METROLINX

Eglinton Crosstown West Extension Initial Business Case

February 2020

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Executive Summary

Scope

The Eglinton West corridor is a missing piece of the Greater Toronto and Hamilton Area (GTHA) region's Frequent Rapid Transit Network (FRTN)[1]. The corridor extends along Eglinton Avenue West from the western end of the Eglinton Crosstown LRT at Mount Dennis to Toronto Pearson International Airport via the eastern end of the Mississauga Transitway at Renforth Station. This corridor serves the growing bidirectional travel demand across the region's urban growth centres and employment hubs of midtown Toronto, downtown Mississauga and the Pearson Airport Area.

Metrolinx has identified four alignment options for the corridor that connect the Eglinton Crosstown LRT's western terminus at Mount Dennis to Pearson Airport via the Transitway's eastern terminus at Renforth (refer to Figure 1):

- Option 1 serves all arterial and most midblock stops on Toronto's Eglinton Avenue West through an at-grade alignment
- Option 2 serves similar stops as Option 1, but via a below-grade alignment
- Option 3 serves only two arterial stops on Toronto's Eglinton Avenue West through a mostly below-grade alignment and a short above-grade section across the Humber River ravine
- Option 4 serves all arterial stops on Toronto's Eglinton Avenue West via the same alignment as Option 3

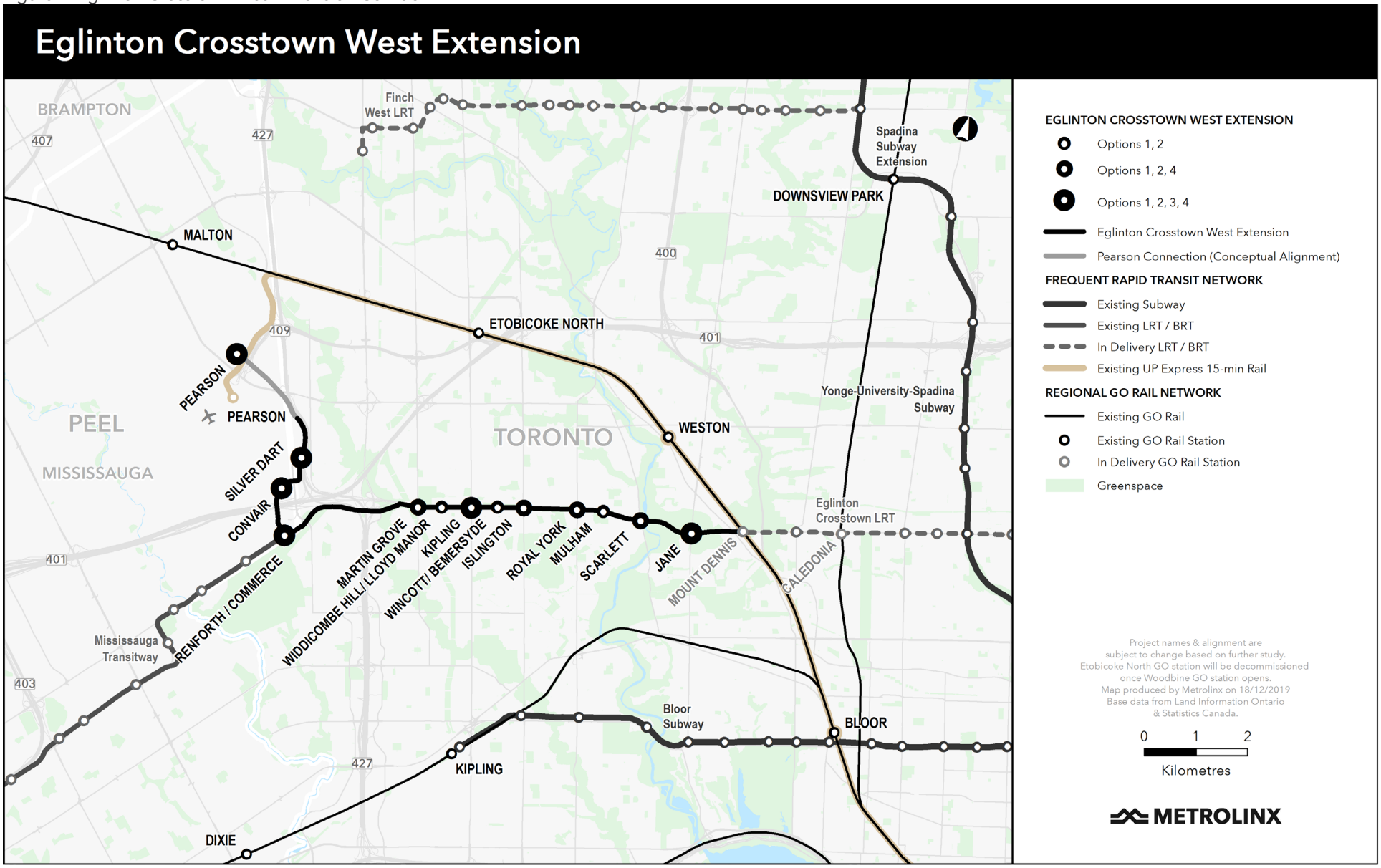
The connection from Renforth Station to Pearson Airport has been included in all the options to understand the demand to the airport. This Initial Business Case (IBC) evaluates the performance of all four options compared to a Business as Usual scenario as the basis for an investment decision.

Method of Analysis

A Business Case is a comprehensive collection of evidence and analysis that sets out the rationale for why an investment should be implemented to solve a problem or address an opportunity. The Eglinton Crosstown West Extension IBC follows the methodology from the Metrolinx Business Case Guidance Volume 2[2].

[1] Metrolinx's 2041 Regional Transportation Plan (2018)
[2] Metrolinx's Business Case Manual Volume 2: Guidance (2019)

Figure 1: Eglinton Crosstown West Extension Corridor



This IBC compares the investment options against a Business As Usual scenario. The investment options are evaluated across four key categories, which are strategic, economic, financial and deliverability and operations cases.

Findings

Strategic Case

The strategic case identifies the desired strategic outcomes of the investment in relation to the 2041 Regional Transportation Plan (RTP) goals, outlines the criteria for each of the outcomes, and evaluates the four investment options through indices that are relevant to each specific criterion.

- Option 4 which presents optimal trade-off between the ease of local access and the speed of travelling outperforms all other options in offering the best network connectivity and corridor travel experience improvements, and still supports livable and sustainable communities along the corridor.
- Options 1 and 2 with both arterial and midblock connections provide the best outcomes for livable and sustainable communities, but slower travel speed results in more marginal network connectivity and corridor travel experience improvements (particularly for surface-running Option 1).
- Option 3's wider spacing between stations results in fastest journey time between Midtown Toronto and Downtown Mississauga, but it skips important arterial bus connections and so trails Options 2 and 4 in network connectivity and corridor travel experience and offers the least support for livable and sustainable communities.

Economic Case

All options provide significant economic benefits that are largely driven by the transit user benefits, but higher economic costs result in Benefit-Cost Ratio (BCR) of less than 1.0 for all of the options. Although Option 4 requires significant capital cost to implement as compared to Option 1, its user benefits in travel time savings are more than double than that of Option 1.

Financial Case

All options feature operating cost recovery ratio of less than 1.0, suggesting that the fare revenues will not be able to recoup the cost of maintenance of operations. This is consistent with most other rapid transit investments of similar nature. Option 1 is preferred as compared to other options from the financial perspective as the capital costs associated with surface LRT alignment are significantly lower.

Deliverability and Operations Case

This IBC treats each option at a conceptual level of design, which is subject to a significant amount of additional design and engineering work. All options are technically feasible, but have distinct challenges in their deliverability and operations. Option 1 is simpler to deliver due to minimal construction progress delays and cost overrun risks. The rest of the options, particularly Option 2, are more challenging to be delivered due to the higher complexity of constructing grade-separated infrastructure.

Summary

Table 1 summarizes the findings for each of the four options in each of the four key cases analyzed in this business case.

Table 1: High-Level Summary of Eglinton West IBC Findings

		Option 1 **Mostly at-grade with 9 Toronto stops**	**Option 2** **Mostly below-grade with 9 Toronto stops**	**Option 3** **Mostly below-grade with 2 Toronto stops**	**Option 4** **Mostly below-grade with 6 Toronto stops**
Strategic Case					
Network Connectivity	Regional transit accessibility (morning peak travel time savings)	62,000 person-minutes less for all GTHA trips	112,000 person-minutes less for all GTHA trips	94,000 person-minutes less for all GTHA trips	142,000 person-minutes less for all GTHA trips
	Network completeness (increase in Crosstown LRT and Transitway BRT weekday boardings)	21% increase	21% increase	17% increase	23% increase
Corridor Travel Experience	Eglinton Crosstown West Extension weekday boardings	42,500 boardings	36,500 boardings	23,000 boardings	37,000 boardings
	Improvements in transit access to jobs for local communities[3]	4% more GTHA jobs by transit in 45 mins	11% more GTHA jobs by transit in 45 mins	14% more GTHA jobs by transit in 45 mins	18% more GTHA jobs by transit in 45 mins
Livable Communities	Corridor Auto Dependency[4] • Auto mode share • Transit mode share	3.5% decrease in auto mode share & 2.4% increase in transit mode share	3.3% decrease in auto mode share & 2.2% increase in transit mode share	2.0% decrease in auto mode share & 1.3% increase in transit mode share	3.2% decrease in auto mode share & 2.1% increase in transit mode share
Sustainable Development	Existing coverage[5] (2016)	44,000 population & 23,000 jobs	44,000 population & 23,000 jobs	24,000 population & 20,000 jobs	42,000 population & 23,000 jobs
	Future coverage[6] (2041)	52,000 population & 31,000 jobs	52,000 population & 31,000 jobs	24,000 population & 27,000 jobs	50,000 population & 31,000 jobs
Strategic Case Evaluation Summary		Notable improvements in livable and sustainable communities	Notable improvements in network connectivity, corridor travel experience & livable and sustainable communities	Least improvements in livable and sustainable communities	Best overall improvements in network connectivity, corridor travel experience & livable and sustainable communities

[3] For households residing within 2km of corridor
[4] Same as above
[5] Within 800m radius
[6] Same as above

	Option 1 Mostly at-grade with 9 Toronto stops	Option 2 Mostly below-grade with 9 Toronto stops	Option 3 Mostly below-grade with 2 Toronto stops	Option 4 Mostly below-grade with 6 Toronto stops
Economic Case				
Total Economic Benefits ($2019 NPV)	$891 M	$1,370 M	$1,266 M	$1,669 M
Total Costs ($2019 NPV)	$3,505 M	$5,867M	$4,168M	$4,916 M
Benefit-Cost Ratio	0.25	0.23	0.30	0.34
Financial Case				
Total Capital Costs (YoE, $2019 NPV)	$2,128 M	$4,390 M	$2,772 M	$3,473 M
Net Revenue (YoE, $2019 NPV)	-$3,171 M	-$5,612 M	-$4,070 M	-$4,647 M
Operating Cost Recovery Ratio	0.40	0.35	0.20	0.34
Return on Investment	0.14	0.07	0.06	0.09
Deliverability and Operations Case				
Right-of-Way Limitations	Moderate	Low	Low	Low
Utilities and Topology Accommodation	Very Low	Very High	Moderate	High
Flooding Mitigation	Moderate	High	Low	Low
Construction Impacts	High	High	Low	Moderate
Operational Challenges	Moderate	Very Low	Low	Low
Deliverability and Operations Case Evaluation Summary	Best option for minimal construction progress delays and cost overrun risks	Least operational risk, but very complicated project planning and engineering risks	Minimal operational risk, but slightly complicated project planning and engineering risks	Minimal operational risk, but complicated project planning and engineering risks

1

Introduction

Background

The Eglinton Crosstown West Extension corridor connects Eglinton Crosstown's Mount Dennis terminal with Pearson Airport via Mississauga Transitway's Renforth Station. It connects many people living in Etobicoke and Mississauga to regional jobs, particularly in North York and around Pearson Airport.

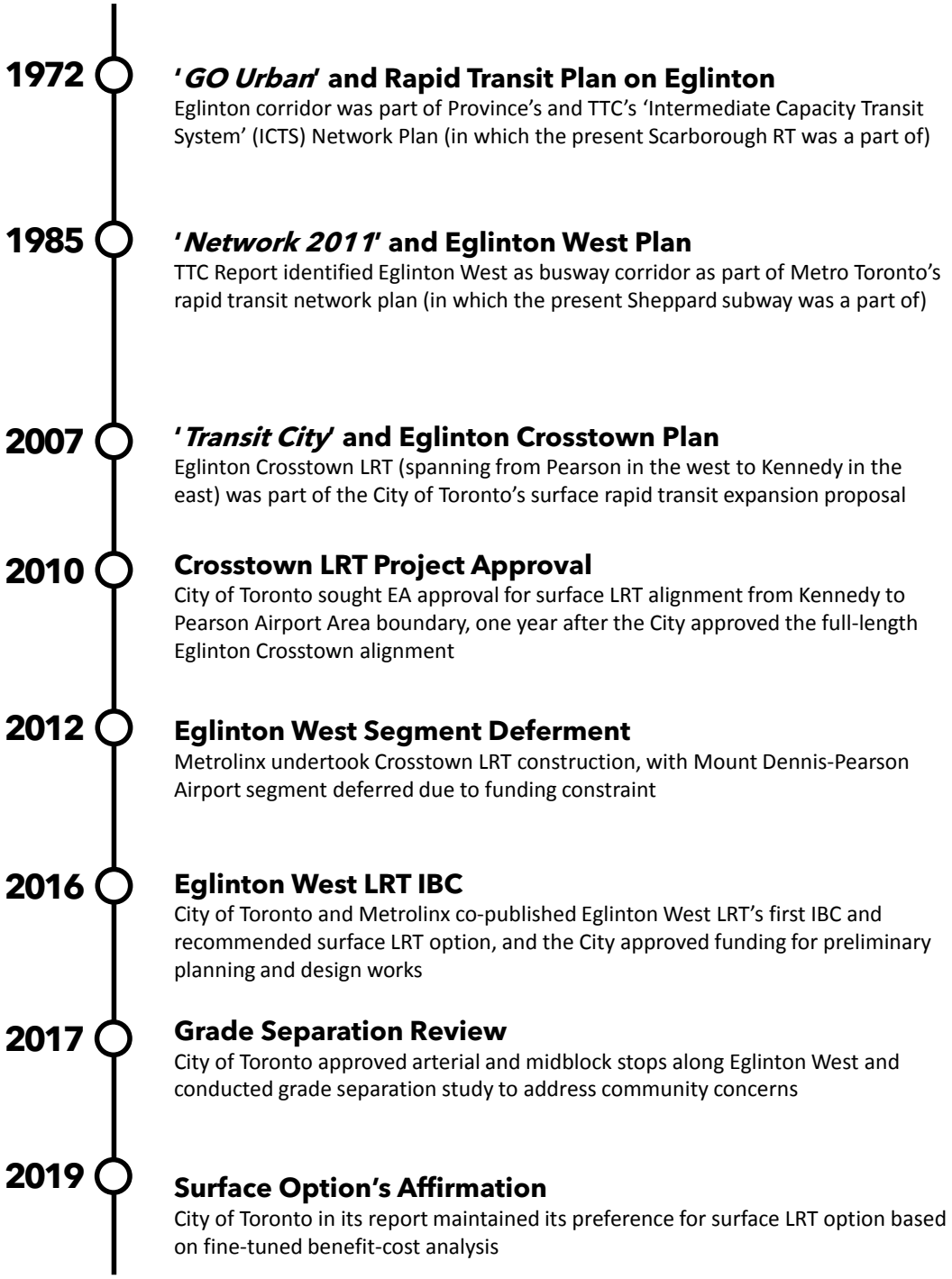
Early rapid transit proposals for Toronto's wider Eglinton corridor appeared in 1972 and 1985 as part of its wider rapid transit network plans. In 2007, the Eglinton Crosstown West Extension was originally conceived as part of the Eglinton Crosstown LRT. The alignment, for which the City of Toronto obtained Environmental Assessment (EA) in 2010, spanned from Pearson Airport in the east to Kennedy Station in the west.

The Mount Dennis-Pearson Airport section was further identified as Phase 2 of the Eglinton Crosstown LRT project (later referred to as the Eglinton West LRT and the Eglinton Crosstown West Extension), and its implementation was deferred in 2012 due to funding constraints. In 2016, the City of Toronto and Metrolinx co-published an IBC for the Eglinton West LRT. The IBC noted the importance of the LRT to bridge the connectivity gaps between Toronto's Mount Dennis LRT station, the Mississauga Transitway, and the Pearson Airport Area.

Planning works for the Mount Dennis-Renforth segment by the City of Toronto have produced four narrowed down options: at-grade and below-grade alignments with many arterial and midblock stops, and mostly below-grade alignments with a single stop and multiple arterial stops between Jane Street and Renforth Station. The Renforth-Pearson Airport segment remains as a representative alignment, pending finalisation of future development planning and infrastructure funding arrangements by Pearson Airport.

In response to community concerns about potential traffic impacts of an at-grade LRT, the City of Toronto produced a report in early 2019 that reaffirms its earlier position that the at-grade, many stops option best meets its project and policy objectives. Now in 2019, this Eglinton Crosstown West Extension IBC evaluates all options against the base case/Business as Usual (BAU) scenario to understand the cost and benefits of the project.

Figure 2: Chronology of Eglinton West Rapid Transit Planning



Business Case Overview

Business Cases inform decision-making and support investment optimization as the investment advances through planning, design, delivery and operation. Business cases are required by Metrolinx for all investments exceeding $50 million.

Business cases provide evidence to decision makers, stakeholders, and the public as a crucial part of transparent and evidence based decision making processes. They are used throughout any proposed investment's lifecycle.

The Eglinton Crosstown West Extension IBC follows the methodology from the Metrolinx Business Case Guidance Volume 2[7]. As with all Metrolinx Business Cases, the Eglinton Crosstown West Extension IBC is structured around four key cases:

- The Strategic Case, which determines the value of addressing a problem or opportunity based on regional development goals, plans and policies.
- The Economic Case, which uses standard economic analysis to detail benefits and costs of the options to individuals and society as a whole, in economic terms.
- The Financial Case, which assesses the overall financial impact of the options, its funding arrangements and technical accounting issues and financial value for money.
- The Deliverability and Operations Case, which considers procurement strategies, deliverability risks, and operating plans and risks.

As projects develop in scope and construction, business cases are completed to define the rationale and requirements for delivering said investment. As shown in

[7] Metrolinx's Business Case Manual Volume 2: Guidance (2019)

Figure 3, the Initial Business Case is the first of four business cases completed in an investment's lifecycle. It reviews variations of the preferred investment and selects a preferred option for further design and analysis.

Figure 3: Metrolinx Business Case Development Process

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Problem Statement

Case for Change

Problem Statement

Significant growth is expected to occur at Toronto's and Mississauga's key rapid transit hubs along the wider Eglinton Avenue corridor, particularly in Midtown Toronto and Downtown Mississauga. Recent openings of the Mississauga Transitway and Union Pearson (UP) Express, as well as the upcoming opening of the Eglinton Crosstown LRT and the Kitchener Line's GO Train/UP Express Mount Dennis Station will bring vital rapid transit improvements to the region.

However, the Eglinton West corridor will remain as a key gap in the rapid transit network along Eglinton Avenue West between Mount Dennis Station (the western end of the Eglinton Crosstown line) and Renforth Station (the eastern end of the Mississauga Transitway).

The corridor is served by Toronto Transit Commission's (TTC) 32A bus route, which is a branch of bus route 32 that serves the entire span of the wider Eglinton Avenue corridor from Yonge Street in the east to Renforth Station in the west.

As demand along the corridor will increase in the future, congestion-based delay will increase overall transit travel times and reliability. Without better, faster and more reliable rapid transit, the region runs a risk of missing the opportunity to steer future infill development that supports greater levels of transit and active transportation use along this corridor.

The corridor was identified as part of 2041 RTP's rapid transit projects that are in development, and will complement other existing, in delivery and in development corridors to create a highly connective grid of frequent rapid transit services across the GTHA that provide strong connections, complete travel experiences and sustainable and healthy communities.

Opportunity for Change

Table 2 below compares the effects of expanding the road, regional rail, and rapid transit networks to address the problem statement, and illustrates the rationale behind an LRT based solution for the Eglinton West corridor.

Table 2: Comparing How Different Modes Could Address the Problem Statement

Problem	Road Expansion	Regional Rail Expansion	BRT Expansion	LRT Expansion
Network Gap	Building additional road capacity to reduce congestion, as suggested by past evidence, will induce demand for additional auto trips, creating congestion along the corridor, making transit journeys slower and less reliable, and limiting sustainable mobility choices for the residents which eventually leads to a return to the original problem	A spur line along the Kitchener GO Rail corridor will require very costly land acquisition and grade separation solutions due to mainline rail design requirements (e.g. turning radii, and maximum grades)[8]	Extending the Mississauga Transitway eastward to the western terminus of the Eglinton Crosstown LRT (i.e. Mount Dennis) will not serve the travel market in the corridor as well as extending the LRT westward to the BRT (as Etobicoke's local bus users would be required to transfer to BRT, then again to LRT to access the subway network)[9]	Bridging the network gap through expanding the Eglinton Crosstown LRT westward to Mississauga Transitway and Pearson Airport will meet the Frequent Rapid Transit Network objectives and expand more sustainable and seamless mobility options for residents along the corridor[10]

Across North America, many cities have invested in LRT extension programs to make their frequent rapid transit network more complete and robust, offering faster, more seamless and reliable connectivity for local and regional travellers. Table 3 below describes other LRT extension programs with similar context.

