

Date: 2021-05-20

Subject: **Recommendation Report: Light Rail Transit (LRT) Extension Study along Main Street from Brampton Gateway Terminal to Brampton GO Station – Preferred LRT Alignments**

Contact: **Compton Bobb, LEL, MCSCE, ENV SP**, Senior Project Engineer, Higher Order Transit – EA’s, Brampton Transit, (905.874.2581)

Report Number: Brampton Transit-2021-744

Recommendations:

1. That the report titled: **Recommendation Report: Light Rail Transit (LRT) Extension Study along Main Street from Brampton Gateway Terminal to Brampton GO Station – Preferred LRT Alignments – Wards #1, 3 & 4 (File IA.A (16-3130-101))**, to the Committee of Council Meeting of June 23, 2021, be received; and
2. That staff be directed to take both preferred LRT Extension Options to the 30% Preliminary Design & Draft EPR Phase of the LRT Extension Study; and
3. That a budget amendment be approved in the amount of \$650,000 to top-up Project #174115-001 – Light Rail Transit Extension Study, with funding of \$650,000 coming from the Community Investment Fund Reserve #110; and
4. That Council endorse that the relocation of the LRT stop from the south side to the north side of the Steeles and Hurontario intersection, be incorporated into future design work for the LRT Extension Study.

Overview:

- **Council directed staff to update the 2014 Hurontario-Main Light Rail Transit Environmental Assessment Study (2014 HMLRT EA) and consider options for a Main-George one-way loop, tunneling, and the original HMLRT EA approved route, and incorporate enhanced streetscaping from Downtown Reimagined where possible.**

- **The project team developed and evaluated a long-list of LRT alignments along the Main Street corridor and refined this list to create a short-list of alignments. The short-list were evaluated using the Metrolinx Preliminary Design Business Case criteria. The preferred LRT alignments for the surface and tunnel alignments were presented at Virtual Public Open House # 2 between April 22 to May 13, 2021 to obtain public feedback.**
- **There has been comprehensive stakeholder engagement, including meetings with Metrolinx, TRCA, Peel Region and DBBIA. Feedback and issues brought up by the stakeholders were considered and addressed as part of the development of the options.**
- **Through the feedback and evaluation process, one surface alignment and one tunnel alignment emerged as preferred options. Both options have distinct benefits. While the preferred surface option is stronger in the Economic and Financial Cases, the underground option is stronger in the Strategic and Deliverability and Operations Cases.**
- **While it was initially envisioned that one single preferred option would be moved forward to the 30% Preliminary Design & Draft EPR phase of the project, given that neither preferred surface or tunnel option has been identified as distinctly superior than the other, staff are recommending that both preferred options are moved forward into this next phase of the project.**
- **Developing the 30% Preliminary Design & Draft EPR for both preferred options will help further differentiate between the two preferred options and help to inform which option is carried forward into the formal TPAP process. To move forward with this approach, an additional \$650,000 in funding will be required and there would also be a modest increase in the overall project schedule of approximately four months. Given the importance of ensuring the best solution is advanced into the TPAP process, staff consider the additional costs and time associated with the approach warranted.**

Background:

At its May 22, 2019 meeting (Committee of Council May 15, 2019), Council approved funding and provided direction to staff to update the 2014 Hurontario-Main Light Rail Transit Environmental Assessment Study (2014 HMLRT EA) with consideration for a Main-George one-way loop, tunneling options, the original 2014 HMLRT EA approved surface route, and incorporation of the elements of enhanced streetscaping for Downtown Reimagined where possible. Council also directed that

the need for rapid transit routes on Kennedy Road and McLaughlin Road be examined as part of the next update to the Brampton Transportation Master Plan.

Study Purpose

The purpose of this study is to ultimately recommend a preferred alignment for the LRT Extension from the Brampton Gateway Terminal to Brampton GO station following the Main Street corridor. As part of the evaluation of LRT alignments, this study will:

- Develop and evaluate LRT route alignment alternatives including two-way surface, one-way loop (along Main Street and George Street), and tunneling options, with the LRT vehicles operating on dedicated or shared right-of-way or a mix of the two, as such to:
 - Avoid or mitigate any adverse effects on areas with constraints or sensitivities
 - Minimize potential effects on the environment
 - Support opportunities to revitalize Downtown Brampton including elements of enhanced streetscaping for Downtown Reimagined
 - Incorporate visioning, planning and urban design principles to address issues relating to land use, public realm, transportation
- Complete technical agency and public consultation
- Complete transportation modelling and analysis to confirm timing and appropriate configuration of the alternative LRT alignments
- Complete related technical studies such as hydrogeology, geotechnical, noise and vibration, etc.
- Recommend the preferred LRT alignment including preliminary design
- Complete a business case analysis in cooperation with Metrolinx
- Complete the requirements of Ontario's Transit Project Assessment Process (TPAP) to satisfy Ontario Environmental Assessment (EA) Act requirements

In early November 2019, an update notice for the LRT Extension Study was mailed to residents, businesses and other stakeholders along McLaughlin Road, Kennedy Road, and Main Street corridors as well as those individuals on the previous project mailing list.

Current Situation:

Short-List of LRT Alignments

The project team developed an initial long-list of alternative LRT alignments along Main Street consisting of surface, one-way loop (on Main Street and George Street), and tunneling options. To facilitate the development of LRT alignments, the Main Street corridor was divided into three segments based on existing right-of-way width, lane configurations, or adjacent land use. The long-list of LRT alignments was screened to determine a short-list of seven (7) LRT alignments based on a set of indicators

consistent with the high level evaluation criteria used by Metrolinx towards preliminary design business cases.

The long-list of LRT and proposed short-list of LRT alignments and potential stops were presented at Virtual Public Open House #1 from June 22 to July 31, 2020 for public and stakeholder input. A comprehension Feedback report was prepared and is published on the project's webpage. Below is an outline of the key messages from Virtual Public Open House #1:

- Expedite the project
- Minimize impacts to Main Street
- Provide express service with fewer stops
- Create a transit hub at Brampton GO Station
- Support businesses and revitalize Downtown
- Retain heritage character and mature tree canopy on Main Street South
- Provide a pedestrian friendly environment and ease of transfer between travel modes
- Calm traffic along surrounding residential streets
- Protect for future northward extension
- Secure Provincial funding for the project

The loop options presented in virtual open house #1 were not advanced to the short-list for further assessment due to physical constraints (i.e. issues accommodating longer light rail vehicles and impacts to property).

Appendix A contains the proposed LRT station locations, short-list surface and underground options, with the evaluation summary.

Metrolinx Business Case

The six (6) short-list options were evaluated using the Metrolinx Business Case framework. Business Case analyses are required by Metrolinx for all capital projects slated to obtain financial contributions from higher levels of government.

The Preliminary Design Business Case (PDBC) was used to assess the short-listed options and the goal of the PDBC is to identify the best performing alternative for the extension of the Hurontario LRT. The analysis was completed for four (4) cases as follows:

- Strategic Case: addresses how the project (with its investment options) will achieve strategic transportation objectives.
- Economic Case: evaluates the life-time economic costs, benefits and impacts of the proposed investment project to establish its economic benefits to society, net benefits, and the benefit-cost ratio.
- Financial Case: establishes the costs to deliver the project, provides an overview of life-cycle costs and revenues related to the project and its overall financial performance.

- Deliverability and Operations Case: provides a discussion on the feasibility and constructability of the project alternatives and considers risks.

Metrolinx staff have also been involved in the development of the PDBC and have reviewed and commented on the final report. The complete PDBC is published on the LRT Extension project webpage and the Executive Summary is attached to this report as Appendix B.

Recent Consultation and Engagement

The project is being coordinated with other Downtown Brampton projects and initiatives. The interdependencies of the LRT Extension project with the other projects in the Downtown Brampton that are currently under various stages of planning or implementation cannot be overstated, and the project is coordinating with the appropriate stakeholders to ensure potential alignment of infrastructure recommendations.

The project team has met individually with Metrolinx, CN Rail, TRCA, Peel Region, and other internal and external stakeholders. Feedback and issues brought up by the stakeholders were considered and addressed as part of further development of the options. There has also been some outstanding potential design issues brought up by some of the stakeholders and these will be further reviewed and addressed through the next stages of the study.

The Downtown Brampton Business Improvement Association (DBBIA) also provided the following key messages as input into the study:

- Strong support for more space dedicated to pedestrians, patios and event programming.
- Concerns about bike lanes hindering business community's ability to provide space for other street elements.
- The DBBIA envision a pedestrian-focused Main Street with wider sidewalks and more outdoor space.
- Members of the DBBIA's board shared their preference for the emerging preferred underground option (U1) as it eliminates conflicts between LRT and civic events in the downtown.
- Members of the DBBIA's board voice their desire for the City to implement public realm in the downtown as soon as possible.
- DBBIA members called for the development of a downtown parking and deliveries strategy to review the availability, safety, and accessibility of existing and future parking space.

Feedback during the Council Workshop held on March 5, 2021, generated the addition of a 7th surface option that involved operating the LRT in mixed traffic and the inclusion of cycle track in segment "B" (between Nanwood and Wellington). This options was then simulated through the Metrolinx Business Cases Analysis and presented at the 2nd Virtual Open House.

Virtual public open House #2 was held online between April 2 and May 13, 2021. The purpose of this open house was to share:

- An update on the study since the last virtual open house in summer 2020;
- The findings of the evaluation of the short-list options; and
- A summary of the emerging preferred options.

The public feedback from Virtual Open House #2 is documented in the Public Feedback Report published on the project's webpage.

During the Open House period, the public was able to view the display boards at their own pace and provide input. The website was visited 714 times and 132 community members provided input through a survey form completed after viewing the material. The survey was composed of six questions and was designed to seek specific input on the evaluation of the short list and feedback on the two emerging preferred options – Underground option U1 and Surface Option S3.

Key Messages from Virtual Open House #2:

- Ability to extend the LRT northward in the future.
- Revitalized Downtown with a vibrant pedestrian realm and streetscape.
- Transit Hub at Brampton GO.
- Maintaining the character and opportunities for reimagining Downtown Brampton as a vibrant pedestrian area.
- 54 % of respondents showed a preference for Underground option U1, 46 % showed a preference for Surface option S3.
- Maintenance of the mature tree canopy on Main Street and less disruption to surface conditions.
- Securing funding from Province.
- Importance of making a decision on which option to take forward.

Summary of Business Case Evaluations

The following presents the overall conclusions drawn from the PDBC for each of the strategic, economic, financial, and deliverability and operations case. One preferred surface and one preferred underground option were identified from this process.

Surface Options Evaluation

All Surface options perform relatively similar. However, Option S3 is preferred as it best fulfils the objectives of the strategic case, generates the second highest economic case outputs and achieves financial case results that are better than most other surface options. Driveway access impacts are the greatest for S3, however, this trade-off was considered acceptable to minimize transit travel times along the corridor.

Option S3 is also supportive of vision from the 2018 Downtown Reimagined (e.g. wider sidewalks, streetscaping and cycle tracks), while also minimizing overall transit travel

time. Driveway accesses will be modified as a result of the dedicated LRT right-of-way, but this will ensure safe and efficient travel for all users of the street.

Underground Options Evaluation

Overall, Option U1 (via Main Street) and U2 (via George Street) perform similarly from a strategic perspective with U1 have certain marginal benefits related to transfer and LRT travel time. However, Option U1 is more preferred than U2 as it is less costly, located closer to the heart of Downtown Brampton, requires less property takings and is more easily extended north in the future.

Option U1 also provides the greatest opportunity to help revitalize Downtown Brampton as it would not significantly impede on any of the various improvements/initiatives considered for Downtown Brampton.

Comparison of Two Preferred Options

The preferred surface and underground options S3 and U1 were compared and their key differences summarized in table 1 below.

	Evaluation Criteria	Option S3 (DDS)	Option U1 (via Main Street)
Strategic Case	Strong Connections	<ul style="list-style-type: none"> 9 minute transit travel time Does not improve multi-modal level of service as much as option U1. 	<ul style="list-style-type: none"> 7 minute transit travel time Improves multi-modal level of service more than option S3.
	Complete Travel Experiences	<ul style="list-style-type: none"> Does not provide the same opportunity for improving pedestrian and cycling at the surface. Lack of dedicated cycling facilities in Segment B creates a discontinuous cycling network More opportunity for conflicts between modes 	<ul style="list-style-type: none"> Improves pedestrian and cycling facilities/level of service at the surface. Continuous cycling network. Less opportunity for conflicts between modes
	Sustainable and Healthy Communities	<ul style="list-style-type: none"> Restricted ability to close streets for civic events in Downtown. Greater temporary and permanent impacts to natural and cultural environment (especially in Segment B). 	<ul style="list-style-type: none"> Provides opportunity to close streets for civic events in Downtown. Fewer impacts to natural and cultural environment (especially in Segment B).
Economic Case	Net Present Value	\$66.9 million	-\$965 million
	Benefit-Cost-Ratio	1.18	0.33
Financial	Capital Costs	\$353 million	\$1.43 billion ¹

¹ Construction costs for underground options do not include streetscape or road configuration improvements at the surface. These were assumed to be undertaken as a separate City of Brampton initiative. Property acquisition are not included.

