Transportation Background Study Final Report

2019 Development Charges Update

City of Brampton
August 7, 2019

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1 Introduction and Purpose

The City of Brampton has initiated a Transportation Background Study which will provide input to the City's 2019 Development Charges (DC) Study Update. The transportation study provides input to update service level calculations (historic road service level and planned transit service level), re-confirms the City's growth related transportation needs to the 2031 and 2041 horizon years, and calculates growth and non-growth related costs associated with transportation infrastructure improvements. This study builds upon the City's 2014 DC Update, 2015 Transportation Master Plan (2015 TMP) Update, Provincial and Regional planning context, and more recent studies conducted by the City.

This report documents the planning context, roads and transit service levels, supporting analysis for the transportation infrastructure needs validation, and the methodology and results of the road capital project costing.

2 Planning Context

The City of Brampton DC Update 2019 is developed within the context of provincial, regional, and municipal planning policies and initiatives. The DC study also builds on recent Environmental Assessment (EA) studies and area specific transportation studies, particularly those which have been completed since the 2014 DC Update, which provides additional details for the transportation network needs in the City.

The key planning documents include:

- 2041 Regional Transportation Plan (2018)
- GTA West Transportation Corridor Route Planning and Environmental Assessment Study, ongoing
- Halton-Peel Boundary Area Transportation Study (2010)
- Region of Peel Official Plan (2016)
- Region of Peel DC Update (2018)
- Region of Peel Long Range Transportation Plan (LRTP) (2012)
- City of Brampton Official Plan (September 2015 Consolidation)
- City of Brampton 2015 TMP Update
- City of Brampton 2014 DC Update
- City of Brampton Bram West Parkway and Financial Drive EA (2016)
- City of Brampton Heritage Heights Transportation Study, ongoing
- City of Brampton Draft Active Transportation Master Plan (ATMP), ongoing
- City of Brampton Complete Streets Guidelines (CSG), ongoing

Details of specific transportation studies that have influence on this Transportation Background Study are summarized in the following sections.

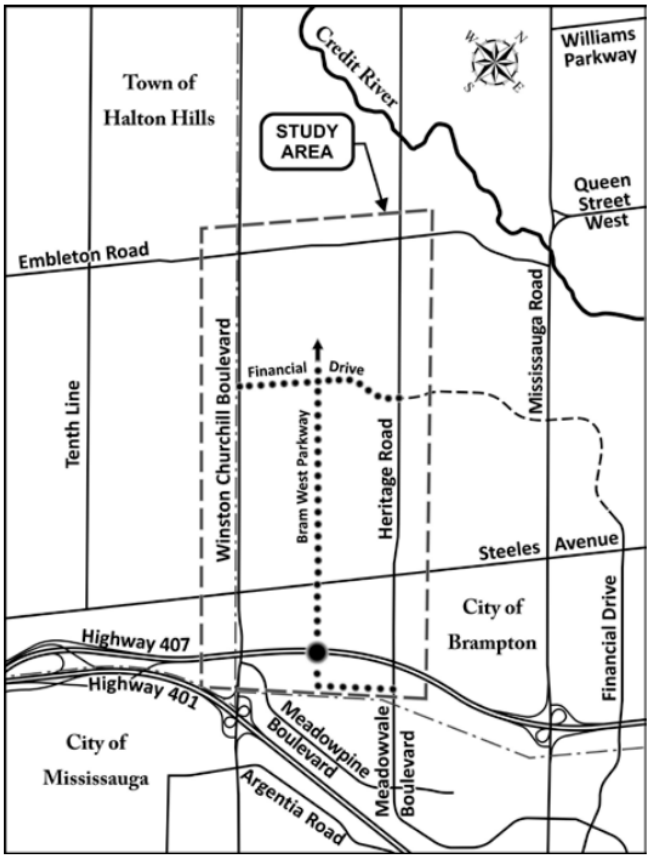
2.1 Bram West Parkway and Financial Drive EA (2016)

The Bram West Parkway (Heritage Road to Financial Drive) and Financial Drive (Heritage Road to Winston Churchill Boulevard) EA (location shown in **Figure 2-1**) was completed in September 2016. To address operational deficiencies and the need for additional transportation infrastructure in the Bram West area, the study recommended:

- A new arterial road, Bram West Parkway, from Financial Drive to Highway 407 ETR, with a new partial interchange at Highway 407 ETR, turn lanes at appropriate intersections, sidewalk on the west side and multi-use path on the east side.
- The extension of a collector road, Financial Drive, from Heritage Road to Winston Churchill Boulevard, with 4 lanes plus centre turn lane; a multi-use trail on the north side and sidewalk on the south side.

These recommendations were included in this study.

Figure 2-1: Bram West Parkway and Financial Drive EA



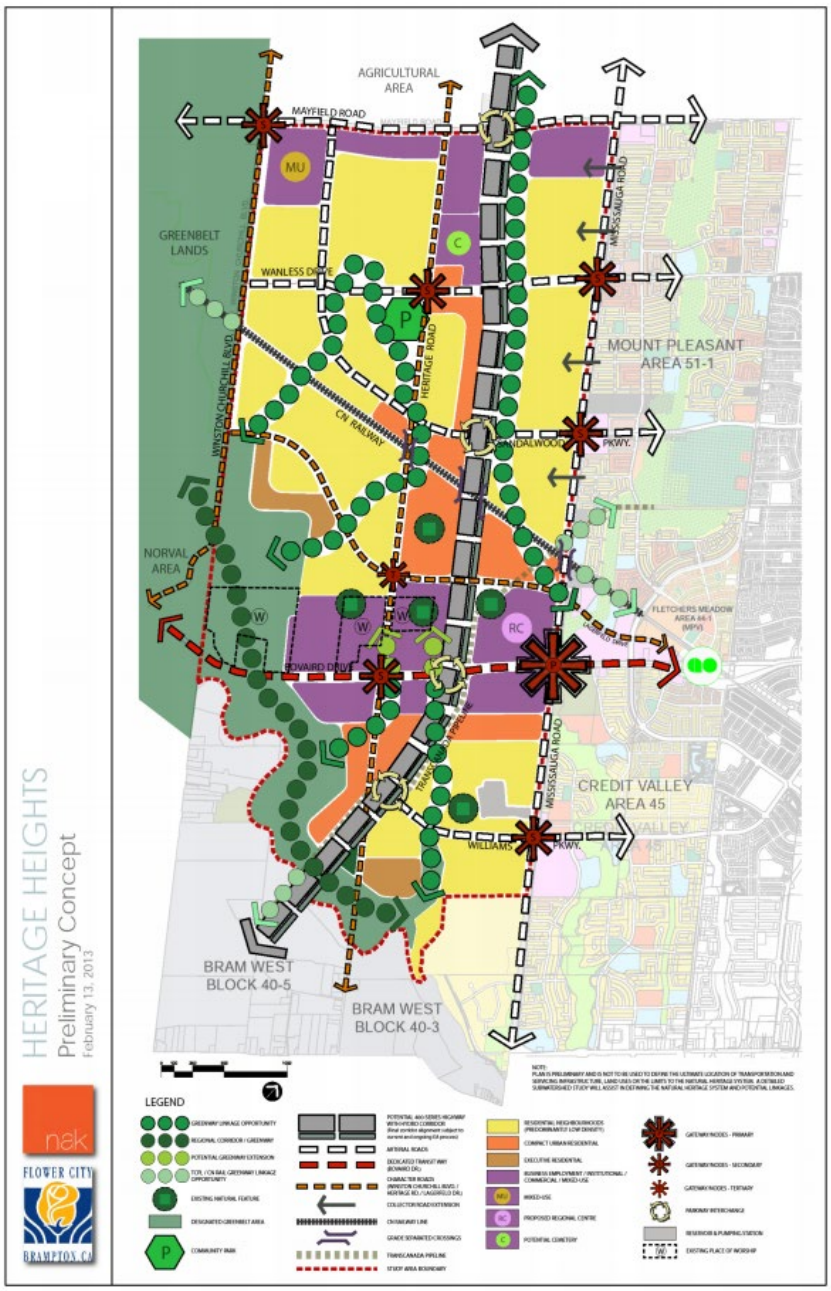
Source: Bram West Parkway and Financial Drive EA, City of Brampton, September 2016

2.2 Heritage Heights Transportation Study (ongoing)

The Heritage Heights Community is bounded by Mayfield Road to the north, Winston Churchill Boulevard to the west, Mississauga Road to the east, and the Credit River Valley to the south. The City has initiated a transportation study as a supporting study to the Secondary Plan for the Heritage Heights Community. The purpose of the study is to identify the transportation needs of the new community in the Secondary Plan area in northwest Brampton.

The Heritage Heights Preliminary Concept Plan (shown in **Figure 2-2**) illustrates a high level community vision that includes new arterial roads and grade separated crossings over the CN Railway Line. This concept plan was endorsed by City Council in April 2013. Proposed road and infrastructure projects are considered in this study.

Figure 2-2: Heritage Heights Preliminary Concept Plan (2013)

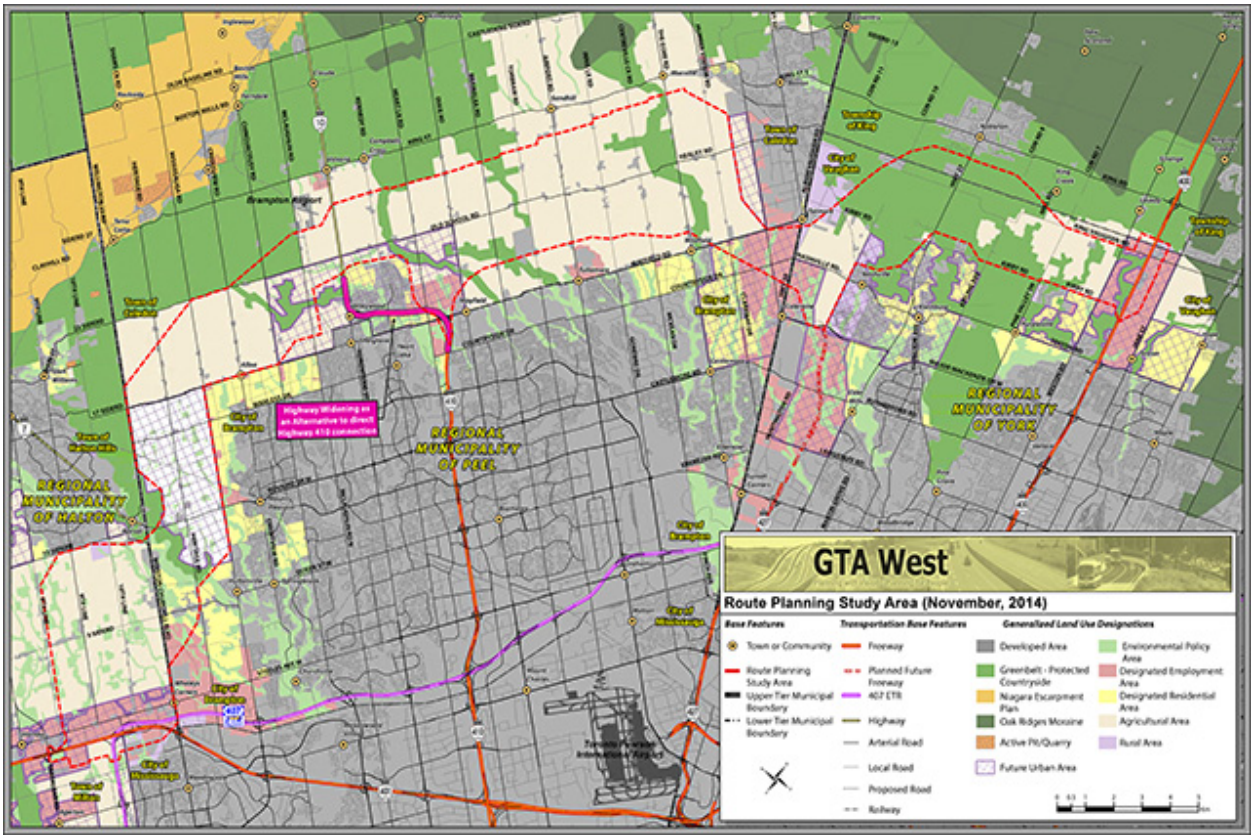


Source: Heritage Heights Preliminary Concept Plan, City of Brampton, February 2013

2.3 GTA West Transportation Corridor Route Planning and Environmental Assessment Study

The GTA West Corridor is a proposed transportation corridor in the western Greater Toronto Area (GTA) that is subject to ongoing planning and analysis by the Ministry of Transportation Ontario (MTO). The proposed corridor would serve the area from Vaughan west to Guelph, generally north of the City of Brampton, with a portion of the corridor cutting through the northwest part of the City (Heritage Heights) and a portion through the northeast (Secondary Plan 47), as shown in **Figure 2-3**.

Figure 2-3: GTA West Corridor



Source: GTA West Transportation Corridor Route Planning and EA Study, MTO, November 2014

In February 2018, MTO announced that the province will not proceed with an environmental assessment for a proposed highway in the GTA West corridor. Instead the MTO initiated a joint study to identify a smaller corridor that will be protected for future infrastructure needs, such as utilities, transit or other transportation options.

In November 2018, the Ontario government announced that it would be resuming the suspended EA for the GTA West Corridor.

Through discussion with the City, it is expected that the GTA West will not be built until post 2031. It was agreed upon not to include GTA West Corridor in the transportation network assumptions for this study.

2.4 City of Brampton Draft Active Transportation Master Plan (ATMP), ongoing

The City of Brampton has initiated the ATMP to develop an active transportation program which identifies a connected cycling and pedestrian network across the City and to neighbouring municipalities. Infrastructure improvements include bike lanes, boulevard multi-use paths, sidewalks, bridge or tunnel crossings, and safety improvements. The ATMP is anticipated to be completed in Spring 2019, while the draft ATMP program is included in the DC Transportation Background study.

3 Overall Study Process

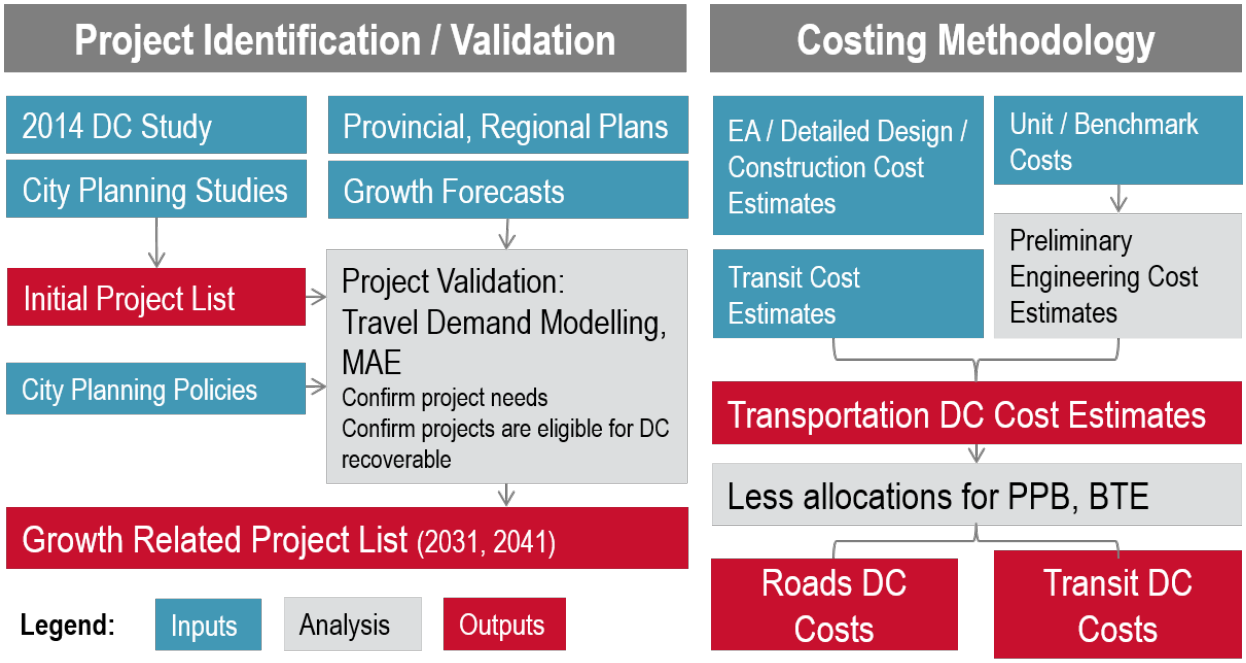
The overall process to identify growth related projects and associated cost estimates for input to the 2019 DC By-Law Update is illustrated in **Figure 3-1**.

An initial project list is first identified based on the 2014 DC Update and more recent City planning studies, and other relevant information such as developer agreements. Projects in the initial project list are validated using a Multiple Account Evaluation (MAE) framework, utilizing the City's updated travel demand model and the City's most recent 2031 and 2041 land use forecast. Details of the project validation analysis are discussed in **Section 4**.

After the project validation analysis is completed, a refined list of growth related projects is identified. For these projects, cost estimates from EA studies, detailed design, or construction is first utilized. Where detailed cost estimates are not available, preliminary engineering cost estimates are developed, based on the City's road design standards and unit costs from tender documents provided by the City (discussed in **Section 5**). It is noted that transit project cost estimates were provided by City staff.

Finally, after cost estimates are developed for all projects, allocations for post-period, growth and non-growth are identified. The approach is discussed further in **Section 8**.

Figure 3-1: DC Transportation Background Study Process



Note: DC = Development Charges, MAE = Multiple Account Evaluation, EA = Environmental Assessment, PPB = Post-Period Benefit, BTE = Benefit to Existing

3.1 Land Use Forecast Assumptions

Land use in 2031 and 2041 is based on the Provincial Growth Plan allocation forecast, provided by the City in September 24, 2018. Population and employment totals in 2011, 2031, and 2041 are summarized in **Table 3-1**. By 2041, the City is expected to have a population of 890,240 and an employment of 324,840. Zonal population and employment totals for 2011, 2031, and 2041 are illustrated in **Figure 3-2**, **Figure 3-3**, and **Figure 3-4**, respectively.

Table 3-1: Total Population and Employment

Horizon Year	Population	Employment	Pop and Emp
2011	523,000	162,700	685,700
2031	812,200	284,800	1,097,000
2041	890,200	324,800	1,215,000

Source: City of Brampton (September 2018)

Figure 3-2: 2011 Total Population and Employment by Traffic Zone

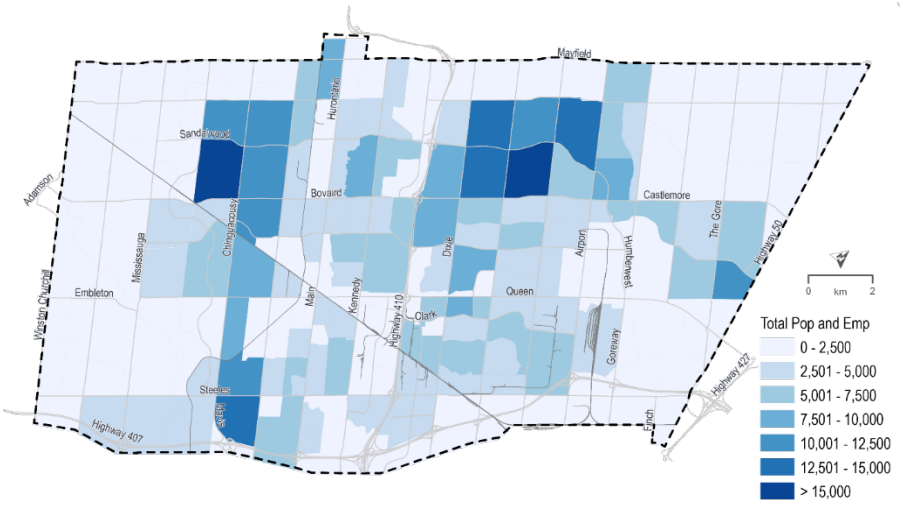


Figure 3-3: 2031 Total Population and Employment by Traffic Zone

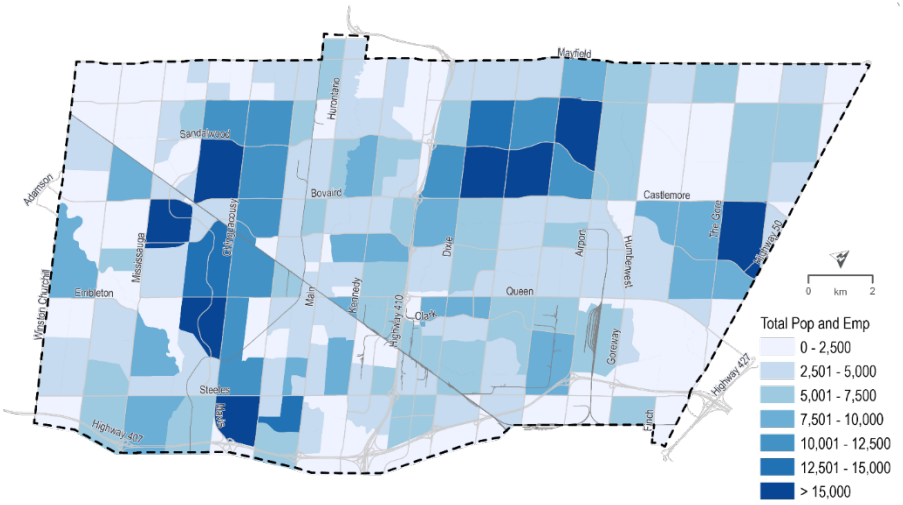
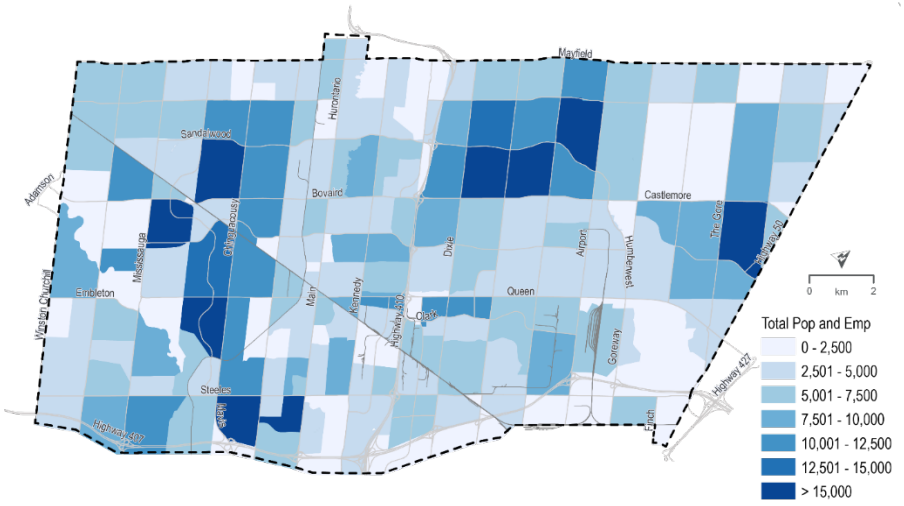


Figure 3-4: 2041 Total Population and Employment by Traffic Zone



Source: City of Brampton (September 2018)

3.2 Travel Demand Model

This study utilizes the City's travel demand model, based on the "GTAModel v4" developed by the Travel Modelling Group (TMG) at the University of Toronto. The City's version of this model is calibrated to screenlines across the City of Brampton. The GTAModel v4 is a 24-hour model that forecasts auto, transit, walk and bicycle demand. The focus of the auto and transit assignment calibration was for the PM Peak Period (3-7 pm). There are three horizon years for this model: 2011, 2031, and 2041.

