EX4.1.2

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Eglinton West LRT Business Case Analysis

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prepared by

Eglinton West LRT Community Working Group

Eglinton West LRT Business Case Analysis

Executive Summary

Preamble

Toronto City Council, in December 2017, directed staff to continue planning for the Toronto Segment of the Eglinton West LRT (EWLRT). The planning concept recommended by the City Manager would extend the Eglinton Crosstown LRT **at-grade** in the centre of the road with ten new stops from Mount Dennis to Renforth Gateway Station. Due to significant opposition by citizens to the at-grade LRT recommendation, supported by arguments that the *Initial Business Case* (IBC) used to support the recommendation was badly flawed, Council also directed staff to establish a Community Working Group (CWG) "*to investigate further grade separation and or tunnelling options to further develop traffic modeling and an enhanced framework that places additional consideration on local community interest*".

The CWG presents here a critical review of the IBC and the CWG's own strategic business case analysis (BCA). Considering current and anticipated growth of air travel and employment in the Pearson Airport area, it is almost certain that the EWLRT will primarily transport commuters and air travelers between the airport area (north of Highway 401) and Toronto. It makes no sense to plan for the Toronto Segment only. If the level of service meets the needs and expectations of the the anticipated users, ridership demand will be greater than one LRT line can accommodate.

The CWG's strategic BCA demonstrates that building the EWLRT **fully-separated from the roads network** will ensure adequate quality of service, nearly double the hourly capacity, and entice more than twice as many riders than an at-grade solution. **Grade separation is necessary to achieve LRT separation from the roads network.** Local community interests will be best served if the LRT is **below-grade (tunneled)** through central Etobicoke. The CWG believes that the at-grade planning concept is not consistent with a reasonable vision and goals for the EWLRT. When considered in a strategic manner, a fully-separated EWLRT, tunneled through central Etobicoke, is the best and most cost-effective solution.

Concerns regarding the IBC

The CWG has reviewed the EWLRT Initial Business Case, while being attentive to the Metrolinx business case guidelines. Notable concerns regarding the IBC include:

- failure to define a vision or goals that would provide a basis for objective analysis and comparison of the alternatives being considered

- the huge impacts of future growth and associated commercial development at Pearson Airport (the route's ultimate terminus) are blatantly ignored
- lack of suitable, specific, transparent and properly weighted criteria for measuring societal and community value and impacts associated with different LRT alternatives
- consideration of grade-separation alternatives that no one would consider reasonable, which constituted a built-in bias favoring the at-grade (non-separated) alternative
- inadequate data and modeling to support rational decision-making on likely utilization, merits, or risks of the different LRT alternatives considered
- lack of transparency regarding ridership modeling assumptions, and modeling results that are not credible
- failure to adequately consider the significance and consequences of current and future congestion on Eglinton West
- failure to consider the implications of different design alternatives on future options for development of the roads and community
- failure to consider flexibility to adapt to changes in demand and technology over the life of the project (60 years)
- indifference to matters of safety (especially for transit users), impacts on local residential streets, system integration and overall efficiency
- inadequate data / modeling and unfounded financial inputs to assess value of the non-transit transportation network and likely impacts on that network associated with different LRT alternatives.

Alternatives for Comparative Analysis

As mandated, the CWG investigated further LRT grade-separation / tunneling options. After considering many variants, it became clear that the dominant issue is whether the LRT is integrated with or kept totally separate from the roads network. Leaving the merits of minor variations for later study, one realistic configuration was chosen to represent each possibility:

Fully-Separated -- Employs grade-separation to stay fully independent of the roads network. Above-grade across the Humber valley, then below-grade (tunneled) to west of Highway 427 and a mix of at-grade (not involving intersections), above-grade and below-grade to the terminus. Nine stops -- seven along Eglinton, two more to the airport terminus.

Non-Separated -- Runs at-grade in the middle of Eglinton Ave., with integrated traffic / LRT signals. Includes bridges over the Humber and Highway 401. Thirteen stops -- ten along Eglinton (as recommended by the City Manager), three more to the airport terminus.

Business Case Analysis Summary

The CWG's business case analysis addresses Strategic, Economic, Financial and Deliverability and Operations perspectives, in keeping with Metrolinx guidelines. The analysis reveals dramatic differences in the business cases for the two alternatives:

- The **Fully-separated** alternative should achieve all the strategic project goals. The **Non-separated** alternative will quite clearly fail to achieve the goals.
- The **Fully-separated** alternative will attract, and have the capacity to carry, about twice as many riders as the **Non-separated** alternative. This is crucial, as planned economic growth at and near Pearson Airport will depend on adequate rapid transit capacity.
- The **Fully-separated** alternative will provide a superior level of service (faster, more predictable, more frequent, better comfort) for transit users with minimal impact (once constructed) on the local community and environment.
- The **Fully-separated** option delivers far greater strategic, economic and social benefits while avoiding most adverse impacts and future development constraints of the **Non-separated** alternative.
- While more costly to build, the **Fully-separated** alternative will have lower ongoing costs and a higher benefit-to-cost ratio than the **Non-separated** alternative.
- The **Fully-separated** alternative offers a more flexible and robust solution, fostering a more livable and sustainable community environment. It will benefit not just the local area but the Greater Toronto Area and beyond.

Conclusion

The Initial Business Case fails to provide a complete, reliable and objective analysis of reasonable alternatives for the EWLRT. No goals were defined against which to judge alternative proposals; projected ridership is not credible; none of the grade-separation alternatives considered was reasonable; and no consideration was given to constraints on long-term evolution of the roads and community.

After careful analysis of the strategic context, the CWG has clearly stated the problem, opportunity, vision and goals. Objective analysis performed for both **Fully-separated** and **Non-separated** (at-grade) alternatives shows that only the **Fully-separated** alternative can achieve the goals, and that a **Fully-separated** EWLRT will deliver more than twice the benefit ($7.2 billion) with a higher benefit-to-cost ratio (3.1).

The CWG's analysis demonstrates that a **Fully-separated EWLRT, tunneled through central Etobicoke**, is the best alternative for an LRT that connects Toronto, Pearson Airport and the airport employment area. It will close critical gaps in the rapid transit network, deliver the greatest value to commuters, air travelers, the local community and the environment, support planned economic growth, and leave flexibility for future development of the Eglinton West corridor.

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Eglinton West LRT Business Case Analysis

prepared by

Eglinton West LRT Community Working Group[1]

1. Introduction

The Eglinton West LRT Community Working Group (CWG) was established on the direction of Toronto City Council “to investigate further grade separation and or tunnelling options to further develop traffic modelling and an enhanced framework that places additional consideration on local community interest." [1]

This document reports business case analysis related to the CWG’s unanimous recommendation of an **Eglinton West LRT (EWLRT) configuration that:**

- **ensures "zero interaction" with road users (autos, cyclists, pedestrians. etc.) all the way from Mt. Dennis to the western terminus at the RTC (or Pearson Airport)**
- **passes below-grade under Weston Rd.**
- **has above-grade stops at Jane and Scarlett and above-grade (above flood level) track between Jane and Scarlett**
- **is tunneled below-grade from west of Scarlett to west of Highway 427**
- **has below-grade stops at Royal York, Islington, Kipling and Martin Grove**
- **meets the “zero interaction” requirement west of Highway 427 in an unspecified, efficient manner**
- **stops at Renforth Gateway station and has one more station (Convair or Silver Dart) before the terminus.**

The analysis presented in the following includes discussion regarding traffic modeling and transit demand modeling, and the reliance on such modeling results within the business case development process. Our analysis also places additional consideration on aspects of local community interest to achieve a more appropriate balance between regional interests (Toronto and the GTA) and the interests of affected local communities.