Table 3: The Role of LRT in Bridging Existing Frequent Rapid Transit Network Gaps

Case Studies	Calgary's C-Train West LRT Extension (2012)	Seattle's Central Link LRT's University-Link Extension (2016)	Dallas Area Rapid Transit LRT's Airport Extension (2014)
Alignment	Mostly at-grade	Below-grade	Above-grade
Length	8.2km	5.1km	22.5km
Number of Stops	6	2	9
Peak Frequency	4 to 7 minutes	6 minutes	15 minutes

[8] City of Toronto's SmartTrack Western Corridor Feasibility Review (2016)
[9] City of Toronto's Eglinton West LRT IBC (2016)
[10] City of Toronto's Eglinton West LRT IBC (2016)

Case Studies	Calgary's C-Train West LRT Extension (2012)	Seattle's Central Link LRT's University-Link Extension (2016)	Dallas Area Rapid Transit LRT's Airport Extension (2014)
Connectivity Improvement Challenges	Dispersed activity centres along the corridor	Presence of water body and lack of acquirable lands	Pinch points due to proximity to highways and airport facilities
Connectivity Improvement Solutions	• Completes the LRT network's missing southwest leg • Serves as trunk line for local buses to feed into • Supports new pathways and cycling infrastructure	• Bridges the region's LRT network gap; corridor to be extended to Seattle's bordering suburb in the short term and neighbouring municipality in the long term • Improved travel times that are up to 80% faster • Augments system ridership due to bidirectional travel demand	• Completes the region's expansive LRT network by providing system-wide connection to the airport which is the country's fourth busiest • Attracts new ridership due to the increased transit service reliability and travel time predictability

Key Drivers

Table 4 outlines the key issues and considerations, both internal and external, for the current and future state of transportation in the Eglinton West corridor that shape the opportunity and support the case for this investment.

Table 4: Key Driver Analysis

	Key Driver	How does this Driver influence the problem/opportunity?	What is the impact of not addressing the problem/opportunity?
Internal to the Transport Network	Travel Behaviour	• Faster and more reliable rapid transit service between Mount Dennis and Renforth stations will support a shift from auto to transit.	• Slower and less reliable local bus service operating in mixed traffic between Mount Dennis and Renforth stations will limit mode shift from auto to transit.
	Transport Service Provision	• Filling the rapid transit gap between Eglinton Crosstown and Mississauga Transitway is critical towards sustaining the region's connectivity needs as it experiences unprecedented growth. • Higher capacity rapid transit is important to sustain economic growth along the corridor – a 2015 Transportation Study of the Pearson Airport Area projected 92% and 41% increases in airport travelers and employment respectively by 2031.	• A key component of the GTHA Frequent Rapid Transit Network will not be realised. • An opportunity to increase transit ridership and mode share along this corridor will be missed. The corridor will be burdened by the increasing cost of auto dependency, particularly reduced accessibility to jobs and services and increased pollution levels due to congestion. •

	Key Driver	How does this Driver influence the problem/opportunity?	What is the impact of not addressing the problem/opportunity?
Internal to the Transport Network *(continued)*	Transport Infrastructure and Technology	• Better, faster and more seamless transit connectivity across the corridor will alleviate congestion and promote higher transit use.	• While not yet at capacity, existing transit configuration requires transferring to and from the TTC 32A bus at both Mount Dennis and Renforth for users of both Eglinton Crosstown LRT and Mississauga Transitway BRT.
External to the Transport Network	Government Policy and Planning	• The corridor is a critical component of the Frequent Rapid Transit Network under the 2041 RTP. • The City of Toronto regards Eglinton Crosstown West Extension as a key component of its rapid transit plan that will improve access to jobs and services for local and area residents. • The Eglinton Crosstown West Extension fits into Greater Toronto Airport Authority (GTAA) plans for a Regional Transit and Passenger Centre (RTPC), which would include ground transportation access for all modes at Pearson Airport.	• A critical Frequent Rapid Transit Network component under the 2041 RTP will not be realised. • GTAA's RTPC will be less integrated with the region's Frequent Rapid Transit Network.
	Economic Activity, Land Use, and Demographics	• The Eglinton Crosstown West Extension can connect residents to employment opportunities along the corridor, including to the GTAA and City of Mississauga. • The Eglinton Crosstown West Extension may generate investment in Transit-Oriented Development.	• Future developments along the Eglinton West corridor will continue to be predominantly shaped by private vehicle travel needs. This will result in a continued auto-oriented land uses causing auto congestion along this corridor to remain and increased travel times to worsen for all modes. • Congestion may limit growth along the corridor, including the economic growth expected at the Pearson Airport Area. • Transit travel times will remain too uncompetitive to be attractive for auto users along the corridor to make the desired shift to transit.

Strategic Value

The 2041 RTP presents a common vision for the region:

"The GTHA will have a sustainable transportation system that is aligned with land use, and supports healthy and complete communities. The system will provide safe, convenient and reliable connections, and support a high quality of life, a prosperous and competitive economy, and a protected environment."

The GTHA is undergoing rapid growth and development. Its population is forecasted to grow from nearly 7 million today to 10.1 million by 2041, alongside a strong increase in the number of jobs. The combined population of the City of Toronto and the City of Mississauga is forecasted to reach 4.3 million by that same year from 3.6 million in 2016.[11]

While growth presents opportunities for the region it can also create challenges. Without investment, the GTHA's regional transportation system will be unable to support a high quality of life, increased prosperity, and environmental sustainability.

[11] Statistics Canada, Region of Peel

Strategic Outcomes

The Eglinton Crosstown West Extension investment is intrinsically tied to 2041 RTP goals of creating strong connections, complete travel experiences and sustainable and healthy communities, as detailed in Diagram 1.

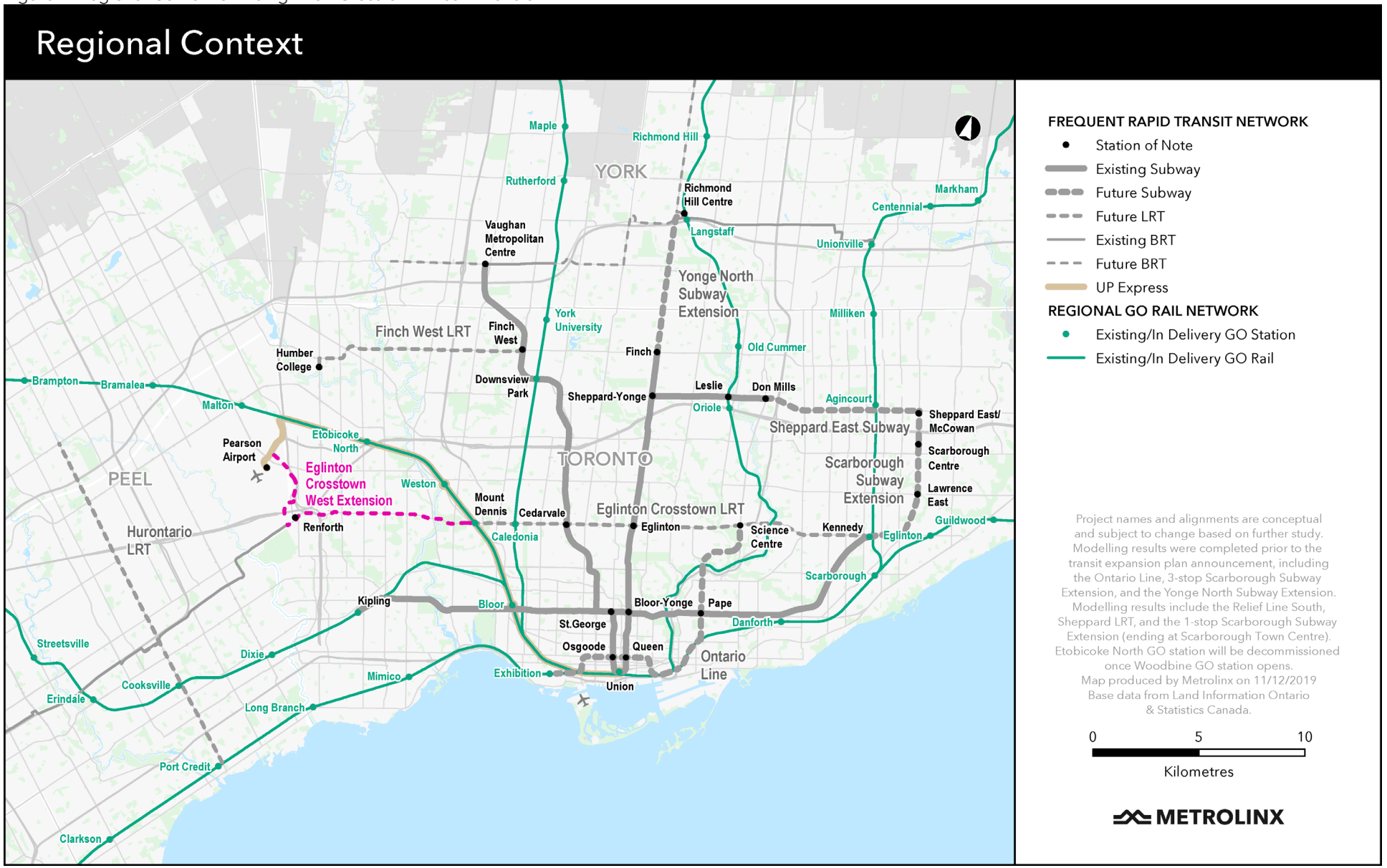
The Eglinton Crosstown LRT together with other existing and future rapid transit projects will complete the Frequent Rapid Transit Network in the GTHA (refer to Figure 4). The Frequent Rapid Transit Network consists of regionally significant, high-demand transit corridors that connect Urban Growth Centres, key Mobility Hubs and areas of high population or employment density.

A comprehensive and integrated Frequent Rapid Transit Network will substantially increase the percentage of the population and jobs that are within walking distance of frequent rapid transit in the GTHA from 9% and 21% in 2011 to 38% and 49% in 2041. As travel demand in the region grows, by 2041 the share of all jobs accessible within one hour by transit for an average resident will drop to 13% without the Frequent Rapid Transit Network as compared to the present 22% share which will be sustained throughout 2041 with the Frequent Rapid Transit Network.

Table 5: Eglinton Crosstown West Extension's Strategic Outcomes

RTP 2041 Goals	Eglinton Crosstown West Extension's Strategic Outcomes
Strong connections	Improving the present GTHA rapid transit network to connect more people to even more jobs and services, and to make their lives better through reduced auto dependency and more efficient transit
Complete travel experiences	Providing a hassle-free, accessible, reliable and comfortable door-to-door travel experience that improves transit use attractiveness for the served residents and businesses
Sustainable and healthy communities	Promoting higher quality of life to the served residents and businesses through more sustainable mobility and land use options that support healthier communities and more prosperous economy

Figure 4: Regional Context of the Eglinton Crosstown West Extension



On top of providing regional benefits, the Eglinton Crosstown West Extension will also improve transit user experiences for the corridor's residents, employers and visitors. With its own right-of-way, the LRT will provide a more attractive mobility option for the local communities due to the improved transit travel times and reliability.

This will lead to greener and healthier active transportation-based travel behaviours and more sustainable transit-supportive developments, which are important for the corridor to be economically prosperous relative to other areas in the region.

Alignment with Broader Policy

The project stakeholders at the provincial, regional and municipal levels of government are aiming to improve quality of life, safety, guide economic growth and development and advance environmental sustainability for their respective jurisdictions.

A review of the following provincial, regional and municipal policies and plans examines how Eglinton Crosstown West Extension aligns with policies in the following documents:

- Provincial Policy Statement Under the Planning Act (2014)
- Growth Plan for the Greater Golden Horseshoe (2017)
- Metrolinx 2041 Regional Transportation Plan (2018)
- Official Plan – City of Toronto (2015)

Toronto Pearson International Airport Master Plan (2017)

Table 6 in page 23 summarizes key policies from these documents that align with the Eglinton Crosstown West Extension.

Table 6: Alignment of Eglinton Crosstown West Extension with Broader Policies and Plans

Stakeholder	Document	Specific Policy and Key Considerations
Government of Ontario – Ministry of Transportation	Metrolinx's 2041 RTP	• The 2041 RTP's vision calls for the GTHA's transportation system to provide a high quality of life, a prosperous economy and a protected environment with the goals of strong connections, complete travel experiences and sustainable and healthy communities to pursue the vision.
Government of Ontario – Ministry of Municipal Affairs and Housing (MMAH)	Provincial Policy Statement under the Planning Act (2014)	• Section 1.6.7 on Transportation Systems states the need to expand transit that makes efficient use of existing and planned infrastructure, creates connections which cross jurisdictional boundaries, supports land use density and mix that minimizes the length and number of vehicle trips and supports current and future use of transit and active transportation.
	Growth Plan for the Greater Golden Horseshoe (2017)	• The Growth Plan outlines a framework to manage growth in the Greater Golden Horseshoe (GGH), and articulates the need for an integrated, multi-modal, regional transit network as the key to economic growth, reduced air pollution and improved public health. • Section 2.2.1 recommends that growth be prioritised around higher order transit nodes, and that infrastructure should be planned by considering the full life cycle costs of these assets and developing options to pay for these costs over the long-term. • Section 2.2.4 states that planning will be prioritized for major transit station areas on priority transit corridors, which include the Mississauga Transitway BRT and the Eglinton Crosstown LRT, with a minimum density target of 160 residents and jobs combined per hectare.
Regional and local municipalities	Official Plan – City of Toronto (2015)	• The vision of the Plan is about creating an attractive and safe city with vibrant neighbourhoods that are part of complete communities served by a comprehensive and high quality affordable transit system that lets people move around the City quickly and conveniently. • Section 2.1 notes that the City cannot plan in isolation and growth management must take into account its neighbouring regions for mutual prosperity, hence an excellent integrated regional transportation system with direct, transfer-free, inter-regional transit service and connection to key regional locations such as Pearson Airport is required. • Section 2.2 points out the Avenues as part of the growth areas with good transit access, and Map 5 delineates the Martin Grove to Mount Dennis section of Eglinton Avenue as part of the Avenues where reurbanization is encouraged but subject to neighbourhood protection policies and to a locally-tailored Avenue Study, which is a framework for change that details how road allowance can be optimized and transit service enhanced.
	Toronto Pearson International Airport Master Plan (2017)	• The Master Plan reiterates GTAA's plan for a Regional Transit Centre (presently known as Regional Transit and Passenger Centre or RTPC) integrating Toronto Pearson with the GTHA's rapid transit network and attract 300,000 airport-area workers to shift to transit. • Pearson Airport's current transit mode share of 10% will need to double or triple to accommodate the growth in forecasted air travel demand (and 2037 goal of 30% transit mode share). • The completion of the RTPC will allow employers in the Airport Employment Zone to gain access to a larger talent pool • Phase 1 of the RTPC will be completed with the opening of Eglinton Crosstown West Extension, and new bus connections to the westernmost LRT station on the Eglinton corridor are planned for near-term connectivity to the TTC.

3

Investment Options

Introduction

This chapter provides a short list of defined, well-scoped and defensible investment options for consideration and evaluation in the Strategic, Economic, Financial, and Deliverability and Operations Cases.

Study Area

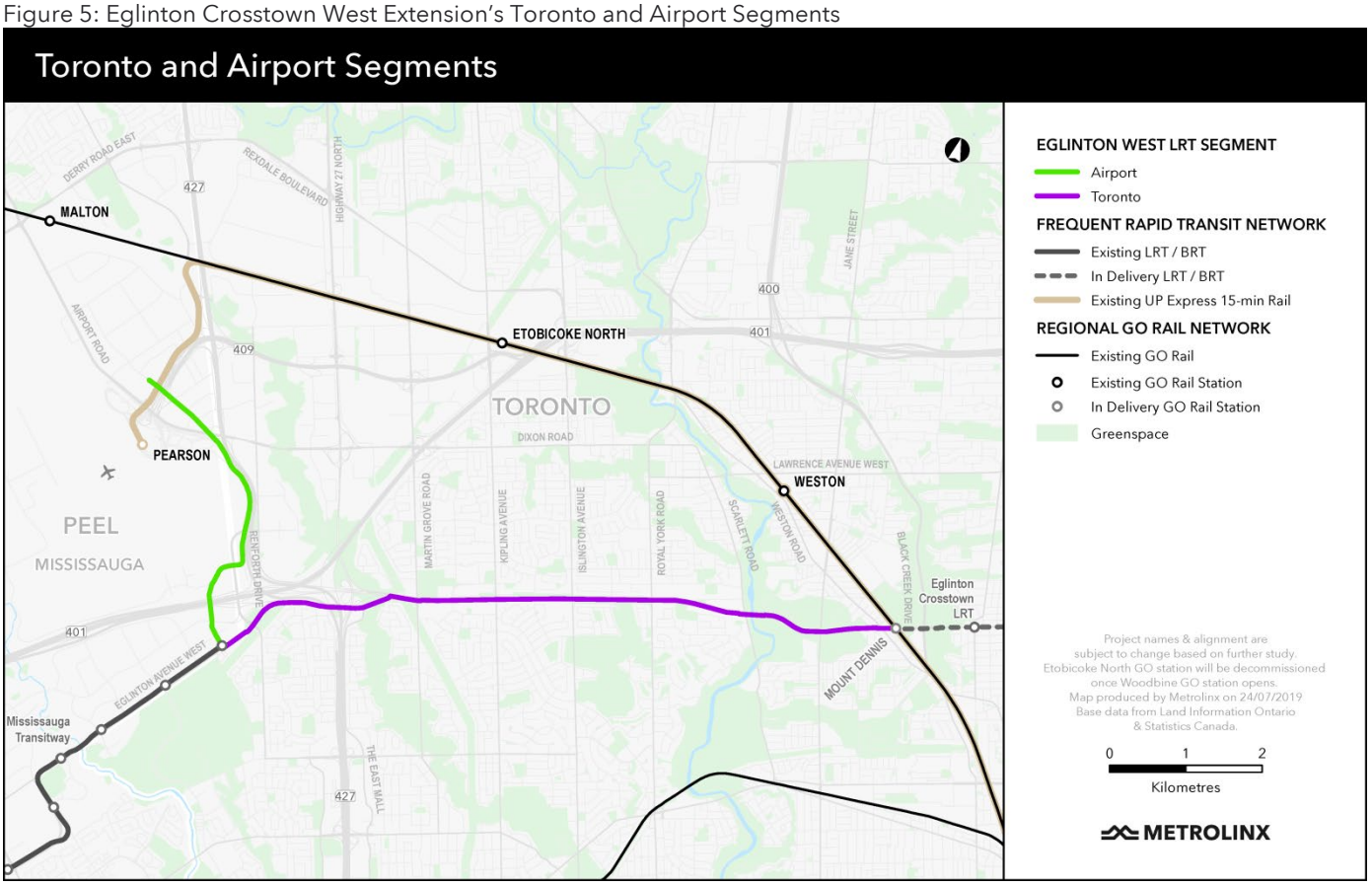
The area of study in this IBC is the Eglinton West corridor. The Eglinton Crosstown West Extension would extend Line 5 (Eglinton Crosstown LRT) 14 kilometres west from Mount Dennis Station to the proposed Regional Transit and Passenger Centre at Pearson Airport. The "Toronto Segment" is from the Eglinton Crosstown LRT's Mount Dennis Station at Weston Road to Renforth Station at the border between Toronto and Mississauga, and the "Airport Segment" is in Mississauga, from Renforth Station to Pearson Airport. The lengths of the Toronto and Airport Segments are 9.2 kilometers and 4.66 kilometres respectively. Figure 5 refers to the Eglinton West corridor with the Toronto and Airport Segments highlighted.

Options Development

The proposed Eglinton Crosstown West Extension alignment, which was inherited from the Eglinton Crosstown LRT project's 2010 Environmental Assessment (EA), spans from the planned Eglinton Crosstown LRT's westernmost station of Mount Dennis through the present Mississauga Transitway BRT's Renforth Station prior to turning northward towards the airport up to the proposed Silver Dart LRT station. The alignment between Silver Dart and Pearson Airport falls under the airport property and hence was not established.

In 2016, Metrolinx and the City of Toronto approved the project concept from the original 2010 EA and co-published an IBC for the Eglinton West LRT. The IBC developed six options for the Toronto segment: four at-grade LRT alignments with many arterial and midblock stops, multiple arterial stops, multiple arterial stops with grade separation at intersections, and few arterial stops, one below-grade LRT alignment with multiple arterial stops, and one at-grade BRT alignment with many arterial and midblock stops.

