steer davies gleave

Hurontario LRT Benefits Case Analysis

Report
March 2016

Metrolinx

Our ref: 22861201
Client ref:

steer davies gleave

Hurontario LRT Benefits Case Analysis

Report
March 2016

Metrolinx

Our ref: 22861201
Client ref:

Prepared by:

Steer Davies Gleave
1500-330 Bay St
Toronto, ON, M5H 2S8
Canada

+1 (647) 260 4860
na.steerdaviesgleave.com

Prepared for:

Metrolinx
97 Front Street West,
Toronto, ON
M5J 1E6

Contents

Figures

Tables

Appendices

A Expanded Policy Context

Executive Summary

Overview

1. This BCA report has drawn together all the final inputs from the PDE study, along with further development work on the BCA process (notably updated land use forecasts), to provide an optimised case for the Hurontario Light Rail Transit (HLRT) project. A land use sensitivity test (reflecting enhanced transit oriented development with HLRT in place) is also included.

Introduction

2. Implementation of an LRT along the Hurontario-Main corridor was a part of the Metrolinx Big Move plan published in 2008. As part of the development of the Big Move, a Hurontario-Main LRT project from Port Credit to downtown Brampton was the subject of a preliminary Business Case Analysis (BCA). This comprises a Multiple Account Evaluation that examines the case for the project across a range of areas, including the Benefit:Cost Ratio (BCR) (a key indicator of the project's value). On the basis of the initial BCA results, the project advanced through a Corridor Master Plan (that confirmed the route and LRT technology) to the Preliminary Design & Engineering (PDE) commission. Following standard practice promoted by Metrolinx, an update of the BCA was produced as a part of the wider PDE commission.

3. Following the BCA Update at the completion of the PDE process, further optimisation work on the BCA from Port Credit to downtown Brampton was undertaken. This included refinements to the capital and operating costs, future land use assumptions and modelling analysis. The result was an optimised BCA for the project from Port Credit to downtown Brampton, which was reported at the end of 2014 and which included a land use sensitivity test (reflecting enhanced transit oriented development with LRT in place).

4. Since that report was issued, the scope of the project has reduced as a result of the 27 October 2015 decision by the City of Brampton council to reject the LRT route north of Steeles Avenue along Main St., through the city's downtown and to the Brampton GO station. The reduced scope consists of a route from Port Credit GO, via a downtown Mississauga service loop to Steeles Avenue. This serves the Gateway Terminal, a Metrolinx designated Gateway mobility hub, planned to integrate Rapid Transit and local bus service. In support, Brampton have a secondary plan for the area (the Hurontario-Main Corridor Secondary Plan, SPA55), which aims to densify land use in the area to provide transit orientated development (TOD) in support of HLRT.

5. This report provides a BCA in support of this revised project scope. The scope and content is consistent with the latest Metrolinx 4-case Business Case Framework, but the technical and economic analyses are taken from the 2014 BCA analysis of such a reduced scope project.

Hurontario corridor and policy context

6. The Hurontario Street corridor connects Port Credit with Steeles Avenue via downtown Mississauga and a number of local communities including Mineola and Cooksville. It is a major transit and transportation corridor, with buses as the mainstay of transit services within the corridor. GO Transit rail services serve the corridor at Port Credit and Cooksville stations. These stations and their environs, as well as the transit hub in downtown Mississauga and the

Gateway Terminal at Steeles Avenue have been designated mobility hubs in The Big Move regional transportation plan.

7. Four bus routes, the 19, 103, 2 and 502 currently form the core of bus services along the corridor, with many other routes, principally operating east-west, using the corridor for part of its length. In 2010-11, these routes carried around 11 million passengers a year; this is forecast to increase to around 22-23 million by 2031.

8. The HLRT Vision Statement uses the HLRT investment as a key component in redesigning the Hurontario corridor as a vibrant and beautiful street, with a greater focus on pedestrians, cyclists and transit users, to offer wider transportation choices, reduce traffic impacts, and create the conditions to support more sustainable, mixed use, higher density transit oriented development. This Vision encompasses GO Transit/HLRT Mobility Hubs and HLRT/BRT/bus transfers in Mississauga and a focus on the Mississauga downtown as a designated Urban Growth Centre.

Project Description

9. The HLRT project is a proposed 20km street running light rail transit system running between Port Credit GO Transit station and Gateway Terminal at Steeles, via a downtown Mississauga service loop, on the Hurontario-Main Street roadway. It will replace the existing principal bus routes on the corridor: the 19 and 103 routes operated by MiWay, with the 2 and 502 routes operated by Brampton Transit truncated at Gateway Terminal. Most other bus routes would continue to operate over short distances on the corridor.

10. The system will have 22 stops, with segregated running throughout. The HLRT preliminary operations plan is based on two overlapping loop services, Port Credit GO Transit station return via the downtown Mississauga service loop; and Gateway Terminal return via the downtown Mississauga service loop. During the weekday peak, it will run every 5 minutes, with lower headways outside the peak and on weekends, up to a maximum headway of 10 minutes. It will be included within the standard MiWay and Brampton Transit fare systems.

11. It will provide an end to end journey time of around 40 minutes (excluding interchange in downtown Mississauga), with an average running speed of 29km/hr. This compares to an average running speed in the AM peak of 17km/hr for MiWay route 19 and 23km/hr for MiWay route 103.

12. This project definition is the basis for the BCA analysis reported below.

2031 Do Minimum

13. Consistent with Metrolinx evaluation guidance, HLRT has been evaluated against a Do Minimum scenario that includes only committed network changes or incremental measures expected as travel conditions change. Due to the forecast growth along the corridor, it was considered that a Do Nothing scenario was not appropriate in this case.

14. On that basis, the Do Minimum scenario includes:

    - Mississuga BRT, with local and GO Transit buses operating along it;
    - Two way all day service on the GO Transit rail network;

- Increases in MiWay and Brampton Transit service levels in line with demand increases;
- Roll-out of the Brampton 2009 Transportation and Transit Masterplan (TTMP) proposals in line with future development;
- Local highway enhancements; and
- Parking charges of $5/day in the downtowns of Mississauga and Brampton, Trillium Health Centre and Port Credit

15. Population and employment growth follows the Growth Plan 2013 Amendment 2 forecasts, with 829,000 and 843,000 residents in Mississauga and Brampton respectively by 2031. Employment totals are 527,000 and 291,000 respectively.

Costs and revenues

16. Capital and operating costs for HLRT are estimated at (all 2012 prices and values):

- HLRT capital cost of $1,219m, including risk, contingency and development costs, but excluding financing costs, with a net capital cost of $1,194m after allowance of road maintenance cost savings
- An allowance of $394m for infrastructure renewals (60% of capital costs, excluding vehicles, and after allowance for long term road maintenance cost savings) has been made, spread evenly over years 16-60;
- An allowance of $214m for LRV fleet renewal at year 30;
- Annual operating costs of $21.35m;
- Costs avoided reflect the direct operating costs of the withdrawn and truncated bus services (19, 103, 2, 502), amounting to $19.2 m in 2031.
- The associated reduction in fleet size amounts to 62 buses in 2031, or $24.8m; similar cost savings are assumed every ten years.
- A one-off saving of $49.6m for associated garaging costs is also assumed for 2021.

17. All costs are assumed to increase at 1% per annum in real terms until 2031 and constant in real terms thereafter.

18. Additional transit revenue will be generated from the new transit trips attracted to HLRT from auto, amounting to $13.4m in 2031.

BCA and Multiple Account Evaluation

19. The BCA process incorporates a range of inputs including a definition of the LRT alignment; proportion of segregated operation; level of priority for LRT at intersections, engineering and design changes to the project specification, traffic impacts, LRT and wider transit network operating assumptions (frequency, hours of service, modifications to rail & bus network), LRT capital costs and operating costs, for LRT and the wider transit network. All of these elements influence the HLRT run time, and overall attractiveness of the LRT system to passengers. Re-allocation of road space for the dedicated LRT right of way, priority to LRT at intersections, and other changes (modified traffic movements etc) will also have an impact on traffic performance.

20. As the PDE work has progressed all of the above aspects of the project have been addressed. The HLRT design has evolved through the Design Work Book/Project Information Centre (PIC)

process, the wider transit network has been defined (the Ultimate Transit Network report), the HLRT operating plan (and associated operating costs) have been specified ((for modelling/business case purposes) in the LRT System Operations Plan report), and the updated, disaggregated capital costs have been produced.

21. In parallel, the Higher-Order Transit (HOT) model has been used to produce AM peak period ridership forecasts (2031) for a range of HLRT scenarios. These forecasts have been annualized and have provided a further input to the BCA Update process for HLRT. The forecasts have assumed Growth Plan 2013 Amendment 2 forecasts for 2031 and do not reflect any potential scope for redistributing growth along the HLRT corridor, such as Mississauga's Downtown 21 growth assumptions. The model outputs, along with the project definition parameters (as described above) then form the inputs to the BCA.

22. Core to the BCA process is a Multiple Account Evaluation (MAE), which sets out the impacts of the project on a range of criteria. This provides a comprehensive assessment of the full benefits and impacts of a project to aid evidence-based decision making.

23. In order to develop this business case, Metrolinx's standard business case guidance and associated assumptions from 2014 were used. The structure of this document has however been updated to reflect Metrolinx's revised four chapter framework approach to business cases. The Metrolinx framework is structured as follows:

- **Strategic Case -** Assesses the alignment of the project with the vision/goals as well as policies and plans
- **Economic Case -** Assesses the economic, social, and environmental impacts of the proposed project, including a cost benefit analysis
- **Financial Case –** Examines lifecycle costs and revenues of the project to understand its broader financial implications
- **Deliverability and Operations Case -** Assesses issues and risks associated with project delivery and operations

24. The Metrolinx business template is used to generate and assess all evidence related to project performance, which may then be used to support project investment and financing. Unless otherwise stated, all parameters values are consistent with the Metrolinx tier 3 business case guidance in use in 2014.

25. Unless otherwise specified, monetised impacts are for a 60-year evaluation period, discounted at 3.5% per annum to 2012 present values[1].

Strategic Case

26. The strategic case establishes the rationale for delivering a project by establishing a strategic framework for the issues and opportunities the project seeks to address. Existing and future conditions were reviewed to establish a foundation for assessing the project, including a problem statement, vision, and goals.

[1] The original BCA assumed a discount rate of 5% p.a. over a 30-year evaluation period. This change is now the accepted Metrolinx guidance standard for major transit projects.

27. The HLRT project, in its current form has evolved from the project originally identified as part of the Big Move, thought to identification of LRT as the preferred rapid transit mode for the corridor as an outcome of the Hurontario / Main Street Corridor Master Plan and now ultimately to a route from Port Credit to Steeles. The project aligns well with the policy framework for the region.

28. A key element of the revised Metrolinx Business Case approach is the requirement to set SMART objectives (specific, measurable, achievable, relevant and time constrained) and related targets that can be assessed following implementation of the project, in order to determine the 'success' of the project.

29. Throughout the course of the development of this project, there has been evolving stakeholder development. This has included discussions with Metrolinx and other regional agencies including MTO, discussions at municipal level with the Cities of Mississauga and Brampton, and the Region of Peel, and with residents and businesses along the corridor both on an individual basis and as part of the wider TPAP process.

30. The following Key Performance Indicators (KPIs) have been identified for the project and are set out in the table below. It is intended that post implementation monitoring will be undertaken to determine if these indicators have been achieved.

Objective	Indicator	Discussion in Strategic Case
Improved transit services	New capacity and capacity utilization (ridership) Variation on peak period corridor travel time	Incremental Transit Ridership
Improved connectivity to transit services	Rapid transit catchment area	Accessibility and Integration with other transport modes
Increase in Transit Mode Share on the corridor	Change in mode share over time along corridor	Mode Share
Creation of TOD opportunities	Increase in GFA - from xx in opening year to YY 5 years after opening measured by tax revenue / floor availability / commercial occupancy	Land Use Shaping
Improves transport network efficiency	Impact on auto traffic and goods movement along the corridor	Goods Movement Impacts, Road Network Impacts
Improves environmental integrity	Reduction of emissions, pollution, and noise	Emissions

31. **Transit Ridership:** HLRT is forecast to attract some 22,500 AM peak boardings in 2031, or 31.9m per annum. Of these, around 15-20% are new transit users in the corridor. Across the transit network, HLRT attracts an additional 1,990 users, or 2.9m annually.

32. **Accessibility:** Based on population and employment catchment analysis, around 110,000 residents would be within 800m of HLRT stops, and around 59,000 employees would be working within 800m of HLRT by 2031. These people are in the position to benefit from the high quality rapid transit services being offered

33. **Mode Share:** HLRT provides a key component in providing an integrated high capacity high quality transit network across the GTA, a key objective of the Big Move. HLRT is forecast to attract passengers to shift from auto transit, with transit mode shares in the corridor increasing from 24% to 49%.

34. **Land Use Shaping:** Investment associated with the fixed rail infrastructure proposed is likely to result in the redevelopment of the corridor and therefore achieve the city's objective to revitalize the city's core and create a more densely developed, less car-dependent urban environment. The HLRT is assessed as significant beneficial under land use shaping.

35. **Goods Movement:** The movement of goods will be affected marginally as a result of HLRT with some access restrictions and LRT priority measures giving rise to a minor adverse impact.

36. **Road Network Impacts:** While Hurontario will impact the road network, it is expected to remove a total of 14.4m vehicle-km travelled from the auto network in 2031. Some 1,260 auto vehicle trips, 1.8m annually, will be removed from the highway network.

37. **Emissions:** HLRT will reduce the use of auto and bus vehicles, but lead to increased electricity generation to power the light rail vehicles. Overall, the net effect is a reduction of some 3,964 tonnes of greenhouse gas (GHG) in 2031.

Financial Case

38. The financial case assesses the cost and affordability for each option, with attention given to how options fit into existing funding mechanisms or how they may leverage available funds.

39. The aforementioned capital and operating costs give rise to the following present value costs (all 2012 prices and values):

- LRT Capital Costs $1,194m
- LRT 60-year Renewal Costs $609m
- Bus 60-year Capital Costs -$194m
- LRT 60-year Operating and Maintenance Costs $1,281m
- Bus 60-year Operating and Maintenance Costs -$1,131m
- 60-year Incremental Revenues $703m

Economic Case

40. The economic case details the options benefits and costs to transport network users and society at large.

41. The faster operating speed of HLRT will be offset to some degree by the lower frequency and wider stop spacing compared to the bus service. It is also expected that there will be a material improvement in service quality and reliability afforded by the segregated and prioritised HLRT service. Overall, there is forecast to be a benefit of 1.9m passenger hours in 2031. Converting these to a present value benefit gives a total of $937m.

42. The reduction of highway capacity in the corridor will impact on remaining highway users, even after some have transferred to using HLRT. This amounts to some 285,000 hrs annually, with a present value of $137m. However, the average change in journey time is much smaller, but is experienced by a significantly larger proportion of auto users.

43. The reduction in vehicle use arising from HLRT gives rise to savings in auto operating costs of $226m present value, and a small level of safety benefit through reduced accidents, worth $21m present value.

44. GHG emission reductions are valued at $4.2m in present values over the evaluation period. Air quality is also improved from a reduction in criteria air contaminants (CACs) such as particulate matter and sulphur dioxide from exhaust fumes.

45. When people change their mode of transport from auto to transit, it typically requires additional walking between transit stops and their ultimate destination. This form of active transportation can lead to health related welfare and cost benefits including reduced mortality and illness. Based on information from Road to Health: Improving Walking and Cycling in Toronto, April 2012, the overall welfare and cost saving to the public sector as a result of improved health that HLRT can deliver is estimated at $51m in present values over the 60-year evaluation period.