4 Project Identification and Validation

The project identification and validation process for growth related projects to the 2031 and 2041 horizon years is identified in this section.

4.1 Initial Project List

The initial road project list considered projects in the City's planning documents, Capital Budget, other on-going studies and additional directions from the City, including:

- Carry over projects and identified infrastructure needs from the 2014 DC study;
- Planned projects based on recently completed or ongoing projects:
  - 2014 Transportation Master Plan, which includes short, medium, and long-term road and transit improvement projects to 2041;
  - Draft Active Transportation Master Plan;
  - 2019-2023 Capital Budget;
  - Recent studies including the Bram West Parkway and Financial Drive EA and Heritage Heights Transportation Study.

The 2014 DC project list for transportation improvements provides a starting point for transportation needs. Improvements which have been completed and for which the City no longer needs to collect Development Charges are removed, based on the City's Road Improvement Program and additional inputs from City Staff. Subsequent studies which identify new projects are then added to the project list or may revise projects in the 2014 DC.

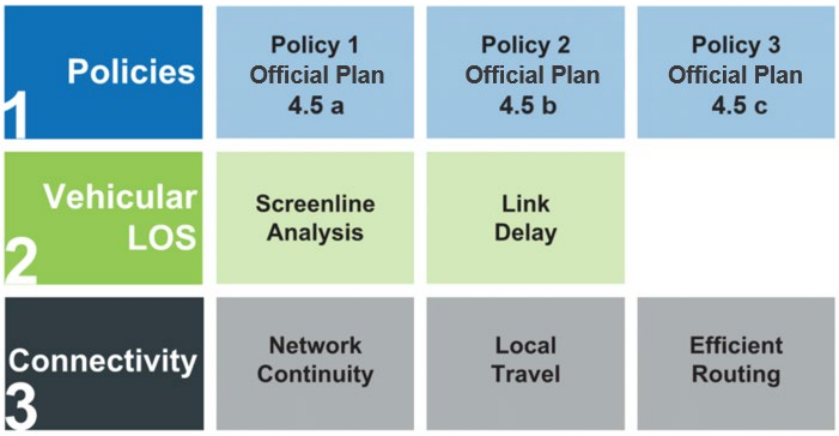
4.2 DC Eligibility

A review of the initial project list was undertaken to confirm DC eligibility. DC eligible projects generally include major and minor arterial roads, structures, and transit and active transportation projects, based on whether the improvement is intended to accommodate future population and employment growth in the City. Some collector roads are also considered to be DC eligible on the basis of consistency with the 2014 DC study.

4.3 Multiple Account Evaluation Framework

In order to validate and confirm the need for the projects identified in the initial project list, a Multiple Account Evaluation (MAE) framework is applied which considers alignment with City policies, travel demand forecasting analysis, and connectivity needs. The framework is illustrated graphically in **Figure 4-1**.

Figure 4-1: Multiple Account Evaluation Framework



Further detail on the MAE framework is provided in the following subsections.

4.3.1 Policies

There are several policies in effect that should be considered when evaluating the need for transportation infrastructure projects. Taken from the City's Official Plan, the following policies are referenced in the multiple account evaluation process:

- **Official Plan Objectives 4.5 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;
- **Official Plan Objectives 4.5 b**: To ensure the provision of adequate and accessible road, transit, pedestrian and bicycle links within Brampton and between Brampton and adjacent municipalities;
- **Official Plan Objectives 4.5 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.

4.3.2 Vehicular Level-of-Service

A detailed travel demand modelling analysis (also described in **Section 3**) was undertaken to assess and reconfirm the need for the projects from a vehicular level of service (LOS) perspective given updates to population and employment forecasts and the planned transportation network.

It is noted that through this process, while the study reconfirms the needs for the projects based on growth in travel demand and LOS, further studies are required to confirm detailed recommendations such as HOV lanes, transit, and active transportation facilities.

Model Analysis Assumptions

Two modelling scenarios for the 2031 and 2041 PM Peak Hour horizon years were considered for the analysis supporting the MAE framework:

1) A "No Build" scenario, which includes a "baseline future" transportation network which includes all completed, approved, or funded projects. The network incorporates the recommendations of the studies documented in **Section 2**, including various Long Range Transportation Plan (LRTP), TMP, and DC studies, as well as the City of Brampton's Draft 2019-2023 Capital Program; and
2) A "Build" scenario, which includes all planned projects identified as DC eligible from the initial project list.

This approach assessed conditions with and without projects in the initial list to provide an understanding of the LOS benefits or impacts of the projects.

Performance Measures

Two performance measures from the travel demand model were used in considering vehicular LOS: screenline analysis and link delay.

Firstly, screenline analysis was used to measure the vehicular LOS for a specified area surrounding the potential improvement. It used a volume to capacity (V/C) analysis to determine where there is a capacity deficiency in the area. The volume to capacity ratio reflects peak hour traffic demand measured against roadway capacity.

Secondly, link delay was used to examine the V/C ratio for the specific project, without and with improvement.

A description of the Link V/C Ratios is provided in **Table 4-1**.

Table 4-1: Link V/C Ratios and Operating Conditions

V/C Ratio	Level of Service (LOS)	Operating Condition
Less than 0.85	LOS A-C	Free-flow, very little, to moderate delay
Between 0.85 and 0.99	LOS D-E	Approaching or at capacity, users experience delays and queuing
Greater than 1.00	LOS F	Over capacity, severe delays, and queuing

4.3.3 Connectivity

Connectivity was the third account used for the multiple account evaluation framework. It assessed the transportation infrastructure projects based on its ability to:

- Maximize network continuity between adjacent blocks;
- Provide for local travel within and between City blocks without the necessity of travelling on arterial streets; and
- Provide for effective routing of transit vehicles, and more direct routes for cyclists and pedestrians.

4.4 Project Validation Results

This section documents the project validation results using the MAE framework.

4.4.1 Multiple Account Evaluation Results

The MAE methodology was applied to all projects in the initial project list with the exception of the North-South Transportation Corridor (NSTC). A more detailed analysis was carried out for the NSTC (**Section 4.4.2**) because of the recent changes in status of the GTA West Corridor Study which has a significant impact on NSTC travel demand.

All projects identified were validated at this stage as growth-related, DC eligible projects with the exception of one. The 4 to 6 lane widening project for Torbram Road between Countryside Drive and Mayfield Road is not recommended for improvements before 2041, and is identified as a post 2041 improvement project. Detailed results can be found in **Appendix A**.

4.4.2 North-South Transportation Corridor

This section provides a summary of the methodology and results to confirm the need for the North-South Transportation Corridor (NSTC) within the eligible period for the 2019 DC Update. A summary of the findings is provided below while further details on the analysis can be found in **Appendix B**.

The 2014 DC and 2015 TMP recommended the NSTC as a new six-lane road from Heritage Road just south of Highway 407 at the southern boundary of the City to northern boundary of the City at Mayfield Road. Since the completion of the 2014 DC, further study for a portion of the NSTC was completed through the Bram West Parkway and Financial Drive Class EA (completed in 2016, herein after referred to as the Bram West EA) examined the needs for the following segments in detail:

- Bram West Parkway (NSTC) from Heritage Road to Financial Drive; and
- Extension of Financial Drive from Heritage Road to Winston Churchill Boulevard.

The study recommended the following improvements:

- Six-through lanes for Bram West Parkway between Financial Drive and Steeles Avenue;
- Four-through lanes for Bram West Parkway between Steeles Avenue and Highway 407;
- Two-through lanes for Bram West Parkway south of Highway 407; and
- Four-through lanes for Financial Drive Extension.

Recommendations in the 2016 Bram West EA listed above was assumed in the network, and this validation work further assessed the needs of NSTC from Financial Drive to Mayfield Road.

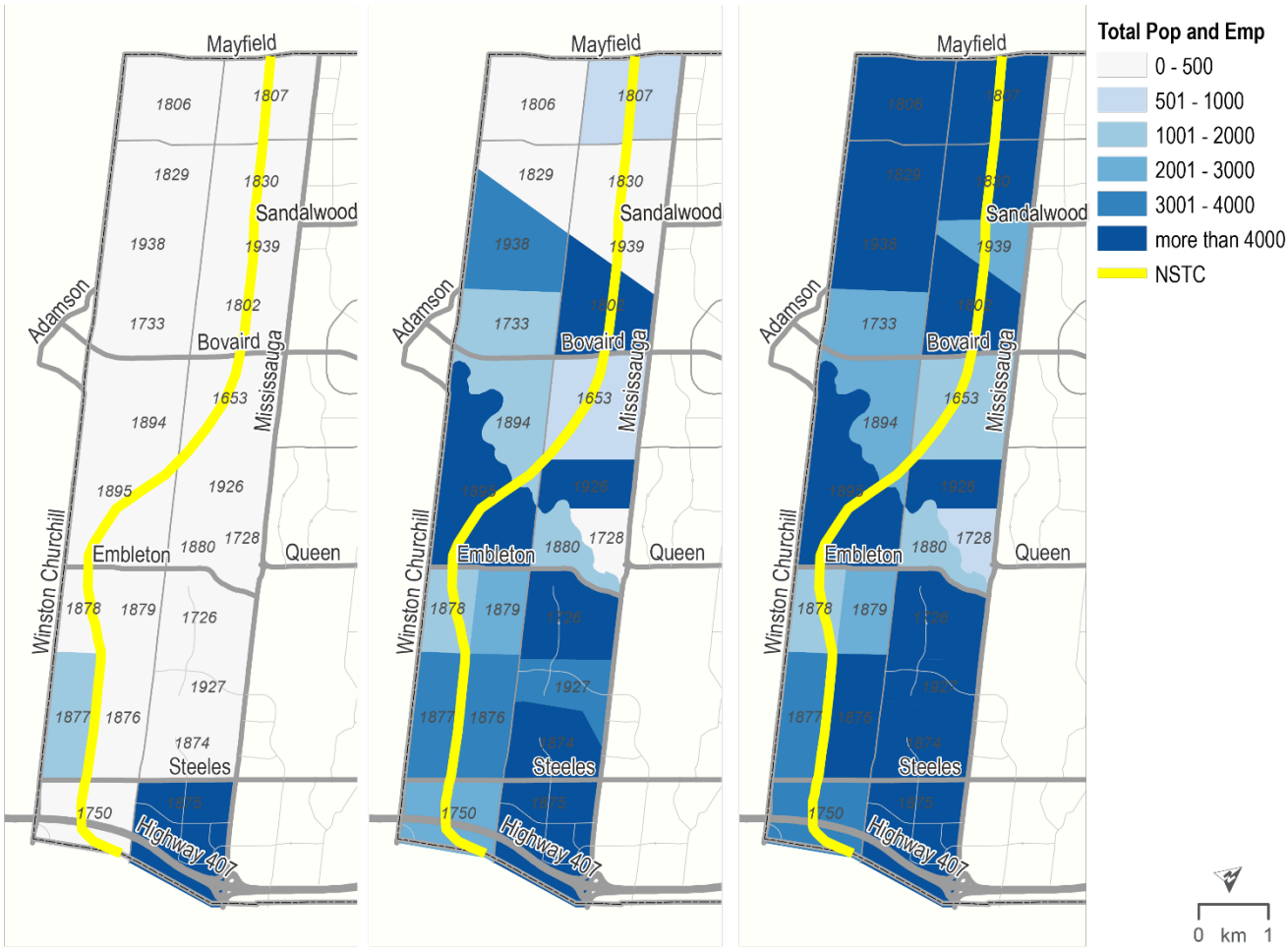
Land Use

To inform timing and to understand the growth in the areas that the NSTC will directly serve, the 2011, 2031, and 2041 population and employment in the traffic zones which the NSTC traverses are summarized in **Table 4-2** and illustrated in **Figure 4-2.** Most of the growth will occur before 2031 for areas south of Embleton Road, whereas areas in the north will expect the growth after 2031, especially for the areas north of Sandalwood Parkway.

Table 4-2: Population and Employment Forecasts by Area

Area	2011 Pop	2011 Emp	2031 Pop	2031 Emp	2041 Pop	2041 Emp
Heritage to Embleton	244	6,066	13,670	22,100	15,220	24,990
Embleton to Bovaird	568	308	15,590	2,540	20,520	6,490
Bovaird to Sandalwood	284	207	7,870	4,960	15,400	7,660
Sandalwood to Mayfield	-	24	120	730	17,180	8,530

Figure 4-2: 2011, 2031 and 2041 Total Zonal Population and Employment along the NSTC



2011 Pop and Emp | 2031 Pop and Emp | 2041 Pop and Emp

Analysis and Evaluation

A summary of the project evaluation can be found in **Table 4-3**.

Table 4-3: Multiple Account Evaluation Framework for NSTC

Project Area		NSTC		NSTC		NSTC	
Project		**Financial Drive to Bovaird Drive**		**Bovaird Drive to Sandalwood Pkwy**		**Sandalwood Pkwy to Mayfield Road**	
Framework		**Without NSTC**	**With NSTC (6 lanes)**	**Without NSTC**	**With NSTC (6 lanes)**	**Without NSTC**	**With NSTC (6 lanes)**
Policies	Policy 1	**No** Does not provide sufficient options to move people and goods	**Neutral** The new connection could create an opportunity to develop a balanced, integrated, and accessible multi-modal network	**Neutral** The existing network provide sufficient options to move people and goods	**Neutral** The new connection could create an opportunity to develop a balanced, integrated, and accessible multi-modal network	**Neutral** The existing network provide sufficient options to move people and goods	**No** New six-lane road would encourage vehicle usage and discourage the use of public transit
	Policy 2	**No** Does not provide adequate road, transit, pedestrian, and bicycle links	**Yes** Provide additional link for road, transit, pedestrian, and bicycle links within Brampton and to adjacent municipalities	**No** Does not provide adequate road, transit, pedestrian, and bicycle links	**Yes** Provide additional link for road, transit, pedestrian, and bicycle links within Brampton and to adjacent municipalities	**No** Does not provide adequate road, transit, pedestrian, and bicycle links	**Yes** Provide additional link for road, transit, pedestrian, and bicycle links within Brampton and to adjacent municipalities
	Policy 3	**No** Lack of connections leads to road congestion and does not foster strong live-work relationships	**Neutral** Additional connection reduces congestion and fosters strong live-work relationships, but six-lane road could also encourage vehicle use	**Neutral** Existing network provides sufficient capacity to ensure an efficient transportation system and support the growth in the future	**Neutral** Additional connection reduces congestion and fosters strong live-work relationships, but six-lane road could also encourage vehicle use	**Yes** Existing network provides sufficient capacity to ensure an efficient transportation system and support the growth in the future	**No** New six-lane road would encourage vehicle usage and discourage the use of public transit
Vehicular LOS	Screenline Analysis	**No** More congestion is experienced on the arterial network surrounding the NSTC	**Yes** NSTC reduces congestion on the arterial network surrounding the VMC	**Neutral** Acceptable degree of congestion on the arterial network parallel to the NSTC	**Neutral** Little to no congestion on the arterial network surround the NSTC	**Neutral** Little to no congestion on the arterial network surround the NSTC	**Neutral** Little to no congestion on the arterial network surround the NSTC
	Link Delay	N/A, no NSTC	**Neutral** NSTC is at capacity	N/A, no NSTC	**Neutral** NSTC is approaching capacity	N/A, no NSTC	**Neutral** NSTC is under capacity
Connectivity	Network Continuity	**No** Provides minimum north-south connections to adjacent areas as there are only 2 continuous connections	**Yes** Provides additional north-south connections to adjacent arterials	**No** Provides minimum north-south connections to adjacent areas as there are only 2 continuous connections	**Yes** Provides additional north-south connections to adjacent arterials	**No** Provides minimum north-south connections to adjacent areas as there are only 2 continuous connections	**Yes** Provides additional north-south connections to adjacent arterials
	Local Travel	**No** Does not provide sufficient connectivity for local travel as there is limited connections	**Yes** Provides local travel due to a finer grid network	**No** Does not provide sufficient connectivity for local travel as there is limited connections	**Yes** Provides local travel due to a finer grid network	**No** Does not provide sufficient connectivity for local travel as there is limited connections	**Yes** Provides local travel due to a finer grid network
	Efficient Routing	**No** Existing network does not provide efficient routing	**Yes** Connected and finer grid system provides for the effective routing of transit vehicles, cyclists, and pedestrians.	**No** Existing network does not provide efficient routing	**Yes** Connected and finer grid system provides for the effective routing of transit vehicles, cyclists, and pedestrians.	**No** Existing network does not provide efficient routing	**Yes** Connected and finer grid system provides for the effective routing of transit vehicles, cyclists, and pedestrians.
RESULT		**Recommend 6-lane road**		**Recommend 4-lane road**		**Recommend 2-lane road**	

Legend: Best, Neutral, and **Worst** **Performing Option**

Recommendations and Timing

Through discussion with the Region of Peel, the Region will be responsible for the following segments of the NSTC and thus these improvements are not included in the Brampton DC program:

- Construction of a new six lane road between Rivermont Road and Bovaird Drive; and
- Construction of a new four lane road between Bovaird Drive and Sandalwood Parkway.

Based on the evaluation, projected land use in 2031 and 2041, Bram West EA (2016), and Peel Region's planned improvements, the following recommendations are made for the NSTC in the Brampton DC program:

Medium term improvements (before 2031):

- Six lane construction between Financial Drive and Rivermont Road.

Long-term improvements (before 2041):

- Two-through lanes between Heritage Road and Highway 407 (Bram West EA recommendation);
- Four-through lanes between Highway 407 and Steeles Avenue (Bram West EA recommendation);
- Six-through lanes between Steeles Avenue and Financial Drive (Bram West EA recommendation); and
- Two-through lanes between Sandalwood Parkway to Mayfield Road.

Post-period improvements (after 2041), protect corridor for:

- Two to four lane widening between Sandalwood Parkway and Mayfield Road.

It is noted that even with the new six-lane road, the NSTC and parallel routes are still expected to be over capacity across the Credit River and south of Bovaird Drive. It is recommended that further planning work in the Bram West and Northwest Brampton areas consider high-occupancy vehicle (HOV) lanes or dedicated bus lanes on the NSTC to encourage more efficient mobility. Land use planning should integrate a complete active transportation network around transit-oriented activity nodes, and transportation demand management (TDM) measures should be incorporated into development approvals.

5 Pre-Engineering Road Infrastructure Costing Methodology

As noted in **Section 3**, project specific costs were first gathered from Environmental Study Reports (ESRs), detailed design, and construction bids. In cases where costs from these sources were not available, a high-level, pre-engineering costing methodology was applied. This pre-engineering method is described in further detail in the following sections including linear roadway benchmark costs, other road related construction items such as intersection tie-ins and bus bays, and other improvements identified by the City such as gateway features and property acquisition.

5.1 Inflation Rate

An inflation rate used to adjust all source costs to account for the time value of money was calculated in accordance with the historical average of the Consumer Price Index (CPI), as per Statistics Canada's 2019 Annual Review. **Table 5-1** displays the variation in the CPI over the 5-year period starting in 2014 and shows an average inflation rate of 1.7% per year. An inflation rate of 1.7% was used for the 2019 Brampton DC study update.