Figure 5: Eglinton Crosstown West Extension's Toronto and Airport Segments



The Airport Segment alignment was added to each option to complete the project scope for modelling purposes, and featured an above-grade segment over Highway 401 which continued northward with a stop near the GTAA headquarter, an at-grade segment along Silver Dart Drive and Highway 427 with a stop serving the employment areas west of Highway 427, and a representative segment leading to the airport terminus at the proposed RTPC.

The options were developed to consider local access and travel speed trade-offs, grade separation impacts and technology choices. The at-grade alignments with many arterial and midblock stops and multiple arterial stops options were preferred due to their local accessibility, project affordability and deliverability, and ridership attractiveness.

The 2016 IBC recommended further study of targeted grade separations at select arterial intersections for the Toronto Segment. Following this, in November 2017, the City of Toronto determined that arterial intersection grade separations did not provide adequate benefits to justify their high costs.

In December 2017, the City of Toronto conducted further studies on additional grade-separated options based on inputs from the local community who are concerned with the at-grade LRT's traffic impact. The number of options for the Toronto Segment were revised to four (featuring at-grade and below-grade alignments with frequent arterial and midblock stops, and a mostly below-grade alignment with either a single stop or multiple arterial stops) and re-evaluated using traffic model updates and additional metrics recommended by community representatives.

Nonetheless, the City of Toronto in early 2019 released a report re-confirming their preference for an at-grade LRT due to its cost-effectiveness in meeting all of the city's project and policy objectives.

Subsequently, the Province's 2019 Budget announcement included the extension of the Eglinton Crosstown LRT to Mississauga as one of the four budgeted rapid transit projects with an underground alignment.

This Initial Business Case was developed in order to provide evidence-based analysis of the four options and to inform decision-making on this project.

Options for Analysis

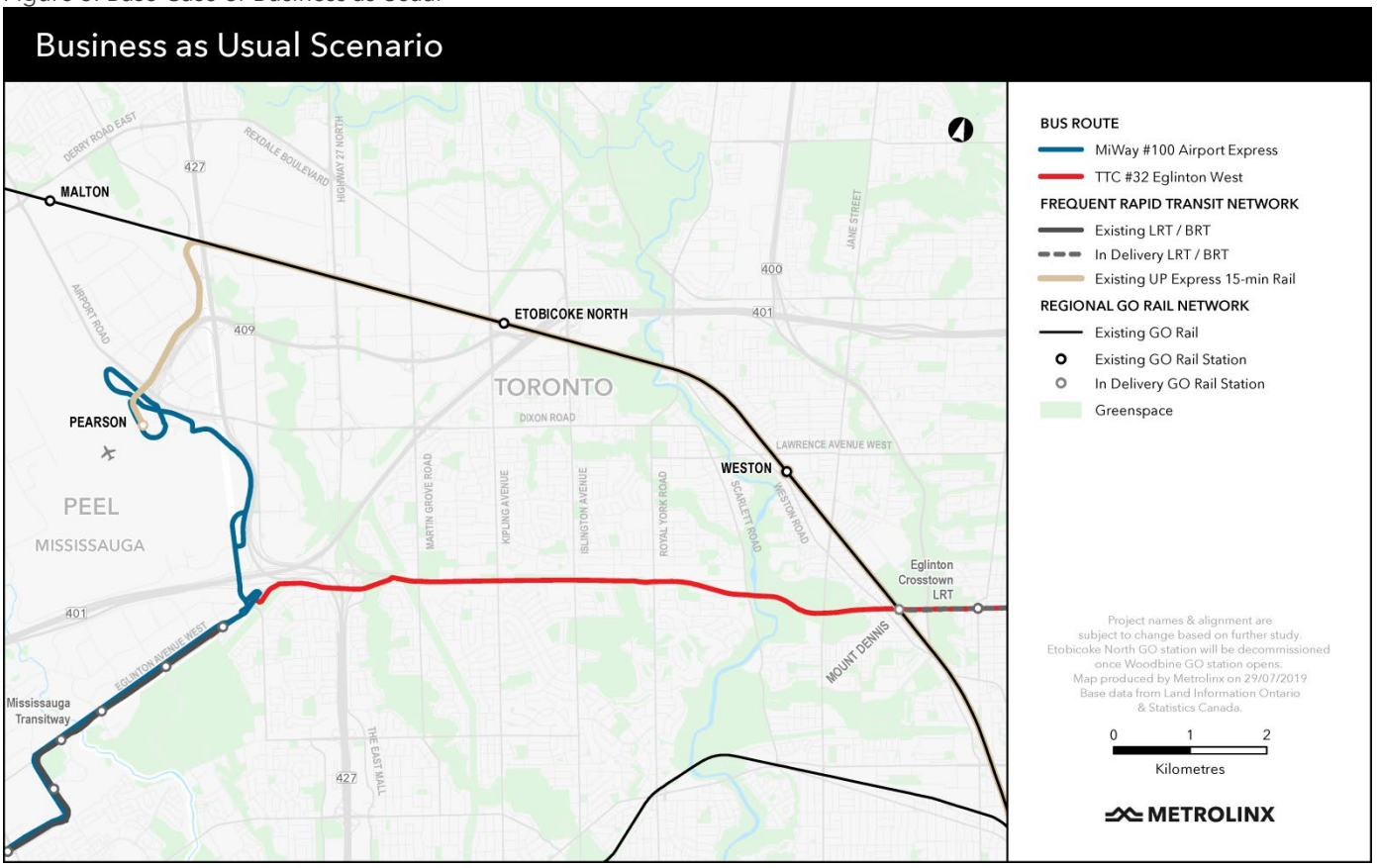
This IBC update evaluates four investment options for the Eglinton Crosstown West Extension alignment against a 'Business as Usual' (BAU) scenario based on different right-of-way and stop spacing strategies for the Toronto Segment. All of the four options share the common three-stop alignment for the Airport Segment as recommended in the 2016 IBC.

The options feature Light Rail Vehicles running as frequent as every four minutes and carrying up to 11,700 riders per hour. The options are assumed to be operationally compatible with the future Eglinton Crosstown LRT as the presumption is that this project is an extension of the LRT.

All options were modelled using the Metrolinx Greater Golden Horseshoe Transportation Model (GGHm) version 4. The options are as follows:

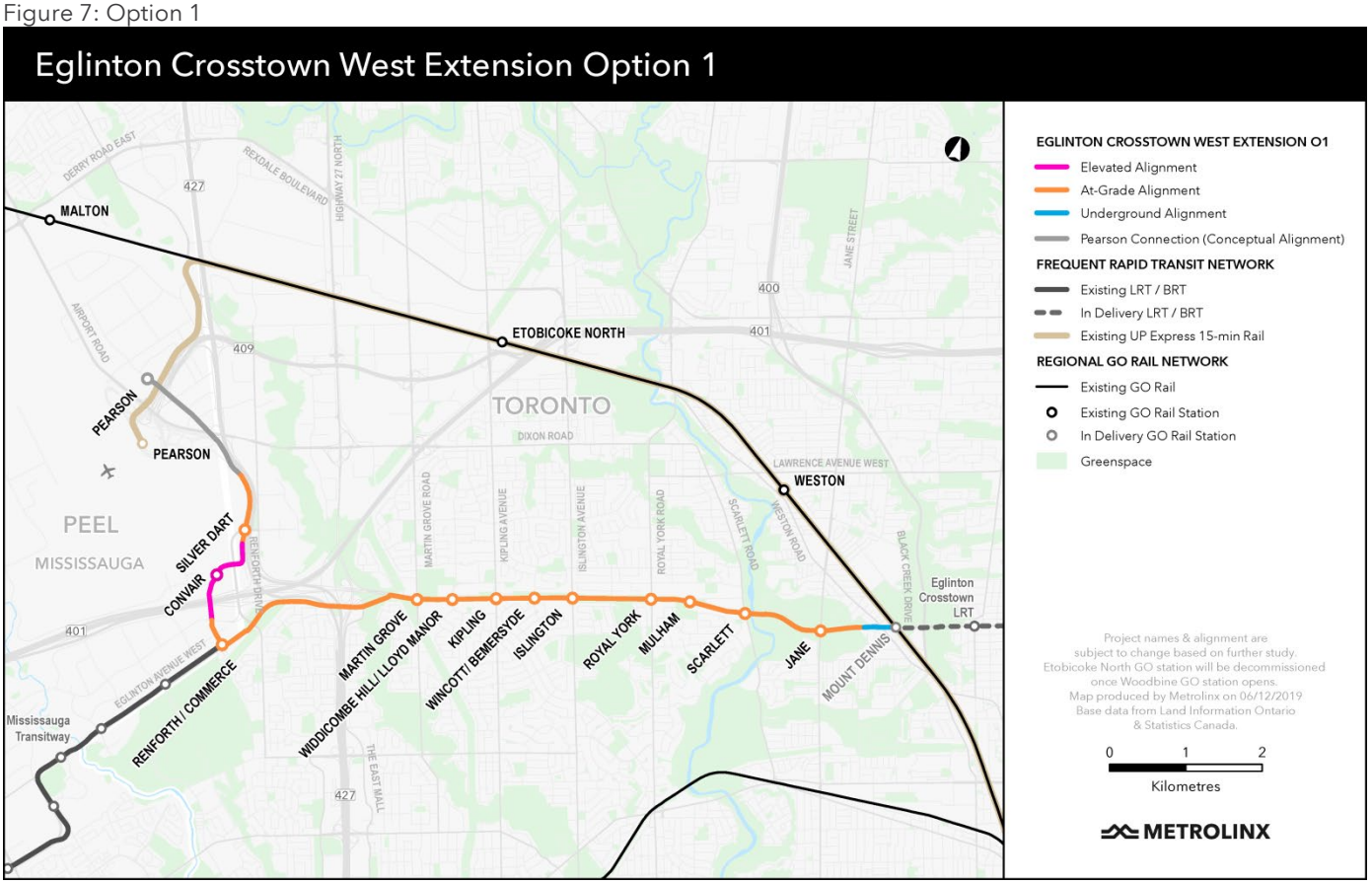
- **Base Case 2041: Regular Surface Transit Service on Eglinton**
  This is the BAU scenario. As shown in Figure 6, local TTC (No. 32A) and MiWay (No. 100) buses will continue to operate along this corridor with service headways of five minutes or higher. There would be no extension of rapid transit between Renforth Transitway BRT and Mount Dennis Eglinton Crosstown LRT stations, and there would be no Airport Segment. This is reflective of the existing and in delivery networks under the 2041 RTP.

Figure 6: Base Case or Business as Usual



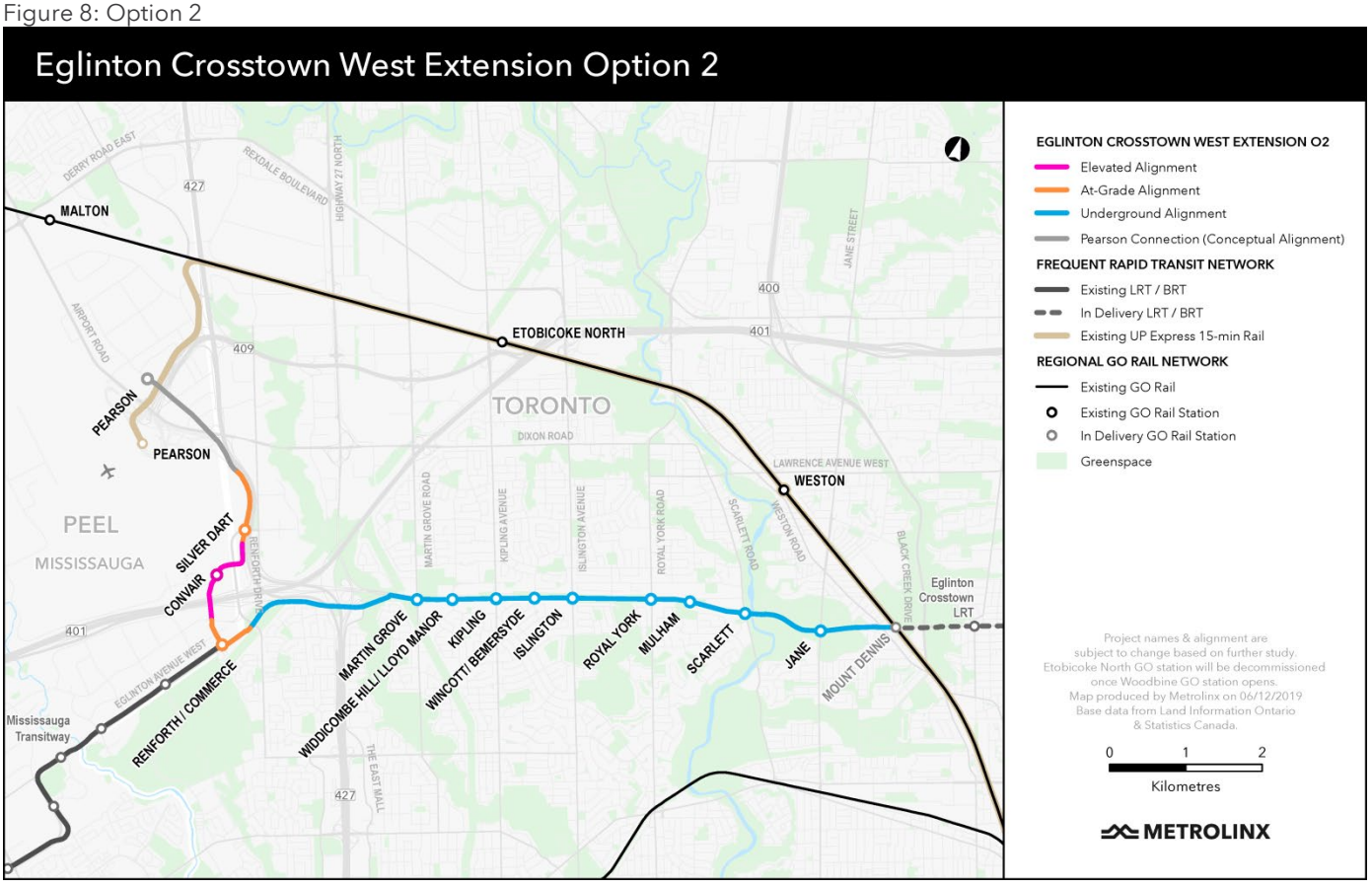
- **Option 1: At-grade with nine Toronto Stops**
  The Toronto Segment would run on an at-grade alignment along the road median with nine stops at key arterial and midblock intersections. There would be a tunnel-to-surface portal east of Weston Road to tie into the Eglinton Crosstown LRT. With a total of 13 new LRT stops along the entire Pearson-Mount Dennis corridor, this investment option, as shown in Figure 7, fully adheres to the approved EA alignment. While there would no longer be a need for a parallel-running TTC 32A bus route, MiWay Transitway bus route 100 would continue to serve Pearson Airport via Highway 427.

Figure 7: Option 1



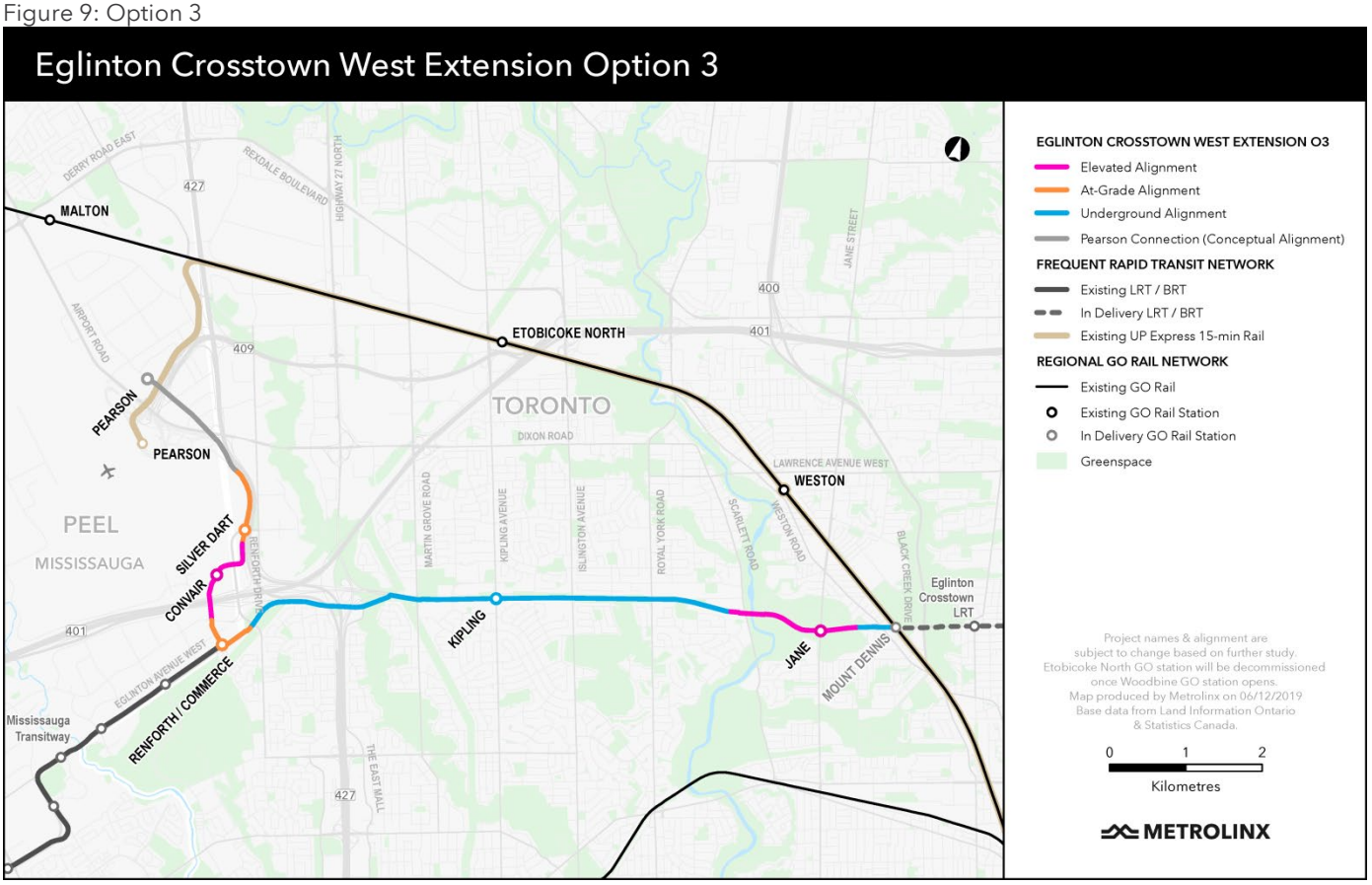
- **Option 2: Below-grade with nine Toronto Stops**
  The Toronto Segment would serve the same stops as Option 1, but instead of being at-grade, this option would extend Eglinton Crosstown's below-grade alignment westward to a portal at Renforth Drive where it would meet the Renforth BRT terminus. This alternative, as shown in Figure 8, was developed to reconcile the need for extended rapid transit access with the Community Working Group's preference for below-grade transit. Like Option 1, 32A and 100 bus routes would be discontinued and preserved, respectively.