46. The HLRT project may result in a slight increase in safety risk to unfamiliar road users because of the specific traffic arrangements required during LRT operations. The improved stop and vehicle design has the potential to improve perceived safety and security for passengers. Overall the safety and security is assessed as neutral.

47. A 'complete streets' approach to the design of the Hurontario-Main LRT corridor can lead to urban realm benefits. These benefits are broadly divided among the categories of cycling facilities, walking facilities and trees. Valuation of these benefits was based on international literature research and, together with estimated walking and cycling trip volumes in the HLRT corridor in 2031, the cycling benefit was valued at $0.2m per annum, the walking benefit at $1.6m per annum and tree benefit at $0.3m per annum. Overall, the urban realm benefit is valued at $1.71m in 2031, or $41m PV.

48. Taking into account capital and operating costs and transit revenues (both set out in more detail below) and in addition to $51m cost savings from healthcare and productivity savings and total monetised benefits of $1,096m, this leads to a BCR of 1.24:1.

49. The implementation of the HLRT project will generate both direct (from construction) and indirect (from suppliers) economic benefits that are temporary in nature and span the schedule of construction. The construction is estimated to create some 6,210 person-years of employment; in terms of wages, this is worth $239m. Overall, HLRT delivers $529m in GDP output for the region during the implementation phase.

50. In the long-term there will be ongoing economic benefits as a result of the HLRT project. This covers changes in consumer spending patterns and direct costs to businesses, as well as improved regional competitiveness for local businesses that now have lower costs of doing business, including access to a larger labour market. HLRT is estimated to create around 211 person-years of employment per annum. In terms of wages, this is worth $8.2m per annum. Overall, HLRT delivers up to $18m in GDP output per annum for the region in the long-term.

51. It is expected that HLRT will increase the attractiveness of the corridor and lead to an increase in the value of land. Based on the current property value data obtained from the cities of

Mississauga and Brampton, the potential land/property value uplift is estimated in the range of $200 million to $420 million.

Deliverability and Operations Case

52. Impacts during construction will centre on frontage access, noise and vibration, and traffic circulation. In all three, mitigation strategies will be developed and implemented to minimise the impacts. The overall impact is considered slight adverse.

53. Constructability of the project is considered to be good, with most elements standard and employed throughout the world on LRT projects. Some risk exists around highway structures and ITS systems.

54. Other criteria (funding, procurement, stakeholders, governance, risk management) are under consideration and development by Metrolinx.

Final MAE

55. From the evaluation of the criteria and accounts set out above, a summary MAE table is set out below. This forms the core of the BCA and enables the various impacts of the BCA analysis to be understood.

Case / Account	Assessment
Strategic Case	
Incremental Transit Ridership (m trips in 2031)	2.9m
Accessibility - catchment within 800m of LRT in 2031	Population: 100,700 Employment: 58,800
Transit Mode Share	Increases from 24% to 49% along corridor
Integration with other modes	✓✓
Land use shaping	✓✓✓
Goods Movement Impacts	×
Change in 2031 Vehicle Kilometres Travelled	-14.4 million vehicle-kms
Road Network Impacts	×
GHG Emissions	3,964 tonnes in 2031
CAC Emissions (Tonnes in 2031)	CO: -21 tonnes, NOx: 5.6 tonnes, SO2: 77 kg
Financial Case	
LRT Capital Costs (2012 prices and values)	$1,194m
LRT 60-year Renewal Costs (2012 prices and values)	$609m
Bus 60-year Capital Costs (2012 prices and values)	-$194m
LRT 60-year Operating and Maintenance Costs (2012 prices and values)	$1,281m
Bus 60-year Operating and Maintenance Costs (2012 prices and values)	-$1,131m
60-year Incremental Revenues (2012 prices and values)	$703m
Economic Case	
Transit User Benefits – Time savings, reliability and quality (PV $m)	$937m

Case / Account	Assessment
Auto User Benefits (PV $m)	-$137m
Auto Operating Cost Savings (PV $m)	$226m
Auto Safety Benefits (PV $m)	$21m
GHG Emissions (PV $m)	$4m
Capital and Renewal Costs (PV $m)	$1,126m
Incremental Operating and Maintenance Costs (PV $m)	$67m
Incremental Revenues (PV $m)	-$258m
Incremental Operating Subsidy (2012 $m in 2031)	-$5.4m
Health – welfare	$4m PV
Health – quality of life and healthcare costs	$51m PV
Urban Realm	$41m PV
Present value Costs	$884m
Present value Benefits	$1,096m
Net Present Value	$212m
Benefit:Cost Ratio	1.24:1
Total Direct and Regional Economic Impacts	During Construction / Long Term pa
Employment (person years)	6,210 / 211
Wages ($2012m)	239 / 8.1
GDP ($2012m)	529 / 18
Development Potential/ Land Value Uplift ($m)	$200m-420m
Deliverability and Operations Case	
Impacts During Construction	✖
Constructability	✓✓
Project Management	n/a
Delivery Strategy (Procurement, Capacity and Risk Allocation)	n/a
Operating Strategy (Service Provider, Capacity and Risk Allocation)	n/a
Governance, Organisational Structure and Roles	n/a
Intervention Implementation Plan	n/a
Approval Requirements and Milestones	n/a
Communications and Stakeholder Relations	n/a
Risk Management and Contingency Arrangements	n/a
Monitoring, Evaluation and Benefits Realisation Plan	n/a

Impact of TOD-style land use

56. A sensitivity test has been undertaken to understand the impact of adopting a more transit-oriented development (TOD) land use pattern with HLRT in place. This is consistent with the vision for the HLRT corridor and as such could arguably be considered as the “central case” for the project.

57. The test retains the overall land use totals for the Cities and assumes an unchanged specification for HLRT. The TOD-style test adds some 7% additional population and employment in the corridor (with reduced growth elsewhere to maintain the overall totals), resulting in an additional 8% demand on the system.

58. Evaluation was restricted to Benefit:Cost (BCR) analysis, providing a summary of the economic case for the TOD-style land use scenario. The overall costs were reduced by 21% due to a larger increase in transit revenue further offsetting the capital and operating costs of the HLRT system. Benefits increased as the complementary land use increased the reduction in auto use and hence the associated safety and auto operating cost savings. The resulting BCR for the TOD-style land use test is 2.14:1, a material increase from the full project BCR of 1.24:1.

$m in 2012 Present Values and Prices	TOD-style land use	Amendment 2 land use	% change
Costs			
Capital and Operating costs	1,194	1,194	0%
Transit Revenue	-398	-258	54%
Healthcare and Productivity Savings	-100	-51	96%
TOTAL COSTS (PVC)	695	884	-21%
Benefits			
Transit User Time Savings	987	937	5%
Auto User Time Savings	-139	-137	1%
Safety Savings	52	21	147%
Auto Operating Cost Savings	560	226	147%
Emission Savings	9	4	105%
Urban realm	41	41	0%
Health - Quality of Life	7	4	95%
TOTAL BENEFITS (PVB)	**1,518**	**1,096**	38%
Net Benefit (NPV)	**823**	**212**	289%
BENEFIT:COST RATIO (BCR)	**2.18:1**	**1.24:1**	

59. The TOD-style land use test highlights an encouraging improvement in the case for the HLRT project and demonstrates the value of the HLRT/Complete Streets/TOD future for the corridor as envisaged in the Hurontario-Main LRT Corridor Master Plan, and developed through the PDE/TPAP stages of project development. The approach is also consistent with wider regional/provincial and Metrolinx goals for rapid transit to support sustainable growth policies in the GTHA. Further work should explore the scope for further TOD intensification to fully exploit the city shaping potential of the HLRT project.

1 Project Context

Background

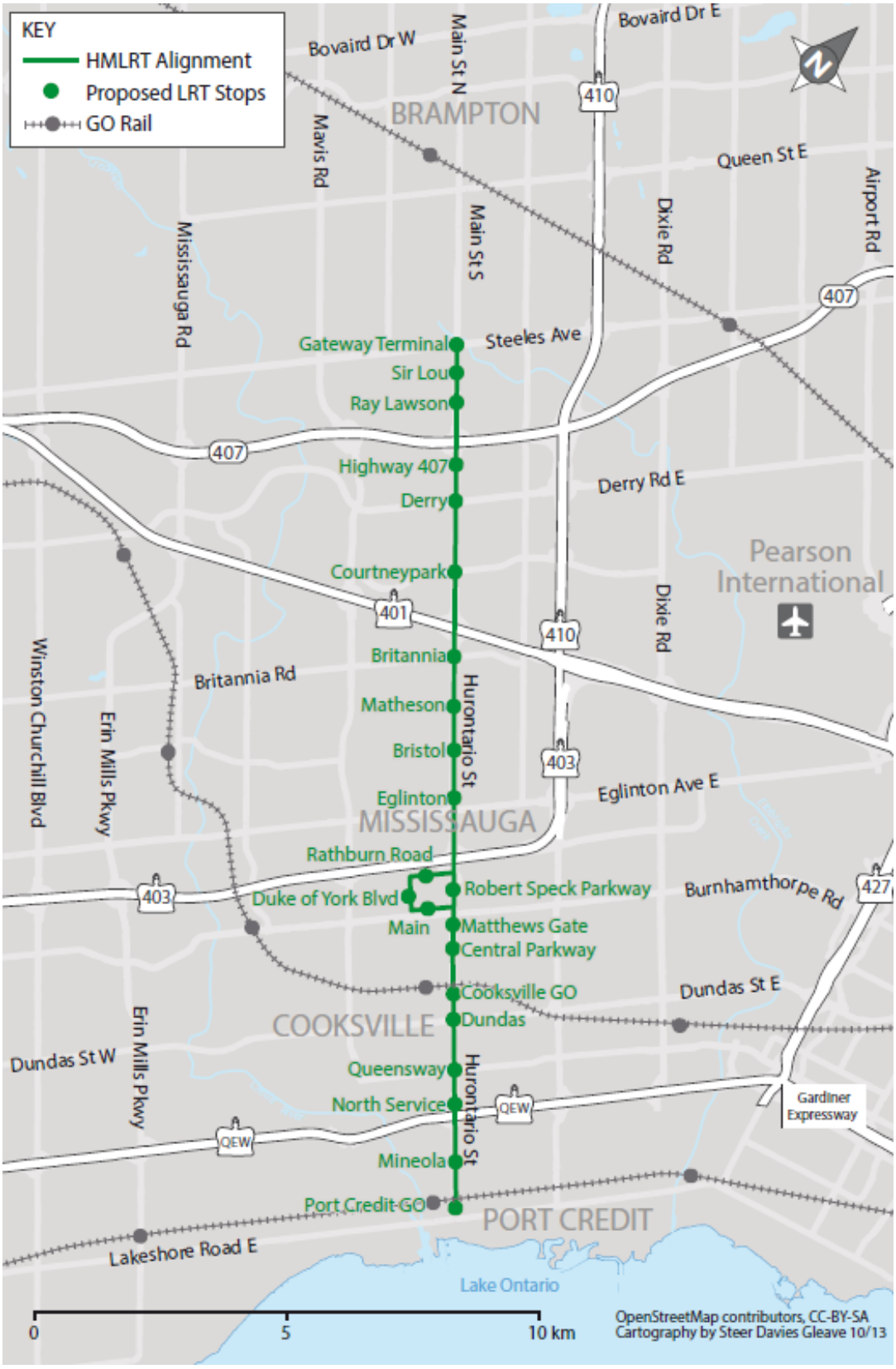
1.1 The Cities of Mississauga and Brampton have been developing the Hurontario-Main Street Light Rail Transit project since 2010. The strategic need for a rapid transit system along the corridor between downtown Brampton and Port Credit was identified through the development of the Big Move Regional Transportation Plan developed by Metrolinx and published in 2008.

1.2 From that, the Cities embarked on a Master Plan study to consider the integrated land use, transportation and city building opportunities that exist in the corridor. The resulting 2010 Master Plan report concluded that an LRT system best met the needs and opportunities for the corridor. Concurrent with the Master Plan study, Metrolinx undertook a Benefits Case Analysis to understand and demonstrate the case for rapid transit in the corridor, concluding that there was a strong case for LRT. Following this work, a Preliminary Design and Engineering (PDE) study was undertaken between 2012 and 2014 to confirm the LRT alignment and design and to support the Transit Project Assessment Process (TPAP), providing the authority to construct the system.

1.3 Following extensive debate within Brampton during 2015, the City of Brampton Council did not support the TPAP alignment north of Steeles Avenue along Main Street. Given that, the scope of the project has been correspondingly reduced to terminate at the Gateway Terminal at Steeles Avenue.

1.4 The Hurontario LRT (HLRT) project evaluated in this report extends from Port Credit at the southern end to the Gateway Terminal at Steeles Avenue in the north, passing through Downtown Mississauga. It is a major north south artery through the respective Cities, linking downtown Mississauga, four mobility hubs, and a number of important employment and community hubs.

Figure 1.1: The Hurontario/Main LRT Route



Existing Transit Services

Local Bus Network

Hurontario/Main Corridor bus routes

1.5 Transit in the Hurontario/Main corridor is principally provided by four bus services (illustrated in Figure 1.2)

- MiWay local 19/19A/19B between Port Credit and Hwy 407 P&R (the 19A and 19B variants diverge to terminate in employment areas east and west of Hurontario Street, south of Hwy 401);
- MiWay express 103 between Port Credit and Shoppers World;
- Brampton local 2 between Hwy 407 Park & Ride and Brampton, continuing north to Heart Lake Centre; and
- Brampton Züm 502 (express - BRT) between Downtown Mississauga and Brampton, continuing north to Sandalwood Parkway.

1.6 These routes are generically referred to in this report as 'corridor bus services'. All run in the weekday peaks and off-peak, at frequencies as shown in Table 1.1, and at weekends.

