty clay loam or clay deposits, which may contain grits, silt balls or pebbles, or may be interbedded with layers of till-like material. The Peel Plain is underlain by Middle to Upper Ordovician sediments of the Georgian Bay Formation, Blue Mountain Formation, Billings Formation, Collingwood Member, and Eastview Member. The Georgian Bay Formation is characterized by interbedded grey-green to dark grey shale and fossiliferous calcareous siltstone to limestone. The Blue Mountain and Billings formations consist of dark blue-grey to brown to black shales with thin interbeds of limestone or calcareous siltstone. The Collingwood and Eastview members are characterized by black, organic-rich, fissile, very fine-grained limestones.

3.13 Hydrogeology Investigation

Existing conditions were evaluated within a 500 m study area around the section of Countryside Drive that will be reconstructed. The entire Countryside Drive study area is in the Peel Plain physiographic region, consisting of beveled till plains. Surface geology along the Countryside Drive study area consists of glaciolacustrine deposits of clay and silt, with clay and silt till and modern alluvial deposits of clay, silt, sand, gravel, and organics along the two tributaries that cross Countryside Drive. The underlying bedrock is composed of limestone, interbedded with shale at depth, in the Georgian Bay Formation from the Ordovician Period. 29 boreholes and three (3) monitoring wells were installed along Countryside Drive. The stratigraphy beneath the road alignment consists of one to two metres of fill, underlain by stiff to hard silty clay to clayey silt with trace sand and gravel, occasionally some sand, to the maximum depth of investigation, up to 9.8 m below ground surface. WSP identified the presence of 78 water well records within 500 m of the proposed road reconstruction. Of the 78 water well records, 29 are listed as water supply wells. These wells are spread out throughout the study area. Further details can be found in Appendix M.

3.14 Road Traffic Noise Impact Study

A Road Traffic Noise Impact Study was undertaken for both Part A and Part B roadways. The results indicate that the noise impacts within the study area are predicted to be more than 5 decibels (dB) for a total of 12 receptors when comparing the Future "build" 2041 and Future "no-build" 2041 scenarios. However, the overall sound levels of the Future "build" scenario at eight (8) of the identified receptors are at or below the 55 A-weighted decibels (dBA) criterion. Therefore, in accordance with the Ministry of Environment (MOE) / MTO protocol, consideration of noise mitigation is not required for those receptors. For the other four (4) receptors, consideration of noise mitigation is required in accordance with the MOE / MTO protocol. The Peel Region and the City of Brampton Noise Attenuation Policies identify a 60 dBA criterion for consideration for noise mitigation. The Future "build" levels are at or above the 60 dBA

criterion at 6 reverse frontage or side exposure locations. Therefore, these locations were assessed for possible noise mitigation in accordance with the Peel Region and City of Brampton Noise Attenuation Policies. Further details can be found in Appendix N.

3.15 Air Quality

An air quality impact assessment was completed to provide estimates of the air emissions resulting from vehicular traffic, predict the resulting air quality effects on ambient air, with consideration of existing background air quality and provide a qualitative discussion of the significance of potential effects and a quantitative comparison of the future air quality effects year 2041 to the current scenario (year 2021) based on how they compare to the relevant criteria. The findings for the air quality assessment can be found in Section 7.11 and the report can be found in Appendix T.

4.0 Development and Evaluation of Alternative Planning Solutions

The evaluation of alternation planning solutions was primarily completed as part of the Area 47 TMP. However, the Project Team revisited and refined the Planning Solutions during the current Study. The Project Team also completed supplementary studies to help inform and support the planning solutions. Problem and Opportunity Statement

Area 47 is projected to grow substantially to house 31,120 residents and support 8,130 jobs by 2041. The current transportation system will be supported by planned future upgrades to surrounding regional and municipal roads, but due to the expected growth, the internal Area 47 network will require improvements as well, including capacity upgrades.

4.1 Identification of Alternatives

In order to meet the requirements of Phase 1 and Phase 2 of the Class EA process, three (3) long term transportation planning alternatives were assessed and evaluated based on 2031 travel demands.

4.1.1 Alternative Planning Solution 1- Do Nothing

This alternative assumes that current road conditions are carried over to 2031, with no changes occurring to roads within the study area but does account for the planned road network and transit improvements surrounding the study area.

4.1.2 Alternative Planning Solution 2 - As Planned

This alternative builds on alternative one (1) by considering both planned improvements outside of the study areas as well as increasing capacity to the arterial network within the study area. Methods considered for increasing network capacity within the study area include:

- Major Mackenzie Drive extension (Arterial A2) from Regional Road 50 to Mayfield Road;
- East-West Arterial and Coleraine Drive intersecting at Arterial A2;
- Widening of Regional Road 50, The Gore Road and Mayfield Road up to six (6) lanes;
- Widening of Coleraine Drive, Countryside Drive and Clarkway Drive to four (4) lanes;
- MUP along all arterial and collector roads; and
- Brampton Transit bus services on Regional Road 50, Countryside Drive and The Gore Road.

4.1.3 Alternative Planning Solution 3 - Increased Network Connectivity

The primary focus of this alternative is to provide increased connectivity throughout the network as well as increased mobility options. This alternative focused on implementing an integrated active transportation network, increasing roadway capacity and limiting the impacts that these changes may have on the environment. Three (3) transportation network options were created for this alternative and they share many traits, including:

- East-West Arterial connecting to Arterial A2 west of Rainbow Creek to minimize environmental impacts;
- Realigned Coleraine Drive;
- Arterial A2 at six (6) lanes between Regional Road 50 and East-West Arterial road; and

- System of minor collectors introduced within the study area residential and employment sectors.

A series of three (3) sub-alternatives were developed for Alternative Planning Solution 3. These are summarized in the following sections.

4.1.3.1 Transportation Network Option 3A

Transportation network design aspects specific to option 3A include:

- Realigned Coleraine Drive connected to Arterial A2 west of Regional Road 50;
- Transit service provided on all arterial roads;
- Countryside Drive and Castlemore Road transit routes extended to serve the collector roads;
- Connectivity with Highway 427 Transitway, York Region Transit and high order transit network provided via Arterial A2 / Major Mackenzie Drive;
- Connectivity with potential Kleinburg GO Station provided via Arterial A2 / Major Mackenzie Drive; and
- Active transportation facilities on arterial and collector roads.

4.1.3.2 Transportation Network Option 3B

Transportation network design aspects specific to option 3B include:

- Realigned Coleraine Drive connected directly to Regional Road 50 north of Major Mackenzie Drive / Arterial A2; and
- Transit system and active transportation network similar to option 3A.

4.1.3.3 Transportation Network Option 3C

Transportation network design aspects specific to option 3C include:

- Realigned Coleraine Drive connected to Arterial A2 west of Regional Road 50;
- Arterial A2 at six (6) lanes between Regional Road 50 and Mayfield Road (entire length);
- Clarkway Drive remains at its present two (2) lane rural cross-section between East-West Arterial and Mayfield Road;
- Transit service provided on all major arterial roads;
- Community-based service on collector roads;
- Better connectivity with Highway 427 Transitway, York Region Transit and high-order transit network provided via Arterial A2 / Major Mackenzie Drive;
- Connectivity with future potential Kleinburg GO Station provided via Arterial A2 / Major Mackenzie Drive;
- Connectivity with future potential Nashville Road GO Station via shuttle service; and
- Active transportation network similar to option 3A.

4.2 Evaluation Criteria

The three (3) Alternative Planning Solutions discussed above were evaluated based on four (4) performance indicators: transportation services, policy environment, natural and cultural heritage environment and economy. These performance indicators are summarized below in Table.

Table 4-1: Alternative Planning Solution Evaluation Criteria

Performance Indicator	Description
Transportation Services	Minimize travel delay Road capacity and volumes consistent with its function Provides multi-modal opportunities
Policy Environment	Support for Provincial, Regional and local municipal policy goals of building sustainable, multimodal transportation networks capable of supporting growth Addresses study goals
Social, Natural and Cultural Heritage Environment	Minimize adverse effects on natural heritage resources, including natural vegetation, aquatic habitat and air quality, as well as archaeological and cultural heritage factors
Economy	Minimize congestion and maximizes accessibility for goods movement and planned industry Supports planned development

4.2.1 Screenline Analysis

A screenline analysis was conducted in the westbound and northbound (peak) directions for all Alternative Planning Solutions in order to identify any significant network deficiencies. Barring the “Do Nothing” alternative, all options yielded similar results and provide ample capacity across the majority of the network. The only major difference between these alternatives is the improved volume to capacity ratio at the Rainbow Creek south screenline, which fell from approximately 0.93 to 0.83 when Arterial A2 is widened to six (6) lanes.

4.2.1.1 Transportation Services

The three (3) Alternative Planning Solutions were evaluated relative to Transportation Services across the following criteria:

- Trips by transit;
- Internal Area 47 travel time;
- Congested lane-km;
- Network utilization;
- Annual greenhouse gas (GHG) due to congestion;
- Supports alternative travel modes; and
- Network connectivity.

It was found that there was very little difference between the alternatives, though it was noted that Option 3C supports transit and the auto passenger travel modes better because of the planned HOV lane along Arterial A2. Furthermore, Option 3B was noted as creating the fewest GHG emissions.

4.2.1.2 Policy Environment

The Alternative Planning Solutions were evaluated with respect to their ability to address study, municipal, regional and provincial policy goals. Although it was found that each of the Alternative 3 network options supports these goals, Alternative 3C more fully addressed policy in two (2) distinct ways. These include: avoiding construction along Clarkway Drive between Countryside Drive and the East-West Arterial (an environmentally sensitive area) and optimization of the capacity of the new Arterial A2 facility.

4.2.1.3 Natural and Cultural Heritage Resources

The following criteria were used to evaluate the Alternative Planning Solutions in regard to natural and cultural heritage resources:

- Impact on aquatic resources;
- Impact on air quality; and
- Impact on archaeological resources.

As expected, the “Do Nothing” approach has no impact on aquatic or archaeological resources but would cause the greatest impact to air quality due to the forecasted increased network congestion.

Alternative 2 would have the greatest impact on aquatic resources as it would require four (4) new creek crossings, followed closely by all Alternative 3 options, which require three (3) new creek crossings. Of the Alternative 3 options, Alternative 3C would have the least amount of impact on aquatic resources as it does not require the widening of Clarkway Drive over the Clarkway Tributary. Alternative 3B would have the least amount of impact on air quality based on predicted traffic congestion, followed close behind by Alternative 3C. Alternative 2 and all Alternative 3 options would have similar impacts on archaeological resources.

For the above noted reason, it can be concluded that Alternative 3C would create the least amount of natural and cultural environment impact, excluding the “Do Nothing” alternative, but is preferred to the “Do Nothing” alternative as planned growth makes the latter option infeasible.

4.2.1.4 Economic Environment

Impact to the economic environment was evaluated using the following two (2) criteria:

- Maximizes access for goods movement and planned industry; and
- Supports planned development.

It was concluded that Alternative 3C “performs the best in this indicator for both the access for goods movement and planned development criteria” due, in part, to the potential for HOV lane in the future on Arterial A2, which increases capacity for trucks (HDR, 2014).

4.3 Preliminary Preferred Solution

Following the specific evaluations, an overall evaluation of the three (3) Alternative Planning Solutions (including the three (3) options associated with Alternative 3) was completed. It was concluded that Alternative 3C was the preliminary preferred Alternative Planning Solution. Based on comments received during a PIC held in June 2012, Alternative 3C was refined and developed into the recommended road network (Refer to Figure 3-6).

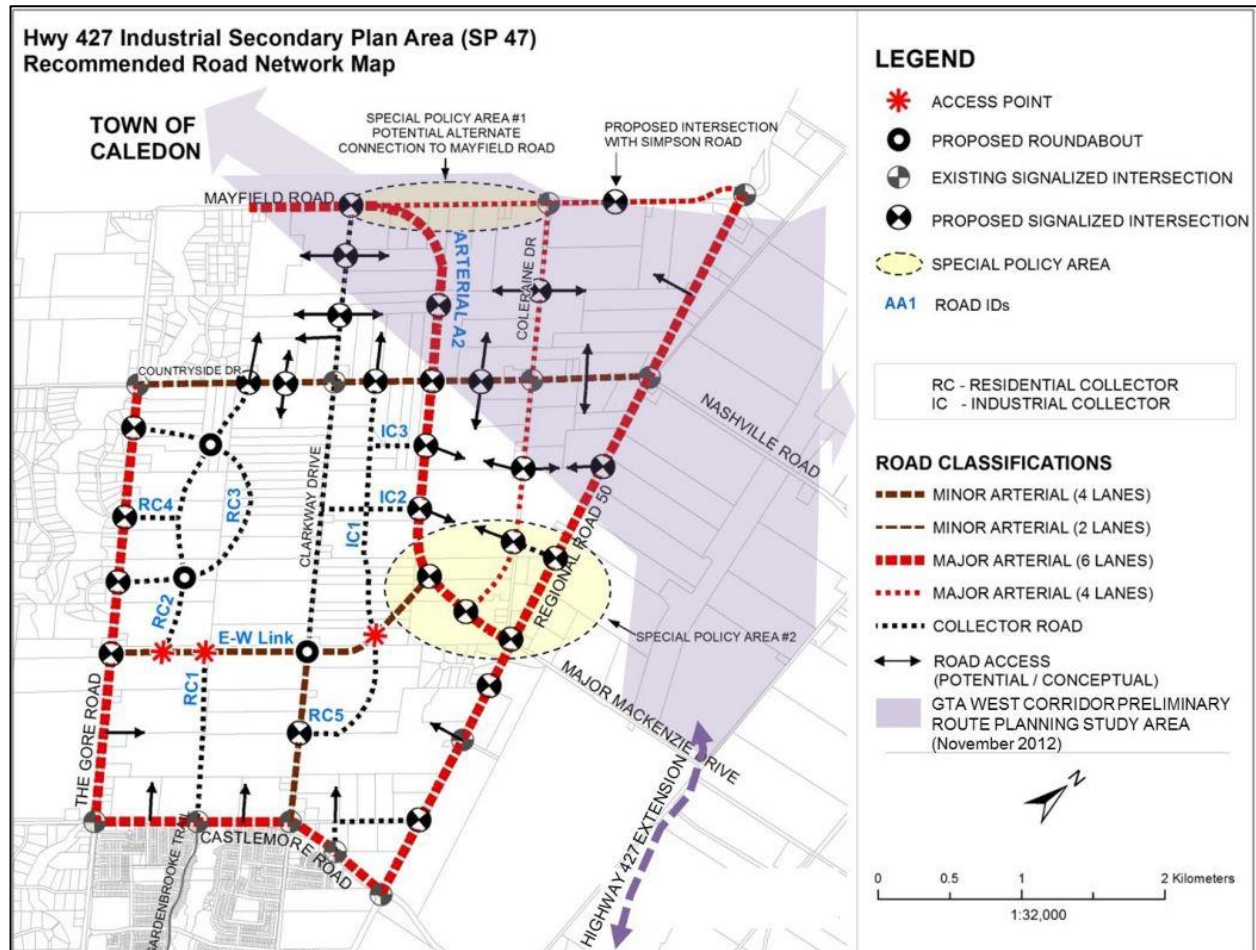


Figure 4-1: Area 47 TMP-Proposed Road Network

5.0 Alternative Alignments - New and Existing Roadways and Critical Intersection

5.1 Overview

The following sections provide details related to the development and evaluation of high-level alternatives for the new arterial roadway (East-West Arterial), as well as the critical intersection of Countryside Drive at Regional Road 50. Information related to the Special Policy Areas and Rainbow Creek can be found in the Part A ESR.

5.2 New Arterial Roadways – East-West Arterial

Running between The Gore Road and Arterial A2, this new four (4) lane arterial roadway will provide improved east-west connectivity for future development lands located between Countryside Drive and Castlemore Road.

5.2.1 Alternative Alignments

A set of four (4) alternative corridor alignments were developed for the East-West Arterial, which were presented to the Technical Agency Committee, the Municipal Advisory Group, the Stakeholder Group, and the general public (at PIC #1) for review and comment. These four (4) alternatives are illustrated in Figure 5-1, with details related to each of these alternatives provided in the following sections.

Alternative 1 – As Identified in the Area 47 TMP

The Area 47 TMP located the East-West Arterial immediately south of the TransCanada Pipeline Corridor, which would be maintained as a wildlife corridor. Construction of the roadway along this alignment would require removal of portions of a mature woodlot, for which loss of habitat would need to be mitigated.

Alternative 2 – Shifted South

East-West Arterial Alternative 2 shifts the roadway south from what was proposed in the Area 47 TMP, aligning the roadway with the existing opening between mature woodlots located just east of The Gore Road, as well as at narrower floodplain locations (relative to Alternative 1) along both The Gore Road and Clarkway Creek tributaries. While this alignment reduces impact to the woodlot, it leaves a strip of relatively undevelopable land between the roadway and the TransCanada Pipeline corridor.

Alternative 3 – North of TransCanada Pipeline

East-West Arterial Alternative 3 runs immediately north of the TransCanada Pipeline corridor, avoiding impacts to the mature woodlot, and crossing The Gore Road and Clarkway Creek Tributaries at locations with narrow floodplains. While this alternative has reduced environmental impacts, it would require removal of existing residential properties and would remove the east-west arterial connection to Arterial A2 from the residential development planned for south the TransCanada Pipeline corridor.

Alternative 4 – Shifted North of Main Branches of The Gore Road Tributary

Alternative 4 locates the East-West Arterial approximately mid-way between Countryside Drive and Castlemore Road, at a location north of one of the main branches of The Gore Road tributary. Due to its more northerly location, this alignment would tie into Arterial A2 along a tangent section, which would be preferred in terms of intersection design. As with Alternative 3, this alignment would remove the east-west arterial connection to Arterial A2 from the residential development planned for south of the TransCanada Pipeline corridor.

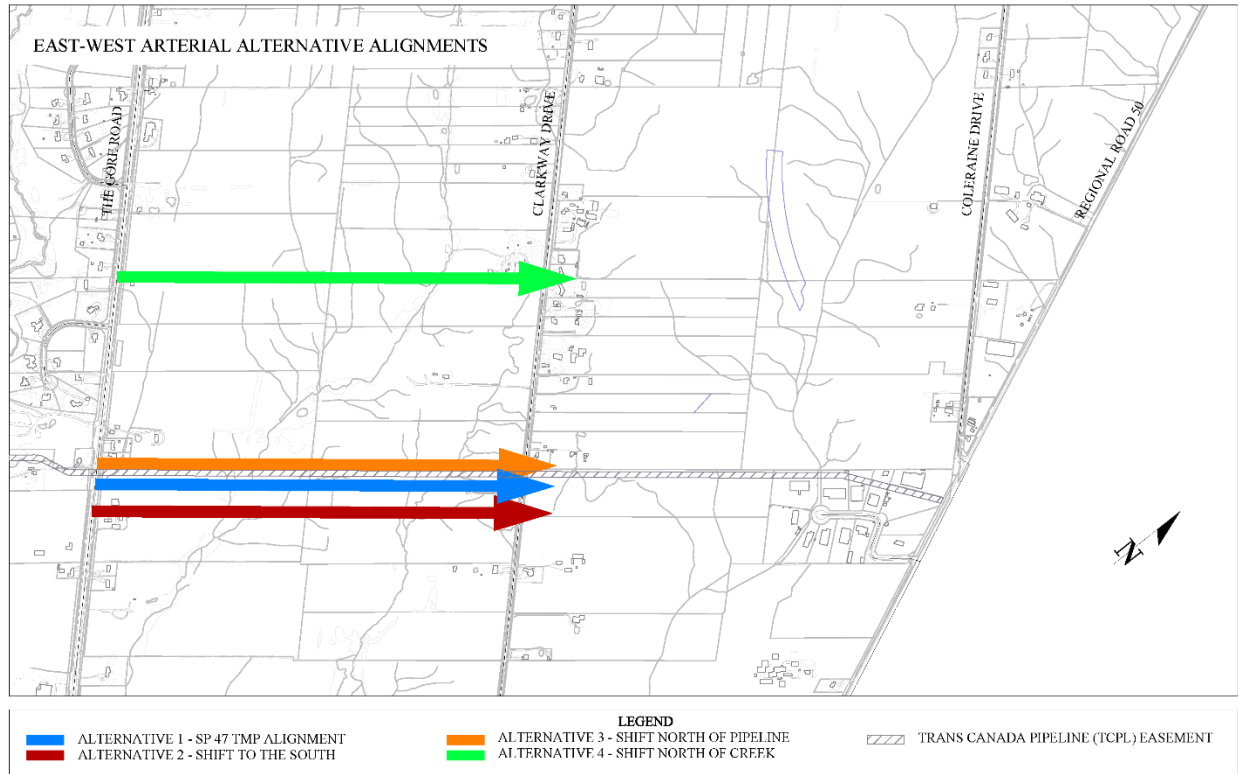


Figure 5-1: Alternative Alignments Considered for East-West Arterial

5.2.2 Evaluation of Alternatives

Evaluation of the East-West Arterial alternatives is provided in Table 5-1.

Table 5-1: Detailed Evaluation of Alternative Alignments for the East-West Arterial





Cat.	Criteria	Criteria Indicator	Alternative 1 SP 47 TMP Alignment (Blue)	Alternative 2 Shift to the South (Red)	Alternative 3 Shift North of the Pipeline (Yellow)	Alternative 4 Shift North of Creek (Green)
Addresses Problem and Opportunity Statement:			The East-West Arterial functions as an east-west connection between Arterial A2 / Major Mackenzie Drive (York Region) and the development area west of Arterial A2 and east of The Gore Road. Primarily local connectivity.			
		Provide enhanced inter-regional connectivity.				
		Provide access to proposed development.	<ul style="list-style-type: none"> Provides access to proposed development, particularly south of the TransCanada Pipeline where there is currently no arterial access. 	<ul style="list-style-type: none"> Provides access to proposed development, particularly south of the TransCanada Pipeline where there is currently no arterial access. 	<ul style="list-style-type: none"> Provides access to proposed development north of the TransCanada Pipeline, and some limited access to the development area to the south. 	<ul style="list-style-type: none"> Provides access to proposed development north of the TransCanada Pipeline but does not facilitate arterial access to development to the south.
		Improve roadway geometrics to meet or exceed City and Regional standards.	<ul style="list-style-type: none"> Alignment of the East-West Arterial between Clarkway Drive and Arterial A2 will require use of back-to-back curves and shortened tangent sections at intersections, which is not preferred. East-West Arterial / Arterial A2 intersection will be located on a curve, which is not preferred. Alignment between The Gore Road and Clarkway Drive will be linear, which is preferred. 	<ul style="list-style-type: none"> Alignment of the East-West Arterial between Clarkway Drive and Arterial A2 will require use of back-to-back curves and shortened tangent sections at intersections, which is not preferred. East-West Arterial / Arterial A2 intersection will be located on a curve, which is not preferred. Alignment between The Gore Road and Clarkway Drive will be linear, which is preferred. 	<ul style="list-style-type: none"> Alignment of the East-West Arterial between Clarkway Drive and Arterial A2 will require use of back-to-back curves, which is not preferred. East-West Arterial / Arterial A2 intersection will be located on a curve, which is not preferred. Alignment between The Gore Road and Clarkway Drive will be linear, which is preferred. 	<ul style="list-style-type: none"> Alignment of the East-West Arterial between Clarkway Drive and Arterial A2 will be primarily linear, which is preferred. East-West Arterial / Arterial A2 intersection will be located on a curve, which is not preferred. Alignment between The Gore Road and Clarkway Drive will be linear, which is preferred.
		Provide pedestrian and cycling facilities.	MUP will be provided on both sides of the road.			
		Improve traffic, pedestrian and cyclist safety.	<ul style="list-style-type: none"> Collector road intersections with the East-West Arterial east of Clarkway Drive will be located on curves, which is not preferred due to reduced sight distances. Arterial road access south of the TransCanada Pipeline will permit better traffic flow within the southerly development block and hence reduce collision potential. 	<ul style="list-style-type: none"> Collector road intersections with the East-West Arterial east of Clarkway Drive will be located on curves, which is not preferred due to reduced sight distances. Arterial road access south of the TransCanada Pipeline will permit better traffic flow within the southerly development block and hence reduce collision potential. 	<ul style="list-style-type: none"> Collector road intersections with the East-West Arterial east of Clarkway Drive will be located on curves, which is not preferred due to reduced sight distances. Limited access to the arterial roadway from the south development areas has the potential to increase traffic in that area. 	<ul style="list-style-type: none"> Increased separation distance between intersections of Arterial A2 with each of the East-West Arterial and Coleraine Drive will improve traffic flow (and hence safety). Limited access to the arterial roadway from the south development areas has the potential to increase traffic in that area.
		Improve watercourse crossings to enhance hydraulics, stream function and fisheries and wildlife passage.	<ul style="list-style-type: none"> Will require new crossings of The Gore Road Tributary and Clarkway Creek, as well as three headwater drainage features (two from The Gore Trib.) Crossing structures will be designed to accommodate flows from the Regional Storm, as well fish and wildlife passage. 	<ul style="list-style-type: none"> Will require new crossings of The Gore Road Tributary and Clarkway Creek, as well as two headwater drainage features. Crossing structures will be designed to accommodate flows from the Regional Storm, as well fish and wildlife passage. 	<ul style="list-style-type: none"> Will require new crossings of The Gore Road Tributary and Clarkway Creek, as well as three headwater drainage features (two from The Gore Trib.) Crossing structures will be designed to accommodate flows from the Regional Storm, as well fish and wildlife passage. 	<ul style="list-style-type: none"> Will require new crossings of The Gore Road Tributary and Clarkway Creek, as well as two headwater drainage features. Crossing structures will be designed to accommodate flows from the Regional Storm, as well fish and wildlife passage.

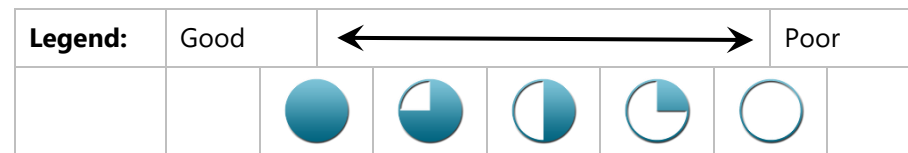
Cat.	Criteria	Criteria Indicator	Alternative 1 SP 47 TMP Alignment (Blue)	Alternative 2 Shift to the South (Red)	Alternative 3 Shift North of the Pipeline (Yellow)	Alternative 4 Shift North of Creek (Green)
		Address structural deficiency.	No existing structures along any proposed East-West Arterial alignments.			
	Transportation Network Safety (includes natural hazards)	Safety related factors include roadway geometrics, roadside hazards, intersection design, and control, accommodating pedestrians and cyclists.	<ul style="list-style-type: none"> 90 degree traditional intersection with Clarkway Drive and the Gore Road. Profile of proposed road to pass through two (2) flood plain areas where guiderails may be required (fill sections). 	<ul style="list-style-type: none"> 90 degree traditional intersection with Clarkway Drive and the Gore Road. Profile of proposed road to pass through two (2) flood plain areas where guiderails may be required (fill sections). 	<ul style="list-style-type: none"> 90 degree traditional intersection with Clarkway Drive and the Gore Road. Profile of proposed road to pass through two (2) flood plain areas where guiderails may be required (fill sections). 	<ul style="list-style-type: none"> 90 degree traditional intersection with Clarkway Drive and the Gore Road. Profile of proposed road to pass through three (3) flood plain areas where guiderails may be required (fill sections).
	Transportation Network Connectivity		<ul style="list-style-type: none"> Improved east-west connectivity provided within the proposed development south of the TransCanada Pipeline. 	<ul style="list-style-type: none"> Improved east-west connectivity provided within the proposed development south of the TransCanada Pipeline. 	<ul style="list-style-type: none"> East-west connection to Arterial A2 / Major Mackenzie Drive within the planned development area south the TransCanada Pipeline will require additional crossings of the pipeline corridor. 	<ul style="list-style-type: none"> Provides enhanced east-west connectivity within the planned development north of the TransCanada Pipeline and south of Countryside Drive. Does not provide adequate east-west connectivity within the development planned south of the TransCanada Pipeline.
	Transportation Network Capacity	Impacts of traffic on local roads and outside the study area. Transportation network improvement and accommodation of goods movement.	<ul style="list-style-type: none"> Will provide improved east-west network capacity between The Gore Road and Arterial A2. 	<ul style="list-style-type: none"> Will provide improved east-west network capacity between The Gore Road and Arterial A2. 	<ul style="list-style-type: none"> Will provide improved east-west network capacity between The Gore Road and Arterial A2. Connection to the East-West Arterial from Block 47-1 will be limited to permitted crossings of the TransCanada Pipeline. 	<ul style="list-style-type: none"> Will provide improved east-west network capacity between The Gore Road and Arterial A2. Access to Highway 427 from Block 47-1 will require drivers to either head north along the 'character road' portion of Clarkway Drive towards the East-West Arterial, or alternatively head south on Clarkway Drive and then east on Castlemore Road. Unplanned widening of both Clarkway Drive and Castlemore Road may be required as a result.
	Promotion of Active Transportation	Impact on the safety and usability of planned AT infrastructure, as well as adherence to City AT policy.	Active transportation will be provided on both sides of the East-West Arterial. Mitigating visibility issues associated with locating intersections on curves will be required east of Clarkway.			
	Transit Improvement	Potential adverse impact on transit service. Assessment of impact on planned transit service improvements.	<ul style="list-style-type: none"> It is anticipated that road linkages across the TransCanada Pipeline will be limited, resulting in reduced accessibility to planned transit services along the East-West Arterial from the north. This roadway configuration was used to develop the recommended transit plan included in the SP47 TMP. 	<ul style="list-style-type: none"> It is anticipated that road linkages across the TransCanada Pipeline will be limited, resulting in reduced accessibility to planned transit services along the East-West Arterial from the north. This roadway configuration is very similar to that used to develop the recommended transit plan included in the SP47 TMP. 	<ul style="list-style-type: none"> It is anticipated that road linkages across the TransCanada Pipeline will be limited, resulting in reduced accessibility to planned transit services along the East-West Arterial from the south. This roadway configuration is very similar to that used to develop the recommended transit plan included in the SP47 TMP. 	<ul style="list-style-type: none"> East-west transit services planned along the East-West Arterial will no longer be located approximately midway between planned services on Countryside Drive and Castlemore Road, making use of these services less desirable for individuals who live south of the TransCanada Pipeline.