	Evaluation Criteria	Option S3 (DDS)	Option U1 (via Main Street)
	Net Financial Impact	- \$324 million	- \$1.5 billion
Deliverability and Operations Case	Impacts to Road Operations	<ul style="list-style-type: none"> More impact to emergency and service vehicle operations 	<ul style="list-style-type: none"> Fewer impact to emergency and service vehicle operations
	Impacts to Property	<ul style="list-style-type: none"> More property impacts (up to 5,100 m² property required) 	<ul style="list-style-type: none"> Fewer property impacts (~2,700m² property required)
	Impacts to Driveways	<ul style="list-style-type: none"> More driveway and access impacts/restrictions (73 driveways) 	<ul style="list-style-type: none"> Fewer driveway and access impacts/restrictions (9 driveways)
	Impacts to Utilities	<ul style="list-style-type: none"> More utility impacts (24 major utility conflicts) 	<ul style="list-style-type: none"> Limited utility impacts
	Schedule	<ul style="list-style-type: none"> Up to 6 years from design to opening day. 	<ul style="list-style-type: none"> 7 to 8 years from design to opening day.

Table 1: Comparison of Preferred Surface and Underground Options.

Both options have distinct benefits. While the preferred surface option is stronger in the Economic and Financial Cases, the underground options is stronger in the Strategic and Deliverability and Operations Cases. Comparing the two preferred options further:

- Both options provide comparable auto and transit travel times and have similar opportunities for economic development within the City and in the downtown. However, the tunnel options provides a greater opportunities for place-making and accommodation of future design elements in the downtown.
- The surface option has a lower cost, and be constructed more quickly. However, it has more impacts to driveway access, utility, and property.
- The surface option doesn't allow for a continuous cycling network along Main Street (gap in segment B) and limits the City's ability to have civic events (such as farmers market) on Main Street in the Downtown without impacting LRT operations.
- The underground option provides many of the benefits that the surface option lacks while minimizing impacts at the surface. However, the underground option takes longer to construct and has a higher construction cost.
- While feedback from consultation and engagement indicates credible support for both options, the tunnel option has garnered slightly more support from the community compared to the surface option.

Brampton Gateway Stop

The City of Brampton has been advocating as part of the current HuLRT construction, to locate the Brampton Gateway LRT Stop to the north side of Steeles Avenue for the past 2 years. Unfortunately, these requests have been repeatedly declined by Metrolinx and the Minister of Transportation. There continues to be distinct benefits of relocating the LRT Brampton Gateway Stop north of Steeles Avenue, namely its proximity to the existing Gateway Transit Terminal to accommodate safe and convenient passenger transfers. To continue to support this relocation, it is recommended that the relocation of the LRT stop be incorporated into future work for the LRT Extension Study. This will allow the city to protect for a possible relocation of the stop at some point in the future.

Downtown Revitalization

Both the preferred surface and preferred tunnel options support the various streetscaping components from the 2018 Downtown Reimagined project design. This includes elements such as wider sidewalks with narrowed roadway, bike paths, new street-lighting, new traffic signals, street furniture and boulevard trees. Advancing design work to the 30% level on either of the preferred alignments, will help further inform decisions and design work in Downtown Brampton. The LRT team will continue to work closely with staff involved in advancing and supporting the various improvements/ initiatives in Downtown Brampton.

Corporate Implications:

Financial Implications:

Funding for the Hurontario-Main Street Light Rail Transit (LRT) Environmental Assessment is available from Transit Capital project #174115-001 – Light Rail Transit Extension Environmental Assessment Study:

Approved Budget	Expenditures	Commitments	Balance
\$5,400,000	\$3,370,000	\$1,650,000	\$380,000

However, additional funds in the amount of \$650,000 are required to take both preferred LRT Extension Options to the 30% Preliminary Design & Draft EPR Phase of the LRT Extension Study.

Therefore, a budget amendment will be required to increase Transit capital project 174115-001 in the amount of \$650,000, funded from the Community Investment Fund Reserve #110. There is sufficient funding available to proceed.

Term of Council Priorities:

The LRT Extension study is in alignment with the 2019-2022 Term of Council Priority – Brampton is a Green City – Equalize all forms of transportation. The LRT Extension will provide a key transit link in the regional transit network connecting Brampton to the GTHA.

Conclusion:

As mention above, the S3 Surface option and the U1 Tunnel option are both viable and have distinct benefits. While it was initially envisioned that one single preferred option would be moved forward to the 30% Preliminary Design & Draft EPR phase of the project, given that neither option has been identified as distinctly superior than the other, staff are recommending that both preferred options are moved forward into this next phase of the project.

The benefits of developing the 30% Preliminary Design & Draft EPR for both preferred options are as follows:

- The advancement of the design and additional studies produced in this phase will help further refine the findings from the PDBC.
- Potential issues and subsequent design solution will be explored further, which could influence or enhance benefits and costs for either option.
- Further consultation with internal and external stakeholders will help improve the overall design.
- Current cost estimates have been prepared at a high level and have a high degree of variability. Through this process, cost estimates will be refined and the variability will be reduced, giving more certainty to the estimates.

All of this additional information will help further differentiate between the two preferred options. This interim period when the 30% Preliminary Design & Draft EPR are being prepared, would also allow the City to investigate potential funding sources for the advancement of this project. All of this information will inform future decision making and ultimately, what option is advanced to the formal TPAP process.

To move forward with this approach, an additional \$650,000 in funding will be required to complete the 30% Preliminary Design & Draft EPR for both preferred options. There would also be a modest increase in the overall project schedule with the overall completion of the project extended by approximately four months. A summary outlining the project schedule for this approach is outlined in Table 2 below.

Task Description	Two Options to 30 % Preliminary Design
Prepare 30% Preliminary Design & Draft EPR.	6 months
Agency Review Period and Update Draft EPR	3 months
Recommend Single Preferred Option	
Commence 120 day TPAP Period	4 months
Public and Ministry Review Period	2 months
Total Time	15 months

Table 2: Project Schedule

Given the benefits outlined above of moving forward with 30% Preliminary Design & Draft EPR on both preferred options, and the importance of ensuring the best solution is advanced into the TPAP process, staff consider the additional costs and time with this approach warranted.

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Attachments:

Appendix A - Proposed LRT station locations, short-list surface and underground Options, with the evaluation study.

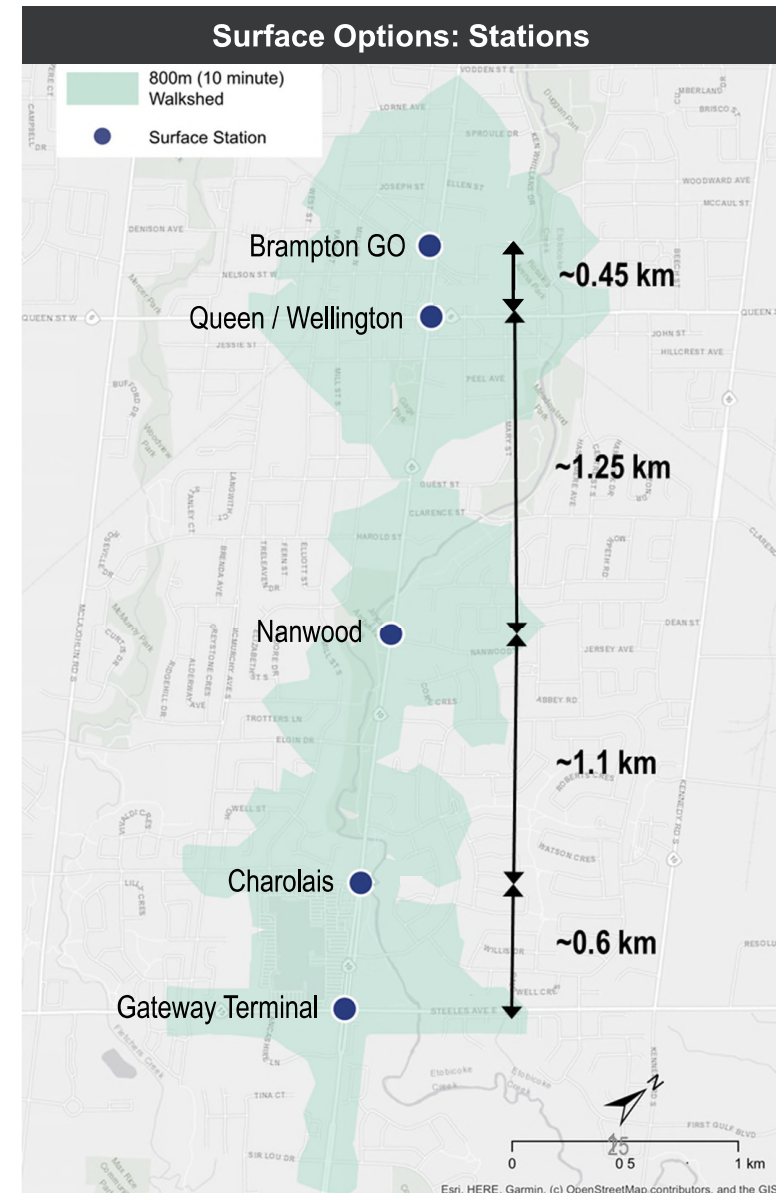
Appendix B - PDBC Executive Summary

Proposed Station Locations

For surface options, stations are proposed at:

- Brampton GO
- Downtown (split platform)
 - Queen (Northbound)
 - Wellington (Southbound)
- Nanwood
- Charolais
- Gateway Terminal

Note: Station locations for surface options are consistent with 2014 TPAP recommendations.

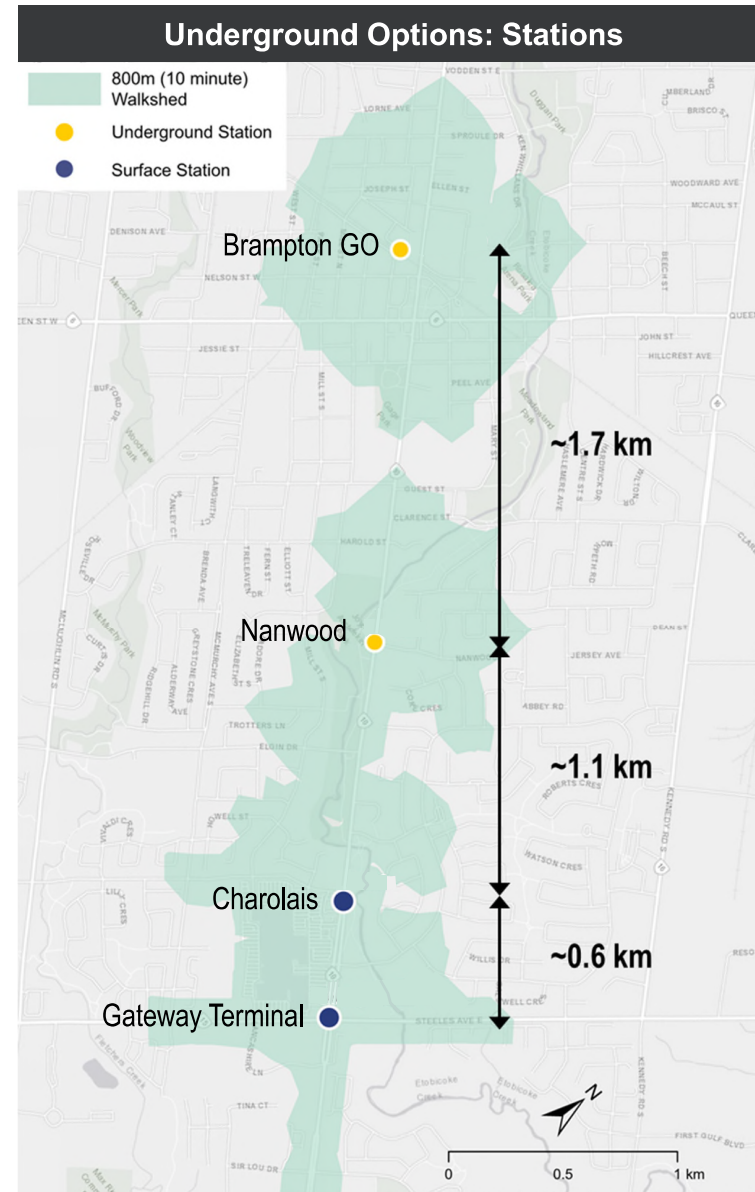


Proposed Station Locations

For underground options, stations are proposed at:

- Brampton GO
- Nanwood
- Charolais (surface stop)
- Gateway Terminal (surface stop)

Note: A station at Wellington Street was screened out during short list phase due its proximity to Brampton GO Station and high cost.