Table 5-1: Inflation Rate Calculation

Index	Description	Change by Year (%)					Historical Average Change (%)
Consumer Price Index	Measures the increase of the cost of basic products and services that Canadians consume on a daily basis, such as: food, shelter, clothing, healthcare, transportation, alcoholic beverages and tobacco products.	2014	2015	2016	2017	2018	1.7%
		2.0	1.1	1.4	1.6	2.3	

Source: Statistics Canada

5.2 Construction Material Unit Costs

Construction material unit costs were determined based on contractor bids received by the City of Brampton between 2014 and 2019. These average unit costs were integral to accurately price the road improvements and calculate the benchmark costs per unit of length for different project types. Incorporating data from previous years ensures that a reasonable sample of projects is included and smoothens out annual fluctuations. The bid documents provided by the City which were reviewed include, but are not limited to, the following projects:

- Castlemore Road Widening (T2016-001)
- Bramalea Road Widening (T2016-003)
- Countryside Drive Widening (T2017-016)

- Reconstruction of Gateway Feature Wall at Various Locations (T2016-044)
- Airport Road Züm (T2017-044)
- Steeles Avenue Züm (T2014-054)
- Road Resurfacing (T2017-024)
- Summerlea Road (between Gateway Boulevard and Clark Boulevard) and Woodslea Road (Between Walker and Airport Road) Sidewalk (T2017-074)
- Bramalea Road Noise Wall (T2017-096)
- James John Realignment (T2018-024)
- Williams Parkway Noise Wall (T2018-045)
- Castlemore Road Widening Goreway Drive to McVean Drive (T2018-079)
- Stormwater Ponds (T2018-064)
- Glidden Road Sidewalk between Rutherford Road and Heartlake Road (T2018-074)
- Humberwest Parkway Widening (T2019-044)

In addition, for new construction projects within subdivisions, only tenders from more comparable road widening projects were used (Castlemore Road widening, Bramalea Road widening, and Countryside Drive widening), as unit costs tend to be significantly lower due to large quantities associated with parallel land development works which are delivered by the development industry. Based on a review of the unit costs for developer delivered roads, there is an approximately 50% cost reduction, and a unit cost of $15.00 per m^3 was used for excavation and earthworks for developer delivered new construction projects within subdivisions.

Table 5-2 displays the average unit costs. For construction items that had no information available in tenders, the 2014 DC costs were escalated. These costs were compared with the unit costs used in the 2014 Brampton DC, as well as other DC studies that were recently completed by HDR to ensure reasonability of the costs. **Table 5-2** shows an overall increase in unit cost since the 2014 DC. Therefore, it is reasonable to anticipate an upward trend in the overall project costs.

Table 5-2: Unit Costs

Construction Item	Unit	2019 DC Cost (2018$)	2019 DC Cost – Subdivision New Construction (2018$)	2014 DC Cost (2018$)	% Diff (2019 and 2014 DC)	Source
Road Unit Cost						
Excavation	m^3	$35.14	$15.00	$16.05	119%	Bid/Tenders
Remove culverts, sewer, catchbasin Leads (all sizes)	m	$94.04	n/a	$42.79	120%	Bid/Tenders
Hot Mix HL3	tonne	$103.03	$105.65	$80.23	28%	Bid/Tenders
Hot Mix HL8	tonne	$99.12	$83.89	$88.79	12%	Bid/Tenders
Granular A Base (all depths)	tonne	$30.34	$24.68	$17.12	77%	Bid/Tenders
Granular B Subbase (all depths)	tonne	$28.82	$24.13	$17.12	68%	Bid/Tenders
Install Concrete Curb and Gutter (all types)	m	$65.00	$55.82	$47.07	38%	Bid/Tenders
Supply and Install Catchbasin Leads including appropriate fittings, Class 'B' beddings and Granular backfill	m	$392.04	$288.82	$212.88	84%	Bid/Tenders
Supply and Install Storm, Sewer Pipes (all sizes and type)	m	$733.45	$480.29	$381.90	92%	Bid/Tenders
Supply and Install Manhole, Maintenance Holes (all size) [1]	each	$7,583.66	$5,374.39	$5,300.63	43%	Bid/Tenders
Supply and Install Catchbasins (all types and sizes)	each	$4,045.61	$3,639.53	$2,123.46	91%	Bid/Tenders
Sidewalk (1.5m wide, one side)	m	$147.46	$65.05	$73.10	102%	Bid/Tenders
Pavement Markings	m	$5.87	$5.22	$5.35	10%	Bid/Tenders
Illumination	km	$170,490.93	$170,490.93	$286,020.06	-40%	Bid/Tenders
Streetscaping	km	$162,884.62	$162,884.62	$88,468.63	84%	Bid/Tenders

[1] For six-lane road improvements, unit cost was inflated by 30% to count for stormceptor cost based on the review of stormceptor unit costs

5.3 Roadway Benchmark Costs

5.3.1 Design Standards

For construction of linear transportation infrastructure, the costing process was based primarily upon the City of Brampton Engineering and Design Standards (2004) and the Brampton Standard Specifications (BSS, as revised in March 2017). The TAC Geometric Design Guide (2017), the MTO Design Supplement for the TAC Geometric Design Guide for Canadian Roads (2017), the MTO Parametric Estimating Guide for Structures (2016), and the Peel Region Public Works Design, Specifications and Procedure Manual (2010) were used to supplement the City's Design Standards.

5.3.2 Benchmarks and Cost Estimates

Using the design standards and unit costs, the road construction costs were estimated on a per kilometre basis. For widening and urbanization projects, it was assumed to be full reconstruction for the existing portions of the road. The roadway costs include the following items:

- Items between the road curb lines (excavation, asphalt, base and subbase materials, curb and gutter, catchbasin leads, storm and sewer pipes, manholes, catchbasins and stormceptors);
- Sidewalks;
- Streetlighting;
- Streetscaping; and
- 10% for miscellaneous items that may have not been accounted for in the list of construction items.

The benchmark costs are presented in **Table 5-3**. Compared to the 2014 DC, roadwork costs have increased by approximately 45% for City delivered roads, which is mostly due to the increase of unit costs, as discussed in the previous section. New construction in subdivision has a lower cost due to the lower unit costs used, as also discussed in the previous section.

Table 5-3: Road Construction Types

Improvement Type	Project Type	Project Code	2019 DC Cost (in million 2018$)	2014 DC Cost (in million 2018$)	Change since 2014
New Construction in Subdivision	2 Lane Urban Collector	NC-2UCol-SD	$2.25	$2.02	11%
New Construction in Subdivision	4 Lane Urban Collector	NC-4UCol-SD	$2.65	$2.39	11%
New Construction in Subdivision	4 Lane Urban Minor Arterial	NC-4UMinA-SD	$2.74	$2.45	12%
New Construction	2 Lane Urban Major Arterial	NC-2UMajA	$2.97	$2.02	47%
New Construction	4 Lane Urban Collector	NC-4UCol	$3.45	$2.39	44%
New Construction	4 Lane Urban Major Arterial	NC-4UMajA	$3.56	$2.39	49%
New Construction	6 Lane Urban Major Arterial	NC-6UMajA	$4.53	$3.00	51%
Urbanization	2 Lane Minor Arterial	UR-2MinA	$3.02	n/a	n/a
Urbanization	4 Lane Major Arterial	UR-4MajA	$3.64	n/a	n/a
Reconstruction	2 Lane Minor Arterial	RC-2MinA	$3.02	n/a	n/a
Widening	2 to 4 Lane Urban Collector	W2-4UCol	$3.52	$2.39	47%
Widening	2 to 4 Lane Urban Minor Arterial	W2-4UMinA	$3.64	$2.45	49%
Widening	2 to 4 Lane Major Arterial	W2-4UMajA	$3.64	$2.45	49%
Widening	4 to 6 Urban Collector	W4-6U-ColA	$4.64	n/a	n/a
Widening	4 to 6 Urban Minor Arterial	W4-6-UMinA	$4.64	n/a	n/a
Widening	4 to 6 Urban Major Arterial	W4-6-UMajA	$4.64	n/a	n/a

Improvement Type	Project Type	Project Code	2019 DC Cost (in million 2018$)	2014 DC Cost (in million 2018$)	Change since 2014
Widening and Urbanization	2 to 4 Lane Urban Minor Arterial	WU-2-4-UMinA	$3.64	n/a	n/a
Widening and Urbanization	2 to 4 Lane Urban Major Arterial	WU-2-4-UMajA	$3.64	n/a	n/a

5.4 Other Road Related Construction Items

The benchmark costs presented in **Section 5.3** were used to calculate the basic road improvement costs. In order to address the total cost of road construction, costs for the following items were included for each construction project in the roads program. The unit prices for each of these items are summarized in **Table 5-4**.

Table 5-4: Other Infrastructure Costs

Construction Item	Unit	2019 DC Cost (2018$)	2014 DC Cost (2018$)	% Diff	Source
Traffic Signals (new signal installation)	each	$199,113.01	$191,485.92	4%	Bid/Tenders
Traffic Signals (existing intersection)	each	$274,926.71	$274,926.71	0%	2014 DC inflated
Intersection Tie-ins (4-way)	each	$100,353.61	n/a	n/a	Bid/Tenders
Intersection Tie-ins (3-way)	each	$50,176.81	n/a	n/a	Bid/Tenders
Bus Bays [1]	per int. (both sides)	$69,500.00	$106,975.37	-35%	Bid/Tenders
Queue Jump Lanes	each	$128,370.45	$128,370.45	0%	2014 DC inflated
HOV Lane Markings	km	$45,785.46	$45,785.46	0%	2014 DC inflated
Patterned Concrete	km	$212,000.00	$44,419.38	377%	Provided by City
Utility installation relocation	km	$376,842.78	$377,730.04	0%	Bid/Tenders
Nosie Walls (one side)	m	$1,408.00	$1,361.80	3%	Bid/Tenders
Structures					
Bridge	m2	$5,481.73	$4,672.68	17%	2016 MTO Parametric Guide
Structural culvert	m2	$5,171.45	$4,509.01	15%	2016 MTO Parametric Guide
Road culvert pipes	Each	$7,617.31	$7,617.31	0%	2014 DC inflated
MNRF requirements on structures					See **Section 5.4.10**
EA Studies					
EA studies (small)	each	$393,134.50	$393,134.50	0%	2014 DC inflated
EA studies (med)	each	$561,620.71	$561,620.71	0%	2014 DC inflated
EA studies (large)	each	$673,944.85	$673,944.85	0%	2014 DC inflated

[1] Includes road work elements only. The costs for bus shelters, bus pads, and passenger loading area were not included as they are recovered through the Transit DC.

The items above were added on a project-by-project basis in accordance with direction, information and details provided by the City. The details are discussed in the following sections.

5.4.1 Traffic Signals

A unit price of $199,113 per intersection for new signal installation was developed according to current prices experienced in recent contracts provided by the City. The unit cost of $274,927 for relocating a set of existing signals per intersection was based on an indexing of the costs used in the 2014 Brampton DC Study. These costs were applied according to the number of signalized intersections per project.

5.4.2 Intersection Tie-ins

The road construction benchmark costs reflect a continuous mid-block road cross-section and do not address the additional costs associated with tying into existing intersections. A detailed review of the intersection tie-in requirements for the roads within the development charge program was carried out to assess the number of intersection tie-ins that will be required. A cost of $50,177 for a tie in to a 3-way intersection and $ 100,354 for a tie-in to a 4-way intersection were derived based on estimates developed by HDR. The cost to supply and install signalized intersections is not included, as they are captured separately in another item (Traffic Signals, **Section 5.4.1**).

5.4.3 Bus Bays

The City of Brampton provided an average cost of $115 per square metre for bus bays (unit cost including concrete and granular base). The individual bus bay costs were produced by consulting the City of Brampton Road Design Standards (261-266). Only road-work related cost was included (30m storage length and 45m taper length). The costs for bus shelters, bus pads, and passenger loading area were not included as they are recovered through the Transit DC. Bus bays were assumed to be located on both sides of the street with transit service (local or Züm) at major intersections and has a cost of $69,500 (per intersection, for both sides).

5.4.4 Queue Jump Lanes

Queue jump lanes provide priority to transit vehicles by allowing them to skip to the front of the queue at intersections. The cost of queue jump lanes only includes the cost for pavement markings and signage. For the 2019 Brampton DC study, a cost of $128,370 was used by indexing the 2014 Brampton DC cost. The costs were applied to the approaches of major signalized intersection.

5.4.5 HOV Lane Marking

A high-occupancy vehicle (HOV) lane is a restricted traffic lane reserved for the exclusive use of vehicles with a driver and one or more passengers, including carpools and transit buses. HOV lanes are distinguished from regular lanes by their

specific lane markings. For the 2019 Brampton DC study, a cost of $45,785 was used by indexing the 2014 Brampton DC cost, which reflects the cost of HOV land marking. The costs were applied to any 4 to 6 lane widening project or new six-lane road in conditions where the six-lane road still does not provide sufficient capacities for vehicle travel, indicating there is a need to provide people moving capacity through encouraging the use of HOV and transit. Capacity deficiencies were identified by the macro modelling results for 2041 when the volume to capacity ratio is over 0.85 (i.e., approaching capacity, congestion will occur).

5.4.6 Patterned Concrete

The unit price for patterned concrete was $106 per square metre according to current prices experienced in recent City contracts provided by City Staff. This area cost was converted to a linear unit cost to account for 1m kill-strips on both sides of the road (as per STD-208) for a cost of $212,000/km. The cost of patterned concrete was applied to projects identified in the 2014 DC.

5.4.7 Utility Installation and Relocation

Contracts and project bids were reviewed to generate costs associated with installing and/or relocating utilities. The utility cost is $376,843 per km for the installation and relocation of utilities.

5.4.8 Noise Walls

The unit price for concrete acoustical walls of $1,408 per metre per side or $2,816 per metre for both sides is based on tender documents from the Williams Parkway project, provided by the City. This cost for noise walls was applied to six-lane road widenings, recognizing that noise walls are typically only required where road widenings are adjacent to residential areas. To account for this, the City conducted a review of historic road widening projects and found that on average, 29.3% of the length of these projects (considering both sides of the street) required noise walls. This factor was applied to all noise wall costs.

5.4.9 Structures

It was assumed that the structures and culverts within a project area would need to be replaced upon implementation of works. The replacement of infrastructure also represents a conservative approach compared to rehabilitation.

Structure Costs

Structure costs were based on the MTO Parametric Estimating Guide (2016). This guide examined historical bid price data for tendered capital contracts from 2010 to 2016. The data reflected the average price of the three low bidders, and all bid values were inflated to 2018 present day worth at 1.7% per year. Because of the high variability of costs for infrastructure projects, the values recommended represent high-level recommendations that can be refined in later stages of the design.

The guide's average costs for bridges was provided per square metre of deck area and helped develop estimates for new 2, 4 and 6 lane bridges, as displayed in **Table 5-5**.

Table 5-5: New Structures Benchmark Cost

New Structure	Units	2019 Brampton DC Cost (2018 $)	Notes
New Bridges (All Types, average)	per m^2 deck area	$5,481.73	2016 MTO Parametric Guide cost inflated at 1.7% over 2 years
New Bridge (2 lanes)	each	$1,726,745.49	Deck area = width of deck * length of span width of deck = lane width + sidewalk width + barrier width length of span = 25 m
New Bridge (4 lanes)	each	$2,686,048.53	
New Bridge (6 lanes)	each	$3,645,351.58	

Note: Costs for new bridges do not include embedded or other electrical work, removal of existing structure, paving, or traffic control.

Costs for new structures include the following activities:

- Structure excavation
- Dewatering
- Formwork
- Reinforcing steel
- Beams
- Piling
- Footings
- Falsework
- Parapet wall
- Joints
- Abutments
- Piers
- Access to structure
- Deck
- Waterproofing

Culvert Costs

Structural culvert costs were provided per metre of length as shown in **Table 5-6**. It was based on the unit cost in the 2016 MTO Parametric Guide and inflated to 2018 values.

Table 5-6: Structural Culvert Benchmark Cost

Structural Culvert	Units	2019 Brampton DC Cost (2018 $)	Notes
Precast Box Culverts	m2	$5,171.45	2016 MTO Parametric Guide cost inflated at 1.7% over 2 years
Structural Culverts	each	$1,375,604.37	The length depends on the width of roadway being crossed. Length of culvert = lane width + sidewalk width + barrier width = 26m

Note: The Parametric Guide (2016) costs for new culverts do not include embedded or other electrical work, dewatering, protection system, temporary flow control, or traffic control. To account for these, a standard length of 26m was assumed for culverts for all road crossed.

Road culvert pipes were also identified in the 2014 Brampton DC. The 2019 update escalated the costs of the previous study and applied them accordingly to projects where road culvert pipes need to be replaced.

Table 5-7: Road Culvert Pipes Benchmark Cost

Road Culvert	Units	2019 Brampton DC Cost (2018 $)	2014 Brampton DC Cost	Notes
Road Culvert Pipes	each	$7,617.31	$7,120.62	2014 DC cost inflated at 1.7% over 4 years

5.4.10 MNRF Requirements

There is an increasing need to minimize impacts to Species at Risk in accordance with Ontario Regulation 230/80. Redside Dace is an endangered fish species found in a few of the major river systems in the City of Brampton. As such, the costs for structures located over Redside Dace habitat are increasing in order to address the increased design requirements of the Ministry of Natural Resources and Forestry (MNRF). In addition, MNRF requires additional monitoring and compensation, and these considerations are described further in the subsequent sections.

Redside Dace Impacted Structures

The City of Brampton provided a list of road projects that have the potential to impact Redside Dace and their habitat, along with information on their proposed crossing type and the dimensions. The proposed designs aim to mitigate impacts to Redside Dace habitat while also controlling the watercourse flow rates.

The proposed structure dimensions were firstly based on the projects' detailed design and their Environmental Study Reports (ESRs). For projects too early in their inception that therefore have no associated information on the future design of their structures and culverts, aerial imaging was used to provide a high-level estimate for deck span while the widening scenario determined the structure width.

The unit prices for bridges and culverts in **Section 5.4.9** were used alongside the proposed crossing type and dimensions for the estimated structure costs.

Monitoring Requirements

Following the implementations of transportation improvements in proximity of Redside Dace habitat, regular on-site monitoring and site inspections are required to ensure mitigation strategies are working effectively and as intended. Based on costs from past projects, the City recommended a total of $125,000 for each structure, which involves monitoring the environmental impact for one year during construction and five years post construction.

Compensation Costs

A compensation cost of $825,000 was applied per structure encroaching on Redside Dace habitat, per City Staff directive based on costs from past projects.

5.4.11 Environmental Assessment Studies

The 2019 DC update retained the methodology used by the 2014 DC regarding the allocation of Environmental Assessment (EA) study costs. The costs were escalated since 2014 and assigned based on the project's scale in keeping with the previous

assumptions for small (project length approximately under 1 km), medium and large studies (project length approximately over 4km). Road classification (collector, minor arterial or major arterial) also helped determine the project's scale and the size of its associated EA study.

Table 5-8: EA study costs

Studies	Unit	2019 Brampton DC Recommended Cost (2018 $)	2014 Brampton DC Cost
EA studies (small)	each	$393,134.50	$393,134.50
EA studies (med)	each	$561,620.71	$561,620.71
EA studies (large)	each	$673,944.85	$673,944.85

5.5 Adjustment Factors

In the early stages of the planning process, the required construction activity cannot be defined to a high level of accuracy. Challenges in accurately predicting costs arise as a result of unreliable data, intangible construction costs, unforeseen site-specific factors and project coordination issues. For this reason, it is common practice to protect against risk and additional costs by applying adjustment factors to a project`s subtotal cost.

The costing analysis includes a final adjustment for Engineering of 15% and a Contingency adjustment amount of 10% for every project. The Engineering adjustment is used to estimate costs associated with detailed design and construction supervision, while the Contingency adjustment can help offset unforeseen expenditures.

These adjustment factors are applied to the final calculated construction costs for every project. A similar approach was used in the City of Brampton's 2014 DC study.

5.6 Other Improvements

The following improvements were also identified by the City:

- Land and Property Acquisition: $10 million for each year.
- Traffic Signals and Intersection Improvements: the City plans for eight traffic signals and intersection improvements for each year. The unit cost was based on the 2014 DC cost and inflated to 2018 values.
- Gateways: the City plans for 17 gateways for $292,600 each. The cost for gateways were based on the 2014 DC cost and inflated to 2018 values.
- Annual Sidewalk Improvement Program: the City plans for an annual sidewalk improvement program totaling $600,000 per year.
- Other Active Transportation Projects: other active transportation projects were identified by the City's Draft Active Transportation Master Plan (ATMP). Only infill projects were identified for a total of $37 million.

6 Road Network Service Level

The DC Act and associated regulations require that analysis be undertaken to determine the average service level that has been provided over the last 10 years, and the service level that is applied to future growth cannot exceed the 10 year historical average.

6.1 10 Year Historical Road Infrastructure Value

The road service level is measured through the 10 year historical road infrastructure value, which is calculated by the total road infrastructure value per population and employment. An inventory of City of Brampton's infrastructure for each year between 2009 and 2018 was provided by the City, which includes all arterial roads and collectors for the following elements:

- Roadways (including sidewalks and landscaping / tree planting)
- Property ROW
- Bridges
- Culverts
- Traffic signals
- Illumination
- Rail grade separations
- Noise attenuation barriers (noise wall)

The average 10-year historical road infrastructure value is summarized in **Table 6-1**, while details are provided in **Appendix C**.