Figure 8: Option 2



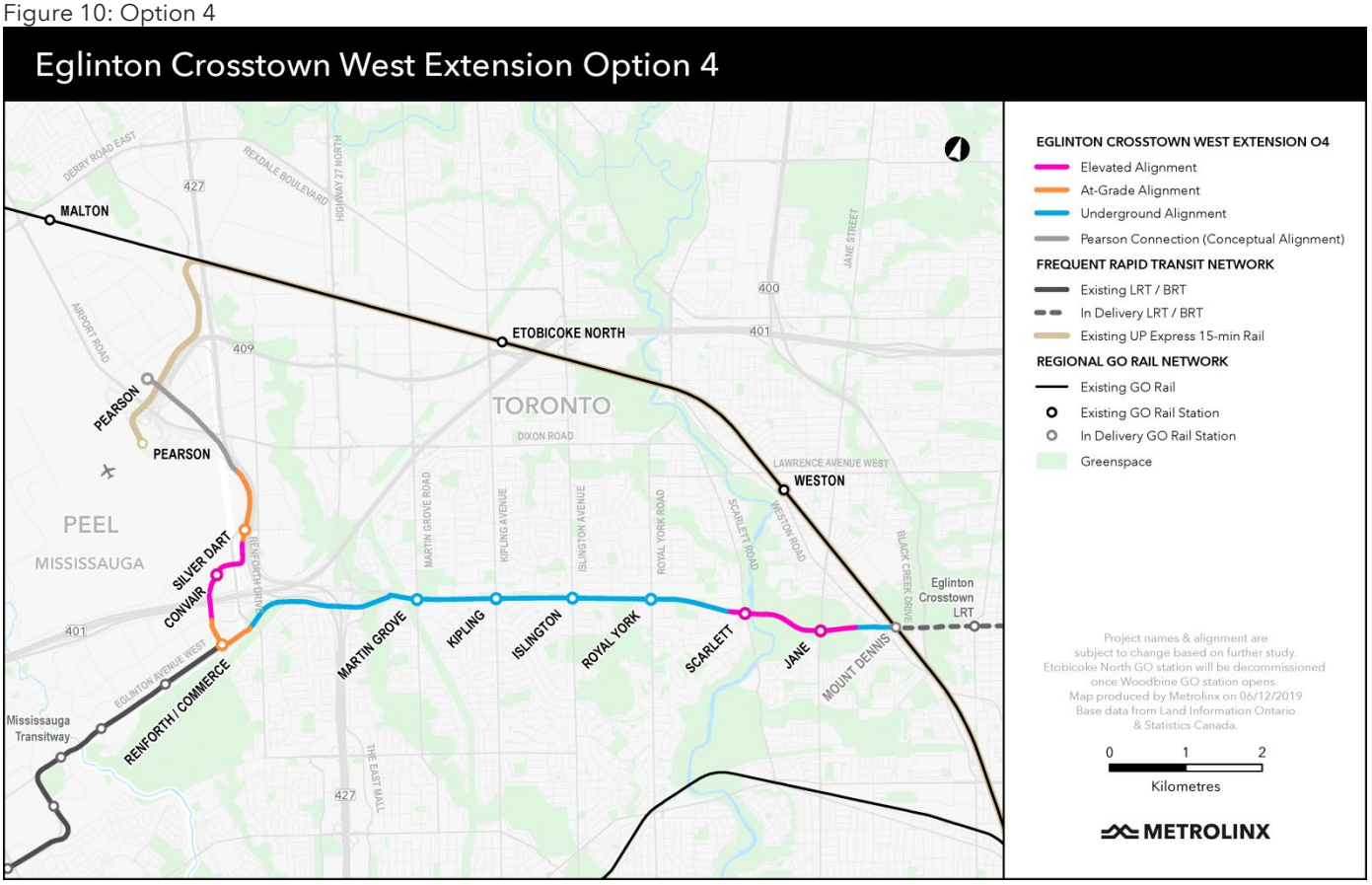
- **Option 3: Mostly Below-Grade with two Toronto Stops**
  The Toronto Segment would be grade-separated from Mount Dennis to Renforth Drive and would only stop at Jane Street and Kipling Avenue in Toronto, which would be built as elevated and underground stations respectively. The alignment, as shown in Figure 9, would require two tunnel-to-elevated portals east of Scarlett Drive and west of Jane Street, and one tunnel-to-surface portal east of Renforth Station. The TTC 32A bus route would need to serve the LRT's coverage gaps along Eglinton Avenue West at reduced headways, and the MiWay 100 bus route would continue to serve Pearson Airport.

Figure 9: Option 3



- **Option 4: Mostly Below-Grade with six Toronto Stops**
  The Toronto Segment would be grade-separated from Mount Dennis Station to Renforth Drive. There would be a short above-grade alignment and two elevated stops between Scarlett Road and Jane Street and the rest of the alignment would be below grade. As shown in Figure 10, the Toronto Segment would include 7 stops, which reflects the inputs of the local community representatives. Like Option 3, the 32A and 100 bus routes would be continued, but Route 32A would see a large increase in headways due to higher LRT service coverage under Option 4.

Figure 10: Option 4



Assumptions for Analysis and Travel Demand Modelling

In order to develop the business case evaluation and undertake the modelling and analysis that support it, a number of assumptions were made with respect to future conditions (see Table 7). These are consistent with the standard assumptions generally applied to Metrolinx studies and are inferred from both policy and observed trends.

Table 7: Summary of Analysis and Travel Demand Modelling Assumptions

	2041 Assumptions (Source)
Urban Structure	• City of Toronto Official Plan, Maps 2, 25 • City of Mississauga Official Plan, Schedules 1,10
Population and Employment	Expanded Market Land Use based on 2011 Census (Statistics Canada) and existing development applications
Base Rapid Transit Network	2041 Regional Transportation Plan "In-Delivery Network"
Fare Structure	**For trips made under single operator:** • 2018 TTC fare on all TTC routes • 2018 MiWay fare on all MiWay routes • 2018 Distance-Based GO fare structure, except within City of Toronto **For trips made under multiple operators:** • 2018 double fare policy for MiWay-TTC transfers • 2018 GO/UP Express and TTC Co-Fare Policy • 2018 GO and Local Transit Providers (e.g. MiWay, Brampton Transit) Co-Fare Policy
GO Network	GO Expansion Full Business Case, 2019
Surface Transit Network	Surface transit network assumptions were provided by TTC, MiWay and Brampton Transit
Travel Behaviour Model	Greater Golden Horseshoe Model v4

4

Strategic Case

Introduction

The Strategic Case evaluates each of the four Eglinton Crosstown West Extension investment options against the identified strategic objectives to understand if the investment addresses the problem statement and the opportunity at hand to improve both regional and local transportation needs.

To address this IBC's problem statement, the options will be measured from how they address the connectivity gap between the Eglinton Crosstown LRT, the Mississauga Transitway BRT and the Pearson Airport Area, in order to provide safe, convenient and reliable connections for GTHA travellers. The 2041 RTP outlines the Frequent Rapid Transit Network which the Eglinton Crosstown West Extension corridor is a part of, as the guiding regional planning framework that seeks to connect more of the region with frequent rapid transit[12]. As part of the Frequent Rapid Transit Network key principles, new rapid transit linkages must be regionally significant with high travel demand, connects major urban centres and areas of high employment density, and promotes efficient transfers with local and regional routes.

This chapter will also evaluate each option's ability to advance the 2041 RTP's progress towards completing a sustainable transportation system that is aligned with land use and supports healthy and complete communities in the GTHA.

This chapter aims to evaluate the options based on the following key strategic benefits in pursuit of the 2041 RTP goals:

- **Effective Transportation Network and Economic Prosperity–**

  The Eglinton Crosstown West Extension will improve capacity and quality of service and bring the GTHA Frequent Rapid Transit Network closer to completion in order to meet future transportation demand and economic prosperity aspirations.

- **Enhanced Travel Experience–**

  The Eglinton Crosstown West Extension will provide a new, convenient connection that connects people and businesses along a presently rapid transit-deprived corridor with a faster and more reliable service – making it easier for users of this corridor to connect, invest, and innovate.

[12] Metrolinx's 2041 Regional Transportation Plan

- **Improved Quality of Life and Protected Environments–**

  The completion of the Eglinton Crosstown West Extension will lead to an overall more sustainable transportation network – increasing healthier active transportation choices and reducing the GTHA's carbon footprint and contributions to climate change.

- **Sustainable Development–**

  The Eglinton Crosstown West Extension will support the development and prosperity of the residential and commercial neighbourhoods that it serves – reinforcing complete communities and spurring new urban developments.

The pursued strategic benefits have been identified across these categories through design review and policy analysis. The desired outcomes are consistent with those realized by other significant LRT investments in North America. The analysis included in subsequent sections of the Strategic Case provides estimates and discussion of the specific benefits of the Eglinton Crosstown West Extension across these categories.

The aforementioned four key benefits are supported through the achievement of the strategic objectives, which are summarised in Table 8:

Table 8: Summary of Eglinton Crosstown West Extension's Strategic Objectives, Criteria and Outcomes

2041 RTP Goals	Key Benefits	Strategic Objectives	Strategic Criteria	Strategic Outcomes
Strong Connections	Effective Transportation Network and Economic Prosperity	**Network Connectivity:** Connect the Region with More People and Places with Frequent Rapid Transit	• To provide high quality transit to more people in more places • To plug the connectivity gap between Eglinton Crosstown LRT and Transitway BRT	Improving the present GTHA rapid transit network to connect more people to even more jobs and services, and to make their lives better through reduced auto dependency and more efficient transit
Complete Travel Experiences	Enhanced Travel Experience	**Corridor Travel Experience:** Improve Transit's Convenience and Attractiveness	• To provide more reliable, safe and enjoyable travel experience • To boost transit use and attractiveness among local residents	Providing a hassle-free, accessible, reliable and comfortable door-to-door travel experience that improves transit use and attractiveness for local residents and businesses

2041 RTP Goals	Key Benefits	Strategic Objectives	Strategic Criteria	Strategic Outcomes
Sustainable and Healthy Communities	Improved Quality of Life and Protected Environment	**Livable Communities:** Promote Healthier and More Sustainable Travel Behaviours	• To improve livability through reduction in traffic delays, auto dependency and air pollution • To encourage use of active modes to access stations	Promoting a higher quality of life to the surrounding stable neighbourhoods and growing employment areas through healthier and more sustainable transportation choices
	Encourage Transit-Supportive Development	**Sustainable Development:** Encourage Transit-Supportive Development	• To support existing neighbourhoods • To support planned growth and economic development	Supporting transit-friendly land use intensification and low-emission mobility that support healthy, complete communities and a more competitive economy

Strategic Objective 1 – Connect More Places with Better Frequent Rapid Transit

Extending Toronto's Eglinton Crosstown LRT to the Mississauga Transitway and Pearson Airport will bring the GTHA region closer to completing its expansive frequent rapid transit network that is necessary to meet, shift and help shape more sustainable travel demand in the future.

The cumulative network effects will help to improve the overall connectivity within the region, particularly for Etobicoke and other suburban areas straddling the Eglinton Ave and Transitway corridors. The proposed investment will result in uninterrupted rapid transit connectivity that stretches from Toronto's Golden Mile (Scarborough) in the east all the way to Mississauga's Erin Mills Town Centre in the west, covering Midtown Toronto and Downtown Mississauga, both of which are important emerging urban growth centres in the GTHA, and Pearson Airport.

This section evaluates how the options' abilities to support the Strategic Objective 1 "Connect More Places with Better Frequent Rapid Transit." The evaluation is summarised in Table 9.

Criterion 1: To provide high quality transit to more people in more places

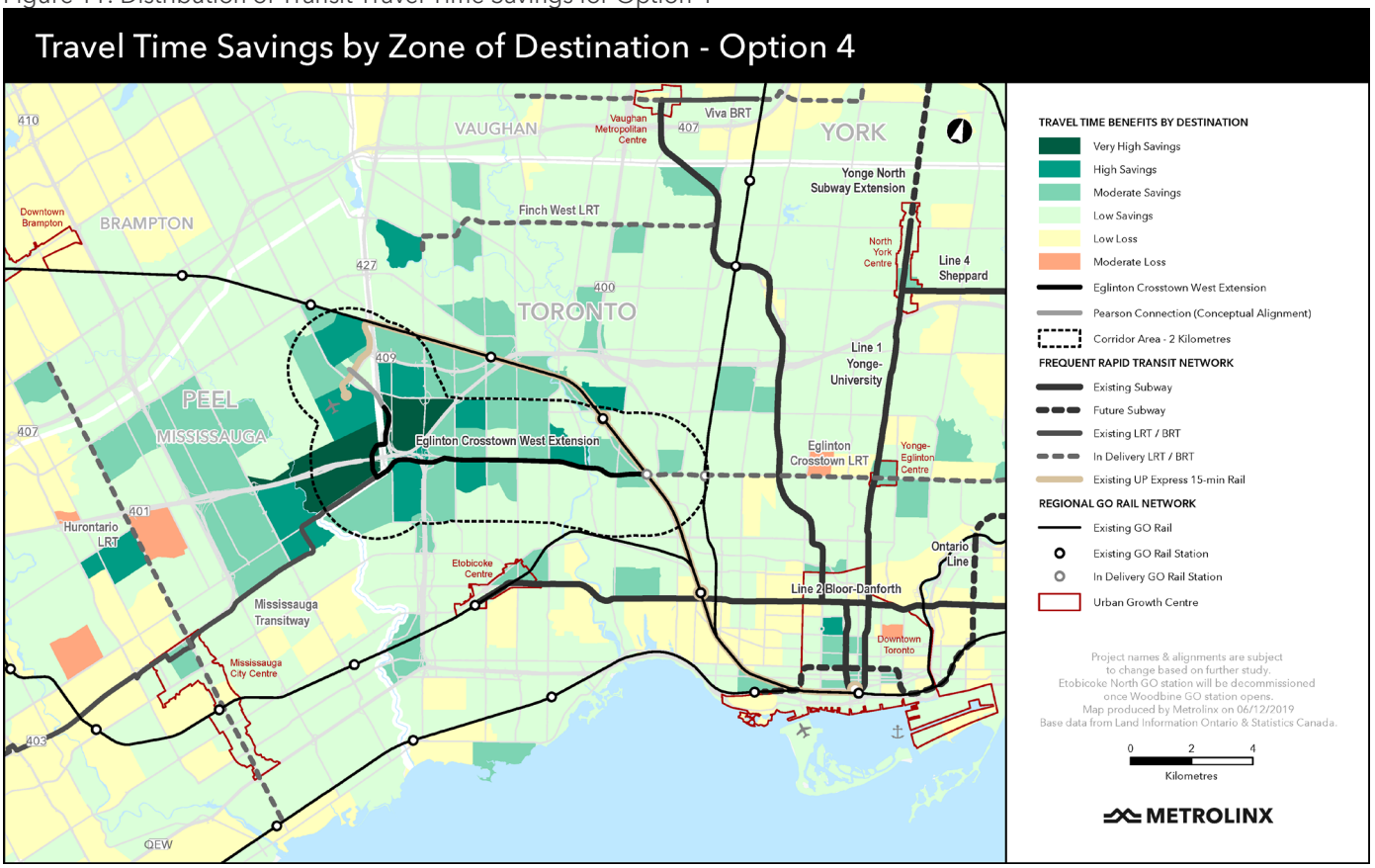
A well-connected frequent rapid transit network improves travel times between key regional destinations to enable transit users to get where they are going faster and to access further destinations. Of the four options, Option 4 will have the largest impact on regional transit accessibility, with 13,000 new transit trips and 140,000 person-minutes of morning peak transit travel time savings for the GTHA transit network as compared to the BAU scenario.

The distribution of Option 4's transit travel time savings across the wider corridor area is illustrated in Figure 11, with significant improvements for the average GTHA traveller heading to Pearson Airport and employment areas south and west of the airport, and notable improvements for the average GTHA traveller heading to the regional urban growth centers of Etobicoke Centre, Downtown Mississauga, Midtown Toronto, Downtown Toronto, and North York Centre.

These urban nodes will become more accessible to more people, and this highlights the importance of network connectivity benefits from the Eglinton Crosstown West Extension in supporting the regional effort in concentrating jobs and services in places that stand to benefit the most from high quality transit.

In contrast, Option 1 will have the least impact, with 9,000 new transit trips and 60,000 person-minutes of morning peak transit travel time savings for the GTHA transit network.

Figure 11: Distribution of Transit Travel Time Savings for Option 4[13]



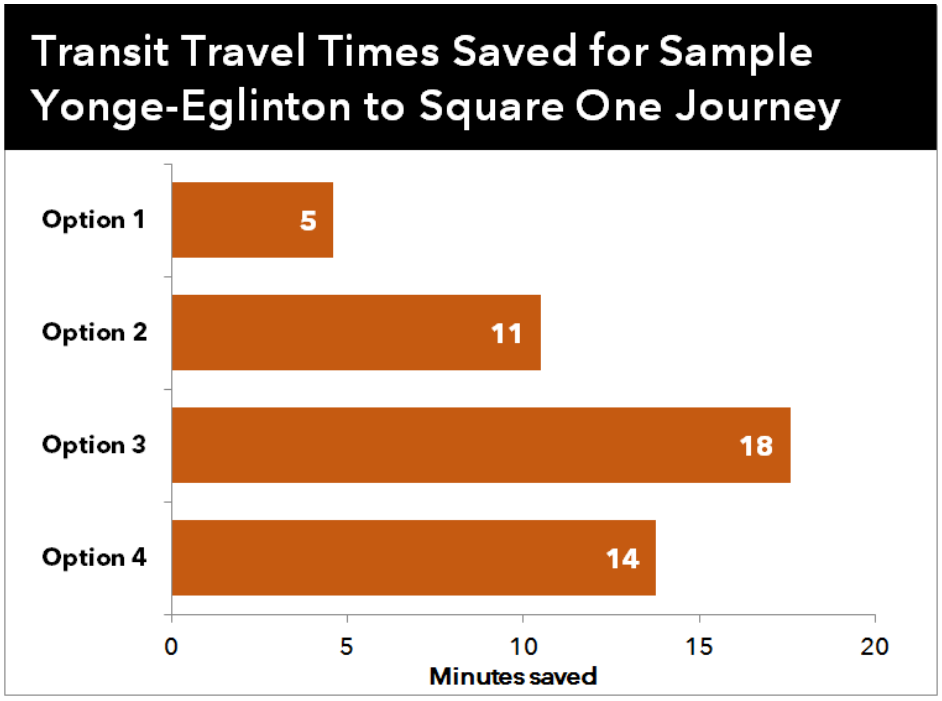
[13] The mapped outcomes correspond to the average transit travel time savings per morning peak person-trip

Criterion 2: To address the connectivity gap between Eglinton Crosstown LRT and Transitway BRT

A high quality rapid transit system depends on the cumulative network effects of its individual routes in providing the region with greater economic advancement opportunities. When comparing against BAU, Option 4 has the highest increase increase in boardings for both Toronto's Eglinton Crosstown LRT and Mississauga's Transitway BRT, with a 23% jump in combined weekday boardings[14]. This increase demonstrates the value of a complete travel network, as existing rapid transit lines become more useful when the network is made seamless with fewer transfers and slow mixed-traffic links.

Option 3, with its least number of stops, offers the speediest travel times along the wider Mississauga Transitway and Eglinton Crosstown corridor (for a sample trip between Downtown Mississauga and Midtown Toronto) at 64 minutes, followed by Option 4 at 68 minutes, as compared to BAU's 82 minutes (refer to Figure 12).

Figure 12: Transit Journey Time for a Sample Midtown Toronto-Downtown Mississauga Trip



[14] Option 4 increases Crosstown and Transitway boardings of 119,000 and 7,000 by 23% and 16% respectively

Table 9: Summarizing Strategic Objective 1 – Connect More Places with Better Frequent Rapid Transit[15]

Network Connectivity Criteria	Indicator	BAU	Option 1	Option 2	Option 3	Option 4
To provide high quality transit to more people in more places	Increase in GTHA transit trips	N/A	+ 9,000 new transit trips	+ 10,000 new transit trips	+ 9,500 new transit trips	+ 13,000 new transit trips
	Increase in GTHA transit travel time savings[16]	N/A	62,000 person-minutes less	112,000 person-minutes less	94,000 person-minutes less	142,000 person-minutes less
To plug the connectivity gap between Eglinton Crosstown LRT and Transitway BRT	New Crosstown LRT and Transitway BRT boardings	206,000 weekday boardings	+ 21% weekday boardings	+ 21% weekday boardings	+ 17% weekday boardings	+ 23% weekday boardings
	Midtown Toronto-Downtown Mississauga Transit Journey Time[17]	82 minutes	5 minutes faster	11 minutes faster	18 minutes faster	14 minutes faster

[15] Sources: GGHm v4, 2041 Market Expanded Land Use (2041 RTP)
[16] Cumulative two-hour am peak hour travel time savings for an average weekday
[17] Actual travel times (inclusive of in-vehicle time, waiting and transfer times, and walking times to and from transit stations) between a sample Midtown Toronto office 250m away from Yonge-Eglinton subway station and a sample Square One retail outlet 500m south of Downtown Mississauga's Transitway station

Strategic Objective 2 – Improve Transit's Convenience and Attractiveness

This section will evaluate the options' abilities to connect local residents, institutions and businesses to wider regional opportunities together, and rank them based on improvements in travel convenience and attractiveness. The impacts the options have on local commuters' transit boardings and access to jobs will also be assessed and summarised in Table 10.