Short List: Surface Options



	Option S1	Option S2	Option S3	Option S4	Option S5
Segment C	LRT in Dedicated Curbside Lanes (4 lanes, cycling in mixed traffic)		LRT in Mixed Traffic (2 lanes, cycle tracks)		
Segment B	LRT in Dedicated Lanes (4 lanes, cycling in mixed traffic)	LRT in Mixed Traffic (4 lanes, cycling in mixed traffic)	LRT in Dedicated Lanes (4 lanes, cycling in mixed traffic)	LRT in Mixed Traffic (4 lanes, cycling in mixed traffic)	LRT in Mixed Traffic (2 lanes, cycle tracks)
Segment A	LRT in Dedicated Lanes (6 lanes, cycle tracks)				

All boulevard configurations shown are subject to change.

Surface Options: Evaluation Summary

Comparison of how each option performs relative to the rest.



The evaluation summarizes key performance measures to help compare the surface options.

		Option S1	Option S2	Option S3	Option S4	Option S5
Strategic Case How and why should the investment be pursued; based on regional goals, plans and policies?	Transit Travel Time*	8 minutes	11 minutes	9 minutes	12 minutes	12 minutes
	Auto Travel Time*	6 minutes	6 minutes	7 minutes	6 minutes	7 minutes
	Cycling Conditions	Cycle Tracks in Segment A, Discontinuous network on Main St	Cycle Tracks in Segment A, Discontinuous network on Main St	Cycle Tracks in Segment A and C, Discontinuous network on Main St	Cycle Tracks in Segment A and C, Discontinuous network on Main St	Cycle Tracks in Segment A and C, Continuous network on Main St
Economic Case What is the investment value to society?	Value for Money	Highest	Lower	Higher	Lower	Lower
Financial Case What are the financial implications of delivering the investment?	Total Costs	Comparable Total Costs				
Deliverability and Operations Case What are the risks and requirement to consider to deliver and operate the investment?	Driveway Access Impacts	77 driveways converted to right-in, right-out	19 driveways converted to right-in, right-out	73 driveways converted to right-in, right-out	15 driveways converted to right-in, right-out	15 driveways converted to right-in, right-out. Safety concerns for left turns from driveways
	Utility Conflicts	24 utility conflicts to be relocated				
	Property Requirements	Up to 5,100 m ² of property required				

* Travel time between Steeles Avenue and Church Street

	S1	S2	S3	S4	S5
Recommendation	✗ Do Not Carry Forward	✗ Do Not Carry Forward	✓ Carry Forward	✗ Do Not Carry Forward	✗ Do Not Carry Forward
Reasoning	<ul style="list-style-type: none"> Inability to provide an improved streetscape in Downtown (wider sidewalks, cycle tracks...) 	<ul style="list-style-type: none"> Inability to provide an improved streetscape in Downtown (wider sidewalks, cycle tracks...) Longer transit travel time Lower value for money (economic benefits) 	<ul style="list-style-type: none"> Ability to provide an improved streetscape in Downtown while minimizing transit and auto travel time Higher value for money (economic benefits) 	<ul style="list-style-type: none"> Longer transit travel time Lower value for money (economic benefits) 	<ul style="list-style-type: none"> Longer transit travel time Lower value for money (economic benefits) Safety concerns for left turns from driveways in Segment B

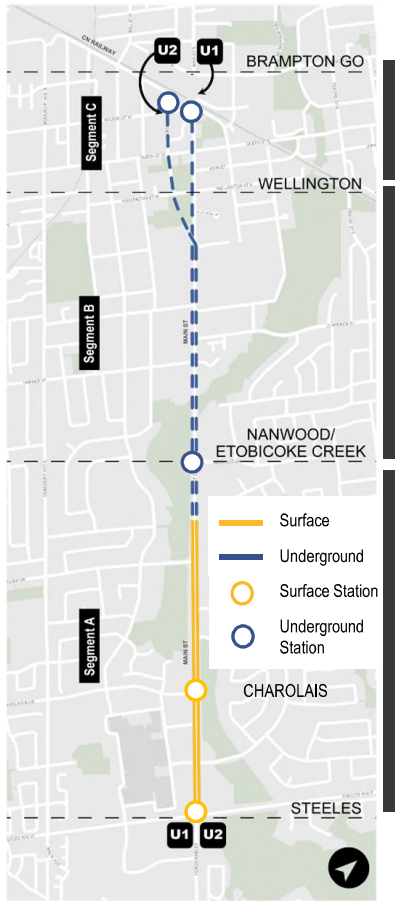
Surface Options: Evaluation Summary

All surface options perform relatively similar; however, Option S3 provides the opportunity to revitalize Downtown Brampton into an aesthetically beautiful, place-making destination with wider sidewalks, streetscaping, and cycle tracks (consistent with Downtown Reimagined Vision) while minimizing overall transit travel time.

Driveway accesses will be modified as a result of the dedicated LRT right-of-way, but this will ensure safe and efficient travel for all users of the street.

Therefore, Option S3 is the emerging preferred surface option.

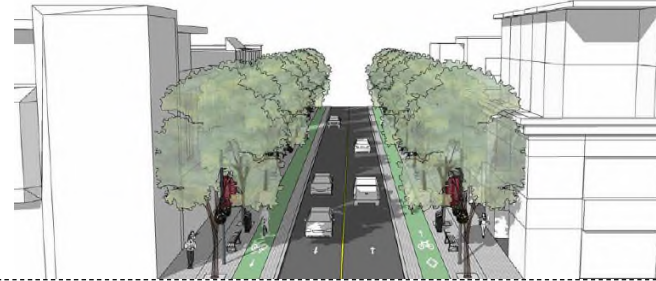
Short List: Underground Options 1 (Main St) & 2 (George St)



Segment C

**LRT Underground
(2 lanes, cycle tracks)**

Note: Cross section is consistent with Downtown Reimagined Vision



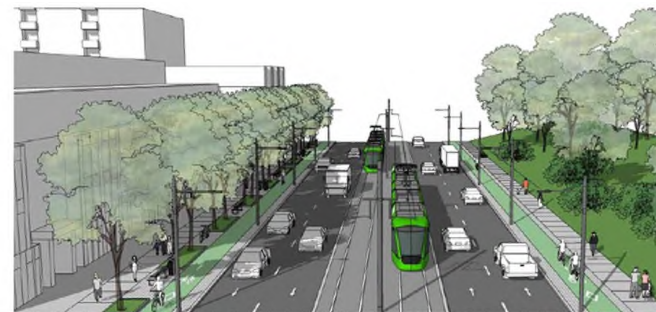
Segment B

**LRT Underground
(3 lanes, cycle tracks)**



Segment A

**LRT in Dedicated Median Lanes
(6 lanes, cycle tracks)**



All boulevard configurations shown Page 456 of 506.



Underground Options: Evaluation Summary

Comparison of how each option performs relative to the rest.

The evaluation summarizes key performance measures to help compare the underground options.

		Worst	Comparable	Best
		Option U1 (via Main St)		Option U2 (via George St)
Strategic Case How and why should the investment be pursued; based on regional goals, plans and policies?	Transit Travel Time*	7 minutes		8 minutes
	Auto Travel Time*	6 minutes		
	Cycling Conditions	Cycle Tracks in all Segments. Continuous Cycling Network.		
Economic Case What is the investment value to society?	Value for Money	Comparable Value for Money		
Financial Case What are the financial implications of delivering the investment?	Total Costs	Lower	Higher	
Deliverability and Operations Case What are the risks and requirement to consider to deliver and operate the investment?	Driveway Access Impacts	All driveways in Segment A converted to right-in, right-out access (9 driveways)		
	Utility Conflicts	Minor utility conflicts	Minor utility conflicts at Brampton GO station	
	Property Requirements	Up to 2,700 m ² of property required	Up to 5,300 m ² of property required	
	Potential to Extend	Able to extend north in the future along Main Street	More difficult to extend north in the future from George Street	

* Travel time between Steeles Avenue and Church Street

	U1 (via Main St)	U2 (via George St)
Recommendation	 Carry Forward	 Do Not Carry Forward
Reasoning	<ul style="list-style-type: none"> • Shorter transit travel time • North terminus station located closer to the heart of Downtown Brampton • Lower cost • Lower property requirements • Able to extend north in the future 	<ul style="list-style-type: none"> • Longer transit travel time • North terminus station located further to the heart of Downtown Brampton • Higher cost • Higher property requirements • Difficult to extend north in the future

Underground Options: Evaluation Summary

Option U1 (via Main Street) and U2 (via George Street) perform similarly from a strategic perspective. However, Option U1 is more preferred than U2 as it is less costly, located closer to the heart of Downtown Brampton, requires less property takings and is more easily extended north in the future.

Therefore, Option U1 is the emerging preferred surface option.

Executive Summary

Introduction

Extending the planned Hurontario LRT from the Brampton Gateway Terminal at Steeles Avenue to the Brampton GO station is a key transit priority and city-building project for the City of Brampton. The LRT extension will play an important role in the long-term rapid transit network in Brampton and is essential for supporting the sustainable growth and evolution of the Downtown Core and Central Area.

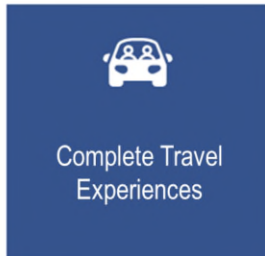
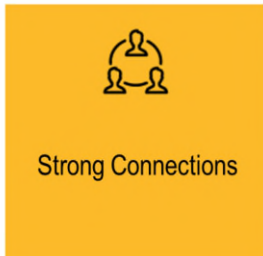
The Brampton LRT Extension study is intended to address the growth-related transportation needs specifically in Brampton by extending the Hurontario LRT along Brampton’s Main Street from the Brampton Gateway Terminal to the Brampton GO Station. In addition, the extension is envisioned as a transformational city-building project helping to achieve broader objectives of the 2041 RTP of building economically strong, well connected, and sustainable communities.

Vision and Goals

The LRT extension will contribute to a safer and more integrated transportation system to serve the City of Brampton, encouraging civic sustainability, emphasizing transit use and other modes of transportation over traditional automobiles, and supporting the revitalization of Downtown Brampton into an aesthetically beautiful, place-making destination. The vision for the LRT extension reflects the transportation vision and actions set out in the Brampton 2040 Vision (2018).

The study has three main goals as follows:

- Create Strong Connections
- Build Complete Travel Experiences
- Support Sustainable and Healthy Communities.





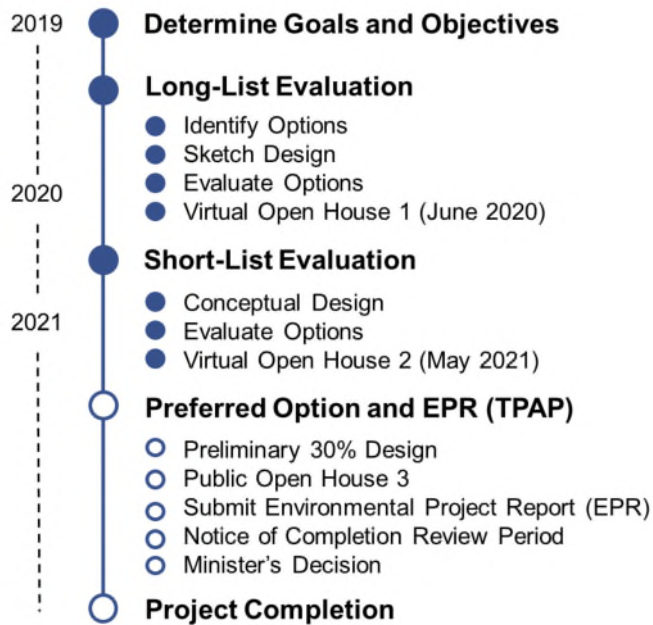
Project Background

In 2008, the publication of Metrolinx’ “Big Move” 2041 Regional Transportation Plan (RTP) identified a strategic need for a rapid transit system along the corridor between downtown Brampton and Port Credit (the Hurontario corridor) due to forecasted significant population and employment growth. In 2018, the [2041 RTP](#) was updated and reaffirmed the recommendation to extend the Hurontario LRT north from Steeles Avenue to Brampton GO.