Table 6-1: 10 Year Historic Road Infrastructure Value

Year	Road Infrastructure Value ($ 000)	Population	Employment	Capita (Pop + Emp)	Road Infrastructure Value per Capita ($)
2009	$ 5,015,436.5	485,808	155,914	641,723	7,816
2010	$ 5,130,426.3	504,495	159,165	663,660	7,731
2011	$ 5,188,252.9	523,900	162,490	686,390	7,559
2012	$ 5,275,009.6	537,275	165,928	703,203	7,501
2013	$ 5,435,026.7	550,992	169,444	720,437	7,544
2014	$ 5,544,271.8	565,059	173,040	738,100	7,512
2015	$ 5,641,989.7	579,485	176,718	756,204	7,461
2016	$ 5,663,218.0	594,280	180,480	774,760	7,310
2017	$ 5,764,500.8	607,036	184,386	791,423	7,284
2018	$ 5,827,165.3	620,067	188,398	808,464	7,208
Average	**$ 5,448,529.8**	**556,840**	**171,596**	**728,436**	**7,492**

Source: City of Brampton, April 2019

6.2 Findings of the Forecast Service Level Analysis

Based on the average road infrastructure value per capita and the expected growth between 2019 and 2041, the maximum allowable infrastructure improvement value is $3,047 million, as shown in the calculations in **Table 6-2**.

Table 6-2: Roads Service Level Summary

Year	Population	Employment	Capita (Pop + Emp)	Road Infrastructure Value per Capita ($)	Road Infrastructure Value ($ Million)
Average 10-Year Historical (2009-2018)	556,840	171,596	728,436	$ 7,492	$ 5,448.53
Incremental Growth 2019-2041 (Max Allowable)	270,173	136,442	406,616	$ 7,492	$ 3,046.52

7 Transit Ridership Forecast

This section documents the ridership forecast methodology, key assumptions, and the results of the forecasts, which were used to inform the growth rate and post-period benefit calculations for the transit DC. It is noted that HDR's scope is limited to developing the transit ridership forecast, and the planned level of service for transit services was conducted by the City's DC consultant, Hemson.

7.1 Requirements of the Development Charges Act

As per the new requirements of the DC Act and associated regulations that came into effect on January 1, 2016, transit service must be treated as a discrete service. Generally, it is understood that this provision is intended to preclude combining the Roads and Transit services into a broader transportation DC service.

Transit services must be based on a "planned level of service" rather than the "10-year historical average level of service". The definition of planned level of service is not explicitly stated in the Act, but it requires any background study to include the following items:

- An assessment of ridership forecast for all modes of transit and whether ridership is generated from existing or planned development.
- An assessment of ridership capacity for all modes of transit over the 10-year forecast period.

The DC Act requires that in estimating the increase in need for Transit services, the increased need "shall not exceed the planned level of service over the 10-year period immediately following the preparation of the background study".

7.2 Forecast Methodology and Key Assumptions

The planned level of transit service is informed by the provincial, regional, and the City's planning context, including the Metrolinx RTP, City's current and proposed capital budgets, the City's 2014 Transportation Master Plan Update, and on-going projects such as the Queen Street Rapid Transit and Hurontario-Main LRT Extension. The travel demand model examined the proposed 2031 transit network, including the following major transit network improvements:

- Queen Street Bus Rapid Transit (BRT), which includes BRT on Queen Street and Highway 50 between Brampton Downtown Terminal and Vaughan Metropolitan Centre (VMC);
- Hurontario LRT between Port Credit GO and Gateway Terminal;
- Brampton LRT Extension, which is the extension of the Hurontario LRT from Gateway Terminal to Brampton GO Terminal through Main Street;
- Züm service on Bovaird, Steeles, Mississauga, Bramalea, and Airport, as recommended in the City's 2014 TMP Update; and
- Regional Express Rail, a project by Metrolinx to provide all-day, two-way service to GO Rail lines, including the Kitchener GO Rail line.

The 2041 transit network includes additional Züm Service on Sandalwood, Mississauga Züm Extension, Chinguacousy, and Kennedy.

The City's travel demand model was utilized to estimate the transit ridership for 2011, 2031, and 2041 planning horizons. Interim year ridership from 2011 to 2019 and 2019 to 2028 were calculated by the City's DC consultant based on shares of population and employment growth forecast. The forecasted transit ridership includes both local transit and rapid transit (Züm, BRT and LRT) for the PM Peak Period (3-7pm).

The ridership includes total transit riders, related to origin and destination trips in the City's network. It is not equivalent to transit boardings. For example, if a person boards a Züm service in Brampton and transfers to a Brampton local transit service to reach their destination, this trip would be counted as two boardings, but only as one transit trip.

7.3 Ridership Forecast

The transit ridership forecast in the PM Peak Period is summarized in **Table 7-1**. Two sets of ridership forecasts are presented in **Table 7-1**. One includes all modes of transit, including GO Rail, GO Bus, and Brampton Transit; whereas the other set summarizes riders who have used Brampton Transit for a portion of their trips (including the Hurontario-Main LRT Extension in Brampton). This excludes riders who access the City using *only* GO Rail, GO Bus, or transit lines from other municipalities that start/end in Brampton. These numbers are able to capture Brampton transit usage more accurately, and are used as inputs to the benefit to existing, including prior growth and post-period benefit allocations for transit projects.

Scenario A, E, and F are the ridership forecasts for 2011, 2041, and 2031 horizon years with their respectable land use assumptions. Scenario B, C, and D assign various land use scenarios on network scenarios: 2031 land use on 2011 network, 2041 land use on 2011 network, and 2041 land use in 2031 network. By applying the anticipated population and employment in 2041 to the proposed 2031 transit network, the total PM peak trips are anticipated to increase from 28,995 in 2011 (base) to 69,343 in 2041 (2031 network).

The difference between Scenario B and A provides the increased ridership due to transit improvements in 2031; similarly, the difference between Scenario C and A shows the increase in ridership due to transit improvements in 2041.

These ridership numbers were further analyzed by the City's DC consultant Hemson to calculate the benefit to existing, in-period, and post-period allocations.

Table 7-1: Transit Ridership Forecast, PM Peak Period (3-7 PM)

Scenario	Land Use	Network	PM Peak Period Transit Trips, including all modes			
			Origin from Brampton	Destination to Brampton	Within Brampton	Total
PM Peak Period Transit Trips, including all modes						
A	2011	2011	19,840	29,502	14,018	35,324
B	2011	2031	23,496	38,170	15,461	46,205
C	2011	2041	24,182	39,564	16,115	47,631
D	2041	2031	47,568	63,754	32,002	79,320
E	2041	2041	50,923	67,611	34,411	84,123
F	2031	2031	40,383	57,265	26,759	70,889
PM Peak Period Transit Trips, Brampton Transit only						
A	2011	2011	17,636	25,148	13,789	28,995
B	2011	2031	21,724	34,145	15,220	40,649
C	2011	2041	22,619	35,730	15,899	42,450
D	2041	2031	43,570	56,898	31,125	69,343
E	2041	2041	47,859	62,328	33,819	76,368
F	2031	2031	37,812	52,102	26,318	63,596

8 Cost Estimates and Allocations

This section summarizes the total roads program cost. Detailed road infrastructure improvements and a map displaying their locations can be found in **Appendix D**.

8.1 Roads Program Costs Summary

The total capital cost to implement the recommended transportation strategy from 2019 to 2041, inclusive of road widenings, new construction, urbanization, reconstruction, intersection improvements and active transportation improvements, totals approximately $1.75 billion (2018$). Road widening accounted for the majority of the total DC program at 57% while the construction of new roads comprised 8% and property acquisitions was 13%.

Table 8-1: Estimated City of Brampton DC (2019) Costs by Project Type

Project Type		Total ($ Million)	Distribution	
Roadway Improvements	4 to 6 lane widening	$605.96	34.5%	57.0%
	2 to 4 lane widening and urbanization	$136.75	7.8%	
	2 to 4 lane widening	$257.32	14.7%	
	New 2 lane road	$14.71	0.8%	8.2%
	New 4 lane road	$97.35	5.5%	
	New 6 lane road	$31.94	1.8%	
	2 lane urbanization	$14.67	0.8%	2.7%
	4 lane urbanization	$33.57	1.9%	
	Reconstruction	$2.44	0.1%	0.1%
	Structure	$78.81	4.5%	4.5%
	Total Roadway Improvements	**$1,273.00**	**72.5%**	
Other Improvements	Traffic Signals and Intersection Improvements (Outside Roads Program)	$62.21	3.5%	
	Sidewalks	$13.80	0.8%	
	Active Transportation Projects (ATMP)	$37.04	2.1%	
	Gateways	$4.82	0.3%	
	Noise Wall Retrofit	$38.12	2.2%	
	Property Acquisition	$230.00	13.1%	
	Grade Separation	$85.19	4.9%	
	Completion of Hwy 410/Countryside Interchange	$10.70	0.6%	
Total		**$1,754.88**	**100.0%**	
Previous DC		**$1,574.79**		
Change from the previous DC		**11.4%**		

Note: not including NSTC DC and post-2041 improvements

8.2 Growth / Non-Growth Allocation

This section summarizes the recommended allocation of project costs to growth (DC eligible) and non-growth (to be funded by the municipality). The growth related costs are referred to as “Benefit to Growth” or BTG, while non-growth related costs are often referred to as “Benefit to Existing” or BTE.

8.2.1 Recommended Allocation Methodology

The BTE-BTG assumptions were based on the allocations used in the 2014 Brampton DC and additional inputs from the City Staff. **Table 8-2** outlines the percentage allocation behind attributing the whole or a portion of an improvement type to existing development. It is noted that based on the City’s local servicing policy, the funding for certain types of collector roadways is shared between the local developer and the DC fund in a 50/50 or 65/35 local/DC split.

Table 8-2: 2014 Brampton DC Study Cost Allocation

Improvement Type	Benefit to Growth		Benefit to Existing / Non-Growth	Note
	Local Service	DC		
2 to 4 Lane Widening and Urbanization	0%	95%	5%	Consistent with 2014 DC
2 to 4 Lane Widening	0%	95%	5%	
2 to 6 Lane Widening	0%	95%	5%	
4 to 6 lane Widening	0%	90%	10%	
New Roads	0%	100%	0%	
New Structure	0%	95-100%	0-5%	
Reconstruction	0%	95%	5%	
Local Service – Roads	65% or 50%	35% or 50%	0%	Based on recent road and structure cost share and discussion with the City. 50% Local Service for roads in subdivisions that have already gone through Block Plan and roads that are already in cost sharing agreements.
Local Service – Structures	50%	50%	0%	
Active Transportation Improvements	0%	31%	69%	Based on future share of population and employment growth

8.2.2 Summary of Costs

Approximately 88.3% of the capital improvement cost is eligible for cost recovery through the Development Charges while 5.2% fall under the Local Service. The remaining 6.5% of expenditures could be financed from the residential tax base. A summary of the costs split by BTE and BTG is provided in **Table 8-3**.

Table 8-3: Benefit to Existing and Benefit to Growth

BTE/BTG Split	Total ($ Million)	Distribution
Developer / Local Service	$91.00	5.2%
Growth DC (BTG)	$1,550.39	88.3%
Non-Growth DC (BTE)	$113.49	6.5%
Total	**$1,754.88**	**100%**

Note: not including NSTC DC and post-2041 improvements

8.3 Timing

The implementation timing for each project is based on the City's 2019 Draft Capital Budget, 2031 and 2041 modelling results, and the recommendations in the 2014 DC and 2015 Transportation Master Plan Update. The recommended timing for each project is provided in **Appendix D**.

Appendices

Appendix A: Road Improvement Validation

2019 Brampton DC Transportation Background Study Final Report
Appendix A - Road Improvement Validation
HDR
07/26/2019

Projects not validated:
Tender/Construction in 2019

Legend

Best	Neautral	Worst

Project #	Project	From	To	Project Type	2041 Do Nothing Modelling			Multiple Account Evaluation								Recommend for Improvements before 2041
								Policies			Vehicular LOS		Connectivity			
					V/C>0.85	# of Lanes per direction	Lane Capacity	OP 4.5 a	OP 4.5 b	OP 4.5 c	Screenline	Link	Network Continuity	Local Travel	Efficient Routing	
1	Bramalea Road	Southern Boundary	Queen Street	4 to 6 lane widening	Yes						congested	V/C>0.85				Yes
2	Bramalea Road	Queen Street	Bovaird Dr	4 to 6 lane widening	Yes						congested	V/C>0.85				Yes
4	Castlemore Road	McVean Dr	The Gore Rd	4 to 6 lane widening	Yes						congested	V/C>0.85				Yes
5	Castlemore Road	The Gore Rd	Highway 50	4 to 6 lane widening	Yes						congested	V/C>0.85				Yes
6	Chinguacousy Road	Bovaird Dr	Wanless Dr	4 to 6 lane widening	Yes						congested	V/C>0.85				Yes
7	Chinguacousy Road	Wanless Dr	Mayfield Rd	2 to 4 lane widening and urbanization	No	1	900				not congested	V/C<0.85	Provide better connection and provide opportunities to improve walk/bike travel			Yes
8	Clark Boulevard	Rutherford Rd	Dixie Rd (500m East of Dixie)	4 to 6 lane widening	Yes						congested	V/C>0.85				Yes
9	Clark Boulevard Extension	Hansen Rd	Rutherford Rd	new 4 lane road	n/a						congested	n/a				Yes
11	Clarkway Drive	Castlemore Rd	Countryside Dr	2 to 4 lane widening and urbanization	Yes						congested	V/C>0.85				Yes
12	Clarkway Drive	Countryside Dr	Mayfield Rd	2 to 4 lane widening	Yes						congested	V/C>0.85				Yes
13	Conservation Drive	Highway 10 / Hurontario St	Kennedy Rd	2 to 4 lane widening	Yes						congested	V/C>0.85				Yes
14	Cottrelle Blvd	Humberwest Pkwy	Goreway Dr	new 4 lane road	n/a						congested	n/a				Yes
15	Countryside Drive	The Gore Rd	Clarkway Dr	2 to 4 lane widening and urbanization	Yes						congested	V/C>0.85				Yes
16	Countryside Drive	Clarkway Dr	Highway 50	2 to 4 lane widening and urbanization	Yes						congested	V/C>0.85				Yes
17	Creditview Road	Wanless Dr	Mayfield Rd	2 to 4 lane widening and urbanization	Yes						congested	V/C>0.85				Yes
18	Denison Street Extension	Park St	Mill St	new 2 lane road	n/a						congested	n/a				Yes
20	Eastern Avenue	Kennedy Rd	Hansen Rd	2 to 4 lane widening	No	1	500				congested	V/C<0.85	Provide better connection and provide opportunities to improve walk/bike travel			Yes
21	Ebenezer Road	Queen St	Highway 50	4 to 6 lane widening	Yes						congested	V/C>0.85				Yes
22	Financial Drive Extension	Highway 407 (Hallstone Rd	Southern Boundary	2 to 4 lane widening	Yes						congested	V/C>0.85				Yes
23	Goreway Drive	Humberwest Parkway	Castlemore Rd	2 to 4 lane widening	Yes						congested	V/C>0.85				Yes
24	Goreway Drive	Castlemore Rd	Countryside Dr	2 to 4 lane widening	Yes						congested	V/C>0.85				Yes
25	Goreway Drive	Countryside Dr	Mayfield Rd	2 to 4 lane widening	No	1	900				congested	V/C<0.85	Provide better connection and provide opportunities to improve walk/bike travel			Yes
26	Heritage Road	Steeles Ave	Financial Dr	2 to 4 lane widening and urbanization	Yes						congested	V/C>0.85				Yes
27	Heritage Road	Financial Dr	Rivermont Rd	2 to 4 lane widening and urbanization	Yes						congested	V/C>0.85				Yes
28	Heritage Road	Rivermont Rd	Bovaird Dr	2 to 4 lane widening	Yes						congested	V/C>0.85				Yes
29	Heritage Road	Bovaird Dr	Wanless Dr	2 to 4 lane widening	Yes						congested	V/C>0.85				Yes
31	Heritage Road	Wanless Dr	Mayfield Rd	2 to 4 lane widening	No	1	900				congested	V/C<0.85	Provide better connection and provide opportunities to improve walk/bike travel			Yes
32	Highway 10 / Hurontario St	Bovaird Dr	Northern City Boundary	4 lane urbanization	n/a						n/a	n/a				Yes
33	Humberwest Parkway	Airport Rd	Williams Parkway	4 to 6 lane widening	n/a						congested	V/C>0.85				Yes
35	Inspire Boulevard	Russel Creek Dr	Sleighbell Rd	new 2 lane road	n/a						congested	n/a				Yes
36	Inspire Boulevard	Sleighbell Rd	Bramalea Rd	new 2 lane road	n/a						congested	n/a				Yes
38	Inspire Boulevard	Bramalea Rd	Countryside Dr	new 2 lane road	n/a						congested	n/a				Yes
39	Intermodal Drive	Airport Rd	CNR Bridge	2 to 4 lane widening	Yes						congested	V/C>0.85				Yes
40	John Street	Truman Street	Centre Street	reconstruction	n/a						n/a	n/a				Yes
41	Ken Whillans Drive	Church St	Nelson St	new 2 lane road	n/a						congested	n/a				Yes
42	Lagerfeld Drive (East West Connection)	Credtiview Road	Winston Churchill Blvd	new 4 lane road	n/a						congested	n/a				Yes

Project # in 2018 DC	Project	From	To	Project Type	2041 Do Nothing Modelling			Multiple Account Evaluation								Recommend for Improvements before 2041
								Policies			Vehicular LOS		Connectivity			
					V/C>0.85	# of Lanes per direction	Lane Capacity	OP 4.5 a	OP 4.5 b	OP 4.5 c	Screenline	Link	Network Continuity	Local Travel	Efficient Routing	
44	McLaughlin Road	Queen St	Steeles Ave	4 to 6 lane widening	Yes						congested	V/C>0.85				Yes
46	McVean Drive	Castlemore Rd	Countryside Dr	2 to 4 lane widening	Yes						congested	V/C>0.85				Yes
47	McVean Drive	Countryside Dr	Mayfield Rd	2 to 4 lane widening and urbanization	No	1	900				not congested	V/C<0.85	Provide better connection and provide opportunities to improve walk/bike travel			Yes
48	New East/West Road (Major MacKenzie ex	New North/South Road	The Gore Rd	new 4 lane road	n/a						congested	n/a				Yes
49	New North/South Road (Major MacKenzie e	Highway 50/Coleraine	Clarkway Dr	new 4 lane road	n/a						congested	n/a				Yes
51	Orenda Road	Dixie Rd	Bramalea Rd	2 to 4 lane widening	Not evaluated - recommendation based on EA study, which concluded the road widening was not required till post 2041											Yes
52	Remembrance Road	Chinguacousy Road	Abercrombie Cres	new 4 lane road	n/a						congested	n/a				Yes
54	Rivermont Road	Lionhead Golf Club Rd	Heritage Rd	new 4 lane road	n/a						congested	n/a				Yes
76	Rivermont Road	Heritage Rd	Winston Churchill Blvd	new 4 lane road	n/a						congested	n/a				Yes
55	Rivermont Road	South Limit	North Limit (Dalbeattie Dr)	new 4 lane road	n/a						congested	n/a				Yes
57	Sandalwood Parkway Extension	Mayfield	Heritage Rd	new 4 lane road	n/a						congested	n/a				Yes
58	Sandalwood Parkway Extension	Heritage Rd	Mississauga Rd	new 4 lane road	n/a						congested	n/a				Yes
59	Sandalwood Parkway	McLaughlin Rd	Heart Lake Rd	4 to 6 lane widening	Yes						congested	V/C>0.85				Yes
60	Sandalwood Parkway	Dixie Rd	Bramalea Rd	4 to 6 lane widening	Yes						congested	V/C>0.85				Yes
61	Sandalwood Parkway	Bramalea Rd	Torbram Rd	4 to 6 lane widening	Yes						congested	V/C>0.85				Yes
62	Sandalwood Parkway	Torbram Rd	Airport Rd	4 to 6 lane widening	Yes						congested	V/C>0.85				Yes
63	Torbram Road	South City Limit	Queen St	4 to 6 lane widening	Yes						congested	V/C>0.85				Yes
64	Torbram Road	Queen St	Bovaird Dr	4 to 6 lane widening	Yes						congested	V/C>0.85				Yes
65	Torbram Road	Bovaird Dr	Countryside Dr	4 to 6 lane widening	Yes						congested	V/C>0.85				Yes
66	Torbram Road	Countryside Dr	Mayfield Rd	4 to 6 lane widening	No	2	700				congested	V/C<0.85	Six lane road could be a barrier for people who walk and bike			No
67	Wanless Drive	Winston Churchill Blvd	Mississauga Rd	2 lane urbanization	n/a						n/a	n/a				Yes
68	Wanless Drive	Winston Churchill Blvd	Mississauga Rd	2 to 4 lane widening	Yes						congested	V/C>0.85				Yes
69	Williams Parkway Extension	Mississauga Rd	Heritage Rd	new 4 lane road	n/a						congested	n/a				Yes
71	Williams Parkway	McLaughlin Rd	Kennedy Rd	4 to 6 lane widening	Yes						congested	V/C>0.85				Yes
72	Williams Parkway	Kennedy Rd	North Park Dr	4 to 6 lane widening	Yes						congested	V/C>0.85				Yes
73	Williams Parkway	North Park Dr	Torbram Rd	4 to 6 lane widening	Yes						congested	V/C>0.85				Yes
74	Williams Parkway	Torbram Rd	Humberwest Pkwy	4 to 6 lane widening	Yes						congested	V/C>0.85				Yes

Appendix B: NSTC Validation

Memo

Date:	Wednesday, April 10, 2019
Project:	Brampton DC Transportation Background Study
To:	City of Brampton
From:	HDR
Subject:	North-South Transportation Corridor Validation

Background

This memorandum documents the methodology and results for the North-South Transportation Corridor (NSTC) validation as part of the City of Brampton Development Charge (DC) Transportation Background study.