Cat.	Criteria	Criteria Indicator	Alternative 1 SP 47 TMP Alignment (Blue)	Alternative 2 Shift to the South (Red)	Alternative 3 Shift North of the Pipeline (Yellow)	Alternative 4 Shift North of Creek (Green)
	Structural Impacts	Potential adverse impact on existing structures.	No existing structures along proposed East-West arterial alignment.			
		Potential impact on proposed structures.	<ul style="list-style-type: none"> Will require new crossings of The Gore Road Tributary and Clarkway Creek, as well as three (3) headwater drainage features (two (2) from The Gore Trib.) 	<ul style="list-style-type: none"> Will require new crossings of The Gore Road Tributary and Clarkway Creek, as well as two (2) headwater drainage features. 	<ul style="list-style-type: none"> Will require new crossings of The Gore Road Tributary and Clarkway Creek, as well as three (3) headwater drainage features (two (2) from The Gore Trib.) 	<ul style="list-style-type: none"> Will require new crossings of The Gore Road Tributary and Clarkway Creek, as well as two (2) headwater drainage features.
		Hydraulics and Hydrology Impacts (Creeks)	Impact on floodplain, existing flood depths at proposed crossing locations, and existing flood return period.	<ul style="list-style-type: none"> 0.30 ha of new linear infrastructure to be constructed within the The Gore Tributary floodplain. 0.65 ha of new linear infrastructure to be constructed within the Clarkway Creek floodplain. 	<ul style="list-style-type: none"> 0.24 ha of new linear infrastructure to be constructed within the The Gore Tributary floodplain. 0.36 ha of new linear infrastructure to be constructed within the Clarkway Creek floodplain. 	<ul style="list-style-type: none"> 0.40 ha of new linear infrastructure to be constructed within the The Gore Tributary floodplain. 0.30 ha of new linear infrastructure to be constructed within the Clarkway Creek floodplain.
Financial	Utility Relocation	Ability to minimize effects on existing and proposed utilities.	<ul style="list-style-type: none"> May require minimal hydro pole relocation at intersection with the Gore Road and Clarkway Drive. Servicing design for the block plans has been developed assuming use of this alignment. 	<ul style="list-style-type: none"> May require minimal hydro pole relocation at intersection with the Gore Road and Clarkway Drive. Rework of the servicing plan for Blocks 47-1 and 47-2 will be required. 	<ul style="list-style-type: none"> May require minimal hydro pole relocation at intersection with the Gore Road and Clarkway Drive. Rework of the servicing plan for Blocks 47-1 and 47-2 will be required. 	<ul style="list-style-type: none"> May require minimal hydro pole relocation at intersection with the Gore Road and Clarkway Drive. Rework of the servicing plan for Blocks 47-1 and 47-2 will be required.
		Capital Costs	Function of total road length and width, AT facilities provided, intersection infrastructure, structural area required, and amount of utility relocation.	<ul style="list-style-type: none"> Two (2) signalized intersections. 2.4 km of roadway. Five (5) new crossing structures. Overall medium / high cost. 	<ul style="list-style-type: none"> Two (2) signalized intersections. 2.5 km of roadway. Four (4) new crossing structures. Overall medium cost. 	<ul style="list-style-type: none"> Two (2) signalized intersections. 2.4 km of roadway. Five (5) new crossing structures. Overall medium / high cost.
	Operating Costs	Function of road length, area of bridge structures (for maintenance) and number of traffic signals.	<ul style="list-style-type: none"> Two (2) signalized intersections. 2.4 km of roadway. Five (5) new crossing structures. Overall medium / high cost. 	<ul style="list-style-type: none"> Two (2) signalized intersections. 2.5 km of roadway. Four (4) new crossing structures. Overall medium cost. 	<ul style="list-style-type: none"> Two (2) signalized intersections. 2.4 km of roadway. Five (5) new crossing structures. Overall medium / high cost. 	<ul style="list-style-type: none"> Two (2) signalized intersections. 2.1 km of roadway. Four (4) new crossing structures. Overall medium cost.

Cat.	Criteria	Criteria Indicator	Alternative 1 SP 47 TMP Alignment (Blue)	Alternative 2 Shift to the South (Red)	Alternative 3 Shift North of the Pipeline (Yellow)	Alternative 4 Shift North of Creek (Green)
Social / Cultural Environment	Property Acquisition		<ul style="list-style-type: none"> Will require the purchase of approximately 8.6 ha of property. Requires acquisition of one (1) residential property and one (1) commercial property which is not currently participating in redevelopment. Overall substantial cost 	<ul style="list-style-type: none"> Will require the purchase of approximately 9.0 ha of property. Requires acquisition of one (1) residential property. Overall substantial cost 	<ul style="list-style-type: none"> Will require the purchase of approximately 8.6 ha of property. Requires acquisition of one (1) residential property Overall substantial cost 	<ul style="list-style-type: none"> Will require the purchase of approximately 7.6 ha of property. Requires acquisition of two (2) residential properties. Overall substantial cost
	Conformance to Planning Objectives (Growth Plan, Official Plan, Secondary Plan, Area 47 TMP)		<ul style="list-style-type: none"> Conforms to City's Official Plan Area 47 TMP and Secondary Plan. Alignment identified through the SP47 TMP. 	<ul style="list-style-type: none"> Conforms to City's Official Plan Area 47 TMP and Secondary Plan Alignment varies slightly from what was presented in the SP47 TMP. 	<ul style="list-style-type: none"> Conforms to City's Official Plan Area 47 TMP and Secondary Plan. Alignment varies slightly from what was presented in the SP47 TMP. 	<ul style="list-style-type: none"> This alignment varies from what was proposed during completion of the Area 47 TMP (similar alignment, significantly different location)
	Residential/ Business Access and Displacement	Existing residences and businesses.	<ul style="list-style-type: none"> Would require relocation of one (1) residence, as well as require purchase of one (1) business that currently fronts onto Clarkway Drive. 	<ul style="list-style-type: none"> Would require relocation of one (1) residence / farm. 	<ul style="list-style-type: none"> Would require relocation of one (1) residence and have impacts on adjacent property. 	<ul style="list-style-type: none"> Would require relocation of two (2) residences.
		Planned residential, commercial and industrial developments.	<ul style="list-style-type: none"> Aligns with planned development. 	<ul style="list-style-type: none"> Primarily aligns with planned development. Would create a strip of property with limited development potential between the East-West Arterial and the TransCanada Pipeline. 	<ul style="list-style-type: none"> Aligns with planned development but removes direct arterial road access from south of the TransCanada Pipeline / along the north limit of commercial district. 	<ul style="list-style-type: none"> Locates arterial roadway along 'character' portion of Clarkway Drive, limiting development potential along the roadway.
	Emergency Services (Police, Fire, Ambulance)	Potential to reduce response times.	<ul style="list-style-type: none"> Locating a new east-west arterial linkage along the TransCanada Pipeline may provide improved response times in the development areas between the TransCanada Pipeline and Castlemore Road. Collector Roadways will be required to provided improved penetration by emergency services into the development areas. 	<ul style="list-style-type: none"> Locating a new east-west arterial linkage along the TransCanada Pipeline may provide improved response times in the development areas between the TransCanada Pipeline and Castlemore Road. Collector Roadways will be required to provided improved penetration by emergency services into the development areas. 	<ul style="list-style-type: none"> Locating a new east-west arterial linkage along the TransCanada Pipeline may provide improved response times in the development areas between the TransCanada Pipeline and Castlemore Road. Collector Roadways will be required to provided improved penetration by emergency services into the development areas. 	<ul style="list-style-type: none"> Locating a new east-west arterial linkage midway between Countryside Drive and Castlemore Road may provide improved response times in the development areas north of the TransCanada Pipeline. Collector Roadways will be required to provided improved penetration by emergency services into the development areas.

Cat.	Criteria	Criteria Indicator	Alternative 1 SP 47 TMP Alignment (Blue)	Alternative 2 Shift to the South (Red)	Alternative 3 Shift North of the Pipeline (Yellow)	Alternative 4 Shift North of Creek (Green)
	Noise Level Impacts	Potential effects of traffic related noise on residences, community facilities, or institutions adjacent to and/or within the study area.	<ul style="list-style-type: none"> Presence of new arterial road and intersection will moderately increase noise levels for four (4) existing homeowners who front onto The Gore Road. Noise impacts will be mitigated through the use of landscaping and noise barriers (if required). 	<ul style="list-style-type: none"> Minor increases in noise levels anticipated as no existing residential properties would be in close proximity to new roadway / intersection (assumes existing property at intersection is bought out). 	<ul style="list-style-type: none"> Presence of new arterial road and intersection will increase noise levels for three (3) adjacent homeowners, two of which will directly abut the new roadway. Noise impacts will be mitigated through the use of landscaping and noise barriers (if required). 	<ul style="list-style-type: none"> Presence of new arterial road and intersection will increase noise levels for four (4) adjacent homeowners, all of which front onto the new intersection. Noise impacts will be mitigated through the use of landscaping and noise barriers (if required).
	Cultural Heritage Impacts	Potential adverse impacts on archaeological resources, built heritage resources and cultural heritage landscapes adjacent to and/or within the study area	<ul style="list-style-type: none"> All undeveloped land within the study area has archaeological potential. No identified archaeological sites or cultural heritage properties are impacted by this alternative. 	<ul style="list-style-type: none"> All undeveloped land within the study area has archaeological potential. No identified archaeological sites or cultural heritage properties are impacted by this alternative. 	<ul style="list-style-type: none"> All undeveloped land within the study area has archaeological potential. Alignment borders a listed heritage property. 	<ul style="list-style-type: none"> All undeveloped land within the study area has archaeological potential. No identified archaeological sites or cultural heritage properties are impacted by this alternative.
	Agricultural Impacts	Impact on existing agricultural properties.	<ul style="list-style-type: none"> Alignment runs immediately south of the TransCanada Pipeline easement. Minimal impact to agricultural properties. 	<ul style="list-style-type: none"> Would segment small section of two (2) agricultural properties 	<ul style="list-style-type: none"> Alignment runs between property limits. Minimal impact to agricultural properties. 	<ul style="list-style-type: none"> Alignment runs along property limits. Minimal impact to agricultural properties.
Natural Environment	Impact to Designated Natural Heritage Features including wetlands	Proximity to, and significance of, impact to designated feature.	No designated natural heritage features within the study area. No difference among alternatives.			
	Impact to Natural Heritage Features such as vegetation and watercourses	Proximity, size, characteristics, and sensitivity of significant rural areas, terrestrial ecosystems, and wetlands. Potential impact or loss of natural areas, terrestrial ecosystems or wetland areas, function or habitat.	Would require two (2) new crossings of Clarkway Creek Tributary and Gore Road Tributary, resulting in some loss of natural areas.			
	Impacts to Avian, Wildlife and Plant Species at Risk (SAR)	Potential effects avian and wildlife including SAR identified in the study area.	<ul style="list-style-type: none"> No identified SAR habitat along this alignment alternative. 	<ul style="list-style-type: none"> No identified SAR habitat along this alignment alternative. 	<ul style="list-style-type: none"> No identified SAR habitat along this alignment alternative. 	<ul style="list-style-type: none"> Alignment runs along the northern limit of approximately 270 m of potential Bobolink and/or Eastern Meadowlark habitat.

Cat.	Criteria	Criteria Indicator	Alternative 1 SP 47 TMP Alignment (Blue)	Alternative 2 Shift to the South (Red)	Alternative 3 Shift North of the Pipeline (Yellow)	Alternative 4 Shift North of Creek (Green)
	Groundwater Impacts	Potential for adverse effects on existing groundwater resources (water quality and/or quantity).	<ul style="list-style-type: none"> 8.6 ha reduction in pervious surface area as a result of construction of this alternative. TRCA requirements for groundwater balance will be met for all alternatives, through provision of off-site recharge or use of on-site LID methods. Preferred method to be confirmed based on hydrogeological and geotechnical assessments. 	<ul style="list-style-type: none"> 9.0 ha reduction in pervious surface area as a result of construction of this alternative. TRCA requirements for groundwater balance will be met for all alternatives, through provision of off-site recharge or use of on-site LID methods. Preferred method to be confirmed based on hydrogeological and geotechnical assessments. 	<ul style="list-style-type: none"> 8.6 ha reduction in pervious surface area as a result of construction of this alternative. TRCA requirements for groundwater balance will be met for all alternatives, through provision of off-site recharge or use of on-site LID methods. Preferred method to be confirmed based on hydrogeological and geotechnical assessments. 	<ul style="list-style-type: none"> 7.6 ha reduction in pervious surface area as a result of construction of this alternative. TRCA requirements for groundwater balance will be met for all alternatives, through provision of off-site recharge or use of on-site LID methods. Preferred method to be confirmed based on hydrogeological and geotechnical assessments.
OVERALL RANKING (Percentage of Total Available Score)						
PREFERRED ALTERNATIVE			The preferred alignment for the East-West Arterial is Alternative 1.			



5.2.3 Preferred Alternative

The preferred alignment for the East-West Arterial is Alternative 1, which was previously identified through the Area 47 TMP and follows along the south limit of the TransCanada Pipeline Corridor.

Additionally, the configuration of the intersection of the East-West Arterial, Coleraine Drive and Arterial A2 has been determined through significant consultation with stakeholders and is summarized in the Part A ESR.

5.3 Existing Arterial Roadways

5.3.1 Countryside Drive





5.3.1.1 Alternative Alignments

Countryside Drive is an existing arterial roadway, and as such, alignment alternatives are limited based on the desire to make use of the existing ROW (and thereby minimize property impacts). Alternatives considered include widening evenly about the existing centreline, widening to the north, widening to the south, or a combination of all three (3) to limit impacts to existing properties, wildlife habitat and structures (hybrid alignment). Additional alternatives were considered for the eastern limit of Countryside Drive due to issues with alignment at the intersection with Regional Road 50.

5.3.1.2 Evaluation of Alternatives









Formal evaluation of alignment alternatives for Countryside Drive is provided in Table 5-2.

Table 5-2: Evaluation of Alignment Alternatives for Countryside Drive, West of Coleraine Drive

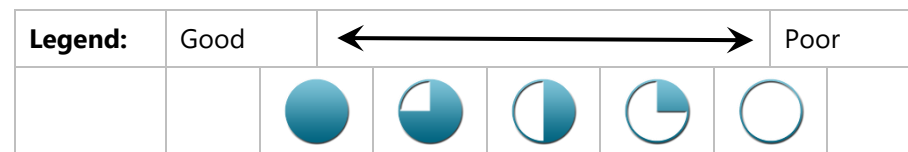
Cat.	Criteria	Criteria Indicator	Alternative 1 Widen about existing centerline	Alternative 2 Widen to the North	Alternative 3 Widen to the South	Alternative 4 Composite Alignment (Widened to the south to east of Clarkway Drive, then to the North to Regional Road 50)
Engineering	Addresses Problem and Opportunity Statement	Provide enhanced inter-regional connectivity.	No additional inter-regional connectivity provided through widening of existing roadways. No difference between alternatives.			
		Provide access to proposed development.	No new road network access provided to proposed development through widening of an existing roadway. No difference between alternatives.			
		Improve roadway geometrics to meet or exceed City and Regional standards.	Profile and sight distance triangles will be adjusted to mitigate issues with visibility and flooding to the extent feasible. Existing linear nature of Countryside Drive will not be changed, with exception of the intersection with Regional Road 50. No significant differences between alternatives.			
		Provide pedestrian and cycling facilities.	New sidewalks and cycle lanes will provide pedestrian and cycling facilities on both sides of Countryside Drive. No difference between alternatives.			
		Improve traffic, pedestrian and cyclist safety.	Additional capacity on congested roadways, correction of sight distance issues, as well as separation of vehicular and active transportation road users will improve overall safety of the roadway. No significant difference between alternatives.			
		Improve watercourse crossings to enhance hydraulics, stream function and fisheries and wildlife passage.	Existing crossings of Countryside Drive over The Gore Road Tributary, Clarkway Creek and Rainbow Creek will be improved to mitigate any identified issues with culvert /bridge capacities (flooding).			
		Address structural deficiency.	No structural deficiencies noted for any existing crossings along the study portion of Countryside Drive. Existing structures will be lengthened / replaced in support of road widening efforts, as well as to address hydraulic capacity issues. No significant difference between alternatives.			
		Improve pavement conditions.	Roadway will be reconstructed as part of widening efforts. Pavement conditions will therefore be improved. No significant difference between alternatives.			
	Transportation Network Safety (includes natural hazards)	Safety related factors include roadway geometrics, roadside hazards, intersection design and control, accommodating pedestrians and cyclists.	<ul style="list-style-type: none"> ROW would be moved closer to Clarkway Creek at Clarkway Drive, as well as an existing pond southwest of The Gore Road Tributary crossing of Countryside, and another on private property. Replacement of existing guiderail will be required at these locations. 	<ul style="list-style-type: none"> Replacement of existing guiderail would be required. 	<ul style="list-style-type: none"> Replacement of existing guiderail would be required. As alignment moves closer to several headwater drainage features of Rainbow Creek adjacent to Coleraine Drive, need for additional guiderail would need to be evaluated. 	<ul style="list-style-type: none"> Replacement of existing guiderail would be required. 
	Transportation Network Connectivity		Widening of existing roadways does not have significant impacts on network connectivity. No significant differences between alternatives.			
Transportation Network Capacity	Impacts on traffic on local roads and outside the study area. Transportation network improvement and accommodation of goods movement.	Widening of Countryside Drive will provide additional capacity along the roadway. No significant differences between alternatives.				
Promotion of Active Transportation	Adheres to Brampton's Active Transportation Policies and Initiatives as Defined in the TMP.	Provision of dedicated pedestrian and cyclist facilities will promote use of active transportation along the corridor. Sidewalk will need to be moved in close to the roadway to minimize impacts to Clarkway Creek at the intersection with Clarkway Drive. This will reduce separation between vehicles and pedestrians / cyclists.				
Transit Supportive Development	Potential adverse impact on transit service. Assessment of impact on planned transit service improvements.	In general, increased roadway capacity, provision of bus bays, and transit service along the corridor will encourage use of transit services. Potential impacts to Clarkway Creek at Clarkway Drive may limit ability to provide transit platforms at this intersection. No difference between alternatives.				
Structural Impacts	Potential adverse impact on existing structures.	Existing structures along Countryside Drive will require widening / replacement to accommodate additional traffic lanes and active transportation facilities, regardless of the alternative selected. No difference between alternatives.				

Cat.	Criteria	Criteria Indicator	Alternative 1 Widen about existing centerline	Alternative 2 Widen to the North	Alternative 3 Widen to the South	Alternative 4 Composite Alignment (Widened to the south to east of Clarkway Drive, then to the North to Regional Road 50)																																															
		Need for additional bridge structures.	No new crossings will be required for this alignment alternative.																																																		
	Hydraulics and Hydrology Impacts (Creeks)	Impact on floodplain, existing flood depths at proposed crossing locations, and existing flood return period.	<ul style="list-style-type: none"> Approximately 2,900 m² of linear infrastructure to be constructed within the floodplain of The Gore Road Tributary. Approximately 4,000 m² of linear infrastructure to be constructed within the floodplain of Clarkway Creek. Approximately 8,200 m² of linear infrastructure to be constructed within the floodplain of Rainbow Creek. Significant impact on existing floodplains. 	<ul style="list-style-type: none"> Approximately 3,000 m² of linear infrastructure to be constructed within the floodplain of The Gore Road Tributary. Approximately 4,100 m² of linear infrastructure to be constructed within the floodplain of Clarkway Creek. Approximately 9,400 m² of linear infrastructure to be constructed within the floodplain of Rainbow Creek. Significant impact on existing floodplains. 	<ul style="list-style-type: none"> Approximately 2,700 m² of linear infrastructure to be constructed within the floodplain of The Gore Road Tributary. Approximately 3,700 m² of linear infrastructure to be constructed within the floodplain of Clarkway Creek. Approximately 5,600 m² of linear infrastructure to be constructed within the floodplain of Rainbow Creek. Moderate impact on existing floodplains. 	<ul style="list-style-type: none"> Approximately 4,200 m² of linear infrastructure to be constructed within the floodplain of The Gore Road Tributary. Approximately 3,700 m² of linear infrastructure to be constructed within the floodplain of Clarkway Creek. Approximately 5,600 m² of linear infrastructure to be constructed within the floodplain of Rainbow Creek. Moderate impact on existing floodplains. 																																															
Financial	Utility Relocation	Anticipated impacts to existing and proposed utilities.	<ul style="list-style-type: none"> All overhead utilities within the corridor will require relocation. Watermain will not be located per the City's standard and may need to be relocated as a result. Significant utility impacts. 	<ul style="list-style-type: none"> Overhead pole line (Hydro, Bell) will need to be relocated between west study limit and Clarkway Drive, as well as between Coleraine Drive and Regional Road 50. Bell pedestals on the north side of Countryside Drive will need to be relocated between west study limit and Coleraine Drive. Watermain may need relocation between west study limit and Clarkway Drive. Moderate utility impacts. 	<ul style="list-style-type: none"> Overhead pole line (Hydro, Bell) will need to be relocated from 400 m east of Clarkway Drive to Regional Road 50. Bell pedestals on both sides of Countryside Drive would need to be relocated between west study limit and Clarkway. From Clarkway Drive to the east, infrastructure on the south side would need to be relocated. Watermain may need relocation between Clarkway Drive and 300 m east of Coleraine Drive. Moderate / significant utility impacts. 	<ul style="list-style-type: none"> Overhead pole line (Hydro, Bell) will need to be relocated from Clarkway Drive to 520 m to the east, and then again between Coleraine Drive and Regional Road 50. Bell pedestals will require relocation along the entire corridor. Moderate/ significant utility impacts. 																																															
		Measure of anticipated infrastructure impacts (m).	<table border="1"> <tr><td>Hydro</td><td>~ 2,500 m</td></tr> <tr><td>Bell</td><td>~ 5,000 m</td></tr> <tr><td>Gas</td><td>~ 130 m</td></tr> <tr><td>Watermain</td><td>~ 2,400 m</td></tr> <tr><td>Storm Sewer</td><td>N/A</td></tr> <tr><td>Sanitary Sewer</td><td>N/A</td></tr> </table>	Hydro	~ 2,500 m	Bell	~ 5,000 m	Gas	~ 130 m	Watermain	~ 2,400 m	Storm Sewer	N/A	Sanitary Sewer	N/A	<table border="1"> <tr><td>Hydro</td><td>~ 1,350 m</td></tr> <tr><td>Bell</td><td>~ 2,100 m</td></tr> <tr><td>Gas</td><td>~ 130 m</td></tr> <tr><td>Watermain</td><td>~ 680 m</td></tr> <tr><td>Storm Sewer</td><td>N/A</td></tr> <tr><td>Sanitary Sewer</td><td>N/A</td></tr> </table>	Hydro	~ 1,350 m	Bell	~ 2,100 m	Gas	~ 130 m	Watermain	~ 680 m	Storm Sewer	N/A	Sanitary Sewer	N/A	<table border="1"> <tr><td>Hydro</td><td>~ 1,400 m</td></tr> <tr><td>Bell</td><td>~ 2,700 m</td></tr> <tr><td>Gas</td><td>~ 0 m</td></tr> <tr><td>Watermain</td><td>~ 1,680 m</td></tr> <tr><td>Storm Sewer</td><td>N/A</td></tr> <tr><td>Sanitary Sewer</td><td>N/A</td></tr> </table>	Hydro	~ 1,400 m	Bell	~ 2,700 m	Gas	~ 0 m	Watermain	~ 1,680 m	Storm Sewer	N/A	Sanitary Sewer	N/A	<table border="1"> <tr><td>Hydro</td><td>~ 1,180 m</td></tr> <tr><td>Bell</td><td>~ 3,250 m</td></tr> <tr><td>Gas</td><td>~ 0 m</td></tr> <tr><td>Watermain</td><td>~ 300 m</td></tr> <tr><td>Storm Sewer</td><td>N/A</td></tr> <tr><td>Sanitary Sewer</td><td>N/A</td></tr> </table>	Hydro	~ 1,180 m	Bell	~ 3,250 m	Gas	~ 0 m	Watermain	~ 300 m	Storm Sewer	N/A	Sanitary Sewer
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	Capital Costs	Function of total road length and width, AT facilities provided, intersection infrastructure, structural area required, and amount of utility relocation.	<ul style="list-style-type: none"> 3,100 m of four (4) lane roadway to be constructed. 6,200 m of cycle lanes and sidewalks to be constructed. 1,500 m² of new culverts / bridge structures to be constructed. Three (3) new signalized intersections between The Gore Road and Regional Road 50. Significant utility relocations required. Significant capital cost. 	<ul style="list-style-type: none"> 3,100 m of four (4) lane roadway to be constructed. 6,200 m of cycle lanes and sidewalks to be constructed. 1,500 m² of new culverts / bridge structures to be constructed. Three (3) new signalized intersections between The Gore Road and Regional Road 50. Moderate utility relocations required. Moderate capital cost. 	<ul style="list-style-type: none"> 3,100 m of four (4) lane roadway to be constructed. 6,200 m of cycle lanes and sidewalks to be constructed. 1,500 m² of new culverts / bridge structures to be constructed. Three (3) new signalized intersections between The Gore Road and Regional Road 50. Moderate / significant utility relocations required. Moderate / significant capital cost. 	<ul style="list-style-type: none"> 3,100 m of four (4) lane roadway to be constructed. 6,200 m of cycle lanes and sidewalks to be constructed. 1,500 m² of new culverts / bridge structures to be constructed. Three (3) new signalized intersections between The Gore Road and Regional Road 50. Moderate / significant utility relocations required. Moderate / significant capital cost.
	Operating Costs	Function of road length and number of traffic signals.	No significant difference between alternatives.			
	Property Acquisition	Estimated cost of acquiring required property.	Approximately 3.3 ha of property required to widen and provide active transportation facilities to Coleraine Drive. No difference between alternatives. Moderate property acquisition costs.			
Social / Cultural Environment	Conformance to Planning Objectives (Growth Plan, Official Plan, Secondary Plan, Area 47 TMP)		<ul style="list-style-type: none"> Alignment assumed during completion of the SP47 TMP. Requirement for widening identified in the Citywide TMP. Primarily matches assumptions regarding ROW widening adjacent to Block 47-2 and developer's properties, with exception of portion east of Coleraine Drive. 	<ul style="list-style-type: none"> Requirement for widening identified in the Citywide TMP. North ROW limit will be located 16 m north of existing, and 6.5 m north of the property limits assumed for development Block Plan 47-2 and the Industrial development area. Minor amendment of the Block Plan designs will be required. 	<ul style="list-style-type: none"> Requirement for widening identified in the Citywide TMP. South ROW limit will be located 16 m south of existing, and 9.5 m south of the property limits assumed for development Block Plan 47-2 and the Industrial development area. Amendment of the Block Plan designs will be required. 	<ul style="list-style-type: none"> Requirement for widening identified in the Citywide TMP. South ROW limit will primarily be located 16 m south of existing, and 9.5 m south of the property limits assumed for development Block Plan 47-2 to mid-block between Clarkway Drive and Coleraine Drive. From mid-block between Clarkway Drive and Coleraine Drive, ROW is widened to the north by 16 m. Amendment of the Block Plan designs will be required.
	Residential / Business Access and Displacement	Potential adverse effects including limited access and changes to existing entrances.	<ul style="list-style-type: none"> Access to one (1) property at the western limit of the project, and one property west of Coleraine Drive will be significantly impacted through required removal of existing circular driveways. Driveways for 13 additional properties will be shortened. 	<ul style="list-style-type: none"> Three (3) residences will require full buyout. Driveways of seven (7) other properties west of Coleraine Drive will be shortened by 16 m. Significant impacts to existing buildings and accesses. 	<ul style="list-style-type: none"> Accesses to five (5) properties on the south side of Countryside Drive will be shortened by 16 m. Existing buildings on south side are set well back from the existing ROW limit. Minor impacts to residential accesses. 	<ul style="list-style-type: none"> Accesses to three (3) properties on the south side of Countryside Drive will be shortened by 16 m. Existing buildings on south side are set well back from the existing ROW limit. Access to six (6) properties on the north side of Countryside Drive will be shortened. One (1) property immediately west of Coleraine Drive will be displaced.

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	Emergency Services (Police, Fire, Ambulance)	Potential to reduce response times. Potential adverse effects include changes to existing entrances.	Additional roadway capacity will help to reduce response times by reducing congestion at intersections and providing areas where emergency vehicles can safely pass other traffic. No significant difference between alternatives.			
	Noise Levels Impacts	Potential effects of traffic related noise on residences, community facilities, or institutions adjacent to and/or within the study area.	<ul style="list-style-type: none"> Roadway moved closer to 15 existing residential properties west of Coleraine Drive. Anticipated noise level increases above the allowable threshold will be mitigated through landscaping and noise barriers, where feasible. 	<ul style="list-style-type: none"> Roadway moved significantly closer to seven (7) properties on the north side of Countryside Drive, west of Coleraine Drive. Anticipated noise level increases above the allowable threshold will be mitigated through landscaping and noise barriers, where feasible. 	<ul style="list-style-type: none"> Roadway will be moved closer to five (5) existing residential buildings, which are currently set well back from the existing ROW limit. Anticipated noise level increases above the allowable threshold will be mitigated through landscaping and noise barriers, where feasible. 	<ul style="list-style-type: none"> Roadway moved closer to nine (9) existing residential properties, three (3) of which are significantly set back, and six (6) of which are located in closer proximity to the existing ROW limit. Anticipated noise level increases above the allowable threshold will be mitigated through landscaping and noise barriers, where feasible.
						
	Cultural Heritage Impacts	Potential adverse impacts on archaeological resources, built heritage resources and cultural heritage landscapes adjacent to and/or within the study area	<ul style="list-style-type: none"> All non-developed land adjacent to the corridor has been identified as having archaeological potential. Widening will require 2,200 m² of property from the north side of the designated heritage property at 10955 Clarkway Drive, although there will be no anticipated impacts to existing building. Widening will require 1,200 m² of property from the southern limit of the listed heritage property at 5556 Countryside Drive. Moderate impacts to heritage properties. 	<ul style="list-style-type: none"> All non-developed land adjacent to the corridor has been identified as having archaeological potential. Widening will not require property from the designated heritage property at 10955 Clarkway Drive. Widening will require 3,000 m² of property from the southern limit of the listed heritage property at 5556 Countryside Drive. Moderate impacts to heritage properties. 	<ul style="list-style-type: none"> All non-developed land adjacent to the corridor has been identified as having archaeological potential. Widening will require 4,400 m² of property from the north side of the designated heritage property at 10955 Clarkway Drive, although there will be no anticipated impacts to existing building. Widening will not require property from the listed heritage property at 5556 Countryside Drive. Moderate impacts to heritage properties. 	<ul style="list-style-type: none"> All non-developed land adjacent to the corridor has been identified as having archaeological potential. Widening will require 4,200 m² of property from the north side of the designated heritage property at 10955 Clarkway Drive, although there will be identified impacts to existing building. Widening will require 3,200 m² of property from the southern limit of the listed heritage property at 5556 Countryside Drive. Significant impacts to heritage properties.
						