Since the publication of the Big Move 2041 RTP and its latest update, the Hurontario-Main corridor has been a subject of studies that demonstrated the case for rapid transit, including [Hurontario Main Street Corridor Master Plan \(October 2010\)](#) and the [Hurontario-Main LRT Environmental Project Report \(June 2014\)](#). The [Hurontario LRT Benefits Case Analysis \(March 2016\)](#) presented a strong business case for this infrastructure, although with a reduced scope from Port Credit GO station in Mississauga through downtown Mississauga to Brampton’s Gateway Terminal. This project was approved by the provincial government, and the construction began in early 2020.

Study Process

The evaluation of options is a multi-level process that has occurred over the course of the study. The Preliminary Design Business Case (PDBC) constitutes the final step in the evaluation of options before the initiation of the Transportation Project Assessment Process (TPAP). The flow chart below illustrates the study process.



Through this process, the long list of LRT options was evaluated and narrowed down to a short list. The short list was evaluated and has been presented at Virtual Open House 2 from April 22 through May 2021. Once a preferred LRT option is selected, the TPAP can be initiated and the Environmental Project Report developed.

Business Case Approach Overview

Business Case analyses are required by Metrolinx for all capital projects slated to obtain financial contributions from higher levels of government. They are completed to define the rationale and requirements for delivering the investment and forecast its performance in relation to the determined goals. This Preliminary Design Business Case (PDBC) will identify the best performing alternative for the extension of the Hurontario LRT. The approach is based on Metrolinx' Business Case framework that comprises four cases and introductory/background chapters as follows:

- **Problem Statement:** defines the need for the project and the case for change. It spells out the project justification and provides directions for the evaluation of investment options considered within the business case by specifying its strategic objectives. The project background dates back to 2008 when the Metrolinx' "Big Move" 2041 Regional Transportation Plan (RTP) identified a strategic need for a rapid transit system along the Hurontario Street between downtown Brampton and Port Credit (the Hurontario Corridor) to address the forecasted significant population and employment growth in the region. The LRT project would also support the "city building" objectives and support sustainable growth and offer competitive transportation service.
- **Investment Options:** introduces the investment alternatives to be evaluated and compared through the four cases that constitute the Business Case. The chapter briefly discusses how the options were developed and outlines the assumptions used in the travel demand and performance modeling. The short list of options evaluated in this business case includes four surface options and two options with underground segments. The options differ principally with respect to the LRT use of the road space along its route (LRT operations on dedicated lanes versus LRT operations on lanes shared with other traffic, and LRT operations underground) and some differences in alignment and station locations.
- **Strategic Case:** addresses how the project (with its investment options) will achieve strategic transportation objectives. The strategic objectives were defined around the strategic goals of the 2041 RTP – (A) Strong Connections, (B) Complete Travel Experiences, and (C) Sustainable and Healthy Communities – and represent the desired outcomes associated with each goal. The objectives center around improving access to transit and its performance, promoting a more sustainable transportation system, and supporting city-building objectives. The Strategic Case presents the performance of the short-listed options against the identified strategic objectives where the performance is measured with a set metrics that include quantitative and qualitative measures, as indicated in the following graphic.

Strategic Case Criteria:



Strong Connections

- Improve access to transit
- Increase access to economic opportunities
- Support city-building objectives



Complete Travel Experiences

- Improve travel time and level of service
- Improve comfort and safety
- Building an integrated transportation network



Sustainable and Healthy Communities

- Move people with less energy and pollution
- Improve quality of life and public health
- Reduce impacts to the natural and cultural environment

- **Economic Case:** evaluates the life-time economic costs, benefits and impacts of the proposed investment project to establish its economic benefits to society, net benefits, and the benefit-cost ratio. Project benefits and impacts were monetized to the greatest extent possible and compared with costs in a structured benefit-cost analysis framework, capturing the following:

Economic Case Criteria:



User Benefits

- Travel Time Savings
- Reliability Benefits
- Journey Quality Benefits
- Travel Time Impacts to Vehicles
- Vehicle Operating Cost Savings



External Benefits

- Decongestion Benefits
- Reduction in Road Accidents
- Reduction in Vehicle Emissions
- Health Benefits



Costs

- Capital Construction Costs
- Major Maintenance, Rehabilitation and Renewal Costs
- Annual Operations and Maintenance Costs

- **Financial Case:** establishes the costs to deliver the project, provides an overview of life-cycle costs and revenues related to the project and its overall financial performance. Costs taken into account include capital construction costs, financial costs, capital renewal costs, and incremental annual LRT operating costs. These are compared against expected incremental fare revenues due to new transit users to determine the overall fiscal impact of the project and operating ratios.

Financial Case Criteria:



Costs

- Capital Construction Costs
- Financing Costs
- Major Maintenance and Renewal Costs
- Incremental Operations and Maintenance Costs



Revenues

- Additional LRT Revenues
- Additional GO Revenues

- **Deliverability and Operations Case:** provides a discussion on the feasibility and constructability of the project alternatives and considers risks. The discussion identifies known issues and constraints around each option that may facilitate or hinder project implementation and progress.

Deliverability and Operations Criteria:



Design / Operational Tradeoffs

- Emergency and Service Vehicles
- Property Impacts
- Driveway Impacts
- Utility Impacts
- Impacts to CN bridge
- Ability extend northward



Construction and Mitigation

- Constructability
- Construction Impacts
- Noise
- Traffic Management



Procurement and Delivery

- Risks and advantages of traditional and innovative procurement approaches



Operations and Maintenance

- Limitations and assumptions dictating the system operation and maintenance plans

The framework is based on common business case concepts and principles including objective, evidence-based and transparent approach, consideration of comprehensive life-time benefits, costs, and impacts compared to a Business as Usual (BAU) or a no-build scenario, and using industry accepted guidance and assumptions for key parameter values such as the of travel time savings or discount rates. In Metrolinx’ approach, business case analysis may be conducted multiple times as the project progresses through its development process, updated when new project-relevant data and information emerge.

As a PDBC, this business case conducts the analysis for a set of identified short-listed of options that incorporate certain design elements with potential impacts on their performance (conceptual design stage).

Problem Statement and Case for Change

Brampton’s population is forecasted to increase by nearly 200,000 between 2016 and 2031 (or by 31.4 percent), and employment is forecasted to increase by nearly 82,000 (or by 40.3 percent). In the study corridor, population is expected to increase by over 20,000 (or 34.6 percent) and employment is expected to increase by over 8,000 (or 46 percent) ¹.

The growth is expected to continue past 2031, although at a slower rate. Between 2031 and 2041, Brampton’s population is expected to increase by 9.6 percent while employment is expected to increase by 14 percent. For the study corridor, the forecasted rates of growth are 12 percent for population and 17 percent for employment. If growing transportation needs are not adequately addressed, the significant increase in population and employment will exacerbate congestion, lengthen travel time and impact the quality of life for City of Brampton residents and commuters.

¹ Future population and employment forecasts provided by the City of Brampton (September 2019)

High capacity rapid transit offers an opportunity to address these needs by providing an attractive travel option with competitive journey times, reliability, and connections to other modes. The Hurontario-Main corridor is currently serviced by four bus services which operate during weekday peaks, off-peak periods and weekends, and provide connections to Brampton GO and other parts of the city. Based on the forecasted ridership, it is estimated that at the minimum by 2031 transit frequencies in Mississauga and Brampton will have to increase by 15 percent, and frequencies of corridor routes will have to increase by 40 percent. Given increasing congestion, it is also estimated that average journey times would increase by 5 percent across all routes². Therefore, introduction of rapid transit in the corridor is needed to increase transit capacity, offer attractive travel times and performance compared to existing transit and to auto travel in this growth corridor.

Further supporting the case for change, since the publication of the Big Move 2041 Regional Transportation Plan, other studies have been undertaken and have demonstrated the need for rapid transit along Main Street in downtown Brampton.

The Hurontario Main Street Corridor Master Plan (October 2010) introduced a project vision to provide an easy, reliable, frequent, comfortable and convenient light rail transit service throughout the corridor, with effective connections to other links in the inter-regional transit network, which could alleviate anticipated congestion on the corridor. The Hurontario-Main LRT Environmental Project Report (June 2014) built on the first master plan's visions and guiding principles, identifying an approach for a comprehensive 'urban style' LRT which would have competitive journey times, increase journey time reliability, minimize adverse impacts, make a positive contribution to the "beautiful street" component of the vision, and have affordable capital and operating costs. The Hurontario LRT Benefits Case Analysis (March 2016) re-instated the vision from the Hurontario-Main LRT Environmental Project Report (June 2014) and compared the vision to Metrolinx "The Big Move" objectives presenting a strong business case for this infrastructure.

The Brampton LRT Extension study plans to connect the Hurontario LRT along Main Street from the Brampton Gateway Terminal to the Brampton GO Station. The project will address the need for an appropriate, reliable, frequent, comfortable and convenient rapid transit service required to meet the forecasted demand. In doing so, the extension will improve the vibrancy of the Main Street corridor and ensure effective connections to other links in the inter-regional transit network. The proposed vision presented in the Brampton LRT Extension Study is consistent with Metrolinx 2041 RPT vision and goals for transportation in the region.

The impacts of the COVID-19 pandemic on transit ridership and travel patterns have been duly noted and are recognized to be especially pronounced in the short term. However, the future population and employment to be served by the LRT extension is based on approved long-term growth forecasts. By 2041, the City continues to expect a need for this investment to meet the future needs of Brampton residents and businesses; therefore, the ongoing planning and design of the LRT is an important step to secure future funding.

² Hurontario LRT Benefits Case Analysis," March 2016; Prepared by Steer Davies Gleave for Metrolinx; para 3.18 and 3.19.

Findings from Public Engagement

The study has engaged the public at several occasions through the study. During the COVID-19 pandemic, following the advice of Ontario's Chief Medical Officer of Health, engagement activities have been hosted in a virtual format.

Following the Summer 2020 virtual Open House, which presented a long list of LRT options, the study team received hundreds of comments from the public regarding the future of the LRT extension. Frequently noted key messages from virtual Open House 1 are as follows:



From Thursday, April 22, 2021 to Thursday May 13, 2021, virtual Open House 2 was held online, to solicit public feedback on the short list, the findings of the Preliminary Design Business Case and the emerging preferred investment options. A summary of the public input from virtual Open House 2 can be found under separate cover.

Investment Options

The study area extends 3.6 km from the Brampton Gateway Terminal at Steeles Avenue East to the Brampton GO Station in Downtown Brampton. To enable the development and evaluation of LRT options, the study area was segmented based on existing and future context such as land use, number of lanes, existing and future right-of-way, and environmental features. The study area was divided into the three major segments (A,B and C), each with its distinct cross-sectional characteristics and constraints:

- **Segment A**, further divided into two segments:
 - A1: Steeles Gateway: from Steeles Avenue to Charolais Boulevard; and
 - A2: Main Street Greenway: from Charolais Boulevard to Nanwood Drive.
- **Segment B**, Main Street South: from Nanwood Drive to Wellington Street.
- **Segment C**, Downtown: from Wellington Street to Brampton GO Station.