Criterion 2: To provide more reliable, safe and enjoyable travel experience

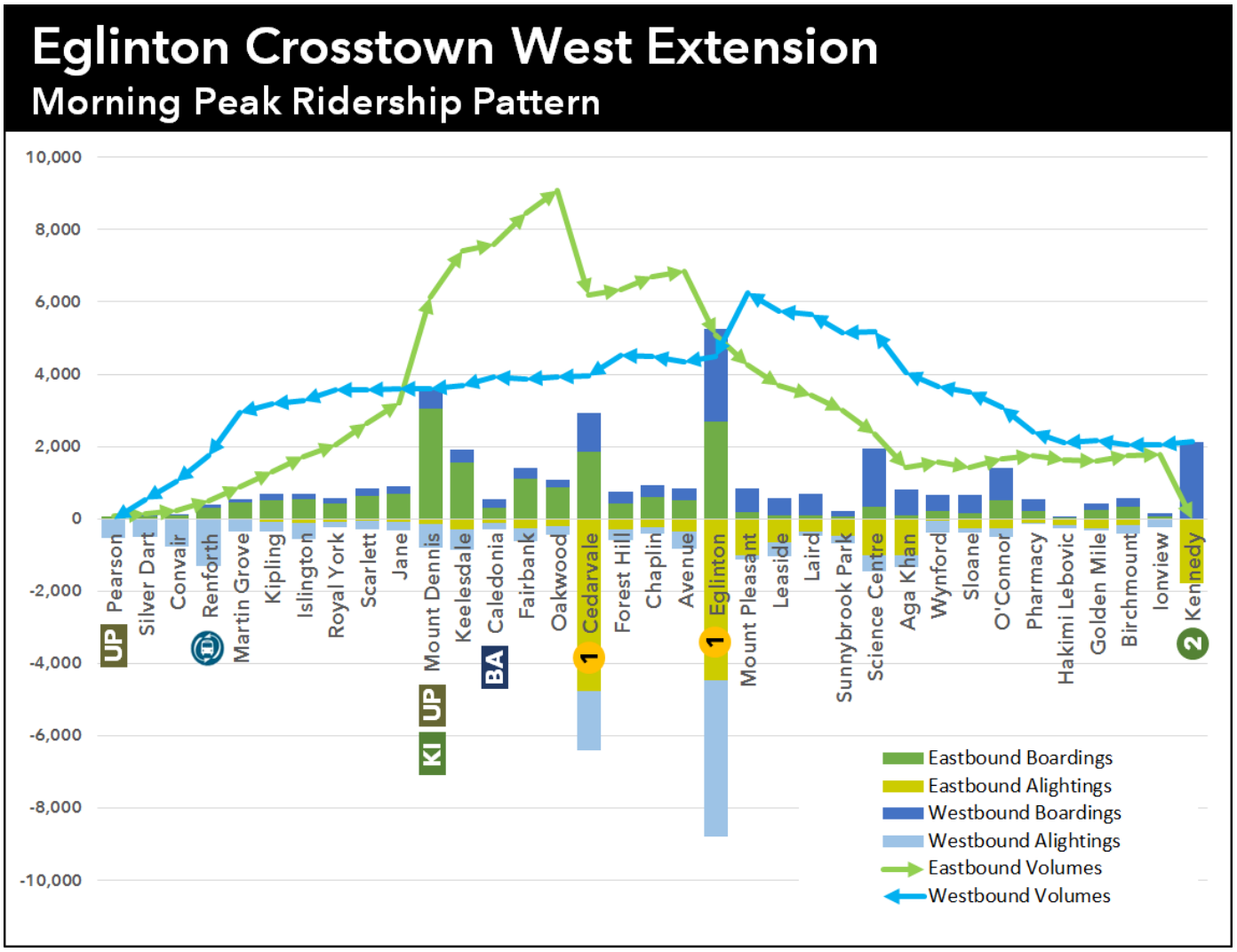
Convenience is pivotal to make transit more attractive. With dedicated right-of-way and sheltered stops or stations, the Eglinton Crosstown West Extension will provide more convenient transit journeys as a result of the LRT's superiority in maintaining regular headways and providing waiting comfort over the local bus which stops may not necessarily be sheltered and which service is prone to unpredictable headways due to bus bunching as it operates under mixed traffic operation.

All options feature positive improvements in service reliability when compared with the BAU scenario thanks to a dedicated right-of-way that the bus routes do not have. Options 2, 3 and 4 would offer a much more significantly reliable service due to the full grade separation for the Toronto Segment, although surface-running Option 1 would still benefit from transit signal priority measures at traffic intersections.

Option 1 will be the most accessible as compared to other grade-separated options which feature elevated guideways and tunnels that require stations to be built further from the surface. Option 2 will be the least desirable in terms of station access and egress times as it features the most underground stations, which will likely require additional access times as compared to elevated stations.

Nonetheless, Option 2 together with Options 3 and 4 feature mostly grade-separated stations that afford the highest level of protection against severe weather conditions. The greater service reliability offered by these options is ultimately the most important contributing factor towards creating a more positive travel experience for transit users.

Figure 13: Eglinton Crosstown West Extension's 2041 Ridership Pattern for Option 4



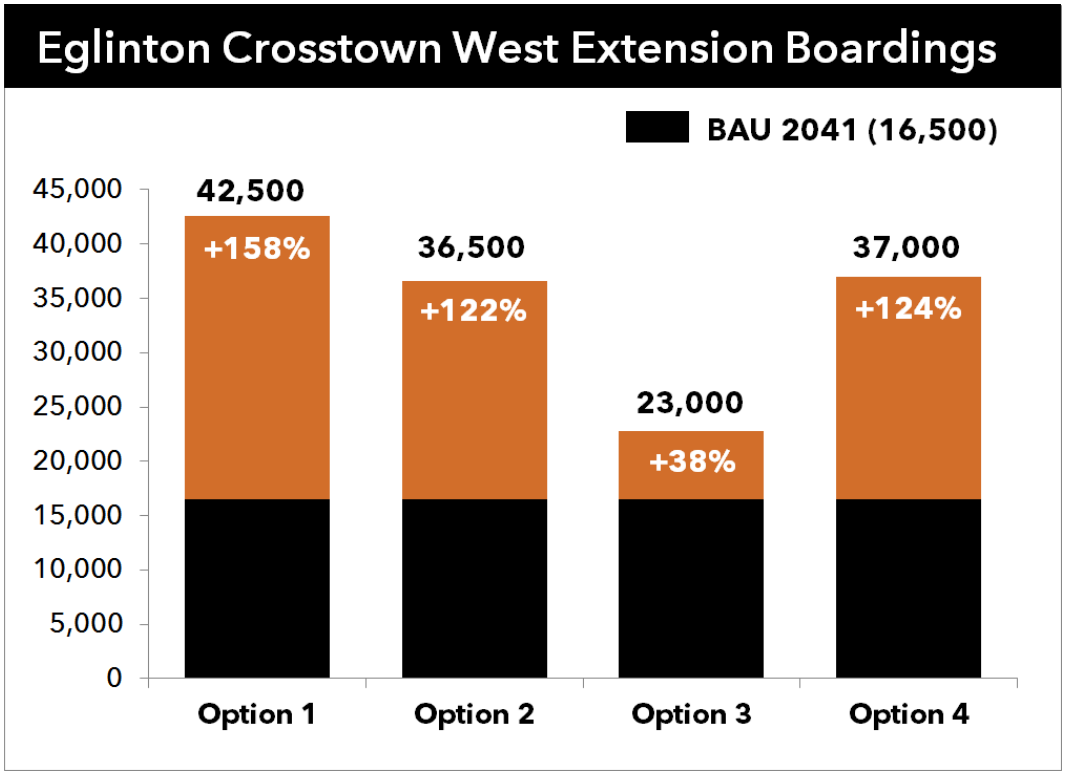
The modelled 2041 ridership pattern[18] for Option 4, as illustrated in Figure 13, suggests the significance of Renforth and Pearson Airport Area-bound[19] transit travel demand along the continuous Eglinton Crosstown corridor as a result of improved travel convenience and service reliability for Mississauga and Pearson Airport Area-bound transit users. Option 4 will provide sufficient capacity for future ridership growth beyond 2041[20] as automatic train control system will allow Light Rail Vehicles (LRVs) to run more reliably and frequently between Renforth and Laird stations.

[18] Based on one-hour morning peak travel demand modelling
[19] The airport has a different demand profile than the rest of the transit system such that off-peak ridership to the airport is likely to be higher than to other employment destinations in the region
[20] Based on Eglinton Crosstown LRT's existing design capacity of more than 9,000 and 14,000 passengers per hour per direction (pphpd) for surface and underground segments respectively

Criterion 2: To boost transit use and attractiveness among local residents and workers

Improvements in connecting transit to employment opportunities is a key factor to capture new transit riders, as well as providing ongoing benefits to existing riders. The Eglinton Crosstown West Extension will result in higher ridership and better transit access to jobs for residents and businesses along the corridor. Option 1 will yield the highest LRT ridership with 42,500 weekday boardings, followed by Option 4 with 37,000 weekday boardings as compared to 16,500 weekday boardings under the BAU scenario (see Figure 14).

Figure 14: 2041 Weekday Boardings for Eglinton Crosstown West Extension



Etobicoke-based and Etobicoke-bound Line 2 subway users will also benefit from the Eglinton Crosstown West Extension investment, as a substantial share of southbound Etobicoke bus riders and Eglinton Avenue West-bound bus riders (who would normally transfer to and from Line 2's Kipling, Islington, Royal York and Jane Subway Stations during the morning peak under the BAU scenario) will shift to the LRT, bypassing the Bloor-Eglinton bus and Kipling-Jane subway segments altogether (see Figure 15).

Figure 15: Impact of Eglinton Crosstown West Extension on Line 2

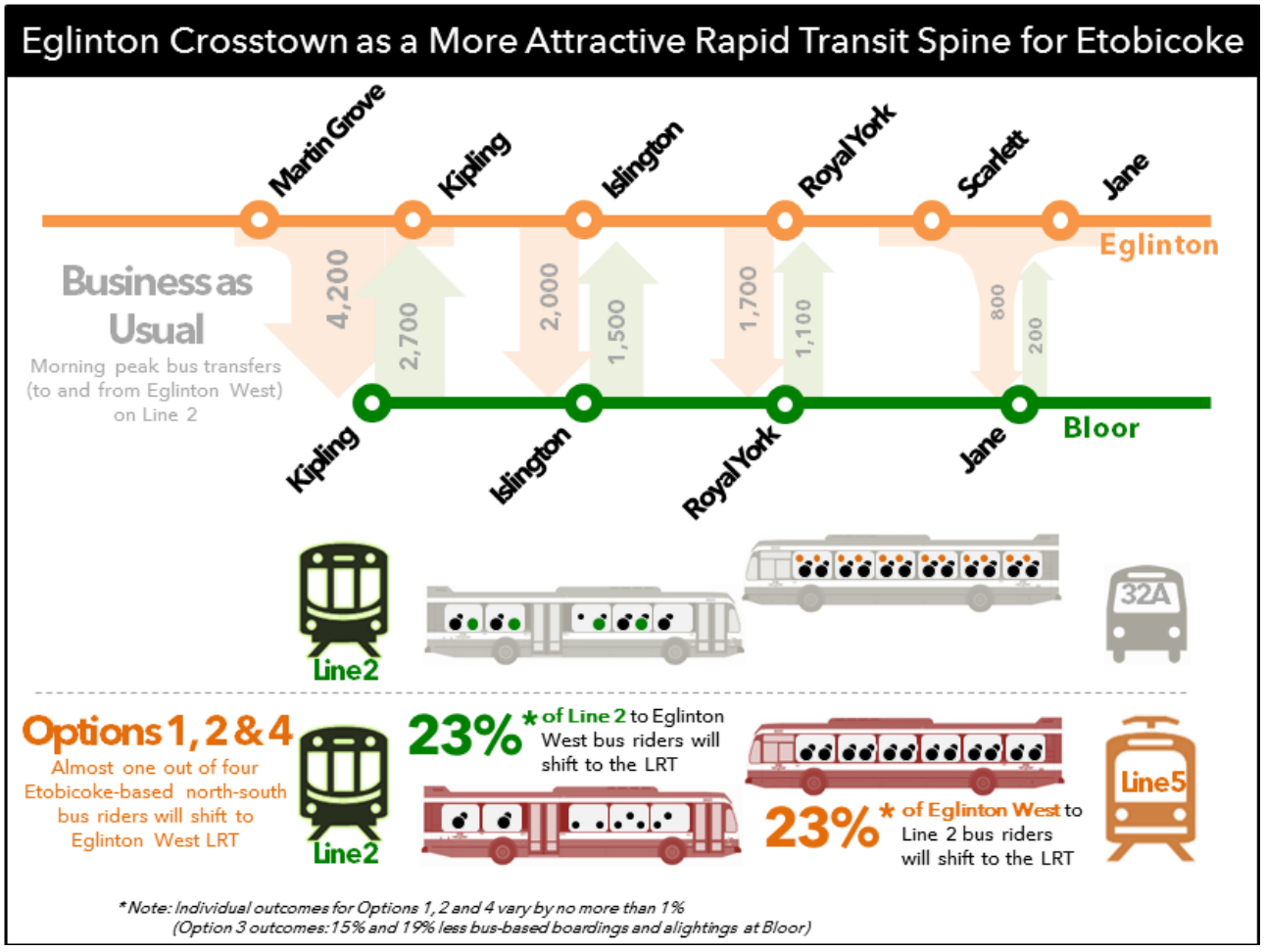
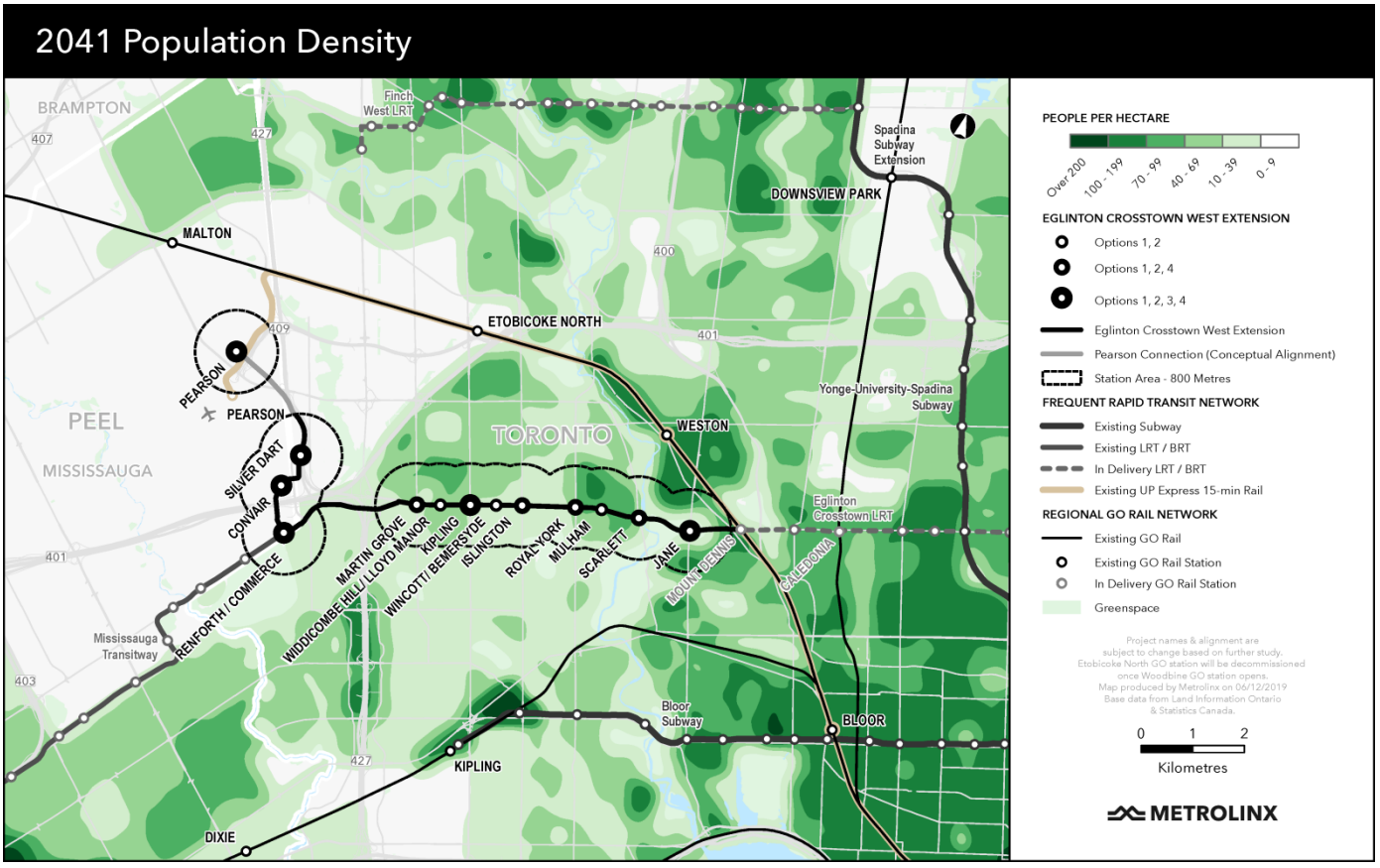


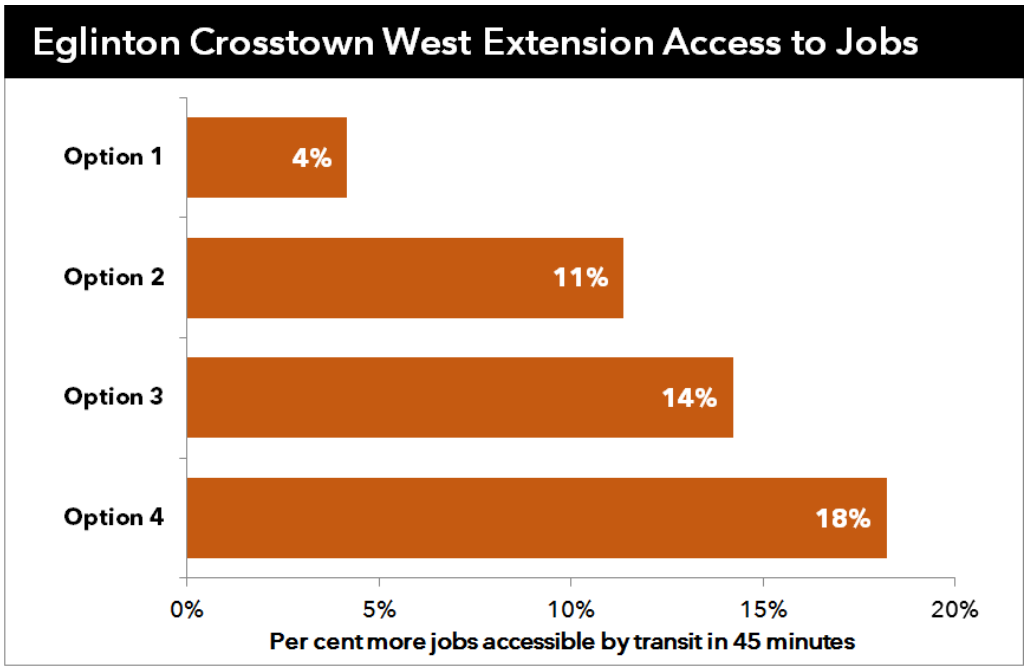
Figure 16 illustrates the forecasted population density for the corridor. Option 4 will increase the number of GTHA jobs accessible by transit in 45 minutes for the corridor's residents by 18%, which is the highest when compared against other options (refer to Figure 17).

Figure 16: 2041 Population Density Forecast[21]



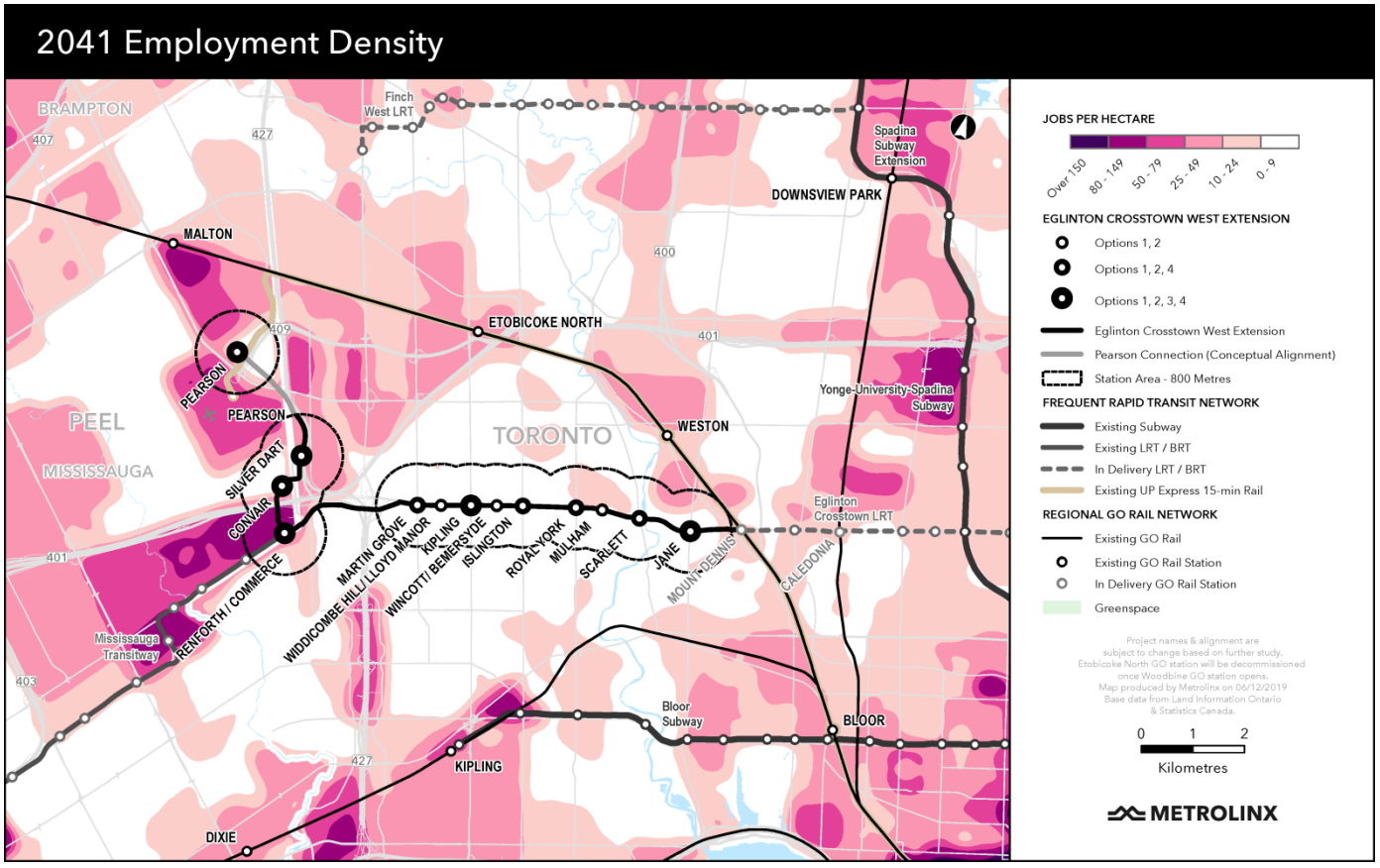
[21] Source: 2041 Market Expanded Land Use

Figure 17: Additional Jobs Accessible by Transit in 45 Minutes



Option 4 will also increase the number of GTHA workers accessible by transit in 45 minutes for the corridor's businesses and employers by 22%, which is the highest when compared against other options (8%, 16% and 19% for Options 1, 2 and 3 respectively). Figure 18 illustrates the forecasted employment density for the corridor.