Where appropriate, we raise concerns regarding the established practices for development and review of business cases for major public transit initiatives, using perceived issues with the Eglinton West LRT Initial Business Case [2] (the IBC) to illustrate our concerns. We provide suggestions for improvement, which are implemented in our own analysis subject to our limited resources, time and access to information.

[1] See Appendix A for CWG membership.

2. Strategic Situation

Guidelines for staged development of business cases have recently been published by MetroLinx [3]. They include the requirement to clearly state the problem, vision, opportunity and goals. Although the IBC provided contextual narrative relevant to these four topics, it failed, in our opinion, to provide clear statements appropriate to the overall initiative as opposed to the limited task of preparing the initial business case.

The following significant thoughts regarding the anticipated EWLRT, expressed by CWG members and residents along the Eglinton West corridor, are listed in no particular order:

- There is strong opposition to a St. Clair style, at-grade LRT due to existing traffic congestion and foreseen adverse impacts on traffic and the community.
- An at-grade LRT will have diminished service levels for riders when compared to their experience in the adjoining tunneled portion of the Eglinton Crosstown LRT (ECLRT).
- Forced transfers (and multiple fares) across municipal boundaries have been a major deterrent to use of public transit.
- The LRT must provide safe, efficient, predictable travel for LRT users. Predictability and service reliability are key objectives for the community.
- The project must thoroughly anticipate transit user demand associated with projected growth at the airport and to its surrounding development.
- Stations should provide easy access for the young, old and physically challenged. They should be functional but not elaborate or expensive structures. Accessibility and safety must be key objectives.
- There is no need for stations / stops at points other than the major intersections.
- The local community should not be adversely affected during construction and regular operation of the LRT.
- Minimize noise, greenhouse gas (GHG) emissions and air pollution.
- Employ tunnel boring machines (TBM) for below-grade construction to minimize ground-level community impacts and traffic congestion along already-congested roads.
- Grade-separated stations should be simple, efficient and have at- (and above-) grade elements respectful of the materials and architectural style of the surrounding community -- blending in unobtrusively rather than standing out.

- Retain (and enhance if appropriate) existing green space, pedestrian walks and bikeways. The streetscape along Eglinton must be vibrant, inviting and compatible with the surroundings.

- Adequate consideration must be given to north-south transit routing connectivity and to minimize traffic delay for vehicular traffic on the connecting roadways and adjoining residential streets.

- Design solutions must be flexible and able to respond to increases in demand and technological change for the life cycle of the project (60 years).

The above thoughts, along with considerable research, strategic analysis and discussion, have helped guide the formulation of the Problem, Opportunity, Vision and Goals elaborated in the following subsections:

2.1. Problem

- To cope with population growth and minimize environmental harm, public transit must become an attractive and better alternative to cars as the default mode of routine travel in Toronto and the surrounding region for distances exceeding a few kilometers.

- Most residents of Toronto and Mississauga do not have suitable options to motivate them to regularly use public transit for east-west travel across Etobicoke, north of Bloor St. This leads people to either travel by car or limit their travel and employment to their own municipality (e.g., Torontonians seek jobs in downtown Toronto).

- Public transit between Pearson Airport and Toronto[2], except for the downtown core, does not meet the reasonable needs of air passengers or airport employees, and falls far short of rapid public transit services at comparable airports around the world. This results in a high percentage of travel by car and substantial associated costs for both car-serving infrastructure and direct personal / business travel expenses along with a growing list of negative environmental impacts.

- Part of the regional transportation network plan is to extend the Eglinton Crosstown LRT from Mount Dennis to an interchange with the Mississauga Bus Rapid Transit (BRT) at Commerce Blvd. Residents of Etobicoke have expressed strong opposition to having

[2] The CWG acknowledges that TTC bus and Metrolinx Union-Pearson Express (UPX) train services are currently available at the airport. The bus service is poorly marked and is not a viable option for air travellers loaded down with bags and who are likely to desire a better service level for their trip. The UPX provides express train service at much higher fare levels (currently subsidized), targets only a certain class of passenger and, although useful, does not fit the bill for regular transit -- especially for airport employees.

the Eglinton West LRT extension constructed at-grade or above-grade between Royal York Rd. and Martin Grove Rd. due to anticipated adverse impacts on the community.

- Due to its major interchanges with highways 401, 427 and 27, the Eglinton West Corridor has become a major arterial channel into and out of Toronto. Local residents produce only a small fraction of the traffic, and that fraction will inevitably decrease with growth of population and employment west of Toronto and at Pearson Airport. Community members have repeatedly expressed concern that current rush hour congestion on Eglinton Ave. W is causing significant incursion of through traffic onto local residential streets by drivers wanting faster routes. Recent and pending developments along Eglinton can only increase traffic and make the problem worse. Costly, strategic changes to the regional transportation network would be needed to materially reduce traffic loading on Eglinton. Planning such changes is fraught with great uncertainties regarding the long term outcomes.

2.2. Opportunity

- Enabling efficient commuting by public transit in both directions between Mississauga and Toronto, north of Bloor St., including from Toronto to jobs in the Airport Employment Area, will help alleviate excessive loading of subways in the downtown core. It will also promote development, increased population density, and economic activity along and north of the entire Eglinton corridor west of Yonge St.

- There is a nascent strategic plan for a major multi-modal Regional Transit Centre (RTC) near Pearson Airport [4]. The RTC will dramatically increase capacity at the airport and will therefore be accompanied by major new commercial development and substantially increased employment in the surrounding region. Providing multiple high-capacity links between the airport and the Toronto public transit network is essential to ensure robust (redundant) connectivity and support the diverse transit needs of people throughout Toronto. Growth at the airport along with its new transportation hub, and good connectivity to the Mississauga BRT, will ensure strong EWLRT ridership in both directions. The projected growth in air travel and employment will undeniably warrant still more high-capacity transit links along other paths into Toronto.

2.3. Vision

- Public transit will become the preferred means of travel for commuters, air travelers and others who have a source and destination that would naturally involve east-west travel through central Etobicoke, south of the 401.

- Ground travel to and from Pearson Airport will, by 2035, achieve a public transit mode share comparable to that of other major international airports. This will be achieved

even as the number of air passengers grows and the modal share of public transit at those other airports also increases.

- New or improved rapid public transit services will support the long-term strategic development of higher density, healthy, sustainable, livable, connected communities along and adjacent to the public transit route(s), consistent with Official Plans and the vision and goals arising from more focused community and Avenue studies.

- An Eglinton West LRT extending from Mount Dennis to Commerce Blvd, and then to Pearson Airport (or the RTC) as a natural extension to the ECLRT (as originally envisaged) will be implemented in a manner that leaves flexibility for medium- to long-term (15 to 60 years) changes to the Eglinton West Corridor that *might* be desired to improve functioning of the transportation network and/or to transition to a higher density, more vibrant community along and adjacent to one of the City's major avenues.

2.4. Goals

- The Eglinton West LRT will bridge the gaps between the Eglinton Crosstown LRT (ECLRT) and SmartTrack (frequent, electrified, heavy rail transit) at Mt. Dennis, the Mississauga BRT at Renforth Gateway, and Pearson Airport (or the contemplated RTC). Capacity, level of service, and upgrade capability and / or identified network upgrade options, will accommodate reasonably-projected passenger demand and service expectations over a 60 year period.