	Agricultural Impacts		2.3 ha of agricultural property west of Coleraine Drive will be impacted by widening along this alignment. Moderate impacts to agricultural properties.			
Natural Environment	Impact to Designated Natural Heritage Features including wetlands	Proximity to, and significance of, impact to designated feature.	No designated natural heritage features within the study area. No difference among alternatives.			
	Impact to Natural Heritage Features such as vegetation and watercourses	Proximity, size, characteristics, and sensitivity of significant rural areas, terrestrial ecosystems, and wetlands. Potential impact or loss of natural areas, terrestrial ecosystems or wetland areas, function or habitat.	<ul style="list-style-type: none"> Would require widening and upsizing of existing Gore Road Tributary, Clarkway Creek, and Rainbow Creek structures, resulting in loss of approximately 8,200 m² of natural area associated with those creeks. Pond on the south side of Countryside Drive, west of Clarkway Drive will be impacted for all alternatives. No natural heritage features identified within the study area. 	<ul style="list-style-type: none"> Would require widening and upsizing of existing Gore Road Tributary, Clarkway Creek, and Rainbow Creek structures, resulting in loss of approximately 8,200 m² of natural area associated with those creeks. Pond on the south side of Countryside Drive, west of Clarkway Drive will be impacted for all alternatives. No natural heritage features identified within the study area. 	<ul style="list-style-type: none"> Would require widening and upsizing of existing Gore Road Tributary, Clarkway Creek, and Rainbow Creek structures, resulting in loss of approximately 8,300 m² of natural area associated with those creeks. Pond on the south side of Countryside Drive, west of Clarkway Drive will be impacted for all alternatives. No natural heritage features identified within the study area. 	<ul style="list-style-type: none"> Would require widening and upsizing of existing Gore Road Tributary, Clarkway Creek, and Rainbow Creek structures, resulting in loss of approximately 8,200 m² of natural area associated with those creeks. Pond on the south side of Countryside Drive, west of Clarkway Drive will be impacted for all alternatives. No natural heritage features identified within the study area.

Cat.	Criteria	Criteria Indicator	Alternative 1 Widen about existing centerline	Alternative 2 Widen to the North	Alternative 3 Widen to the South	Alternative 4 Composite Alignment (Widened to the south to east of Clarkway Drive, then to the North to Regional Road 50)	
	Impact to Avian, Wildlife and Plant Species at Risk (SAR)	Potential effects to SAR habitat.					
			<ul style="list-style-type: none"> Approximately 2,700 m² of potential Bobolink habitat impacted by proposed roadway alignment. Compensation may be required. 	<ul style="list-style-type: none"> No anticipated impacts to identified potential Bobolink habitat. 	<ul style="list-style-type: none"> Approximately 5,300 m² of potential Bobolink habitat impacted by proposed roadway alignment. Compensation may be required. 	<ul style="list-style-type: none"> No anticipated impacts to identified potential Bobolink habitat. 	
	Groundwater Impacts	Potential for adverse effects on existing groundwater resources (water quality and/or quantity).	4.1 ha reduction in pervious surface area as a result of construction of this alternative. TRCA requirements for groundwater balance will be met for all alternatives, through provision of off-site recharge or use of on-site LID methods.				
OVERALL RANKING							
PREFERRED ALTERNATIVE			While both Alternatives 2 and 3 score equally overall, Alternative 3 will have the least significant impact on existing residential properties, both in terms of necessary acquisitions and noise. As a result, Alternative 3, widen to the south, is the preferred alternative.				



5.3.1.3 Preferred Alignment

The preferred alignment for Countryside Drive, west of Coleraine Drive, is Alternative 3 – widen to the south. This alternative is preferred primarily due to limited impacted to existing residential properties. Mitigation of impacts to the existing designated heritage property in the southeast quadrant of the Countryside Drive / Clarkway Drive intersection, as well as potential species-at-risk habitat, will be required.

5.3.2 Clarkway Drive

5.3.2.1 Alternative Alignments

Clarkway Drive is an existing collector roadway, and as such, alignment alternatives are limited based on the desire to make use of the existing ROW (and thereby minimize property impacts). Alternatives considered include widening evenly about the existing centreline, widening to the east, widening to the west, or a combination of all three to limit impacts to existing creeks, buildings, heritage features, wildlife habitat and structures (hybrid alignment). Critical to evaluation of Clarkway Drive widening alternatives is the relative location of the Clarkway Creek floodplain, as well as the proximity of a heritage properties and cultural heritage landscapes.

5.3.2.2 Evaluation of Alternatives

Formal evaluation of alignment alternatives for Clarkway Drive are provided in Table 5-3.









Table 5-3: Alternative Alignment Evaluation for Clarkway Drive

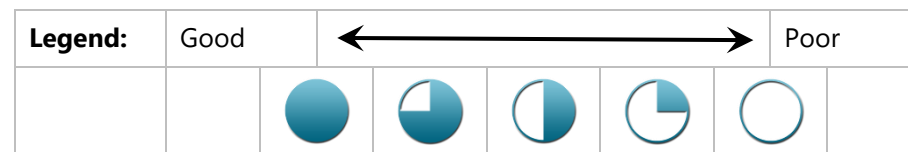
Cat.	Criteria	Criteria Indicator	Alternative 1 Widen About Existing Centerline	Alternative 2 Widen to the West	Alternative 3 Widen to the East	Alternative 4 Composite Alignment
	Addresses Problem and Opportunity Statement	Provide access to proposed development.	Increased roadway capacity at north and south limits will improved access to proposed development.			
		Improve roadway geometrics to meet or exceed City and Regional standards.	<ul style="list-style-type: none"> Offset alignment at Clarkway Drive / Mayfield Road intersection corrected. 	<ul style="list-style-type: none"> Offset alignment at Clarkway Drive / Mayfield Road intersection corrected. Curve introduced on approach to Castlemore Road intersection. 	<ul style="list-style-type: none"> Offset alignment at Clarkway Drive / Mayfield Road intersection corrected. 	<ul style="list-style-type: none"> Offset alignment at Clarkway Drive / Mayfield Road intersection corrected. Several curves introduced along existing linear alignment. Curves will be designed to required standards.
		Provide pedestrian and cycling facilities.	Pedestrian and cycling facilities will be provided. No difference between alternatives.			
		Improve traffic, pedestrian and cyclist safety.	Improved pedestrian and cyclist safety through provision of dedicated facilities. Improvements to vehicular safety through profile corrections to address issues with flooding and sight distance.			
		Address structural deficiency.	<ul style="list-style-type: none"> Existing crossing of Clarkway Drive over Clarkway Creek can be maintained with this alignment alternative. Structure is in good condition. 	<ul style="list-style-type: none"> Change in alignment of Clarkway Drive at Clarkway Creek will necessitate changes to the existing structural crossing. 	<ul style="list-style-type: none"> Change in alignment of Clarkway Drive at Clarkway Creek will necessitate changes to the existing structural crossing. 	<ul style="list-style-type: none"> Change in alignment of Clarkway Drive at Clarkway Creek will necessitate changes to the existing structural crossing.
		Improve pavement conditions.	Roadway will be fully reconstructed, resulting in improved pavement conditions.			
	Transportation Network Safety (includes natural hazards)	Safety related factors include roadway geometrics, roadside hazards, intersection design, and control, accommodating pedestrians and cyclists.	<ul style="list-style-type: none"> Roadway moved closer to Clarkway Creek and will therefore require additional guiderail. Two (2) back-to-back curves will be required to correct issue with intersection offset at Mayfield Road. Intersection at Castlemore Road is properly aligned. 	<ul style="list-style-type: none"> Roadway moved closer to Clarkway Creek and will therefore require additional guiderail. Two (2) back-to-back curves will be required to correct issue with intersection offset at Mayfield Road. Existing curve on approach to Castlemore Road can be removed. 	<ul style="list-style-type: none"> Two (2) back-to-back curves will be required to correct issue with intersection offset at Mayfield Road. Two (2) back-to-back curves will be required to correct issue with intersection offset at Castlemore Road 	<ul style="list-style-type: none"> Two (2) back-to-back curves will be required to correct issue with intersection offset at Mayfield Road. Intersection at Castlemore Road is properly aligned.
	Transportation Network Connectivity		Existing intersections will be maintained and/or improved. No significant change from existing.			
	Transportation Network Capacity	Impacts on traffic on local roads and outside the study area. Transportation network improvement and accommodation of goods movement.	Increased roadway capacity to be provided south of Collector Road 'C', allowing for improved access to planned residential development. Anticipated congestion through Collector Road 'C' segment will increase overall travel times along Clarkway Drive. No significant difference between alternatives.			

Cat.	Criteria	Criteria Indicator	Alternative 1 Widen About Existing Centerline	Alternative 2 Widen to the West	Alternative 3 Widen to the East	Alternative 4 Composite Alignment																															
	Promotion of Active Transportation	Impact on the safety and usability of planned AT infrastructure, as well as adherence to City AT policy.	<ul style="list-style-type: none"> Provision of dedicated pedestrian and cyclist facilities will promote use of active transportation along the corridor. Sidewalk will need to be moved in close to the roadway to minimize impacts to Clarkway Creek between Countryside Drive and East-West Arterial. 	<ul style="list-style-type: none"> Provision of dedicated pedestrian and cyclist facilities will promote use of active transportation along the corridor. Sidewalk will need to be moved in close to the roadway to minimize impacts to Clarkway Creek between Countryside Drive and East-West Arterial. 	<ul style="list-style-type: none"> Provision of dedicated pedestrian and cyclist facilities will promote use of active transportation along the corridor. Roadway moved away from Clarkway Creek to the extent feasible, permitting greater separation of vehicular and sidewalk between Countryside Drive and the East-West Arterial. 	<ul style="list-style-type: none"> Provision of dedicated pedestrian and cyclist facilities will promote use of active transportation along the corridor. Roadway moved away from Clarkway Creek to the extent feasible, permitting greater separation of vehicular and sidewalk between Countryside Drive and the East-West Arterial. 																															
	Transit Supportive Development	Potential adverse impact on transit service. Assessment of impact on planned transit service improvements.	Increased roadway capacity (in sections), provision of bus bays, and transit service along the corridor will encourage use of transit services. Potential impacts to Clarkway Creek at Clarkway Drive may limit ability to provide transit platforms at this intersection. No difference between alternatives.																																		
	Structural Impacts	Potential adverse impact on existing structures.	Clarkway Creek crossing structure south of Countryside Drive will require widening / replacement to accommodate additional roadway width due to addition of active transportation facilities. No difference between alternatives.																																		
		Potential adverse impact on proposed structures.	If compensation for loss of floodplain storage on the east side of Clarkway Drive cannot be provided on the west side, two (2) new crossing structures may be required between Countryside Drive and the East-West Arterial. No significant difference in required structures between alternatives.																																		
Hydraulics and Hydrology Impacts (Creeks)	Impact on floodplain, existing flood depths at proposed crossing locations, and existing flood return period.	Approximately 4,200 m ² of new linear infrastructure to be constructed within the floodplain of Clarkway Creek. Significant impact to hydraulics and hydrology.																																			
Financial	Utility Relocation	Ability to minimize effects on existing and proposed utilities.	<ul style="list-style-type: none"> Hydro and bell infrastructure will require relocation from approximately 280 m south of Mayfield Road to Castlemore Road. Sanitary sewer between Countryside Drive and Castlemore Road will be located under the median. Watermain will be located under the road surface from the East-West Arterial to Castlemore Road. Significant utility impacts. 	<ul style="list-style-type: none"> Hydro will require relocation across the proposed curves between Mayfield Road and Countryside Drive, as well as from south of Countryside Drive to Castlemore Road. Bell infrastructure which is currently located on the west side of the road will require relocation. Watermain will be located under the roadway surface from 600 m south of Mayfield Road south to Castlemore Road. Sanitary sewer may be located under the boulevard on the east side. Moderate utility impacts. 	<ul style="list-style-type: none"> Hydro would require relocation from 900 m north to 700 m south, of Countryside Drive, as well as through the Collector Road 'C' section. All Bell infrastructure which is currently located on the east side of Clarkway Drive will require relocation. Watermain will be located under the future sidewalk/boulevard on the west side. Sanitary sewer between Countryside Drive and Castlemore Road will be located under the southbound lanes. Moderate utility impacts. 	<ul style="list-style-type: none"> Hydro would require relocation where the road curves near Countryside Drive, as well as from the Collector Road 'C' section south to Castlemore Road. Segments of Bell infrastructure on either side of the roadway would require relocation between Mayfield Road and Castlemore Road. Watermain will be located under the roadway with exception of the segment between East-West Arterial and Countryside Drive, where it will be located under the west side boulevard. Sanitary sewer between Countryside Drive and Castlemore Road will be located under the southbound lanes. Moderate utility impacts. 																															
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Storm Sewer	N/A																																				

Cat.	Criteria	Criteria Indicator	Alternative 1 Widen About Existing Centerline	Alternative 2 Widen to the West	Alternative 3 Widen to the East	Alternative 4 Composite Alignment
	Capital Costs	Function of total road length and width, AT facilities provided, intersection infrastructure, structural area required, and amount of utility relocation.	<ul style="list-style-type: none"> 4.3 km of roadway to be reconstructed. 8.6 km of sidewalk and cycle lanes to be constructed. Two (2) new arterial-to-arterial signalized intersections. Significant utility impacts. 	<ul style="list-style-type: none"> 4.3 km of roadway to be reconstructed. 8.6 km of sidewalk and cycle lanes to be constructed. Two (2) new arterial-to-arterial signalized intersections. Moderate utility impacts. 	<ul style="list-style-type: none"> 4.3 km of roadway to be reconstructed. 8.6 km of sidewalk and cycle lanes to be constructed. Two (2) new arterial-to-arterial signalized intersections. Moderate utility impacts. 	<ul style="list-style-type: none"> 4.3 km of roadway to be reconstructed. 8.6 km of sidewalk and cycle lanes to be constructed. Two (2) new arterial-to-arterial signalized intersections. Moderate utility impacts.
	Operating Costs	Function of road length, area of bridge structures (for maintenance) and number of traffic signals.	Approximately 4.3 km of roadway to be maintained. Two (2) new traffic signals (Countryside Drive and East-West Arterial). 640 m ² of bridge deck to be maintained. Moderate operating costs.			
	Property Acquisition	Estimated cost of acquiring required property.	<ul style="list-style-type: none"> Approximately 6.15 ha of property required to construct the proposed roadway along this alignment. Moderate property requirements. 	<ul style="list-style-type: none"> Approximately 6.1 ha of property required to construct the proposed roadway along this alignment. Moderate property requirements. 	<ul style="list-style-type: none"> Approximately 6.1 ha of property required to construct the proposed roadway along this alignment. Moderate property requirements. 	<ul style="list-style-type: none"> Approximately 6.0 ha of property required to construct the proposed roadway along this alignment. Moderate property requirements.
Social / Cultural Environment	Conformance to Planning Objectives (Growth Plan, Official Plan, Secondary Plan, Area 47 TMP)		<ul style="list-style-type: none"> Alignment improvements at Mayfield Road result in impacts to planned Mixed-Use commercial in southeast quadrant of that intersection. Remainder of alignment is as assumed during completion of the transportation master plan for the area. 	<ul style="list-style-type: none"> Alignment improvements at Mayfield Road result in impacts to planned Mixed-Use commercial in southeast quadrant of that intersection. Remainder of alignment is further west than assumed during completion of the transportation master plan for the area and would require some modifications to the Block Plan layout at the East-West arterial and through the Collector Road 'C' section. 	<ul style="list-style-type: none"> Alignment improvements at Mayfield Road result in impacts to planned Mixed-Use commercial in southeast quadrant of that intersection. Remainder of alignment is further east than assumed during completion of the transportation master plan for the area and would require some modifications to the Block Plan layout through the Collector Road 'C' section. Edge impacts on the planned community park. 	<ul style="list-style-type: none"> Alignment improvements at Mayfield Road result in impacts to planned Mixed-Use commercial in southeast quadrant of that intersection. Remainder of alignment meanders to limit impacts to Clarkway Creek and would therefore require some modifications to the Block Plans. Edge impacts to the Community Park and Secondary School at the East-West Arterial. Alignment from East-West Arterial south is primarily what was assumed during completion of the transportation master plan for the area.
	Residential/Business Access and Displacement	Potential adverse effects including changes to existing entrances.	<ul style="list-style-type: none"> No existing residential properties will require full buyout. Three (3) existing residential properties require bridges over Clarkway Creek to access their properties. These will require replacement to complete construction of the roadway. 	<ul style="list-style-type: none"> One (1) residential property will require full buyout. Three (3) existing residential properties require bridges over Clarkway Creek to access their properties. These will require replacement to complete construction of the roadway. 	<ul style="list-style-type: none"> Two (2) existing residential properties will require full buyout. Parking will require reconfiguration at one (1) residential property. 	<ul style="list-style-type: none"> Two (2) existing residential properties will require full buyout. Parking will require reconfiguration at two (2) residential properties.
	Emergency Services (Police, Fire, Ambulance)	Potential to reduce response times. Potential adverse effects include changes to existing entrances.	Improved roadway connectivity, particularly adjacent to the proposed East-West Arterial, as well as resulting from increased capacity on intersecting roadways, is anticipated to reduce response times. No significant difference between alternatives.			

Cat.	Criteria	Criteria Indicator	Alternative 1 Widen About Existing Centerline	Alternative 2 Widen to the West	Alternative 3 Widen to the East	Alternative 4 Composite Alignment
	Noise Levels Impacts	Potential effects of traffic related noise on residences, community facilities, or institutions adjacent to and/or within the study area.	<ul style="list-style-type: none"> South of the Collector Road 'C' portion of Clarkway Drive, the edge of pavement will be moved approximately 7 m closer to four (4) existing homes. Remainder of the roadway remains two (2) lanes and follows the existing centerline alignment. Opportunities to mitigate any significant changes in noise levels will be investigated. 	<ul style="list-style-type: none"> South of the Collector Road 'C' portion of Clarkway Drive, the edge of pavement will be moved approximately 9 m closer to two (2) existing homes. Through the future Collector Road 'C' section north to Countryside Drive, the future edge of pavement will be moved approximately 10 m closer to seven (7) existing homes on the west side of Clarkway Drive. Opportunities to mitigate any significant changes in noise levels will be investigated. 	<ul style="list-style-type: none"> South of the Collector Road 'C' portion of Clarkway Drive, the edge of pavement will be moved approximately 9 m closer to two (2) existing homes. Through the future Collector Road 'C' section north to Mayfield Road, the future edge of pavement will be moved approximately 10 m closer to 18 existing homes on the east side of Clarkway Drive. Opportunities to mitigate any significant changes in noise levels will be investigated. 	<ul style="list-style-type: none"> South of the Collector Road 'C' portion of Clarkway Drive, the edge of pavement will be moved approximately 7 m closer to four (4) existing homes. Through the future Collector Road 'C' section north to Mayfield Road, the future edge of pavement will be moved an average of 12 m closer to 15 existing homes on Clarkway Drive. Opportunities to mitigate any significant changes in noise levels will be investigated.
	Cultural Heritage Impacts	Potential adverse impacts on archaeological resources and built heritage adjacent to and/or within the study area.	<ul style="list-style-type: none"> Would require acquisition of approximately 1,200 m² of the west frontage (extending 8 m from the existing property limit) from the designated heritage property in the southeast quadrant of the Countryside Drive intersection. No anticipated impacts to the buildings on the site. Property would be required from two listed heritage properties at the south end of Clarkway Drive. No anticipated impacts to the buildings on the sites. Clarkway Drive is a cultural heritage landscape, design is to maintain this heritage value to the extent possible. 	<ul style="list-style-type: none"> Clarkway Drive is a cultural heritage landscape, design is to maintain this heritage value to the extent possible. 	<ul style="list-style-type: none"> Would require acquisition of approximately 1,700 m² of the west frontage (extending 14 m from the existing property limit) from the designated heritage property in the southeast quadrant of the Countryside Drive intersection. No anticipated impacts to the buildings on the site. Property would be required from two listed heritage properties at the south end of Clarkway Drive. No anticipated impacts to the buildings on the sites. Clarkway Drive is a cultural heritage landscape, design is to maintain this heritage value to the extent possible. 	<ul style="list-style-type: none"> Property would be required from two listed heritage properties at the south end of Clarkway Drive. No anticipated impacts to the buildings on the sites. Clarkway Drive is a cultural heritage landscape, design is to maintain this heritage value to the extent possible.
	Agricultural Impacts		<ul style="list-style-type: none"> 3.2 ha of agricultural property along the existing road ROW will be impacted by this alignment, most of which has been identified for redevelopment. Minor impacts to agricultural lands. 	<ul style="list-style-type: none"> 3.6 ha of agricultural property along the existing road ROW will be impacted by this alignment, most of which has been identified for redevelopment. Minor impacts to agricultural lands. 	<ul style="list-style-type: none"> 3.6 ha of agricultural property along the existing road ROW will be impacted by this alignment, most of which has been identified for redevelopment. Minor impacts to agricultural lands. 	<ul style="list-style-type: none"> 4.0 ha of agricultural property along the existing road ROW will be impacted by this alignment, most of which has been identified for redevelopment. Minor impacts to agricultural lands.
Natural Environment	Impact to Designated Natural Heritage Features including wetlands	Proximity to, and significance of, impact to designated feature.	No designated natural heritage features within the study area. No difference among alternatives.			

Cat.	Criteria	Criteria Indicator	Alternative 1 Widen About Existing Centerline	Alternative 2 Widen to the West	Alternative 3 Widen to the East	Alternative 4 Composite Alignment
	Impact to Natural Heritage Features such as vegetation and watercourses	Proximity, size, characteristics, and sensitivity of significant rural areas, terrestrial ecosystems, and wetlands. Potential impact or loss of natural areas, terrestrial ecosystems or wetland areas, function or habitat.	<ul style="list-style-type: none"> Widening will impact an additional 2.5 ha of natural area associated with Clarkway Creek. No natural heritage features identified within the study area. Moderate / significant impacts to the existing natural features. 	<ul style="list-style-type: none"> Widening will impact an additional 2.2 ha of natural area associated with Clarkway Creek. No natural heritage features identified within the study area. Moderate / significant impacts to the existing natural features. 	<ul style="list-style-type: none"> Widening will impact an additional 1.6 ha of natural area associated with Clarkway Creek. No natural heritage features identified within the study area. Moderate impacts to the existing natural features. 	<ul style="list-style-type: none"> Widening will impact an additional 1.6 ha of natural area associated with Clarkway Creek. No natural heritage features identified within the study area. 
	Impact to Avian, Wildlife and Plant Species at Risk (SAR)	Potential effects to SAR habitat.	No SAR habitat was identified in close proximity to Clarkway Drive. No difference between alternatives.			
	Groundwater Impacts	Potential for adverse effects on existing groundwater resources (water quality and/or quantity).	Approximately 4.1 ha reduction in pervious surface area as a result of construction of this alternative. TRCA requirements for groundwater balance will be met for all alternatives, through provision of off-site recharge or use of on-site LID methods. Preferred method to be confirmed based on hydrogeological and geotechnical assessments.			
OVERALL RANKING						
PREFERRED ALTERNATIVE			Alternative 1, widen Clarkway Drive about the existing centerline, is the preferred alternative.			



5.3.2.3 Preferred Alignment

With all criteria weighted equally, the preferred alignment alternative for Clarkway Drive is to widen evenly about the existing centerline. On the northern end, the Clarkway Drive to be realigned towards east side to match Humber Station Road on the north at Mayfield Road intersection.

5.4 Critical Intersections

The intersection of Regional Road 50 with Countryside Drive was identified as requiring particular attention, either due to issues with alignment or as a result of inability to provide at least a LOS of 'D' or better by the 2041 planning horizon regardless of implementation of auxiliary lanes or signal timing. The intersection was identified as requiring modification to address issues with alignment.

5.4.1 Countryside Drive at Regional Road 50

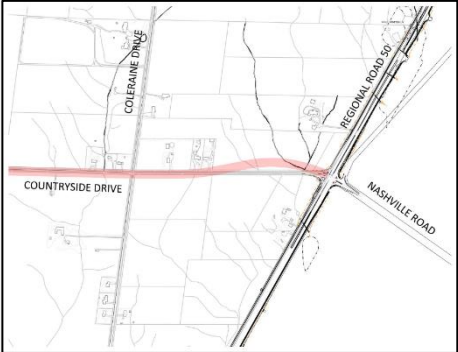
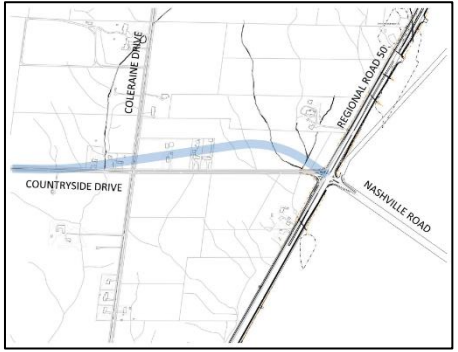

Under existing conditions, the Countryside Drive at Regional Road 50 intersection is a four (4) leg intersection with Nashville Road continuing to the east in York Region. While Nashville Road intersects Regional Road 50 at approximately 84 degrees, Countryside Drive intersects at a substandard 61 degrees. If projected along their mainline alignments, a skew of approximately 17 m would also exist between the two (2) roadways at Regional Road 50. This intersection is being reconstructed as part of the work currently underway to widen Regional Road 50 from four (4) to six (6) lanes. However, as the work is limited to the area directly adjacent to Regional Road 50, correction of the alignment discrepancy between Countryside Drive and Nashville Road has been only partially addressed through introduction of a curvilinear alignment through the intersection (radius of 300 m). The relatively small radius would necessitate a reduced driving speed through the intersection relative to the posted speeds on the approaches, which could cause issues with drivers entering the intersection excessive speed (50 km/h at intersection versus 70 km/h on approaches). Non-perpendicular approaches also require additional pavement widths to provide large enough turning radii for large vehicles to safely navigate turns.

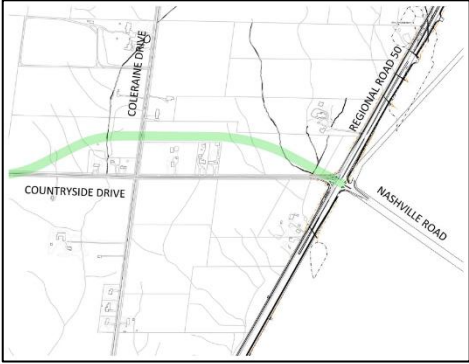
Of particular importance with respect to the temporary configuration of Regional Road 50 and Countryside Drive / Nashville Road is the less than ideal visibility and requirement for larger sight triangles in the southwest quadrant provided by the skewed approaches and 300 m curve radius. This is a particular issue for those drivers making northbound right turns onto Nashville Road and, to a lesser degree, those making westbound left turns onto Regional Road 50. For a design speed of 90 km/h, the TAC Manual indicates a minimum sight distance of ~265 m to the left is required for drivers making a right turn (TAC, 2017). To see this far to the left, and particularly once Countryside Drive is widened to four (4) lanes, making a right turn from northbound Regional Road 50 will require that drivers look for vehicles approaching at nearly 70 degrees back from their left shoulder. The generally recommended maximum angle for visibility is 20 degrees. This issue could be partially addressed through removal of the right turn channel from northbound Regional Road 50; however, large areas of property will need to remain free of development to accommodate the required intersection sight triangles.

A total of four (4) alternative intersection approach configurations were developed for this critical intersection. These are illustrated and described in more detail in the following subsections.

5.4.1.1 Alternative Solutions

Table 5-4: Alternative Solutions for Countryside Drive at Regional Road 50

Alternatives	Descriptions	Design
<p>Alternative 1 – Partial Correction of Skew and Shorter Tangent</p>	<p>Alternative 1 contemplates introduction of a short tangent section perpendicular to Regional Road 50 through the intersection, with larger radius (530 m) back-to-back curves along the Countryside Drive approach. These larger radius curves can be used in combination with superelevation (i.e., banking) to maintain a consistent design speed of 90 km/h. This alternative would require purchase of property from an adjacent residential property.</p>	
<p>Alternative 2 – Curves West of Regional Road 50 with Consistent Design Speed</p>	<p>Alternative 2 provides longer linear approaches (aligned with City standards) to the intersection by extending the existing Nashville Road alignment to west of Regional Road 50 and introducing back-to-back curves to correct the offset alignments outside of the intersection. By introducing the larger curve outside of the intersection, superelevation (banking) can be used to maintain the existing design speed of 90 km/h on the intersection approaches. While this alternative does provide a linear intersection approach and uniform design speed, it results in significant impacts to existing properties adjacent to the Coleraine Drive / Countryside Drive intersection.</p>	
<p>Alternative 3 – Curve West of Regional Road 50 with Reduced Design Speed</p>	<p>Alternative 3 provides linear approaches to the intersection by extending the existing Nashville Road alignment to west of Regional Road 50 and introducing a curve to correct the offset alignments outside of the intersection. To limit impacts to existing residential properties adjacent to the Countryside Drive / Coleraine Drive intersection, the size of the curve was reduced relative to Alternative 2. Even with the introduction of spirals and superelevation (banking), the design speed</p>	

Alternatives	Descriptions	Design
	for Countryside Drive west of the Regional Road 50 intersection is reduced to 70 km/h.	
Alternative 4 – Realign Countryside Drive to the North Between Coleraine and Regional Road 50	Similar to Alternatives 2 and 3, Alternative 4 provides linear approaches to the intersection by extending the existing Nashville Road alignment to west of Regional Road 50 and introducing a curve to correct the offset alignments outside of the intersection. To both limit impacts to existing residential properties adjacent to the Countryside Drive / Coleraine Drive intersection and maintain a 90 km/h design speed, the alignment of Countryside Drive is shifted north of the residential properties at the Coleraine Drive intersection. In order to maintain access to existing properties, a portion of existing Countryside Drive would be maintained, and dead ended beyond the accesses for the existing residential properties. While this option does mitigate issues at the Regional Road 50 intersection without impacts to existing residential properties or the design speed, it does subdivide two large properties and would require an additional crossing of Rainbow Creek.	

5.4.1.2 Evaluation of Alternatives

Evaluation of the Countryside Drive at Regional Road 50 intersection configuration alternatives is provided in Table 5-5.