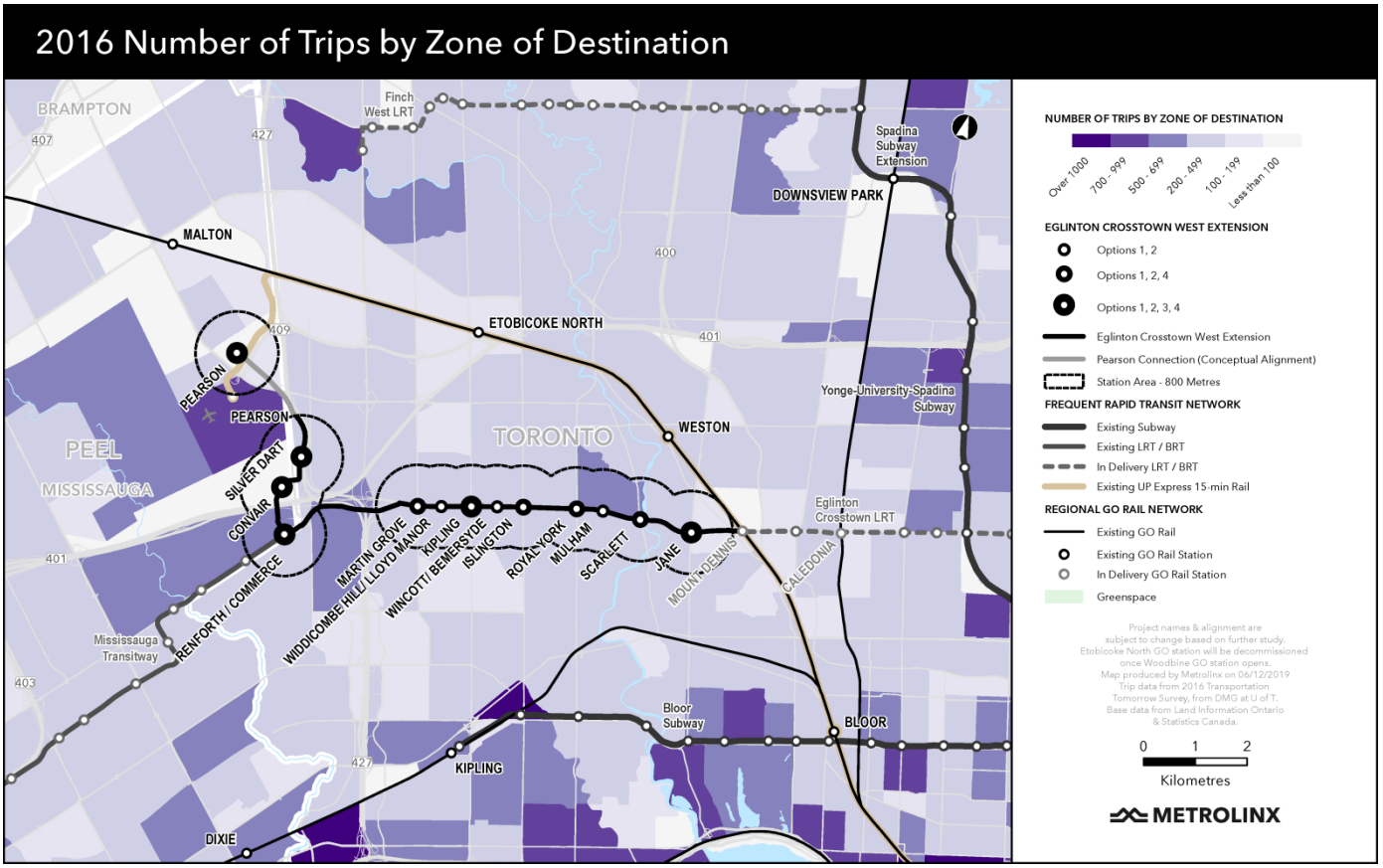
Figure 18: 2041 Employment Density Forecast[22]



[22] Source: 2041 Market Expanded Land Use

Figure 19 illustrates the present density of daily trips made into the corridor. In summary, Option 4 outperforms all other options due to its superior transit accessibility to jobs and its ability to attract significant ridership.

Figure 19: Density of Trips by Zone of Destination along Eglinton West Corridor [23]



[23] Source: 2016 Transportation Tomorrow Survey

Table 10: Summarizing Strategic Objective 2 – Improve Transit's Convenience and Attractiveness[24]

Travel Experience Criteria	Indicator	BAU	Option 1	Option 2	Option 3	Option 4
To provide more reliable, safe and enjoyable travel experience	Service reliability improvement	Service reliability affected by mixed traffic operations	Dedicated right-of-way provides substantial improvement in service reliability	Dedicated infrastructure provides the greatest improvement in service reliability		
	Stop or station accessibility	All stops are directly accessible at street level	Surface-level platforms for all stops provide the highest degree of stop accessibility as compared to all other options	Longest average vertical distances to access stations[25] compared to all other options	Longer station access times as compared to Option 1 as passengers travel long average vertical distances to access grade-separated platforms	
	Waiting comfort	Minimal weather protection	Much improved weather protection at all at-grade stops	Most significant weather protection improvement at all grade-separated stations		
To boost transit use and attractiveness among local residents and workers	Increase in transit boardings along the corridor	16,500 weekday boardings	158% increase	122% increase	38% increase	124% increase
	Improvements in Eglinton West residents' transit access to jobs[26]	7,400 GTHA jobs reachable by Eglinton West residents by transit in 45 minutes	4% more GTHA jobs	11% more GTHA jobs	14% more GTHA jobs	18% more GTHA jobs

[24] Sources: GGHm v4, 2041 Market Expanded Land Use (2041 RTP)
[25] Particularly for Jane, Scarlett, Royal York and Mulham underground stations which would be served by tunneled alignment that would run deep underneath the Humber River ravine
[26] Modelled GTHA job accessibility outcomes for residents within 2km of the Eglinton Crosstown West Extension corridor, weighted by population

Strategic Objective 3 – Promote Healthier and More Sustainable Travel Behaviours

The introduction of a higher order, frequent rapid transit along the Eglinton West corridor will improve the quality of life of the surrounding communities through greater transportation and environmental benefits. The LRT will support a cost effective, sustainable and safe mobility environment, and will encourage more sustainable urban design practices and streetscape planning decisions that prioritize walking, cycling, transit, and public space.

In this section, the investment options will be measured based on how they promote healthier and cleaner transportation choices (refer to summary in Table 11).

Criterion 1: To improve liveability through reduction in traffic delays, auto dependency and air pollution

Private motorized vehicles are less efficient in transporting people as they inflict a heavy cost to society in forms of traffic congestion, environmental pollution, urban land use inefficiencies, and public road safety hazards. The new LRT investment will take more cars off the road, resulting in improved traffic conditions and air quality for the surrounding neighbourhoods.

Without the Eglinton Crosstown West Extension investment, it is projected that 83.0% and 11.5% of all trips starting or ending within the corridor's two kilometre buffer will be made by auto and transit respectively. Options 1, 2 and 4 will increase the transit mode share by 2.1-2.4% and decrease the auto mode share by 3.2-3.5%, and reduce the corridor's dependency on private vehicles.

All options will be almost equally capable in reducing the GTHA's contributions to climate change compared to the BAU due to the LRT's cleaner energy source as compared to the traditional diesel bus, which the TTC recently aims to fully phase out beyond 2040. Besides, the LRT will likely produce lower well-to-wheel greenhouse gas (GhG) emission even when compared to electric buses with similar carrying capacity due to the former's superiority in energy-efficient vehicle design.

Criterion 2: To encourage use of active modes to access stations

Walking and cycling are healthy and sustainable transportation choices that must be promoted to increase transit use and attractiveness. The magnitude of rapid transit's pedestrian accessibility can be measured through dividing the actual walkable area or 'walkshed' by the conceptual circle radius of 800 metres surrounding the rapid transit stops to obtain a walkshed coverage ratio.

The higher the ratio, the more likely people within the walkshed will walk or bike to reach the LRT. Figure 20, Figure 21, and Figure 22 depict the extent of the coverage areas under both the 800 metre radii and the 800 metre walksheds.

Option 3 will be the least attractive in promoting active transportation, as the LRT alignment, which offers only one stop between Jane Street and Renforth Drive, possesses the lowest walkshed coverage ratio with less desirable walking proximity to common destination points along the corridor.

Figure 20: Walkshed Coverage Ratio Scores

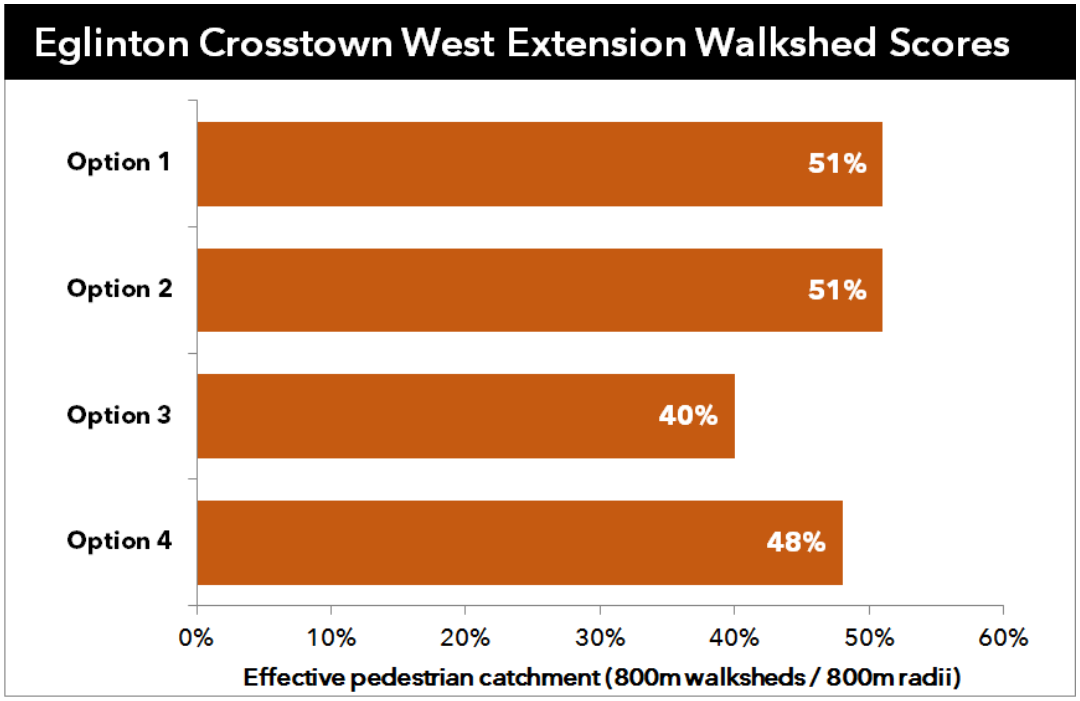


Figure 21: Land Use Designations within Station Areas (800m Walksheds)

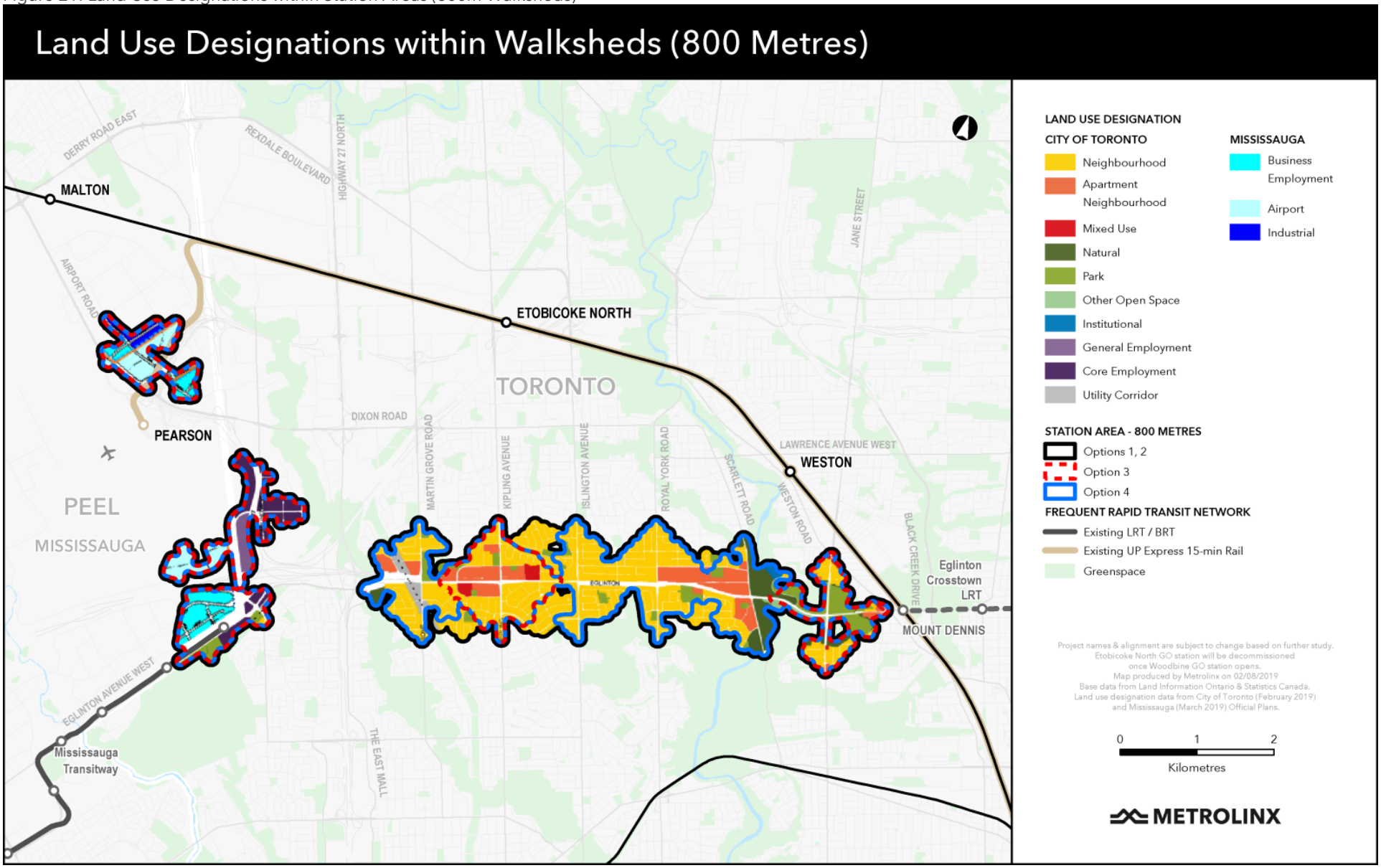


Figure 22: Land Use Designations within Station Areas (800m Radiuses)

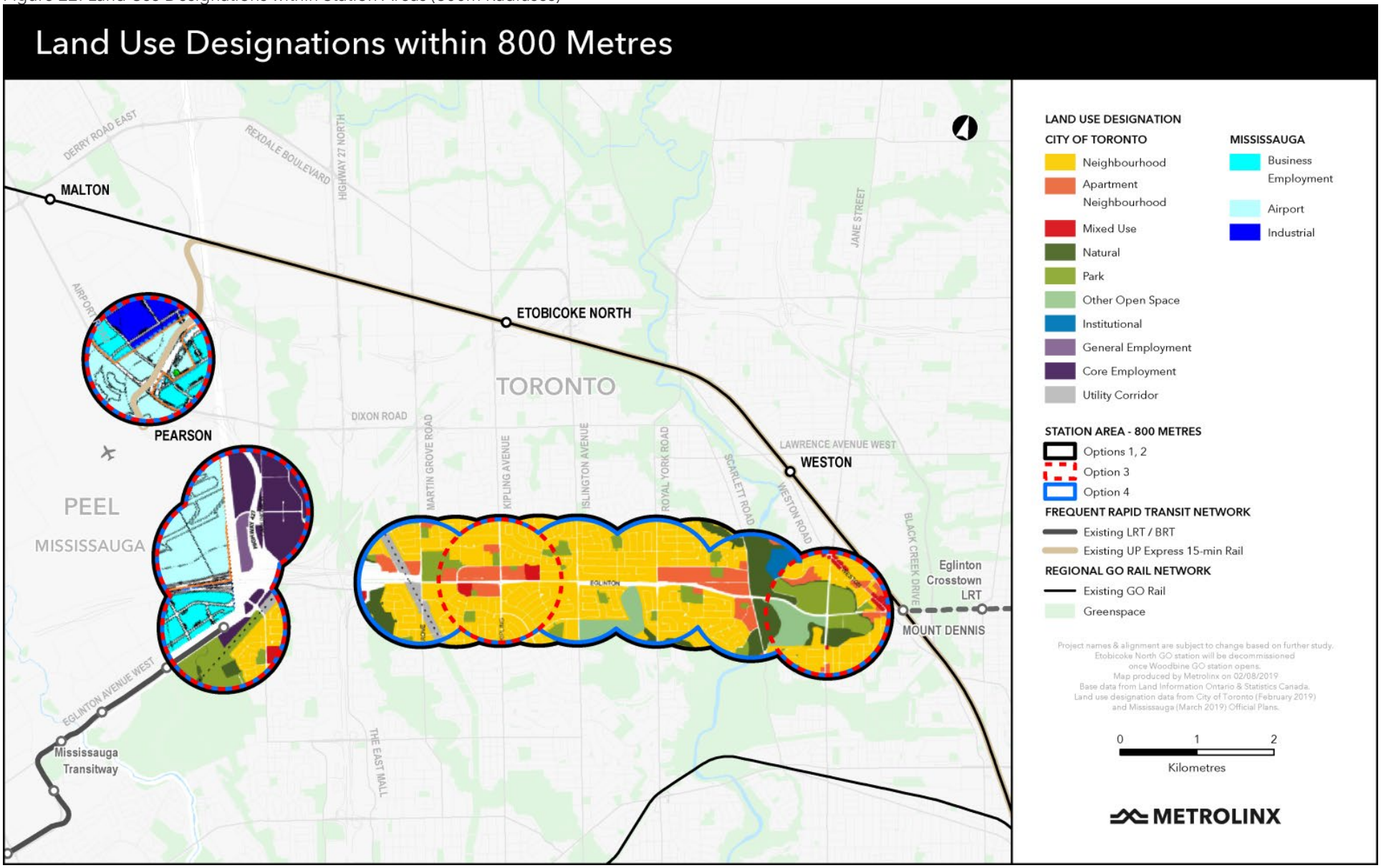


Table 11: Summarizing Strategic Objective 3 – Promote Healthier and More Sustainable Travel Behaviours[27]

Liveability Criteria	Indicator	BAU	Option 1	Option 2	Option 3	Option 4
To improve livability through reduction in traffic delays, auto dependency and air pollution	GTHA air quality improvement	33,470,000 metric tons of annual CO2 emission	30,000 less metric tons of annual CO2 emission	44,000 less metric tons of annual CO2 emission	42,000 less metric tons of annual CO2 emission	39,000 less metric tons of annual CO2 emission
	Transit use along the corridor	11.5% transit mode share	2.4% increase	2.2% increase	1.3% increase	2.1% increase
	Auto use along the corridor	83.0% auto mode share	3.5% decrease	3.3% decrease	2.0% decrease	3.2% decrease
	Auto travel time between Renforth and Mount Dennis stations	25 minutes and 12 seconds	54 seconds faster	65 seconds faster	74 seconds faster	74 seconds faster
To encourage use of active modes to access stations	Effective walking shed area surrounding LRT station	N/A	51% of LRT stop radius areas (800m) are within walking distance	51% of LRT stop radius areas (800m) are within walking distance	40% of LRT stop radius areas (800m) are within walking distance	48% of LRT stop radius areas (800m) are within walking distance

[27] Sources: GGHm v4, 2041 Market Expanded Land Use (2041 RTP)

Strategic Objective 4 – Encourage Transit-Supportive Development

The Eglinton West corridor is predominantly characterised by single-family detached housing with limited intensification potential partially due to the absence of rapid transit service (refer to Figure 22). However, the new Eglinton Crosstown West Extension investment will encourage more sustainable transit-supportive development along the corridor, which connects to the Pearson Airport and other regional destinations (via Eglinton Crosstown LRT and Mississauga Transitway BRT).

This section compares the investment options on their compatibility with the surrounding neighbourhood and potential for more transit-supportive densities in the future. The summary of findings can be found in Table 12.