The 2014 DC and 2015 TMP recommended the NSTC as a new six-lane road from Heritage Road just south of Highway 407 at the southern boundary of the City to northern boundary of the City at Mayfield Road. Since the completion of the 2014 DC, further study for a portion of the NSTC was completed through the Bram West Parkway and Financial Drive Class EA (completed in 2016, herein after referred to as the Bram West EA) examined the needs for the following segments in details:

- Bram West Parkway (NSTC) from Heritage Road to Financial Drive; and
- Extension of Financial Drive from Heritage Road to Winston Churchill Boulevard.

The study recommended the following improvements:

- Six-through lanes for Bram West Parkway between Financial Drive and Steeles Avenue;
- Four-through lanes for Bram West Parkway between Steeles Avenue and Highway 407;
- Two-through lanes for Bram West Parkway south of Highway 407; and
- Four-through lanes for Financial Drive Extension.

The recommended improvements based on the 2014 DC and the 2016 Bram West EA are summarized in **Table 1**. The validation work is focused on the Bram West Parkway from Financial Drive to Mayfield Road (project 5 and 6 in **Table 1**), and recommendations in the 2016 Bram West EA are acknowledge and assumed in the Do Nothing scenario (project 1-4 in **Table 1**). Locations of the NSTC corridor, Bram West EA study area, and the validation focus area for this study are shown in **Figure 1**.

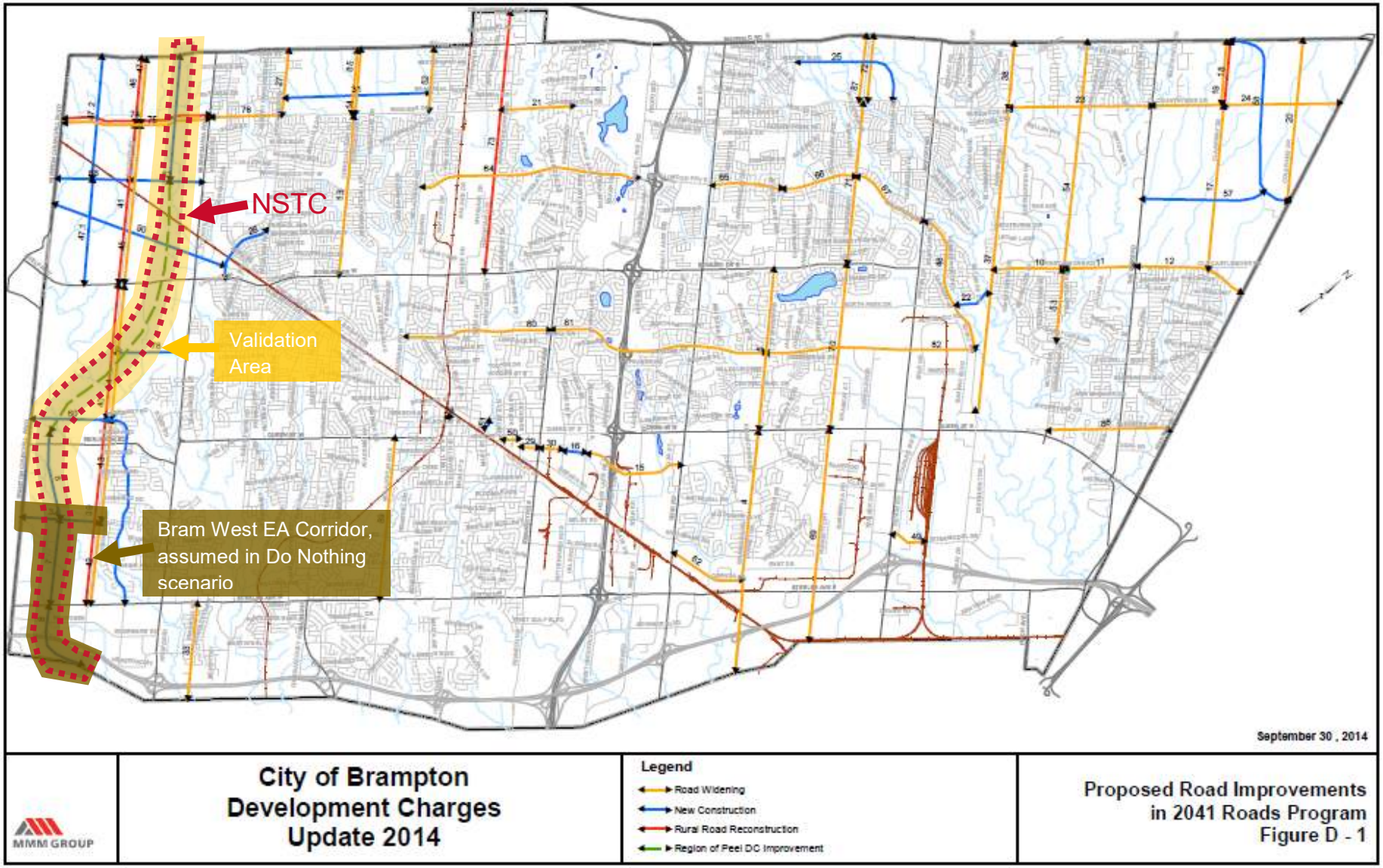
Table 1: NSTC Project Validation

#	Road	From	To	Status	Improvement	Timing in 2014 DC
1	Financial Drive Extension	Heritage Rd	Winston Churchill Blvd	EA completed in 2016 [1]	New 4 lane road	2021
2	Bramwest Parkway (NSTC)	Financial Dr	Steeles Ave		New 6 lane road	2021
3	Bramwest Parkway (NSTC)	Steeles Ave	Highway 407		New 4 lane road	2021
4	Bramwest Parkway (NSTC)	Highway 407	Heritage Rd		New 2 lane road	2021
5	Bramwest Parkway (NSTC)	Financial Dr	Sandalwood Pkwy	To be further validated	New 6 lane road	n/a *
6	Bramwest Parkway (NSTC)	Sandalwood Pkwy	Mayfield Road		New 6 lane road	2022

* Note: this segment was assumed to be under Region of Peel DC Improvement in the 2014 DC. To understand the needs for the transportation system for the entire City of Brampton, this segment was included in the validation process.

[1] Source: Bram West Parkway and Financial Drive Class EA, http://www.brampton.ca/en/residents/Roads/Pages/road-works-details.aspx/1485/Bram-West-Parkway-and-Financial-Drive

Figure 1: Location of the NSTC



Multiple Account Evaluation Framework

The NSTC corridor was evaluated using the Multiple Account Evaluation Framework (MAE). The framework evaluates the project against three major criteria: policies, vehicular level-of-service (LOS), and connectivity. The framework is summarized in **Figure 2** with details in the following sections.

Figure 2: Multiple Account Evaluation Framework

Policies

There are several policies in effect that should be considered when evaluating the need for transportation infrastructure projects. Taken from the City's Official Plan, the following policies will be used in the multiple account evaluation process:

- Official Plan Objectives 4.5 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;
- Official Plan Objectives 4.5 b: To ensure the provision of adequate and accessible road, transit, pedestrian and bicycle links within Brampton and between Brampton and adjacent municipalities;
- Official Plan Objectives 4.5 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.

Vehicular Level-of-Service

Vehicular LOS is the second account that will be used in evaluating the transportation infrastructure projects. It is important to understand the level of traffic demand against the available transportation capacity to determine where additional capacity is needed. Two methodologies will be used in considering vehicular LOS: screenline analysis and link delay.

Firstly, screenline analysis is used to measure the vehicular LOS for a specified area surrounding the potential improvement. It uses a volume to capacity (V/C) analysis to determine where there is a capacity deficiency in the area. The volume to capacity ratio reflects peak hour traffic demand measured against roadway capacity.

Secondly, link delay specifically examines the volume over capacity ratio for the specific project, without and with improvement.

A description of the v/c ratios is provided in **Table 2**.

Table 2: Link V/C Ratios and Operating Conditions

V/C Ratio	Level of Service (LOS)	Operating Condition
Less than 0.85	LOS A-C	Free-flow, very little, to moderate delay
Between 0.85 and 0.99	LOS D-E	Approaching or at capacity, users experience delays and queuing
Greater than 1.00	LOS F	Over capacity, severe delays, and queuing

Connectivity

Connectivity is the third account used for the multiple account evaluation framework. It assesses the transportation infrastructure projects based on its ability to:

- Maximize network continuity between adjacent blocks;
- Provide for local travel within and between City blocks without the necessity of travelling on arterial streets; and
- Provide for effective routing of transit vehicles, cycling network, and the pedestrian network.

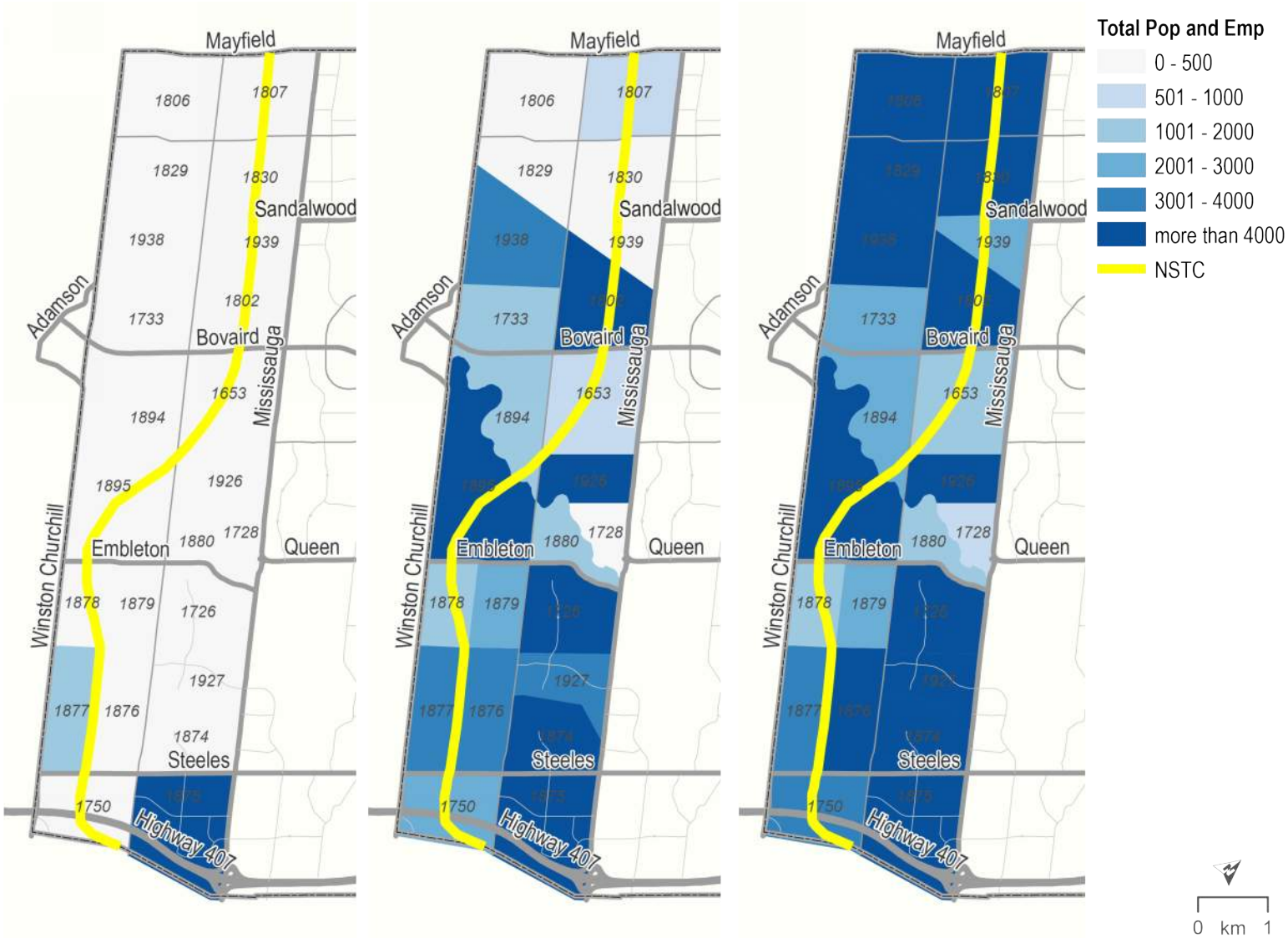
Land Use

To inform timing and to understand the growth in the areas that the NSTC will directly serve, the 2011, 2031, and 2041 population and employment in the traffic zones which the NSTC traverses are summarized in **Table 3** and illustrated in **Figure 3**. Most of the growth will occur before 2031 for areas south of Embleton Road, whereas areas in the north will expect the growth after 2031, especially for the areas north of Sandalwood Parkway.

Table 3: Population and Employment Forecast

Zone	2011 Pop	2011 Emp	2031 Pop	2031 Emp	2041 Pop	2041 Emp
NSTC, Heritage Road to Embleton						
1726	38	73	4,320	290	4,760	320
1879	-	-	1,220	1,150	1,330	1,360
1878	118	-	330	1,430	360	1,580
1876	41	22	40	3,620	40	4,120
1877	47	1,255	20	3,540	20	3,730
1874	-	285	5,100	1,290	5,800	1,450
1927	-	-	2,630	1,100	2,900	1,210
1750	-	64	10	2,460	10	3,270
1875	-	4,367	-	7,220	-	7,950
Total	244	6,066	13,670	22,100	15,220	24,990
NSTC, Embleton to Bovaird						
1895	133	95	6,830	1,340	7,520	1,500
1880	-	70	1,420	80	1,580	100
1926	71	72	5,450	770	8,530	3,430
1894	-	-	870	220	1,460	960
1653	-	-	570	90	950	460
1728	364	71	450	40	480	40
Total	568	308	15,590	2,540	20,520	6,490
NSTC, Bovaird to Sandalwood						
1802	-	174	3,110	4,440	5,780	6,210
1939	-	-	30	170	1,730	870
1733	224	15	1,150	100	1,910	160
1938	60	18	3,580	250	5,980	420
Total	284	207	7,870	4,960	15,400	7,660
NSTC, Sandalwood to Mayfield						
1807	-	-	40	590	2,720	3,620
1806	-	24	30	140	3,460	3,350
1829	-	-	30	-	5,150	350
1830	-	-	20	-	5,850	1,210
Total	-	24	120	730	17,180	8,530

Figure 3: 2011, 2031 and 2041 Total Zonal Population and Employment along the NSTC



2011 Pop and Emp

2031 Pop and Emp

2041 Pop and Emp

Analysis and Evaluation

To determine the impact of the road improvements summarized in the above sections, an EMME analysis was conducted on the 2041 PM Peak Hour base scenario (without improvement) and with the road improvements. **Figure 4** illustrates the volume to capacity ratio and auto volumes for the project validation area, with and without improvement, in the PM peak hour in 2041. **Table 4** shows detailed volume to capacity ratio for four screenlines, south of Mayfield Road, north of Sandalwood Parkway, north of Bovaird Drive, and North of Embleton Road. Congestion between Embleton Road to Sandalwood Drive was reduced with the NSTC, although even with the six-lane widening, congestion is still expected between Embleton Road to Bovaird Drive.

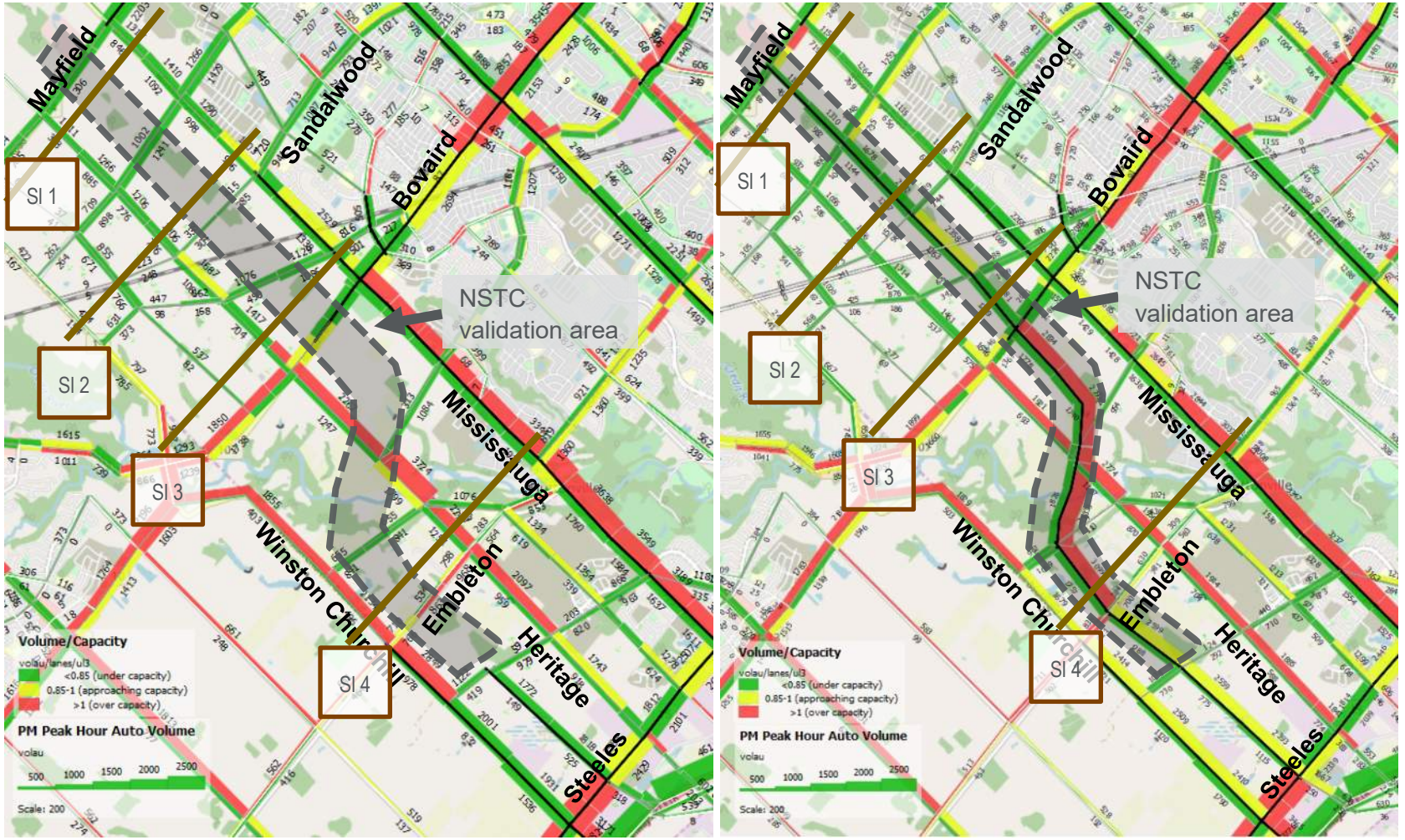
Table 4: Volume of Capacity Ratio at Screenlines, 2041 PM Peak hour, without and With NSTC

Road	Lane per Dir	Lane Capacity (per hour)	Total Capacity		Total Volume		Total V/C	
			Without NSTC	With NSTC	Without NSTC	With NSTC	Without NSTC	With NSTC
Screenline 1: South of Mayfield Rd (between Sandalwood and Mayfield)								
Mississauga Rd	2	900	1,800	1,800	1,317	1,150	0.73	0.64
Winston Churchill Blvd	1	900	900	900	498	455	0.55	0.51
Heritage Rd	2	900	1,800	1,800	1,111	815	0.62	0.45
NSTC	3	900	-	2,700	-	1,107	-	0.41
Total	**8**		**4,500**	**7,200**	**2,926**	**3,527**	**0.65**	**0.49**
Screenline 2: North of Sandalwood Pkwy (between Sandalwood and Mayfield)								
Mississauga Rd	2	900	1,800	1,800	1,603	1,428	0.89	0.79
Winston Churchill Blvd	1	900	900	900	433	253	0.48	0.28
Heritage Rd	2	900	1,800	1,800	1,206	1,056	0.67	0.59
NSTC	3	900	-	2,700	-	2,032	-	0.75
Total	**8**		**4,500**	**7,200**	**3,242**	**4,769**	**0.72**	**0.66**
Screenline 3: North of Bovaird Dr (between Bovaird and Sandalwood)								
Mississauga Rd	3	900	2,700	2,700	2,452	2,356	0.91	0.87
Winston Churchill Blvd	1	900	900	900	987	850	1.10	0.94
Heritage Rd	2	900	1,800	1,800	1,896	1,616	1.05	0.90
NSTC	3	900	-	2,700	-	1,981	-	0.73
Total	**9**		**5,400**	**8,100**	**5,335**	**6,803**	**0.99**	**0.84**
Screenline 4: North of Embleton Rd (between Embleton and Bovaird)								
Mississauga Rd	3	900	2,700	2,700	4,356	4,008	1.61	1.48
Winston Churchill Blvd	2	900	1,800	1,800	2,134	1,679	1.19	0.93
Heritage Rd	2	900	1,800	1,800	2,277	1,956	1.27	1.09
NSTC	3	900	-	2,700	-	3,099	-	1.15
Total	**10**		**6,300**	**9,000**	**8,767**	**10,742**	**1.39**	**1.19**

Legend

Under capacity	Approaching capacity	Over capacity
V/C < 0.85	V/C between 0.85 to 1	V/C > 1

Figure 4: 2041 PM Peak Hour Volume to Capacity Ratio with and without NSTC



2041 Without NSTC

2041 With NSTC (six-lane)

In the baseline scenario, parallel roads including Mississauga Road, Heritage Road, and Winston Churchill Road experience significant congestion due to the increase in population and employment. With the six-lane widening, the same area experiences less congestion as traffic has spread onto the NSTC.