Table 5-5: Evaluation of Intersection Configuration Alternatives for Countryside Drive at Regional Road 50

Cat.	Criteria	Criteria Indicator	Alternative 1 Partial Correction of Skew and Large Diameter Curves West of Regional Road 50	Alternative 2 Curves West of Regional Road 50 with 90 km/h Design Speed	Alternative 3 Curves West of Regional Road 50 with 70 km/h Design Speed	Alternative 4 Shift Countryside Drive North and Keep 90 km/h Design Speed
Addresses Problem and Opportunity Statement:	Provide enhanced inter-regional connectivity.		Intersection alignment correction will improve connectivity between York and Peel Regions by improving driver comfort with use of the intersection.			
	Improve roadway geometrics to meet or exceed City and Regional standards.	<ul style="list-style-type: none"> Reduced tangent length at Regional Road 50 does not meet City / Regional standards. Intersection still slightly skewed. 	<ul style="list-style-type: none"> Improved Countryside Drive / Regional Road 50 intersection meets City / Regional standards. Skewed intersection introduced at Coleraine Drive, which is not preferred and does not improve on the existing intersection. 	<ul style="list-style-type: none"> Improved Countryside Drive / Regional Road 50 intersection meets City / Regional standards provided posted speed on Countryside Drive is reduced to 50 km/h. 	<ul style="list-style-type: none"> Improved Countryside Drive / Regional Road 50 intersection meets City / Regional design standards. 	
	Provide pedestrian and cycling facilities.		Pedestrian and cycling facilities will be provided on Countryside Drive.			
	Improve intersection safety and operations.	<ul style="list-style-type: none"> Partial correction of the skew at Regional Road 50 will result in improved safety at that intersection. Profile adjustments will also be required. 	<ul style="list-style-type: none"> Partial correction of the skew at Regional Road 50 will result in improved safety at that intersection. Introduction of a skew at the Coleraine Drive intersection will reduce sight distances at that intersection (not preferred). Profile adjustments will also be required. 	<ul style="list-style-type: none"> Correction of skew and reduction of operating speeds will improve safety at the Regional Road 50 intersection, provides drivers actual reduce operating speeds approaching the intersection. Profile adjustments will also be required. 	<ul style="list-style-type: none"> Correction of the skew and provision of adequate tangent sections at Regional Road 50 will improve the safety of that intersection. Spacing between existing and future Countryside Drive intersections with Coleraine Drive would be substandard. Profile adjustments will also be required. 	
	Improve watercourse crossings to enhance hydraulics, stream function and fisheries and wildlife passage.	<ul style="list-style-type: none"> Existing creek crossings will be improved as part of the planned widening of Countryside Drive. Northerly shift in the alignment of Countryside Drive at Regional Road 50 will result in a new crossing being located within a wider portion of the Robinson Creek floodplain (common to all alternatives). 	<ul style="list-style-type: none"> Existing creek crossings will be improved as part of the planned widening of Countryside Drive. Northerly shift in the alignment of Countryside Drive at Regional Road 50 will result in a new crossing being located within a wider portion of the Robinson Creek floodplain (common to all alternatives). 	<ul style="list-style-type: none"> Existing creek crossings will be improved as part of the planned widening of Countryside Drive. Northerly shift in the alignment of Countryside Drive at Regional Road 50 will result in a new crossing being located within a wider portion of the Robinson Creek floodplain (common to all alternatives). 	<ul style="list-style-type: none"> Existing creek crossings will be improved as part of the planned widening of Countryside Drive. Northerly shift in the alignment of Countryside Drive at Regional Road 50 will result in a new crossing being located within a wider portion of the Robinson Creek floodplain (common to all alternatives).' New, additional crossing of Rainbow Creek will be required north of the existing Countryside Drive crossing. 	
Address structural deficiency.		Existing structures will be improved as part of the widening of Countryside Drive.				
Improve pavement conditions.		Roadway will be fully reconstructed between Regional Road 50 and the tie-in to existing Countryside Drive. Pavement condition will be improved as a result.				

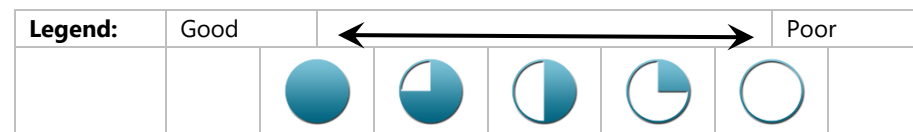
Cat.	Criteria	Criteria Indicator	Alternative 1 Partial Correction of Skew and Large Diameter Curves West of Regional Road 50	Alternative 2 Curves West of Regional Road 50 with 90 km/h Design Speed	Alternative 3 Curves West of Regional Road 50 with 70 km/h Design Speed	Alternative 4 Shift Countryside Drive North and Keep 90 km/h Design Speed	
	Transportation Network Safety (includes natural hazards)	Safety related factors include roadway geometrics, roadside hazards, intersection design, and control, accommodating pedestrians and cyclists.	<ul style="list-style-type: none"> Improved visibility for critical turning movements provided by skew correction and removal of the northbound right-turn channel. As a result of shorter tangent section, provision of intersection sight triangles for critical turning movements will require purchase of lands within 12 m of curves. Maintains consistent design speed on intersecting roadways. 	<ul style="list-style-type: none"> Improved visibility for critical turning movements provided by skew correction and removal of the northbound right-turn channel. Some property beyond limits of proposed 36 m ROW will be required for critical intersection sight triangles. Maintains consistent design speed on intersecting roadways. 	<ul style="list-style-type: none"> Improved visibility for critical turning movements provided by skew correction and removal of the northbound right-turn channel. As a result of smaller radius curves, intersection sight triangles for critical turning movements are larger than with other alternatives (lands within 18 m of curve). Requires speed reduction on east-west approaches to the intersection which reduces intersection capacity. 	<ul style="list-style-type: none"> Improved visibility for critical turning movements provided by skew correction and removal of the northbound right-turn channel. Intersection sight triangles for critical turning movements are within limits of standard ROW. Maintains consistent design speed on intersecting roadways. 	
	Transportation Network Connectivity						
	Transportation Network Capacity	Impacts of traffic on local roads and outside the study area. Transportation network improvement and accommodation of goods movement.	<ul style="list-style-type: none"> No significant change compared to existing. 	<ul style="list-style-type: none"> No significant change compared to existing. 	<ul style="list-style-type: none"> No significant change compared to existing. 	<ul style="list-style-type: none"> Would require construction of a new intersection 175 m north of the current Countryside Drive / Coleraine Drive intersection. Absolute minimum intersection spacing along arterials is generally 200 m. 	
	Promotion of Active Transportation	Impact on the safety and usability of planned AT infrastructure, as well as adherence to City AT policy.	<ul style="list-style-type: none"> Improved intersection alignment at Regional Road 50 will provide better visibility for pedestrians and cyclists moving through the intersection. 	<ul style="list-style-type: none"> Improved intersection alignment at Regional Road 50 will provide better visibility for pedestrians and cyclists moving through the intersection. Introduction of skew at Coleraine Drive intersection reduces visibility at that location. 	<ul style="list-style-type: none"> Improved intersection alignment at Regional Road 50 will provide better visibility for pedestrians and cyclists moving through the intersection. Reduced vehicular operating speeds provide for a safer AT environment. 	<ul style="list-style-type: none"> Improved intersection alignment at Regional Road 50 will provide better visibility for pedestrians and cyclists moving through the intersection. 	
	Transit Improvement	Potential adverse impact on transit service. Assessment of impact on planned transit service improvements.	<ul style="list-style-type: none"> Reduced tangent length on eastbound approach to Regional Road 50 places transit stop on a curve, reducing visibility of transit vehicles moving into and out of transit stops. No other difference from existing condition. 	<ul style="list-style-type: none"> Increased tangent length on eastbound approach to Regional Road 50 places transit stop on a curve, increasing visibility of transit vehicles moving into and out of transit stops. No other difference from existing condition. 	<ul style="list-style-type: none"> Reduced tangent length on eastbound approach to Regional Road 50 places transit stop on a curve, reducing visibility of transit vehicles moving into and out of transit stops. No other difference from existing condition. 	<ul style="list-style-type: none"> Increased tangent length on eastbound approach to Regional Road 50 places transit stop on a curve, increasing visibility of transit vehicles moving into and out of transit stops. No other difference from existing condition. 	
	Structural Impacts	Potential adverse impact on existing structures.	Existing creek crossings will be improved as part of the planned widening of Countryside Drive.				

Cat.	Criteria	Criteria Indicator	Alternative 1 Partial Correction of Skew and Large Diameter Curves West of Regional Road 50	Alternative 2 Curves West of Regional Road 50 with 90 km/h Design Speed	Alternative 3 Curves West of Regional Road 50 with 70 km/h Design Speed	Alternative 4 Shift Countryside Drive North and Keep 90 km/h Design Speed
	Hydraulics and Hydrology Impacts (Creeks)	Potential adverse impacts on proposed structures.	<ul style="list-style-type: none"> Floodplain for Robinson creek is limited to south of Countryside Drive. As a result, no new structure will be required. 	<ul style="list-style-type: none"> Floodplain for Robinson creek is limited to south of Countryside Drive. As a result, no new structure will be required. 	<ul style="list-style-type: none"> Floodplain for Robinson creek is limited to south of Countryside Drive. As a result, no new structure will be required. 	<ul style="list-style-type: none"> Floodplain for Robinson creek is limited to south of Countryside Drive. As a result, no new structure will be required. New, additional crossing of Rainbow Creek will be required north of the existing Countryside Drive crossing.
		Impact on floodplain, existing flood depths at proposed crossing locations, and existing flood return period.	<ul style="list-style-type: none"> No new linear infrastructure to be constructed within a floodplain. No anticipated impacts to hydraulics or hydrology. 	<ul style="list-style-type: none"> No new linear infrastructure to be constructed within a floodplain. No anticipated impacts to hydraulics or hydrology. 	<ul style="list-style-type: none"> No new linear infrastructure to be constructed within a floodplain. No anticipated impacts to hydraulics or hydrology. 	<ul style="list-style-type: none"> 0.3 ha of new linear infrastructure to be constructed within the floodplain.
Financial	Capital Costs	Ability to minimize effects on existing and proposed utilities.	<ul style="list-style-type: none"> Approximately 650 m of new overhead hydro / Bell would be required along new roadway alignment. Approximately 620 m of this overhead will require relocation to accommodate road widening regardless of which alternative is selected. 	<ul style="list-style-type: none"> Approximately 1,230 m of new overhead hydro / Bell would be required along new roadway alignment. Approximately 1,200 m of this overhead would have required relocation to accommodate road widening regardless of which alternative is selected. 	<ul style="list-style-type: none"> Approximately 460 m of new overhead hydro / Bell would be required along new roadway alignment. Approximately 470 m of this overhead will require relocation to accommodate road widening regardless of which alternative is selected. 	<ul style="list-style-type: none"> Approximately 1,400 m of new overhead hydro / Bell would be required along new roadway alignment. Approximately 1,330 m of this overhead will require relocation to accommodate road widening regardless of which alternative is selected.
		Function of total road length and width, AT facilities provided, intersection infrastructure, structural area required, and amount of utility relocation.	<ul style="list-style-type: none"> Approximately 30 m of additional roadway required as a result of realignment at the intersection. Limited utility relocations required. New crossing structures for Rainbow Creek and Robinson Creek required. Intersections to be reconstructed as part of Countryside Drive widening, regardless of select alternative. Lower capital cost. 	<ul style="list-style-type: none"> Approximately 35 m of additional roadway required as a result of realignment at the intersection. Significant utility relocations required. New crossing structures for Rainbow Creek and Robinson Creek required. Intersections to be reconstructed as part of Countryside Drive widening, regardless Limited utility relocations required of select alternative. Moderate capital costs. 	<ul style="list-style-type: none"> Approximately 20 m of additional roadway required as a result of realignment at the intersection. Limited utility relocations required. New crossing structures for Rainbow Creek and Robinson Creek required. Intersections to be reconstructed as part of Countryside Drive widening, regardless of select alternative. Lower capital cost. 	<ul style="list-style-type: none"> Approximately 60 m of additional roadway required as a result of realignment at the intersection. Significant utility relocations required. Two (2) new crossing structures for Rainbow Creek and a new structure over Robinson Creek required. Intersections to be reconstructed as part of Countryside Drive widening, regardless of select alternative. High capital cost.

Cat.	Criteria	Criteria Indicator	Alternative 1 Partial Correction of Skew and Large Diameter Curves West of Regional Road 50	Alternative 2 Curves West of Regional Road 50 with 90 km/h Design Speed	Alternative 3 Curves West of Regional Road 50 with 70 km/h Design Speed	Alternative 4 Shift Countryside Drive North and Keep 90 km/h Design Speed
	Operating Costs	Function of road length, area of bridge structures (for maintenance) and number of traffic signals.	<ul style="list-style-type: none"> Approximately 30 m off additional road length. Two (2) crossing structures to be maintained. Signalized intersections at Coleraine Drive and Regional Road 50. Low operating costs. 	<ul style="list-style-type: none"> Approximately 35 m off additional road length. Two (2) crossing structures to be maintained. Signalized intersections at Coleraine Drive and Regional Road 50. Low operating costs. 	<ul style="list-style-type: none"> Approximately 20 m off additional road length. Two (2) crossing structures to be maintained. Signalized intersections at Coleraine Drive and Regional Road 50. Low operating costs. 	<ul style="list-style-type: none"> Approximately 65 m off additional road length. Three (3) crossing structures to be maintained. Signalized intersections at Coleraine Drive and Regional Road 50, and two (2) way stop along existing portion of Countryside Drive (to be maintained for existing residents). Low maintenance costs. Moderate operating costs.
	Property Acquisition		<ul style="list-style-type: none"> 1.84 ha of property required along this alignment as compared to 1.00 ha of property if road is widened along existing alignment. 0.84 ha of property required beyond what is already being considered as part of Countryside Drive widening. Overall low cost. 	<ul style="list-style-type: none"> Purchase of five (5) residential properties required. Relocation of one (1) listed heritage structure required. 3.50 ha of property required along this alignment as compared to 1.86 ha of property if road is widened along existing alignment. 1.64 ha of property required beyond what is already being considered as part of Countryside Drive widening. Overall high cost. 	<ul style="list-style-type: none"> 1.81 ha of property required along this alignment as compared to 1.27 ha of property if road is widened along existing alignment. 0.54 ha of property required beyond what is already being considered as part of Countryside Drive widening. Overall low cost. 	<ul style="list-style-type: none"> 4.56 ha of property required along this alignment as compared to 2.12 ha of property if road is widened along existing alignment. 2.44 ha of property required beyond what is already being considered as part of Countryside Drive widening. Overall medium cost.
Social / Cultural Environment	Conformance to Planning Objectives (Growth Plan, Official Plan, Secondary Plan, Area 47 TMP)		<ul style="list-style-type: none"> Conforms to OP, Area 47 TMP and Secondary Plan. Would require some minor redistribution of property limits within areas slated for future development. 	<ul style="list-style-type: none"> Conforms to OP, Area 47 TMP and Secondary Plan. Would require some redistribution of property limits within areas slated for future development. 	<ul style="list-style-type: none"> Conforms to OP, Area 47 TMP and Secondary Plan. Would require some minor redistribution of property limits within areas slated for future development. 	<ul style="list-style-type: none"> Varies slightly from what is illustrated in planning guidelines. Would require some redistribution of property limits within areas slated for future development.
	Residential/ Business Access and Displacement	Existing residences and businesses.	<ul style="list-style-type: none"> Some property required from existing residential properties fronting onto Countryside Drive. 	<ul style="list-style-type: none"> Significant impacts to five (5) residential properties. 	<ul style="list-style-type: none"> No impacts to residential or business properties or access ways. 	<ul style="list-style-type: none"> Will impact residential access as properties will no longer front onto Countryside Drive. Impacts could be mitigated by maintaining existing roadway for local access.
		Planned residential, commercial and industrial developments.	<ul style="list-style-type: none"> Minor impacts to planned development adjacent to the Countryside Drive / Regional Road 50 intersection. 	<ul style="list-style-type: none"> Would require some redistribution of property limits within areas slated for future development. 	<ul style="list-style-type: none"> Minor impacts to planned development adjacent to the Countryside Drive / Regional Road 50 intersection. 	<ul style="list-style-type: none"> Would require some redistribution of property limits within areas slated for future development.

Cat.	Criteria	Criteria Indicator	Alternative 1 Partial Correction of Skew and Large Diameter Curves West of Regional Road 50	Alternative 2 Curves West of Regional Road 50 with 90 km/h Design Speed	Alternative 3 Curves West of Regional Road 50 with 70 km/h Design Speed	Alternative 4 Shift Countryside Drive North and Keep 90 km/h Design Speed	
	Emergency Services (Police, Fire, Ambulance)	Potential to reduce response times.					
			<ul style="list-style-type: none"> No anticipated impact to response times. 	<ul style="list-style-type: none"> No anticipated impact to response times. 	<ul style="list-style-type: none"> No anticipated impact to response times. 	<ul style="list-style-type: none"> Alternative would move access to existing residential properties off of mainline Countryside Drive, resulting in minimal impacts to response times. 	
	Noise Level Impacts	Potential effects of traffic related noise on residences, community facilities, or institutions adjacent to and/or within the study area.					
			<ul style="list-style-type: none"> Countryside Drive would be relocated closer to one existing residential property. Changes in noise level will need to be mitigated to the extent possible. 	<ul style="list-style-type: none"> No impact to noise levels to existing residential receivers as all properties will require buyout to implement this alternative. 	<ul style="list-style-type: none"> No change in noise levels anticipated, as roadway not moved closer to any existing residential properties. 	<ul style="list-style-type: none"> Countryside Drive will be relocated to the reverse frontage of five (5) existing residential properties. Changes in noise level will need to be mitigated to the extent possible. 	
	Cultural Heritage Impacts	Potential adverse impacts on archaeological resources and built heritage adjacent to and/or within the study area.					
			<ul style="list-style-type: none"> New alignment has potential archaeological impacts. 	<ul style="list-style-type: none"> Significant impacts to listed heritage property at 5556 Countryside Drive. New alignment has potential archaeological impacts. 	<ul style="list-style-type: none"> New alignment has potential archaeological impacts. 	<ul style="list-style-type: none"> New alignment has potential archaeological impacts. As this alternative has the longest segment of realigned roadway and a new creek crossing, it has the greatest potential for archaeological impacts. 	
	Agricultural Impacts	Impact on existing agricultural properties.					
			<ul style="list-style-type: none"> Minor impacts to one (1) agricultural property. 	<ul style="list-style-type: none"> Will divide two (2) existing agricultural properties. 	<ul style="list-style-type: none"> Minor impacts to one (1) agricultural property. 	<ul style="list-style-type: none"> Will divide two (2) existing agricultural properties. 	
	Natural Environment	Impact to Designated Natural Heritage Features including wetlands	Proximity to and significance of impact to designated feature.	No designated natural heritage features within this portion of the study area.			
		Impact to Natural Heritage Features such as vegetation and watercourses	Proximity, size, characteristics, and sensitivity of significant rural areas, terrestrial ecosystems, and wetlands. Potential impact or loss of natural areas, terrestrial ecosystems or wetland areas, function or habitat.	No natural areas, terrestrial ecosystems or wetland areas within this section of the study area – only agricultural and residential property impacts. No significant difference among alternatives.			

Cat.	Criteria	Criteria Indicator	Alternative 1 Partial Correction of Skew and Large Diameter Curves West of Regional Road 50	Alternative 2 Curves West of Regional Road 50 with 90 km/h Design Speed	Alternative 3 Curves West of Regional Road 50 with 70 km/h Design Speed	Alternative 4 Shift Countryside Drive North and Keep 90 km/h Design Speed
	Impacts to Avian, Wildlife and Plant SAR	Potential effects avian and wildlife including SAR identified in the study area.	<ul style="list-style-type: none"> Approximately 1.1 ha of potential Bobolink habitat impacted by proposed road alignment. Minor impacts to identified Bobolink habitat in the agricultural fields adjacent to the existing intersection / residential properties. Compensation will be required. 	<ul style="list-style-type: none"> Approximately 1.6 ha of potential Bobolink habitat impacted by proposed road alignment. Minor impacts to identified Bobolink habitat in the agricultural fields adjacent to the existing intersection / residential properties. Compensation will be required. 	<ul style="list-style-type: none"> Approximately 1.1 ha of potential Bobolink habitat impacted by proposed road alignment. Minor impacts to identified Bobolink habitat in the agricultural fields adjacent to the existing intersection / residential properties. Compensation will be required. 	<ul style="list-style-type: none"> Approximately 2.6 ha of potential Bobolink habitat impacted by proposed road alignment. Moderate impacts to identified Bobolink habitat in the agricultural fields adjacent to the existing intersection / residential properties. Compensation will be required.
	Groundwater Impacts	Potential for adverse effects on existing groundwater resources (water quality and/or quantity).	<ul style="list-style-type: none"> 0.84 ha reduction in pervious surface area as a result of construction of this alternative. TRCA requirements for groundwater balance will be met for all alternatives, through provision of off-site recharge or use of on-site LID methods. Preferred method to be confirmed based on hydrogeological and geotechnical assessments. 	<ul style="list-style-type: none"> 1.64 ha reduction in pervious surface area as a result of construction of this alternative. TRCA requirements for groundwater balance will be met for all alternatives, through provision of off-site recharge or use of on-site LID methods. Preferred method to be confirmed based on hydrogeological and geotechnical assessments. 	<ul style="list-style-type: none"> 0.54 ha reduction in pervious surface area as a result of construction of this alternative. TRCA requirements for groundwater balance will be met for all alternatives, through provision of off-site recharge or use of on-site LID methods. Preferred method to be confirmed based on hydrogeological and geotechnical assessments. 	<ul style="list-style-type: none"> 2.44 ha reduction in pervious surface area as a result of construction of this alternative. TRCA requirements for groundwater balance will be met for all alternatives, through provision of off-site recharge or use of on-site LID methods. Preferred method to be confirmed based on hydrogeological and geotechnical assessments.
OVERALL RANKING (Percentage of Total Available Score)						
PREFERRED ALTERNATIVE			Alternative 3 is the Preferred Alternative.			



5.4.1.3 Preferred Alternative

The preferred alternative was chosen based on the ability to address issues associated with the current substandard angle of approach of the Countryside Drive / Regional Road 50 intersection. The proposed design significantly reduces the existing intersection skew angle and is design within recommended range outlined in TAC Geometric Design Guide. The reduction in skew angle would improve traffic safety where angular approach tends to reduce sightlines. Also, it provides comfortable driving experience as it relieves drivers from overlooking while making turning maneuver.

6.0 Description of Preferred Design

6.1 Major Features of the Recommended Plan

The following sections outline the development and evaluation process applied during selection of the preferred alternatives for the arterial roads within Part B. Information related to the Special Policy Areas and Rainbow Creek can be found in the Part A ESR.

An Access Management Report was also prepared, focusing on access management along Part A roadways. The Access Management Report discussed the existing properties with accesses that will be impacted, the existing standards, and future mitigation procedures as well as suggested intersection and accessway locations as per the TAC and Region of Peel Guidelines. This report primarily focuses on Part A roadways and as such, this report can be found in the Part A ESR Appendix.

6.1.1 Roadway Design

All roadways are to be designed in accordance with TAC's *Geometric Design Guide for Canadian Roads* (2017), along with the applicable owner's *Design, Specifications and Procedures Manuals*. Roadway design criteria that govern the horizontal and vertical designs for these roadways is summarized in Table 6-1.

Within the urban environment, horizontal roadway design curves are generally constrained so that superelevation (commonly referred to as 'banking') is not required. Superelevation, particularly for wider road cross-sections, causes issues with drainage and tie-ins to driveways and at intersections due to the difference in elevation between curbs on either side of the roadway. Superelevation is also undesirable where vehicles may slow, stop or change lanes, particularly when ice or snow may be present. The lowest limit of curve radii that can therefore be used within the urban environment is that associated with what is termed 'reverse crown', with the preference being for 'normal crown'.

Table 6-1: Horizontal and Vertical Design Criteria for Part B Arterial Roads

Design Criteria	East-West Arterial	Countryside Drive	Clarkway Drive			
			Castlemore Road to Collector Road 'C'	Collector Road 'C' to E/W Arterial	E/W Arterial to Countryside Drive	Countryside Drive to Mayfield Road
General						
Jurisdiction	City of Brampton	City of Brampton	City of Brampton	City of Brampton	City of Brampton	City of Brampton
Posted Speed (km/h)	50	60	50	50	60	60
Design Speed (km/h)	70	80	60	60	80	80
Horizontal Constraints						
Normal Crown (-0.02 m/m) R_{min} (m)	1,680	2,130	1,290	1,290	2,130	2,130
Reverse Crown (+0.02 m/m) R_{min} for $e = 0.04$ (m) – 0.06 m	290-330	400-450	185-220	185-220	400-450	400-450

Min. Tangent Length at Intersections (m)	75	75	75	75	75	75
Vertical Constraints						
Maximum Grade	5%	5%	5%	5%	5%	5%
Minimum Grade	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Sag Vertical Curve K_{min}	23	30	18	18	30	30
Crest Vertical Curve K_{min}	17	26	11	11	26	26
Intersection Design						
Min. Radius of Curbs at Intersections (m)	-	-	-	-	-	-
ROW Width (m)	36	36	36	30	36	36

6.1.2 Cross-Sections

Alternative cross-sections were developed for each roadway and presented to the public at PIC #1 for review and comment. They were developed using City of Brampton standards, recommendations for active transportation facilities provided through the SP47 Secondary Plan, as well as input from internal and Technical Advisory Committee stakeholders. Details related to the cross-section alternatives considered are provided below. No comments were received related to cross-section alternatives, with exception of the downtown core segment of Clarkway Drive, for which additional dedicated meetings were held.

For detailed design, the following commitments are made:

- A need for a raised centre median may be required for a length of 300 m east of Arterial A2 and Countryside Drive intersection. However, if the applicant of the property east of Arterial A2 signalizes their access, a median will not be required; and
- It shall be noted that the five (5) lane cross section shown in the Class EA may be revised to a four (4) lane cross section with a centre median at the detailed design stage in order to restrict access to adjacent developments.

6.1.3 Active Transportation Facilities

The form that active transportation facilities take plays an important role in determining a preferred cross-section alternative. Consideration must be given to the preferred width of pedestrian facilities based on anticipated / desired volumes, while user type, roadway design speed, and anticipated traffic volumes (among other things) must be considered when determining what type of cycling facility is most appropriate for a given roadway. Connectivity to planned active transportation networks and community amenities is another important consideration. Evaluation of appropriate active transportation facilities (pedestrian and cyclist) is provided in each of the following sections, on a roadway-by-roadway basis.

6.1.3.1 Transit Facilities

Compatibility of cross-section elements with anticipated transit facilities is also a key consideration when evaluating alternatives. Secondary transit routes are anticipated on all roadways considered under this Class EA, with GO Shuttles and Local Routes also operating on portions of Countryside Drive, East-West Arterial and Clarkway Drive.

Transit-compatible cross-sections consider the frequency and interaction of buses and other road users (cyclists and other motorized vehicles). Roadways where anticipated transit volumes exceed 30 vehicles per hour may not be suitable for on-street cycling facilities and should consider potential delay to other lane users.

6.1.4 Horizontal Alignments

For existing roadways, minor changes in horizontal alignment are generally considered to limit impact to existing and planned properties and infrastructure resulting from widening of the road and ROW, as well as to correct issues with alignment at intersections. These minor changes would include consideration for widening about, left or right of the existing centreline. For intersections where approaches are offset or not perpendicular, shifts in alignment may be made outside of the intersection to correct the issue.

6.1.4.1 Rainbow Creek Crossing

This roadway alignment alternative locates the single Arterial A2 / Coleraine Drive / East-West Arterial intersection within the Rainbow Creek NHS, with the north-south axis of the intersection approximately aligned with existing Rainbow Creek. Arterial A2 approximately follows the alignment set out in the SP47 TMP, with the tie-in to Major Mackenzie Drive appropriately adjusted, and the curve radius increased to 900 m to move the intersection to a suitable location. East-West Arterial approximately follows the alignment set out in Block 47-2, while Coleraine Drive is aligned to minimize impacts to industrial development blocks. Horizontal design details for the arterial road segments located within Special Policy Area 2 are summarized in Table 6-2.

Some flexibility exists in the alignments of both Arterial A2 and Coleraine Drive, although changes to the Arterial A2 design will impact the location of the creek crossing.

Table 6-2: Horizontal Design Details for Transportation Network Alternative 1

Design Requirement	Roadway		
	Arterial A2	Coleraine Drive	East-West Arterial
Min. Radius (m)	900	400	300
Min. Tangent at Intersections (m)	No tangent segments. 900 m curve at intersection.	No tangent segments. 1,300 m curve at intersection.	No tangent segments. 1,300 m curve at intersection.
Meets Design Requirements?	No	Yes	Yes
Required Design Modifications	Curve radius has been increased to straighten approach. No further modification required.	Large radius curve is sufficiently long to approximate tangent.	Large radius curve is sufficiently long to approximate tangent.

6.1.5 Vertical Alignment

6.1.5.1 Rainbow Creek Crossing

Through the study area the natural topography is relatively flat, with a natural slope rising from the south to the north of the project extents. The vertical alignments of East-West Arterial / Coleraine Drive and Arterial A2 have been designed to follow this natural slope while maintaining minimum grade

requirements. This results in East-West Arterial and Coleraine Drive rising at a constant 0.5% grade from the south to the north through the NHS area. Arterial A2 also rises at a constant 0.5% grade from the west to the east through the intersection area suit its overall horizontal north-west alignment. As this follows the natural topography it allows the intersection to be lower comparatively to Arterial Road Network Alternative 2 options.

Due to the location of the intersection, following the natural topography vertically provides adequate cover to the structures and clearance to the regional WSEL flood event. For preliminary grading it has been assumed that fill embankments be graded at 3:1 slope. The resultant area of impact on the NHS is approximately 15,316 m² with a fill volume of 34,780 m³ (within NHS only). Further steepening of the embankments could be contemplated to reduce impacts to the NHS to an estimated minimum of 13,100 m².

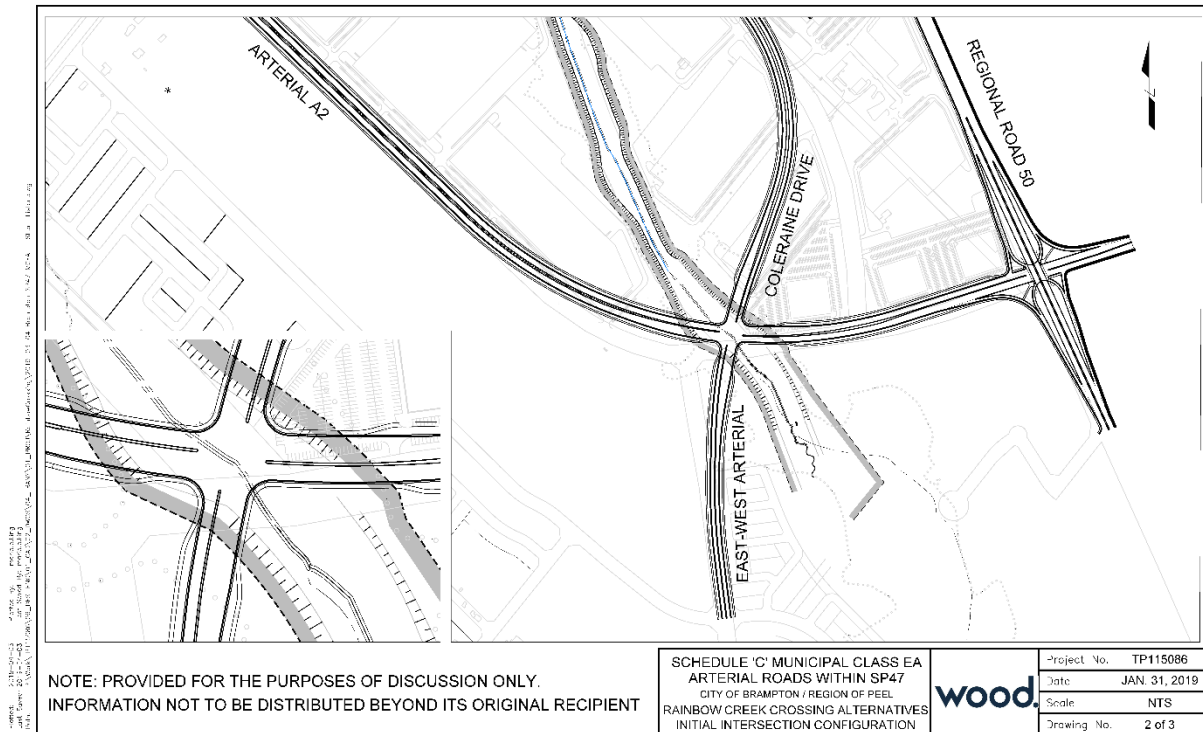


Figure 6-1: Roadway Design Alternative 1 - Intersection Within the NHS

6.1.6 Structural Details

For each of the road crossings over the watercourses, a General Arrangement drawing was prepared with a conceptual design show the road cross section, and a feasible bridge structure type and orientation based on the available information. These bridge designs could be optimized or revised based on additional investigation completed and information gained during detailed design. The General Arrangement drawing can be found in Appendix O and Figure 1-2 presents the locations of the crossing / culverts.