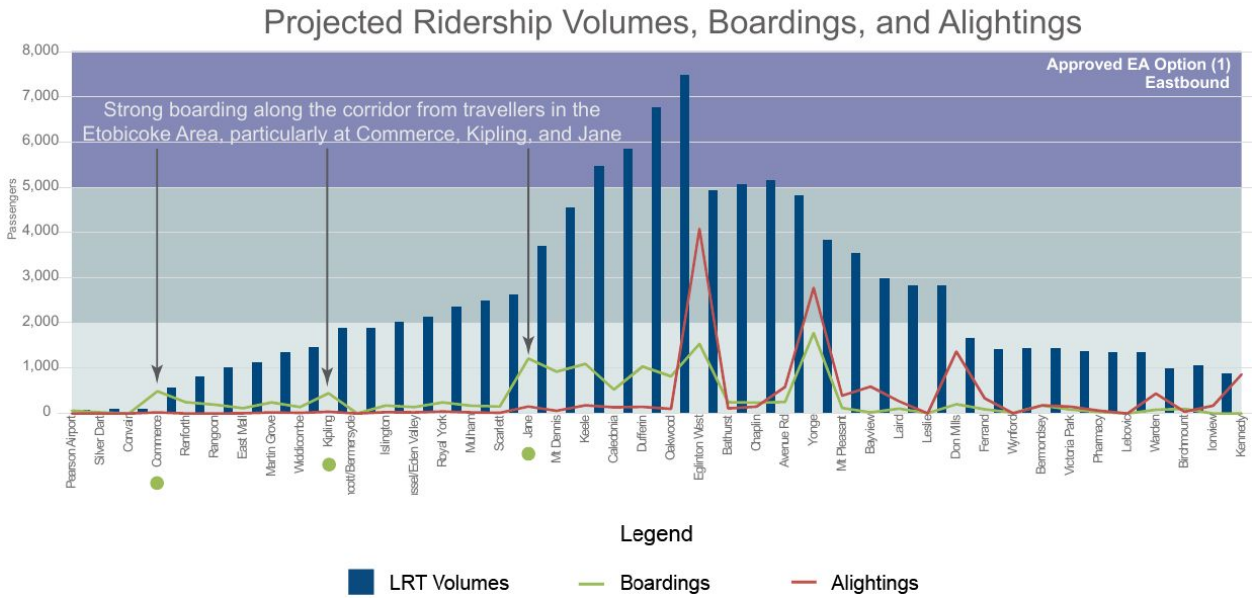
- The EWLRT will directly serve the communities passed through, adding value without disrupting or negatively impacting the activities, flow and connectivity of people and services within their communities nor impact the local environment.

- Directly, and through connections to other existing and planned transit services (e.g., SmartTrack), the EWLRT will alleviate loading on Toronto's overcrowded subway system by providing many passengers better alternative routes to/from their destination. This enhancement of the transit network will also create viable alternative routes for passengers in the case of localized service disruption.

3. Transit Demand Analysis

The IBC, in its "Context" section, placed significant focus on the need to serve the public transit needs of air travelers and workers at Pearson Airport and the surrounding Airport Employment Area. Reference was made to the report "Pearson Connects: A Multi-Modal Platform for Prosperity" [5]. That report identifies the need for a multi-modal transit hub near the airport with multiple higher-order transit links to Toronto, Mississauga and the neighbouring regions. It emphasizes the expected substantial growth in both air travel and employment, the congested state of area roads and highways, and the need to divert people from cars to public transit.

In spite of the substantial ridership that air travelers and workers in the Airport Employment Area would generate for the EWLRT, to indicate projected ridership the IBC provided only the following chart — which shows almost no boardings or alightings at Pearson Airport. **This cannot be a fair representation of the likely ridership!**



Note that only eastbound travel is shown and, although not properly labeled, City staff have indicated that the numbers are for the morning peak hour. In addition to the projected lack of use by air travelers, the very small number of alightings at Mt Dennis is not credible, since transferring to SmartTrack would provide by-far the fastest, most comfortable route to downtown Toronto for commuters from Mississauga (via the BRT) and from north-central Etobicoke.

3.1. Demand modeling methodology

Examination of the methodology reveals why the IBC ridership projections cannot be trusted. They were obtained using a software system called GTAModel [6] (or GTHAModel), various versions of which are used for modeling transportation usage throughout the region. GTAModel

uses an agent-based modeling approach, which involves simulation of the source, destination, timing and decision strategies of all users of the transportation network (roads, transit, bicycle, walking). Statistical information about the users and their trips comes from the Transportation Tomorrow Survey (TTS) [7], which involves interviews of roughly 5% of households in the Greater Golden Horseshoe, and adjustments to achieve consistency with census data from Statistics Canada. The TTS data input to GTAModel represents a snapshot of the past. The GTAModel also requires a representation of the transportation network, including the road system, public transit infrastructure and schedules, and travel times.

To project into the future, assumptions must be made about potential changes to the transportation network and its performance, and to the economic, social and other factors that will cause changes to the numbers and travel patterns of users. If a change to the transportation system is assumed ─ such as addition of an EWLRT ─ then one should also expect complex feedback mechanisms to cause responsive changes to the numbers and patterns of users. But the feedback will involve many factors, such as shifting of commercial activities that will involve different numbers and types of jobs. Modeling the feedback mechanisms and predicting the responsive changes is beyond the scope of the GTAModel. Instead, the changes must be stipulated as inputs. As a consequence, predicted usage of the EWLRT depends entirely on the assumptions made. Outputs from GTAModel are just a reflection of those assumptions.

Origin-Destination trip-making is an important component for any agent-based modeling. The Airport is the terminus for the LRT and will generate a significant number of trips. Plans must fully respect the Airport's plans for the future Mega-Hub -- not only for air passenger growth but for the economic and commercial activity that this mega-hub will create. The current model incorporates air passenger growth but does not provide for any increased LRT trip-making resulting from the commercial and economic growth that will accompany such a mega-hub. Pearson will be creating a hub of the scale of a Dubai, London Heathrow or Singapore Changi. Fast, reliable, safe, predictable multi-modal transit to/from the airport will be an absolute necessity. The LRT must provide this service in concert with all the other travel options already on the books. The time to actively deal with this new 'Aerotropolis' development at the Airport and its effect on the LRT is now. It's not good enough to say that Metrolinx and Pearson have discussions 'just' underway and that strategic inputs are not incorporated for modeling LRT use because planning is at an early stage.

An alternative approach to demand modeling is to take a macro view. Treat public transit as part of the critical transportation infrastructure. Consider the combination of transportation with the water, sewer, energy, health care, education, communications, finance and government services needed to support evolution of the population and socio-economic system consistent with strategic development plans and objectives. From this view, ridership for some particular transit initiative is ***created*** by providing a service that helps achieve society's vision and goals (see Section 2) in an effective and reasonably efficient manner. Ridership is not the uncertain

result of innumerable decisions of autonomous *agents*, but the intentional result of strategic and tactical actions that induce people to decide to use the transit system as set out in the goals.

3.2. EWLRT Ridership - Macro View

Strategically, the EWLRT should attract riders to achieve the following:

- Supplement and complement the Union-Pearson Express (UPX) and existing bus lines into the airport to increase the percentage of air travelers and airport employees using public transit for ground travel to / from Toronto and Mississauga (south of the 401) from 10% to 40% or more. Using GTAA numbers (see Section 3.3), and assuming 30% of travelers and employees could potentially make use of the EWLRT, this alone would generate about 16,000 trips per day by 2035.

- Provide crucial links in the regional transit system that, combined with other transit services connecting to the multi-modal RTC near Pearson Airport, will induce 40% of workers in the Airport Employment Area to commute to work by transit. In particular, the EWLRT should provide the key transit service that enables residents of Toronto to commute to work in the Airport Employment Area. By 2035 that will be 700,000 workers, of which over 200,000 will likely live in Toronto, of which 20,000 might use the EWLRT. This would generate 40,000 trips per weekday, concentrated in the morning and evening rush hours. It could also overload the EWLRT, requiring new capacity to be provided on other lines (e.g., UPX).

- Avert 60 y cost of expansion of the highway and road network that would be needed, in absence of the EWLRT, to cope with increased air travel and planned growth in the Airport Employment Area.