Table 5 summarizes the multiple account evaluation for the NSTC, broken down into three sections:

- Financial Drive to Bovaird Drive
- Bovaird Drive to Sandalwood Parkway
- Sandalwood Parkway to Mayfield Road

Table 5: Multiple Account Evaluation Framework for NSTC

Project Area		NSTC		NSTC		NSTC	
Project		Financial Drive to Bovaird Drive		Bovaird Drive to Sandalwood Pkwy		Sandalwood Pkwy to Mayfield Road	
Framework		Without NSTC	With NSTC (6 lanes)	Without NSTC	With NSTC (6 lanes)	Without NSTC	With NSTC (6 lanes)
Policies	Policy 1	**No** Does not provide sufficient options to move people and goods	**Neutral** The new connection could create an opportunity to develop a balanced, integrated, and accessible multi-modal network	**Neutral** The existing network provide sufficient options to move people and goods	**Neutral** The new connection could create an opportunity to develop a balanced, integrated, and accessible multi-modal network	**Neutral** The existing network provide sufficient options to move people and goods	**No** New six-lane road would encourage vehicle usage and discourage the use of public transit
	Policy 2	**No** Does not provide adequate road, transit, pedestrian, and bicycle links	**Yes** Provide additional link for road, transit, pedestrian, and bicycle links within Brampton and to adjacent municipalities	**No** Does not provide adequate road, transit, pedestrian, and bicycle links	**Yes** Provide additional link for road, transit, pedestrian, and bicycle links within Brampton and to adjacent municipalities	**No** Does not provide adequate road, transit, pedestrian, and bicycle links	**Yes** Provide additional link for road, transit, pedestrian, and bicycle links within Brampton and to adjacent municipalities
	Policy 3	**No** Lack of connections leads to road congestions and does not foster strong live-work relationships	**Neutral** Additional connection reduces congestions and fosters strong live-work relationships, but six-lane road could also encourage vehicle use	**Neutral** Existing network provides sufficient capacity to ensure an efficient transportation system and support the growth in the future	**Neutral** Additional connection reduces congestions and fosters strong live-work relationships, but six-lane road could also encourage vehicle use	**Yes** Existing network provides sufficient capacity to ensure an efficient transportation system and support the growth in the future	**No** New six-lane road would encourage vehicle usage and discourage the use of public transit
Vehicular LOS	Screenline Analysis	**No** More congestion is experienced on the arterial network surrounding the NSTC	**Yes** NSTC reduces congestion on the arterial network surrounding the VMC	**Neutral** Acceptable degree of congestion on the arterial network surround the NSTC	**Neutral** Little to no congestion on the arterial network surround the NSTC	**Neutral** Little to no congestion on the arterial network surround the NSTC	**Neutral** Little to no congestion on the arterial network surround the NSTC
	Link Delay	N/A due to new project	**Neutral** NSTC is at capacity	N/A due to new project	**Neutral** NSTC is approaching capacity	N/A due to new project	**Neutral** NSTC is under capacity
Connectivity	Network Continuity	**No** Provides minimum north-south connections to adjacent areas as there are only 2 continuous connections	**Yes** Provides additional north-south connections to adjacent arterials	**No** Provides minimum north-south connections to adjacent areas as there are only 2 continuous connections	**Yes** Provides additional north-south connections to adjacent arterials	**No** Provides minimum north-south connections to adjacent areas as there are only 2 continuous connections	**Yes** Provides additional north-south connections to adjacent arterials
	Local Travel	**No** Does not provide sufficient connectivity for local travel as there is limited connections	**Yes** Provides local travel due to a finer grid network	**No** Does not provide sufficient connectivity for local travel as there is limited connections	**Yes** Provides local travel due to a finer grid network	**No** Does not provide sufficient connectivity for local travel as there is limited connections	**Yes** Provides local travel due to a finer grid network
	Efficient Routing	**No** Existing network does not provide efficient routing	**Yes** Connected and finer grid system provides for the effective routing of transit vehicles, cyclists, and pedestrians.	**No** Existing network does not provide efficient routing	**Yes** Connected and finer grid system provides for the effective routing of transit vehicles, cyclists, and pedestrians.	**No** Existing network does not provide efficient routing	**Yes** Connected and finer grid system provides for the effective routing of transit vehicles, cyclists, and pedestrians.
RESULT		**Recommend 6-lane road**		**Recommend 4-lane road**		**Recommend 2-lane road**	

Legend: Best, Neutral, and **Worst Performing Option**

Recommendations and Timing

Based on the evaluation and projected land use in 2031 and 2041, the following recommendations are made for NSTC (Bram West Parkway):

Medium term improvements (before 2031):

- Six-through lanes between Financial Drive and Bovaird Drive. This segment is recommended before 2031 due to the forecasted population and employment growth (shown in **Table 3**), where the majority of the growth south of Bovaird Drive is expected before 2031. The screenline between Embleton Road and Bovaird Drive is expected to be over capacity by 2031, as shown in **Table 6** and **Figure 5**.

Long-term improvements (before 2041):

- Four-through lanes between Bovaird Drive and Sandalwood Parkway; and
- Two-through lanes between Sandalwood Parkway to Mayfield Road.

Post-period improvements (after 2041), protect corridor for:

- Four to six lane widening between Bovaird Drive and Sandalwood Parkway; and
- Two to four lane widening between Sandalwood Parkway to Mayfield Road.

Through discussion with the Region of Peel, the Region will be responsible for the following segments of the NSTC and thus these improvements are not included in the Brampton DC program:

- New six lane construction between Rivermont Road and Bovaird Drive
- New four lane construction between Bovaird Drive and Sandalwood Parkway

It is noted that even with the new six-lane road, the NSTC and parallel routes are still expected to be over capacity across the Credit River and south of Bovaird Drive. It is recommended that further planning work in the Bram West and Northwest Brampton areas consider high-occupancy vehicle (HOV) lanes or dedicated bus lanes on the NSTC to encourage more efficient mobility. Land use planning should integrate a complete active transportation network around transit-oriented activity nodes, and transportation demand management (TDM) measures should be incorporated into development approvals.

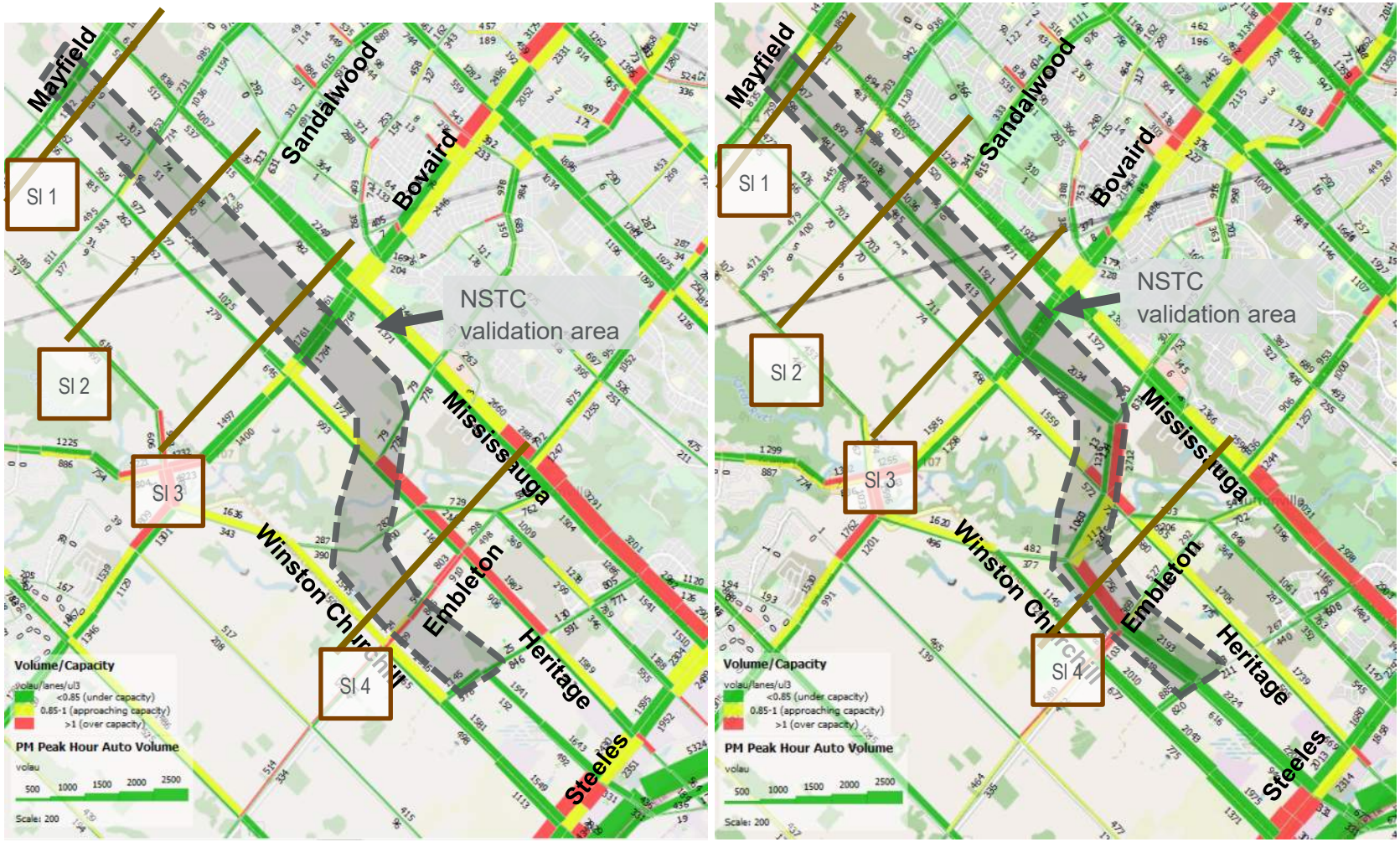
Table 6: 2031 PM Peak Hour Traffic Volume at Screenline 4 – between Embleton Road and Bovaird Drive

Road	Lane per Dir	Lane Capacity (per hour)	Total Capacity		Total Volume		Total V/C	
			Without NSTC	With NSTC	Without NSTC	With NSTC	Without NSTC	With NSTC
Mississauga Rd	3	900	2,700	2,700	3,911	3,561	1.45	1.32
Winston Churchill Blvd	2	900	1,800	1,800	1,545	1,145	0.86	0.64
Heritage Rd	2	900	1,800	1,800	2,151	1,665	1.19	0.92
NSTC	3	900	-	2,700	-	2,756	-	1.02
Total	**10**		**6,300**	**9,000**	**7,607**	**9,127**	**1.21**	**1.01**

Legend

Under capacity	Approaching capacity	Over capacity
V/C < 0.85	V/C between 0.85 to 1	V/C > 1

Figure 5: 2031 PM Peak Hour Volume to Capacity Ratio with and without NSTC



2031 Without NSTC

2031 With NSTC (six-lane)

Appendix C: Historical Roads Service Level

ROADS & RELATED

Source: City of Brampton, April 2019

INVENTORY OF CAPITAL ASSETS

ROAD NETWORK	# of Centreline kms										UNIT COST
# of Lanes	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	($/km)
2 Lanes	202.4	200.1	194.7	198.6	197.2	203.8	207.4	204.3	206.1	208.3	$2,250,000
3 Lanes	1.9	1.9	1.9	1.9	1.9	1.9	2.7	3.3	3.3	3.3	$2,495,000
4 Lanes	138.6	147.0	154.5	157.5	157.5	160.0	163.0	164.3	168.2	169.1	$2,740,000
5 Lanes	25.5	25.6	25.6	25.6	25.6	25.6	25.6	25.6	25.6	26.0	$3,635,000
6 Lanes	8.8	8.8	8.8	8.8	14.9	14.9	14.9	14.9	14.9	14.9	$4,530,000
7 Lanes	0.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	$4,530,000
Total (kms)	**377.5**	**384.6**	**386.7**	**393.6**	**398.3**	**407.3**	**414.7**	**413.4**	**419.2**	**422.7**	
Total ($000)	**$973,913.3**	**$996,066.5**	**$1,004,429.1**	**$1,021,391.5**	**$1,045,798.9**	**$1,067,280.6**	**$1,085,501.2**	**$1,083,515.9**	**$1,098,322.8**	**$1,107,255.9**	

RIGHT-OF-WAY PROPERTY	# of Acres										UNIT COST
# of Lanes	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	($/acre)
2 Lanes	999.7	988.6	962.0	981.2	974.3	1,006.5	1,024.4	1,009.2	1,018.0	1,029.1	$1,575,000
3 Lanes	10.9	10.9	10.9	10.9	10.9	10.9	15.2	18.5	18.5	18.5	$1,575,000
4 Lanes	890.3	944.1	992.1	1,011.4	1,011.6	1,027.6	1,046.8	1,054.9	1,080.3	1,085.7	$1,575,000
5 Lanes	227.0	227.6	227.6	227.6	227.6	227.6	227.6	227.6	227.6	231.4	$1,575,000
6 Lanes	97.9	97.9	97.9	97.9	165.2	165.2	165.2	165.2	165.2	165.2	$1,575,000
7 Lanes	3.1	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	$1,575,000
Total (acres)	**2,228.9**	**2,282.0**	**2,303.4**	**2,341.9**	**2,402.5**	**2,450.7**	**2,492.1**	**2,488.4**	**2,522.5**	**2,542.8**	
Total ($000)	**$3,510,452.7**	**$3,594,147.5**	**$3,627,841.0**	**$3,688,420.7**	**$3,784,006.5**	**$3,859,874.9**	**$3,925,037.8**	**$3,919,167.4**	**$3,972,898.8**	**$4,004,943.5**	

BRIDGES	Total Deck Area (m^2)										UNIT COST
Structure Type	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	($/$m^2$)
O-RR	5,873	5,873	5,873	5,873	5,873	5,873	5,873	5,873	5,873	5,873	$5,500
O-WAT	24,280	24,280	25,177	25,177	31,612	31,612	33,210	33,210	37,202	38,507	$5,500
U-RR	665	665	665	665	665	665	665	665	1,618	1,618	$5,500
Total (m^2)	**30,818**	**30,818**	**31,715**	**31,715**	**38,150**	**38,150**	**39,748**	**39,748**	**44,693**	**45,998**	
Total ($000)	**$169,497.0**	**$169,497.0**	**$174,433.8**	**$174,433.8**	**$209,826.0**	**$209,826.0**	**$218,613.0**	**$218,613.0**	**$245,810.7**	**$252,988.4**	

CULVERTS	Total Deck Area (m^2)										UNIT COST
Structure Type	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	($/$m^2$)
O-PED	1,018	1,018	1,018	1,018	1,018	1,018	1,018	1,018	1,018	1,018	$5,500
O-WAT	27,838	27,982	28,567	29,310	29,310	30,966	31,003	31,235	31,659	33,853	$5,500
Total (m^2)	**28,856**	**29,000**	**29,585**	**30,328**	**30,328**	**31,984**	**32,020**	**32,253**	**32,677**	**34,871**	
Total ($000)	**$158,709.4**	**$159,498.6**	**$162,719.4**	**$166,803.3**	**$166,803.3**	**$175,909.7**	**$176,112.7**	**$177,390.5**	**$179,722.3**	**$191,790.9**	

TRAFFIC SIGNALS	# of Signals										UNIT COST
Description	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	($/signal)
Traffic Signals	213	240	266	286	299	308	328	338	347	356	$199,000
Total (#)	**213**	**240**	**266**	**286**	**299**	**308**	**328**	**338**	**347**	**356**	
Total ($000)	**$42,387.0**	**$47,760.0**	**$52,934.0**	**$56,914.0**	**$59,501.0**	**$61,292.0**	**$65,272.0**	**$67,262.0**	**$69,053.0**	**$70,844.0**	

ILLUMINATION	# of Centreline kms										UNIT COST
Description	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	($/km)
Number of Centreline kms with Illumination	175	184	192	195	201	204	207	209	213	214	$289,000
Total (kms)	**175**	**184**	**192**	**195**	**201**	**204**	**207**	**209**	**213**	**214**	
Total ($000)	**$50,621.2**	**$53,319.1**	**$55,476.4**	**$56,345.5**	**$58,108.7**	**$58,824.5**	**$59,907.4**	**$60,442.0**	**$61,584.5**	**$61,952.1**	

RAIL GRADE SEPARATIONS	# of Grade Separations										UNIT COST
Description	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	($/unit)
Number of Rail Grade Separations	4	4	4	4	4	4	4	5	5	5	$25,000,000
Total (kms)	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**5**	**5**	**5**	
Total ($000)	**$100,000.0**	**$100,000.0**	**$100,000.0**	**$100,000.0**	**$100,000.0**	**$100,000.0**	**$100,000.0**	**$125,000.0**	**$125,000.0**	**$125,000.0**	

NOISE BARRIERS	Total Metres of Noise Barriers										UNIT COST
Description	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	($/metre)
Metres of Noise Barriers (Concrete)	3,500	3,600	3,700	3,800	3,900	4,000	4,100	4,200	4,300	4,400	$2,816
Total (m)	**3,500**	**3,600**	**3,700**	**3,800**	**3,900**	**4,000**	**4,100**	**4,200**	**4,300**	**4,400**	
Total ($000)	**$9,856.0**	**$10,137.6**	**$10,419.2**	**$10,700.8**	**$10,982.4**	**$11,264.0**	**$11,545.6**	**$11,827.2**	**$12,108.8**	**$12,390.4**	

ROAD NETWORK	Summary of Road Infrastructure Value ($000s)									
Asset Type	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
ROAD NETWORK	$973,913	$996,066	$1,004,429	$1,021,392	$1,045,799	$1,067,281	$1,085,501	$1,083,516	$1,098,323	$1,107,256
RIGHT-OF-WAY PROPERTY	$3,510,453	$3,594,148	$3,627,841	$3,688,421	$3,784,006	$3,859,875	$3,925,038	$3,919,167	$3,972,899	$4,004,944
BRIDGES	$169,497	$169,497	$174,434	$174,434	$209,826	$209,826	$218,613	$218,613	$245,811	$252,988
CULVERTS	$158,709	$159,499	$162,719	$166,803	$166,803	$175,910	$176,113	$177,390	$179,722	$191,791
TRAFFIC SIGNALS	$42,387	$47,760	$52,934	$56,914	$59,501	$61,292	$65,272	$67,262	$69,053	$70,844
ILLUMINATION	$50,621	$53,319	$55,476	$56,345	$58,109	$58,825	$59,907	$60,442	$61,584	$61,952
RAIL GRADE SEPARATIONS	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$125,000	$125,000	$125,000
NOISE BARRIERS	$9,856	$10,138	$10,419	$10,701	$10,982	$11,264	$11,546	$11,827	$12,109	$12,390
Total ($000)	**$5,015,436.5**	**$5,130,426.3**	**$5,188,252.9**	**$5,275,009.6**	**$5,435,026.7**	**$5,544,271.8**	**$5,641,989.7**	**$5,663,218.0**	**$5,764,500.8**	**$5,827,165.3**
Total ($ Million)	**$5,015.4**	**$5,130.4**	**$5,188.3**	**$5,275.0**	**$5,435.0**	**$5,544.3**	**$5,642.0**	**$5,663.2**	**$5,764.5**	**$5,827.2**

APPENDIX C
TABLE 1 - PAGE 2

CITY OF BRAMPTON
INVENTORY OF CAPITAL ASSETS
PARKS & RECREATION DEPARTMENT
ROADS & RELATED

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Historic Population	485,808	504,495	523,900	537,275	550,992	565,059	579,485	594,280	607,036	620,067
Historic Employment	155,914	159,165	162,490	165,928	169,444	173,040	176,718	180,480	184,386	188,398
Total Historic Population & Employment	**641,723**	**663,660**	**686,390**	**703,203**	**720,437**	**738,100**	**756,204**	**774,760**	**791,423**	**808,464**

INVENTORY SUMMARY ($000)

Total ($000)	**$5,015,436.5**	**$5,130,426.3**	**$5,188,252.9**	**$5,275,009.6**	**$5,435,026.7**	**$5,544,271.8**	**$5,641,989.7**	**$5,663,218.0**	**$5,764,500.8**	**$5,827,165.3**	
SERVICE LEVEL ($/pop & emp)											**Average Service Level**
Total ($/pop & emp)	**$7,815.58**	**$7,730.50**	**$7,558.75**	**$7,501.40**	**$7,544.07**	**$7,511.55**	**$7,460.94**	**$7,309.64**	**$7,283.72**	**$7,207.70**	**$7,492.38**