Crossing A - E-W Arterial over Gore Tributary: For a vehicular bridge with a single span of 35 m over a watercourse, both concrete prestressed NU girders and steel plate girders are good options. To provide the maximum clearance over the watercourse, a concrete slab on steel plate girder bridge was chosen. The steel plate girders can be much shallower than a concrete NU girder of a similar span. This is an economical and constructable structure type for this crossing. To prevent deterioration at the girder ends, joints at the ends should be eliminated by using either a fully integral or semi-integral configuration.

Crossing B - Countryside Drive over Gore Tributary: Completed by others in a separate Countryside Drive Municipal Class EA, Heart Lake Road to Clarkway Drive, prepared by Trow Associates Inc. (2005).

Crossing C - E-W Arterial over Clarkway Tributary: Crossing C has a similar span and road cross section to Crossing A, and the same structure type has been shown. It is a single 35 m span concrete slab on steel plate girder bridge. As there is a much greater clearance from the superstructure to the watercourse, a more efficient 1,500 mm deep steel girders could be used compared to the shallower girders used in Crossing A. Retaining walls will be required at the four corners of the bridge to accommodate a 2H:1V slope down from road to creek level. To prevent deterioration to the girder ends, joints at the ends should be eliminated by using either a fully integral or semi-integral configuration. A concrete prestressed NU girder could also be considered for this crossing.

Crossing D - Clarkway Drive over Clarkway Tributary: Crossing D is shown as a single 36 m span slab on steel plate girder bridge. Similar to Crossing A, due to the low clearance over the watercourse, steel plate girders are preferred as they would be the shallowest conventional superstructure and would also be an economical and constructable structure type for this crossing. A concrete prestressed NU girder of the same span would need to be substantially deeper, which would reduce the hydraulic opening size. To prevent deterioration to the girder ends, joints at the ends should be eliminated by using either a fully integral or semi-integral configuration.

Crossing E - Countryside Drive over Clarkway Tributary: A single 40 m span slab on steel plate girder bridge was shown which is the most economical and constructable structure type for this crossing. The use of steel girders allows for a shallower superstructure than a prestressed concrete NU girder bridge of the same span. To prevent deterioration to the girder ends, joints at the ends should be eliminated by using either a fully integral or semi-integral configuration.

Crossing H - Countryside Drive over Rainbow Creek Tributary: For this 17 m single span structure, a rigid frame bridge structure is the most efficient and durable structure type and would convey the required channel width. The rigid frame configuration allows the top slab of the bridge to be shallow and provides more vertical clearance from underside of the structure to the watercourse below.

A system with cast-in-place concrete footings and precast arch sections is also a feasible option but has some disadvantages for durability, especially with the joints between the precast units often leaking and causing localized defects.

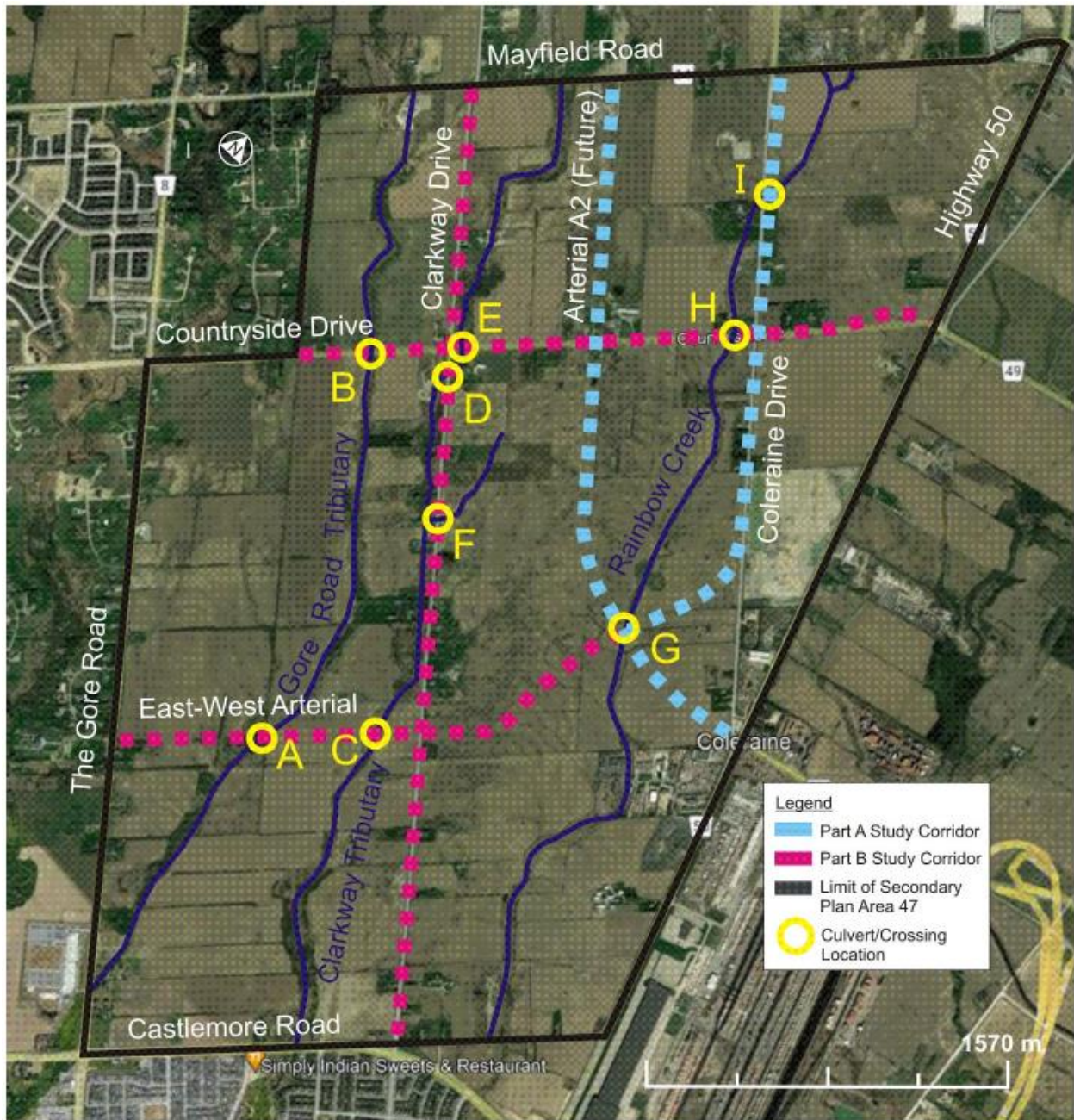


Figure 6-2: Culvert / Crossings Locations within the Study Area

6.2 East-West Arterial

6.2.1 Development and Evaluation of Alternative Designs

The East-West Arterial is a minor arterial that will provide access to The Gore Road to the west and Arterial A2 to the east from the lands within development Blocks 47-1 and 47-3. To accommodate proposed curves around the City park area located at the intersection of Clarkway Drive and the East-West Arterial, the design speed for this roadway will be reduced to 70 km/h with a posted speed of 50 km/h. All other relevant design criteria for the East-West Arterial are provided in the Recommended Design portion of this ESR.

6.2.1.1 Infrastructure Requirements

Clear Zone

Based on design speed and anticipated annual average daily traffic (AADT), clear zone width for the East-West Arterial is calculated to be 6.5 m. Additional details are provided in Table 6-3.

Table 6-3: Clear Zone Width for East-West Arterial Based on the MTO Roadside Design Manual

Design Speed	PM Peak Hour Traffic Volumes (2041)	# of Lanes per Direction	AADT (Calculated as PHT/K, K=0.9)	Clear Zone Width
70 km/h	401 (EB) 822 (WB)	2	4,460 9,140	AADT >= 6,000 CZ = 6.5 m

EB - Eastbound

WB – Westbound

PHT: Peak Hour Traffic

K: Proportion of AADT on a roadway segment or link during the Design Hour, e.g., the hour in which the 30th highest hourly traffic flow of the year takes place.

Vehicular Lanes

Based on traffic analysis completed as part of this study, a four (4) lane cross-section will be required for this roadway by 2041. City standards dictate that through lanes should be a maximum of 3.50 m wide. Wider lane widths do not support the City’s desire to reduce operating speeds along this roadway, particularly along the linear segment between The Gore Road and Clarkway Drive. The updated TAC *Geometric Design Guide for Canadian Roads* recommends the use of reduced lane widths to promote reductions in operating speeds. To encourage reduced operating speeds on East-West Arterial, a through lane width of 3.3 m and 3.5 m is recommended and is in-line with City standards. This reduced lane width will also provide an additional 1.0 m of boulevard on either side of the roadway.

Active Transportation: Pedestrian Facilities

The need for pedestrian facilities and connections along the East-West Arterial were determined through completion of the SP47 TMP and City-wide TMP. As a starting point, the City’s standard cross-section for minor arterials indicates a desire to provide a 3.0 m wide multi-use trail on the north side of the roadway (accommodating both pedestrians and cyclists), and a 1.8 m wide sidewalk on the south side. The need to provide MUP on both sides, to accommodate cyclists off-road should this be warranted, was to be determined through the current study.

Active Transportation: Cycling Facilities

Determination of cycling facility need is based on the recommendations made in the SP47 Secondary Plan; while the recommended form of those facilities is determined through the evaluation process set out in Section 3 of *Ontario Traffic Manual (OTM) Book 18: Cycling Facilities*. Table 6-4 provides an overview of the evaluation process used to determine the preferred form of cycling facility on East-West Arterial.

Table 6-4: Evaluation of Suitable Cycling Facility Types for East-West Arterial

Evaluation Criteria		Suitable Cycling Facility Type(s)			
		Shared Lanes	Exclusive Cycle Lanes	Buffered Cycle Lanes	Physically Separated / MUP
Secondary Plan Recommendation					
OTM Book 18 Recommendation Based On:					
Figure 3.3	Estimated AADT: 9,100	Shared facility not considered appropriate.	Combination of speed and volume puts this on the boundary of being acceptable.	Separated facility recommended.	Separated facility recommended.
	Design Speed: 70				
Roadway Function	Mobility (Arterial)	Table 3.3 recommends cycle lane or separated facility.			
Vehicle Mix	Buses and Some Trucks (not a truck route)	Cyclist discomfort due to bus interaction.	Cyclists may prefer increased visibility around buses.	Additional width given to cycling increases visibility.	Separated facility creates comfort for cyclists.
Anticipated Users	Experienced, recreational, some children	Preference for separated facilities by all groups.	Exclusive facilities preferred. Not suitable for children.	Exclusive cycle lanes / separated facilities preferred.	Exclusive cycle lanes / separated facilities preferred.
Anticipated Cycle Volumes	Low	Wide curb lane may be appropriate, though may discourage volume growth.	Could foster increase in cyclist volumes.	Could foster increase in cyclist volumes.	Could foster increase in cyclist volumes.
Route Function	Access & Connection	Primary route should have higher order facilities.	Not consistent with facilities on adjacent arterials	Facility type that encourages new cyclists.	Consistent facility type that encourages use.
On-Street Parking	Not permitted	Opportunity to provide shared lane.	Opportunities to provide cycle lane.	Opportunities to provide cycle lane.	Opportunities to provide separate facility.
Other considerations		Cycling facilities on connecting routes along The Gore Road, Arterial A2 and Coleraine Drive consist of physically separated facilities (multi-use pathways) that encourage use by all abilities.			
Recommended Cycling Facility Type(s)		MUP			

6.2.1.2 Preferred Cross-Section

The preferred cross-section for the East-West Arterial is Alternative 2, which provides a 1.50 m median (including curbs), 3.5 m and 3.3 m vehicular lanes, 2.0 m total boulevard widths (including 1.0 m kill strips), 4.0 m MUP. The recommended cross-sections for the East-West Arterial are illustrated in Figure 6-3.

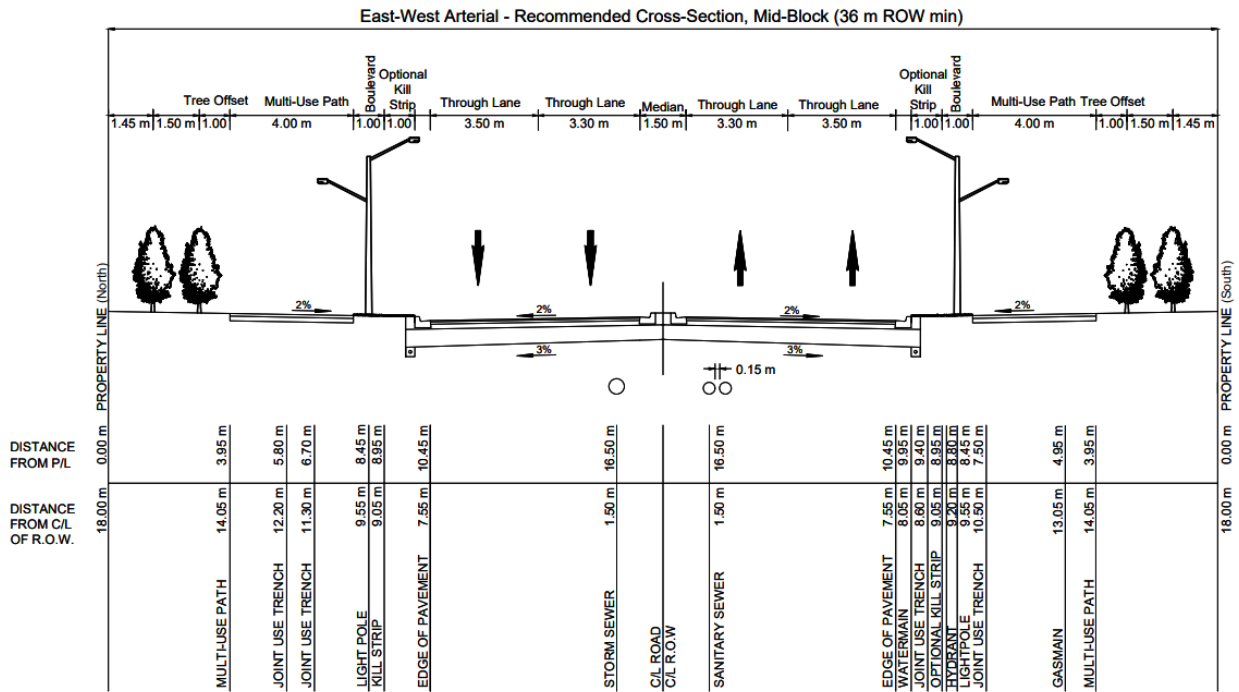


Figure 6-3: Recommended Cross-Section for the East-West Arterial

6.3 Countryside Drive

Countryside Drive is a minor east-west arterial that connects areas west of The Gore Road to areas to the east of Regional Road 50. The City's standard design speed for minor arterial roadways is 80 km/h, with a posted speed of 60 km/h. All other relevant design criteria for Countryside Drive are provided in the Recommended Design portion of this ESR.

6.3.1 Development and Evaluation of Alternative Designs

6.3.1.1 Infrastructure Requirements

Clear Zone

Based on design speed and anticipated AADT, clear zone width for Countryside Drive is calculated to be 7.5 m. Additional details are provided in Table 6-5.

Table 6-5: Clear Zone Width for Countryside Drive Based on the MTO Roadside Design Manual

Design Speed	PM Peak Hour Traffic Volumes (2041)	# of Lanes per Direction	AADT (Calculated as PHT/K, K=0.9)	Clear Zone Width
80 km/h	378 (EB) 1,095 (WB)	2	4,200 12,170	AADT >= 6,000 CZ = 7.5 m

Vehicular Lanes

Based on traffic analysis, a four (4) lane cross-section, east of Arterial A2 and five (5) lane cross-section, west of Arterial A2 will be required for this roadway by 2041. City standards dictate that through lanes should be 3.50 m wide.

Active Transportation: Pedestrian Facilities

The need for pedestrian facilities and connections along Countryside Drive were determined through completion of the SP47 TMP and City-wide TMP. As a starting point, the City's standard cross-section for minor arterials indicates a desire to provide a 3.0 m wide multi-use trail on the north side of the roadway, and a 1.8 m wide sidewalk on the south side. The Area 47 TMP recommended the provision of sidewalks on both sides of Countryside Drive alongside separate on-road cycle lanes. The need to provide MUP on both sides, to accommodate both pedestrians and cyclists on off-road facilities, was to be determined through the current study.

Active Transportation: Cycling Facilities

The Area 47 TMP recommends the provision of on-road cycling lanes along the length of Countryside Drive. The suitability of this type of facility is further evaluated in Table 6-6.

Based on the detailed evaluation, the preferred cycle facility type is a 3.0 m multi-use path on both sides of the roadway. This type of facility will allow for the greatest safety and comfort for cyclists.

Table 6-6: Evaluation of Suitable Cycling Facility Types for Countryside Drive

Evaluation Criteria	Suitable Cycling Facility Type(s)				
	Shared Lanes	Exclusive Cycle Lanes	Buffered Cycle Lanes	Physically Separated / MUP	
Secondary Plan Recommendation					
OTM Book 18 Recommendation Based On:					
Table 3.3	Estimated AADT: 12,200	Shared facility not recommended.	Cycle lane without buffer not recommended.	Physical separation recommended.	Physical separation recommended.
	Design Speed: 90				
Roadway Function	Mobility (Arterial)	Not suitable.		Table 3.3 recommends cycle lane or separated facility.	
Vehicle Mix	Buses	Cyclist discomfort due to bus interaction.	Cyclists may still feel uncomfortable, not enough separation.	Cyclists may still feel uncomfortable.	Separated facility creates comfort for cyclists.
Anticipated Users	Novice & Experienced	May be comfortable with shared roadways	May be comfortable with shared roadways	Exclusive cycle lanes / separated facilities preferred.	Exclusive cycle lanes / separated facilities preferred.

		but separate facilities preferred.	but separate facilities preferred.		
Anticipated Cycle Volumes	Low	Wide curb lane may be appropriate, though may discourage volume growth.	Suitable for anticipated volumes.	Suitable for anticipated volumes.	Suitable for anticipated volumes.
Route Function	Connection	Primary route should have higher order facilities.	Suitable for connection route.	Suitable for connection route.	Suitable for connection route.
On-Street Parking	Not permitted	No difference between alternatives.			
Recommended Cycling Facility Type(s)		MUP			

6.3.1.2 Preferred Cross-Section

The preferred cross-section for the Countryside Drive is Alternative 1 and the cross-sections for Countryside Drive, west of Arterial A2 and east of Arterial A2 is presented in Figure 6-4 and Figure 6-5, respectively.

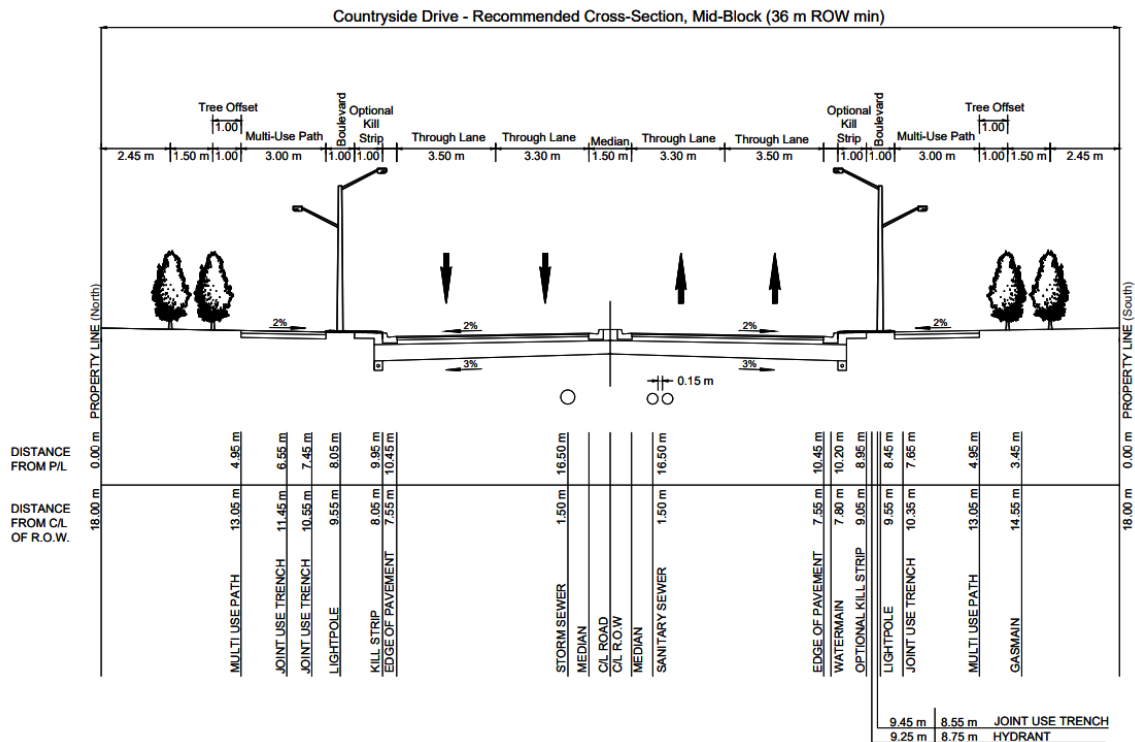


Figure 6-4: Recommended Cross-Section for the Countryside Drive (West of Arterial A2)

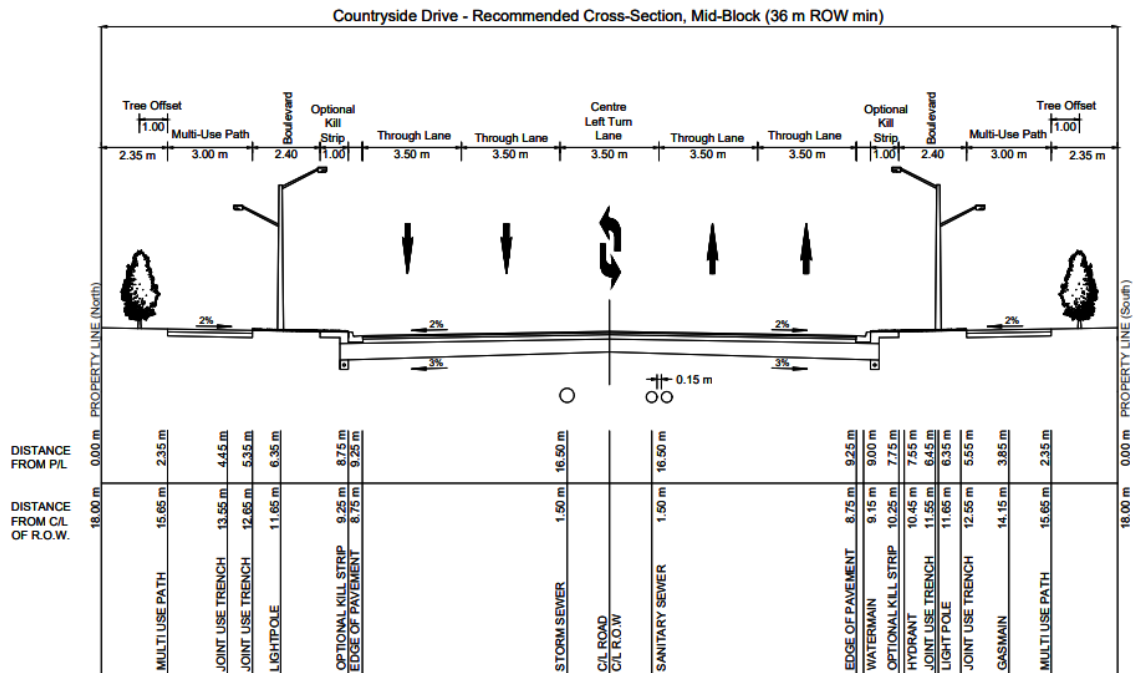


Figure 6-5: Recommended Cross-Section for the Countryside Drive (East of Arterial A2)

6.4 Clarkway Drive

Clarkway Drive will form the major collector spine for the residential and commercial developments planned within development Blocks 47-1 and 47-2 and will vary in form significantly between its north and south limits. South of the future East-West Arterial, Clarkway Drive will be the focus of SP47's Collector Road 'C', with narrowed lanes, on-street parking and a vibrant pedestrian environment. Between the East-West Arterial and Countryside Drive, Clarkway will retain its current feel as a 'special character road', reflecting the existing rural cultural landscape of the broader study area. North of Countryside Drive and south of the Collector Road 'C', Clarkway Drive will have a familiar urban collector feel.

Posted speeds will also vary along the length of Clarkway Drive, with lower operating speeds desirable in the Collector Road 'C' south of the East-West Arterial. Through this area, a design speed of 60 km/h and a posted speed of 50 km/h will be used. The remainder of the roadway will employ the City's standard design speed for minor arterial roadways of 90 km/h, with posted speeds of 70 km/h. All other relevant design criteria for the various segments of Clarkway Drive are provided in the Recommended Design portion of this ESR.

6.4.1 Development and Evaluation of Alternative Designs

6.4.1.1 Infrastructure Requirements

Clear Zone

Based on design speed and anticipated AADT, clear zone widths for Clarkway Drive are calculated to be between 4.5 m and 7.5 m. Additional details are provided in Table 6-7.

Table 6-7: Clear Zone Width for Clarkway Drive Based on the MTO Roadside Design Manual.

Road Segment	Design Speed	PM Peak Hour Traffic Volumes (2041)	# of Lanes per Direction	AADT (Calculated as PHT/K, K=0.9)	Clear Zone Width
Castlemore Road to Collector Road 'C'	60 km/h	1,211 (NB) 457 (SB)	2	13,460 5,080	AADT >=6,000 CZ = 4.5 m
Collector Road 'C'	60 km/h	1,211 (NB) 457 (SB)	1	13,460 5,080	AADT >=6,000 CZ = 4.5 m
East-West Arterial to Countryside Drive	80 km/h	557 (NB) 154 (SB)	1	6,200 1,710	AADT >= 6,000 CZ = 7.5 m
Countryside Drive to Mayfield Road	80 km/h	281 (NB) 106 (SB)	1	3,150 1,200	1,500 ≤ AADT ≤ 6,000 CZ = 7.5 m

Vehicular Lanes

Based on traffic analysis completed as part of this study, a two (2) lane cross-section will be sufficient for the majority of this roadway to 2041, with the exception being the portion between Castlemore Road and the Collector Road 'C' segment, which will require a four (4) lane cross-section. Lane width of 3.50 m is recommended based on recommendations made by the TAC with respect to measures to reduce operating speed. Per City standards, auxiliary lanes should be 3.50 m wide.

Active Transportation: Pedestrian Facilities

The need for pedestrian facilities and connections along Clarkway Drive was determined through completion of the SP47 TMP and City-wide TMP. As a starting point, the City's standard cross-section for major collectors indicates a desire to provide 1.8 m sidewalks on both side of the roadway. The need to provide MUP on both sides, to accommodate both pedestrians and cyclists, was to be determined through the current study using updated information related to design speed and traffic volumes.

Section 2.2.7 of The Highway 427 Special Policy Area Community Design Framework expands upon this recommendation, to include the provision of wider sidewalks through the Collector Road 'C' segment, which will support pedestrian movement and gathering areas, as well as café seating areas. To support this function, the Highway 427 Special Policy Area Community Design Framework also recommends that up to 1/3 of the available ROW be dedicated for pedestrian uses.

Active Transportation: Cycling Facilities

The Area 47 TMP recommends the provision of on-road cycling lanes along the length of Clarkway Drive. The suitability of this type of facility is further evaluated in Table 6-8 to Table 6-11, provided below. Based on the detailed evaluation, multi-use paths are recommended for the full length of Clarkway Drive, except for Collector Road 'C' to E/W Arterial, where a buffered cycle lane is recommended.