Target EWLRT rider populations include:

- Air passengers (not counting meeters/greeters):
  - ➢ 41 million air passengers per year in 2017, growing to 80 million by 2035. No projections are available for after 2035.
  - ➢ 60% of air trips start / end at Pearson. Assume 30% of those could use EWLRT and 20% of the 30% (6% of the total) actually do use EWLRT. That gives an average ~8,000 EWLRT passengers per day (ppd) in 2035, with 25,000 ppd likely on peak days.
  - ➢ This EWLRT load would be bi-directional throughout the day.

- Workers at Pearson Airport and the Airport Employment Area:
  - ➢ 40,000 airport employees, many of them shift workers. Without including growth in the number of workers, this is estimated to generate 50,000 one-way commute trips per day. Assuming 30% could use EWLRT, and 20% of the 30% actually do, gives 3,000 ppd on the EWLRT.

- ➢ 400,000 present workers in the Airport Employment Area, growing to 700,000 by 2035. Having adequate public transit will induce many more Toronto residents to work in Mississauga. Using the same percentages as above gives 84,000 ppd on EWLRT, with weekday peaks westbound in the morning and eastbound in the evening. But this will significantly exceed the LRT capacity, so we assume just 40,000 ppd and anticipate that other transit lines will be planned to serve the remainder.

- Mississauga and Etobicoke commuters traveling to work or school in Toronto:
  - ➢ The EWLTR, combined with SmartTrack from Mt. Dennis, will greatly reduce commuting times relative to use of the Bloor subway for residents of central Etobicoke and for Mississauga residents wanting to transfer from BRT.
  - ➢ Since population and employment density along Eglinton through Etobicoke are both low, most of these riders will be transferring from BRT or a north-south bus in Etobicoke. Numbers are uncertain, but could exceed 5,000 ppd (8% of employed population of Toronto Ward 4).
  - ➢ Many of these riders would transfer to SmartTrack at Mt. Dennis, cutting the travel time to downtown Toronto by 30 minutes compared with using subways.

- Local residents, for elective trips not included above:
  - ➢ These numbers will be small compared to those above. Short-distance trips may be dominated by school children, shoppers, and seniors. The LRT will likely replace the Bloor subway as the preferred transit line for elective trips from north-central Etobicoke to downtown and all locations in Toronto east of the UPX rail corridor.

3.3. Pearson Airport & Regional Transit Centre

The GTAA report "Growing Canada with a Mega Hub Airport" [4] identifies increased use of public transit by air travelers and workers in the Airport Employment Area as a high priority:

"***Recommendation 1***

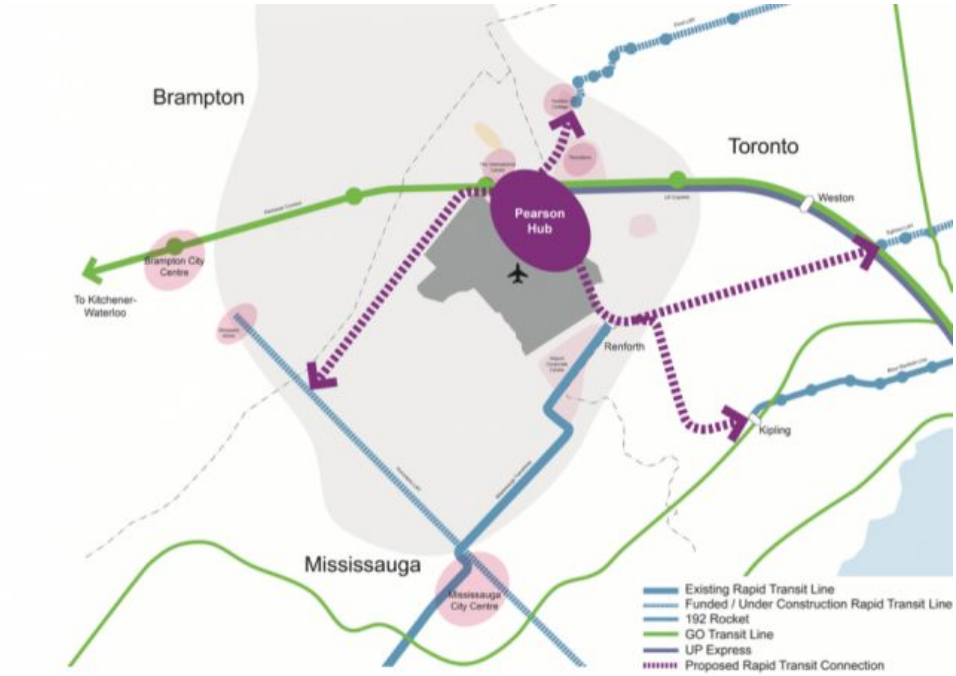
> The Federal Government of Canada should move to enhance GTAA investments in a multi-modal hub by providing significant cost sharing of transit projects undertaken by the Province of Ontario and the cities of Toronto and Mississauga to connect a multi-modal hub at Toronto Pearson.

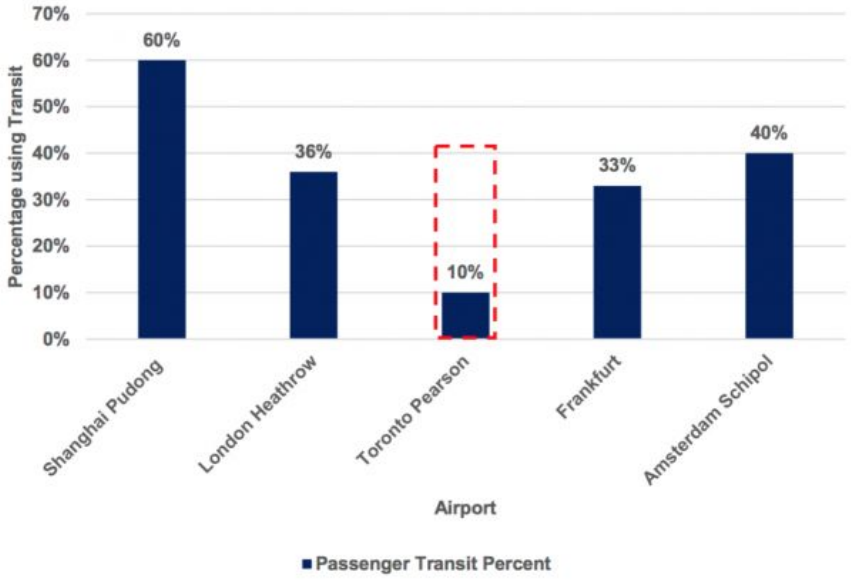
"Improving transit infrastructure around the airport with transit lines linked directly to Toronto Pearson will shorten commute times for passengers and employees, and ease congestion on the roadways making it easier for goods movement—a critical component of the airport's operations and the region's economy. The highways around Toronto Pearson are among the most congested in the region and carry the highest value goods of any roadway in the country.

Shifting people out of their cars and onto transit would free up space for high-value products to move more quickly."

"According to the Neptis Foundation, the Airport Mega Zone ("AMZ") is the second largest employment area in the country, only smaller than downtown Toronto with a workforce of 465,000. Despite its size and economic importance, the area surrounding Toronto Pearson has limited transport connections to the city and region, inconveniencing both employees and passengers."

The report projects 80 million air passengers per year by 2035 and employment growth to 700,000 in the AMZ. Transit lines and utilization needed to support the expected growth of air travel and employment are shown in the following figures.