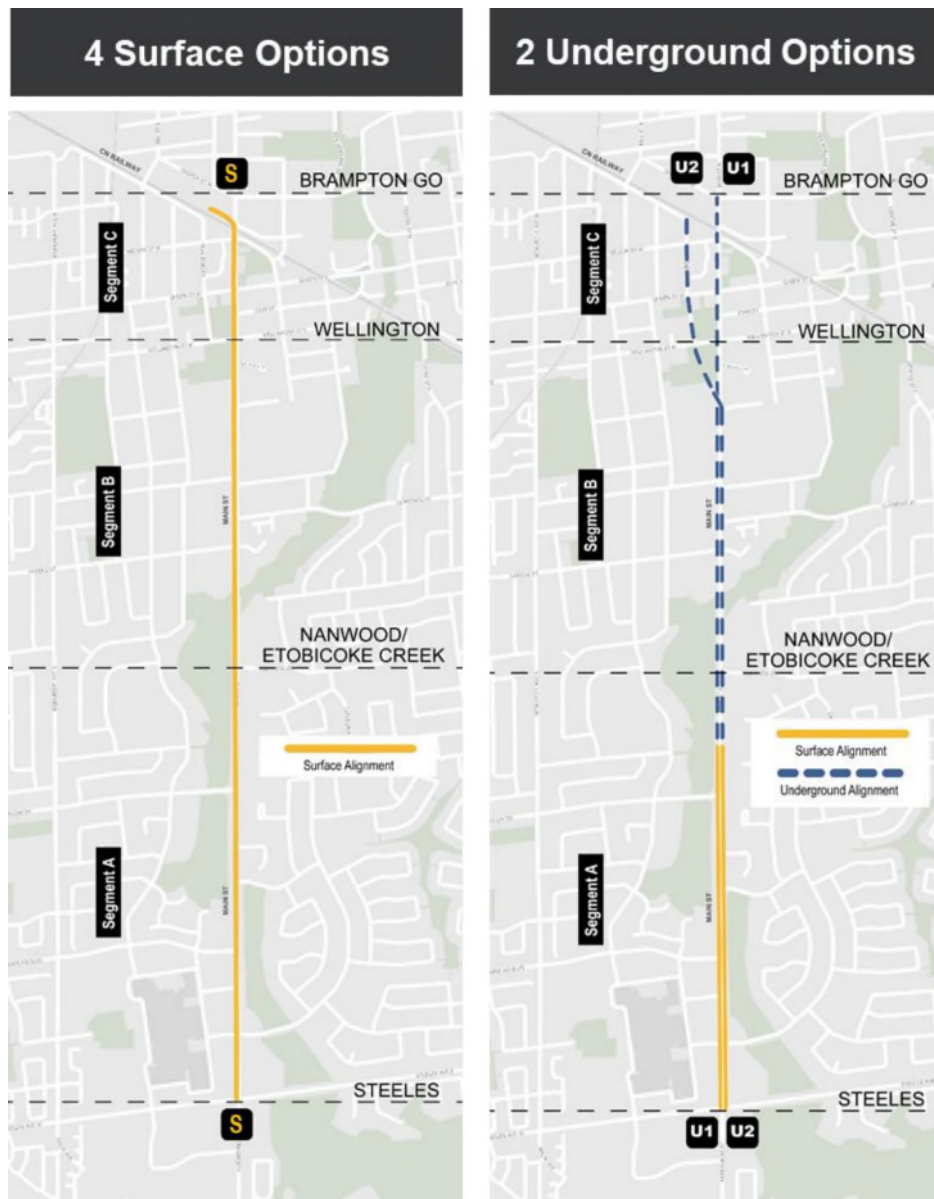


A long list of twelve (12) options was developed and included:

- Six (6) Surface Options (surface LRT along Main Street);
- Four (4) Loop Options (surface LRT along Main Street with a one-way counterclockwise loop along Nelson Street, George Street, and Wellington Street); and
- Two (2) Underground Options (surface LRT along Main Street from Steeles Avenue to just south of Nanwood Drive and then underground from Nanwood Drive to the Brampton GO Station).

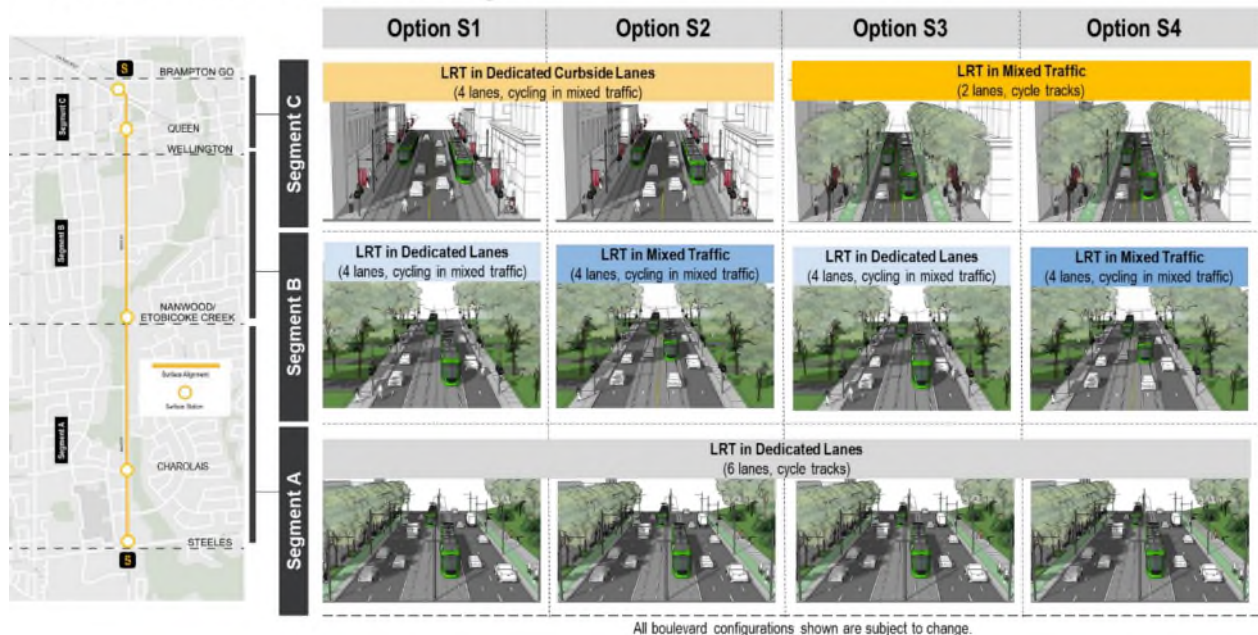
The long list of options was evaluated, presented to the public at virtual Open House 1 from June 22 to July 31, 2020 and narrowed down to a short list for further assessment. Loop options were not advanced due to technical feasibility pertaining to physical constraints and operational challenges in Downtown Brampton with respect to the proposed Hurontario LRT vehicle.

Based on the evaluation of the long list, a short list of six (6) options were carried forward. The short list is composed of four (4) surface options and two (2) underground options which were modelled to investigate impacts on transit and vehicular levels of service. Options generally differ with respect to the use of the road space (dedicated lanes versus lanes shared with other traffic), in alignment and station locations. Surface options are denoted by an “S” whereas underground options are denoted by a “U”.



Surface Options

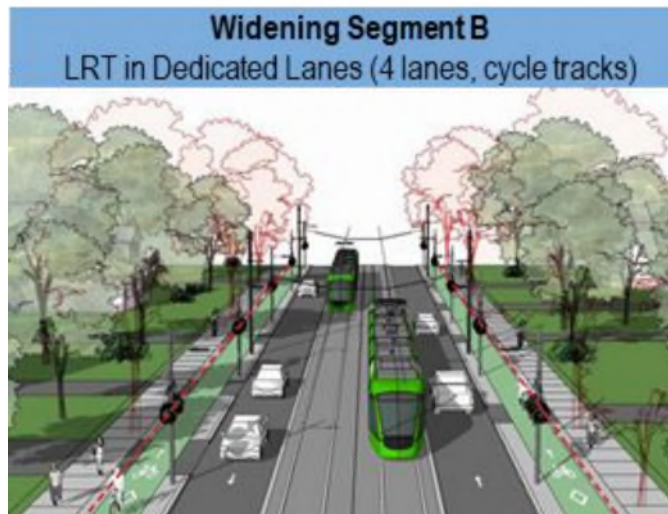
Short List: Surface Options



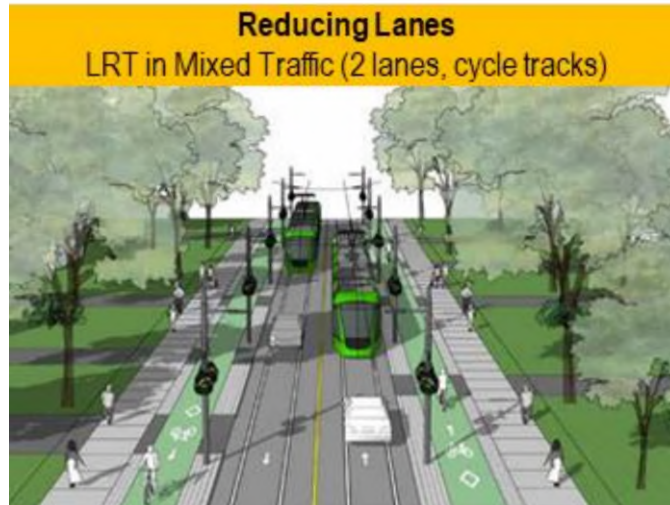
- Option S1** This option consists of an above-ground dedicated LRT lanes in all segments of Main Street with the terminal station at the Brampton GO Station. This option reduces the travel lanes for automobiles to 2 lanes in Segments B and C. This alternative does not permit left turns along Segment B. No on-street parking is planned for Main Street. This option does not provide a continuous dedicated cycling route: cyclists can use dedicated cycle tracks in Segment A but must ride in mixed traffic conditions or on parallel routes in Segment B and C.
- Option S2** This option consists of an above-ground dedicated LRT lanes in Main Street segments A and C and an LRT in mixed traffic within Segment B. The terminal station at the Brampton GO Station. This option is consistent with the 2014 TPAP recommendations. No on-street parking is planned for Main Street. This option does not provide a continuous dedicated cycling route: cyclists can use dedicated cycle tracks in Segment A but must ride in mixed traffic conditions or on parallel routes in Segment B and C.
- Option S3** This option alignment consists of a dedicated LRT lane in Segments A and B, and a shared LRT lane in Segment C. The terminal station is at the Brampton GO Station. This segment reflects the vision of Downtown Reimagined, which includes two lanes of shared mixed traffic and wide boulevards on either side in Segment C. No on-street parking is planned for Main Street. This option does not provide a continuous dedicated cycling route: cyclists can use dedicated cycle tracks in Segment A and C but must ride in mixed traffic conditions or on parallel routes in Segment B.

- Option S4** This option alignment consists of a dedicated LRT lane in Segment A and a shared LRT lane in Segment B and C. The terminal station is at the Brampton GO Station. This segment reflects the vision of Downtown Reimagined, which includes two lanes of shared mixed traffic and wide boulevards on either side in Segment C. No on-street parking is planned for Main Street. This option does not provide a continuous dedicated cycling route: cyclists can use dedicated cycle tracks in Segment A and C but must ride in mixed traffic conditions or on parallel routes in Segment B.

Surface options presented challenges in accommodating dedicated cycling facilities between Nanwood Drive and Wellington Street due to the limited 20 m right-of-way available in that section of the study corridor. This led to a subset of options being developed that would enable cycling and provide full cycling network connectivity between uptown and downtown Brampton. Variations in the Segment B cross-section were identified while retaining Segment A and C elements consistent with options S3 and S4. These additional options ultimately possessed critical flaws, major impacts and operational and safety concerns. Therefore, they were not evaluated in the PDBC. The investigation of cycling opportunities in Segment B is summarized and reasons for not including them in the PDBC are explained as follows:



- Right-of-way (ROW) widening in Segment B to accommodate dedicated cycle tracks:** ROW widening posed significant impacts to the natural and cultural heritage environment as well as residential properties and their driveways. Widening would require an additional 6180 m² of property acquisition (as compared to no widening) which would result in increased project costs to the City. Furthermore, strong public and property owner interest has been expressed for the retention of the heritage character and mature tree canopy on Main Street south. An arborist survey was conducted on November 24, 2020 to quantify impacts of widening the ROW to 30m on existing trees. Trees expected to be removed, injured and retained were identified, including mature trees of significance (>100 cm Diameter at Breast Height). 148 trees would be removed (0 significant) while 111 would be injured (5 significant). A meandering multi-use trail was considered but was found to not minimize impacts to trees between the edge of the street and the future ROW line.