Table 6-8: Evaluation of Suitable Cycling Facility Types for Clarkway Drive - Castlemore Road to Collector Road 'C'

Evaluation Criteria	Suitable Cycling Facility Type(s)			
	Shared Lanes	Exclusive Cycle Lanes	Buffered Cycle Lanes	Physically Separated / MUP
Secondary Plan Recommendation				
OTM Book 18 Recommendation Based On:				

Evaluation Criteria		Suitable Cycling Facility Type(s)			
		Shared Lanes	Exclusive Cycle Lanes	Buffered Cycle Lanes	Physically Separated / MUP
Figure 3.3	Estimated AADT: 13,500	Shared facility not acceptable due to AADT & design speed.	Unbuffered cycle lanes acceptable but not preferred.	Preferred facility type based on operating speed and AADT.	Preferred facility type based on operating speed and AADT.
	Design Speed: 60				
Roadway Function	Mobility (Arterial)		Table 3.3 recommends cycle lane or separated facility.		
Vehicle Mix	Buses	Cyclist discomfort due to bus interaction.	Cycle facilities should be more clearly delineated through provision of wider lanes.	Separated facility creates comfort for cyclists. Conflict points to be clearly delineated.	Separated facility creates comfort for cyclists. Conflict points to be clearly delineated.
Anticipated Users	Novice & Experienced	May be comfortable for experienced users but not for novice users.	More comfortable for all users compared to shared lanes. Not preferred for novice users.	More comfortable for novice users. Preferred by commuter (experienced) cyclists.	Separated facility preferred by novice users. MUP not preferable for commuter cyclists due to conflict with pedestrians.
Anticipated Cycle Volumes	Moderate	Wide curb lane may be appropriate, though may discourage volume growth	Appropriate lane width to be provided for anticipated cyclist volumes.	Encourages use by larger cycle volumes.	Encourages use by larger cycle volumes.
Route Function	Access & Connection	Acceptable but not preferred.	Preferred to encourage cycling by diverse users.	Preferred to encourage cycling by diverse users.	Preferred to encourage cycling by diverse users.
On-Street Parking	Not permitted	Compatible cycling facility type.	Compatible cycling facility type.	Compatible cycling facility type.	Compatible cycling facility type.
Recommended Cycling Facility Type(s)		MUP			

Table 6-9: Evaluation of Suitable Cycling Facility Types for Clarkway Drive's Collector Road 'C' to E/W Arterial

Evaluation Criteria		Suitable Cycling Facility Type(s)			
		Shared Lanes	Exclusive Cycle Lanes	Buffered Cycle Lanes	Physically Separated/ MUP
Secondary Plan Recommendation					
OTM Book 18 Recommendation Based On:					
Figure 3.3	Estimated AADT: 6,200	Share facility acceptable, but not preferred.	Preferred facility type based on operating speed and AADT.	Preferred facility type based on operating speed and AADT.	Preferred facility type based on operating speed and AADT.
	Design Speed: 60				

Evaluation Criteria		Suitable Cycling Facility Type(s)			
		Shared Lanes	Exclusive Cycle Lanes	Buffered Cycle Lanes	Physically Separated/ MUP
Roadway Function	Mobility (Collector)		Table 3.3 recommends cycle lane or separated facility		
Vehicle Mix	Buses	Cyclist discomfort due to bus interaction	Cycle facilities should be more clearly delineated through provision of wider lanes.	Separated facility creates comfort for cyclists. Conflict points to be clearly delineated.	Separated facility creates comfort for cyclists. Conflict points to be clearly delineated.
Anticipated Users	Novice & Experienced	May be comfortable for experienced users.	May be slightly more comfortable for all users	More comfortable for novice users. Preferred by commuter (experienced) cyclists.	Separated facility preferred by novice users. Multi-use pathway not preferable for commuter cyclists due to conflict with pedestrians.
Anticipated Cycle Volumes	Significant	Higher order facilities recommended.	Higher cyclist volumes increase risk of interaction with vehicles. Higher order facility recommended.	Encourages use by larger cycle volumes.	Encourages use by larger cycle volumes.
Route Function	Access & Connection	Acceptable but not preferred.	Preferred to encourage cycling by diverse users.	Preferred to encourage cycling by diverse users.	Preferred to encourage cycling by diverse users.
On-Street Parking	High turnover & demand	Conflict between cyclists and parking/parked vehicles	Conflict between cyclists and parking/parked vehicles	Eliminates conflict between cyclists and Pedestrian	Eliminates conflict between cyclists and parking/parked vehicles
Other Considerations		Adjacent segments of Clarkway Drive require either buffered or otherwise physically separated facilities based on AADT. Pedestrian spaces will have high volumes which may spill over onto adjacent cycling facilities if not physically separated.			
Recommended Cycling Facility Type(s)		Buffered Cycle Lanes			

Table 6-10: Evaluation of Suitable Cycling Facility Types for Clarkway Drive between E/W Arterial and Countryside Drive

Evaluation Criteria	Suitable Cycling Facility Type(s)			
	Shared Lanes	Exclusive Cycle Lanes	Buffered Cycle Lanes	Physically Separated/ MUP
Secondary Plan Recommendation OTM Book 18 Recommendation Based On:				

Evaluation Criteria		Suitable Cycling Facility Type(s)			
		Shared Lanes	Exclusive Cycle Lanes	Buffered Cycle Lanes	Physically Separated/ MUP
Figure 3.3	Estimated AADT: 6,200	Shared facility not suitable due to AADT & design speed	Unbuffered cycle lanes acceptable but not preferred.	Preferred facility type based on operating speed and AADT.	Preferred facility type based on operating speed and AADT.
	Design Speed: 90				
Roadway Function	Mobility (Collector)	Table 3.3 recommends cycle lane or separated facility			
Vehicle Mix	Buses	Cyclist discomfort due to bus interaction	Cycle facilities should be more clearly delineated through provision of wider lanes.	Separated facility creates comfort for cyclists. Conflict points to be clearly delineated.	Separated facility creates comfort for cyclists. Conflict points to be clearly delineated.
Anticipated Users	Novice & Experienced	May be comfortable for experienced users but not for novice users.	More comfortable for all users compared to shared lanes. Not preferred for novice users.	More comfortable for novice users. Preferred by commuter (experienced) cyclists.	Separated facility preferred by novice users. MUP not preferable for commuter cyclists due to conflict with pedestrians.
Anticipated Cycle Volumes	Moderate	Wide curb lane may be appropriate, though may discourage volume growth	Appropriate lane width to be provided for anticipated cyclist volumes.	Encourages use by larger cycle volumes.	Encourages use by larger cycle volumes.
Route Function	Connection	Acceptable but not preferred.	Preferred to encourage cycling by diverse users.	Preferred to encourage cycling by diverse users.	Preferred to encourage cycling by diverse users.
On-Street Parking	Not permitted	Compatible cycling facility type.	Compatible cycling facility type.	Compatible cycling facility type.	Compatible cycling facility type.
Recommended Cycling Facility Type(s)		MUP			

Table 6-11: Evaluation of Suitable Cycling Facility Types for Clarkway Drive between Countryside Drive and Mayfield Road

Evaluation Criteria	Suitable Cycling Facility Type(s)			
	Shared Lanes	Exclusive Cycle Lanes	Buffered Cycle Lanes	Physically Separated/ MUP
Secondary Plan Recommendation				

Evaluation Criteria		Suitable Cycling Facility Type(s)			
		Shared Lanes	Exclusive Cycle Lanes	Buffered Cycle Lanes	Physically Separated/ MUP
OTM Book 18 Recommendation Based On:					
Figure 3.3	Estimated AADT: 3,150	Shared facility not acceptable due to AADT & design speed	Unbuffered cycle lanes acceptable but not preferred.	Preferred facility type based on operating speed and AADT.	Preferred facility type based on operating speed and AADT.
	Design Speed: 90				
Roadway Function	Mobility (Collector)		Table 3.3 recommends cycle lane or separated facility		
Vehicle Mix	Buses	Cyclist discomfort due to bus interaction	Cycle facilities should be more clearly delineated through provision of wider lanes.	Separated facility creates comfort for cyclists. Conflict points to be clearly delineated.	Separated facility creates comfort for cyclists. Conflict points to be clearly delineated.
Anticipated Users	Experienced	May be comfortable for experienced users	Acceptable facility type for experienced users.	Acceptable facility type for experienced users.	Acceptable facility type for experienced users. MUP not preferred for experienced cyclists due to conflict with pedestrians.
Anticipated Cycle Volumes	Low	Wide curb lane may be appropriate, though may discourage volume growth	Appropriate lane width to be provided for anticipated cyclist volumes.	Encourages use by larger cycle volumes.	Encourages use by larger cycle volumes.
Route Function	Connection	Acceptable but not preferred.	Preferred to encourage cycling by diverse users.	Preferred to encourage cycling by diverse users.	Preferred to encourage cycling by diverse users.
On-Street Parking	Not permitted	Compatible cycling facility type.	Compatible cycling facility type.	Compatible cycling facility type.	Compatible cycling facility type.
Recommended Cycling Facility Type(s)		MUP			

6.4.1.2 Preferred Cross-Sections

Preferred cross-sections for the four (4) segments of Clarkway Drive are discussed in the following sections. Recommended cross-sections for the various segments are illustrated in Figure 6-6 to Figure 6-9 on the following pages.

Clarkway Drive: Castlemore Road to Collector Road 'C'

The preferred cross-section for the Clarkway Drive between Castlemore Road and the Collector Road 'C' segment is Alternative 1, which provides a 1.50 m median (including curbs), 3.5 m (through) and 3.50 m (curb side) vehicular lanes, 2.6 m MUP and 2.75 m total boulevard widths (including 1.0 m kill strips). Although not shown in the cross-section, it should be noted that there is a watermain planned for Clarkway Drive from Castlemore Road to Collector Road C, as per the 2020 Water and Wastewater Master Plan / 2041 Water Capital Program.

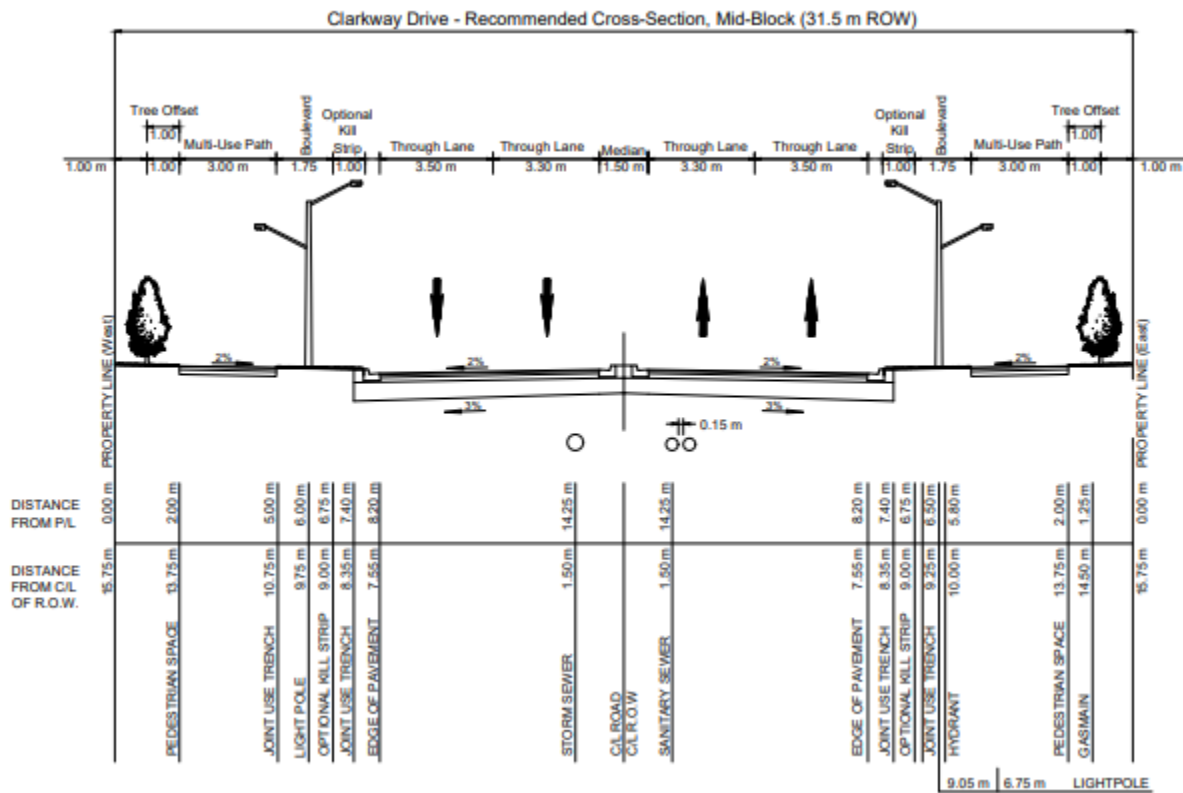


Figure 6-6: Recommended Cross-Section for the Clarkway Drive: Castlemore Road to Collector Road 'C' with Median

Clarkway Drive: Collector Road 'C' To E-W Arterial

The preferred cross-section for Clarkway Drive's Collector Road 'C' segment is Alternative 5, which provides a 1.50 m median (including curbs), 3.5 m through lanes, 2.0 m cycle space and 2.1 m parking lanes. With exception of the intersections, the entire pedestrian zone is located outside of the clear zone along this segment of Clarkway Drive.

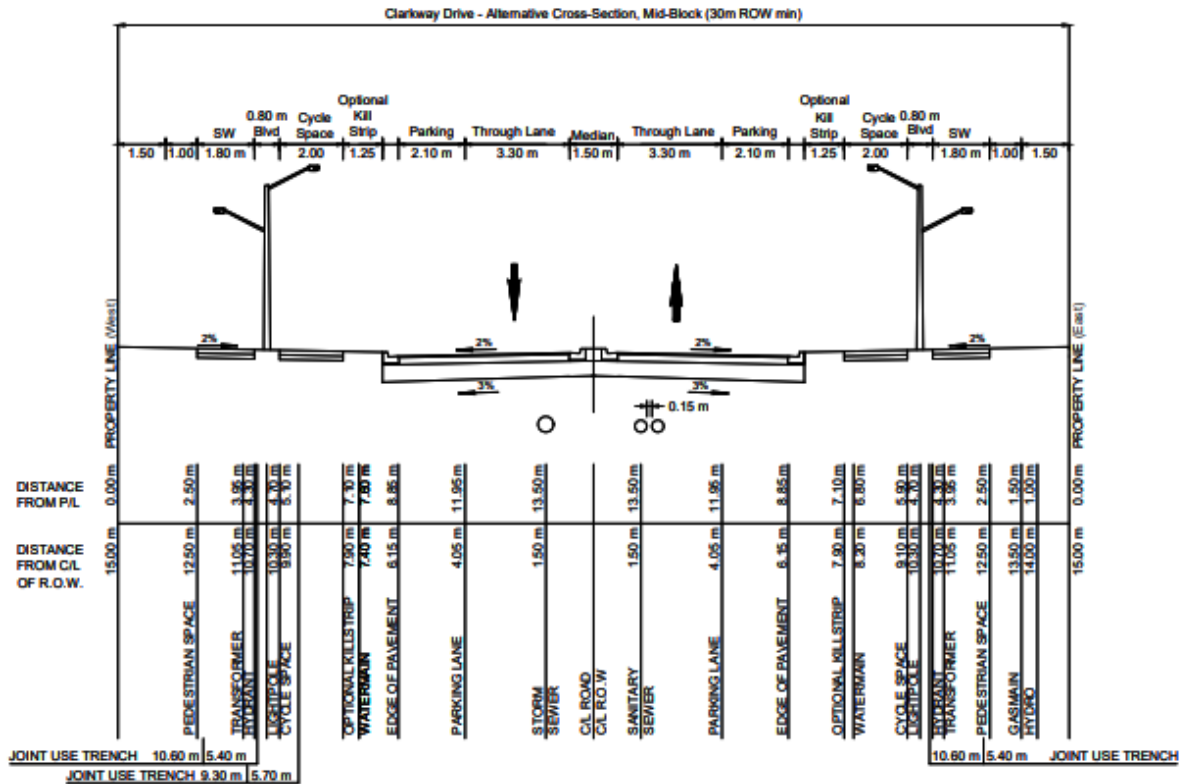


Figure 6-7: Recommended Cross-Section for Clarkway Drive: Collector Road 'C' To E-W Arterial (Option 2)

Clarkway Drive: Countryside Drive to Mayfield Road

The preferred cross-section for the Clarkway Drive between Countryside Drive and Mayfield Road is Alternative 4, which provides 3.5 m through lanes, 4.0 m MUP, 4.80 m total boulevard widths and 2.50 m tree offset on either side of the road.

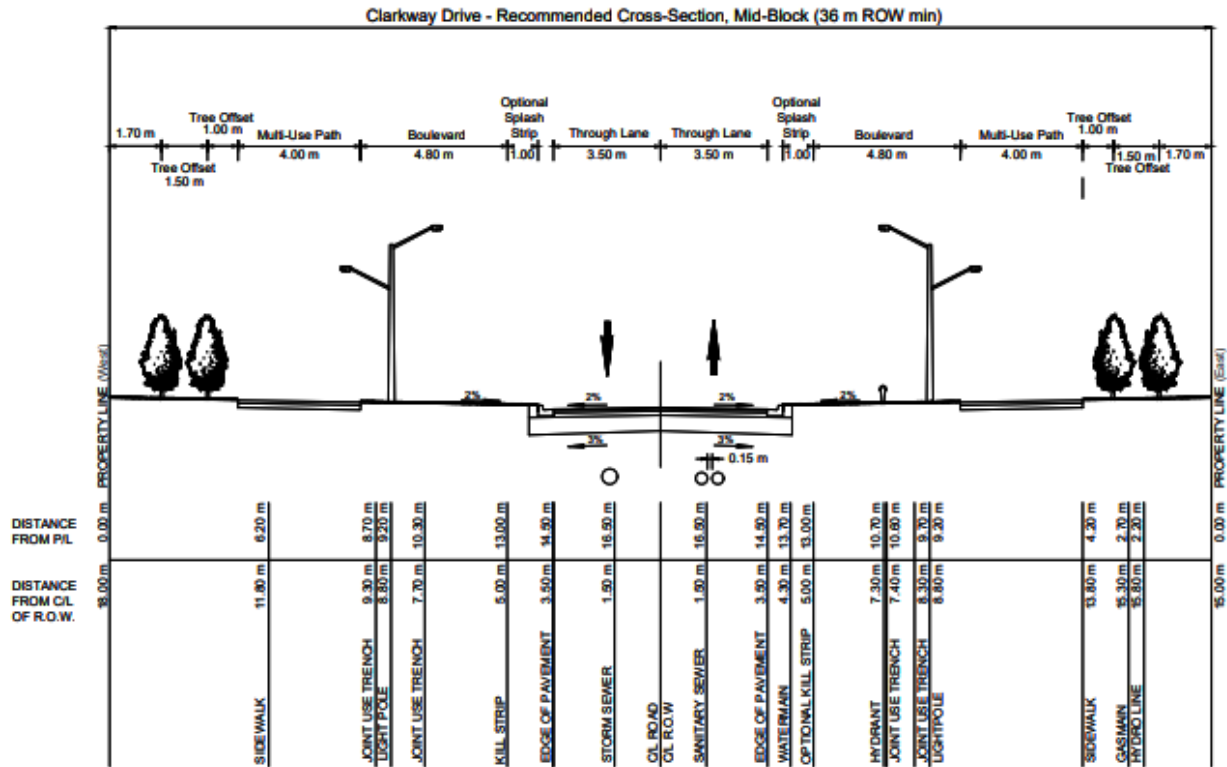


Figure 6-8: Recommended Cross-Section for Clarkway Drive: Countryside Drive to Mayfield Road

Clarkway Drive: East-West Arterial to Countryside Drive

The preferred cross-section for Clarkway Drive’s “Special Character” segment is a semi-urban section, as opposed to the fully rural section that was recommended in the Community Design Framework for the study area (City of Brampton, 2015). A semi-urban section will provide a similar user experience to that provided by a rural section, but provides shallow swales instead of ditches, and requires installation of subdrain to facilitate removal of water from the granular road base. It was determined that a full rural section was not recommended as it would preclude the provision of sidewalks and/or cycling facilities due to the depth (and therefore width) of ditches required.

The recommend section includes 3.5 m vehicular lanes, 3.0 m MUP and 4.75 m enhanced swales. As this segment of Clarkway Drive is located within, or in very close proximity to, Clarkway Creek and its floodplain, it is anticipated that the location of sidewalks and swales may vary within the ROW to minimize impacts to these features. Additionally, as a result of changes to the profile and the impacts this may have on grading within the section, it may not be feasible to provide sidewalks on one or both sides of this segment of Clarkway Creek.

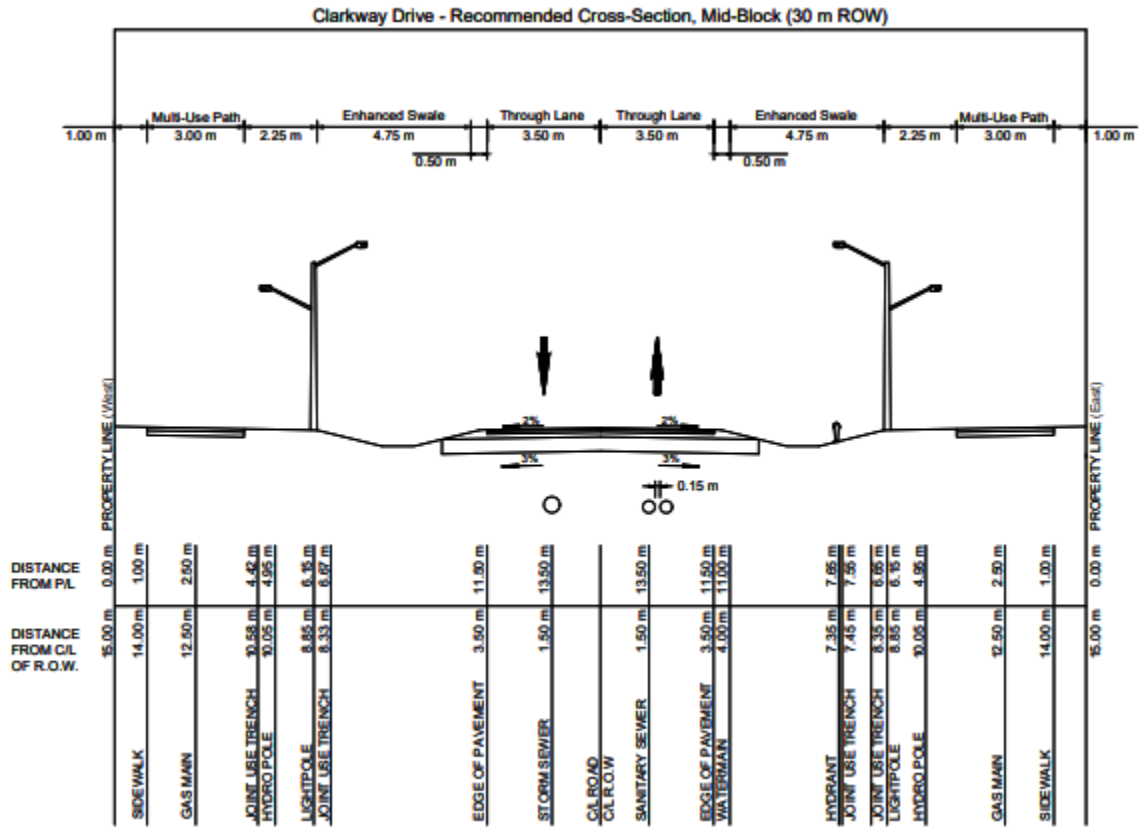


Figure 6-9: Recommended Cross-Section for Clarkway Drive: E-W Arterial to Countryside Drive

6.5 Property Requirements

Table 6-12 provides the property requirements for the study area. The requirements will be further refined during detailed design.

Table 6-12: Properties Impacted

Road	Address
East-West Arterial	10517 Clarkway Drive
East-West Arterial	10491 Clarkway Drive
East-West Arterial	No Assigned Address
East-West Arterial	No Assigned Address
East-West Arterial	10514 Coleraine Drive
East-West Arterial	10568 Coleraine Drive
East-West Arterial	No Assigned Address
East-West Arterial	10376 Clarkway Drive
East-West Arterial	10365 The Gore Road

Road	Address
East-West Arterial	10365 The Gore Road
Total (East-West Arterial)	
Countryside Drive	5232 Countryside Drive
Countryside Drive	5200 Countryside Drive
Countryside Drive	No Assigned Address
Countryside Drive	No Assigned Address
Countryside Drive	No Assigned Address
Countryside Drive	11075 Clarkway Drive
Countryside Drive	5253 Countryside Drive
Countryside Drive	No Assigned Address
Countryside Drive	5193 Countryside Drive
Countryside Drive	5137 Countryside Drive
Countryside Drive	10955 Clarkway Drive
Countryside Drive	5482 Countryside Drive
Countryside Drive	5444 Countryside Drive
Countryside Drive	No Assigned Address
Countryside Drive	5272 Countryside Drive
Countryside Drive	No Assigned Address
Countryside Drive	No Assigned Address
Countryside Drive	5620 Countryside Drive
Countryside Drive	5556 Countryside Drive
Countryside Drive	No Assigned Address
Countryside Drive	10980 Highway 50
Countryside Drive	No Assigned Address
Countryside Drive	10900 Coleraine Drive
Countryside Drive	5171 Countryside Drive
Countryside Drive	No Assigned Address
Countryside Drive	No Assigned Address
Countryside Drive	No Assigned Address
Countryside Drive	No Assigned Address
Total (Countryside Drive)	
Clarkway Drive	No Assigned Address
Clarkway Drive	No Assigned Address
Clarkway Drive	No Assigned Address
Clarkway Drive	No Assigned Address
Clarkway Drive	11411 Clarkway Drive
Clarkway Drive	No Assigned Address
Clarkway Drive	11075 Clarkway Drive
Clarkway Drive	10955 Clarkway Drive

Road	Address
Clarkway Drive	10845 Clarkway Drive
Clarkway Drive	10699 Clarkway Drive
Clarkway Drive	10651 Clarkway Drive
Clarkway Drive	10645 Clarkway Drive
Clarkway Drive	10623 Clarkway Drive
Clarkway Drive	10599 Clarkway Drive
Clarkway Drive	10577 Clarkway Drive
Clarkway Drive	10517 Clarkway Drive
Clarkway Drive	10491 Clarkway Drive
Clarkway Drive	No Assigned Address
Clarkway Drive	No Assigned Address
Clarkway Drive	10411 Clarkway Drive
Clarkway Drive	10307 Clarkway Drive
Clarkway Drive	10287 Clarkway Drive
Clarkway Drive	10671 Clarkway Drive
Clarkway Drive	10671 Clarkway Drive
Clarkway Drive	No Assigned Address
Clarkway Drive	No Assigned Address
Clarkway Drive	No Assigned Address
Clarkway Drive	No Assigned Address
Clarkway Drive	10015 Clarkway Drive
Clarkway Drive	No Assigned Address
Clarkway Drive	10059 Clarkway Drive
Clarkway Drive	No Assigned Address
Clarkway Drive	No Assigned Address
Clarkway Drive	10089 Clarkway Drive
Clarkway Drive	No Assigned Address
Clarkway Drive	5076 Old Castlemore Road
Clarkway Drive	No Assigned Address
Clarkway Drive	10201 Clarkway Drive
Clarkway Drive	No Assigned Address
Clarkway Drive	No Assigned Address
Clarkway Drive	10799 Clarkway Drive
Clarkway Drive	No Assigned Address
Clarkway Drive	No Assigned Address
Clarkway Drive	10874 Clarkway Drive
Clarkway Drive	10852 Clarkway Drive
Clarkway Drive	No Assigned Address
Clarkway Drive	No Assigned Address

Road	Address
Clarkway Drive	10786 Clarkway Drive
Clarkway Drive	10778 Clarkway Drive
Clarkway Drive	10742 Clarkway Drive
Clarkway Drive	10728 Clarkway Drive
Clarkway Drive	10644 Clarkway Drive
Clarkway Drive	No Assigned Address
Clarkway Drive	10376 Clarkway Drive
Clarkway Drive	10308 Clarkway Drive
Clarkway Drive	10108 Clarkway Drive
Clarkway Drive	10086 Clarkway Drive
Clarkway Drive	10740 Clarkway Drive
Clarkway Drive	No Assigned Address
Clarkway Drive	10484 Clarkway Drive
Clarkway Drive	No Assigned Address
Clarkway Drive	No Assigned Address
Clarkway Drive	No Assigned Address
Clarkway Drive	No Assigned Address
Clarkway Drive	No Assigned Address
Clarkway Drive	No Assigned Address
Clarkway Drive	No Assigned Address
Clarkway Drive	No Assigned Address
Clarkway Drive	No Assigned Address
Total (Clarkway Drive)	

6.6 Utilities

The utility information was provided to WSP by the City and Region and various different utility companies. This includes location of existing infrastructure such as watermain, wastewater (sanitary), gas, hydro and cables within the study area. WSP has shown these utilities on the design drawings and identified if relocation is required due to the proposed road elevations or potential utility conflicts.

During the filing of the Part A ESR, Bell Canada identified some Bell infrastructure in the existing roads on Countryside Drive between Coleraine Drive and Arterial A2 and at the crossing of Countryside Drive and Arterial A2, which will be impacted by the work. Further coordination to occur during the Detail Design Stage.

Along proposed East West Arterial, existing TransCanada and Enbridge gas pipelines are available that runs east west direction within the study area. WSP has gathered existing service information from TC Energy. Pipeline locations based on a developer's field investigation was also incorporated into the design to determine exact location of the buried pipes and offset requirements. TC energy has identified concerns regarding future East West Arterial crossing the pipeline. The concerns were discussed with TC

Energy and commitments to future work has been noted, refer to Appendix C for response and commitments.

6.7 Agency Approvals

Agency approvals are required before construction can begin. Approval requirements are summarized in Table 6-13.

Table 6-13: Required Agency Approvals / Permitting Requirements

Agency	Approval / Permit Required	Comments
Required Permits		
Department of Fisheries and Oceans	Fisheries Act	Request for Review during detailed design
Toronto and Region Conservation Authority	Permit under O. Reg. 166/06	Required to construct in areas within regulated limit
Ministry of the Environment, Conservation and Parks	Ontario Water Resources Act, 1990	Where construction dewatering volumes are expected to exceed 400,000 L/day, a PTTW will be required.
Potentially Required (To be determined in the Detailed Design Stage)		
Ministry of the Environment, Conservation and Parks	License to Collect Fish for Scientific Purposes Fish and Wildlife Conservation Act, 1997	Required if wildlife is collected or relocated. However, it is expected that any wildlife present on site will be able to leave the area under their own power and relocation will not be required.
Ministry of the Environment, Conservation and Parks	Endangered Species Act, 2007	Required if threatened and/or endangered species are encountered during detailed design (e.g., Barn Swallow)

6.8 Preliminary Cost Estimate

A summary of the preliminary cost is provided in Table 6-14 and the detailed cost estimate can be found in Appendix Q. The cost estimate does not include Rainbow Creek crossing, as this crossing was accounted for during the Part A cost estimate.

Table 6-14: Preliminary Cost Estimate

Summary (rounded)	Countryside Drive	Clarkway Drive	East-West Arterial
General	\$620,000	\$620,000	\$620,000
Roadwork	\$7,270,000	\$7,970,000	\$9,820,000
Traffic Signals	\$1,320,000	\$2,310,000	\$1,650,000
Street Lighting	\$825,000	\$1,432,200	\$719,400
Utility Relocations (Estimated)	\$4,144,800	\$9,947,460	\$127,050
Structural	\$11,670,000	\$3,080,000	\$8,680,000

Summary (rounded)	Countryside Drive	Clarkway Drive	East-West Arterial
30% Contingency	\$7,750,000	\$7,610,000	\$6,480,000
Property	\$78,100,000	\$91,000,000	\$73,900,000
Total Tender	\$111,700,000	\$124,000,000	\$102,000,000

7.0 Environmental Issues and Commitments

7.1 Natural Environment

7.1.1 Terrestrial Resources

The vegetation communities within the Study Area have been created by human disturbance and are classified as cultural vegetation types, residential areas, and predominantly agricultural fields. These are the land uses which will be primarily impacted by the planned development. Species of conservation concern should be considered as they may be present. However, the severe agricultural landscape limits the candidacy of SWH, as habitat required to delineate SWH is not available. The most substantial impact on terrestrial wildlife will be the change from a relatively penetrable landscape to an impenetrable landscape due to an increase in roads. The following potential impacts relate primarily to the impacts associated with road infrastructure:

- Direct loss of floral and faunal habitat and soil compaction resulting from vehicle and machinery operations to be calculated in detailed design;
- Reduced stability of landforms composed of unconsolidated material;
- Tree/shrub root stress and possible decline as a result of re-grading/fill placement along natural area edges and the removal of 488 trees (based on preliminary design); and
- Changes in drainage which may affect aquatic and wetland habitats.

Many of the usual impacts associated with a direct loss of flora and fauna are not the case for this Study Area, as the severe agricultural landscape limits the amount of natural area and inherent resiliency.

7.1.1.1 Significant Wildlife Habitat Impacts

E-W Arterial will impact a woodlot along the Gore Road Tributary. Little Brown Myotis, and potentially other Myotis species, were documented within this area. The most important threats to the survival of bats include destruction of hibernating bats and nursery colonies, habitat loss, and persecution. Road construction may impact bat maternity colonies by destroying forest habitat which includes tree hollows used as nurseries. Road development close to woodlots may also increase human access to woodlots, which can indirectly harm bats (disturbed bats may drop pups). Development will not be permitted in a bat maternity colony SWH unless it can be demonstrated that there will be no negative impacts on the feature or its ecological function. The best mitigation option is to avoid developing in the habitat. To avoid direct impacts to individuals, vegetation removal should be done in the winter.

Roads may be the most significant source of turtle mortality, and poorly designed roads have the potential to cause local populations to be extirpated. Road-effect zones range from less than 200 m for sedentary species to more than 2 km for some turtle and frog species. Thus, effects from roads may be very far-reaching. Development will not be permitted in SWH unless it can be demonstrated that there are no negative impacts on the feature or its ecological function. Roads need to be designed so that they are not barriers to turtles travelling between water and nesting, and if this is not possible, suitable underpasses need to be provided.