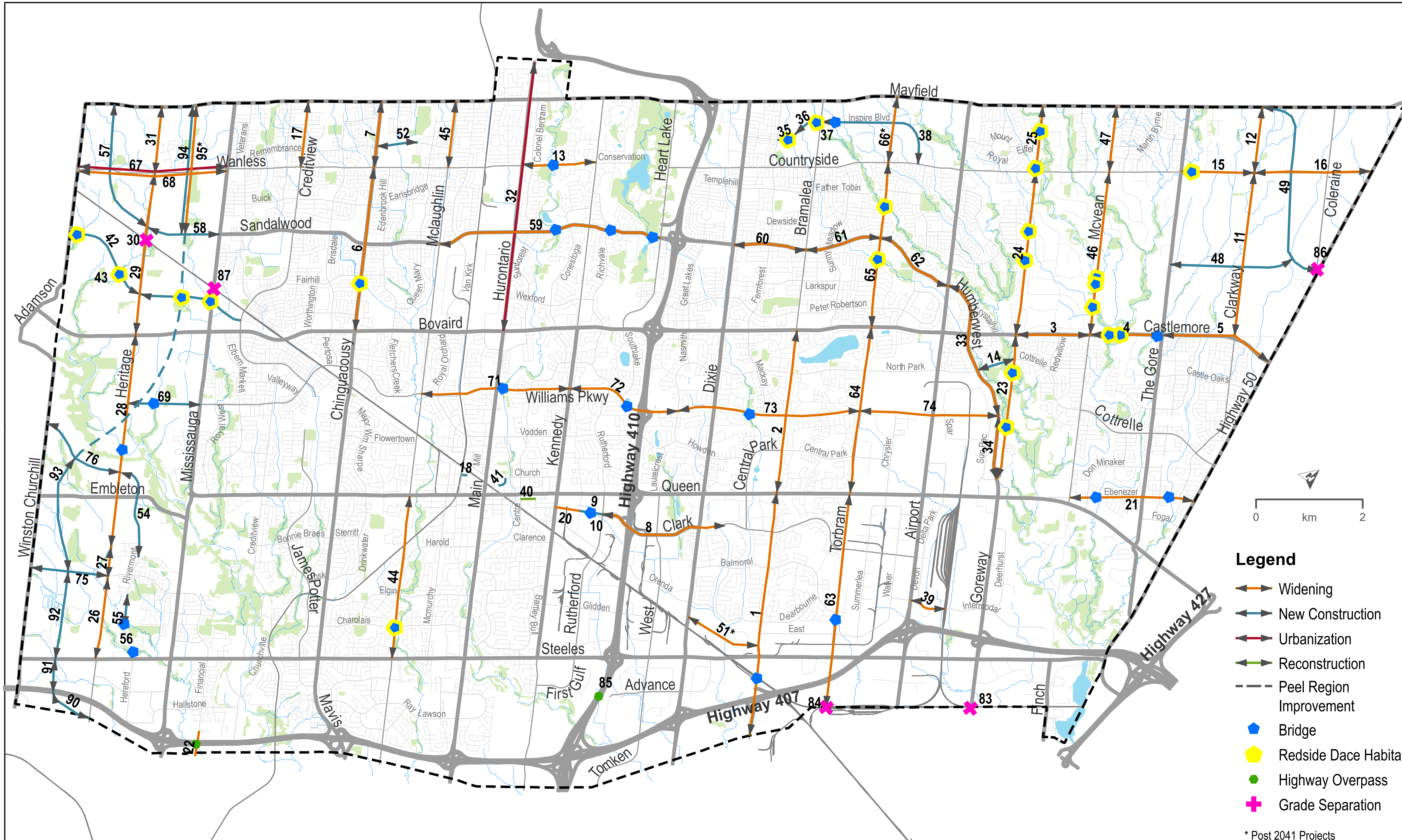
Appendix D: Road Infrastructure Improvements

2019 Brampton DC Transportation Background Study Final Report
Appendix D - Roads Infrastructure Improvements
HDR
7/26/2019

Project #	Project	From	To	Timing	Recommend before 2041	Section Length (km)	Existing # Lanes	Future # Lanes	Existing Cross Section	Future Cross Section	Road Class	Project Type	Project Code	Project Type 2	EA Needed (Y/N)	EA size
ROAD PROJECTS																
1	Bramalea Road	Southern Boundary	Queen Street	2031	Yes	4.60	4	6	Urban	Urban	Minor Arterial	4 to 6 lane widening	W4-6-UMinA	Widening	N	
2	Bramalea Road	Queen Street	Bovaird Dr	2031	Yes	3.00	4	6	Urban	Urban	Minor Arterial	4 to 6 lane widening	W4-6-UMinA	Widening	Y	S
3	Castlemore Road	Goreway Dr	McVean Dr	2019		1.50	4	6	Urban	Urban	Major Arterial	4 to 6 lane widening	W4-6-UMajA	Widening	N	
4	Castlemore Road	McVean Dr	The Gore Rd	2022	Yes	1.30	4	6	Urban	Urban	Major Arterial	4 to 6 lane widening	W4-6-UMajA	Widening	Y	M
5	Castlemore Road	The Gore Rd	Highway 50	2031	Yes	2.05	4	6	Urban	Urban	Major Arterial	4 to 6 lane widening	W4-6-UMajA	Widening	Y	M
6	Chinguacousy Road	Bovaird Dr	Wanless Dr	2031-2041	Yes	3.10	4	6	Urban	Urban	Major Arterial	4 to 6 lane widening	W4-6-UMajA	Widening	Y	M
7	Chinguacousy Road	Wanless Dr	Mayfield Rd	2020	Yes	1.20	2	4	Rural	Urban	Major Arterial	2 to 4 lane widening and urba	WU-2-4-UMajA	Widening	N	
8	Clark Boulevard	Rutherford Rd	Dixie Rd (500m East of Dix	2023	Yes	2.30	4	6	Urban	Urban	Major Arterial	4 to 6 lane widening	W4-6-UMajA	Widening	N	
9	Clark Boulevard Extension	Hansen Rd	Rutherford Rd	2031	Yes	0.43	-	4		Urban	Minor Arterial	new 4 lane road	NC-4UMinA-SD	New Construct	N	
10	Clark Boulevard Extension **Structure**	Hansen Rd	Rutherford Rd	2031	Yes						Structure	Structure				
11	Clarkway Drive	Castlemore Rd	Countryside Dr	2031	Yes	3.10	2	4	Rural	Urban	Minor Arterial	2 to 4 lane widening and urba	WU-2-4-UMinA	Widening	Y	M
12	Clarkway Drive	Countryside Dr	Mayfield Rd	2031-2041	Yes	1.25	2	4	Urban	Urban	Minor Arterial	2 to 4 lane widening	W2-4UMinA	Widening	Y	M
13	Conservation Drive	Highway 10 / Hurontario St	Kennedy Rd	2031	Yes	1.30	2	4	Urban	Urban	Minor Arterial	2 to 4 lane widening	W2-4UMinA	Widening	Y	S
14	Cottrelle Blvd	Humberwest Pkwy	Goreway Dr	2019	Yes	0.80	-	4		Urban	Collector	new 4 lane road	NC-4UCol	New Construct	Y	S
15	Countryside Drive	The Gore Rd	Clarkway Dr	2022	Yes	1.40	2	4	Rural	Urban	Minor Arterial	2 to 4 lane widening and urba	WU-2-4-UMinA	Widening	N	
16	Countryside Drive	Clarkway Dr	Highway 50	2024	Yes	2.20	2	4	Rural	Urban	Minor Arterial	2 to 4 lane widening and urba	WU-2-4-UMinA	Widening	N	
17	Creditview Road	Wanless Dr	Mayfield Rd	2031-2041	Yes	1.30	2	4	Rural	Urban	Minor Arterial	2 to 4 lane widening and urba	WU-2-4-UMinA	Widening	Y	S
18	Denison Street Extension	Park St	Mill St	2022	Yes	0.10	-	2		Urban	Collector	new 2 lane road	NC-2UCol-SD	New Construct	Y	S
20	Eastern Avenue	Kennedy Rd	Hansen Rd	2036-2041	Yes	0.46	2	4	Urban	Urban	Minor Arterial	2 to 4 lane widening	W2-4UMinA	Widening	N	
21	Ebenezer Road	Queen St	Highway 50	2031-2041	Yes	2.40	4	6	Urban	Urban	Collector	4 to 6 lane widening	W4-6U-ColA	Widening	Y	S
22	Financial Drive Extension	Highway 407 (Hallstone Road)	Southern Boundary	2031	Yes	0.90	2	4	Urban	Urban	Collector	2 to 4 lane widening	W2-4UCol	Widening	Y	S
75	Financial Drive Extension	Heritage Rd	Winston Churchill Blvd	2031-2041	Yes	1.50	-	4		Urban	Collector	new 4 lane road	NC-4UCol-SD	New Construct	N	
23	Goreway Drive	Humberwest Parkway	Castlemore Rd	2020	Yes	2.75	2	4	Urban	Urban	Major Arterial	2 to 4 lane widening	W2-4UMajA	Widening	N	
24	Goreway Drive	Castlemore Rd	Countryside Dr	2020	Yes	3.10	2	4	Urban	Urban	Major Arterial	2 to 4 lane widening	W2-4UMajA	Widening	N	
25	Goreway Drive	Countryside Dr	Mayfield Rd	2023	Yes	1.24	2	4	Urban	Urban	Major Arterial	2 to 4 lane widening	W2-4UMajA	Widening	N	
26	Heritage Road	Steeles Ave	Financial Dr	2031	Yes	1.60	2	4	Rural	Urban	Minor Arterial	2 to 4 lane widening and urba	WU-2-4-UMinA	Widening	N	
27	Heritage Road	Financial Dr	Rivermont Rd	2031	Yes	0.50	2	4	Rural	Urban	Minor Arterial	2 to 4 lane widening and urba	WU-2-4-UMinA	Widening	N	
28	Heritage Road	Rivermont Rd	Bovaird Dr	2031	Yes	4.10	2	4	Urban	Urban	Minor Arterial	2 to 4 lane widening	W2-4UMinA	Widening	Y	S
29	Heritage Road	Bovaird Dr	Wanless Dr	2031	Yes	3.00	2	4	Urban	Urban	Minor Arterial	2 to 4 lane widening	W2-4UMinA	Widening	Y	M
30	Heritage Road **Grade Separation**	Bovaird Dr	Wanless Dr	2031	Yes						Structure	Structure				
31	Heritage Road	Wanless Dr	Mayfield Rd	2036-2041	Yes	1.20	2	4	Urban	Urban	Minor Arterial	2 to 4 lane widening	W2-4UMinA	Widening	Y	M
32	Highway 10 / Hurontario St	Bovaird Dr	Northern City Boundary	2031-2041	Yes	5.00	4	4	Rural	Urban	Major Arterial	4 lane urbanization	UR-4MajA	New Construct	Y	L
33	Humberwest Parkway	Airport Rd	Williams Parkway	2019	Yes	2.80	4	6	Urban	Urban	Major Arterial	4 to 6 lane widening	W4-6-UMajA	Widening	N	
34	Humberwest Parkway	Williams Parkway	Goreway Dr	2019		1.20	4	6	Urban	Urban	Major Arterial	4 to 6 lane widening	W4-6-UMajA	Widening	N	
35	Inspire Boulevard	Russel Creek Dr	Sleighbell Rd	2019	Yes	0.35	-	2		Urban	Collector	new 2 lane road	NC-2UCol-SD	New Construct	N	
36	Inspire Boulevard	Sleighbell Rd	Bramalea Rd	2021	Yes	0.45	-	2		Urban	Collector	new 2 lane road	NC-2UCol-SD	New Construct	N	
37	Inspire Boulevard **Structures**	Russel Creek Dr	Countryside Dr	2021	Yes						Structure	Structure				
38	Inspire Boulevard	Bramalea Rd	Countryside Dr	2021	Yes	2.40	-	2		Urban	Collector	new 2 lane road	NC-2UCol-SD	New Construct	N	
39	Intermodal Drive	Airport Rd	CNR Bridge	2022	Yes	0.70	2	4	Urban	Urban	Collector	2 to 4 lane widening	W2-4UCol	Widening	N	
40	John Street	Truman Street	Centre Street	2019	Yes	0.50	2	2	Urban	Urban	Minor Arterial	reconstruction	RC-2MinA	Reconstruction	N	
41	Ken Whillans Drive	Church St	Nelson St	2031-2041	Yes	0.30	-	2		Urban	Collector	new 2 lane road	NC-2UCol-SD	New Construct	N	
42	Lagerfeld Drive (East West Connection)	Credtview Road	Winston Churchill Blvd	2031	Yes	3.45	-	4		Urban	Collector	new 4 lane road	NC-4UCol-SD	New Construct	N	
43	Lagerfeld Drive (East West Connection)	Credtview Road	Winston Churchill Blvd	2031	Yes						Structure	Structure				
44	McLaughlin Road	Queen St	Steeles Ave	2031	Yes	3.10	4	6	Urban	Urban	Minor Arterial	4 to 6 lane widening	W4-6-UMinA	Widening	Y	S
45	McLaughlin Road	Wanless Dr	Mayfield Rd	2019		1.20	2	4	Urban	Urban	Minor Arterial	2 to 4 lane widening	W2-4UMinA	Widening	N	
46	McVean Drive	Castlemore Rd	Countryside Dr	2023	Yes	3.10	2	4	Urban	Urban	Minor Arterial	2 to 4 lane widening	W2-4UMinA	Widening	Y	M
47	McVean Drive	Countryside Dr	Mayfield Rd	2036-2041	Yes	1.30	2	4	Rural	Urban	Minor Arterial	2 to 4 lane widening and urba	WU-2-4-UMinA	Widening	Y	M
48	New East/West Road (Major MacKenzie	New North/South Road	The Gore Rd	2021	Yes	2.40	-	4		Urban	Minor Arterial	new 4 lane road	NC-4UMinA-SD	New Construct	N	
49	New North/South Road (Major MacKenz	Highway 50/Coleraine	Clarkway Dr	2031-2041	Yes	3.90	-	4		Urban	Major Arterial	new 6 lane road	NC-6UMajA	New Construct	N	
51	Orenda Road	Dixie Rd	Bramalea Rd	post 2041	No	1.44	2	4	Urban	Urban	Collector	2 to 4 lane widening	W2-4UCol	Widening	N	
52	Remembrance Road	Chinguacousy Road	Abercrombie Cres	2020	Yes	0.80	-	4		Urban	Collector	new 4 lane road	NC-4UCol-SD	New Construct	N	
54	Rivermont Road	Lionhead Golf Club Rd	Heritage Rd	2031	Yes	1.80	-	4		Urban	Collector	new 4 lane road	NC-4UCol-SD	New Construct	N	
76	Rivermont Road	Heritage Rd	Winston Churchill Blvd	2031	Yes	1.80	-	4		Urban	Collector	new 4 lane road	NC-4UCol-SD	New Construct	N	
55	Rivermont Road	South Limit	North Limit (Dalbeattie Dr)	2020	Yes	0.61	-	4		Urban	Collector	new 4 lane road	NC-4UCol-SD	New Construct	N	
56	Rivermont Road **Structure**	South Limit	North Limit	2020							Structure	Structure				
72	Williams Parkway	Kennedy Rd	North Park Dr	2020	Yes	2.18	4	6	Urban	Urban	Minor Arterial	4 to 6 lane widening	W4-6-UMinA	Widening	N	
73	Williams Parkway	North Park Dr	Torbram Rd	2031	Yes	3.50	4	6	Urban	Urban	Minor Arterial	4 to 6 lane widening	W4-6-UMinA	Widening	Y	
74	Williams Parkway	Torbram Rd	Humberwest Pkwy	2031-2041	Yes	2.60	4	6	Urban	Urban	Minor Arterial	4 to 6 lane widening	W4-6-UMinA	Widening	N	
						133.02										
77	Traffic Signals and Intersection Improve	City Wide, 8 intersections per year		2019-2041	Yes							Traffic Signals and Intersection Improvements (Outside Roads P			N	
78	Sidewalks	City Wide, 600K per year		2019-2041	Yes							Sidewalks			N	
79	Active Transportation Projects (ATMP)	City Wide		2019-2041	Yes							Active Transportation Projects (ATMP)			N	
80	Gateways	City Wide, 17 gateways for $292.6k each (cost inflated from		2019-2041	Yes							Gateways			N	
81	Noise Wall Retrofit	City Wide		2019-2041	Yes							Noise Wall Retrofit			N	
82	Completion of Hwy 410/Countryside Int	Highway 410 / Countryside		2019-2041	Yes							Completion of Hwy 410/Countryside Int			N	
83	Goreway Drive & CN Halton Line Grade Separation Widening (Phase 1)			2019	Yes							Grade Separation				
84	Torbram Road and CN Halton Line Grade Separation			2019	Yes							Grade Separation				
85	Hwy 410 Overpass @ Biscayne Creek/Westcreek.			2031-2041	Yes							Grade Separation				
86	SP47 at Highway 50 Grade Separation			2031-2041	Yes							Grade Separation				
87	Mississauga Road Crossing over CN Railway Grade Separation			2031-2041	Yes							Grade Separation				
88	Property Acquisition	City Wide, $10M per year		2019-2041	Yes							Property Acquisition			N	
Total (by 2041 only, excluding NSTC)																
Bramwest Parkway (NSTC)																
90	Bramwest Parkway (NSTC)	Heritage Rd	Highway 407	2031-2041	Yes	0.50	-	2		Urban	Major Arterial	new 2 lane road	NC-2UMajA	New Construct		
91	Bramwest Parkway (NSTC)	Highway 407	Steeles Ave	2031-2041	Yes	0.85	-	4		Urban	Major Arterial	new 4 lane road	NC-4UMajA	New Construct		
92	Bramwest Parkway (NSTC)	Steeles Ave	Financial Dr	2031-2041	Yes	1.65	-	6		Urban	Major Arterial	new 6 lane road	NC-6UMajA	New Construct		
93	Bramwest Parkway (NSTC)	Financial Dr	Rivermont Rd	2031	Yes	2.20	-	6		Urban	Major Arterial	new 6 lane road	NC-6UMajA	New Construct	Y	
94	Bramwest Parkway (NSTC)	Sandalwood Parkway	Mayfield	2031-2041	Yes	2.40	-	2		Urban	Major Arterial	new 2 lane road	NC-2UMajA	New Construct	Y	
95	Bramwest Parkway (NSTC)	Sandalwood Parkway	Mayfield	post 2041	No	2.40	2	4	Urban	Urban	Major Arterial	2 to 4 lane widening	W2-4UMajA	Widening	Y	M
Total NSTC (by 2041 only)						10.00										
															N	