1.7 Several other bus routes cover shorter sections of the HLRT corridor, these are:

- MiWay 8 between Port Credit and Mineola;
- MiWay 62 (peaks) between Hillcrest Avenue (Cooksville GO Transit) and Fairview Road;
- MiWay 10 between Rathburn Road and Ceremonial Drive (S/B) or Bristol Road (N/B);
- MiWay 65 between Trailwood Drive and Barondale Drive (N/B only, as part of a terminal loop);
- Brampton Transit 7/7A between Courtneypark Drive and Derry Road (N/B only, as part of a terminal loop);

Figure 1.2: Existing Corridor Bus Routes (Source: City of Mississauga and City of Brampton websites)

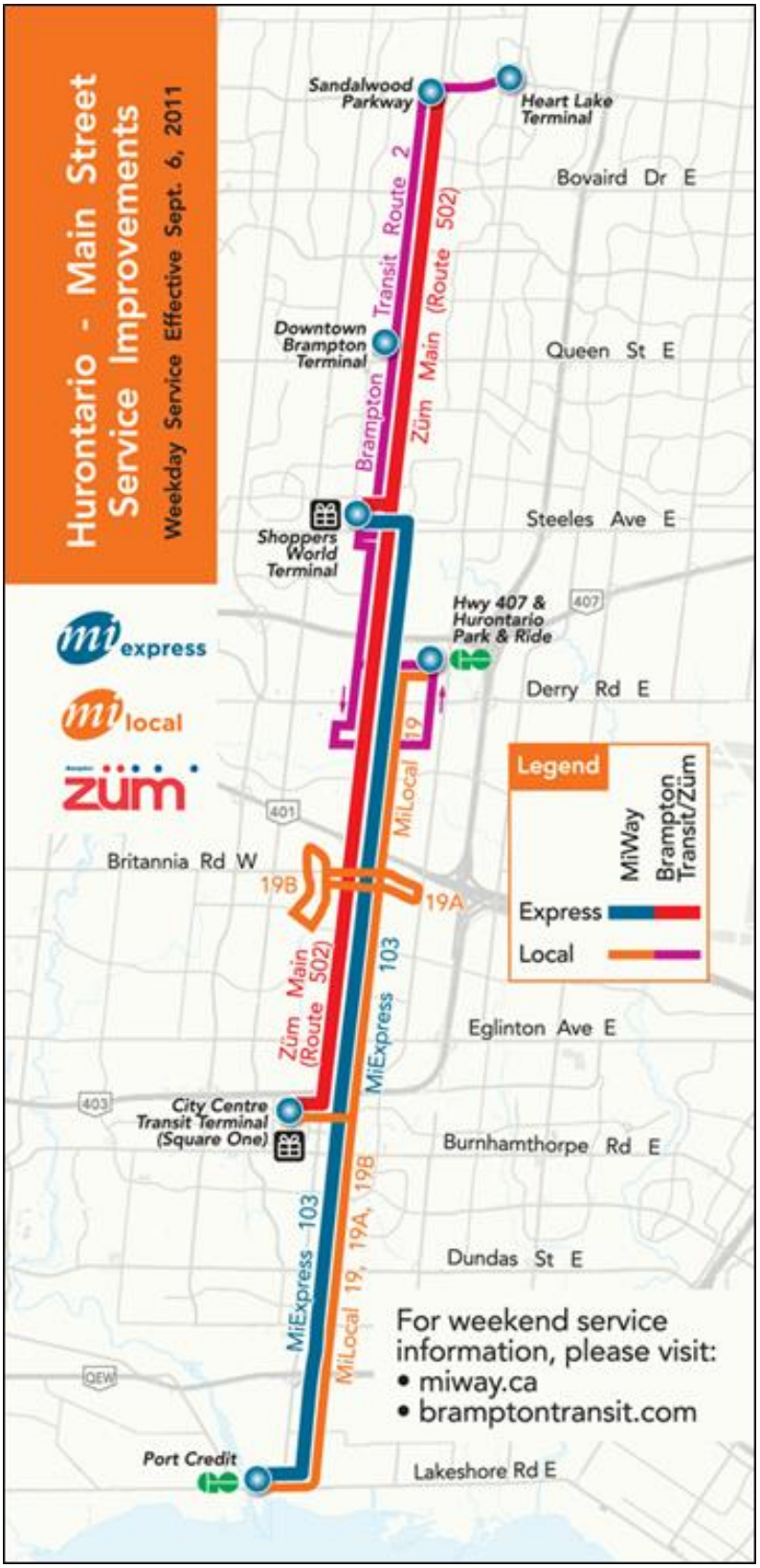


Table 1.1: Existing Corridor Bus Frequencies

Route	Weekday peak frequency (buses/hour)	Weekday off-peak frequency (buses/hour)
19/19A/19B combined	12 (4 per branch)	12 (4 branch route)
103	3-4	3-4
2	3	3
502	6	3

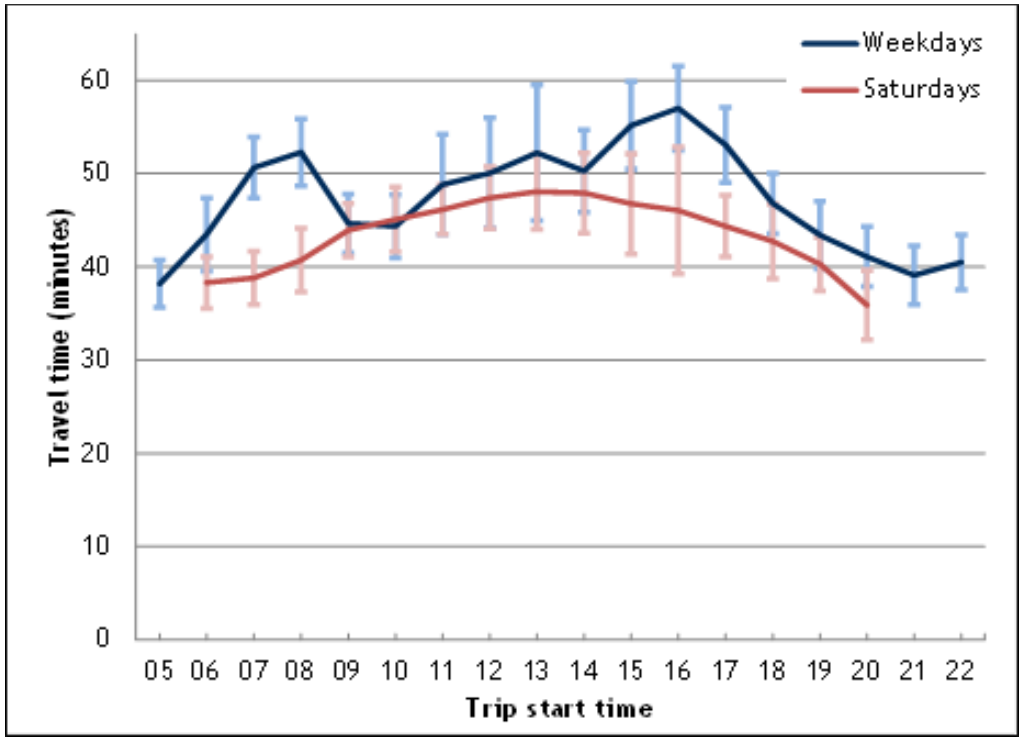
1.8 In addition, several MiWay and Brampton Transit routes run along the LRT corridor for short distances (one block or thereabouts).

1.9 Local buses on Hurontario/Main Street (routes 2 and 19/19A/19B) have stops at an average interval of about 370m. The exact spacing varies depending on the nature of the adjacent land uses and street pattern. Express routes 103 and 502 have an average stop spacing of approximately 1000m, about one in three stops compared with local buses.

Hurontario/Main Corridor bus journey times

1.10 Analysis has been conducted into bus journey time reliability; an example of the results is shown in Figure 1.3. The vertical bars show the standard deviation of bus trip times in that hour. Route 103 Hurontario Express is MiWay's express route from Brampton Gateway Terminal to Lakeshore Rd, and covers 100% of the proposed route for the LRT. Consequently, it is a useful indicator of the operational challenges and reliability of bus routes in the LRT corridor. The chart shows that there is considerable variation in trip times through the day.

Figure 1.3: Average Trip by Time of Day – Route 103 Hurontario Express Northbound



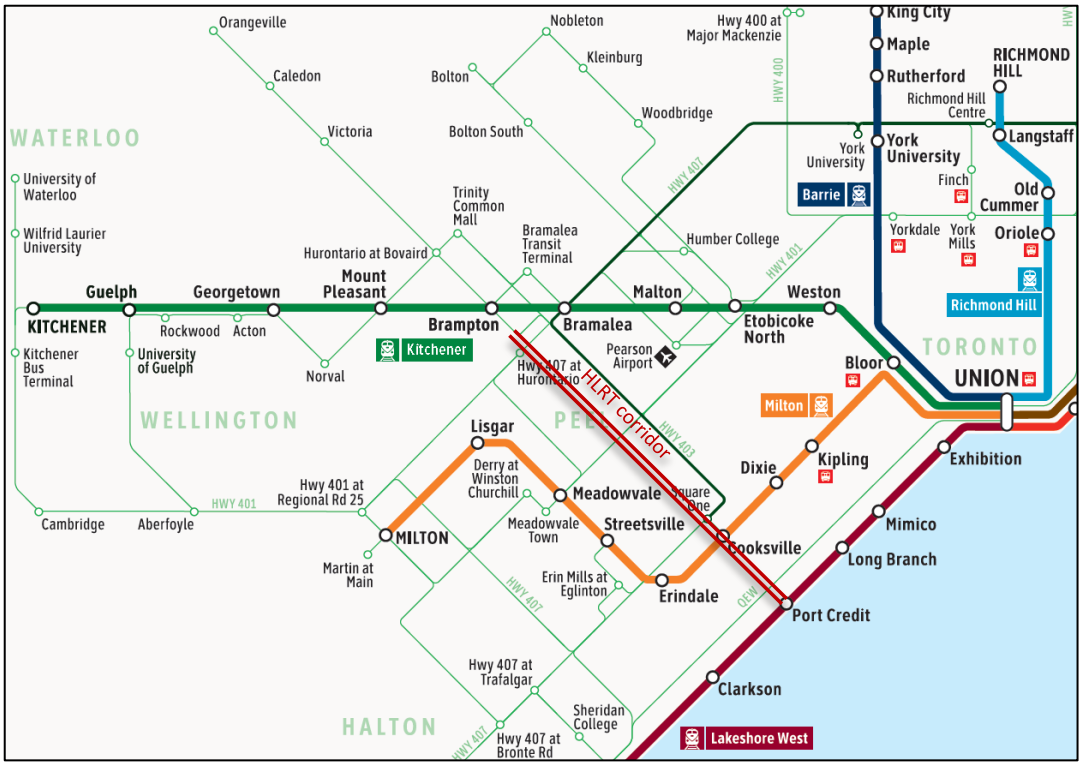
Inter-Regional Transit

1.11 Most inter-regional transit is provided by a network of GO Transit rail and bus services, illustrated in Figure 1.4, with the HLRT corridor added to show its relationship to the wider network. The plan does not show the full details of bus routings at a local level. There are two passenger rail stations on the HLRT route:

- Port Credit GO Transit, served by the Lakeshore West line, which has 30 minute all-day service as far as Aldershot and additional peak services which operate beyond there to Hamilton (though the latter do not stop at Port Credit).
- Cooksville GO Transit, served by the Milton line, with eight trains in each 3-hour peak period (to Toronto AM, from Toronto PM).

1.12 On other routes, and on the rail corridors outside the hours of rail service, inter-regional transit is provided by a network of GO Transit buses. The network is complex, and many routes have a number of variations in start/end point and routing, each combination identified by a suffix letter. In and around the Hurontario/Main corridor, most GO Transit bus routes provide broadly east-west movements, focused on either Downtown Toronto or the North York area (Finch Station/York Mills and York University). In addition, GO Transit buses provide some links of a more local character.

Figure 1.4: Existing GO Transit Network West of Toronto

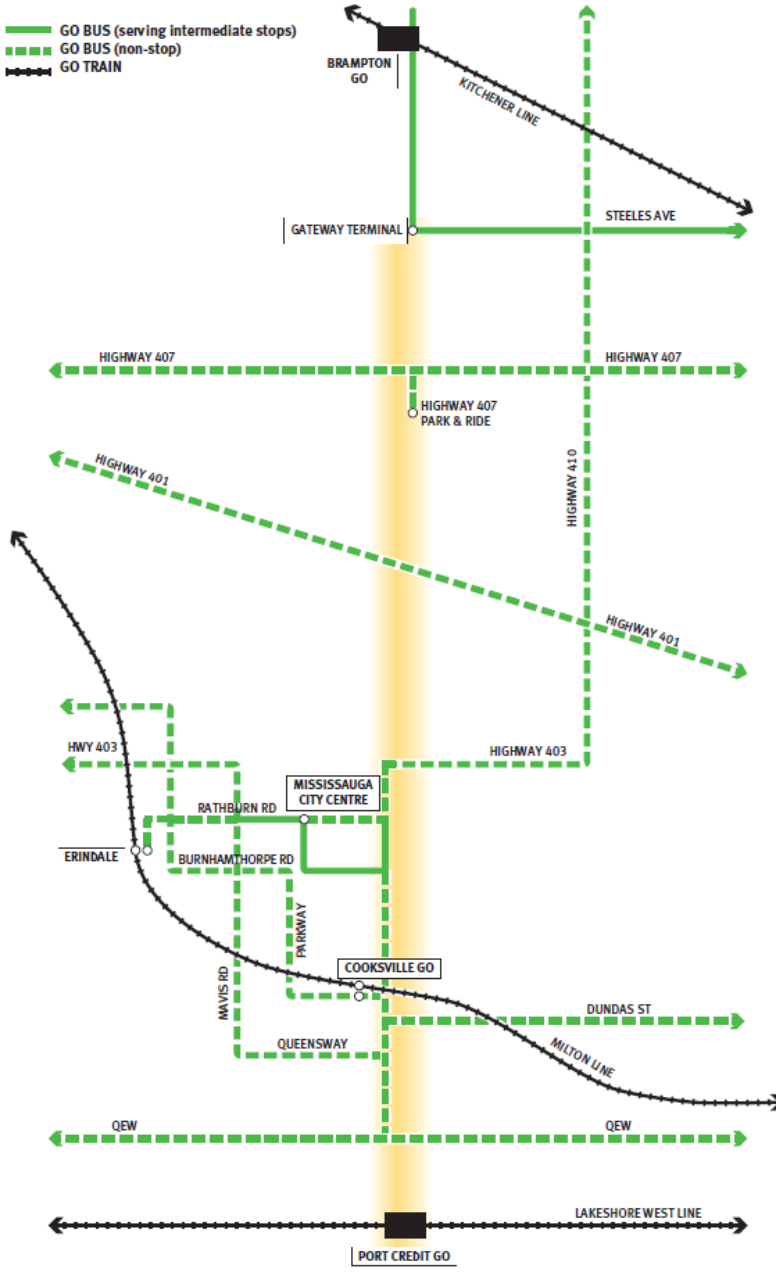


Source: GO Transit System Map, with HLRT corridor added

1.13 Extensive use is made of the highway network by GO Transit buses, resulting in long non-stop runs. However, many routes also have sections that run on local streets, in some cases making local stops but in others running non-stop.

1.14 The GO Transit bus network intersects with the Hurontario/Main LRT corridor at a number of points, and some routes also follow parts of the corridor itself. A schematic plan of the GO Transit network in the local area is shown in Figure 1.5.

Figure 1.5: GO Transit Network in HLRT Corridor



Note: where GO Transit bus routes shown as 'non-stop' cross the HLRT corridor, there are no connections unless indicated by a circle.

Buses in Downtown Mississauga

1.15 Local and express buses follow a variety of routings in Downtown Mississauga. All routes serving the Downtown call at the City Centre Transit Terminal, and in most cases terminate there, except for the following 'cross-city' routes:

- 19/19A/19B Hurontario
- 26 Burnhamthorpe
- 103 Hurontario Express
- 109 Meadowvale Express (peak-only)

1.16 These routes all serve the Transit Terminal, apart from route 103, which runs direct via Hurontario Street.

1.17 The Transit Terminal is located on the north side of Square One. Consequently, bus routes serving areas to the north generally follow a simple, direct route via Rathburn Road. However, bus routes serving areas to the south use a variety of routes, including Confederation Parkway, Living Arts Drive, Duke of York Boulevard and City Centre Drive, as illustrated in Figure 1.6.

Figure 1.6: Existing Bus Routes in Downtown Mississauga

Source: MiWay Weekday Map, March 2012

1.18 The Transit Terminal is a key node in the MiWay bus network and, as such, handles high volumes of buses and bus passengers. As at March 2012, some 1,600 bus departures per day were scheduled, with up to 60 in a half hour period at peak times.

1.19 The Transit Terminal doesn't just provide access to Downtown land uses - it is also an important transfer point between routes. A survey carried out by the City of Mississauga in 2009 collected information on the origins and destinations of a sample of passengers, in terms of their arrival and departure route (if by bus) or a trip end in the local area. The data emphasizes the importance of the Transit Terminal for transfers, with three-quarters of surveyed passengers transferring from one bus route to another. However, passengers were surveyed only at the terminal itself, and this

will tend to overestimate the proportion of transfers, since other Downtown bus stops would be expected to serve predominantly those trips with a local origin or destination.