Figures source: "Growing Canada with a Mega Hub Airport"

4. Traffic Analysis

The primary responsibility of the CWG was “to investigate further grade separation and or tunnelling options” for the EWLRT. Many local residents had expressed opposition to an at-grade LRT, with adverse traffic impacts being a major concern. The CWG was thus also charged with the responsibility “to further develop traffic modelling”. It is argued below that, due to the great uncertainties involved, traffic modeling alone should not be relied upon to predict future traffic conditions. Only if modeling results are validated with sufficient empirical data are they likely to provide trustworthy insight into the increased and more aggressive traffic **on local roads** due to congestion on Eglinton Ave. and other arterial roads. Whether modeling (as described to the CWG during one of our meetings) will be able to provide trustworthy guidance on the local traffic impacts of an at-grade LRT is uncertain.

Residents’ traffic concerns were focused on two main issues:

- Traffic on Eglinton Ave. W has for many years suffered from serious congestion and delay between Highway 427 and Scarlett Rd., during rush hours, road construction and other busy periods. This is believed to occur primarily due to the major interchange with Highways 401, 427 and 27, and commuting traffic generated by the Airport Employment Area, both north and south of the 401 interacting with the Eglinton Martingrove intersection.
- There has been increasing and more aggressive traffic on local roads of the communities north and south of Eglinton attributed to drivers (both local and non-local) trying to find a faster alternate route to their destination than along Eglinton and the arterial roads that cross it.

The above issues have made both Eglinton and local roads less appealing and less safe for all users, but especially for cyclists, pedestrians, children and seniors. Residents worry that an at-grade LRT on Eglinton would exacerbate both of the above issues, and have not been persuaded otherwise at public meetings or in other exchanges with the City, TTC, or MetroLinx. By Metrolinx’s own admission at one of our meetings, an at-grade LRT would limit vehicular turning movements along Eglinton, constrict roadway widths in certain areas thereby reducing roadway capacity, and increase the cycle time of signalized intersections all contributing to increased delay to both LRT and vehicular traffic.

Whether the belief that the major highway interchange is truly responsible for congestion along Eglinton is valid cannot readily be determined. Over the past decade or more, there have also been periods of substantial congestion on all major east-west roads that cross Highway 427 in Etobicoke. The limited number (6) of arterial roads on which to cross the highway, and reliance of buses on the same roads, may cause each of those roads to become congested and suffer reduced service levels, with many approaching saturation and failure. By natural redistribution, traffic will concentrate on the 427-crossing roads best connected to the extended road networks

of Toronto and Mississauga. Congestion on the QEW, 427 or 401 will also cause diversion of traffic onto faster arterial routes.

The City has retained consultants to develop a traffic model for a study area surrounding the proposed EWLRT up to a distance of about 3 km. The model will include highways, arterial roads, and local roads thought likely to be used as shortcuts to avoid congestion on Eglinton. The software being used [3], which performs microsimulation of a statistical representation of all road users, is best-in-class. The results obtained, however, will depend on good data and many assumptions.

The traffic data used as input to and for calibration of the model is limited to measured flows on major roads entering and leaving the model area and on limited arterial road segments within the model area. The model will also include data for public transit routes within the model area, including schedules and daily ridership profiles. Pedestrians and cyclists are incorporated to some degree, although it is not evident that suitable relevant data is available. Since most local roads within the study area are not included in the model it is also unknown whether trips starting / ending on such local roads will be included in the model -- if not, then traffic on local roads will be underestimated.

The model will first be tuned to ensure current traffic flows, where data is available, can be replicated. Then changes will be made corresponding to various LRT configurations (e.g., at-grade, partially below-grade) and to signals timing and minor changes to roads (e.g., length of turn lanes) that might optimize traffic flow. Results from the modeling, for each of the scenarios, are expected to characterize traffic infiltration into local roads of residential neighbourhoods, as well as indicating the expected flows on the arterial roads.

Traffic modeling may do a reasonable job of simulating traffic flows for a given transportation network configuration and input traffic data. It may be a useful aid for design efforts or to understand existing problem situations. However, modeling results must be used with great caution. The input data available for the study area is sparse in coverage, frequency and statistical variation. Only a small part of the overall transportation network is being modeled and changed for the different scenarios, although (unmodeled) changes on other parts of the network (e.g., introduction of HOT lanes, GO electrification, the Toronto Pearson mega-hub initiative ...) may have an even greater impact on traffic flows across the study area boundaries. There is also no plan to validate model results by comparing them with real-world data that characterizes actual traffic on local roads in a statistically significant manner. Without such empirical validation, there will be no evidence that the model's predictions for local roads are reliable.

Many unknowns regarding the future transportation network and present and future traffic conditions, and unforeseeable political and economic changes, make it impossible to accurately forecast how the model inputs (or other 'what-if' scenarios) may evolve. It is thus not credible that traffic in the study area could be accurately predicted for even 10 years into the future (as

[3] Aimsun Next, https://www.aimsun.com/

noted by the consultants performing the simulations). Traffic modeling should certainly not be relied upon to guide decisions on a multi-billion dollar transit investment with a 60 year lifetime.

Research studies that compared the systematic and stochastic variability of microsimulation model predictions with actual, detailed observations found that both kinds of variation can be quite large -- possibly to the extent that simulated results could be completely misleading. To address such uncertainty, the traffic modeling work being conducted by the City should, at the very least, explicitly investigate and provide estimates of the magnitude of the uncertainty of results, and an analysis of the sensitivity of results to changes of the input data (which is itself uncertain).

Changes to the regional transportation system, including major construction projects such as implementation of HOT lanes, will likely have a much greater effect on traffic along the Eglinton West corridor than any effect of an LRT. Those large-scale, often politically driven, changes will thus render any modeling of a future state of little value as a guide to choosing an appropriate EWLRT configuration.

Modeling could potentially be of value to simulate and better understand the present use of local roads as a response to congestion on Eglinton Ave. and other arterial roads. But to know whether such modeling is valid it will be necessary to compare the model outputs with data collected along selected residential roads on sufficiently many different days to achieve good statistical characterization. Present City practices for traffic data collection do not collect sufficient data on a sufficiently representative sample of days to characterize the traffic in a manner that is statistically robust, and there is no evidence that more appropriate data collection is planned in order to support data-based validation of model outputs.

In summary, and irrespective of any sophisticated traffic modeling and analysis, what we do know is that:

1. Something has to be done regarding vehicular interactions at the 401/427 connection at Martingrove and Eglinton to alleviate traffic on Eglinton

2. Introduction of an at-grade LRT will most certainly add to increased congestion and delay on Eglinton, with many undesirable effects on the local road system and on the local community.

5. Investment Options

The vision and goals stated in Section 2, above, can only be met by implementation of an Eglinton West LRT from Mt. Dennis to an interchange with the Mississauga BRT at Commerce Blvd, and then continuing to Pearson Airport or the proposed RTC. Taking it as a given that the EWLRT will be implemented, the analysis of this report is limited to configuration options that involve:

- different portions of the EWLRT being at-grade, elevated, or below-grade
- different choices of where to have stops/stations.

All of the configuration options considered in the Eglinton West LRT Initial Business Case were consistent with the above bullets. However, the grade separation options evaluated in the IBC were seemingly chosen as extreme cases that are not realistic, and they are not considered acceptable by the community. Moreover, the evaluation methodology was highly dependent on anticipated ridership which, as argued in Section 3, appears to have been badly underestimated.

The CWG considered a wide array of potential configurations of grade separation and stop locations. A consensus emerged that the Vision and Goals elaborated in Section 2 can best be achieved by implementing the EWLRT with a configuration that:

- ensures "zero interaction" with road users (autos, cyclists, pedestrians. etc.) all the way from Mt. Dennis to the western terminus at the RTC (or Pearson Airport)
- passes below-grade under Weston Rd.
- has above-grade stops at Jane and Scarlett and above-grade (above flood level) track between Jane and Scarlett
- is tunneled below-grade from west of Scarlett to west of Highway 427
- has below-grade stops at Royal York, Islington, Kipling and Martin Grove
- meets the “zero interaction” requirement west of Highway 427 in an unspecified, efficient manner
- stops at Renforth Gateway station and has one more station (Convair or Silver Dart) before the terminus.