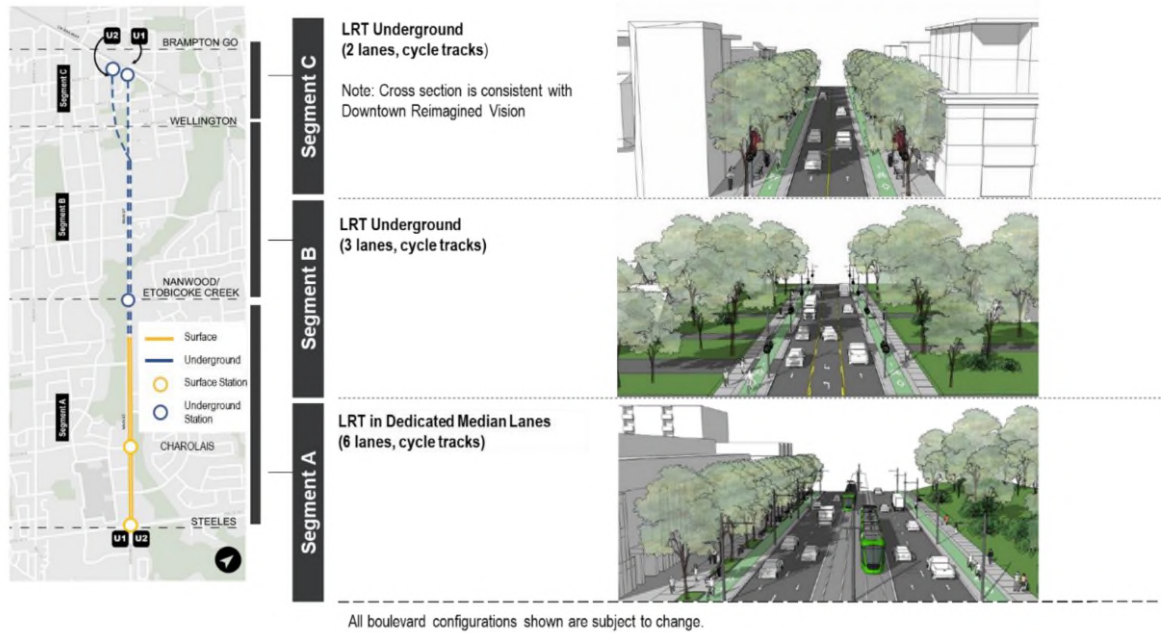
- **Reduction of lanes in Segment B to 2 / 3 shared LRT and general traffic lanes:** With a 2 or 3 lane section in Segment B, a significant increase in auto and transit travel time was observed, eroding the value of money proposition for such an option. Moreover, it would be unsafe to have vehicles turn left out of driveways across the opposing LRT lanes. The number of driveways (approximately 73) and length (~1 km) of this segment further increases risk of severe collisions (broadside and rear end). It would be extremely difficult to enforce turn restrictions as these are private, unsignalized driveways, making this option unfavorable from a traffic safety perspective. The mixed traffic/transit conditions would also be very poor for emergency/service vehicle operations (garbage removal, snow clearing) and would have additional negative impacts on transit/traffic unless shifted to off peak hours.

In light of the interrupted cycling network that characterizes surface options in Segment B, alternative or parallel cycling routes are under consideration to provide cycling connections to downtown Brampton. Potential cycling connections include routes along low traffic streets such as Elizabeth Street or along the existing Etobicoke Creek trail. Improvements to alternative or parallel cycling routes will be confirmed in the next stages of the study. In the absence of dedicated infrastructure, cycling in mixed traffic is to be protected in surface options through the use of sharrows and the provision of dedicated cycling facilities along alternate parallel routes.

This analysis is consistent with the Hurontario-Main LRT TPAP (2014) recommendations which do not include dedicated cycle facilities between Nanwood Drive and Wellington Street.

Underground Options

Short List: Underground Options 1 (Main St) & 2 (George St)



- Option U1** This option consists of a dedicated surface LRT in Segment A and underground portion running along Main Street in Segments B and C. Surface stations are provided at Steeles and Charolais while underground stations are provided at Nanwood and Brampton GO. For underground options, there is no station at Wellington/Queen. On the surface, the 3 traffic lanes will be provided along Segment B and the Downtown Reimagined vision of two lanes of shared mixed traffic with wide boulevards on either side will be provided in Segment C. No on-street parking is planned for Main Street. The terminus station is to be under Main Street. This option provides a continuous dedicated cycling route: cyclists can use dedicated cycle tracks in Segment A, B and C
- Option U2** This option consists of a dedicated surface LRT in Segment A and an underground portion running along Main Street in Segment B before diverting onto George Street in Segment C. Surface stations are provided at Steeles and Charolais while underground stations are provided at Nanwood and Brampton GO. For underground options, there is no station at Wellington/Queen. On the surface, the 3 traffic lanes will be provided along Segment B and the Downtown Reimagined vision of two lanes of shared mixed traffic with wide boulevards on either side will be provided in Segment C. No on-street parking is planned for Main Street. The terminus station is located under George Street. This option provides a continuous dedicated cycling route: cyclists can use dedicated cycle tracks in Segment A, B and C

Station Locations

Station locations identified in the long list evaluation stage were reviewed and confirmed. The short list evaluation stage incorporated additional technical findings as well as public feedback received during virtual Open House 1 (held from June 22 to July 31, 2020) to inform the recommended station locations for surface and underground routes.

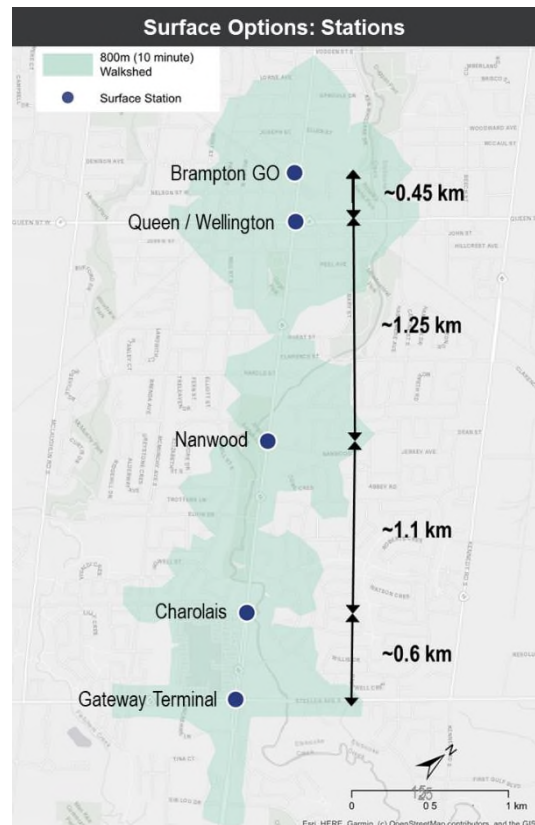
It should be noted that, although the Brampton Gateway Terminal Station is shown as part of the LRT Extension Study, it will be implemented as part of the Hurontario LRT project (Port Credit GO Station to Brampton Gateway Terminal). The exact location of the station (i.e. south of Steeles Avenue or north of Steeles Avenue) is subject to discussions with Metrolinx; however, for the purposes of this PDBC, it has been assumed to be located on the north side of Steeles Avenue.

Surface Stations / Stops

The proposed station locations for the surface options are shown below and are as follows:

- Brampton GO
 - Island Platform
- Downtown
 - Queen Street, Northbound Platform
 - Wellington Street, Southbound Platform
- Nanwood
 - Far-Side, Split Platform
- Charolais
 - Far-Side, Split Platform
- Gateway Terminal
 - North side of Steeles, Island Platform

There was no change to the station locations relative to the base assumptions from the long list phase. Furthermore, the station locations are consistent with the 2014 Hurontario-Main TPAP recommendations.



Underground Stations / Stops

The proposed station locations for the underground options are shown below and are as follows:

- Brampton GO (underground)
- Nanwood (underground)
- Charolais (surface)
 - Far-Side, Split Platform
- Gateway Terminal (surface)
 - North side of Steeles, Island Platform

The underground station at Wellington Street was screened out during the short list phase. The implications on Metrolinx Preliminary Design Business Case strategic criteria such as ridership, future population, employment, low-income demographics served were reviewed.

Results indicated that the strategic benefits of maintaining the underground station were not deemed to outweigh implementation costs and impacts to Wellington Park, especially given the station’s proximity to Brampton GO (within its 800m walkshed). Moreover, public support at virtual Open House 1 for an express service with fewer stops as well as general concerns related to project funding and availability further validated the removal of Wellington Station.



Summary of the Business Case Evaluation

The Preliminary Design Business Case (PDBC) for the Brampton LRT Extension study evaluated four surface and two underground LRT options to identify an emerging preferred option for each.

The following sections document the comparison of LRT options and present the overall conclusions drawn from the PDBC for each of the strategic, economic, financial and deliverability and operations case. One emerging preferred surface and one emerging preferred underground option has been identified.

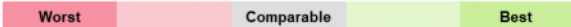


Surface Options

D: LRT in Dedicated Lanes
S: LRT in Shared Lanes

Strategic Case

Comparison of how each option performs relative to the rest.



Evaluation Criteria ³		S1 (DDD)	S2 (DSD)	S3 (DDS)	S4 (DSS)	
Strong Connections	LRT Daily Ridership	30,900	27,700	29,500	26,300	
	Ridership increase on HuLRT (Peak Period)	6,200	5,200	5,800	4,800	
	2041 Population within 800 m of Stations	All options serve the same future population (28,500)				
	2041 Employment & low-income residents served	All options serve the same number of jobs and low-income residents (17,000 and 2,400)				
	Support areas with land uses compatible with rapid transit	Compatible (transit in dedicated lanes, cycling in mixed traffic in Segment C)	Least Compatible (transit in shared lanes, cycling in mixed traffic in Segment C)	Most Compatible (transit in mostly dedicated lanes, dedicated cycling in Segment C)	Less Compatible (transit in shared lanes, dedicated cycling in Segment C)	
	Complete Travel Experiences	Transit Travel Time (PM Peak hour)	8 min	11 min	9 min	12 min
		Average Auto Travel Time in LRT Corridor per trip	6 min	6 min	7 min	6 min
		Total Transit Travel Time Savings	35,000 person-min	17,000 person-min	28,000 person-min	11,000 person-min
		Pedestrian and Bicycle Level of Service	Worse active transportation conditions		Better active transportation conditions	
		Transit and Vehicle Level of Service	Generally comparable between surface options.			
Potential for Conflicts between LRT, Autos and AT		Low Conflict (LRT & auto) High Conflict (AT & auto)	High Conflict (LRT & auto) High Conflict (AT & auto)	Low Conflict (LRT & auto) Low Conflict (AT & auto)	High Conflict (LRT & auto) Low Conflict (AT & auto)	
Transfer times from LRT to nearby transit services (Bus and GO) and Downtown Brampton		All options have similar transfer times: 2 minutes to Brampton Transit Bus Terminal, 4 minutes to Brampton GO (EB) and 4 minutes to Queen / Main Street.				
Sustainable Communities	Daily VKT Reduced in Study Corridor, PM Peak	1,500	400	1,300	300	
	Additional Transit Trips, PM Peak (Diverted from Auto)	950	500	700	500	
	Ability to Incorporate Downtown Reimagined Compatibility with Parks and Public Spaces Ability to provide a continuous cycling network	Less desirable public realm Gap in the cycling network connectivity in Segments B and C		More desirable public realm Gap in cycling network connectivity in Segment B		
	Impacts to Natural Environment, Cultural Heritage & Drainage	Similar impacts between surface options All options require similar ROW, Traction Power Substations at-grade and similar stormwater management considerations.				
Strategic Case Recommendation		S3 best fulfils the objectives and supports the strategic case.				

³ This table presents the key differentiating elements between options. For a complete account of evaluation criteria and performance metrics, please see the full PDBC report.

Economic Case

D: LRT in Dedicated Lanes
S: LRT in Shared Lanes

Comparison of how each option performs relative to the rest.

		Worst	Comparable	Best				
Evaluation Criteria		S1 (DDD)	S2 (DSD)	S3 (DDS)	S4 (DSS)			
Economic Case	Total Economic Benefits (\$ Million, 2019)	\$529	\$338	\$446	\$276			
	Total Economic Costs (\$ Million, 2019)	\$375	\$381	\$379	\$385			
	Net Present Value (\$ Million, 2019)	\$155	-\$43	\$67	-\$109			
	Benefit-Cost Ratio (BCR)	1.41	0.89	1.18	0.72			
Economic Case Recommendation		S1 and S3 best support the economic case.						

Financial Case

D: LRT in Dedicated Lanes
S: LRT in Shared Lanes

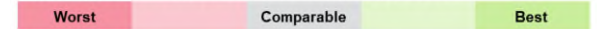
Comparison of how each option performs relative to the rest.