1.20 In the future, as development of Downtown Mississauga continues, the proportion of trips with an origin or destination in the Downtown area could be expected to increase considerably, reducing the proportion of transfers. However, the absolute number of transfers is not expected to decrease, so the Downtown area will remain an essential transfer node in the network. Consequently, future services and facilities will need to reflect this.

GO Transit Bus Services

1.21 GO Transit buses in downtown Mississauga call at the GO Transit terminal in Station Gate Road, just north of the MiWay/Brampton Transit terminal. Buses serving the west run via either Rathburn Road or Centre View Drive; buses serving the east or south run via Duke of York Boulevard, City Centre Drive, Robert Speck Parkway and Hurontario Street, serving several intermediate stops around the Downtown area.

1.22 The numbers of bus movements to and from the GO Transit terminal are substantial, in the range 20-30 buses per hour, with some additional movements during university terms and on certain days of the week, making it the second busiest bus terminal in on the GO Transit bus network.

Existing Road Context

1.23 The HLRT corridor has been designated a major arterial in the road hierarchy for the area. The number of through traffic lanes along the corridor can be categorized into two sections:

- Park Street East to Northern Service Road: two lanes in each direction with a median;
- Northern Service Road to Charolais Boulevard: generally three lanes in each direction, often with a raised median. However, there are short distances where this varies to two or four lanes per direction;

1.24 Posted speed limits in the corridor range between 50km/hr and 80km/hr:

- 50km/hr: Lakeshore Road to Kirwin Avenue
- 60km/hr: Kirwin Avenue to World Drive; Ray Lawson Boulevard to Harold Street
- 80km/hr: World Drive to Ray Lawson Boulevard

1.25 As a key transportation corridor between Mississauga and Brampton, the Hurontario-Main corridor connects to four major east-west highways:

- The QEW
- Highway 403
- Highway 401
- Highway 407

1.26 The corridor also intersects with a number of Peel regional roads: The Queensway, Britannia Rd, Derry Rd W and Steeles Ave.

1.27 Although some minor parallel roads exist, there is no continuous north-south parallel road network in proximity to the corridor.

Population and Employment Growth

1.28 Table 1.2 shows the modelled Base 2006 and forecast 2031 population and employment for the Brampton, Mississauga, and the LRT corridor. (The 2031 data is consistent with the latest Growth Plan Amendment 2 forecasts[2], with data for Brampton and Mississauga being provided by the respective cities at a detailed level, and existing land use data for the rest of the GTA scaled to match the Amendment 2 forecasts at a regional level.)

Table 1.2: Population and Employment

Municipality		Brampton	Mississauga	Total	*LRT Corridor*
Population	2006	453,000	698,000	1,151,000	*152,000*
	2031	843,000	829,000	1,672,000	*218,000*
	Change	*86%*	*19%*	*45%*	*43%*
Employment	2006	156,000	431,000	587,000	*76,000*
	2031	291,000	527,000	818,000	*111,000*
	Change	*87%*	*22%*	*39%*	*46%*

1.29 The data in the table shows that significant growth is expected between 2006 and 2031, especially in Brampton. It also shows that population and employment in the LRT corridor (using a 1km buffer) is expected to grow at the same rate or faster than for the combination of Brampton and Mississauga (noting that the very high growth in Brampton will occur predominately in the undeveloped north east and north west of the city, and along Queen Street).

1.30 Figure 1.7 shows the resultant geographic distribution of the change in population density. Each dot represents a change in population density by 100 persons/km². Similarly Figure 1.8 shows the geographic distribution of the change in employment density, with each dot a change in employment density by 100 persons/km². Blue dots indicate growth; red dots indicate decline. The red line indicates the planned LRT route.

[2] Amendment 2 (2013) To The Growth Plan For The Greater Golden Horseshoe, 2006

Figure 1.7: Population Growth (2006-2031)

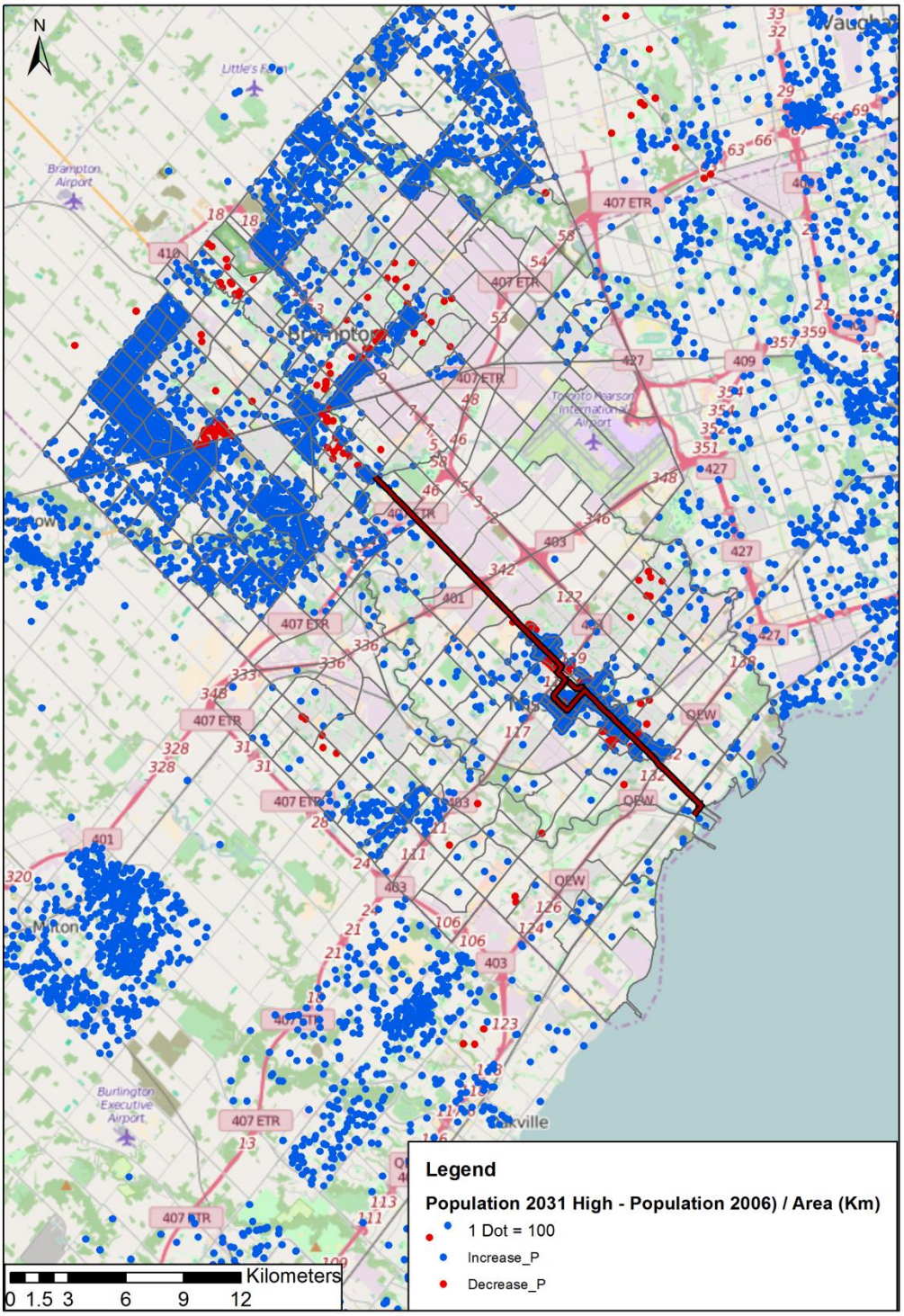
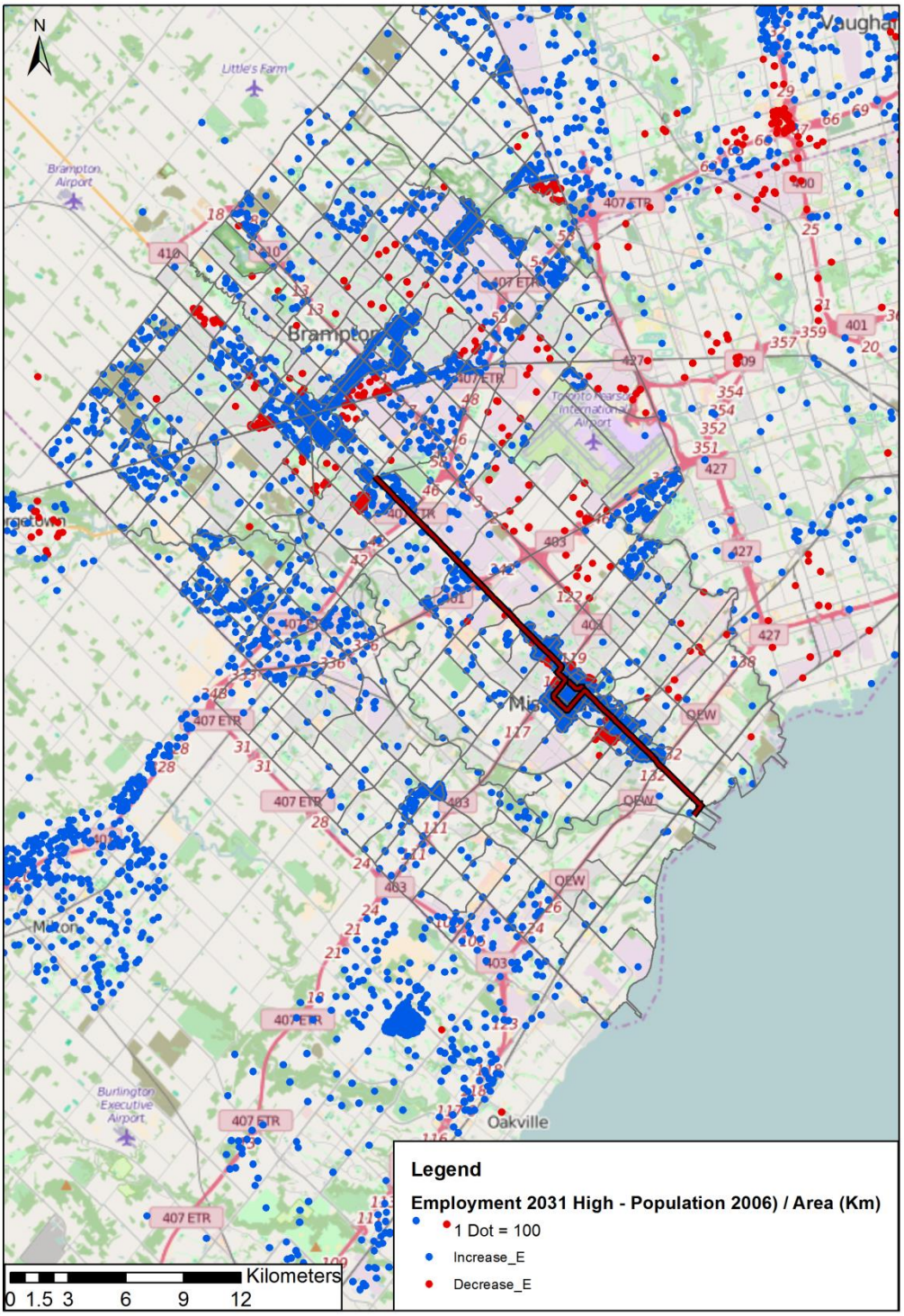


Figure 1.8: Employment Growth (2006-2031)



1.31 Strong growth in population (Figure 1.7) is most evident along the northern and western edges of Brampton, as its urban area expands through greenfield development. There is also strong growth in and around downtown Brampton and along the Queen Street corridor to the east. In Mississauga, high population growth is focused along the HLRT corridor from the QEW highway to Eglinton Avenue. Beyond Brampton and Mississauga, high population growth is forecast for Milton, with Oakville and Toronto showing more modest and even growth.

1.32 A comparable pattern is evident for employment growth, the key exception being the northern and western area of Brampton, which employment growth is much more modest than population growth, this area being largely residential in nature.

1.33 The implication of this significant growth in population and employment along Hurontario-Main is a significant increase in travel demand, leading to increased auto traffic and congestion. Additional transit services would need to be deployed to accommodate the increase in demand.

Benefits Case

1.34 The Benefits Case sets out the rationale for the project and draws together the various forecasts of its costs and benefits as prepared by the Project Team. This analysis is presented to the Cities and Metrolinx as part of the ongoing authorisation process for the project. This version of the Benefits Case reflects the project design freeze DW3 and the associated project specification, costs and benefits but with the reduced scope with the downtown Brampton to Steeles section removed.

1.35 This BCA report has drawn together all the final inputs from the PDE study, along with further development work on the BCA process, to provide an optimised case for the HLRT project from Port Credit to Steeles.

1.36 The Benefits Case is structured as follows:

- Section 2 – Problem Statement;
- Section 3 - Project Overview;
- Section 4 –Strategic Case;
- Section 5 - Financial Case;
- Section 6- Economic Case;
- Section 7 - Deliverability and Operations Case;
- Section 8 – MAE Summary;
- Section 9 - TOD-Style Land Use Sensitivity Analysis

2 Problem Statement and Vision

Introduction

2.1 The Hurontario Street corridor is a major north south artery through Mississauga and Brampton, linking Mississauga downtown, four mobility hubs, and a number of important employment and community hubs. The area was identified through the Big Move as a key corridor with significant growth forecast over the future years and a need was established to review the transit provision in the corridor.

2.2 Previous work for the project identified project visions and objectives but no specific problem statement was defined for the project. Based on the previously developed material (presented below) a problem statement has been defined as follows:

> In order to facilitate the forecast growth along the HLRT corridor and the establishment of four mobility hubs along its length, an appropriate reliable, frequent, comfortable and convenient rapid transit service is required to meet the forecast demand, improve the vibrancy of the corridor, and ensure effective connections to other links in the inter-regional transit network.

Policy Framework

2.3 The HLRT project vision fits within a body of provincial, regional, and municipal policies whose future goals, objectives and targets may impact the Hurontario Street Corridor.

2.4 The Province provides policy direction on matters related to land use and development that are of provincial interest through the Ontario Provincial Policy Statement, Places to Grow plan (The Growth Plan) and Greenbelt legislation. The Growth Plan designates areas of growth in the Greater Golden Horseshoe. The policy direction provided in these documents for growth and development are used to shape Region and Municipal Official Plans, which must conform with provincial requirements.

2.5 Metrolinx's The Big Move complements The Growth Plan with a planning framework that supports increasing transportation choices. The Big Move will be compared to the HLRT vision statements in a separate section.

2.6 Official Plans provide a long-term plan to manage growth and development in a region or municipality. Official Plans define how land should be used and provides goals and objectives for master plans. Master plans focus on key topics or geographic areas that are covered in an Official Plan. They provide plans on how objectives in an Official Plan could be achieved in the future.

Policy Summary

2.7 This section assesses HLRT's "fit" with the current body of planning and transportation policy. The HLRT project visions are supported by policies and the provincial, regional and municipal levels of planning. Appendix A provides more detail on each policy discussed in this section.