From Mt. Dennis to Scarlett Rd., configuration options are constrained by topography and the flood plane, as detailed in “Eglinton West LRT: Development of Conceptual Grade Separations - Stage One Report“ [8]. Further analysis may indicate that the flood-related risk of having at-grade track between Jane and Scarlett is not sufficient to warrant constructing that track segment above-grade instead of at-grade. However, the Jane and Scarlett stations would still need to be above-grade in order to meet the “zero interaction” requirement.

West of Highway 427, the “zero interaction” requirement means that the LRT must be completely separated from the roads, with no at-grade tracks through intersections. Stations will likely need to be either above- or below-grade. It may prove most desirable to implement

one or more track segments west of 427 at-grade, while still meeting the “zero interaction” requirement by offsetting the LRT horizontally from the roadways. Specification of a particular configuration for this segment is beyond the scope of the CWG’s activities. Identifying feasible configurations will necessarily require significant involvement by Metrolinx, the GTAA and the Ministry of Transportation to properly address their plans and restrictions related to airport and highway infrastructure.

The CWG believes that the cost savings and reduced travel times from having stops only at intersections with major arterials would outweigh the benefits of including stops at intermediate roads (Mulham, Russell / Eden Valley, Wincott / Bemersyde, Widdicombe Hill / Lloyd Manor, East Mall, and Rangoon). However, a more detailed analysis, at a later planning stage, may indicate a positive net benefit of adding one or more of the intermediate stops (perhaps at a later date).

5.1. Alternatives for Comparative Evaluation

As has been noted above, the IBC presented a comparative analysis of the business cases for several different alternatives for the EWLRT configuration. However, all but one of those alternatives were extreme cases with little prospect of being carried forward as the preferred configuration. Comparative analysis of the one reasonable alternative and each of the extreme alternatives will inevitably result in the realistic alternative being selected to carry forward.

To avoid the possibility or appearance of bias, a business case analysis should compare only EWLRT configurations that are considered realistic prospects for final selection. If two or more configurations differ only in minor details then only one of them should be included in the primary comparative analysis. Subsequent analysis could compare the relative merits of each of the minor variants to decide which detailed configuration is preferred.

In this document, two widely different alternatives will be considered for potential comparison:

Fully-Separated -- This configuration is consistent with the CWG’s consensus solution, detailed in the bullet list in Section 5, above. Since multiple configurations will likely be viable west of Highway 427, the analysis here will assume that west of Highway 427 there is a balanced mix of below- and above-grade stations and of below-, above- and at-grade track segments. The analysis here will also assume that for the fully-separated configuration there will be a station at Convair or Silver Dart, but not both.

Non-Separated -- This configuration is completely at-grade except for an above-grade track segment to cross over Highway 401. It has all of the stops of the Separated option, plus stops at Mulham, Russell / Eden Valley, Wincott / Bemersyde and Widdicombe Hill / Lloyd Manor, East Mall, and Rangoon and stops at both Convair and Silver Dart.

5.2. Significant Issues

While the two options are both viable, reference back to Section 2 will make it clear that they reflect significantly different visions. They would solve the identified problems and seize the opportunities to different degrees, achieve different goals, and have significantly different cost, benefit and risk profiles.

The MetroLinx Business Case Manual requires the business case to begin with statement of a problem / opportunity that "Sets out a defensible problem or opportunity that should be addressed based on core transport and regional development issues, policies, and plans. This section is also required to articulate the vision, goals, and objectives that investments are evaluated against."

Subsequent sections of the business case are to evaluate the contemplated solution options against the clearly stated vision, goals and objectives. However, the IBC fails to do that because of multiple shortcomings:

- failure to clearly state Vision, Goals and Objectives, with consensus amongst stakeholder groups
- lack of City development goals and objectives for the Eglinton Ave W corridor
- lack of suitable, specific transparent criteria for measuring Societal and Community value and impacts associated with different LRT alternatives
- data and modeling that are inadequate to support rational decision-making on likely utilization, merits, or risks of different LRT alternatives
- lack of transparency regarding ridership modeling assumptions, and modeling results that are not credible
- inadequate data / modeling and questionable financial inputs to assess value of the non-transit transportation network and likely impacts on that network associated with different LRT alternatives.

The first of these shortcomings is perhaps the most serious, since there is no way to judge whether, or to what extent, the alternatives considered in the IBC will achieve what society deems important.

The Strategic Situation we have proposed in Section 2 represents the consensus of CWG members. The CWG also appreciates that other stakeholder groups would surely want their perspective to be represented as well. A greater effort would thus seem warranted to develop statements of the Problem, Opportunities, Vision and Goals that represent a consensus of all stakeholder groups, including communities represented by the CWG. Lacking such a broad consensus, the analysis below will be based on the CWG's consensus presented in Section 2.

6. Business Case

Given clearly stated Vision and Goals against which solution alternatives can be measured, the Metrolinx guidelines call for the business case to be addressed from four perspectives:

a) Strategic Case

- How does the investment achieve strategic goals and objectives?
    - value of addressing the problem
    - evaluate alternatives against objectives
    - demonstrates why investment should proceed

b) Economic Case

- What is the value to society?
    - economic costs and benefits to individuals and society over entire lifetime of solution
    - establishes benefits to society in economic terms

c) Financial Case

- What are the financial implications?
    - funding, accounting issues, value for money
    - capital, operating, revenue - direct and indirect
    - establishes cost in financial terms

d) Deliverability and Operations

- What are the risks and requirements for delivering and operating?
    - evidence on overall viability of different alternatives
    - establishes what is required to deliver and operate the solution

Formulation of detailed (SMART) objectives would be premature at the present, preliminary stage of planning. The analysis below thus examines, primarily, how effectively and efficiently the alternatives will achieve the Vision and Goals presented in Section 2.

6.1. Business Case for Fully-Separated Alternative

This is the CWG's preferred alternative, with a nine stop LRT fully-separated from the road network.

a) Strategic Case

Fully separating the LRT from the roads, and including only stops expected to have substantial usage and connectivity with major north-south bus routes, will ensure the maximum ridership, fastest trips, superior level of service, and most reliable and predictable service possible with the LRT technology already chosen for the Eglinton Crosstown LRT. By providing high quality service to commuters, this alternative should operate near or at capacity over most of its length during peak hours[4]. It will also be kept reasonably busy by air travelers, airport employees and shift workers during off peak hours.

Running below-grade through central Etobicoke will enhance transit service for the community, greatly reduce the volume of buses along Eglinton, and open up the options for future development of the Eglinton corridor. It responds positively to all the identified community interests, is safer because it eliminates interaction of transit with vehicular traffic, and provides less environmental impacts. By drawing people out of their cars, the LRT will also reduce traffic on Eglinton. We recognize, however, that this reduction may be small compared to the the effects of population growth and of ongoing changes to regional highways (401, 427, 409, 27, QEW, 403, 400) that will cause redistribution of traffic throughout the network.

LRT stops / stations are located to achieve an optimal balance between local demand, walking distances, network connectivity and station cost. More importantly, they provide direct connectivity to all existing north-south bus lines.

As warranted by user demand, local bus service could be provided to better connect the local community -- both north and south of Eglinton -- to the LRT stops at north-south arterials. This could be an enhancement of, or in addition to, the existing 405 Etobicoke Community Bus. Routes could be designed to quickly take riders from Mulham, Russell, Wincott, Lloyd Manor and other stops along Eglinton to nearby LRT stations, without having a dedicated bus service along Eglinton. By using small, quiet (electric, eventually self-driving) buses that go on collector roads into the community, such service could reduce walking distances and persuade significantly more people to regularly use public transit.