Criterion 1: Compatibility with Existing Neighbourhood Character

The Eglinton West corridor is already a busy transit corridor with a high-frequency local bus service that serves both the Mississauga Transitway BRT and the future Mount Dennis Crosstown terminal. The neighbourhoods adjacent to the corridor are mainly characterised by one- and two-storey single family-detached homes, with few linear pockets of three- and four-storey townhouses and considerable clusters of mid- and high-rise residential buildings particularly on the north side of the corridor.

There is only one heritage building (listed on Toronto's Heritage Register) that is directly adjacent to the corridor, in which grade separation is most likely not a concern due to the currently sufficient road set back provision. Options 3 and 4 may reduce visual appeal for the stretch between Jane Street and Scarlett Road due to the elevated alignment. Design mitigation strategies can be considered at the next stage of the project.

Criterion 2: Opportunity to Support Future Growth

The prevalence of single-family homes along the corridor significantly reduces future redevelopment potentials due to the complexity of assembling multiple land parcels. Below are the general area characteristics which surround the corridor's key intersections:

- **Jane Street:** Recreational uses, flood plains
- **Scarlett Road:** Residential towers (west side), Humber River ravine (east side)
- **Royal York Road:** Single-family homes (except for residential towers on the northeast side)
- **Islington Avenue:** Single-family homes, protected woodlot
- **Kipling Avenue:** Multi-storey townhouses and apartments, single-family homes, protected woodlot
- **Martin Grove Road:** Recreational and institutional uses

Option 3 is the least desirable in encouraging transit-supportive redevelopments, as the alignment only serves Jane and Islington stations. It is the only option that would not serve the two planned high-rise residential tower developments (4000 Eglinton and 1 Richview sites) near Royal York and Scarlett stops respectively.

Options 1 and 2 have higher redevelopment potentials as compared to Option 4, as the mid-block serving alignments serve built-up land parcels with less challenging land assembly required for any significant redevelopments to occur:

- **Mulham Place (in between Scarlett Road and Royal York Road):** Low density big box retail with surface parking
- **Wincott Drive/Bemersyde Drive (in between Islington Avenue and Kipling Avenue):** Low density strip mall and apartments with surface parking
- **Widdicombe Hill Boulevard/Lloyd Manor Road (in between Kipling Avenue and Martin Grove Road):** Low density strip mall with surface parking

As summarised in Table 12 below, except for immediate opportunities for infill developments at midblock sites, there is no significant differences on the influence of the Eglinton Crosstown West Extension investment on sustainable development across Options 1, 2 and 4.

Table 12: Summarizing Strategic Objective 4 – Encourage Transit-Supportive Development[28]

Sustainability Criteria	Indicator	Option 1	Option 2	Option 3	Option 4
To support existing neighbourhoods	Present population and jobs within walking distance	44,000 population and 23,000 jobs within 800m radius (2016)	44,000 population and 23,000 jobs within 800m radius (2016)	20,000 population and 20,000 jobs within 800m radius (2016)	42,000 population and 23,000 jobs within 800m radius (2016)
	Compatibility with existing neighbourhood character	Moderate (Toronto Segment to run on road median)	Moderate (Toronto Segment to be tunneled in entirety)	Moderate (Toronto Segment to be tunneled west of Scarlett and elevated across Humber River ravine)	Moderate (Toronto Segment to be tunneled west of Scarlett and elevated across Humber River ravine)
To support planned growth and economic development	Future population and jobs within walking distance	52,000 population and 31,000 jobs within 800m radius (2041)	52,000 population and 31,000 jobs within 800m radius (2041)	24,000 population and 27,000 jobs within 800m radius (2041)	50,000 population and 31,000 jobs within 800m radius (2041)
	Future transit-supportive development potentials	Moderate (immediate opportunities for infill developments at midblock sites)	Moderate (immediate opportunities for infill developments at midblock sites)	Weak (Jane station area is the sole potential for longer term opportunity)	Slightly Weak (longer term opportunities for infill developments at key arterial sites)

[28] Source: 2016 and 2041 Market Expanded Land Use (2041 RTP)

Strategic Case Summary

The Strategic Case (refer to Table 13) describes how the Eglinton Crosstown West Extension investment will complete the Frequent Rapid Transit Network and help towards attaining the strategic objectives relating to network connectivity, corridor travel experience, and livable and sustainable communities which are tied to 2041 RTP goals of strong connections, complete travel experiences and sustainable and healthy communities.

Table 13: Summarizing the Strategic Case Outcomes against BAU by Investment Options

Strategic Objectives	Strategic Criteria	Option 1	Option 2	Option 3	Option 4
	To provide high quality transit to more people in more places	GTHA's two-hour morning peak transit travel time savings of 62,000 person-minutes	GTHA's two-hour morning peak transit travel time savings of 112,000 person-minutes	GTHA's two-hour morning peak transit travel time savings of 94,000 person-minutes	GTHA's two-hour morning peak transit travel time savings of 142,000 person-minutes
Network Connectivity	To plug the connectivity gap between Eglinton Crosstown LRT and Transitway BRT	21% increase in Transitway and Crosstown weekday boardings, with Midtown Toronto-Downtown Mississauga transit journey trips faster by 5 minutes	21% increase in Transitway and Crosstown weekday boardings, with Midtown Toronto-Downtown Mississauga transit journey trips faster by 11 minutes	17% increase in Transitway and Crosstown weekday boardings, with Midtown Toronto-Downtown Mississauga transit journey trips faster by 18 minutes	23% increase in Transitway and Crosstown weekday boardings, with Midtown Toronto-Downtown Mississauga transit journey trips faster by 14 minutes
	To provide more reliable, safe and enjoyable travel experience	Good reliability, great accessibility, and good comfort	Great reliability, satisfactory accessibility, and great comfort	Great reliability, good accessibility, and great comfort	Great reliability, good accessibility, and great comfort
Corridor Travel Experience	To boost transit use and attractiveness among local residents	158% increase in corridor boardings 4% more GTHA jobs reachable by transit in 45 mins for residents along the corridor	122% increase in corridor boardings 11% more GTHA jobs reachable by transit in 45 mins for residents along the corridor	38% increase in corridor boardings 14% more GTHA jobs reachable by transit in 45 mins for residents along the corridor	124% increase in corridor boardings 18% more GTHA jobs reachable by transit in 45 mins for residents along the corridor

Strategic Objectives	Strategic Criteria	Option 1	Option 2	Option 3	Option 4
Livable Communities	To improve livability through reduction in traffic delays, auto dependency and air pollution	3.5% decrease and 2.4% increase in auto and transit mode shares respectively	3.3% decrease and 2.2% increase in auto and transit mode shares respectively	2.0% decrease and 1.3% increase in auto and transit mode shares respectively	3.2% decrease and 2.1% increase in auto and transit mode shares respectively
	To encourage use of active modes to access stations	LRT walkshed coverage of 51%	LRT walkshed coverage of 51%	LRT walkshed coverage of 40%	LRT walkshed coverage of 48%
Sustainable Development	To support existing neighbourhoods	44,000 population and 23,000 jobs within 800m radius (2016) with moderate neighbourhood compatibility	44,000 population and 23,000 jobs within 800m radius (2016) with high neighbourhood compatibility	20,000 population and 20,000 jobs within 800m radius (2016) with slightly high neighbourhood compatibility	42,000 population and 23,000 jobs within 800m radius (2016) with slightly high neighbourhood compatibility
	To support planned growth and economic development	52,000 population and 31,000 jobs within 800m radius (2041) with moderate TOD opportunity	52,000 population and 31,000 jobs within 800m radius (2041) with moderate TOD opportunity	24,000 population and 27,000 jobs within 800m radius (2041) with very weak TOD opportunity	50,000 population and 31,000 jobs within 800m radius (2041) with slightly weak TOD opportunity
Overall Evaluation		Notable improvements in promoting livable and sustainable communities (i.e. highest transit-supportive development potential), but some network connectivity and corridor travel experience improvements are marginal	Notable improvements in promoting livable and sustainable communities, network connectivity and corridor travel experience	Least improvements in promoting livable and sustainable communities (i.e. lowest increase in transit mode share) and mostly marginal improvements in network connectivity and corridor travel experience (i.e. lowest increase in LRT boardings)	Best improvements in both network connectivity and corridor travel experience (i.e. highest GTHA travel travel time savings and local communities' job accessibility by transit), and some improvements in promoting livable and sustainable communities

5

Economic Case

Introduction and Assumptions

The Economic Case is one of two chapters focused on the rationale for pursuing an investment (the other being the Strategic Case). While the Strategic Case evaluates options based on a project specific policy/plan oriented evaluation framework, the Economic Case determines if the expected benefits of this investment exceed the costs required to deliver it, and articulates the overall benefit to society of pursuing each investment option.

The Economic Case compares costs and benefits to determine the overall economic viability of an investment. This analysis considers the magnitude of costs and benefits for a 60-year lifecycle (the evaluation period) as well as:

- Benefit Cost Ratio (BCR) – the net benefits divided by the net costs, which is used to indicate benefits that are realized per dollar spent
- Net Present Value (NPV) – the net benefits minus net costs, which is used to indicate total net benefits to the region

The impacts of the proposed investment were estimated using the GGHm version 4. The model utilizes the generalized time of the travel modes available to a user for each trip made in the transportation network to calculate ridership for the entire 60-year lifecycle.

The benefits of the increased ridership are compared against the costs required to deliver the investment to determine the overall economic impacts. The model makes use of assumptions and parameters throughout the social cost benefit analysis, as noted in Table 14.

Table 14: Economic Case Assumptions

Input	Impact Type
Analysis Approach	All benefits/costs are expressed in real terms in 2019$. Appraisal begins in 2019. It includes 5-6 years of construction (2022 for Option 1, 2023 for Options 2, 3 and 4), with an opening year of 2028, and 60 years of operation (2028-2088).
Evaluation Period	60 years
Economic Discount Rate	3.5%
Inflation Rate	2.0%
Cost escalation in real terms	1.0%
Value of Time (VoT) (2019$)	$18.06/hour
VoT Growth Rate	0%
Auto Occupancy	1.077
Auto Operating Cost Savings (2019$)	Marginal auto operating cost: $0.09/km
Safety Improvements (Accident Mitigation) (2019$)	$0.10/km, de-escalated by 5.3% annually
GHG Value	$0.011/km

All analysis completed in this section uses real values and a social discount rate, as opposed to nominal values and a financial discount rate. Real values do not include the impact of general inflation, but must consider real growth. A social discount rate reflects society's time value preference for consumption – a benefit or cost incurred tomorrow may be less 'valuable' than the same benefit or cost incurred today.

Costs

The costs or 'required investment' to deliver the Eglinton Crosstown West Extension are divided into two categories:

- Capital Costs – fixed one-time costs incurred during the implementation of the investment. The capital costs include the labour and materials required for construction; as well as contingency. Property acquisition costs are excluded from the economic analysis.
- Operating and Maintenance Costs – ongoing costs required to operate the service, provide day to day maintenance, and complete major rehabilitations throughout the lifecycle of the project.

The capital and operating and maintenance costs for the entire lifecycle of the Eglinton Crosstown West Extension investment are listed in Table 15 below. These costs are incremental to the BAU scenario and have been discounted based on the approach defined earlier in this chapter.

Option 1 has the least economic costs due to its significantly lower capital costs as compared to other options, whereas Option 2 has the highest economic costs due to the number of underground stations that the option alignment features.

Table 15: Economic Costs Summary

Economic Costs ($2019 NPV)	**Option 1**	**Option 2**	**Option 3**	**Option 4**
Capital Costs	$2,119.7 M	$4,374.2 M	$2,762.4 M	$3,460.7 M
Operating and Maintenance Costs	$1,115.8 M	$1,112.3 M	$1,191.1 M	$1,155.9 M
Rehabilitation Costs	$269.7 M	$380.3 M	$214.8 M	$298.9 M
Total Present Value of Costs	$3,505.1 M	$5,866.8 M	$4,168.4 M	$4,915.7 M

User Impacts

User Impacts are a key area of analysis for transport investments. They capture how the investment will improve the welfare of transport network users or travellers. This includes both Eglinton Crosstown West Extension riders and all other transportation network users since both groups benefit from travellers switching to transit from other modes.

The Eglinton Crosstown West Extension investment will change the cost of travel to three main groups:

- Existing Transit Users – The investment will reduce the generalized cost of travel below the current cost of travel by reducing the travel time along the corridor. This investment will provide a direct benefit to existing users.
- New Transit Users – The investment will reduce the generalized cost of travel along the corridor. This will attract new users to transit that used to travel via other modes. These new users will receive a benefit equal to the difference in what they were willing to pay and the new generalized cost of travel on transit.
- Auto Users – The investment will attract some auto users off of local roads**, this will generate congestion reduction benefits when compared to the business as usual for the remaining auto users.**

All user impacts included in this analysis, which is summarised in Table 16, are 'net impacts' across the investment; a sum of benefits and disbenefits. Due to travel demand modelling limitations, this analysis does not capture transit user benefits related to the Eglinton Crosstown West Extension investment's positive impacts on service reliability and transit vehicle overcrowding improvements.

Option 4 has the highest total transit and auto user benefits when compared against other options.

Table 16: User Impacts Summary (2019$)

Category	Impact Measure ($2019 NPV)	Option 1	Option 2	Option 3	Option 4
Transit	Travel Time Benefits	$344.6 M	$714.0 M	$521.2 M	$854.3 M
Automobile	Congestion Reduction	$303.4 M	$381.0 M	$470.5 M	$477.2 M
	Operating Cost Reduction	$96.2 M	$111.6 M	$110.9 M	$127.5 M

External Impacts

Every auto trip taken can contribute negative impacts to society through emissions that pollute the air or injuries that can occur from collisions. These impacts are called external impacts, or the 'social cost of transport'. Transportation investments are an opportunity to reduce these social costs by improving the economic efficiency of the transportation system.

For instance, motorists switching to transit increase transit farebox revenue and decrease the number of trips on the GTHA's road network. This will lead to higher transit farebox recovery and fewer auto collisions and emissions, making the GTHA's transportation network more cost-effective, safer and healthier and contributing to the province's greenhouse gas emissions reduction targets.

External impacts are estimated through the mode changes generated by the proposed investment. If travellers move from a less efficient mode to transit, then there is an impact equivalent to the externalities per trip on transit, minus the externalities on their previously used mode. These benefits are calculated based on the change in automobile vehicle kilometres travelled (VKT).

As summarised in Table 17, there is not a significant difference in health and safety and environmental improvements across all options, although Option 4 performs significantly better than Option 1.

Table 17: External Impacts Summary (2019$)

Category	Impact Measure ($2019 NPV)	Option 1	Option 2	Option 3	Option 4
Health and Safety	Collision Reduction	$33.3 M	$38.6 M	$38.3 M	$44.1 M
Environment	GHG Emissions Reduction	$10.7 M	$12.4 M	$12.3 M	$14.2 M
	Air Quality Improvement	$2.1 M	$2.5 M	$2.5 M	$2.8 M

Economic Case Summary

The economic evaluation, as summarised in Table 18, indicates that the Eglinton Crosstown West Extension investment would generate travel time savings for existing and new transit riders, and reduce automobile usage along the corridor.

These benefits do not balance out the capital, operating and maintenance costs associated with the investment, resulting in a negative net present value and benefit-cost ratio that is positive but less than 1.0 for all of the options. This indicates that there is an economic benefit associated with the implementation of the Eglinton Crosstown West Extension, but the benefits do not outweigh the cost.

There may be opportunity to further refine the service and infrastructure through the preliminary design phase to increase the investment's net benefit and improve the economic case.

Table 18: Economic Case Summary

Impact Type ($2019 NPV)	**Option 1**	**Option 2**	**Option 3**	**Option 4**
Total Costs	$3,505.1 M	$5,866.8 M	$4,168.4 M	$4,915.7 M
Capital Costs	$2,119.7 M	$4,374.2 M	$2,762.4 M	$3,460.7 M
Operating and Maintenance Costs	$1,115.8 M	$1,112.3 M	$1,191.1 M	$1,155.9 M
Rehabilitation Costs	$269.7 M	$380.3 M	$214.8 M	$298.9 M
Total Benefits	$891 M	$1,370 M	$1,266 M	$1,669 M
User Impacts	$744.3 M	$1,206.5 M	$1,102.6 M	$1,458.9 M
External Impacts	$46.09 M	$53.4 M	$53.1 M	$61.9 M
Incremental Fare Revenue Adjustment	$101.1 M	$109.5 M	$109.8 M	$149.2 M
Net Benefits	-$2,613.7 M	-$4,497.3 M	-$2,902.7 M	-$3,246.4 M
Benefit-Cost Ratio	0.25	0.23	0.30	0.34

6

Financial Case

Introduction

The Financial Case assesses the overall financial impact of the proposed investment options. While the Strategic Case and Economic Case outline how an investment achieves organizational goals and social value, the Financial Case is one of two cases that focuses on the requirements to successfully deliver an investment. This includes a review of total revenue (fares) gained and expenditures (capital, operating, maintenance and refurbishment) required over the lifecycle of the investment incremental to the base case scenario. These revenue and costs were nominal, non-discounted estimates in the Year of Expenditure (YoE) dollars based on the summation of sixty years of cash flows which are inflated by 2% every year (refer to Table 14).

Capital Costs

The capital cost of building and delivering the proposed investment options forms the largest component of overall project costs. They include a contingency allowance based on the conceptual level of engineering utilized for this assignment, as well as a professional services allowance to account for the completion of designs, procurement activities, and support activities during construction.

Option 1 would result in the lowest capital costs since it is a surface-level alignment. The other options would result in higher capital expenditures since they are grade-separated.

The costing estimations for the Eglinton Crosstown West Extension investment options, which follow a Class 5 cost estimation level estimate[29], are consistent with those applied to the Eglinton Crosstown LRT project. Other capital cost estimation assumptions include:

- Private property acquisition to be required only for the Airport Segment.
- Tunnelling and underground stations to be built with a mix of tunnel-boring machine and cut and cover, depending on location.
- Underground stations to have platform, concourse and street levels, and a minimum of two entrances, with Jane and Scarlett stations fortified with flood proofing elements.
- Humber River bridge to be upgraded and utilities to be relocated to accommodate at-grade LRT alignment.
- Additional provisions to be made to the present Mount Dennis Maintenance and Storage Facility (MSF) to accommodate expansion to the Eglinton Crosstown LRT fleet to serve the extended corridor.
- Financing, legal and procurement-related costs are excluded.

[29] As defined by the Association for the Advancement of Cost Engineering (AACE)

The capital cost estimates for Eglinton Crosstown West Extension is summarised in Table 19. These are consistent with the costing estimations applied to Metrolinx's Eglinton Crosstown LRT project.

Table 19: YoE Capital Cost Breakdown in Financial Terms

Item (Total Expenditures in YoE Dollars)	**Option 1**	**Option 2**	**Option 3**	**Option 4**
Track and Guideway	$320 M	$969 M	$925 M	$925 M
Stations and Stops	$116 M	$1,222 M	$249 M	$679 M
Maintenance and Storage Facility	$34 M	$28M	$22 M	$25 M
Sitework	$496 M	$265 M	$265 M	$272 M
Systems	$218 M	$230 M	$219 M	$223 M
Vehicles	$410 M	$343 M	$258 M	$300 M
Indirect Costs	$177 M	$407 M	$252 M	$319 M
Property Acquisition	$31 M	$31 M	$31 M	$31 M
Professional Services	$422 M	$968 M	$599 M	$757 M
Contingency	$677 M	$1,361 M	$859 M	$1,076 M
Non-recoverable HST	$32 M	$73 M	$45 M	$57 M
Total Capital Costs	**$2,935 M**	**$5,896 M**	**$3,723 M**	**$4,665 M**

Operating, Maintenance and Rehabilitation Costs

The operation, maintenance and rehabilitation costs of the Eglinton Crosstown West Extension are shown in Table 20. Operating, maintenance and rehabilitation costs cover all aspects of the new LRT including staffing, vehicle upkeep and refurbishment, track and station maintenance, power, and savings from reduced local bus costs. Further work will be required in the Preliminary Design phase to refine assumptions based on complexity of station layouts and better understanding of changes to the local bus network.

The operating and maintenance costs are the highest for Option 3 due to the parallel-running TTC 32A bus route which would be required to serve the large station coverage gaps along the Toronto Segment. Station refurbishment represents a considerable portion of the entire project rehabilitation costs, and hence Option 3 has the lowest rehabilitation cost as it has fewer stations than the rest of the options.

Table 20: YoE Operating, Maintenance and Rehabilitation Costs in Financial Terms

Item (Total Expenditures in YoE Dollars)	Option 1	Option 2	Option 3	Option 4
Incremental Operating and Maintenance Costs	$9,942 M	$10,019 M	$10,473 M	$10,223 M
Total Operating and Maintenance Costs	$10,739 M	$10,779 M	$11,308 M	$11,043 M
Incremental Rehabilitation Costs	$2,875 M	$4,129 M	$2,318 M	$3,238 M
Total Rehabilitation Costs	$3,017 M	$4,270 M	$ 2,389 M	$3,285 M

Incremental Revenue Impacts

Based on the travel demand modelling outcomes, 9,000, 10,000, 9,500 and 13,000 net new weekday riders will utilize the GTHA transit network post-Eglinton Crosstown West Extension implementation based on Option 1, Option 2, Option 3 and Option 4 respectively. The resulting (incremental) fare revenues over the 60-year lifecycle are detailed out in Table 21.