2.8 Key issues addressed by the policies include:

- Encourage and promote sustainable modes of transportation (i.e. public transit, carpooling, cycling, walking, etc.) to provide increased mobility and travel mode choice;
- Promote sustainable mode choice through mixed use development, which will allow people to live and work in the same area
- Support intensification and recognize Hurontario Street as a major corridor connecting local and regional destinations
- Support high order transit like priority BRT or LRT
- Stimulate economic growth
- Support pedestrian and cycle friendly environments to create healthy communities
- Encourage cooperation between all levels of government

Project Vision

2.9 As described in the original Hurontario-Main Street Corridor Master Plan, the HLRT project vision is as follows:

- **Easy, reliable, frequent, comfortable and convenient rapid transit service is provided through the corridor**, with effective connections to other links in the inter-regional transit network (Consistent with the Transportation Choices, Comfort and Convenience, Multi-Modal Integration and Interconnectedness goals);

- **Hurontario/Main Street is a beautiful street**, with attractive places along the corridor featuring expanded mobility, vibrant economic activity, and livable, connected, mixed-use neighbourhoods, integrated with the transportation infrastructure (Consistent with the Foundation of an Attractive and Well- Planned Region goal);
- **The Regional Urban Systems and the planned urban structure of each City are recognized and reinforced**, and accordingly, mixed-use, compact Transit Oriented Development is present along the corridor, customized to suit the varying and distinct nature of each existing community and sensitive to the presence of adjacent stable neighbourhoods (Consistent with the Foundation of an Attractive and Well- Planned Region goal).

2.10 Overall, the HLRT project vision is very closely linked with goals and objectives set out in The Big Move.

HLRT Vision and The Big Move

2.11 The Big Move goals and objectives are just one set of overarching objectives and the HLRT project vision and objectives, defined by the City of Mississauga and City of Brampton, are consistent but have different priorities.

2.12 The project vision and objectives have been reviewed and mapped onto MAE criteria to understand if the project vision and objectives can be assessed under the conventional MAE scope. Table 2.1 illustrates how the three HLRT vision statements align with The Big Move Goals.

Table 2.1: The Big Move Goals and HLRT Vision Statements

Big Move Objective	HLRT Vision		
	Transit	Urban Realm	Land Use
Transportation Choices	✓		
Comfort and Convenience	✓		
Active and Healthy Lifestyles			
Safe and Secure Mobility	✓	✓	
Fairness and Transparency			✓
A Smaller Carbon Footprint and Lower Greenhouse Gas Emissions			
Reduced Dependence on Non-Renewable Resources			
Foundation of an Attractive and Well-Planned Region		✓	
Prosperity and Competitiveness			
Multi-Modal Integration	✓		✓
Interconnectedness			✓
Efficiency and Effectiveness			
Fiscal Sustainability			

2.13 Table 2.2 shows the visions for The Big Move and HLRT. They both address the themes of providing transportation choices, improving the urban realm, reducing the urban development footprint through higher transit-supportive densities and protecting the environment. The main discrepancies between the two visions, is that The Big Move clearly mentions economic development, which the HLRT vision does not do.

Table 2.2: The Big Move Goals and HLRT Visions

Plan Visions	
The Big Move	**HLRT**
A high quality of life	Easy, reliable, frequent, comfortable and convenient rapid transit service is provided through the corridor
A thriving, sustainable and protected environment	Hurontario Street is a beautiful street
A strong, prosperous and competitive economy	The Regional Urban Systems and the planned urban structure of each City are recognized and reinforced

Policies and HLRT Project Visions

2.14 Table 2.3 provides an overview of provincial, regional and municipal plans that support three HLRT vision statements. A more detailed summary of each policy is provided in Appendix A.

Table 2.3: Policies Supporting HLRT Project Vision

	HLRT Project Visions		
	Transit	Urban Realm	Land Use
Places to Grow	✓		✓
Peel Official Plan	✓	✓	✓
Peel Long Range Transportation Plan	✓		✓
Brampton Official Plan	✓		✓
Brampton Transportation and Transit Masterplan	✓		✓
Pathways			✓
Mississauga Official Plan	✓	✓	✓
Mississauga Cycling Master Plan		✓	✓
Downtown21	✓	✓	✓
Port Credit Local Area Plan		✓	✓

3 Project Overview

Project Proposal

3.1 The HLRT project, illustrated in Figure 3.1, is a proposed 20km street running light rail transit system running between Port Credit GO Transit station and Gateway Terminal at Steeles Avenue, via a downtown Mississauga service loop, on the Hurontario-Main Street roadway. Along the route, it serves Cooksville GO Transit station, downtown Mississauga and the Shoppers World mall.

3.2 The HLRT is planned as a Higher Order Transit service that will bring a major improvement to the pattern of express and local transit in the corridor and provide a good fit with 'complete street' design through its 'urban-style' LRT design.

3.3 At the local level, HLRT will form the spine of the north-south transit network in Mississauga and Brampton, supported by the network of local bus services. Some changes to the pattern of this network will be required to maximise the effectiveness of the LRT route and the bus network, as discussed later in this report.

3.4 In addition to its local function, HLRT will form a key element of the regional network. The main trend in the future transit network identified in the RTP is based on radial routes serving Downtown Toronto, with additional east-west oriented routes through Toronto and York Region.

Route Alignment

3.5 The preferred track alignment has been developed using pre-determined operational criteria. The LRT alignment comprises double track throughout, and is generally at-grade, and within the existing road right-of-way.

3.6 Over most of the route the number of road traffic lanes is reduced to accommodate the LRT tracks. Limited land acquisition is required at a few locations to accommodate LRT and road infrastructure, mainly at LRT stops and intersections.

3.7 The LRT alignment is segregated from other traffic, except at road. There is a proposed new underpass for LRT beneath the rail lines at Port Credit. There is also a new road underpass to carry Hurontario Street traffic beneath the QEW Highway.

Stop Locations, Spacing and Platform Length

3.8 Stops are located along the HLRT route at locations selected to serve local centres, GO Transit rail stations and transit terminals and other demand generators along the route. The average stop spacing is approximately 900 m.

3.9 The platform length is nominally 90 m to accommodate 30 m LRVs operating in 3-unit consists.

Figure 3.1: The Hurontario/Main LRT Route

3.10 Stops are typically located close to an intersection, using the pedestrian crosswalks to access the platforms. Mid-block pedestrian crosswalks will also be provided at the opposite end of the platform in most cases.

Maintenance and Storage Facility

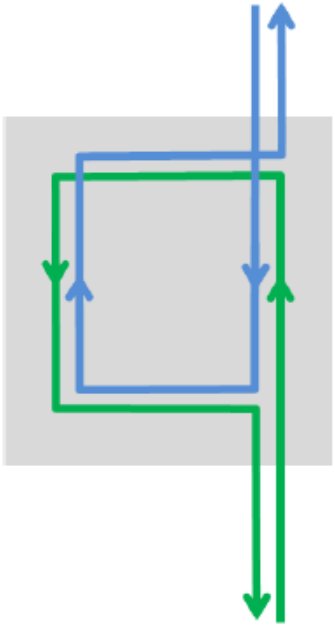
3.11 The preferred site for the MSF has been identified as the provincially-owned land bounded by Highway 407 to the north, Hurontario Street to the west, the Hydro One Networks Inc. transmission line and utility corridor to the south and Kennedy Road to the east.

LRT Operating Assumptions

Operating Pattern

3.12 The preliminary operating pattern of the proposed HLRT is illustrated in the diagram below. This includes services that run from Steeles to Square One and return; and from Port Credit to Square One and return. This does require an interchange for trips travelling from the north of Square One to the south of Square one and the reverse.

Figure 3.2: HLRT Operating Pattern



Frequency and Run Times

3.13 The proposed HLRT is assumed to operate at a 5 minute headway during the weekday peak periods, a 7.5 minute headway during the midday and Saturdays and at a 10 minute headway early morning and Sundays. The working assumption is that these would operate as 60m 2-unit LRT vehicles, with the option for 3-unit vehicles in the future when demand warrants.

3.14 Table 3.1 and Table 3.2 set out the proposed LRT stop names, stop-to-stop distances and run times for the north and south services respectively. The run times assume a medium to high level of signal priority for LRT at intersections.

Table 3.1: LRT Distances and Run Times – North Service

Origin Station	Destination Station	Length (m)	Time (min)
Gateway Terminal	Sir Lou	670	1.6
Sir Lou	Ray Lawson Blvd	470	1.1
Ray Lawson Blvd	Highway 407	1,340	2.2
Highway 407	Derry	630	1.2
Derry	Courtneypark	1,540	2
Courtneypark	Britannia	1,680	2.7
Britannia	Matheson	930	1.6
Matheson	Bristol	770	1.4
Bristol	Eglinton	1,200	1.8
Eglinton	Robert Speck Parkway	1,670	3.3
Robert Speck Parkway	Main Street	930	2.3
Main Street	Duke of York Blvd	710	2
Duke of York Blvd	Rathburn	640	2
Rathburn	Eglinton	1,825	4.6
Subtotal		*15,005*	*29.8*
Eglinton	Bristol	1,205	2.1
Bristol	Matheson	770	1.7
Matheson	Britannia	920	1.6
Britannia	Courtneypark	1,690	2.8
Courtneypark	Derry	1,530	2.2
Derry	Highway 407	630	1.2
Highway 407	Ray Lawson Blvd	1,340	2.5
Ray Lawson Blvd	Sir Lou	480	1.1
Sir Lou	Gateway Terminal	660	1.6
Total		**24,230**	**46.6**

Table 3.2: LRT Distances and Run Times – South Service

Origin Station	Destination Station	Length (m)	Time (min)
Port Credit GO Transit	Mineola Street	630	1.6
Mineola Street	North Service	1,410	2.9
North Service	Queensway	525	1.2
Queensway	Dundas	975	1.8
Dundas	Cooksville GO Transit	650	1.7
Cooksville GO Transit	Central Parkway	940	1.9
Central Parkway	Matthews Gate	480	1.1
Matthews Gate	Robert Speck Parkway	570	1.8

Robert Speck Parkway	Rathburn	1,010	2.6
Rathburn	Duke of York Blvd	705	1.9
Duke of York Blvd	Main Street	635	1.9
Main Street	Matthews Gate	610	2
Subtotal		*9,140*	*22.4*
Matthews Gate	Central Parkway	480	1.1
Central Parkway	Cooksville GO Transit	940	1.7
Cooksville GO Transit	Dundas	650	2
Dundas	Queensway	980	2
Queensway	North Service	510	1.2
North Service	Mineola Street	1,425	2.7
Mineola Street	Port Credit GO Transit	620	1.7
Total		**14,745**	**34.8**

Transit Network Assumptions

Do Minimum Scenario

Bus Services

3.15 The impacts of HLRT are assessed against a Do Minimum scenario as defined in the Metrolinx Business Case guidance as due to the growth forecasts on the corridor, evaluation against a do nothing is not feasible. This required amendments from the 2006 base transport model.

3.16 The initial changes to the transit networks were made to reflect changes to transit service that had been implemented between when the Base model had been built in 2006 and the present day (2012) transit services.

3.17 The 2031 local bus networks were initially updated to reflect the latest 2012 local transit networks in the Cities of Mississauga and Brampton. Outside of the Brampton and Mississauga areas, the transit network is broadly consistent with the 2006 networks, with few exceptions.

3.18 Further changes to the 2012 bus networks were undertaken to reflect the anticipated increases in network demand between the present day and 2031. To this end, Mississauga and Brampton transit frequencies were uplifted by 15%, with an uplift of 40% to the corridor routes utilized. These figures are derived from the change in boardings between 2006 and 2031 model runs.

3.19 It was considered that in the future, bus travel times will be slower than those in the current timetable. Based on traffic modelling work undertaken, we have assumed that between 2012 and 2031 the average journey time increased by 5% across all routes.

GO Transit rail Services

3.20 The peak period GO Transit rail service is assumed to remain reasonably unchanged into the future, and a pragmatic approach was taken not to add new planned stations to the network that were well away from the study area. Service frequencies were updated to be consistent with the

GO Transit Rail Electrification Study Reference Case timetable, which was the long term planning aspiration for rail service. Subsequently, in 2014, the Provincial Government announced a $13.5bn upgrade of the GO Transit rail system to a Regional Express Rail system. This is planned to deliver two-way all-day service on the Kitchener, Barrie and Stouffville lines in addition to that already operating on the Lakeshore Line, with modest peak period enhancements across the network. For the purposes of HLRT ridership forecasting, which considers the AM peak period only, the differences are not considered material.

With HLRT Scenario

Bus Services

3.21 The guiding principle adopted in developing changes to the network has been to retain existing links as far as possible and to make changes only where required to maximise the travel opportunities provided by the new mode.

3.22 While the introduction of HLRT may provide opportunities for a more general and widespread bus network reorganization, this is beyond the scope of the current work and will require a more detailed analysis of demand patterns, route performance and network form. However, for the purpose of evaluating the impacts of LRT, the assumed frequencies and changes to bus routes in the HLRT corridor are shown in Table 3.3 and Table 3.4 respectively.

Table 3.3: Changes in Frequencies on Corridor Bus Routes (BPH)

Route	2012	2031 DM	2031 With LRT
(19/19a/19b)	12	16	3
103	3	4	-
2	3	4	4
502	6	8.5	8.5
LRT	**-**	**-**	**12**

Table 3.4: Main Changes to Corridor Bus Routes

Route	Proposed Change	Notes
MiWay 19/19A/19B	Shorten to run Port Credit - Square One only as a single route 19.	Frequency reduced – assumption of 3[3] buses per hour
Hurontario	Replace 19A/19B branches with new local distributor route feeding LRT at Britannia stop.	Integrated with a revised 25 Traders Loop
MiWay 103 Hurontario Express	Remove.	Replaced by LRT.
Brampton 2 Main	Shorten to run between Steeles and Heart Lake Terminal.	

[3] Frequency suggested by MiWay transit planners

Route	Proposed Change	Notes
Brampton 502 Züm Main	Shorten to run between Steeles, Sandalwood Parkway and a new northern terminus (to be defined).	Northern terminus as in Do Minimum.

Highway Network Assumptions

Do Minimum Scenario

3.23 As with the transit network, the impacts of HLRT are assessed against the Do Minimum scenario. This required amendments from the 2006 base transport model.

3.24 Only projects that have received full funding or been completed post-2006 are included in the 2031 network, and these include:

- 400 series intersection reconfigurations
- 410 extension
- 401 widening at Hurontario
- Network additions around Mississauga downtown
- Brampton network development consistent with their 2009 Transportation and Transit Masterplan (TTMP) proposals in line with future development
- Miscellaneous GTHA highway projects away from corridor

3.25 Parking charges are also assumed to apply to the downtowns, as well as Trillium Hospital and Port Credit. Following review of existing charging levels, a common charge of $5 has been applied.

3.26 Finally, as the Hurontario-Main corridor develops further, it is expected that it will take on a more urban character and that the posted speed limits will be gradually reduced to reflect this changing character. By 2031, it is assumed the maximum speed limit will be 60km/hr.

With HLRT Scenario

3.27 The with-HLRT scenario removes a lane in each direction between QEW and Steeles. South of the QEW, the right of way is sufficient to accommodate HLRT and retain two lanes in each direction.

Ridership Forecasts

3.28 This section of the report sets out the modelling assumptions and ridership forecasts for the HLRT project.

3.29 Forecasts are made using the Higher Order Transit (HOT) model, developed in 2009 for the Master Plan study. The model consists of a four stage transportation model representing trip generation, distribution, mode split and assignment stages.

3.30 The model covers a 3 hour morning peak period from 06:00 – 09:00, with the transit assignment being for the 3-hour peak period, and the highway assignment being for a 1- hour peak.

3.31 The model is of a typical structure and functionality for considering strategic changes to a transportation network.