Burying the LRT through central Etobicoke gives maximum flexibility for ongoing evolution of the roads and the community. It places no restrictions on future intensification, diversification or

[4] Metrolinx indicated at one of the CWG meetings that ridership on a below-grade LRT would quickly reach capacity, anticipating that many Line 2 Subway users would use the LRT instead.

enhancements to the streetscape and neighbourhood. It has minimal environmental impact and no direct impact on ground-level travelers within and through the corridor.

Having the LRT below- or above-grade will allow intersections to be better designed so pedestrians and cyclists, including children, seniors and those with reduced abilities, can safely cross Eglinton.

The above-grade segment across the Humber valley keeps the LRT and stations above flood level and exploits the natural topography for the portals to underground on the east and west. (This is similar to the Line 2 (Bloor) subway at Old Mill.)

b) Economic Case

Note: The dollar values given below build on the ridership estimates of Section 3.2, and could easily be high or low by a factor of 2 or more. A real interest rate of 6% is assumed for calculating present value (PV) for the 60 year LRT lifetime. For a 3% interest rate, multiply the given PVs by 1.66.

Air travelers will save about $10 per trip by using transit (including LRT) instead of car or cab. At 16,000 trips per day this will save $60 million/y, with PV ~ $1 billion.

Savings of about $2,000 per year from reduced car ownership and operating costs for 20,000 commuters using the LRT amount to $40 million/y, with PV ~ $0.7 billion.

Averted cost of expansion and maintenance of the highway and road networks by removing over 20,000 vehicles. PV ~ $0.8 billion.

Averted increase of economic cost of gridlock, by eliminating about 20,000 commuter vehicles. PV ~ $2 billion.

Travel times to central Toronto reduced by 20 min./trip for 5,000 Etobicoke commuters will save them personal time worth $15 million/y, with PV ~ $0.2 billion.

A similar number of Etobicoke commuters will be drawn away from the Bloor subway, freeing capacity for other passengers. PV ~ $0.2 billion.

Increased value of land and economic activity in the AMZ attributable to the fully-separated EWLRT. Very difficult to estimate, but almost certainly PV > $1 billion.

Property values along a below-grade LRT through central Etobicoke, and extending north and south, will likely increase, just as the subway boosted values along Bloor St. The value increase could be 10% or more, and could add up to over $1 billion. There would be a corresponding increase of tax revenue for the City, with PV ~$0.2 billion.

City land freed for other uses by having the LRT below grade could be worth more than $0.1 billion.

Reduction of GHG production due to less use of cars. PV ~ $0.2 billion.

c) Financial Case

Revenue from new riders:

16 million trips/y x $3/trip = $50 million/y, PV ~ $0.8 billion

Increased operating cost of TTC network (including EWLRT and enhanced local bus service) due to new riders:

16 million trips/y x $3.65/trip = $60 million/y, PV ~ $1.0 billion

Life-cycle capital cost of fully-separated EWLRT: PV ~ $2.1 billion

Net cost: PV ~ $2.3 billion

Total economic benefit: PV ~ $7.2 billion

Benefit / Cost ratio: 3.1 (1.6 to 6.3)

Discussion of the sources or methods of financing is beyond the scope of CWG efforts.

d) Deliverability and Operations

The technology and construction methods of the below- and at-grade components of the fully-separated alternative should be similar to those of the ECLRT. Design and construction of above-grade components should not present any unusual challenges, since there is well-developed capability in Ontario to design and construct such structures. Both delivery and operations of the EWLRT should thus be viewed as extensions of similar activities for the ECLRT. Consideration might be given to Construction Management at Risk, or to Progressive Design-Build delivery methods. Each of these have proven to save on cost and to achieve desired schedules.

Elimination of complexity associated with integration or interaction with the roads, and having much of the LRT underground, should enable precise adherence to a defined schedule and trains as frequently as every two minutes. Maintenance activities should have no impact on traffic using the road network.

6.2. Business Case for Non-Separated Alternative

This is the alternative recommended in the Initial Business Case, with a seventeen stop LRT at-grade in the centre of the road.

a) Strategic Case

Due to its integration with the roads and their signals, this alternative will function similar to the St. Clair streetcar, but with higher capacity. The spacing of stops is comparable to the existing 32 Eglinton bus. Travel times will be adversely affected by the large number of stops, traffic signals at and between stops. Reliability and predictability of service (the "Holy Grail" when it comes to airport destined users) will be adversely affected by gridlock or accidents in intersections or where drivers are able to do U-turns, and by full exposure to bad weather, ice and snow. Frequency of service will be limited to no more than the traffic signal cycle time (about one LRT train every three minutes, even with prioritized signaling); this will also limit the line's capacity during peak hours. Such service will fall short of the needs and expectations of many air travelers and commuters. Combining the reduced peak frequency and lower level of service suggests that ridership may be one half of that estimated for the fully-separated alternative. (Our estimate of one half needs to be bolstered by ridership modeling for both alternatives, whose results are not yet available.)

This alternative will fall far short of the goal of meeting service quality, speed and capacity expectations of air travelers and AMZ workers, and will fail to persuade 40% of those traveling to / from Toronto to choose transit instead of cars. Even the Mississauga BRT would provide better service, since it is fully-separated from the roads and thus not affected by traffic signals or intersections blocked by gridlock or accidents, and has greater distance between stops.

At-grade LRT tracks down the centre of Eglinton Ave. through the residential community of central Etobicoke would create a more pronounced physical and psychological boundary between the areas north and south of Eglinton than presently exists. Such boundaries have great detrimental effects on communities [9]. They separate residents from each other and from local facilities and services: schools, library, parks, sports fields, swimming pools, skating rinks, tennis courts, cycle trails, commercial centres (banks, medical, dental, personal care, shops, restaurants). Extra effort and perceived hazard to cross Eglinton will result in fewer customers for local businesses, impeding their success. Residents will be more likely to travel by car, even within their own community.

An LRT in the centre of the road will, without doubt, have an adverse effect on traffic when compared with the same road without the LRT. Although measures may be taken to simultaneously optimize the flow of both the LRT and traffic, applying similar effort to optimize the flow of traffic without the LRT (or with the LRT below-grade) will always achieve superior traffic results. Signals that give preference to transit will make traffic flow less than optimal and increase cycle times at the main intersections. An at-grade LRT will pose restrictions for left

turns, especially at non-arterial roads / driveways, and will increase the walking distance to cross the road and add even more to signal cycle times. The impacts on traffic will result in increased incursion of vehicles into local residential streets as drivers seek faster and/or less stressful routes. Such incursion will make the streets less safe and friendly, and adversely affect property values.

Users of LRT stops that are not major transfer hubs (Mt. Dennis, Renforth Gateway, airport) will be exposed to heat, cold, wind, snow, rain, noise, and pollution on at-grade platforms. They will be forced to stand closer to active traffic, on a busier road, than when waiting in a typical bus shelter. Residents of the local community will be more likely to pick a more comfortable route (e.g., bus and Line 2 subway) or continue driving.

An at-grade LRT will severely limit the options for future changes to the design of Eglinton Ave. and for strategic evolution of the community. It will militate against implementing more frequent crossing points to shorten pedestrians' and cyclists' trips and better tie together the community. It will not be possible to diminish the boundary that divides north from south, and which acts against development of a vibrant, higher density, mixed use community with Eglinton Ave. as its popular central avenue -- consistent with Toronto's strategic plan for its avenues.

b) Economic Case

As noted in the Strategic Case, above, ridership for the at-grade LRT is expected to be about one half of the ridership for the fully-separated alternative. Numbers below are reduced accordingly.

Air travelers will save about $10 per trip by using transit (including LRT) instead of car or cab. At 8,000 trips per day this will save $30 million/y, with PV ~ $0.5 billion.