		Worst	Comparable	Best				
Evaluation Criteria		S1 (DDD)	S2 (DSD)	S3 (DDS)	S4 (DSS)			
Financial Case	Capital Construction Costs (\$ Million, 2019)	\$348	\$354	\$353	\$357			
	Rehabilitation and Major Maintenance (\$ Million, 2019)	\$38	\$39	\$39	\$39			
	Operations and Maintenance Costs (\$ Million, 2019)	\$25	\$25	\$25	\$25			
	Total Incremental Revenues (\$ Million, 2019)	\$97	\$76	\$89	\$67			
	Net Financial Impact (\$ Million, 2019)	-\$315	-\$342	-\$327	-\$354			
Financial Case Recommendation		S1 and S3 best support the financial case.						

D: LRT in Dedicated Lanes
S: LRT in Shared Lanes

Deliverability and Operations Case

Comparison of how each option performs relative to the rest.



		Evaluation Criteria	S1 (DDD)	S2 (DSD)	S3 (DDS)	S4 (DSS)
Deliverability and Operations	Procurement & Delivery	Procurement Strategies	Two potential procurement strategies are recommended for consideration: <ul style="list-style-type: none"> Option 1: Proponent issues Design – Bid – Build (DBB) contract for construction of the extension. Proponent to reach agreement for HuLRT Project Co to operate and maintain the extension. Proponent could also use Design – Bid – Finance model in which a single contract is awarded for the design, construction, and full or partial financing of a facility Option 2: Proponent to reach agreement for HuLRT Project Co to Design – Build – Finance – Operate – Maintain (DBFOM) the extension. Potential to remove finance from DBFOM contract if it can be financed publicly. 			
		Emergency and Service Vehicle Operations	Impact to operations in Segment B (single traffic lane in each direction).	Limited impact to operations.	Impact to operations in: Segment B (single traffic lane in each direction) and Segment C (single mixed traffic/transit lane in each direction)	Impact to operations in Segment C (single mixed traffic/transit lane in each direction).
	Design and Operational Trade-Offs and Issues	Property Impacts	All options pose similar magnitude impacts to properties (~4,900 – 5,100 m ² property required)			
		Driveway Impacts	Conversion of full moves access driveways to right-in-right-out (RIRO) for Segments A, B & C (77 driveways)	Conversion of full moves access driveways to right-in-right-out (RIRO) for Segments A and C (19 driveways)	Conversion of full moves access driveways to right-in-right-out (RIRO) for Segments A and B (73 driveways)	Conversion of full moves access driveways to right-in-right-out (RIRO) for Segment A (15 driveways)
		Utility Impacts	24 major utility conflicts have been identified			
		Impacts to CN bridge	Overhead Catenary System (OCS) mitigation required to provide vertical clearance under Main Street bridge. S1 may require widening to improve active transportation (i.e. add dedicated cycling infrastructure); whereas S3 and S4 do not.	Overhead Catenary System (OCS) mitigation required to provide vertical clearance under Main Street bridge. S2 may require widening to improve active transportation (i.e. add dedicated cycling infrastructure); whereas S3 and S4 do not.	Overhead Catenary System (OCS) mitigation required to provide vertical clearance under Main Street bridge.	Overhead Catenary System (OCS) mitigation required to provide vertical clearance under Main Street bridge.
		Ability to Extend Line in the Future	All options enable future extensions to the north.			
		Constructability	Surface construction is to be undertaken similarly to typical road widening construction for the length of the study area.			
		Schedule	Surface options are estimated to take up to 6 years from design to opening day.			
		O & M	Operations and Maintenance	<ul style="list-style-type: none"> The LRT extension is to be designed as a fully compatible extension of the planned and under construction HuLRT, building on system assets such as Maintenance and Storage facilities and technology specifications. The extension is to be facilitated such that the preliminary system operations plan documented in the 2014 Hurontario-Main LRT Environmental Project Report (EPR) applies to this project and that operator of the extension and overall line will achieve consistent operations and maintenance plans. 		
Deliverability and Operations Recommendation		S2 and S4 best meet the deliverability and operations objectives as they minimize impacts to roadway and service operations and driveways.				

Preliminary Design Business Case Findings

The performance of each option has been synthesized for each business case criterion in the table below.

Evaluation Criteria		S1 (DDD)	S2 (DSD)	S3 (DDS)	S4 (DSS)
Surface Options	Strategic Case				
	Economic Case				
	Financial Case				
	Deliverability and Operations Case				
	PDBC Recommendation	✘ Do Not Carry Forward	✘ Do Not Carry Forward	✔ Carry Forward	✘ Do Not Carry Forward

With the considerations above, Option S3 is preferred as it best fulfils the objectives of the strategic case, generates the second highest economic case outputs and achieves financial case results that are better than most other surface options. Driveway access impacts are the greatest for S3, however, this trade-off is acceptable to minimize transit travel times along the corridor.

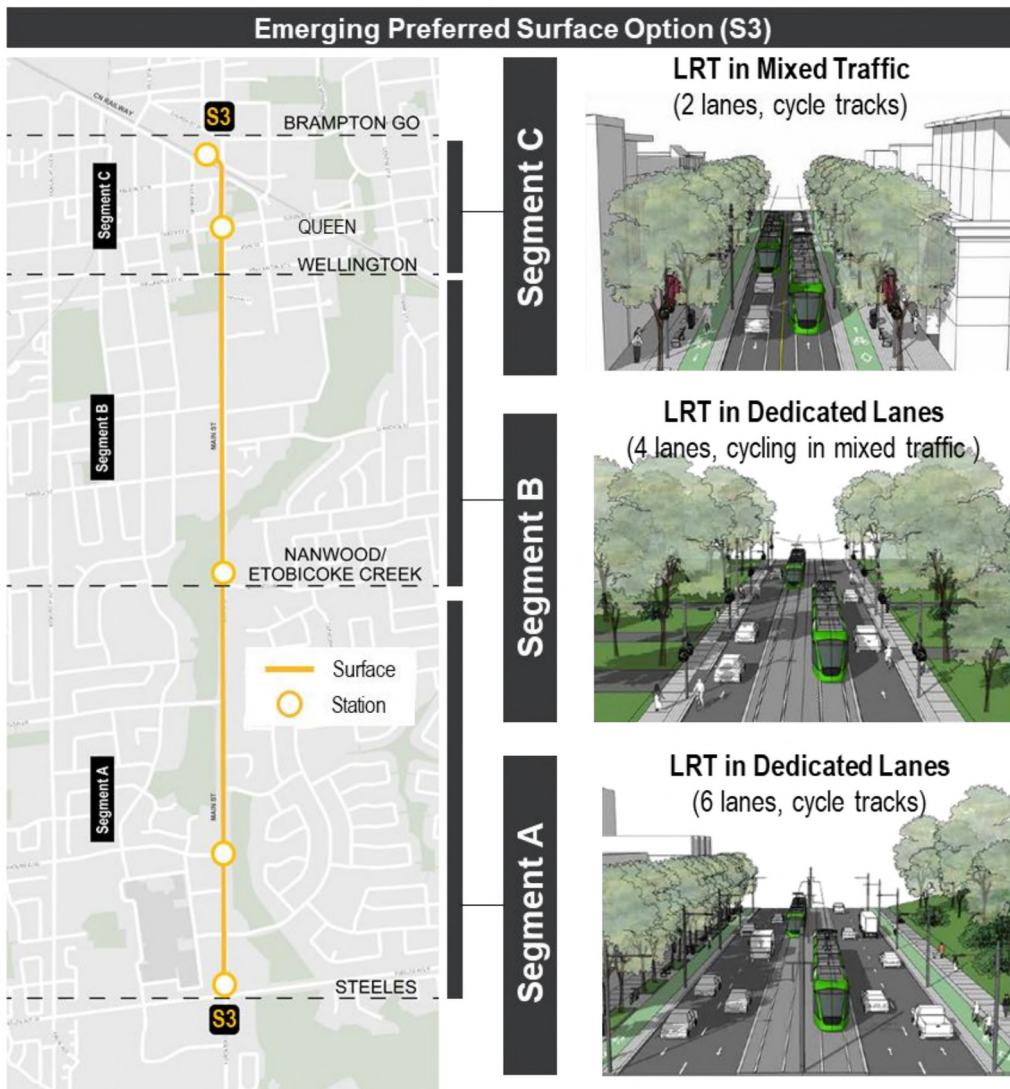
Option S3 provides the opportunity to revitalize Downtown Brampton into an aesthetically beautiful, place-making destination with wider sidewalks, streetscaping, and cycle tracks (consistent with Downtown Brampton Reimagined Vision) while minimizing overall transit travel time. Driveway accesses will be modified as a result of the dedicated LRT right-of-way, but this will ensure safe and efficient travel for all users of the street.

Therefore, Option S3 is the emerging preferred surface option.

Emerging Preferred Surface Option S3

The emerging preferred surface Option S3 is described as follows:

- The LRT will run in dedicated lanes between Steeles Avenue and Wellington Street and in shared lanes from Wellington Street to the Brampton GO Station. There will be 5 surface stops along the route at Brampton Gateway, Charolais, Nanwood, Queen / Wellington and Brampton GO.
- Option S3 allows for an enhanced streetscape in Segments A and C, including: cycle tracks, widened sidewalks, and a planting and furnishing zone. Cyclists must ride in mixed traffic in Segment B or use parallel routes.
- Driveways in Segment B will be modified to right-in, right out access.
- Overhead catenary systems and traction power substations (TPSS) will be located above ground in the study area.



All boulevard configurations shown are subject to change.

Underground Options

Strategic Case

U: Underground

Comparison of how each option performs relative to the rest.



		Evaluation Criteria	U1 (via Main St)	U2 (via George St)
Strategic Case	Strong Connections	LRT Daily Ridership	30,500	
		Ridership increase on Hurontario LRT (Peak Period)	6,100	
		2041 Population within 800 m of Stations	All options serve the same future population (28,000)	
		2041 Employment and Number of low-income residents served	All options serve the same number of jobs and low-income residents (15,000 and 2,200)	
		Support areas with land uses compatible with rapid transit	Compatible (higher order transit, AT improvements)	Compatible (higher order transit, AT improvements)
	Complete Travel Experiences	Transit Travel Time (PM Peak hour)	7 min	8 min
		Average Auto Travel Time in LRT Corridor, Minutes per Trip	6 min	6 min
		Total Transit Travel Time Savings compared to BAU	35,000 person-min	
		Pedestrian and Bicycle Level of Service	Improved active transportation conditions throughout study area	
		Transit and Vehicle Level of Service	Comparable transit and vehicle conditions	
		Potential for Conflicts between modes (LRT, Autos and AT)	Low Conflict between LRT, auto & AT	
		Transfer times from LRT to nearby transit services	Similar transfer times to nearby transit services: 3 minutes to Brampton Transit Bus Terminal, 4-5 minutes to Brampton GO Station	
		Transfer times from LRT to Downtown Brampton	4 min	6 min
	Sustainable Communities	Daily VKT Reduced in Study Corridor, Peak Period	1,200	
		Additional Transit Trips, PM Peak (Diverted from Auto)	700	
		Ability to Incorporate Downtown Reimagined	Ability to incorporate Downtown Reimagined in Segment C	
		Compatibility with Parks and Public Spaces	Similar relationship to parks and public spaces	
		Ability to provide a continuous cycling network	Ability to provide continuous and uninterrupted cycling facilities along the study corridor (reallocating road space for Segment B)	
		Impacts to the Natural Environment, Cultural Heritage & Drainage	Similar impacts on natural and cultural heritage resources and drainage	
Strategic Case Recommendation		U1 best fulfils the objectives and supports the strategic case.		

Economic Case

U: Underground

Comparison of how each option performs relative to the rest.

		Worst	Comparable	Best
Evaluation Criteria		U1 (via Main St)	U2 (via George St)	
Economic Case	Total Economic Benefits (\$ Million, 2019)	\$466	\$472	
	Total Economic Costs (\$ Million, 2019)	\$1,432	\$1,465	
	Net Present Value (\$ Million, 2019)	-\$965	-\$992	
	Benefit-Cost Ratio (BCR)	0.33	0.32	
Economic Case Recommendation		U1 best supports the economic case as it has a marginally better value for money.		

Financial Case

U: Underground

Comparison of how each option performs relative to the rest.

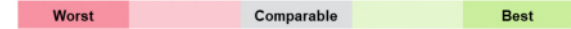
		Worst	Comparable	Best
Evaluation Criteria		U1 (via Main St)	U2 (via George St)	
Financial Case	Capital Construction Costs ⁴ (\$ Million, 2019)	\$1,425	\$1,425	
	Rehabilitation and Major Maintenance (\$ Million, 2019)	\$140	\$143	
	Operations and Maintenance Costs (\$ Million, 2019)	\$25	\$25	
	Total Incremental Revenues (\$ Million, 2019)	\$86	\$87	
	Net Financial Impact (\$ Million, 2019)	-\$1,504	-\$1,506	
Financial Case Recommendation		U1 and U2 have a comparable financial case performance.		