The development within the habitat for the Meadow and Chimney Crayfish will result in the direct loss of their habitat and possibly extirpation of the local population. The development of roads in terrestrial crayfish habitat may result in its loss. Surface water from roads that is directed towards crayfish habitat has the potential to have adverse effects as this may result in flooding of burrows, unstable water levels within burrows, and introduction of contaminants into the crayfish habitat. Surface water also has the potential to introduce sediments into crayfish habitat, which means the soil changes may not be suitable for burrowing or constructing chimneys. Changes in water level will result in the destruction of habitat. Development will not be permitted within the SWH unless it can be demonstrated that there will be no negative impacts on the feature or its ecological function. The ELC ecosite that contains the terrestrial crayfish burrows is the SWH.

7.1.1.2 Tree Inventory

Impacts on trees within the study area will be largely associated with construction and grading activities. To meet the requirements for the construction footprint provided in the preferred alternative design, a total of 488 trees will need to be removed, and 20 trees may potentially be injured. While the nature of the work to be completed is generally understood, the sites specific locations/extent of the work has not been determined. The Design Builder is responsible to confirm the limits of the work and tree removals.

Potential impacts to trees could be avoided during construction with appropriate protection measures and practices. The location and type of protection is to be confirmed during detailed design and are not illustrated at this time. Compensation for trees needs to be discussed between the City, the Region and the TRCA. However, using the City and TRCA guidelines, 4,965 compensation trees is likely required. As it is preferred that compensation plantings occur on-site, and the Rainbow Creek Corridor is subject to an extensive restoration plan, compensation plantings required as part of the arterial road network could be included within the Rainbow Creek Restoration plan, if accepted by the City, Region, and TRCA.

7.1.1.3 Erosion and Sediment Control Mitigation

Design and implement standard Erosion and Sediment Control (ESC) measures, consistent with Ontario Provincial Standards and Specifications (OPSS), to contain / isolate the construction zone, manage site drainage / runoff and prevent erosion of exposed soils and migration of sediment. ESC measures should be implemented before the commencement of works, and maintained through all phases of the project, until vegetation is re-established, or erosion protection materials stabilize all disturbed ground. The ESC plan should include regular inspection and maintenance, and removal of non-biodegradable ESC materials once the site is stabilized. Furthermore:

- Operate, store, handle, and dispose of all materials used or generated (e.g., organics, soils, construction waste and debris, etc.) and maintain equipment in a manner that prevents the entry of any deleterious substance from entering the watercourse or contaminating the natural environment. Store and stockpile materials at a safe distance from the watercourse and ensure they are stabilized and contained as necessary.
- Prohibit or limit access to banks or areas adjacent to waterbodies, to the extent required to protect the structural integrity of the banks or shorelines. Whenever possible, operate machinery on land above the high-water mark in a manner that minimizes disturbance to the bed and banks of the waterbody.

- Ensure any part of equipment entering the watercourse, or operating from the bank, shall be free of fluid leaks, invasive species and noxious weeds and externally cleaned/degreased to prevent any deleterious substances from entering the watercourse and contamination of the natural environment. Design and implement a containment plan to isolate all work above water and keep airborne contaminants and all deleterious substances from entering the watercourse (Adherence to the Region of Peel's Salt Management Plan and the City of Brampton's Salt Management Guidelines). The containment plan should include regular inspection, removal and disposal of materials generated and use in-water scaffolding where appropriate.
- Ensure a Spill Management Plan (including spill kit materials, instructions regarding their use, education of contract personnel, and emergency contact numbers) is always present on site for implementation in the event of an accidental spill.
- Minimize the removal and clearing of natural materials such as herbaceous plants, woody debris, and rocks from the banks or the shoreline of the watercourse. Where vegetation is removed, incorporate temporary measures (e.g., biodegradable materials, nurse-crop vegetation) to provide interim stabilization until vegetation is fully established. Stabilize and reinforce banks to pre-disturbance condition (or better) using properly designed and installed stabilization measures. Restore vegetation according to a vegetation rehabilitation plan.
- Design and implement a vegetation rehabilitation plan to restore riparian vegetation to pre-construction state or better. Considerations:
 - Plant with site-appropriate native species and where possible, use commercial seed mats, perforated soil cloth, etc.;
 - Plant trees and shrubs for shade to cool water and provide overhead cover;
 - Design and install riparian plantings to avoid or minimize encroachment into and/or alteration of bank and bed profile;
 - Re-instate native soils or replace them with topsoil/suitable planting medium and use only clean material free of particulates;
 - Incorporate soil / seed bank salvage, vegetation transplant or bio-engineering (e.g., live stakes, cuttings) techniques;
 - Reinstatement and re-stabilize any portion of the waterbody bed / substrates disturbed during construction to pre-construction (or better) condition including morphological elements (e.g., pools and riffles) and substrates (salvage and reinstatement of native materials); and
 - Integrate the provision of fish cover where feasible. Design and install in-stream cover habitat elements (e.g., woody debris structures, boulders, overhanging vegetation on banks) to replace or reinstate fish cover removed, altered or disturbed during construction.

7.1.1.4 Terrestrial Environment Mitigation

Removal of woody vegetation is recommended to occur outside of the migratory bird nesting period (April 1 to August 31) and activities will occur in accordance with the MBCA and *Migratory Bird Regulations*. These timing constraints should not be perceived as absolutes. This period represents the core breeding period, although some species may nest in March and September. Ultimately, the objective from a compliance perspective is to not circumvent the MBCA. As such, due diligence measures should be implemented and documented for any nest searching efforts, including record control, to ensure compliance with the MBCA.

For activities, including vegetation removal, which may occur during bird nesting season, surveys to identify nesting activity will be completed by an Avian Biologist within 24 hours of scheduled work

activities. The Avian Biologist conducting the surveys must be able to identify birds by species and be knowledgeable of nesting seasons and activities for appropriate species. It is important to note, that depending on the time of clearing activities, nest sweeps during the breeding season may not be a viable option. More specifically in the event vegetation becomes too dense and a clear confirmation / due diligence cannot be provided through nest sweeps, clearing activities may not be able to move forward until a timing where credible due diligence can be implemented (e.g., following the nesting season).

If a species listed under the ESA as extirpated, endangered or threatened is identified, Section 9 of the Act prohibits killing, harming, harassing, capturing, taking, possessing, collecting, buying, selling, leasing, trading or offering to buy, sell, lease or trade a member of the species. Some of these prohibitions also apply to body parts of a member of the species and to things derived from a member of the species. Similarly, if a species is listed under the ESA as endangered or threatened, Section 10 of the Act prohibits damaging or destroying the habitat of the species. Species listed as special concern are not afforded protection under Sections 9 and 10 of the ESA; however, due diligence should be enforced if a special concern species or their habitat is present. More specifically;

- Should any SAR be encountered on site during Project implementation, the MECP should be contacted immediately;
- Construction personnel should watch for wildlife attempting to nest in and around construction areas, and as possible avoid nesting areas. Construction personnel should avoid preventing wildlife from reaching other sensitive areas beyond the work area, and;
- The effects of construction activities in areas where terrestrial crayfish chimneys were found should be considered. The current hydrology should be maintained through the appropriate design of roadside ditches and stormwater management systems. Minimize the footprint of the road and the construction area to the greatest extent practicable to avoid damaging colonies.

Other mitigation measures to consider are fencing to direct wildlife movement through wildlife crossings but also to prevent uncontrolled access and encroachment from pedestrians into adjacent natural areas. Should impenetrable barriers be considered, opportunities for wildlife passage should be incorporated. It is recommended that buffer widths be increased from the minimum 10 m to 15 m near areas of ecological sensitivity. Additionally, all crossing structures should be clear-span structures with abutments located outside any significant valleylands and natural heritage systems to reduce impacts as recommended by Savanta (2019). These clear-span structures will also act as passages to reduce crossing hazards for wildlife.

Lastly, keeping with similar recommendation as identified within the MESP, it is recommended that low mast lighting is implemented and directed downward and shielded (often referred to as directional lighting systems) to minimize light projection into the NHS and lightening at wildlife crossings should be limited, where feasible.

7.1.1.5 Habitat Compensation

The proposed removal of natural features to facilitate the proposed project (that are deemed acceptable to the City/Region and TRCA), must be mitigated by restoring areas that will be encompassed into the future NHS as described within the MESP and further to be reflected into the City and Regional Official Plan policies. The NHS contains various ecological components that are important to the City and the Region. For all tableland woodlands and tableland wetlands, the MESP recommends at least a 1:1

compensation, as to ensure no net loss of natural features. During detailed design, the proposed removal of features is to be totaled, and their compensation included in the Rainbow Creek corridor restoration. Further consultation with TRCA will occur during detail design.

Additionally, the removal of trees from hedgerows and other areas will require compensation. Compensation is currently estimated to be 4,965 compensation trees which will be further refined in detailed design.

7.1.2 Aquatic Resources

Possible impacts from the proposed construction and improvements may include the alteration of water levels and the change in the pattern of surface water flow and shallow groundwater movement. Surface water runoff from the proposed roadways may also introduce contaminants (e.g., salt or sediments).

Potential impacts to fish and fish habitat are anticipated to be limited but may the following:

- Removal of riparian vegetation could result in increased water temperatures and instability in channel banks;
- The project works associated with new culvert installation or installation of culvert extensions within permanent fish habitat will require temporary in-water works and associated timing restrictions;
- Introduction of pollutants, concrete outwash and other deleterious substances (e.g., sediment, salt, paint, solvents, oil and grease) into the watercourse;
- Changes in stream channel structure and water clarity;
- Roadside drainage could increase the input of pollutants; and
- Removal of rocks, woody debris, and/or riparian vegetation from the banks may alter natural habitat features and bank stability.

Headwater drainage features (HDF) recommended for "Protection" and "Conservation" should remain as open watercourses at the current location. Future stormwater management planning will require that flows be maintained to these features, via storm pond outfalls, low impact development swales, or other techniques. HDFs classified as "Mitigation 1," and "Mitigation 2" could either remain as open watercourses, provided that flows can be maintained, or be replicated using well-vegetated urban swales or wetlands. HDFs with "No Management" classification could be eliminated and replaced with a traditional urban major-minor drainage system.

Development opportunities and constraints, including stormwater management, will have to be assessed as development proceeds through future Block or Tertiary Planning and associated environmental studies.

7.1.2.1 Aquatic Environment Mitigation

To mitigate damages specific to the aquatic environment, design and install culverts to prevent the creation of barriers to fish movement and maintain bankfull channel and habitat functions to the extent possible. This includes embedment of the culvert, or installing open bottom structures, reinstatement of the low flow channel and native substrates, proper sizing of the culvert, and maintaining channel slope. Additionally, conducting in-stream work during periods of low flow to allow work to be conducted during dry conditions or isolated from flows. If in-water works are required beyond the timing constraints, a Request For Review (RF) from Department of Fisheries and Oceans Canada (DFO) is required. The

duration of in-water work should be minimized and scheduled to avoid wet, windy and rainy periods that may increase erosion and sedimentation.

If in-water work is to occur, always design and implement an isolation / containment plan to isolate temporary in-water work zones and maintain clean flow downstream / around the work zone. The design should:

- Use only clean materials free of particulate matter for temporary cofferdams;
- Situate or otherwise manage flow withdrawal and discharge (e.g., see dewatering discharge) to prevent erosion and sediment release into a waterbody; and
- Ensure the work zone is stabilized against the impacts of high flow events during the work period.

Reinstate and re-stabilize any portion of the waterbody bed/substrates disturbed during construction to pre-construction (or better) condition, including:

- Morphological elements, e.g., pools and riffles; and
- Substrates, which may include salvage and reinstatement of native materials.
- Identify local regulatory authorities and have contact information available while on site.

Significant impacts to aquatic habitat as a result of the proposed works are not anticipated. There is potential for localized changes in hydrology and water quality due to the increase in impervious surfaces; however, mitigation measures and best management practices are expected to prevent these changes from impacting aquatic habitat.

Other considerations are the management of flows (e.g., minimum flows, seasonal flow augmentation, flushing flows) for specific aquatic habitat management goals and to mitigate other effects of flow management (e.g., fish passage, fish stranding). To avoid impacts to fishes:

- Exclude or move fish from the work area. Retain a qualified environmental professional to ensure applicable permits for relocating fish are obtained. Fish trapped within an isolated work area should be captured and relocated to adjacent channels sections outside the work area using appropriate capture, handling and release techniques to prevent harm and minimize stress.
 - A License to Collect Fish for Scientific Purposes (LCFSP) as part of the *Fish and Wildlife Conservation Act* will be required to rescue and relocate fish. The LCFSP will need to be obtained by the contractor that will be undertaking the fish rescue and relocation work.
- Pumps utilized for dewatering activities should be fitted with screens or barriers to avoid entrainment and impingement of fish at water intakes during dewatering processes.
- Discharge water from dewatering activities will be directed to an area located a minimum of 30 m from a watercourse and within a vegetated area and/or onto a scour pad.

Lastly, to mitigate damages specific to the aquatic environment, avoid hard engineering (sheet pile or other vertical walls) if possible. If rock reinforcement / armouring is required, ensure that appropriately sized, clean rock is used, and that rock is installed at a similar slope to maintain a uniform bank/shoreline and natural stream/shoreline alignment.

Based on the information collected, the in-water construction timing to be considered for this project would follow that associated with timing restrictions for warmwater fish habitat where appropriate, e.g.,

in-water works must be conducted between July 1 and March 31. This timing is to be confirmed during future phases of the project through consultation with TRCA / MNRF / DFO.

7.2 Vegetation and Aesthetic Assessment

The following table summarizes the streetscape opportunities as noted in this report.

Table 7-1: Streetscape Treatment

Opportunity/Issue	Streetscape Treatment
Clarkway Drive	
Boulevard Trees	A Landscape Plan will be developed at the Detailed Design Stage providing opportunities to enhance the Streetscape with doubled staggered rows, accent plantings and spacing that will be in accordance to current City of Brampton standards and recommendations.
Wetland/Riparian Zone Restoration	Repair or restore existing wetland plant communities, relocated wetlands, ponds, riparian zones, creek channels, and improved drainage areas.
ROW Planting	Consider using low growing meadow species in place of sod for beautification, reduction of ROW maintenance costs, and improvement of adjacent habitat.
Low Impact Development	Consider setting aside space to accommodate LID Strategies to improve water quality, ground water recharge, and reduce non-point source pollution; Bioretention Structures, Bioswales, etc.
Streetscape Design	A Landscape Plan will be developed at the Detailed Design Stage providing opportunities to enhance the Streetscape and include features such as rest areas in appropriate locations in consultation with and consideration of public transit.
Countryside Drive	
Boulevard Trees	Diverse species to be planted on 8.0 m centres on both sides of streets where possible. Trees should provide shade to MUP.
Wetland/Riparian Zone Restoration	Repair or restore existing wetland plant communities, relocated wetlands, ponds, riparian zones, creek channels, and improved drainage areas.
ROW Planting	Consider using low growing meadow species in place of sod for beautification, reduction of ROW maintenance costs, and improvement of adjacent habitat.
Low Impact Development	Consider setting aside space to accommodate LID Strategies to improve water quality, ground water recharge, and reduce non-point source pollution; Bioretention Structures, Bioswales, etc.
Streetscape Design	A Landscape Plan will be developed at the Detailed Design Stage providing opportunities to enhance the Streetscape and include features such as rest areas in appropriate locations in consultation with and consideration of public transit.
East-West Arterial	
Boulevard Trees	A Landscape Plan will be developed at the Detailed Design Stage providing opportunities to enhance the Streetscape with doubled staggered rows, accent plantings and spacing that will be in accordance to current City of Brampton standards and recommendations.
Wetland/Riparian Zone Restoration	Repair or restore existing wetland plant communities, relocated wetlands, ponds, riparian zones, creek channels, and improved drainage areas.
ROW Planting	Consider using low growing meadow species in place of sod for beautification, reduction of ROW maintenance costs, and improvement of adjacent habitat.
Low Impact Development	Consider setting aside space to accommodate LID Strategies to improve water quality, ground water recharge, and reduce non-point source pollution; Bioretention Structures, Bioswales, etc.

Streetscape Design	A Landscape Plan will be developed at the Detailed Design Stage providing opportunities to enhance the Streetscape and include features such as rest areas in appropriate locations in consultation with and consideration of public transit.
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The following recommendations relate to the streetscape improvements that are to be implemented along this portion of the Highway 427 Industrial Secondary Plan Area.

- A Vegetation Assessment will be required, prepared by a certified International Society of Arboriculture arborist. All existing vegetation removed as part of this project should be inventoried.

Comments from Region’s Urban Forestry for consideration during detailed design include the following:

- Tree clearing must not be conducted during the MBCA breeding season commonly considered May-August, unless under appropriate permitting.
- Retention of as many mature trees as possible would be best. As many are fully mature, transplant is not a reasonable option and they are of high value to the Region and the environment.
- Possible new plantings (planted to Peel Urban Forest Standards and Specifications), amongst more established trees would offer more diversity to the area, as well as aesthetics.
- Increased root zone around driveways.
- Suggestion to plant trees found on both Region of Peel and City of Brampton Approved Street Tree Lists. This includes salt-tolerant deciduous street tree species (i.e., Pin Oak, Privacy Pine, Austrian Pine, Thornless Honey Locust, Silver Maple).
- Invasive species should be kept in check as construction activities can greatly increase their numbers.
- Proper mulching of new trees and those retained trees that may be impacted by construction is recommended.
- Ensuring minimal compaction of soils in the root zone and no change in grade surrounding retained trees.

Mitigation During Construction:

- Construction activities are to avoid damaging existing, healthy, trees located close to the ROW wherever possible. This is to be accomplished by installing suitable tree protection fencing, extending to the ‘dripline’ of trees designated for protection. This tree protection zone is to remain undisturbed by excavation, storage of materials and equipment, and other construction related activities. The fencing is to remain in place through the duration of construction activities.
- Existing trees scheduled for removal are to be inspected to determine if transplanting is a feasible option (depending on size, species and health of tree).

Street Tree Planting and Planting/Streetscape Design:

- Tree planting/streetscape plans are to be prepared for the corridor by a registered landscape architect, as part of the detailed design of the roadway. These plans are to address:
 - Compensation for vegetation requiring removal on or near private property.
 - A Landscape Plan will provide opportunities to enhance the Streetscape with doubled staggered rows, accent plantings and spacing that will be in accordance to current City of Brampton standards and recommendations.
 - Restoration of Riparian Zones, Stream Channels, and Wetlands.
- All trees to be planted are to be selected from the City of Brampton approved street tree plant list
- The planting of new trees along the corridor is to be coordinated with existing and proposed utility corridors, and light standards.

- Construction impacts at stream crossings are to be mitigated with the planting of riparian vegetation. This vegetation should be native, non-invasive, riparian vegetation, as approved by the local Conservation Authority.
- Trees to be planted near overhead utilities to be selected to conform to mature height limitations (Hydro approved species)

Further details can be found in Appendix F.

7.3 Archaeology

The recommendations from the Stage 1 Archaeological Assessments included the following:

- Undisturbed portions of the study area have archaeological potential and warrant Stage 2 property assessment given:
 - The proximity of numerous nearby watercourses;
 - The proximity of several early historic transportation routes; and
 - The presence of 180 registered archaeological sites within a 1 km radius.
- All areas that have archaeological potential and are accessible by plough will be subjected to Stage 2 Property Assessment by means of a pedestrian survey. This technique involves walking across the entire field in parallel rows at 5 m intervals and surveying the ground for artifacts. The agricultural land will be prepared for pedestrian survey by disk harrowing to the depth of previous ploughing. The fields must be allowed to weather through one heavy rainfall to improve surface visibility.
- All areas that have archaeological potential but cannot be accessed by plough will be assessed by means of a hand-shovel test pitting at 5m grid intervals. All test pits will be a minimum of 30cm in diameter and dug to a minimum of 5cm into the subsoil. Soil fills will be screened through 6mm mesh screens in order to facilitate artifact recovery. Test pit profiles will be examined for cultural deposits prior to being backfilled. Test pitting will be conducted within 1m of all disturbances. All test pits will be backfilled to level grade, and any sod caps replaced and tamped down by foot.
- There may also be a possibility of previously undocumented archaeological resources being unexpectedly encountered during construction, in spite of prior assessments. The Ministry of Citizenship and Multiculturalism (MCM) will be notified (at archaeology@ontario.ca) if this occurs and all activities impacting archaeological resources must cease immediately. A licensed archaeologist is required to carry out an archaeological assessment in accordance with the Ontario Heritage Act and the Standards and Guidelines for Consultant Archaeologists. If human remains are encountered, all activities must cease immediately, and the local police and coroner must be contacted.

For detailed design, it is recommended that all necessary further stages of archaeological assessment be completed as early as possible. It is recommended to not commence ground-disturbing activities until all required archaeological reports have been entered into the Ontario Public Register of Archaeological Reports. Further details can be found in Appendix G.

7.4 Built Heritage Resources and Cultural Heritage Landscapes

The Cultural Heritage Assessment Report determined that indirect impacts are anticipated to two (2) properties, 5556 Countryside Drive, and 10089 Clarkway Drive, as a result of minor property acquisition along property frontage to accommodate the widened roadway. Direct impacts are anticipated to four properties: 10955 Clarkway Drive, 10307 Clarkway Drive, Countryside Drive, and Clarkway Drive, since the

proposed road widening will result in the removal/disturbance of various heritage attributes at 10955 Clarkway Drive and 10307 Clarkway Drive, and the permanent alternation of the various historical rural roadscapes.

The following recommendations are made regarding built heritage resources and cultural heritage landscapes:

- The locations of built heritage resources and cultural heritage landscapes will be identified on construction mapping so that project personnel are aware of the presence of heritage properties within, and adjacent to the proposed work
- Indirect impacts are anticipated to two heritage properties, 5556 Countryside Drive and 10089 Clarkway Drive as a result of minor acquisition along property frontages to accommodate the widened roadway. Existing mature trees along property frontages and tree lines along driveways may be removed as part of the proposed work. Where possible, these landscape elements will be retained and tree protection zones will be established during construction. If tree removals are required, then post-construction landscaping will include the replacement of removed trees with large stock trees of the same or similar species.
- Direct impacts anticipated to one protected heritage property, 10955 Clarkway Drive, since the proposed work will result in the removal or disturbance of various known heritage attributes (mature trees, split rail fence, and tributary) on the property. This property is designated under Part IV of the *Ontario Heritage Act*. Therefore, impacts to this property will be evaluated in an HIA and where impacts are anticipated, a conservation strategy and mitigation measures will be prepared. The HIA will be completed at the outset of the detailed design phase of the project, and once completed, will require presentation to the Brampton Heritage Board.
- Direct impacts are anticipated to three potential heritage properties: 10307 Clarkway Drive, Countryside Drive, and Clarkway Drive, due to the proposed road construction and widenings that will permanently alter the historical character of these resources. HIAs will be completed for all three potential heritage resources. Each HIA must contain an O. Reg. 9/06 Evaluation to determine the presence or absence of CHVI. Where CHVI is present, then an impact assessment will be completed and mitigation measures prepared. The HIAs will be completed at the outset of the detailed design phase of the project, and once complete will require a presentation to the Brampton Heritage Board. One standalone HIA must be completed for 10307 Clarkway Drive, and one (1) combined HIA may be completed for Countryside Drive and Clarkway Drive.
- This report will be submitted to the City, the Region, and MCM for review and comment.

7.5 Contamination Overview Study

Further environmental studies of the high and medium ranked properties directly impacted by project activities are recommended to confirm the environmental conditions in support of property acquisitions, environmental due diligence, and management of excess soils and materials. These investigations may include Phase One and Phase Two Environmental Site Assessments. If any properties within the Study Area require change in property use, a Record of Site Condition would be required. If contamination is identified, mitigation measures may need to be developed and implemented, which may include environmental remediation or a risk assessment. Further details can be found in Appendix I.

7.6 Stormwater Management

Stormwater Management practices (SWMPs) for the management of roadway runoff generally fall into two categories: those that address stormwater quantity (including erosion) and those that manage stormwater quality of surface runoff. Stormwater quantity, quality, and erosion criteria for the Study Area are to be provided by the internal development blocks within Area 47. As such, proposed works for the current study are limited to water balance and road reconstruction criteria. In terms of water balance and road reconstruction criteria, the SWMPs relate to the retention (i.e., infiltration) of runoff from the new pavement, and where possible, runoff from the existing pavement; however, current legislation solely relates to the former. Typically, the required retention volumes are dictated by agency standards, and are also often defined in a watershed or subwatershed planning study. It has been determined by that the City's road reconstruction criteria govern the retention volume requirements.

It is directed that detailed evaluation of stormwater management alternatives be evaluated as a component of detailed design. Based on the technical report review, the following Low Impact Development Best Management Practices have been short-listed for stormwater management: Infiltration trenches, Pervious Paves/Pavement, Pervious Pipes, Conventional Underground Storage, and Bioretention Systems. The SWM facilities proposed within the Area 47 development blocks are to be designed to service the City and Region ROWs for the water quantity, quality, and erosion control SWM requirements. Information pertaining to the way that major and minor systems of the City and Region ROWs would be connected to the systems servicing the development blocks has not been made available for the current study. As such, the advantages and disadvantages of the short-listed LID BMPs should be further reviewed and refined when information becomes available, expected at the detailed design stage.

7.7 Fluvial Geomorphology

The Fluvial Geomorphology Investigation revealed the need to realign channels due to road widening and construction works. Recommendations are based on reach characteristics and have been designed based on the ROW dimensions. Based on review of the risk factors and minimum recommended crossing structure sizes, all watercourses require channel realignment as a result of the road widening and construction works, although some more substantive than others. From a fluvial geomorphic perspective, it is recommended that new crossing structures accommodate a minimum span of the largest meander amplitude within the vicinity of the crossing. If this is not achievable from a design perspective, the medium risk span of three times the bankfull width of the channel may be considered, but the design of more robust bed and bank stabilization measures may be required.

The crossing recommendations will reasonably minimize the risk due to natural erosion hazards within the watercourse corridors, but all recommended structures will still be within the recommended meander belt widths. At new bridge crossings, it is recommended that the structure be placed at an optimal skew to the meander axis to ensure long term channel and bank stability and the channel will have to be realigned to pass through the axis of the intersection. At all crossing locations, natural channel design principles will need to be implemented when considering upstream and downstream tie-in points as well as bed and bank treatments.

7.8 Geotechnical Investigation

The purpose of the geotechnical investigation was to assess the existing pavement condition and obtain subsurface and groundwater information by means of a limited number of boreholes within the investigated areas. The information was used to provide recommendations for pavement design alternatives for the new roads/road widening, foundation design for the culverts, slope stability analysis for embankments (where required), roadway cut and fill operations, dewatering requirements, and chemical analyses and disposal requirements of surplus materials in conformance to the MOE cleanup guidelines for this project.

Prior to completing the rehabilitation, it is recommended that adequate drainage be provided both laterally and longitudinally along the length of the project. To meet the design requirements for the pavement life, the road subgrade and granular courses should be well drained at all times.

7.9 Hydrogeology Investigation

Based on the results of the hydrogeological assessment in Appendix M, the following recommendations are provided:

- While a PTTW for groundwater extraction from excavations is not anticipated to be needed, permitting may be required if dewatering rates exceed the thresholds for EASR registration and a PTTW because of surface water, storm water and wetland water influx into excavations.
- Record the amount of water taking during each day of dewatering to ensure the maximum water taking does not exceed the thresholds for EASR registration or a PTTW.
- To be diligent, it is recommended that a private well survey be completed to confirm the location of depth of and water level in water supply wells 4902856, 4902866 and 4905894 near Clarkway Drive.
- In addition to groundwater extraction, stream diversion may be necessary to install the culverts. Any dewatering system should be designed by a dewatering contractor and should take the stream surface water flow into consideration.
- Use standard ESC measures that meet or exceed OPSS to discharge the abstracted water into the adjacent wetlands, streams or other natural surface water body. The measures should be implemented prior to work and be maintained during construction until disturbed areas have been effectively stabilized and restored. Removing sediment from the abstracted water could be achieved by filter bags or for higher amounts by collecting the abstracted water in a weir tank to allow sediment to settle out of the water first.
- The quality of the water discharged into the adjacent wetlands, streams or other natural surface water body should meet upstream (e.g., background) water quality and/or the Ontario Provincial Water Quality Objectives.

Further details can be found in Appendix M. Additionally, the MECP recommends performing a door-to-door survey to all properties on private wells as water supply and invite property owners to participate on the monitoring program for the project during detailed design. Lastly, groundwater levels will be monitored on an ongoing basis to determine seasonal water level fluctuations during detailed design.

7.10 Road Traffic Noise Impact Study

A Road Traffic Noise Impact Study was undertaken for both Part A and Part B roadways in accordance with the provincial guidelines (MOE / MTO Protocol) and the Region and City's Noise Policies. Based on the noise modelling results, a noise barrier/mitigation investigation was completed for eight (8) receptors: mitigation consideration was warranted for two (2) receptors in accordance with the MOE / MTO Protocol, two (2) receptors with both the MOE / MTO Protocol and the Region and City's Noise Policies, and four (4) receptors with Region / City Policies only. Three (3) barrier heights were considered in this investigation: 2.4 m, 3 m and 4 m. As per the noise policies, in order to be warranted, the barrier must achieve a minimum 5 dB reduction at a targeted receptor. An objective level of 55 dBA (16-hour Leq) was also considered as per the MOE / MTO Protocol. The investigation results indicated that none of the barriers with lower heights (e.g., 3 m and 2.4 m) can achieve the 5 dB minimum reduction requirement at the target receptors, except Barrier 7 which is expected to provide 7 dB and 5 dB reductions at receptor RD08 with heights of 3 m and 2.4 m, respectively. However, the mitigated future "build" levels at RD08 under both cases would remain above the MOE / MTO Protocol objective level of 55 dBA by at least 3 dBA. As a result, 5 barriers (each 4 m high) were considered feasible and recommended for implementation. The proposed barrier height may be achieved via a combination of earth berm and barrier. The use of earth berm may also require other considerations such as slope requirement and potential effects on nearby properties and/or development lands. Further investigations to verify the noise wall locations and heights are recommended during the detailed design stage. In addition, as the assessed receptors were identified based on existing conditions, should land uses be updated in the future, the mitigation recommendation may require a re-evaluation.

7.11 Air Quality

The air quality assessment report identifies the following findings:

- There is a potential increase in airborne emissions due to the increase of traffic volume for both future 2041 scenarios in comparison with the current 2021 scenario.
- Highest predicted effects are expected to be along Castlemore Road for all three (3) scenarios.

Cumulative effects for the future build scenario were calculated based on the modelled project results. The proposed Project effects are relatively low when compared to background levels and Project effects are expected to diminish as vehicle emission standards improve and as fleets electrify. This conclusion is made based on air dispersion modelling results at the locations of the sensitive receptors presented in the Air Quality Assessment. In the 2041 scenarios, the same sensitive receptor locations were used as new land use maps or sensitive receptor lists for 2041 was unavailable. When this information becomes available the modelling assessment may need to be refined.