Table 21: YoE Revenue Impacts in Financial Terms

Item (Total Expenditures in YoE Dollars)	Option 1	Option 2	Option 3	Option 4
Incremental Project Revenue	$760 M	$823 M	$826 M	$1,121 M
Total Project Revenue	$3,767 M	$3,243 M	$2,014 M	$3,275 M

Funding Sources

The Government of Ontario has committed $4.7 billion in funding to plan, design and construct the required infrastructure for the Toronto Segment of the Eglinton Crosstown West Extension before 2031. The capital expenditures for all options fall within the current funding commitment. Metrolinx will further explore opportunities to optimize the scope to reduce capital costs through the preliminary design phase and through future collaboration with the GTAA.

Analysis Summary

For all options, the overall net present value (NPV) of the investment is negative over the 60-year time horizon, indicating that the project is not profitable on a strictly financial basis. As shown in Table 22, which lists out the options' revenues and costs in discounted 2019 dollar estimates, the operating cost recovery ratio is below 1.0 for all options, indicating that the fare revenue from the new service will not recover the project operating and maintenance costs. Option 1 outperforms all other options due to the other options' higher capital costs associated with grade separation.

Table 22: Financial Case Summary

Financial Case Metric (YoE Dollars, 2019 NPV)	**Option 1**	**Option 2**	**Option 3**	**Option 4**
Total Revenue Impacts	$511 M	$440 M	$273M	$444 M
Total Capital Costs	$2,128 M	$4,390 M	$2,772 M	$3,473 M
Total Operating and Maintenance Costs	$1,264 M	$1,258 M	$1,344 M	$1,307 M
Total Rehabilitation Costs	$290 M	$404 M	$227 M	$311 M
Net Operating Cash Flow	-$753 M	-$818 M	-$1,071 M	-$862 M
Net Present Value (NPV)	-$3,171, M	-$5,612 M	-$4,070 M	-$4,647 M
Operating Cost Recovery Ratio (R/OpEx Ratio)	0.40	0.35	0.20	0.34
Return on Investment Ratio (ROI)	0.14	0.07	0.06	0.09

7

Deliverability and Operations Case

Introduction

The Deliverability and Operations Case is an analysis of investment delivery, operations and maintenance, service plans and any other issues required for the realization of an option. This includes delivering the project from original concept through planning, design, environmental assessment, stakeholder engagement, procurement, construction and operations. The Deliverability and Operations Case is one of two cases focused on requirements for delivering the investment.

Toronto Segment

The deliverability and operational constraints for the Toronto Segment are grouped into the following categories:

- Right-of-way limitations
- Utility limitations
- Waterways and flood plains limitations
- Topology challenges
- Construction impacts

Detailed analysis and the identification of mitigation measures for these constraints will be completed as part of the Preliminary Design Business Case (PDBC).

With regards to the EA requirement, it is anticipated that there will be no additional requirement for an addendum to the 2010 EA for the Toronto Segment listed under Option 1, whereas addenda to the EA will be required for the Toronto Segment listed under Options 2, 3 and 4.

Right-of-Way Limitations

Option 1 will require road widening along Eglinton Avenue West, but there will be very minimal property impacts as most of the required space had been protected for the cancelled Richview Expressway. Additional evaluation is required of the impact on several protected woodlots along the corridor.

Option 1 will also require Transit Signal Priority to mitigate the negative impact traffic congestion will impose on the LRV travel times, particularly at the Eglinton Avenue-Martin Grove Road intersection which is one of the city's busiest. On the contrary, Options 2, 3 and 4 will not require any changes to the present road configuration.

All options will not decrease the capacity of the existing roadway as there will be no reduction in the number of general road lanes, and all turning movements currently permitted at signalized intersections will be maintained. Nonetheless, judging by the higher risk of auto-LRT, LRT-pedestrian and auto-pedestrian right-of-way conflicts when the LRT is operational, Option 1 is less preferred as compared to other options.

Utility and Topology Challenges

There is no substantial risk of conflict with surface utilities, particularly the overhead height limit imposed by hydro corridors west of Martin Grove Road, as all of the options will feature either surface or underground alignments along the height-restricted stretch.

However, Options 2 and 4 will require more complex underground station construction solutions due to the presence of high pressure gas lines underneath most of the arterial intersections. Option 2 will likely to present the most significant tunneling challenges due to the steep grade change requirements presented by the Humber River ravine.

Waterways and Flood Plains Mitigation Challenges

The Toronto Segment alignment will intersect several waterways, namely Humber River (east of Scarlett Road), Humber River Tributary (west of Royal York Road), Mimico Creek (west of Martin Grove Road) and Elmcrest Creek (west of Renforth Drive). Eglinton Avenue currently crosses over the Humber River using a bridge, while the other waterways are either channelized or buried beneath the surface.

Option 1 will require an additional bridge across the Humber River Ravine, which poses the highest flooding risk along Eglinton West corridor. A short stretch of the corridor west of Jane Street and east of Humber River Bridge is in a flood plain zone (as defined by the Toronto and Region Conservation Authority), necessitating a resilient design to avoid corridor-wide LRT service disruptions during flooding events.

Option 2 will involve tunnelling underneath three flood-prone waterways (Humber Ravine, Humber River Tributary and Mimico Creek) and will require complex tunnelling solutions. Options 3 and 4 will be elevated along the Jane Street to Scarlett Road segment that passes through the ravine and hence will require portals to be constructed above the flood elevation level to minimise flooding risk in the event of a regional storm occurrence.

Since the Jane Street to Scarlett Road segment is in a flood plain, Options 1 and 2 will require medium and high levels of mitigation efforts respectively to minimize flooding risk. Option 2 will likely to present the most significant technical challenges as the tunneled Jane Street-Scarlett Road segment and the underground Jane and Scarlett stations will lie underneath the floodplains.

Construction Impacts

Travel time delays from periodic lane reductions and temporary intersection closures together with street-level noise and visual impacts will pose as the major discomfort factor for the surrounding residents, businesses and visitors and through-traffic road users alike during the construction phase.

General construction activities to build LRT tracks and right-of-way along the existing road median will be the main concern for Option 1, whereas extensive excavation works required to construct underground stations and ancillary buildings using the cut-and-cover method will be the main cause of disruption for Options 2, 3 and 4 with below grade alignments.

Other construction activities related to tunneling will potentially be constrained to specific locations, particularly at Tunnel Boring Machine launch and extraction sites, between stations (for secondary structures such as emergency exits and ventilation shafts), and along the eastern and western portals. Larger volume of excavated soil removal, remediation and disposal typically associated with tunneling activities will be mitigated through the application of Eglinton Crosstown LRT's best practices in soil management techniques in full compliance with the Ministry of Environment's recommended guidelines.

Options 1 and 2 will pose the most significant construction impacts as compared to the rest of the options. Option 1's construction impacts will be spread out along the entire surface alignment for three to five years and Option 2's extensive excavation works for nine cut-and-cover stations and ancillary buildings, with most of them less than 400 metres apart, will last for five to seven years. Option 4's construction impacts will be less severe with fewer underground stations involved. Option 3 will pose the least construction impacts as it features only one underground station.

Operational Challenges

Due to the exclusive right-of-way, all options fare roughly similar in absence of any significant operational risk. However, Option 1 will likely to face more frequent operational challenges due to direct exposure to weather elements such as blizzard and flash flooding, especially along the stretch that falls under the flood plain zone. Severe weather preparedness strategy will be needed to ensure the safety of passengers, to avoid costly LRV damage, and to reduce travel impacts due to LRT service disruptions during severe weather events. Option 1 will also carry higher collision risk due to numerous conflict points with road traffic vehicles and pedestrians.

Other options will generally be protected from similar service disruption challenges resulting from severe weather and right-of-way conflicts. Option 2 fares the best, as the almost fully underground-running alignment will have to deal with the least amount of snow and ice during winter as compared to Options 3 and 4.

Airport Segment

The Airport Segment follows the original approved alignment in the 2010 EA from Renforth Station in the south up until the northernmost point where Silver Dart Drive parallels Highway 427. The rest of the segment that leads to Pearson Airport remains as a conceptual linkage. Metrolinx and the Greater Toronto Airport Authority (GTAA) are actively collaborating to finalize the Airport Segment's full alignment as the latter is in the midst of completing its plans for the future RTPC and the former is working with engineering design consultants to develop and refine the alignment of the final segment into the airport and connection to the future RTPC.

With the capital funding arrangement and RTPC site planning uncertain, developing the Airport Segment will take longer and require further analysis. The Renforth-Silver Dart alignment was inherited from the 2010 EA, and additional reviews by the consultants would be required to confirm the deliverability of the alignment considering the complex constraints of the Highway 401-427-27 interchange and the challenging road geometry and built-environment that exist between that interchange and the proposed airport terminus.

There are several preliminary design challenges identified by the consultants for the Renforth-Silver Dart alignment that would need to be addressed (particularly tight radii, steep grades, bridge elevation mismatch at Convair Drive and Matheson Boulevard, short tail track, non-compliant track crossovers and insufficient storage track capacity).

The Renforth-Silver Dart alignment's key considerations would include MTO highway setbacks and crossing limitations, GTAA flight and electromagnetic interference clearances, potential stop at Airway Centre (an office hub north of Airport Road), power substation requirements and Transport Canada security measure parameters. The present alignment has already factored in the height restriction at the end of runways, which results in an at-grade alignment for much of the Silver Dart alignment.

The engineering design consultants are in the process of developing and evaluating LRT alignment alternatives between Silver Dart and the future RTPC. The preferred option would depend on GTAA's future development, infrastructure and road network plans (particularly the RTPC design future Finch West LRT interface, the proposed land use plans and the need to serve the Airway Centre).

Further analysis of the Airport Segment options and the identification of mitigation measures for the resulting constraints would rely on potential funding arrangements and synergy with the GTAA's future plans. Addenda to the 2010 EA would be required for the alignment beyond Silver Dart LRT Stop.

Constructing transit infrastructure next to one of North America's busiest airports presents its own challenges. Aviation requirements may dictate construction procedures and practices near the airport. This may impact the overall project cost and schedule.

Service Integration

This section will identify the requirements to ensure integration of the proposed Eglinton Crosstown West Extension service with other transit services. Seamless transit connections and integrated fares are equally desirable for all of the investment options considered in this IBC. Hence, the recommendations made here will be relevant regardless of the chosen investment option.

Crosstown LRT Project Interface

The Eglinton Crosstown West Extension would be an extension of the Eglinton Crosstown LRT. The Eglinton Crosstown LRT was originally conceived to provide seamless rapid transit service from Pearson Airport to Kennedy Station. The project was divided into two phases, and Metrolinx proceeded with the phase from Mount Dennis Station to Kennedy Station (Phase 1). The section from Weston Road to Pearson International Airport (Phase 2), which is now known as Eglinton Crosstown West Extension, was deferred due to limited funding.

In order to meet the seamless connectivity objective, the extension will have to interface with the Eglinton Crosstown project scheduled for completion in 2021. As the Eglinton Crosstown project has been built to allow for a westerly extension, the two projects would connect just west of Weston Rd, where the tail tracks of the current project end. The deliverability of the interface is compatible with all of the identified options in this Business Case.

The next PDBC stage will dictate how the Phase 2 project would be procured and delivered. The analysis of the various procurement options is ongoing and is intended to identify the optimal procurement strategy that ensures a fully compatible expansion of the existing Crosstown LRT. The procurement options analysis currently being contemplated are assessed with respect to the following key objectives:

- Ensuring value for money for the contributed public funds in line with the same risk profile as in Phase 1
- Deriving efficiencies from Phase 1 system assets, including for vehicle maintenance, and be designed to existing standards

Future Frequent Rapid Transit Project Interface

The Eglinton Crosstown West Extension may need to interface with Finch West LRT Extension at Pearson Airport, as part of the RTPC.

The line will also need to be integrated with the proposed Jane South Rapid Transit that would run along Jane Street between Steeles Avenue and Bloor Street. As the planning for Jane South Rapid Transit progresses, further analysis will be required to ensure convenient passenger connections between the two rapid transit systems. The following are the identified potential requirements that will need to be refined based on the considered investment options:

- Option 1: Surface platform positioning (near-side or far-side) and configuration (unidirectional or bidirectional)
- Option 2: Underground station layout arrangement (island or side platforms) and positioning of station entrances (near-side or far-side)
- Options 3 and 4: Elevated station layout arrangement (island or side platforms) and positioning of station entrances (near-side or far-side)

Fare Integration

Fare integration between TTC and MiWay is important for the Eglinton Crosstown West Extension investment to be successful. The transportation and economic benefits for each investment option are modelled and calculated based on the assumption that the present fare policy is maintained for cross-boundary transit connections along Eglinton Crosstown West Extension (refer to Table 23):

- Discounted $1.60 and $0.80 co-fares apply for TTC and MiWay users connecting to and from GO Transit respectively as of end-2019
- As there is no co-fare arrangement between TTC and MiWay, Toronto-bound MiWay and Mississauga-bound TTC passengers transferring at Renforth are subject to pay double fares
    - An exception exists for Pearson Airport-serving TTC 900, 952 and 52A routes where airport-bound users enjoy single fare rides

Assuming the same policy continues to apply when the new Eglinton Crosstown West Extension service commences, Mississauga-based workers within Convair and Silver Dart station areas will likely be discouraged from paying double fares considering the proportionally shorter LRT trip length as part of the entire BRT-LRT trip length and will remain on MiWay services.

Table 23: Cross-boundary Transit Connections along Eglinton Crosstown West Extension[30]

Stop or Station	TTC	MiWay	GO Transit	UP Express
Renforth	**Eastbound Eglinton Crosstown West Extension to Eglinton West Subway and Mount Dennis GO** stations**	**Westbound Transitway BRT to Square One**** 100: Erin Mills 107: Westwood Square 109: Kipling Subway	19: Square One**/Finch Terminal 40: Hamilton GO/Richmond Hill Centre**	
Convair and Silver Dart	112C: Kipling Subway*-Renforth/Etobicoke's Carlingview Dr	7*: Square One-Renforth/ Pearson-Malton's Westwood Square		
Pearson	900: Kipling Subway 952 & 52A: Lawrence West Subway	100: Square One**/Erin Mills	34: Hamilton GO / Richmond Hill Centre** 40: Finch Terminal	Union, Weston, Mount Dennis** and Bloor stations

* Infrequent, peak hour-only local bus service

** Future rapid transit station

[30] Future surface transit (i.e. TTC and MiWay) and GO Bus routes are subject to future changes in the configuration of surface transit and GO Bus networks

An integrated fare system will not only attract more cross-boundary travellers, but also eliminate service redundancies across different transit operators and increase Eglinton Crosstown West Extension's capacity utilization. As such, strategies to overcome the aforementioned fare integration challenges will continue to be developed as planning for the Eglinton Crosstown West Extension advances throughout the PDBC and Full Business Case (FBC) stages.

Deliverability and Operations Case Summary

As shown in Table 24, Option 1 provides the lowest project deliverability risk, as there is lower probability for construction progress delays and cost overruns as compared against the rest of the options due to the at grade LRT's less complex design. Option 2 carries the highest project deliverability risk due to the highest number of underground stations, followed by Option 4 and Option 3.

Option 1 carries higher operational risks as compared to other options due to reliance on traffic signals, exposure to severe weather and traffic collisions at intersections.

For all Options, further refinements on the Airport Segment alignment and the interface with in delivery and proposed rapid transit lines (i.e. Eglinton Crosstown LRT, Jane South BRT and Finch West LRT) will be required to advance this IBC to later stages.

Table 24: Summarizing the Deliverability and Operations Case

Key Deliverability and Operations Risk	Option 1	Option 2	Option 3	Option 4
Right-of-Way Limitations	Moderate (Conflicts with traffic and pedestrian right-of-way)		Low (No right-of-way conflict)	
Technical Challenges to Accommodate Utilities and Topology	Very Low (Option has no underground station)	Very High (Option has the most underground stations)	Moderate (Option has fewer underground stations)	High (Option has many underground stations)
Technical Challenges to Mitigate Flooding	Moderate (Section between Jane Street and Scarlett Road is prone to flooding)	High (Flood-proofing of tunnels and underground stations near Humber River ravine)	Low (Elevated guideways above Humber River ravine reduce flooding risk)	
Construction Impacts	High (Up to 5 years of disruptive periodic lane reductions along the entire corridor)	High (Up to 7 years of disruptive cut-and-cover excavation for nine underground stations)	Low (Disruptive excavation works limited to a single underground station)	Moderate (Disruptive cut-and-cover works for four underground stations)
Operational Challenges	Moderate (Many traffic signals, risk of weather and traffic-related service disruptions)	Very Low (Best severe weather protection)	Low (No risk of traffic-related service disruption)	

Glossary

Term	Definition
2041 Regional Transportation Plan (RTP)	Developed in partnership with municipal partners and many others, the 2041 RTP builds on the successes of The Big Move (2008), the first regional transportation plan for the GTHA. It presents a vision for the future, and sets out creating strong connections, complete travel experiences, and sustainable and healthy communities as the 2041 RTP's three goals.
Business As Usual (BAU)	A scenario used in Business Case analysis that reflects the future state of the region (including population, employment, and the transportation network) without the investment that is appraised in the Business Case. In this document, Business as Usual refers to the future state of the region and GO Rail with GO Expansion, but without the Kitchener Expansion program.
Frequent Rapid Transit Network (FRTN)	A seamless and reliable network of transit services running at least every 10-15 minutes all- day, every day. The FRTN will consist of transit routes and corridors that ensure fast and reliable service through the use of dedicated infrastructure, design elements, and other supporting investments as required (e.g., full grade separation, exclusive right-of-way, wider stop spacing than conventional transit routes, signal priority, or other transportation systems management measures). The FRTN proposed for the GTHA will allow transit users to make efficient transfers between routes on the network, which includes subways, transitways, Bus Rapid Transit, Light Rail Transit, Regional Express Rail, and Priority Bus corridors.
Greater Toronto and Hamilton Area (GTHA)	The combined area of the Cities of Hamilton, and Toronto; and the Regions of Durham, Halton, Peel, and York.
Greater Golden Horseshoe (GGH)	The combined area of the Greater Toronto and Hamilton Area, as well as the Cities of Barrie, Branford, Guelph, Kawartha Lakes, Orillia, Peterborough; the Counties of Brant, Dufferin, Haldimand, Northumberland, Peterborough, Simcoe, and Wellington; and the Regions of Niagara and Waterloo.
Initial Business Case (IBC)	The first Business Case prepared for a project in line with part two of Metrolinx's stage gate process (Feasibility and Options Analysis). This Business Case compares potential investments to identify if there is merit in further design and development.
Local Bus/Transit	A passenger transit system that is operated principally within an upper-tier, lower-tier or single-tier municipality. Public transit in the GTHA is provided by Burlington Transit, Brampton Transit, Durham Region Transit, GO Transit, Hamilton Street Railway, Milton Transit, MiWay (Mississauga Transit), Oakville Transit, the Toronto Transit Commission (TTC) and York Region Transit (Viva).

Term	Definition
Light Rail Transit (LRT)	Transit infrastructure and services consisting of light rail vehicles running in an exclusive right-of-way, fully separated from traffic, with signal priority measures in place and longer spacing between stops than conventional transit routes (typically 500 metres - 1 kilometre) to maintain higher average speeds and ensure reliability of the service.
Mode Share	The percentage of person-trips made by one mode of travel relative to the total number of trips made by all modes.
Net Present Value (NPV)	The total economic value of a project. Determined by subtracting project costs from its total benefits. A positive Net Present Value indicates that the project's benefits exceed its costs
Preliminary Design Business Case (PDBC)	This Business Case is aligned with step three of Metrolinx's stage gate process (Preliminary Design) and develops a more detailed design for one or more investment options discussed in an Initial Business Case. It is used to secure funding for a potential investment.
Transit Priority Measures	Techniques designed to minimize delays for buses or rail vehicles at intersections and along congested roads to provide a faster, more reliable trip. Transit priority measures include HOV lanes, bus-only lanes, signal priority and queue jump lanes.
Transit-Supportive Development	Land uses and urban form designed to make transit more viable and attractive. It often refers to compact, mixed-use development that has a high level of employment and residential density.
Urban Growth Centres	Existing or emerging downtown areas shown in Schedule 4 in the Growth Plan for the Greater Golden Horseshoe, 2017, and as further identified by the Minister (of Municipal Affairs) on April 2, 2008. They represent twenty-five downtown areas that are intended to be mixed-use, high-density, and transit-supportive focal points for residential and employment growth and intensification in a municipality.
Vehicle-Kilometres Travelled (VKT)	A measure of roadway use, commonly used in estimating congestion, that reflects the distance that an individual drives, or, more typically, the cumulative distance driven by all vehicles in an urban region during a specified period of time. Vehicle kilometres travelled can reflect the link between land use and transportation. Land uses that are further away from each other result in longer trip lengths, more traffic on roadways and more vehicle kilometres travelled, for example