3.32 Further details on the modelling framework and assumptions are set out in the EMME Model Report (November 2013).

Key Modelling Assumptions

3.33 The alignment, journey time and headway assumptions of the proposed LRT and bus network were set out previously. In order to reflect improved quality and reliability offered to passengers by LRT in the HLRT corridor, in-vehicle time (IVT) factors were applied to the corridor buses and LRT as follows:

- 1.17 for corridor buses
- 1.02 for LRT

3.34 The result is that time spent in LRT is perceived to be 15% faster than conventional bus.

Ridership Forecasts

3.35 In 2031[4], with the introduction of HLRT, demand on transit routes on the Hurontario-Main corridor (19/103/2/502/LRT) increases from 20,100 in the Do Minimum to 28,700 boardings (42% increase) during the peak period, though a combination of mode shift from auto and transfer from other adjacent transit routes. Of the 28,700 with-LRT boardings, 22,550 are LRT boardings, with a further 6,150 boardings on the residual bus services on the corridor (the residual MiWay route 19 and the truncated Brampton Transit 2 and 502 routes to the north of Steeles).

3.36 LRT line boardings are shown in Table 3.5. The service pattern proposed requires an interchange for trips that travel beyond Downtown Mississauga; as shown in Table 3.5, around 1,100 trips make this transfer in the AM peak period.

Table 3.5: 2031 AM Peak Period LRT Demand and Boardings

	Demand	Boardings
Brampton – Mississauga Downtown	9,600	10,700
Port Credit - Mississauga Downtown	10,700	11,800
Both lines	1,100	
Total AM Peak Period	**21,400**	**22,500**
Total Weekday	102,000	107,000
Total Annual	**30.4m**	**31.9m**

3.37 Figure 3.3 and Figure 3.4 shows the loading profile the in 2031 AM 1-hour peak hour, both by the service pattern and then by direction to give the overall picture for the LRT demand, which is forecast to remain within the planning capacity of the system. They also highlight the importance of Downtown Mississauga as a trip destination.

3.38 Downtown Mississauga is a major trip origin and destination. In addition, it connects other transits routes with stops at major intersections, landmarks, and transit centres. This is shown with high activities at the three GO Transit rail stations. The three highest LRT to transit transfer occurs at Port Credit, Mississauga Transitway, and Steeles stops.

[4] HOT model tests s32 for Do Minimum and s97 for LRT

3.39 While the AM peak hour forecast demand is well within the planning capacity of the system, it must be noted that:

- The PM peak demand is typically around 20-30% higher (reflecting the presence of the Square One mall and broader travel profiles);
- The analysis has not addressed any complementary land use scenarios (such as the Downtown 21 Master Plan concept for downtown Mississauga), a key aim of the project vision and objectives.
- The forecast year is 2031 and land use and travel demand growth is expected to continue. The Growth Plan Amendment 2 forecasts population growth from 2031 to 2041 of around 11% in Peel.

Figure 3.3: Brampton - Downtown Mississauga – Brampton Load Profile (2031 AM Peak Hour)

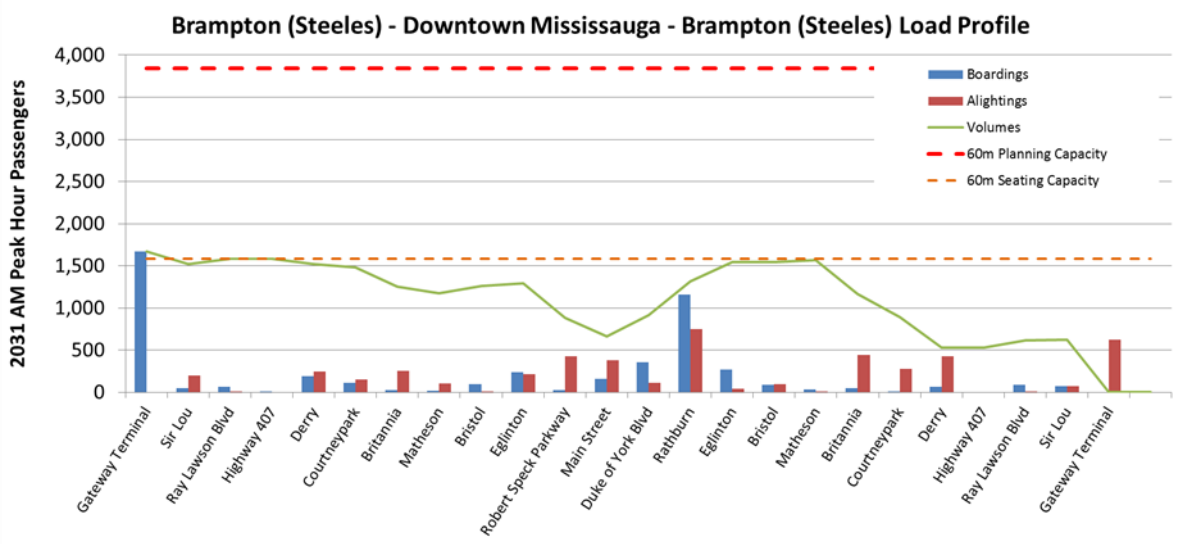
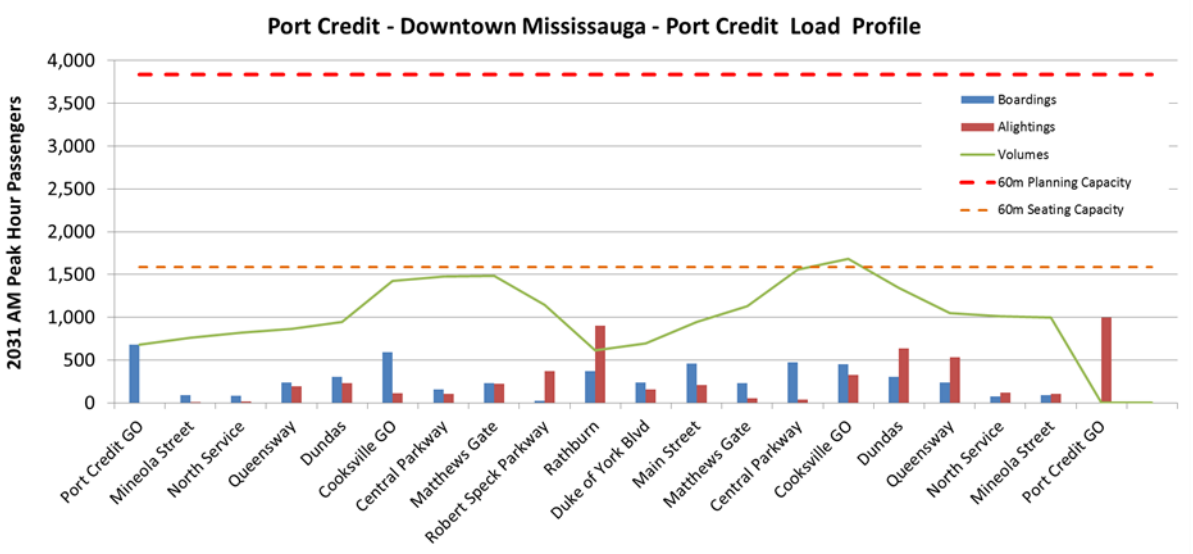


Figure 3.4: Port Credit - Downtown Mississauga – Port Credit Load Profile (2031 AM Peak Hour)



Evaluation Framework and Assumptions

3.40 The Regional Transportation Plan, The Big Move, sets out Metrolinx's goals and objectives of the Greater Toronto and Hamilton Area (GTHA). As projects are developed and evaluated, an MAE is required to assess how well the project meets goals and objectives from The Big Move.

Benefits Case Analyses (BCA)

3.41 The HLRT BCA template and format follows the guidelines as outlined by Metrolinx for project evaluation, to ensure acceptability and consistency. The Multiple Account Evaluation (MAE) is the core part of a BCA report adopted by Metrolinx.

3.42 Since the BCA document for the full project from Port Credit to downtown Brampton was produced, Metrolinx have revised their BCA guidance. This document has been prepared using the revised 4-chapter approach[5].

Multiple Account Evaluation Framework

3.43 An MAE framework provides a systematic identification and analysis of the impacts of an option. It compares the impacts on costs, users, environment, economy and community and enables decision makers to understand and consider the trade-offs among the often conflicting criteria.

3.44 The information gathered in an MAE can be used to support and justify investment in the overall project, and it can also be used to compare options within a project so that there is a clear audit trail in the decision making process.

[5] Business Case Development Handbook, Metrolinx, September 2015

3.45 The standard Metrolinx MAE framework includes a number of evaluation 'cases' that together address the most significant project performance and policy considerations for a specific project:

- Strategic Case
- Financial Case
- Economic Case
- Deliverability and Operations Case

3.46 Within each of these cases there are a number of individual criteria for which project performance measures are provided. For example, the financial case includes capital costs, changes in operating costs, incremental revenue and subsidy, and the revenue/operating cost ratio.

Key Evaluation Assumptions

Annualisation

3.47 The modelling process specifically examines the AM Peak Period. This period generally has the most number of trips (and hence highest traffic levels), and hence is when the impacts (positive and negative) are at their most acute.

3.48 These are then converted to annual figures by scaling the outputs by the annualisation factor of 1,420. This factor was derived from analysis of the HLRT corridor and network bus demand profiles. Highway impacts are annualised at a lower value of 1,073 to reflect the lower levels of highway demand outside the peak periods and hence a lower impact level.

Evaluation Parameters

3.49 The following parameters were used throughout the evaluation:

- Price base of costs and benefits: 2012 prices;
- Annual discount rate: 3.5% (in accordance to Metrolinx's guidance provided during project meetings in 2014);
- Evaluation period of 60 years from an assumed 2020 opening date;
- Background inflation of 2% p.a., the average CPI inflation rate over the 20 years from 1991 to 2011. (Source: Statistics Canada[6]).;
- Value of time of $14.63/hour in 2012 prices;
- Value of time growth of 1.64% p.a. in real terms;
- Real inflation rate for construction, operations and revenues: 1% p.a. until 2031 and no real inflation thereafter;
- Real inflation rate for auto operating costs: 2% p.a. until 2031 and no real inflation thereafter; and
- Ramp-up of effects (and hence revenue and benefits): 60% in 2020, 75% in 2021, 90% in 2022 and 100% thereafter.

[6] Statistics Canada: Consumer Price Index, historical summary. **http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/econ46a-eng.htm**

3.50 The modelling process uses 2031 as the core modelled year. The modelled effects for earlier years is scaled back to the opening year in line with 2011 Census to 2031 forecast growth rates (1.5% per annum) and for growth from 2031 onwards at the Growth Plan rate for Peel of 1.1% per annum until 2041, beyond which no further growth is assumed.

3.51 The modelling process produces ridership forecasts for LRT, other local transit and relevant GO Transit services. It also produces change in auto trips and vehicle kilometres.

4 Strategic Case

Overview

4.1 The Strategic Case for a project sets out the rationale for the project, the process by which the options tested were determined, how these meet the local and regional objectives, and how project success will be defined. The Strategic Case draws on some of the information presented in more detail in earlier context sections, but reformatted to fit the structure of the Metrolinx Strategic Case guidance.

Project Development

4.2 The HLRT project, in its current form has evolved from the project originally identified as part of the Big Move, thought to identification of LRT as the preferred rapid transit mode for the corridor as an outcome of the Hurontario / Main Street Corridor Master Plan and now ultimately to a route from Port Credit to Steeles being under evaluation.

4.3 Section two of this document set out the project vision as stated in the Hurontario / Main Street Corridor Master Plan:

- Easy, reliable, frequent, comfortable and convenient rapid transit service is provided through the corridor, with effective connections to other links in the inter-regional transit network (Consistent with the Transportation Choices, Comfort and Convenience, Multi-Modal Integration and Interconnectedness goals);
- Hurontario/Main Street is a beautiful street, with attractive places along the corridor featuring expanded mobility, vibrant economic activity, and livable, connected, mixed-use neighbourhoods, integrated with the transportation infrastructure (Consistent with the Foundation of an Attractive and Well- Planned Region goal);
- The Regional Urban Systems and the planned urban structure of each City are recognized and reinforced, and accordingly, mixed-use, compact Transit Oriented Development is present along the corridor, customized to suit the varying and distinct nature of each existing community and sensitive to the presence of adjacent stable neighbourhoods (Consistent with the Foundation of an Attractive and Well- Planned Region goal).

Policy Support

4.4 As set out in section two, the project aligns with the goals of the Big Move regional strategy and in addition aligns with the local policy context in Mississauga and Brampton. Further detail on the policy context in set out in Appendix A of this document.

Existing and Future Conditions

4.5 Section one of this document set out in detail the existing transit and highway network conditions. It also identified the growth forecasts which precipitate the need for the improved transit in the corridor and ultimately the LRT project as defined.

4.6 A Do Minimum scenario has been defined as in order to meet the growing demand, as a do nothing scenario is not a viable option. Without the HLRT project as defined, the opportunity for growth and the creation of a vibrant and growing corridor, that supports development, and high quality reliable transit journeys will be lost.

Interdependencies with other projects

4.7 The HLRT corridor sits within the wider regional transit network and it has a number of interdependencies with other projects. The key inter-related projects are set out below:

- Development of Mobility Hubs along the corridor
- GO Rail / RER service upgrades (all day, more frequent service)

4.8 The current forecasts are based on the assumption that the above projects/policies are implemented. Due to the related nature of the network, it is likely that if any of the items mentioned above do not occur, the business case for HLRT will be impacted to a lesser or greater extent. In particular, as Hurontario may be a feeder service for RER, RER in Mississauga may have an interdependency with Hurontario to attract transit feeder trips.

Stakeholder Involvement

4.9 Throughout the course of the development of this project, there has been evolving stakeholder development. This has included discussions with Metrolinx and other regional agencies including MTO, discussions at municipal level with the Cities of Mississauga and Brampton, and the Region of Peel, and with residents and businesses along the corridor both on an individual basis and as part of the wider TPAP process.

4.10 Throughout the course of project development and on an ongoing basis, a wide range of parties have had the opportunity to contribute and shape the project. Further information on the specific consultation undertaken can be found in the documentation supporting the PDE.

Definition of Project 'Success'

4.11 A key element of the revised Metrolinx Business Case approach is the requirement to set SMART objectives (specific, measurable, achievable, relevant and time constrained) and related targets that can be assessed following implementation of the project, in order to determine the 'success' of the project.

4.12 The following Key Performance Indicators (KPIs) have been identified for the project and are set out in Table 4.1. It is intended that post implementation monitoring will be undertaken to determine if these indicators have been achieved.

Table 4.1: Definition of Key Performance Indicators

Objective	Indicator	Discussion in Strategic Case
Improved transit services	New capacity and capacity utilization (ridership) Variation in peak period corridor travel time	Incremental Transit Ridership
Improved connectivity to transit services	Rapid transit catchment area	Accessibility and Integration with other transport modes
Increase in transit mode share on the corridor	Change in mode share over time along corridor	Mode Share
Creation of TOD opportunities	Faster than average increase in GFA after opening year measured by tax revenue / floor availability / commercial occupancy	Land Use Shaping
Improves transport network efficiency	Impact on auto traffic and goods movement along the corridor	Goods Movement Impacts, Road Network Impacts
Improves environmental integrity	Reduction of emissions, pollution, and noise	Emissions

4.13 The following sub-sections provide a discussion on Hurontario LRT's expected performance against these objectives.

Incremental Transit Ridership

4.14 The project is forecast to increase transit ridership. The primary reasons for this are the improvement in travel times, journey time reliability and quality compared to the existing service.

4.15 The transit ridership in the AM peak period is an output from the modelling process. Ridership is noted in the modelling process, and in Table 4.2.

Table 4.2: 2031 AM Peak Period LRT Demand and Boardings

	Demand	Boardings
Brampton – Mississauga Downtown	9,600	10,700
Port Credit - Mississauga Downtown	10,700	11,800
Both lines	1,100	
Total AM Peak Period	**21,400**	**22,500**
Total Weekday	102,000	107,000
Total Annual	**30.4m**	**31.9m**

4.16 The modelling process produced a 2031 forecast of 2,060 additional transit riders due to mode shift from auto to transit. This equates to 2.9m additional transit riders per year.