Savings of about $2,000 per year from reduced car ownership and operating costs for 10,000 commuters using the LRT amount to $20 million/y, with PV ~ $0.3 billion.

Averted cost of expansion and maintenance of the highway and road networks by removing over 10,000 vehicles. PV ~ $0.4 billion.

Averted increase of economic cost of gridlock, by eliminating about 10,000 commuter vehicles. PV ~ $1 billion.

Travel times to central Toronto reduced by 15 min./trip for 2,000 Etobicoke commuters will save them personal time worth $6 million/y, with PV ~ $0.1 billion.

A similar number of Etobicoke commuters will be drawn away from the Bloor subway, freeing capacity for other passengers. PV ~ $0.1 billion.

Increased value of land and economic activity in the AMZ attributable to the at-grade EWLRT. Very difficult to estimate, but perhaps PV ~ $0.5 billion.

Property values along a below-grade LRT through central Etobicoke, and extending north and south, may or may not increase, since an at-grade LRT would result in modest improvement to local transit service but would also have detrimental effects as described above. Contribution to the financial case will thus be taken as nil.

Reduction of GHG production due to less use of cars. PV ~ $0.1 billion.

c) Financial Case

Revenue from new riders:

8 million trips/y x $3/trip = $25 million/y, PV ~ $0.4 billion

Increased operating cost of TTC network (including EWLRT) due to new riders:

8 million trips/y x $3.65/trip = $30 million/y, PV ~ $0.5 billion

Life-cycle capital cost of at-grade EWLRT: PV ~ $1.0 billion

Net cost: PV ~ $1.1 billion

Total economic benefit: PV ~ $3.0 billion

Benefit / Cost ratio: 2.7 (1.3 to 5.4)

Discussion of the sources or methods of financing is beyond the scope of CWG efforts.

d) Deliverability and Operations

The technology and construction methods of the at-grade LRT should be similar to those of the at-grade segment of the ECLRT. However, the character of Eglinton Ave. E, where the crosstown LRT is being constructed at-grade, is completely different from Eglinton Ave. W through Etobicoke. The eastern segment is three lanes in each direction, with right turn lanes at major intersections and a median that is a full lane wide and is used for left turn lanes (many of them for mid-block entrances to shopping and other businesses). The adjoining lands are almost entirely commercial. The median is being removed to accommodate the LRT -- how left turns will be accommodated is not clear, but there may well be great inconvenience and adverse impact on businesses. In Etobicoke, the local neighbourhood is dominantly residential and, with two lanes in each direction and no existing median, the roadway will need to be widened. Construction of the EWLRT is without question to be much more disruptive.

Operations of an at-grade EWLRT should have similar characteristics to the at-grade segment of the ECLRT. In both cases, how the resulting roads will function, especially for left turns, and impact the communities remains to be seen.

The complexity associated with integration and interaction of the at-grade LRT with the roads will make it more difficult to adhere to a defined schedule. Train frequency will likely not be able

to exceed every three minutes. Significant track maintenance / reconstruction will likely be required more often for an at-grade LRT. Maintenance of either the road or the LRT may have impacts on the other, so both transit service and traffic are affected. A major accident in an intersection could halt both traffic and the LRT, with some segments having no viable alternate routing for an emergency bus service.

6.3. Commentary on Business Cases

The two alternatives considered above have some dramatic differences:

- The fully-separated alternative is consistent with the stated vision and will achieve all of the project goals. The non-separated alternative does not align well with the vision and will fail to achieve the goals. It will have reduced levels of service compared to the fully-separated version.
- The fully-separated alternative will attract, and have the capacity to carry, about twice as many riders as the the non-separated alternative. It will certainly be more attractive to airport travelers and staff and to the adjoining airport business community, the latter providing increased economic activity benefiting all of Toronto.
- The fully-separated alternative will be significantly faster (allowing for reduced headways more compatible with the latest in signalling technology) and more predictable, reliable and comfortable, due to having fewer stops, being completely independent of the roads network, and having mostly enclosed stations.
- Economic benefits of the fully-separated alternative are more than twice those of the non-separated alternative. Some of the benefits are unique to the fully-separated alternative. This is especially true for airport-related users, enhancing the development of the Toronto Pearson Mega-Hub where good transportation connectivity is a must.
- The fully-separated alternative will cost about twice as much as the non-separated alternative to construct and maintain over its 60 year lifetime. The CWG recognizes this consideration but argues that, especially over a 60 year lifecycle, the benefits, flexibility and making for a more livable environment benefiting not just the local community, but Toronto as a whole clearly outweigh the additional costs of a fully-separated EWLRT.

Although we have followed the Metrolinx guidelines for preparation of business cases, we believe that there is insufficient attention to risks and opportunities associated with the different alternatives. For example, it is assumed that the non-separated alternative will function without major complications due to interaction with the roads and vehicular traffic. However, Toronto has no experience implementing a brand new LRT down the middle of an already highly congested arterial road. There is significant risk that integration with the roads network will

cause major, possibly insurmountable, problems that affect the LRT and/or traffic. Such risk does not exist for the fully-separated alternative.

The numbers presented in the above analyses rely on research and macro-economic scaling instead of detailed micro-economic analysis. For example:

- operating costs are calculated as the projected numbers of new riders times the TTC's present operating budget divided by the total number of TTC riders per year. These numbers thus allow for complete trips of the new riders, including buses and other non-LRT trip components.
- Economic costs of traffic congestion are based on published estimates for the GTA, scaled according to the fraction of cars removed from the roads.

Use of detailed analysis for business case analysis carries significant risk of bias and error due to inherent deficiencies of modeling tools. Such analysis should always be conducted in parallel with strategic analysis that takes a macro approach. Findings of the two approaches should be further investigated to understand and resolve any significant differences.

The data provided to the CWG provides costs and benefits as a range without any detail. It would be useful to have data and discussion on risk or sensitivity analysis of variables including trip generation, traffic distribution, modal split, time delay cost, cost of fuel, etc.

If modeling is used in support of a more detailed business case analysis, the the following points should be observed:

- Modeling should incorporate a robust risk analysis to consider many 'what if' scenarios.
- The modeling exercise should incorporate sensitivity analysis to gauge how the results could vary with different assumptions, parameters and input data.
- The reliability of model predictions should be demonstrated by comparison against statistically robust empirical data independent of the data used as input or to tune the model.
- Traffic modeling should adequately and fairly incorporate the needs of transit users, vehicle travel and local community concerns. Modeling should not be biased against interacting vehicular traffic.

The following observations regarding tunneling are relevant to the fully-separated alternative:

- A tunneling distance of approximately 6 km is efficient and has economies of scale for TBM implementation.
- Tunneling is more environmentally friendly.

- Bored tunnel is more adaptable than cut-and-cover to dealing with existing underground service conflicts and water infiltration. The TTC has much experience with this type of construction.

- A large diameter single-bore tunnel may be preferable to smaller twin-bore tunnels. This can avoid cut-and-cover construction of track cross-overs and underground stations, thereby greatly reducing the ground level disruption during construction.

- LRT tunneling geometric design has large enough diameter to accommodate a future subway retrofit. Retrofitting for subway use by re-design of inverts and introducing a third power rail. Nice to have this option.

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Appendix A - CWG Members

The CWG members were selected by Councillors Stephen Holyday (Ward 3) and John Campbell (Ward 4) following an open request for participants from within the local community. They are:

Jim Chapman	
Don Charles	
Janice Charles	
John Disalvo	
Jurij Fedyk	
Martin Green	(Chair, , after July 10, 2018)
Joseph Lorincz	
Frank Pallotta	
Phil Poulos	
Margareta Shpir	
Christopher Solecki	
Laila Strazds	(Chair, until July 10, 2018)
Steven Tufts	

One additional person was selected, but attended only one meeting and did not respond when invited to participate in preparation of CWG reports.