7.12 Summary of Environmental Effects, Proposed Mitigation, Commitment to Further Work

Table 7-2 provides a summary of the mitigation and commitments to further investigation for all technical studies completed for this Study.

Table 7-2: Summary of Mitigation and Commitments to Further Investigation

Category	Details
Natural Environment	Design and implement standard ESC measures, consistent with OPSS, to contain/isolate the construction zone, manage site drainage/runoff and prevent erosion of exposed soils and migration of sediment. ESC measures should be implemented before the commencement of works, and maintained through all phases of the project, until vegetation is re-established, or erosion protection materials stabilize all disturbed ground. The ESC plan should include regular inspection and maintenance, and removal of non-biodegradable ESC materials once the site is stabilized.
	Operate, store, handle, and dispose of all materials used or generated and maintain equipment in a manner that prevents the entry of any deleterious substance from entering the watercourse or contaminating the natural environment. Store and stockpile materials at a safe distance from the watercourse and ensure they are stabilized and contained as necessary.
	Prohibit or limit access to banks or areas adjacent to waterbodies, to the extent required to protect the structural integrity of the banks or shorelines. Whenever possible, operate machinery on land above the high-water mark in a manner that minimizes disturbance to the bed and banks of the waterbody.
	Ensure any part of equipment entering the watercourse, or operating from the bank, shall be free of fluid leaks, invasive species and noxious weeds and externally cleaned/degreased to prevent any deleterious substances from entering the watercourse and contamination of the natural environment. Design and implement a containment plan to isolate all work above water and keep airborne contaminants and all deleterious substances from entering the watercourse. The containment plan should include regular inspection, removal and disposal of materials generated and use in-water scaffolding where appropriate.
	Ensure a Spill Management Plan is always present on site for implementation in the event of an accidental spill.
	Minimize the removal and clearing of natural materials such as herbaceous plants, woody debris, and rocks from the banks or the shoreline of the watercourse. Where vegetation is removed, incorporate temporary measures to provide interim stabilization until vegetation is fully established. Stabilize and reinforce banks to pre-disturbance condition (or better) using properly designed and installed stabilization measures. Restore vegetation according to a vegetation rehabilitation plan.
	Design and implement a vegetation rehabilitation plan to restore riparian vegetation to pre-construction state or better.
	To mitigate damages specific to the aquatic environment, design and install culverts to prevent the creation of barriers to fish movement and maintain bankfull channel and habitat functions to the extent possible. This includes embedment of the culvert, or installing open bottom structures, reinstatement of the low flow channel and native substrates, proper sizing of the culvert, and maintaining channel slope. Additionally, conducting in-stream work during periods of low flow to allow work to be conducted during dry conditions or isolated from flows. If in-water works are required beyond the timing constraints, a Request For Review from DFO is required. The duration of in-water work should be minimized and scheduled to avoid wet, windy and rainy periods that may increase erosion and sedimentation.
	If in-water work is to occur, always design and implement an isolation/containment plan to isolate temporary in-water work zones and maintain clean flow downstream/around the work zone.
	Reinstate and re-stabilize any portion of the waterbody bed/substrates disturbed during construction to pre-construction (or better) condition.
Exclude or move fish from the work area. Retain a qualified environmental professional to ensure applicable permits for relocating fish are obtained. Fish trapped within an isolated work area should be captured and relocated to adjacent channels sections outside the work area	

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	<p>using appropriate capture, handling and release techniques to prevent harm and minimize stress. A LCFSP as part of the Fish and Wildlife Conservation Act will be required to rescue and relocate fish. The LCFSP will need to be obtained by the contractor that will be undertaking the fish rescue and relocation work,</p>
	<p>Pumps utilized for dewatering activities should be fitted with screens or barriers to avoid entrainment and impingement of fish at water intakes during dewatering processes.</p>
	<p>Discharge water from dewatering activities will be directed to an area located a minimum of 30 m from a watercourse and within a vegetated area and/or onto a scour pad.</p>
	<p>To mitigate damages specific to the aquatic environment, avoid hard engineering (sheet pile or other vertical walls) if possible. If rock reinforcement/armouring is required, ensure that appropriately sized, clean rock is used, and that rock is installed at a similar slope to maintain a uniform bank/shoreline and natural stream/shoreline alignment.</p>
	<p>The in-water construction timing to be considered for this project would follow that associated with timing restrictions for warmwater fish habitat where appropriate, e.g., in-water works must be conducted between July 1 and March 31. This timing is to be confirmed during future phases of the project through consultation with TRCA/MNRF/DFO.</p>
	<p>Removal of woody vegetation is recommended to occur outside of the migratory bird nesting period (April 1 to August 31) and activities will occur in accordance with the MBCA and Migratory Bird Regulations. These timing constraints should not be perceived as absolutes. This period represents the core breeding period, although some species may nest in March and September. Ultimately, the objective from a compliance perspective is to not circumvent the MBCA. As such, due diligence measures should be implemented and documented for any nest searching efforts, including record control, to ensure compliance with the MBCA.</p>
	<p>For activities, including vegetation removal, which may occur during bird nesting season, surveys to identify nesting activity will be completed by an Avian Biologist within 24 hours of scheduled work activities. The Avian Biologist conducting the surveys must be able to identify birds by species and be knowledgeable of nesting seasons and activities for appropriate species. It is important to note that, depending on the time of clearing activities, nest sweeps during the breeding season may not be a viable option. More specifically in the event vegetation becomes too dense and a clear confirmation/due diligence cannot be provided through nest sweeps, clearing activities may not be able to move forward until a timing where credible due diligence can be implemented.</p>
	<p>If a species listed under the ESA as extirpated, endangered or threatened is identified, Section 9 of the Act prohibits killing, harming, harassing, capturing, taking, possessing, collecting, buying, selling, leasing, trading or offering to buy, sell, lease or trade a member of the species. Some of these prohibitions also apply to body parts of a member of the species and to things derived from a member of the species. Similarly, if a species is listed under the ESA as endangered or threatened, Section 10 of the Act prohibits damaging or destroying the habitat of the species. Species listed as special concern are not afforded protection under Sections 9 and 10 of the ESA; however, due diligence should be enforced if a special concern species or their habitat is present.</p>
	<p>Other mitigation measures to consider are fencing to direct wildlife movement through wildlife crossings but also to prevent uncontrolled access and encroachment from pedestrians into adjacent natural areas. Should impenetrable barriers be considered, opportunities for wildlife passage should be incorporated. It is recommended that buffer widths be increased from the minimum 10 m to 15 m near areas of ecological sensitivity. Additionally, all crossing structures should be clear-span structures with abutments located outside any significant</p>

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	<p>valleylands and natural heritage systems to reduce impacts. These clear-span structures will also act as passages to reduce crossing hazards for wildlife.</p> <p>It is recommended that low mast lighting is implemented and directed downward and shielded to minimize light projection into the NHS and lightening at wildlife crossings should be limited, where feasible.</p> <p>The proposed removal of natural features to facilitate the proposed project must be mitigated by restoring areas that will be encompassed into the future NHS as described within the MESP and further to be reflected into the City and Regional Official Plan policies. During detailed design, the proposed removal of features is to be totaled, and their compensation included in the Rainbow Creek corridor restoration. Further consultation with TRCA will occur during detail design.</p> <p>Additionally, the removal of trees from hedgerows and other areas will require compensation. Compensation is currently estimated to be 4,965 compensation trees which will be further refined in detailed design.</p>
Vegetation/ Aesthetic	<p>Clarkway Drive, Countryside Drive and East-West Arterial: Existing hydrological patterns should be maintained or replicated.</p> <p>Countryside Drive and East-West Arterial: Existing creeks, tributaries, and ponds should remain and or be enhanced for ecological value.</p> <p>Clarkway Drive: Consider re-aligning, restoring, and improving Clarkway Tributary where construction efforts are in conflict with existing riparian zone, in line with the Environmental Assessment for this project.</p> <p>Clarkway Drive, Countryside Drive and East-West Arterial: Consider LID strategies to treat non-point source pollution from roadways, such as bioswales, bioretention areas, treatment trains, etc.</p> <p>Clarkway Drive, Countryside Drive and East-West Arterial: For minor seasonal flow areas, culverts size should be adequate for passage of appropriate wildlife species. Wildlife underpasses should also be considered where appropriate based on the Ecological Study.</p> <p>Clarkway Drive, Countryside Drive and East-West Arterial: Street Tree plantings should follow City of Brampton standards and prioritize diverse, appropriate species with a focus on salt tolerance and ecological value. Trees must have adequate volume of high quality, or remediated soils. City of Brampton current street tree planting standards and specification will be followed.</p> <p>Clarkway Drive: Wetlands removed should be replaced following regional guidelines for mitigation.</p> <p>Clarkway Drive, Countryside Drive and East-West Arterial: Ensure species diversity. The Peel Urban Forest Strategy recommends no single streetscaping species represents more than 5% of the tree population, no genus represents more than 10% of the tree population, and no family represents more than 20% of the tree population.</p> <p>Clarkway Drive, Countryside Drive and East-West Arterial: Improved plantings for beautification, reduction of ROW maintenance costs, and improvement of adjacent habitat. Sod/turf strips should be reconsidered, replaced by a diverse and native low growing meadow mix requiring a single seasonal mowing.</p> <p>Clarkway Drive, Countryside Drive and East-West Arterial: Intersections should enhance pedestrian and cycling visibility and crossing as appropriate for the context (e.g., reducing crossing distance, cross-ride treatments, providing a pedestrian crossing island, removing right turn channels or moving to smart channels).</p> <p>Clarkway Drive, Countryside Drive and East-West Arterial: Tree cover for active transportation infrastructure (including sidewalks) to provide shade (trees that will grow greater than or equal to 15 m tall at maturity).</p> <p>Clarkway Drive, Countryside Drive and East-West Arterial: Consider planting more shrubs and perennials for increased vegetation densities suited to the growing conditions and constraints.</p>

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	<p>A Landscape Plan will be developed at the detailed design stage providing opportunities to enhance the streetscape with doubled staggered rows, accent plantings and spacing that will be in accordance to current City of Brampton and Region of Peel standards and recommendations. This will also include features such as rest areas in appropriate locations in consultation with and consideration of public transit.</p>
	<p>Repair or restore existing wetland plant communities, relocate wetlands, ponds, riparian zones, creek channels, and improve drainage areas.</p>
	<p>Consider using low growing meadow species in place of sod for beautification, reduction of ROW maintenance costs, and improvement of adjacent habitat.</p>
	<p>Consider setting aside space to accommodate Low Impact Development Strategies (LID) to improve water quality, ground water recharge, and reduce non-point source pollution; Bioretention Structures, Bioswales, etc.</p>
	<p>A Landscape Plan will be developed at the detailed design stage providing opportunities to enhance the Streetscape and include features such as rest areas in appropriate locations in consultation with and consideration of public transit.</p>
	<p>A Vegetation Assessment will be required, prepared by a certified International Society of Arboriculture arborist. All existing vegetation removed as part of this project should be inventoried.</p>
	<p>Construction activities are to avoid damaging existing, healthy, trees located close to the ROW wherever possible. This is to be accomplished by installing suitable tree protection fencing, extending to the 'dripline' of trees designated for protection. This tree protection zone is to remain undisturbed by excavation, storage of materials and equipment, and other construction related activities. The fencing is to remain in place through the duration of construction activities.</p>
	<p>Existing trees scheduled for removal are to be inspected to determine if transplanting is a feasible option (depending on size, species, and health of tree).</p>
	<p>Tree planting/streetscape plans are to be prepared for the corridor by a registered landscape architect, as part of the detailed design of the roadway. These plans are to address:</p> <ul style="list-style-type: none"> - Compensation for vegetation requiring removal on or near private property. - A Landscape Plan will provide opportunities to enhance the streetscape with doubled staggered rows, accent plantings and spacing that will be in accordance to current City of Brampton and Region of Peel standards and recommendations. - Restoration of Riparian Zones, Stream Channels, and Wetlands.
	<p>All trees to be planted are to be selected from the City of Brampton and Region of Peel Approved Street Tree List.</p>
	<p>The planting of new trees along the corridor is to be coordinated with existing and proposed utility corridors, and light standards.</p>
	<p>Construction impacts at stream crossings are to be mitigated with the planting of riparian vegetation. This vegetation should be native, non-invasive, riparian vegetation, as approved by the local Conservation Authority.</p>
	<p>Trees to be planted near overhead utilities to be selected to conform to mature height limitations (Hydro approved species).</p>
	<p>Comments from Region's Urban Forestry for consideration during detailed design include the following:</p> <ul style="list-style-type: none"> - Tree clearing must not be conducted during the MBCA breeding season commonly considered May- August, unless under appropriate permitting. - Retention of as many mature trees as possible would be best. As many are fully mature, transplant is not a reasonable option, and they are of high value to the Region and the environment.

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	<ul style="list-style-type: none"> - Possible new plantings (planted to Peel Urban Forest Standards and Specifications), amongst more established trees would offer more diversity to the area, as well as aesthetics. - Increased root zone around driveways. - Suggestion to plant trees found on both Region of Peel and City of Brampton Approved Street Tree Lists. This includes salt-tolerant deciduous street tree species (i.e., Pin Oak, Privacy Pine, Austrian Pine, Thornless Honey Locust, Silver Maple). - Invasive species should be kept in check as construction activities can greatly increase their numbers. - Proper mulching of new trees and those retained trees that may be impacted by construction is recommended. - Ensuring minimal compaction of soils in the root zone and no change in grade surrounding retained trees.
Archaeology	<p>Prior to any land altering activities, the portions of the study area deemed to have archaeological potential require Stage 2 assessment by means of shovel test pit survey or pedestrian survey, as appropriate, in accordance with the Standards and Guidelines for Consultant Archaeologists. All necessary further stages of archaeological assessment required should be completed as early as possible during detailed design. It is recommended to not commence ground-disturbing activities until all required archaeological reports have been entered into the Ontario Public Register of Archaeological Reports.</p> <p>Where ploughing is viable, all open land greater than 10 m by 10 m in area must be freshly ploughed (and disked if necessary) and then allowed to weather sufficiently before being subjected to pedestrian survey at 5 m intervals.</p> <p>For lands measuring less than 10 m by 10 m in area, or where ploughing is not viable, a test pit survey must be executed. Such lands may include woodlots, pasture with high rock content, abandoned farmland with heavy brush and weed growth, orchards and vineyards that cannot be strip ploughed, parkland, residential lawns that will remain as lawns for an extended length of time, and properties with existing landscaping or infrastructure.</p> <p>There may also be a possibility of previously undocumented archaeological resources being unexpectedly encountered during construction, in spite of prior assessments. MCM should be notified (at archaeology@ontario.ca) if this occurs and all activities impacting archaeological resources must cease immediately. A licensed archaeologist is required to carry out an archaeological assessment in accordance with the Ontario Heritage Act and the Standards and Guidelines for Consultant Archaeologists. If human remains are encountered, all activities must cease immediately, and the local police and coroner must be contacted.</p>
Built Heritage Resources and Cultural Heritage Landscapes	<p>The locations of built heritage resources and cultural heritage landscapes should be identified on construction mapping so that project personnel are aware of the presence of heritage properties within, and adjacent to, the proposed work.</p> <p>Direct impacts are anticipated to two (2) properties, 5556 Countryside Drive, and 10089 Clarkway Drive, as a result of minor property acquisition along property frontage to accommodate the widened roadway. The properties is listed on the City of Brampton Municipal Register of Cultural Heritage. Therefore, impacts to this property should be evaluated in an HIA and where impacts are anticipated, a conservation strategy and mitigation measures should be prepared. The HIA should be completed at the outset of the detailed design phase of the project. The HIA once completed, will require presentation to the Brampton Heritage Board.</p> <p>Direct impacts are anticipated to four properties: 10955 Clarkway Drive, 10307 Clarkway Drive, Countryside Drive, and Clarkway Drive, since the proposed road widening will result in the removal/disturbance of various heritage attributes at 10955 Clarkway Drive and 10307 Clarkway Drive, and the permanent alternation of the various historical rural roadscape. An HIA should be completed for this roadscape to determine whether this road has heritage value when evaluated against the criteria contained in O. Reg. 9/06 of the Ontario Heritage Act. If the roadscape is found to have Cultural Heritage Value, then an impact assessment should be complete and mitigation measures prepared.</p>

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	The HIA should be completed at the outset of the detailed design phase of the project. The HIA once completed, will require presentation to the Brampton Heritage Board.
Contamination	Further environmental studies of the high and medium ranked properties directly impacted by project activities would be recommended to confirm the environmental conditions in support of property acquisitions, environmental due diligence, and management of excess soils and materials. These investigations may include Phase One and Phase Two Environmental Site Assessment.
	Assessment of possible contaminated sites along the road alignments and the risk of entrainment of contaminated groundwater during construction dewatering.
	If any properties within the study area require change in property use, a Record of Site Condition would be required. If contamination is identified, mitigation measures may need to be developed and implemented, which may include environmental remediation or a risk assessment.
Stormwater Management	The stormwater facilities proposed within the Area 47 development blocks are to be designed to service the City and Region ROWs for the water quantity, quality, and erosion control SWM requirements. Information pertaining to the way that major and minor systems of the City and Region ROWs would be connected to the systems servicing the development blocks has not been made available for the current study. As such, the advantages and disadvantages of the short-listed LID BMPs should be further reviewed and refined when information becomes available, expected at the detailed design stage.
	Source water protection analysis should be completed during detailed design.
Fluvial Geomorphology	From a fluvial geomorphic perspective, it is recommended that new crossing structures accommodate a minimum span of three (3) times the bankfull width of the channel or the maximum existing meander amplitude.
	The crossing recommendations will reasonably minimize the risk due to natural erosion hazards within the watercourse corridors, but all recommended structures will still be within the recommended meander belt widths.
	At new bridge crossings, it is recommended that the structure be placed at an optimal skew perpendicular (90 degrees) to the meander axis to ensure long term channel and bank stability and the channel will have to be realigned to pass through the axis of the intersection.
	At all crossing locations, natural channel design principles will need to be implemented when considering upstream and downstream tie-in points as well as bed and bank treatments.
Geotechnical	All topsoil and loose soil or soil mixed with organic matter should be stripped from pavement areas, manhole / catch basin founding areas, and base of underground utility services.
	Any loose, soft or unstable areas in the exposed subgrade should be sub-excavated and replaced with approved fill and compacted.
	Lean concrete may be used to backfill sub-excavated areas. Excavation should be carried out with a temporary slope of 1H:1V or flatter above the groundwater level.
	Roadway shoring protection systems may be required during construction of the culverts.
	The embankment required for road widening should be constructed with compacted engineered fill at two (2) Horizontal: one (1) Vertical (or flatter) side slopes. If a side slope steeper than two (2) Horizontal: one (1) Vertical slope is required or if the height of the embankment / cut slope is greater than 2 m, slope stability analysis should be carried out to assess stability of the planned slope, depending on the subsurface conditions. Where existing embankments are to be widened, the side slopes should be benched in accordance with Ontario Provincial Standard Drawing 208.010 prior to placement of the widening fills. Final (permanent) embankment side slopes in granular fills

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	<p>should be established to match the existing slopes or as per Ontario Provincial Standard Drawing 200.010. Final slopes should be treated with a seed and mulch to prevent ravelling.</p>
	<p>Widening of the road will require, as a minimum, stripping the existing ground surface cover from the area required for road widening. The planned widening will generally be constructed to the same elevation as the existing road surface. Grading, backfilling and compacting should follow OPSS.MUNI 206, OPSS.MUNI 401, OPSS 501.MUNI, and / or the City/Region's requirements.</p> <p>Backfilling, if required, for site grading should be placed as engineered fill. Engineered fill per OPSS.MUNI 1010 should be used to replace soft / incompetent soils and/or raising grade. Engineered fill should be prepared according to the City's standards / contract specifications. The fill soils used for embankment widening should consist of approved clean fill.</p>
	<p>Engineered fill per OPSS.MUNI 1010, where required, may be used to backfill excavated areas, backfill around manholes, replace soft/incompetent soils, and / or raise grades. Engineered fill for backfill of excavated areas should be placed after stripping existing fill soils, any soils containing excessive organic matters and otherwise unsuitable soils. Engineered fill can be prepared by placing fill soil and compacted as per OPSS.MUNI 501 and/or applicable City Standard. Alternatively, engineered fill should be placed in loose layers not exceeding 200 mm. The water content of the fill should be within $\pm 2\%$ of its optimum moisture content at the time of its placement, and it should be thoroughly compacted to a minimum of 98% of Standard Proctor Maximum Dry Density in general. The fill soils should consist of inorganic soils and should not be frozen during backfilling and compaction. Full-time geotechnical inspection and quality control are necessary for the construction of a certifiable engineered fill. The compaction procedures and quality control should be overseen by a geotechnical engineer.</p>
	<p>All excavations should be carried out in accordance with the latest Ontario's Occupational Health and Safety Act and Regulations for Construction Projects (O. Reg. 213/91).</p>
	<p>In accordance with the OHSA, a maximum short-term slope of 1H:1V is required to within 1.2 m of the trench bottom for temporary excavations in Type 1 and 2 cohesive till and native silty sand that is above the groundwater level, or properly dewatered. For Type 1 and 2 soils, a maximum depth of 1.2 m high vertical cut at the bottom of excavation may generally be constructed. However, under the groundwater table a 1.2 m high vertical cut may not be stable and flatter slopes may be required. Type 3 soils above the groundwater level may be inclined at 1H:1V or flatter from the bottom. In the case of saturated Type 3 fills or native granular deposits below the prevailing groundwater, if adequate dewatering is not implemented, slopes of open excavations will have to be reduced to 2H: 1V or flatter. In the absence of proper dewatering or groundwater control of Type 3 soils, slope flattening may be insufficient to prevent particularly saturated granular soils from becoming unstable and devolving to Type 4 materials. Near the ground surface, occasional 3H:1V or flatter slopes may be required due to loose/soft surficial soils. If open cut cannot be carried out, a temporary shoring system may be used to limit the extent of excavation. Trenching should be carried out in accordance with OPSS.MUNI 401. Stockpiles, materials or any heavy equipment should be kept at least the same horizontal distance as the depth of the excavation from the upper edge of the excavation to prevent slope instability. All surface drainage should be directed away from any open excavations and trenches.</p>
	<p>During the construction, temporary runoff controls such as sediment trap, interceptor drain, dyke and / or silt fence should be installed to prevent uncontrolled water / sediment flow into existing water courses. The effluent from dewatering operations should also be filtered or passed through sediment traps to prevent turbidity.</p>
	<p>Based on the soil and groundwater conditions at the borehole locations, groundwater control within the excavated area should not be significant. In the clayey soils, groundwater seepage into the excavation, if encountered, is likely to be slow and a properly filtered sump</p>

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	<p>and pump system or gravity drainage may be used for dewatering the excavation. High water flow rates may be encountered during construction and the dewatering effort could require an increased number of sumps and pumps.</p> <p>Use of lean concrete mud mat or granular layer may be warranted where founding surfaces are to be exposed for extended period, especially if the work is carried out during wet weather. Care should also be exercised to minimize disturbance to the final subgrade during excavation.</p> <p>It is recommended that qualified geotechnical personnel be present during the foundation excavation to review the conditions of the foundation subgrade.</p> <p>Based on observations at the borehole locations and planned excavation depth, normal excavation equipment should be suitable for excavation. Hard till soils may require additional effort for excavation. The terms describing the compactness or consistency of soil strata give an indication of the effort needed for excavation. It should be noted that cobbles / boulders can be encountered in the till and in fill soils. Therefore, removal of the cobbles / boulders should be considered and planned for.</p> <p>Temporary shoring may be required for vertical excavation during construction of culverts, installation of underground utilities or roadway protection. This can be accomplished using soldier piles with lagging (or similar) in order to support the sides of the excavation. Temporary shoring design and construction should comply with OPSS.MUNI 539, or applicable City/Region Standard. The temporary shoring system should be designed to resist the lateral earth, surcharge and hydrostatic pressures which could occur during construction. Bracings should be installed within the shoring system to minimize movements of the soils. The temporary shoring system should be designed in accordance with the latest editions of Canadian Foundation Engineering Manual's and Canadian Highway Bridge Design Code, together with the requirements of the Ontario Health and Safety Regulations, as applicable. The shoring system should be designed and approved by a professional engineer.</p> <p>Most of the excavated soils can be suitable for being reused for backfill, provided they can be separately stored, properly compacted and are environmentally acceptable. Fill soils containing construction debris (or similar) and organic matter should not be reused. Soils that are too wet to compact will require additional processing (e.g., drying). Cobbles and boulders (larger than 100 mm in size), if any, should be discarded by mechanical means or manual removal.</p>
Hydrogeology	<p>While a permit to take water for groundwater extraction from excavations is not anticipated to be needed, permitting may be required if dewatering rates exceed the thresholds for EASR registration and a PTTW because of surface water, storm water and wetland water influx into excavations.</p> <p>Record the amount of water taking during each day of dewatering to ensure the maximum water taking does not exceed the thresholds for EASR registration or a PTTW.</p> <p>It is recommended that a private well survey be completed to confirm the location of, depth of and water level in water supply wells 4902856, 4902866 and 4905894 near Clarkway Drive.</p> <p>In addition to groundwater extraction, stream diversion may be necessary to install the culverts. Any dewatering system should be designed by a dewatering contractor and should take the stream surface water flow into consideration.</p> <p>Ongoing water level monitoring to determine seasonal water level fluctuations.</p> <p>Use standard erosion and sediment control measures that meet or exceed OPSS to discharge the abstracted water into the adjacent wetlands, streams or other natural surface water body. The measures should be implemented prior to work and be maintained during construction until disturbed areas have been effectively stabilized and restored. Removing sediment from the abstracted water could be</p>

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	<p>achieved by filter bags or for higher amounts by collecting the abstracted water in a weir tank to allow sediment to settle out of the water first.</p> <p>The quality of the water discharged into the adjacent wetlands, streams or other natural surface water body should meet upstream (e.g., background) water quality and/or the Ontario Provincial Water Quality Objectives.</p>
Noise	<p>The contract documents should identify the contractor's responsibilities with respect to controlling noise, as well as recording, investigating and, if possible, addressing complaints.</p> <p>The contract documents should also explicitly state that compliance with all applicable law is an expectation of the contract including adherence to the City of Brampton By-Law 93-84 and MECP Publication NPC-115.</p> <p>Further analysis and confirmation will be required regarding noise mitigation during detailed design, including further consultation and coordination with the Region.</p>
Consultation	<p>Further consultation to occur with HDI during detailed design and construction. HDI will be involved in weekly inspection visits to observe erosion and sediment control measures, vegetation removal, work near watercourses, and any wildlife sweeps that may occur.</p> <p>Further consultation to occur with York Region Capital Planning and Delivery during the detailed design stage.</p> <p>Further consultation to occur with Peel Region during the detailed design stage, specifically with respect to design at intersections under Regional jurisdiction (e.g., The Gore Rd/E-W Arterial, Mayfield Rd/Clarkway Dr, and Hwy 50/Countryside Dr).</p> <p>The City will work with the Region to confirm the Arterial A2 and Mayfield Road intersection LOS for 2051 through the upcoming TMP and will continue, through subsequent stages of this project, to consult with the Town of Caledon to ensure best outcomes. The upcoming TMP will assess the traffic operations for 2051 at the intersections of Mayfield Road with Humber Station Road, Coleraine Drive, and Arterial Road A2.</p>
TransCanada Pipeline	<p>Written consent is required from TransCanada Pipeline for any work within 30 m of the pipeline(s).</p> <p>The City of Brampton/Region of Peel shall engage with TransCanada Pipeline for an evaluation of the road widening/reconstruction across TransCanada Pipeline's facilities. Any costs associated with the evaluation and any mitigations required for TransCanada Pipeline's facilities shall be borne by the City.</p> <p>It is recommended that overburden/additional grading within the TransCanada Pipeline easement and within 7 m of either edge of it be reduced as much as possible. Significant overburden over TransCanada Pipeline's assets may have a material impact on TransCanada Pipeline's evaluation of the widening and reconstruction.</p>
Design	<p>A need for a raised centre median may be required for a length of 300 m east of Arterial A2 and Countryside Drive intersection. However, if the applicant of the property east of Arterial A2 signalizes their access, a median will not be required.</p> <p>It shall be noted that the five (5) lane cross section shown in the Class EA may be revised to a four (4) lane cross section with a centre median at the detailed design stage in order to restrict access to adjacent developments.</p> <p>The roundabout at future Collector Road 'C' and Clarkway Drive to be designed during the detailed design stage, as per Block Plan recommendation.</p> <p>The number of lanes along Clarkway Drive south of Mayfield Rod may be increased in the future if/when the GTA West Corridor is implemented, and an interchange is constructed at Humber Station Road.</p>

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Utilities	Bell Canada has identified some Bell infrastructure in the existing roads on Countryside Drive between Coleraine Drive and Arterial A2 and at the crossing of Countryside Drive and Arterial A2, which will be impacted by the work. Further coordination to occur during the Detail Design Stage.
Air Quality	An update to the Air Quality Assessment may be required to reassess the 2041 scenarios, once updated land use maps or sensitive receptor lists are available.

8.0 Monitoring and Commitments to Further Investigations

A monitoring program will be established to ensure that the mitigation measures are undertaken. The key impacts to the environment are the short-term impacts that require monitoring during construction. The construction of this project will be monitored on site by the City to ensure that the Contractor is implementing standard construction practices. This will include erosion and sedimentation control, dust and noise control, protection of existing vegetation, assurance of traffic safety and maintenance of traffic flow without causing unnecessary delays, etc. The overall performance and effectiveness of the environmental mitigating measures specified are to be monitored and assessed during and subsequent to the construction of the project.

The environmental impacts outlined are considered as normal impacts associated with roads construction. The established standard construction practices outlined as the mitigating measures will be incorporated in the contract documents. The Contract Administrator is to ensure that these mitigating measures are undertaken during construction. Should unforeseen environmental concerns and/or issues arise during the construction period, the appropriate ministry and agencies will be contacted, and appropriate measures will be taken to mitigate the environmental concerns / issues.

Commitments to further investigation during the detailed design stage are:

- Utilities coordination and possible sub-surface utility engineering to determine types, location, and depths of the existing and any new facilities;
- Potential utility relocations and/or replacements;
- Detailed stormwater management design and coordination with agencies;
- Landscape design;
- Property acquisition;
- Detailed cost estimate;
- Construction phases / implementation;
- Construction staging & detour;
- Continued consultation with TC Energy and Enbridge Gas will be required during detailed design;
- Continued consultation with York Region Capital Planning and Delivery will be required during detailed design for matching into existing and/or proposed road geometrics of Highway 50 and Major Mackenzie Drive and Countryside Drive and Highway 50;
- Continued consultation with Town of Caledon will be required during detailed design stage for future intersections and/or proposed improvements at Mayfield Road;
- Continued consultation with Peel Region will be required during detailed design, specifically with respect to design at intersections under Regional jurisdiction (e.g., The Gore Road / E-W Arterial, Mayfield Road / Clarkway Drive, and Hwy 50 / Countryside Drive);
- Further noise assessments required during detailed design to determine noise wall locations and heights; and
- Further geotechnical investigations required during detailed design.

Additional investigations identified by agencies (Refer to **Appendix C** 'Agency Consultation' for details).

9.0 References

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