4.17 For comparison, Brampton Transit had 18.4m riders in 2012, and MiWay had 34.4m riders in 2012. The increase in transit ridership is therefore 8% of the combined MiWay/Brampton Transit ridership.

4.18 The increase in transit ridership shows that the investment in HLRT will deliver a more sustainable future, reducing the reliance on the private auto and increasing public transit mode shares.

Accessibility

4.19 Through the provision of a high quality and reliable rapid transit system, HLRT can improve the perceived accessibility along the corridor. The accessibility improvements are further supported by enhancements to the urban realm which reduces barriers of walking to and from LRT stops, as well as contributing to the broader ease of walking and cycling along the corridor.

4.20 This section sets out information on the catchments of the stops along the Hurontario Main Street LRT route. Information was provided on the resident population and number of jobs for 400m and 800m walk catchments and for the years 2011 and 2031.

4.21 The 400m and 800m walk catchments are based on an analysis of Mississauga and Brampton road networks available to access each stop, and therefore the shape of the catchment boundaries varies depending on the local street network. Footpaths away from roads have not been included in this access network.

4.22 The catchment populations and employment have been derived from a GIS analysis of data provided by the Cities of Mississauga and Brampton, and assume a uniform distribution across each data zone. The 2031 forecasts are based on the use of the 2006 Hemson[7] derived Growth Plan land use and growth assumptions, disaggregated below the municipality level by the respective municipalities.

[7] The catchment analysis has not been updated to the 2013 Amendment 2 data for 2031. Analysis of simple corridor forecasts show very modest changes from the 2006 Hemson data used previously and so the results presented here remain valid for illustrating the broad accessibility of LRT stops. Similarly, the analysis includes the Elisabeth Street stop, which has now been removed from the project definition. However, this overlaps somewhat with Port Credit and is included in both the 2011 and 2031 results and so it is considered that the results presented here remain valid for illustrating the broad accessibility of LRT stops.

4.23 Figure 4.1, Figure 4.2 and Figure 4.3 illustrate the 400m and 800m walking catchments for the southern, central and northern sections of the HLRT respectively.

4.24 Table 4.3 sets out the estimated population and catchment of HLRT. It shows that by 2031, around 100,700 people would be living within 800m of HLRT, and around 58,800 would be working within 800m of HLRT. These people are in the position to benefit from the high quality rapid transit services being offered.

Table 4.3: Population and Employment Catchment of LRT

Catchment Size	Population		Employment	
	2011	2031	2011	2031
Up to 400m	22,600	34,000	16,600	21,900
400m-800m	50,200	66,700	28,900	36,900
Total 800m	72,800	100,700	45,500	58,800

Figure 4.1: 400m and 800m Catchment – Southern Section of LRT

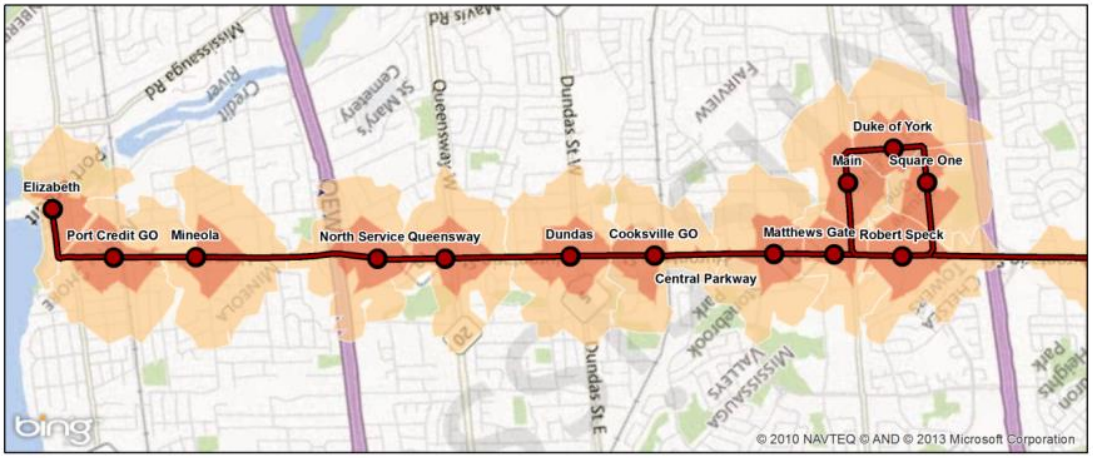


Figure 4.2: 400m and 800m Catchment – Central Section of LRT

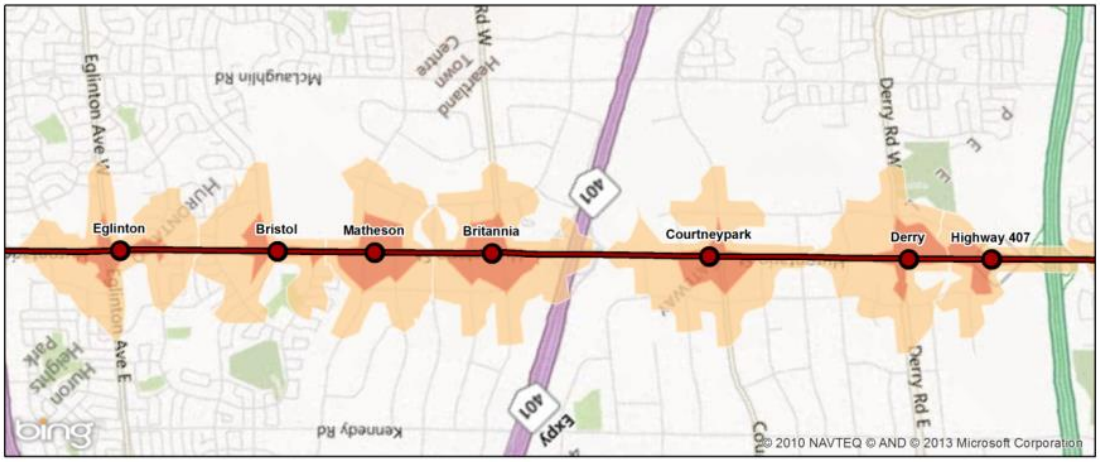
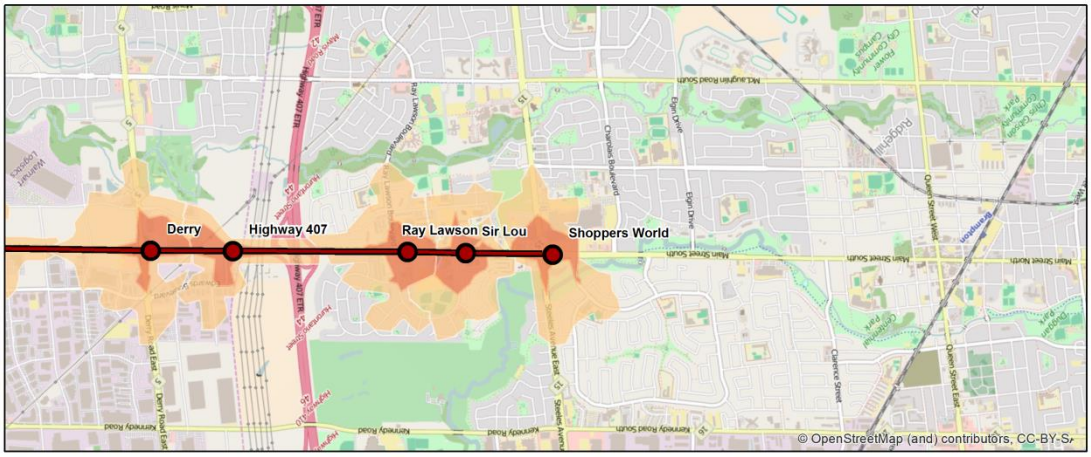


Figure 4.3: 400m and 800m Catchment – Northern Section of LRT



Mode Share

4.25 The introduction of the HLRT is intended to produce a mode shift from road use to transit, by making transit use more attractive for trips using the Hurontario-Main Corridor. This is measured by the increase in transit's mode share. The Hurontario-Main Corridor runs through Mississauga and Brampton, and is intended to primarily serve trips with an origin and/or destination in the combined Mississauga-Brampton area.

4.26 The data on mode share is obtained from the transportation model, which produces estimates for trips specifically on the Hurontario-Main corridor, and more generally within the combined Mississauga-Brampton area. The figures for the weekday AM peak period in 2031 are shown in Table 4.4.

Table 4.4: Transit Mode Share (AM Peak 2031)

Scenario	Hurontario-Main Corridor	Within Mississauga-Brampton
Do Minimum	24%	13.60%
With HLRT	49%	14.00%
Change	***25%***	***0.40%***

4.27 The mode share results show that HLRT increases the transit mode share on the corridor substantially, from 24% to 49%. Across the wider Mississauga – Brampton area, the change is more modest as the much larger scale of demand across the area dilutes the impact of HLRT.

Integration with other transportation modes

4.28 "Mobility hubs" are areas identified by Metrolinx as being key nodes in the transit network where multiple modes and routes come together. They also have (or are expected to have) a high density of population, employment, or other services.

4.29 Metrolinx defined two types of Mobility Hubs: "Anchor Hubs are major transit station areas associated with an urban growth centre (as defined in the Province's Growth Plan for the Greater

Golden Horseshoe). Gateway Hubs are major transit station areas that are located at the interchange of two or more current or planned regional rapid transit lines." [8]

4.30 The HLRT line will serve four mobility hubs, providing access to other high-order transit as follows:

- Port Credit GO Transit station (gateway): Lakeshore West line
- Cooksville GO Transit station (gateway): Milton line
- Mississauga City Centre (anchor): Mississauga Transitway, Square One transit terminal
- Hurontario-Steeles (gateway): Brampton Gateway transit terminal, Steeles Ave Züm

4.31 One of the fundamental guiding principles used when planning and designing the proposed LRT is its integration with other transport modes. The LRT is designed to facilitate convenient interchange with key regional services such GO Transit rail and local BRT and bus services.

4.32 Not only will there be improved physical integration by way of proximity, there will be improved wayfinding and information to encourage passengers to interchange between services. LRT has a fixed route and stops are more prominent, so casual passengers will also be able to use it more confidently.

Land Use Shaping

4.33 Experience in other jurisdictions demonstrates that, when combined with complementary local planning initiatives, the implementation of transit can positively support and influence development, particularly around rapid transit stations, and promotes more compact, mixed use communities. The type and magnitude of the development is dependent upon a number of factors including the general nature of the transit corridor and the surrounding neighbourhoods.

4.34 As shown in the land value uplift section above, the Hurontario/Main Street corridor is a well establish corridor within the city consisting of a mix of residential, commercial, retail, industrial, recreational (parks) and institutional uses. Densities also vary along the corridor with more concentrated development occurring closer to the city centre and within the downtown section of the proposed rapid transit alignment.

4.35 For the purpose of this analysis, it is generally accepted that investments in rail rapid transit initiatives are more likely to attract complementary land development investments compared to bus-based transit initiatives, provided that the transit investment is undertaken in concert with other complementary planning initiatives.

4.36 With this in mind, the investment associated with the fixed rail infrastructure proposed is likely to result in the redevelopment of the corridor and therefore achieve the city's objective to revitalize the city's core and create a more densely developed, less car-dependent urban environment. Such transit oriented development is a key objective of HLRT and is the focus of one of the three vision statements for the project.

[8] Metrolinx: Downtown Brampton Mobility Hub Profile
http://www.metrolinx.com/mobilityhubs/en/map/mobility_hubs_map/MHP_DowntownBrampton.pdf

Goods Movement Impacts

4.37 The introduction of LRT to the Hurontario Main Street corridor potentially impacts on the movement of goods vehicles in the following ways:

- Reductions in the number of traffic lanes along the corridor;
- Changes to signal operations at intersections;
- Changes in intersection geometry which particularly affect large vehicles; and
- Removal of left-turn opportunities along parts of the corridor.

4.38 In Downtown Mississauga the LRT layout has been amended from that shown in the Corridor Master Plan and the Downtown21 plan, in part to minimise the impacts of LRT on the access and servicing requirements of civic buildings and the Square One Mall.

Reductions in Number of Traffic Lanes, Changes to Intersection Geometry and Signal Timings

4.39 In most respects the impacts on freight vehicle movements will be similar to those for other traffic. Through the development of the HLRT project the layout changes have been modelled to determine the traffic impacts, with intersection layouts and signal timings adjusted to optimise intersection operation. This process necessarily involves a balance between giving a fairly high level of priority to LRT services (for a high quality reliable transit service) while maintaining acceptable impacts on traffic operation.

Removal of Left-Turn Opportunities

4.40 For the section of the HLRT route from Cooksville to Steeles Avenue, Hurontario Street comprises a divided roadway, with an almost continuous curbed central median, broken only at signal controlled intersections and a few other individual locations. Within this section most of the frontage properties currently have right in right out only access to Hurontario Street (although some properties also have access onto other streets). For these properties there is no change in accessibility.

4.41 Gaps are currently provided in the central median at a few properties within this length, allowing left turns in or out of the property. Some of these left turn opportunities will be removed, with consequent impact on the accessibility of the properties served by those gaps.

4.42 On the section of the route from north of Port Credit to Cooksville a new median is introduced into the existing single roadway. Over this length most frontage properties will have right in right out access only. The intersection layouts and signal arrangements provide for U-turns to be made at intersections along these lengths, allowing for access for smaller vehicles, but larger vehicles may have to use the wider road network to access some frontage properties.

Downtown Mississauga

4.43 The route of LRT in Downtown Mississauga which was shown in the Corridor Master Plan and in the Downtown21 plan impacted on the accesses to civic buildings and Square One Mall.

4.44 The route along Living Arts Drive ran directly past the main service accesses to City Hall and the Living Arts Centre. Various layouts within the street were considered, but all would have required larger vehicles to turn across the LRT tracks, with consequent disruption to LRT operations. Goods vehicles waiting for an LRV to pass would also obstruct other traffic.

4.45 The rerouting of the west side of the Downtown service loop along Duke of York Boulevard removes these conflicts.

4.46 Similarly, the earlier alignment of LRT along City Centre Drive passed directly in front of the main service and delivery entrance to the Square One Mall. Delivery vehicles accessing the mall would have to cross the LRT tracks. Queuing of trucks on City Centre Drive occurs at present, and with LRT also here there would be significant potential for delays and disruption to both LRT services and other traffic.

4.47 This conflict has been removed by the realignment of the east side of the Downtown service loop along Hurontario Street.

Road Network Impacts

4.48 The transportation model is used to forecast changes in auto use across the GTA as a result of HLRT. This is measured by the change in auto vehicle-kilometres travelled (VKT) on the road network. The distances reflect the fact that some passengers may choose to walk to an LRT stop and use GO Transit to commute to Union station rather than drive all the way, so the potential for reducing auto VKT is significant.

4.49 Table 4.5 sets out the forecast change in VKT in the 2031 forecast year. The change in vehicle-kilometres is an output form the modelling process, and around 14.4 million vehicle-kilometres are expected to be removed ever year as a result of HLRT.

Table 4.5: Forecast Change in VKT

Change in Auto Vehicle-Kilometres travelled	2031
3- hour AM peak period (vehicle-kilometres)	10,100
Annual (million vehicle-kilometres)	14.4

4.50 Similar to the movement of goods, HLRT will affect the local road network in two significant ways.

4.51 Firstly, in order to operate the LRT at its proposed journey times, a level of signal priority will be required. Depending on the extent of signal priority required, there is the potential to negatively impact traffic at intersections where there are likely to be longer delays while priority is given to the LRT.