Project #	Redside Dace Impacts (Y/N)	# of Int 3-Way	# of Int 4-Way	# of Int Total	# of Signalized Int. 3-Way	4-Way	Flashing Beacon	Total	Bus Bays / # Major Int with Transit	# of Rd. Culverts	# of Str. Culverts	# of Str.	BM Cost ($M/km)	Rdwy Cost ($M)	Signal Cost ($M)	Intersection Cost	Bus Bays ($M)	Queue Jump Lane ($M)	HOV ($M)	Road Culverts	Structural Culverts ($M)	Structures ($M)
1	N	8	8	**16**	3	7	1	**11**	3	0	0	1	$ 4.64	$ 21.33	$ 3.02	$ 1.204	$ 0.209	$ 0.385	$ 0.211	$ -	$ -	$ 3.65
2	N	1	7	**8**	0	7	0	**7**	3	0	0	0	$ 4.64	$ 13.91	$ 1.92	$ 0.753	$ 0.209	$ 0.385	$ 0.137	$ -	$ -	$ -
3																						
4	Y	0	2	**2**	0	2	0	**2**	2	0	0	3	$ 4.64	$ 6.03	$ 0.55	$ 0.201	$ 0.139	$ -		$ -	$ -	$ 3.65
5	N	4	3	**7**	4	3	0	**7**	3	0	3	0	$ 4.64	$ 9.50	$ 1.92	$ 0.502	$ 0.209	$ -		$ -	$ 4.13	$ -
6	Y	1	7	**8**	1	7	0	**8**	3	1	0	1	$ 4.64	$ 14.37	$ 2.20	$ 0.753	$ 0.209	$ -		$ 0.008	$ -	
7																						
8	N	1	6	**7**	1	6	0	**7**	2	0	2	0	$ 4.64	$ 10.66	$ 1.92	$ 0.652	$ 0.139	$ -	$ 0.105	$ -	$ 2.75	$ -
9	N	0	1	**1**	0	1	0	**1**	0	0	0	0	$ 2.74	$ 1.18	$ 0.20	$ 0.100	$ -	$ -		$ -	$ -	
10																						$ 7.84
11	N	0	4	**4**	0	4	0	**4**	2	0	1	0	$ 3.64	$ 11.27	$ 1.10	$ 0.401	$ 0.139	$ -		$ -	$ 1.01	$ -
12	N	0	2	**2**	0	2	0	**2**	2	0	0	0	$ 3.64	$ 4.55	$ 0.55	$ 0.201	$ 0.139	$ -		$ -	$ -	$ -
13	N	2	4	**6**	0	1	0	**1**	0	0	1	1	$ 3.64	$ 4.73	$ 0.27	$ 0.502	$ -	$ -		$ -	$ 1.01	$ 2.69
14	N	0	2	**2**	0	2	0	**2**	0	0	2	0	$ 3.45	$ 2.76	$ 0.40	$ 0.201	$ -	$ -		$ -	$ 2.03	$ -
15	Y	0	2	**2**	0	2	0	**2**	2	0	2	1	$ 3.64	$ 5.09	$ 0.55	$ 0.201	$ 0.139	$ -		$ -	$ 2.03	
16	Y	0	3	**3**	0	3	0	**3**	3	2	1	0	$ 3.64	$ 8.00	$ 0.82	$ 0.301	$ 0.209	$ -		$ 0.015	$ 1.01	$ -
17	N	0	4	**4**	0	1	0	**1**	2	0	0	0	$ 3.64	$ 4.73	$ 0.27	$ 0.401	$ 0.139	$ 0.257		$ -	$ -	$ -
18	N	0	1	**1**	0	1	0	**1**	0	0	0	0	$ 2.25	$ 0.22	$ 0.20	$ 0.100	$ -	$ -		$ -	$ -	$ -
20	N	0	1	**1**	0	1	0	**1**	0	0	0	0	$ 3.64	$ 1.67	$ 0.27	$ 0.100	$ -	$ -		$ -	$ -	$ -
21	N	2	7	**9**	1	4	0	**5**	2	0	0	2	$ 4.64	$ 11.13	$ 1.37	$ 0.803	$ 0.139	$ -		$ -	$ -	$ 7.29
22	N	0	1	**1**	0	1	0	**1**	0	0	0	1	$ 3.52	$ 3.17	$ 0.27	$ 0.100	$ -	$ -		$ -	$ -	$ 9.13
75	N	1	2	**3**	1	2	0	**3**	0	2	0	0	$ 2.65	$ 3.98	$ 0.60	$ 0.251	$ -	$ -		$ 0.015	$ -	$ -
23	Y	2	2	**4**	2	2	0	**4**	2	0	1	2	$ 3.64	$ 10.00	$ 1.10	$ 0.301	$ 0.139	$ -		$ -	$ 1.01	
24	Y	3	6	**9**	0	5	0	**5**	2	0	2	2	$ 3.64	$ 11.27	$ 1.37	$ 0.753	$ 0.139	$ -		$ -	$ 2.03	
25	Y	4	2	**6**	1	2	0	**3**	2	0	0	2	$ 3.64	$ 4.51	$ 0.82	$ 0.401	$ 0.139	$ -		$ -	$ -	
26																						
27																						
28	N	1	3	**4**	1	3	0	**4**	4	0	1	1	$ 3.64	$ 14.91	$ 1.10	$ 0.351	$ 0.278	$ -		$ -	$ 1.01	$ 2.69
29	N	0	5	**5**	0	5	0	**5**	3	2	0	0	$ 3.64	$ 10.91	$ 1.37	$ 0.502	$ 0.209	$ -		$ 0.015	$ -	$ -
30																						$ 6.08
31	N	0	3	**3**	0	3	0	**3**	2	0	0	0	$ 3.64	$ 4.36	$ 0.82	$ 0.301	$ 0.139	$ -		$ -	$ -	$ -
32	N	3	9	**12**	2	9	0	**11**	4	0	1	0	$ 3.64	$ 18.19	$ 2.19	$ 1.054	$ 0.278	$ 0.513		$ -	$ 1.01	$ -
33	Y	2	2	**4**	1	2	0	**3**	0	0	0	1	$ 4.64	$ 12.98	$ 0.82	$ 0.30	$ -	$ -	$ 0.128			
34	Y	1	2	**3**	1	1	0	**2**	0	3	0	0	$ 4.64	$ 5.56	$ 0.55	$ 0.25	$ -	$ -		$ 0.023	$ -	$ -
35	Y	1	1	**0**	0	0	0	**0**	0	0	0	0	$ 2.25	$ 0.79	$ -	$ 0.151	$ -	$ -				
36	Y	0	2	**0**	0	1	0	**1**	0	0	0	0	$ 2.25	$ 1.01	$ 0.20	$ 0.201	$ -	$ -				
37																						$ 1.73
38	N	1	5	**6**	0	4	0	**4**	0	0	0	1	$ 2.25	$ 5.40	$ 0.80	$ 0.552	$ -	$ -		$ -	$ -	$ -
39																						
40	N	1	1	**2**	0	0	0	**0**	0	0	0	0	$ 3.02	$ 1.51	$ -	$ 0.151	$ -	$ -		$ -	$ -	$ -
41	N	0	2	**2**	0	1	0	**1**	0	0	0	0	$ 2.25	$ 0.67	$ 0.20	$ 0.201	$ -	$ -		$ -	$ -	$ -
42	Y	1	5	**6**	0	6	0	**6**	0	0	1	4	$ 2.65	$ 9.15	$ 1.19	$ 0.552	$ -	$ -		$ -	$ 1.01	
43																						
44	Y	3	6	**9**	1	5	0	**6**	2	0	0	1	$ 4.64	$ 14.37	$ 1.65	$ 0.753	$ 0.139	$ 0.257	$ 0.142	$ -	$ -	
45																						
46	Y	3	3	**6**	0	2	0	**2**	2	3	1	3	$ 3.64	$ 11.27	$ 0.55	$ 0.452	$ 0.139			$ 0.023	$ 1.01	
47	N	2	3	**5**	0	5	0	**5**	2	1	0	0	$ 3.64	$ 4.73	$ 1.37	$ 0.401	$ 0.139	$ 0.257		$ 0.008	$ -	$ -
48	N	0	6	**6**	0	6	0	**6**	3	0	3	0	$ 2.74	$ 6.57	$ 1.19	$ 0.602	$ 0.209	$ -		$ -	$ 3.04	$ -
49	N	0	5	**5**	0	5	0	**5**	2	0	3	0	$ 4.53	$ 17.65	$ 1.00	$ 0.502	$ 0.139	$ -		$ -	$ 3.04	$ -
51	N	4	0	**4**	1	1	0	**2**	0	0	1	0	$ 3.52	$ 5.07	$ 0.55	$ 0.201	$ -	$ -		$ -	$ 1.01	$ -
52	N	0	2	2	0	2	0	**2**	0	0	2	0	$ 2.65	$ 2.12	$ 0.40	$ 0.201	$ -	$ -		$ -	$ 2.03	$ -
54	N	0	1	**1**	0	1	0	**1**	0	0	0	0	$ 2.65	$ 4.77	$ 0.20	$ 0.100	$ -	$ -		$ -	$ -	$ -
76	N	0	1	**1**	0	1	0	**1**	0	0	0	0	$ 2.65	$ 4.77	$ 0.20	$ 0.100	$ -	$ -		$ -	$ -	$ -
55	N	7	2	**9**	0	5	0	**5**	0	0	0	0	$ 2.65	$ 1.62	$ 1.00	$ 0.552	$ -	$ -		$ -	$ -	
56												2										$ 2.36
72	N	1	5	**6**	3	3	0	**6**	3	0	0	1	$ 4.64	$ 10.11	$ 1.65	$ 0.552	$ 0.209	$ 0.385	$ 0.100	$ -	$ -	$ 3.65
73	N	5	4	**9**	1	5	0	**6**	4	0	1	1	$ 4.64	$ 16.23	$ 1.65	$ 0.652	$ 0.278	$ 0.513	$ 0.160	$ -	$ 1.38	$ 3.65
74	N	1	7	**8**	1	7	0	**8**	3	0	0	0	$ 4.64	$ 12.05	$ 2.20	$ 0.753	$ 0.209	$ 0.385	$ 0.119	$ -	$ -	$ -
95	N	0	3	3	0	3	0	**3**	3	0	2	0	$ 3.64	$ 8.73	$ 0.82	$ 0.301	$ 0.209	$ -		$ -	$ 2.75	$ -

Project #	Structures-Additional MNR Req. ($M)	MNRF Monitoring Costs	MNRF Compstn. Costs	Utility Installation / Reloc ($M)	Noise wall ($M)	Patterned Concrete ($M)	EA Studies ($M)	Preliminary Eng Cost Subtotal ($M)	EA Cost / City's additional cost estimate	Eng 15%	Cont 10%	Total Amount ($M)	%	Developer	%	DC 2019-2041	%	Non-Growth	Source
1		$ -	$ -	$ 1.73	$ 3.80	$ 0.975	$ -	$ 36.5		$ 5.5	$ 3.7	$ 45.64	0	$0	90	$41	10	$5	2015 TMPU
2		$ -	$ -	$ 1.13	$ 2.48	$ 0.636	$ 0.393	$ 22.0		$ 3.3	$ 2.2	$ 27.44	0	$0	90	$25	10	$3	2015 TMPU
3												$ 15.00	0	$0	90	$14	10	$2	Draft 2019-2023 C
4	$ 6.41	$ 0.250	$ 1.650	$ 0.49	$ 1.07	$ 0.276	$ 0.562	$ 21.3		$ 3.2	$ 2.1	$ 26.59	0	$0	90	$24	10	$3	Draft 2019-2023 C
5		$ -	$ -	$ 0.77	$ 1.69	$ 0.435	$ 0.562	$ 19.7		$ 3.0	$ 2.0	$ 24.66	0	$0	90	$22	10	$2	2015 TMPU
6	$ 3.56	$ 0.125	$ 0.825	$ 1.17	$ 2.56	$ 0.657	$ 0.562	$ 27.0		$ 4.0	$ 2.7	$ 33.75	0	$0	90	$30	10	$3	2015 TMPU
7									9.30	$ 1.4	$ 0.9	$ 11.63	0	$0	95	$11	5	$1	Draft 2019-2023 C
8		$ -	$ -	$ 0.87	$ 1.90	$ 0.488	$ -	$ 19.5		$ 2.9	$ 1.9	$ 24.36	0	$0	90	$22	10	$2	Draft 2019-2023 C
9		$ -	$ -	$ 0.16		$ -	$ -	$ 1.6		$ 0.2	$ 0.2	$ 2.05	0	$0	100	$2	0	$0	2015 TMPU
10								$ 7.8		$ 1.2	$ 0.8	$ 9.80	0	$0	100	$10	0	$0	2015 TMPU
11		$ -	$ -	$ 1.17		$ 0.657	$ 0.562	$ 16.3		$ 2.4	$ 1.6	$ 20.39	0	$0	95	$19	5	$1	2015 TMPU
12		$ -	$ -	$ 0.47		$ 0.265	$ 0.562	$ 6.7		$ 1.0	$ 0.7	$ 8.42	0	$0	95	$8	5	$0	2015 TMPU
13		$ -	$ -	$ 0.49		$ 0.276	$ 0.393	$ 10.4		$ 1.6	$ 1.0	$ 12.95	0	$0	95	$12	5	$1	2014 DC
14		$ 0.125	$ 0.825	$ 0.30		$ -	$ 0.393	$ 7.0		$ 1.1	$ 0.7	$ 8.79	0	$0	100	$9	0	$0	Draft 2019-2023 C
15	$ 3.68	$ 0.125	$ 0.825	$ 0.53		$ 0.297	$ -	$ 13.5		$ 2.0	$ 1.3	$ 16.83	0	$0	95	$16	5	$1	2015 TMPU
16		$ -	$ -	$ 0.83		$ 0.466	$ -	$ 11.7		$ 1.7	$ 1.2	$ 14.58	0	$0	95	$14	5	$1	2015 TMPU
17		$ -	$ -	$ 0.49		$ 0.276	$ 0.393	$ 7.0		$ 1.0	$ 0.7	$ 8.70	0	$0	95	$8	5	$0	2015 TMPU
18		$ -	$ -	$ 0.04		$ 0.021	$ 0.393	$ 1.0		$ 0.1	$ 0.1	$ 1.22	0	$0	100	$1	0	$0	Draft 2019-2023 C
20		$ -	$ -	$ 0.17		$ -	$ -	$ 2.2		$ 0.3	$ 0.2	$ 2.78	0	$0	95	$3	5	$0	2015 TMPU
21		$ -	$ -	$ 0.90	$ 1.98	$ -	$ 0.393	$ 24.0		$ 3.6	$ 2.4	$ 30.01	0	$0	90	$27	10	$3	2015 TMPU
22		$ -	$ -	$ 0.34		$ 0.191	$ 0.393	$ 13.6		$ 2.0	$ 1.4	$ 17.00	0	$0	95	$16	5	$1	2015 TMPU
75		$ -	$ -	$ 0.57		$ 0.318	$ -	$ 5.7		$ 0.9	$ 0.6	$ 7.16	65	$5	35	$3	0	$0	Bram West EA
23	$ 7.50	$ 0.250	$ 1.650	$ 1.04		$ 0.583	$ -	$ 23.6		$ 3.5	$ 2.4	$ 29.47	0	$0	95	$28	5	$1	Draft 2019-2023 C
24	$ 4.80	$ 0.250	$ 1.650	$ 1.17		$ 0.657	$ -	$ 24.1		$ 3.6	$ 2.4	$ 30.12	0	$0	95	$29	5	$2	Draft 2019-2023 C
25	$ 4.08	$ 0.250	$ 1.650	$ 0.47		$ 0.263	$ -	$ 12.6		$ 1.9	$ 1.3	$ 15.74	0	$0	95	$15	5	$1	Draft 2019-2023 C
26								$ 11.0	$ 43.05	$ 6.5	$ 4.3	$ 23.42	0	$0	95	$22	5	$1	2015 TMPU
27								$ 14.3				$ 30.39	0	$0	95	$29	5	$2	2015 TMPU
28		$ -	$ -	$ 1.55		$ 0.869	$ 0.393	$ 23.1		$ 3.5	$ 2.3	$ 28.93	0	$0	95	$27	5	$1	2015 TMPU
29		$ -	$ -	$ 1.13		$ 0.636	$ 0.562	$ 15.3		$ 2.3	$ 1.5	$ 19.17	0	$0	95	$18	5	$1	2015 TMPU
30								$ 6.1		$ 0.9	$ 0.6	$ 7.60	0	$0	95	$7	5	$0	Heritage Heights T
31		$ -	$ -	$ 0.45		$ 0.254	$ 0.562	$ 6.9		$ 1.0	$ 0.7	$ 8.62	0	$0	95	$8	5	$0	2015 TMPU
32		$ -	$ -	$ 1.88		$ 1.060	$ 0.674	$ 26.9		$ 4.0	$ 2.7	$ 33.57	0	$0	95	$32	5	$2	2014 DC
33				$ 1.06	$ 2.31	$ 0.59	$ -	$ 18.2		$ 2.7	$ 1.8	$ 22.74	0	$0	90	$20	10	$2	2015 TMPU
34		$ -	$ -	$ 0.45	$ 0.99	$ 0.25	$ -	$ 8.1		$ 1.2	$ 0.8	$ 10.10	0	$0	90	$9	10	$1	2015 TMPU
35							$ -	$ 0.9		$ 0.1	$ 0.1	$ 1.17	50	$1	50	$1	0	$0	Draft 2019-2023 C
36							$ -	$ 1.4		$ 0.2	$ 0.1	$ 1.76	50	$1	50	$1	0	$0	Draft 2019-2023 C
37	$ 5.96	$ 0.250	$ 1.650					$ 9.6		$ 0.9	$ 0.6	$ 11.07	50	$6	50	$6	0	$0	
38		$ -	$ -			$ 0.509	$ -	$ 7.3		$ 1.1	$ 0.7	$ 9.07	50	$5	50	$5	0	$0	2015 TMPU
39									8.00	$ 1.2	$ 0.8	$ 10.00	0	$0	95	$10	5	$1	Draft 2019-2023 C
40		$ -	$ -	$ 0.19		$ 0.106	$ -	$ 2.0		$ 0.3	$ 0.2	$ 2.44	0	$0	95	$2	5	$0	2014 DC
41		$ -	$ -	$ 0.11		$ -	$ -	$ 1.2		$ 0.2	$ 0.1	$ 1.48	0	$0	100	$1	0	$0	2015 TMPU
42						$ -	$ -	$ 11.9		$ 1.8	$ 1.2	$ 14.89	65	$10	35	$5	0	$0	2015 TMPU
43	$ 28.20	$ 0.500	$ 3.300					$ 32.0		$ 4.8	$ 3.2	$ 40.00	50	$20	50	$20	0	$0	City provided costs
44	$ 1.34	$ 0.125	$ 0.825	$ 1.17	$ 2.56	$ -	$ 0.393	$ 23.7		$ 3.6	$ 2.4	$ 29.66	0	$0	90	$27	10	$3	2015 TMPU
45									9.30	$ 1.4	$ 0.9	$ 11.63	0	$0	95	$11	5	$1	Draft 2019-2023 C
46	$ 14.60	$ 0.375	$ 2.475	$ 1.17			$ 0.562	$ 32.6		$ 4.9	$ 3.3	$ 40.79	0	$0	95	$39	5	$2	Draft 2019-2023 C
47		$ -	$ -	$ 0.49		$ 0.276	$ 0.562	$ 8.2		$ 1.2	$ 0.8	$ 10.29	0	$0	95	$10	5	$1	2015 TMPU
48		$ -	$ -			$ -	$ -	$ 11.6		$ 1.7	$ 1.2	$ 14.52	65	$9	35	$5	0	$0	2015 TMPU
49		$ -	$ -		$ 3.22	$ -	$ -	$ 25.5		$ 3.8	$ 2.6	$ 31.94	0	$0	100	$32	0	$0	2015 TMPU
51		$ -	$ -	$ 0.54		$ 0.305	$ -	$ 7.7		$ 1.2	$ 0.8	$ 9.60	0	$0	95	$9	5	$0	2015 TMPU
52		$ -	$ -			$ 0.170	$ -	$ 4.9		$ 0.7	$ 0.5	$ 6.15	50	$3	50	$3	0	$0	Draft 2019-2023 C
54		$ -	$ -			$ 0.382	$ -	$ 5.5		$ 0.8	$ 0.5	$ 6.82	50	$3	50	$3	0	$0	2014 DC
76		$ -	$ -			$ 0.382	$ -	$ 5.5		$ 0.8	$ 0.5	$ 6.82	65	$4	35	$2	0	$0	2014 DC
55		$ -	$ -			$ 0.129	$ -	$ 3.3		$ 0.5	$ 0.3	$ 4.12	65	$3	35	$1	0	$0	Draft 2019-2023 C
56								$ 2.4		$ 0.4	$ 0.2	$ 2.95	50	$1	50	$1	0	$0	
72		$ -	$ -	$ 0.82	$ 1.80	$ -	$ -	$ 19.3		$ 2.9	$ 1.9	$ 24.08	0	$0	90	$22	10	$2	2018-2020 Capita
73		$ -	$ -	$ 1.32	$ 2.89	$ -	$ 0.393	$ 29.1		$ 4.4	$ 2.9	$ 36.38	0	$0	90	$33	10	$4	2015 TMPU
74		$ -	$ -	$ 0.98	$ 2.15	$ 0.551	$ -	$ 19.4		$ 2.9	$ 1.9	$ 24.24	0	$0	90	$22	10	$2	2015 TMPU
77												$ 62.2	0	$0	100	$62	0	$0	City staff
78												$ 13.8	0	$0	100	$14	0	$0	City staff
79												$ 37.0	0	$0	31	$11	69	$26	Draft ATMP - infill
80												$ 4.8	0	$0	90	$4	10	$0	City staff
81												$ 38.1	0	$0	100	$38	0	$0	City staff
82												$ 10.7	0	$0	100	$11	0	$0	2014 DC
83												17.00	0	$0	95	$16	5	$1	City
84												$ 6.2	0	$0	95	$6	5	$0	City of Brampton T
85								$ 14.8		$ 2.2	$ 1.5	$ 18.48	0	$0	95	$18	5	$1	City of Brampton T
86								$ 23.9		$ 3.6	$ 2.4	$ 29.91	0	$0	95	$28	5	$1	City of Brampton T
87								$ 10.9		$ 1.6	$ 1.1	$ 13.61	0	$0	95	$12.9	5	$0.68	Heritage Heights T
88												$ 230.0	0	$0	100	$230	0	$0	City staff
Total (by 2041 only, excluding NSTC)												1,754.88		91.00		1,550.39		113.49	
90												$ 13.65	0	$0	100	$13.7	0	$0.00	Bram West EA
91												$ 23.21	0	$0	100	$23.2	0	$0.00	Bram West EA
92												$ 45.06	0	$0	100	$45.1	0	$0.00	Bram West EA
93												$ 19.27	0	$0	100	$19.3	0	$0.00	2015 TMPU
94												$ 13.75	0	$0	100	$13.7	0	$0.00	2015 TMPU
95		$ -	$ -	$ 0.90			$ 0.562	$ 14.3		$ 2.1	$ 1.4	$ 17.85	0	$0	100	$17.9	0	$0.00	2015 TMPU
Total NSTC (by 2041 only)												114.95		-		114.95		-	
									$ 65.54	$ 9.8	$ 6.6								



PROPOSED IMPROVEMENTS IN 2041 DC ROADS PROGRAM

July 26, 2019

PATH: \\TORE-INFS01\PWEXTERNAL\450766\10129584_BRAMPTONDC\MAP_DOCS\DRAFT\BRAMPTON_BASEMAP_20190305.MXD - USER: YUZHANG - DATE: 3/5/2019