⁴ Construction costs for underground options do not include streetscape or road configuration improvements at the surface as these were assumed to be undertaken as a separate City of Brampton initiative. Property acquisition are not included.

Deliverability and Operations Case

U: Underground



Comparison of how each option performs relative to the rest.



Evaluation Criteria		U1 (via Main St)	U2 (via George St)
Deliverability and Operations	Procurement Strategies	Two potential procurement strategies are recommended for consideration, similar to surface options: <ul style="list-style-type: none"> Option 1: Proponent issues Design – Bid – Build (DBB) contract for construction of the extension. Proponent to reach agreement for HuLRT Project Co to operate and maintain the extension. Proponent could also use Design – Bid – Finance model in which a single contract is awarded for the design, construction, and full or partial financing of a facility Option 2: Proponent to reach agreement for HuLRT Project Co to Design – Build – Finance – Operate – Maintain (DBFOM) the extension. Potential to remove finance from DBFOM contract if it can be financed publicly. 	
	Emergency and Service Vehicle Operations	Limited impact to emergency and service vehicles.	
	Property Impacts	~2,700 m ² property required.	~5,300 m ² property required.
	Driveway Impacts	All full moves access driveways in Segment A converted to right-in-right-out unless at signalized intersection (9 driveways along the surface portion)	
	Utility Impacts	<ul style="list-style-type: none"> Segment B will have no impact on existing utilities. Segment C will have limited impact on existing utilities. 	<ul style="list-style-type: none"> Segment B will have limited impact on existing utilities. Proposed location of surface connection for Brampton GO station may have minor impacts on existing utilities.
	Ability to Extend Line in the Future	<ul style="list-style-type: none"> Able to extend north in the future along Main Street. 	<ul style="list-style-type: none"> More difficult to extend north in the future from George Street. Potential conflict with building foundations.
	Constructability	<ul style="list-style-type: none"> For underground sections, a combination of Sequential Excavation Method (mining) and Open Cut construction is anticipated. TBM was ruled out during optioneering due to its high costs for such short length of the study area. For surface sections (Segment A), construction is to be undertaken similarly to typical road widening construction for the length of the study area. 	
	Schedule	Underground options are estimated to take between 7 and 8 years from design to opening day.	
	Operations and Maintenance	<ul style="list-style-type: none"> The LRT extension is to be designed as a fully compatible extension of the planned and under construction HuLRT, building on system assets such as Maintenance and Storage facilities and technology specifications. The extension is to be facilitated such that the preliminary system operations plan documented in the 2014 Hurontario-Main LRT Environmental Project Report (EPR) applies to this project and that operator of the extension and overall line will achieve consistent operations and maintenance plans. 	
Deliverability and Operations Recommendation		U1 better meets the design and operational objectives as it minimizes property and utility impacts and facilitates future extensions.	

Preliminary Design Business Case Findings

The performance of each option has been synthesized for each business case criterion in the table below.

	Evaluation Criteria	U1 (via Main St)	U2 (via George St)
Underground Options	Strategic Case		
	Economic Case		
	Financial Case		
	Deliverability and Operations Case		
	PDBC Recommendation	 Carry Forward	 Do Not Carry Forward

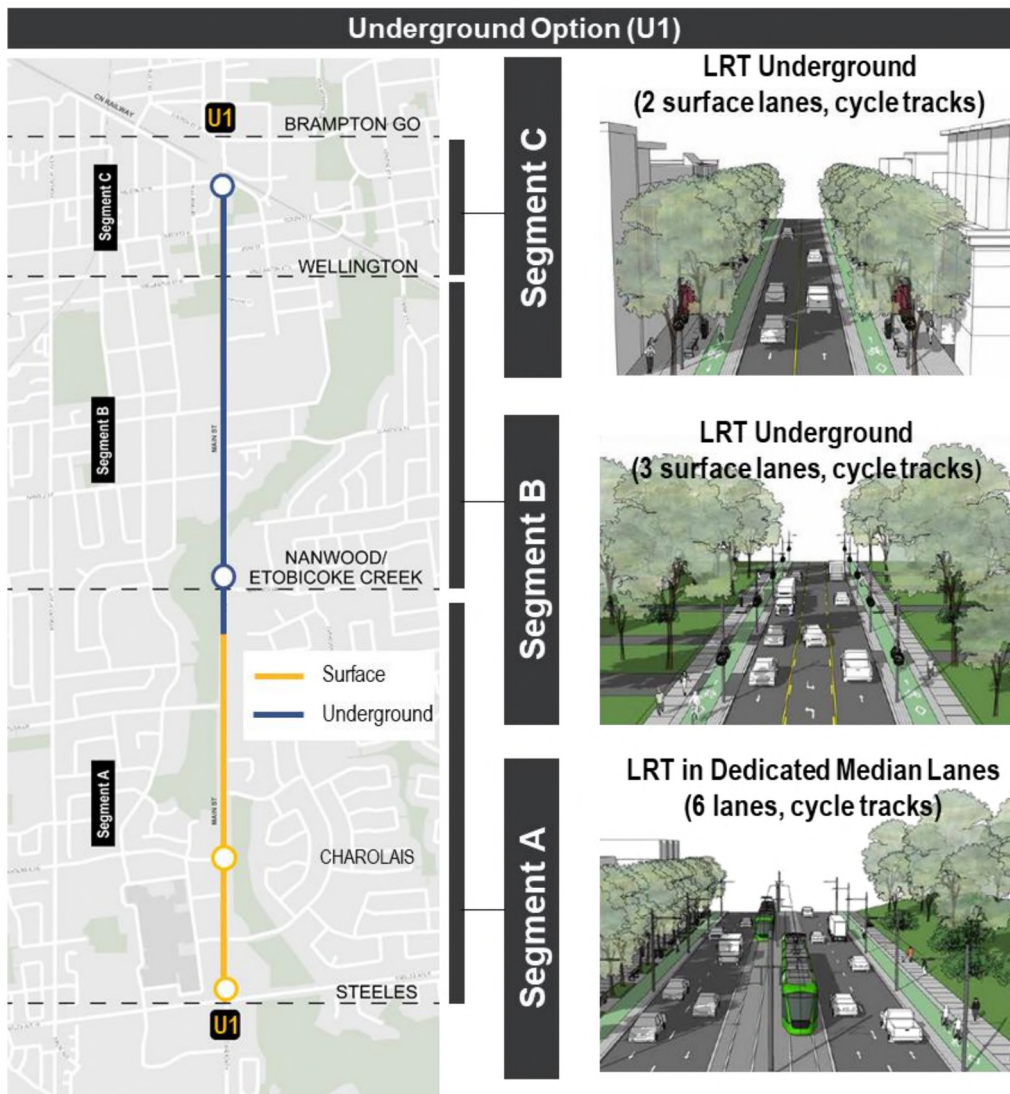
Overall, Option U1 (via Main Street) and U2 (via George Street) perform similarly from a strategic perspective with U1 have certain marginal benefits related to transfer and LRT travel time. However, Option U1 is more preferred than U2 as it is less costly, located closer to the heart of Downtown Brampton, requires less property takings and is more easily extended north in the future.

Therefore, Option U1 is the emerging preferred surface option.

Emerging Preferred Underground Option U1

The emerging preferred underground option U1 is described as follows:

- The LRT will run in dedicated lanes north of Steeles Avenue to Elgin Drive then run underground from just south of Nanwood Drive to the Brampton GO Station along Main Street. There would be 4 stops / stations along the line, with 2 at the surface (Brampton Gateway and Charolais) and 2 underground (Nanwood and Brampton GO).
- Option U1 allows for an enhanced streetscape in Segments A, B, and C, including: cycle tracks, widened sidewalks, and a planting and furnishing zone. Option U1 allows for a continuous cycling network along Main Street.
- No access modifications are required in Segment B. Traction Power Substations (TPSS) will be located underground within underground station.
- The portal and the two underground stations are located in the floodplain. Potential impacts to be mitigated.



All boulevard configurations shown are subject to change.

Comparison of Emerging Preferred Options

The emerging preferred surface and underground options S3 and U1 were compared and their key differences summarized as follows.

	Evaluation Criteria	Option S3 (DDS)	Option U1 (via Main Street)
Strategic Case	Strong Connections	<ul style="list-style-type: none"> 9 minute transit travel time Does not improve multi-modal level of service as much as option U1. 	<ul style="list-style-type: none"> 7 minute transit travel time Improves multi-modal level of service more than option S3.
	Complete Travel Experiences	<ul style="list-style-type: none"> Does not provide the same opportunity for improving pedestrian and cycling at the surface. Lack of dedicated cycling facilities in Segment B creates a discontinuous cycling network More opportunity for conflicts between modes 	<ul style="list-style-type: none"> Improves pedestrian and cycling facilities/level of service at the surface. Continuous cycling network. Less opportunity for conflicts between modes
	Sustainable and Healthy Communities	<ul style="list-style-type: none"> Inability to close streets for civic events in Downtown. Greater temporary and permanent impacts to natural and cultural environment (especially in Segment B). 	<ul style="list-style-type: none"> Provides opportunity to close streets for civic events in Downtown. Fewer impacts to natural and cultural environment (especially in Segment B).
Economic Case	Net Present Value	\$66.9 million	-\$965 million
	Benefit-Cost-Ratio	1.18	0.33
Financial Case	Capital Costs	\$353 million	\$1.43 billion ⁵
	Net Financial Impact	-\$324 million	-\$1.5 billion
Deliverability and Operations Case	Impacts to Road Operations	<ul style="list-style-type: none"> More impact to emergency and service vehicle operations 	<ul style="list-style-type: none"> Fewer impact to emergency and service vehicle operations
	Impacts to Property	<ul style="list-style-type: none"> More property impacts (up to 5,100 m² property required) 	<ul style="list-style-type: none"> Fewer property impacts (~2,700m² property required)
	Impacts to Driveways	<ul style="list-style-type: none"> More driveway and access impacts/restrictions (73 driveways) 	<ul style="list-style-type: none"> Fewer driveway and access impacts/restrictions (9 driveways)
	Impacts to Utilities	<ul style="list-style-type: none"> More utility impacts (24 major utility conflicts) 	<ul style="list-style-type: none"> Limited utility impacts
	Schedule	<ul style="list-style-type: none"> Up to 6 years from design to opening day. 	<ul style="list-style-type: none"> 7 to 8 years from design to opening day.

Next steps will include refining the design and engineering to maximize benefits and mitigate outstanding risks for the emerging preferred options, selecting a preferred option and carrying it through the Transit Project Assessment Process (TPAP).

⁵ Construction costs for underground options do not include streetscape or road configuration improvements at the surface. These were assumed to be undertaken as a separate City of Brampton initiative. Property acquisition are not included.

Date: 2021-05-25

Subject: Hurontario LRT Project Road Dedication By-Laws – Hurontario Street and Kennedy Road

Contact: Mario Goolsarran, Manager LRT Implementation, Transit
905.874.2750 ext.42544, mario.goolsarran@brampton.ca

Report Number: Brampton Transit-2021-681

Recommendations:

1. **THAT** the report titled, Hurontario LRT Project Road Dedication By-Laws – Hurontario Street and Kennedy Road, dated May 25, 2021 from Mario Goolsarran, Manager LRT Implementation, Brampton Transit, be received; and
2. **THAT** a by-law be enacted to establish as part of the public highway system lands owned by the City of Brampton and described as follows:
 - (a) Part of Lots 4, 5 and 6 on Plan 347, designated as Part 7 on Plan 43R-27461, Brampton being all of PIN 14079-0328 (LT) to be part of Hurontario Street; and
 - (b) Part of Lot 12, Concession 2 East of Hurontario Street, designated as Parts 2, 4, 7, 9, 11, 13, 15, 17 and 48 on Plan 43R-31747, Brampton being part of PIN 14300-0196 (LT) to be part of Kennedy Road.
3. **THAT** with respect to any additional City lands now owned or subsequently acquired, that staff may from time to time recommend be established as public highway in order to facilitate the completion of the Hurontario LRT Project, staff be directed to dispense with a recommendation report to Council provided the draft road establishing by-law to be included in any agenda for Council's meeting explicitly indicates that same is to facilitate the completion of the Hurontario LRT Project.