4.52 Secondly, the dedicated alignment on which HLRT will operate on will lead to a number of turning movements, primarily left turns, being banned. This is required to reduce conflict of paths between traffic and the LRT. As a result, there will be some residents and businesses who will have to change their driving route in order to reach their destination. However, given that the road network is largely in a grid layout, such changes are not expected to significantly disrupt drivers.

Emissions

GHG EMissions

4.53 One of the major reasons for encouraging transit use is that it results in lower emissions of greenhouse gases. The emission of greenhouse gases has a cost associated with it, and the mode shift from HLRT has a benefit that can be monetised.

4.54 The change in greenhouse gases is from three sources:

- Reduction in auto vehicle-kilometres from the mode shift from auto to HLRT;
- Reduction in bus vehicle-kilometres operated with HLRT in place; and
- Greenhouse gases associated with electricity generation for HLRT

4.55 The estimation of the impact of HLRT on greenhouse gas emissions is consistent with the methodology and assumptions used by RWDI in their Air Quality Assessment for the HLRT Environmental Project Report (EPR). This includes emission rates per vehicle-kilometre for auto and bus based on the MOVES model developed for this purpose by the U.S. Environmental Protection Agency. The emission rates decline over time to reflect improving vehicle technology. The greenhouse gases associated with electricity generation for HLRT has been taken from the aforementioned report directly.

4.56 The most common greenhouse gas is carbon dioxide (CO2). However, there are other gases that have a small but significant effect, such as methane (CH4) and nitrous oxide (N2O). Rather than present separate figures for each and every GHG, standard practice is to "convert" emissions to the equivalent amount of CO2. Thus, all GHG emissions are presented as a total amount of carbon dioxide equivalent (CO2e).

4.57 The greenhouse gas emission reductions from HLRT in 2031 are set out in Table 4.6, along with the total change over the 60-year evaluation period. Overall, HLRT is forecast to remove around 4,000 tonnes CO2 annually or some 212,000 tonnes over the 60-year evaluation period.

Table 4.6: Greenhouse Gas Emission Reductions (2031)

	Car	Bus	LRT	Total
VKT reduction (m) in 2031	14.36	4.89	-	
Emission rate (g/vkt) in 2031	200	692	110	n/a
2031 CO2e emission reduction (tonnes)	2,871	3,389	-2,296	**3,964**
60-year CO2e emission reduction (tonnes)	147,850	200,900	-137,800	**210,950**

CAC Emissions

4.58 Criteria air contaminants (CACs) are a set of air pollutants that cause smog, acid rain and/or health problems in the general population. They include carbon monoxide, nitrogen oxides, and sulphur dioxide.

4.59 The change in CAC emissions is from three sources:

- Reduction in auto vehicle-kilometres from the mode shift from auto to HLRT;
- Reduction in bus vehicle-kilometres operated with HLRT in place; and
- Greenhouse gases associated with electricity generation for HLRT

4.60 The estimation of the impact of HLRT on CACs is consistent with the methodology and assumptions used by RWDI in their Air Quality Assessment for the Environmental Project Report (EPR). This includes emission rates per vehicle-kilometre for auto and bus based on the MOVES model developed for this purpose by the U.S. Environmental Protection Agency. The emission rates decline over time to reflect improving vehicle technology. For the purposes of this study, the reduction has been calculated but not monetised.

4.61 The CAC emission reductions from HLRT in 2031 are set out in Table 4.7, along with the total change over the 60-year evaluation period. Overall, HLRT is forecast to remove around 21 tonnes of CO annually, or some 621 tonnes over the 60-year evaluation period. For nitrogen oxides, the reduction is 5.6 tonnes and 143 tonnes respectively, and for sulphur dioxide 77kg and 3,381kg respectively.

Table 4.7: CAC Emission Reduction

	Car	Bus	LRT	Total
VKT reduction (m) in 2031	14.36	4.89	-	-
Carbon Monoxide (CO)				
Emission rate (g/vkt) in 2031	1.4	0.18	-	-
2031 CO emission reduction (tonnes)	20.1	0.9	-0.1	20.9
60-year CO emission reduction (tonnes)	609	25	-12	621
Nitrogen Oxides (NOx)				
Emission rate (g/vkt) in 2031	0.14	0.75	-	-
2031 CO emission reduction (tonnes)	2	3.7	-0.1	5.6
60-year CO emission reduction (tonnes)	52	100	-9	143
Sulphur oxides (SO2)				
Emission rate (g/vkt) in 2031	0.0039	0.0065	-	-
2031 CO emission reduction (kg)	56	32	-11	77
60-year CO emission reduction (kg)	2,887	1,664	-1,171	3,381

5 Financial Case

Introduction

5.1 The Financial Case sets examines lifecycle costs and revenues of the project to understand its broader financial implications and in turn how the project will be funded and financed, both in the short and long term. Metrolinx are developing the funding and financing proposals for the HLRT project; this section therefore focuses on the current estimates of the capital, renewal and operating cost of the HLRT project.

5.2 The costs set out here are $2012 costs. No allowance has been made for nominal or real inflation. The Economic Case applies a 1% p.a. real inflation to costs and revenues to 2031, with 0% thereafter.

Capital Costs

LRT Construction Costs

5.3 The capital costs of building and delivery a functioning LRT system form the largest part of the overall project costs and fall into two main groups. Direct costs relate to the actual construction of the infrastructure; non-direct costs cover all related costs such as risk/contingency, design, project management, etc. The capital costs are detailed in Table 5.1.

5.4 The overall capital cost is estimated at $1,280m in September 2014 prices[9]. For the purposes of this evaluation, the capital cost was converted to 2012 prices, for consistency with the evaluation price base, giving a cost of $1,219m in 2012 prices.

5.5 With the LRT assumed to reduce the extent of highway to be maintained, the City of Mississauga has identified savings in their road maintenance budget, estimated at around $23m (2014 prices) to 2021. A further 33% has been added to reflect a similar saving in the Brampton section of the project (based on having 25% of the route length), giving a total of $26.8m savings by 2021 ($25.3m in 2012 prices).

5.6 On that basis, the net cost of HLRT in 2012 prices is $1,194m.

[9] Based on a June 2014 cost memo with a total cost stated of $1,581m, adjusted to remove indirect costs and other costs applied to LRT vehicles.

Table 5.1: Capital Cost Estimates

Item	Original	Adjusted	2012 prices
Guideway	127.2	127.2	123.5
Bridges/Walls	16.3	21.1	15.9
Trackwork	165.3	191.1	160.5
Traction Power	66.1	77.5	64.2
Signalling and Communications	115.5	124.2	112.1
Vehicles	220.9	256.0	214.4
MSF	72.6	84.1	70.5
Stops	18.5	28.0	17.9
Signage	3.8	4.5	3.7
Direct cost	**806.2**	**945.9**	**782.7**
Indirect cost	138.3	118.4	97.6
Risk and contingency	120.9	141.9	117.4
Other items	86.1	80.1	44.0
Mark-up	46.1	41.2	33.1
Total design and construction cost	**1,197.5**	**1,327.4**	**1,074.8**
Land	63.8	75.0	60.1
Management	86.7	101.7	84.1
Total project cost	**1,347.9**	**1,281.0**	**1,219.0**
Road maintenance cost savings	-26.8	-26.8	-25.3
Net capital cost of HLRT	**1,321.1**	**1,254.2**	**1,193.7**

LRT Renewal Costs

5.7 LRT renewal costs were split into two distinct elements, shown in Table 5.2:

- General renewal of the infrastructure - set at 60% of the direct costs, excluding vehicles, with an allowance for indirect costs and mark-up only. This was applied using a uniform profile starting 15 years after opening day through to the end of the 60 year evaluation period.
- Fleet replacement of life expired LRVs at 30 years after opening (2050).

Table 5.2: Renewal Cost Estimates (2012 Prices)

Item	Infrastructure	Vehicles
Guideway	74.1	0.0
Bridges/Walls	9.5	0.0
Trackwork	96.3	0.0
Traction Power	38.5	0.0
S+T	67.3	0.0
Vehicles	0.0	214.4
MSF	42.3	0.0
Stops	10.7	0.0
Signage	2.2	0.0
Direct cost	**340.9**	**214.4**

Item	Infrastructure	Vehicles
Indirect cost	56.3	0.0
Risk and contingency	0.0	0.0
Other items	0.0	0.0
Mark-up	15.9	0.0
Total design and construction cost	**413.1**	**214.4**
Land	0.0	0.0
Management	0.0	0.0
Total project cost	**486.9**	**248.6**
Road maintenance cost savings	-18.8	0.0
Net capital cost of HLRT	**394.3**	**214.4**

Bus Capital Costs Savings

5.8 With the implementation of HLRT, there will be a reduction in buses required compared to the Do Minimum network. In reality, when buses become life expired, they could either not be replaced or be replaced and redeployed on other routes. The modelling work for evaluation purposes has not assumed that the buses will be redeployed, and that there will be bus capital cost savings compared to the Do Minimum.

5.9 It is estimated that a total of 50 and 62 buses will be saved in 2021 and 2031 respectively. Beyond 2031, it is assumed 62 buses will be saved every 10 years until the end of the evaluation period. These are assumed to cost $400,000 each in 2012 prices.

5.10 In addition to cost savings from a reduced bus fleet, a bus maintenance facility to accommodate these buses would no longer be required and a one off cost saving of $49.6m (2012 prices) in 2021 is assumed.

Incremental Operating and Maintenance Costs

5.11 The operation and maintenance of the LRT system will bring additional costs, but these will be off-set by reductions in bus operating costs.

LRT Operating Costs

5.12 Operating and maintenance costs cover all aspects of keeping the system running after opening day. It includes staffing, electricity, vehicle maintenance, track maintenance and other day-to-day costs. The input assumptions used in calculating the operating and maintenance are recorded in Table 5.3.

Table 5.3: LRT Operating and Maintenance Costs Assumptions

Item	Cost Assumption
Power	
Vehicles	7kWh/vehicle-km
Stations	12.3 MWh/stop/year
Maintenance and storage facility.	1,779 MWh/year
Electricity cost	2.9c/kWh
Maintenance and materials	

Item	Cost Assumption
Vehicle costs	66c/tonne-km/year
Tracks costs	31c/tonne-km/year
Vehicle loading	247,000,000 tonne-km/year
Power supply costs	$816/track-km/year
Signals and communications	$8,160/track-km/year
Stop maintenance	$4,080/stop/year
Revenue collection equipment	$6,120/stop/year.

5.13 Staff costs form the largest portion of annual operating costs. These were calculated by assessing the number of employees needed in each category and multiplying by expected salary. The total staff costs in 2012 prices are estimated to be $15.8m/year.

5.14 Costs for electrical power consumption and maintenance were calculated using the assumptions list in Table 5.3, while overheads were assumed to be 10% of all other costs. The overall annual LRT operating costs are set out in Table 5.4.

Table 5.4: Annual LRT Operating and Maintenance Costs

Item	Annual Cost (2012 $m)
Staff	15.8
Power	1.0
Maintenance and materials	2.6
Overheads	1.9
Total	21.3

Bus Operating Cost Savings

5.15 As described in previous sections, the introduction of LRT service will result in changes to the local bus network operated by Brampton Transit and MiWay. The overall effect will be to reduce the quantity of service required by an estimated 222,000 bus hours/year. This reduction in bus hours will result in a cost saving estimated at (in 2012 values) $15.7m at 2021 service levels and $19.2m at 2031 service levels, based on hourly rates supplied by the transit operators.

5.16 Given the level of bus operating cost savings, over 90% of the LRT's operating costs are regained through bus operating cost savings by 2031.

Incremental Revenues

5.17 The project is forecast to produce an increase in transit ridership due to mode shift from auto to transit, with a corresponding increase in revenue. The modelling process estimates the incremental change in revenues for local transit and GO Transit rail services in the 2031 AM peak period. The 2031 forecast incremental local transit and GO Transit rail revenues (in 2012 prices and values) are $6.6m and $4.5m respectively, a total of $11.1m, $703m over the 60-years of the project.

5.18 The local transit revenues reflect the assumed fare integration between HLRT and other local transit services, meaning that passengers who interchange only pay once. It also reflects the existing co-fare arrangements between GO Transit rail and MiWay and Brampton Transit.

Affordability and Financial Risks

5.19 A key consideration of the Financial Case is the affordability and risks for the project. These were not specifically considered in the 2014 BCA, and only high level consideration has been given to the financial risks, but not affordability in this updated document. This is an area of future development.

5.20 As stated throughout the report, cost estimates were produced in 2014 and quoted in 2012 prices. Risk contingency has been included in the forecasts, however project pricing remains the highest project risk. While the investment required for LRT is considerable, the ability to offset some future costs, in particular ongoing bus operating and maintenance costs and operating subsidy, helps increase the ongoing affordability of the project and reduces the financial risk.

6 Economic Case

Key inputs and assumptions

6.1 The evaluation of transportation impacts used the Higher-Order Transit (HOT) model. This model has been developed specifically for the HLRT project, focusing on Mississauga and Brampton, and thus enables the project to be evaluated at a robust and accurate level. It is more detailed than the regional Greater Golden Horseshoe Model (GGHM) typically employed by Metrolinx for evaluating projects in the region on a consistent basis.

6.2 The model provides forecasts on transportation benefits, ridership and revenue for the 2031 forecast year. These outputs of the model, including statistics such as the change in vehicle kilometres travelled, are used for this account. The values are annualised, and ramp-up, interpolation and extrapolation processes documented earlier is applied and presented as discounted 2012 present values (PV) for the 60-year evaluation period.

6.3 The model uses "generalised journey time" as a measure for accessibility, reflecting the perceived travel costs by passengers. For example, passengers prefer one minute of transit in-vehicle time compared to one minute of walking or waiting for transit, and the model has been calibrated according to observed passenger behaviour.

Transit User Benefits

6.4 The Hurontario-Main LRT is forecast to reduce journey times for existing transit users, generally by providing a faster service than existing bus routes along the corridor with its signal priorities at intersections. In some cases, higher service frequencies may result in lower wait times for transit users – both at the start of their journey and at any transfer points.

6.5 In addition to faster journey times, the LRT is expected to deliver more reliable journey times and regular headways for passengers through its dedicated right of way. LRT also has a higher perceived quality – with superior ride quality compared to conventional bus, real time information at stops and on board, and spacious carriages that accommodate passengers with buggies, wheelchairs, shopping or luggage.

6.6 The benefits are not limited to existing transit users. Where users switch modes from auto to transit, they generally have a change in their journey time and/or cost.

6.7 The changes in generalised journey time in the 3-hour AM Peak for existing and new transit users are an output from the model for 2031. The values are then annualised and monetised, and ramp-up, interpolation and extrapolation processes documented earlier are applied.

6.8 The transit user benefit is estimated at 82,300 generalised minutes in 2031 AM peak period. This equates to each of the 22,500 LRT boardings in the peak period having an average benefit per trip of 3.7 generalised minutes.

6.9 The transit user benefits are summarised in Table 6.1, which shows that the 60-year discounted present value of the transit user benefits is $937m.

Table 6.1: Transit User Travel Time Benefits (2031)

	Transit User Benefits
2031 AM Peak in minutes	82,300
2031 Annual total in hours	1.9
2031 Annual total value ($m)	$20.2m
Present Value Transit User Benefits ($m PV)	**$937m PV**

Auto User Benefits

6.10 The benefits to auto users from the introduction of the Hurontario-Main LRT fall into two categories: changes in travel times, and changes in vehicle operating costs. The increase in transit from the HLRT would be expected to reduce congestion, saving auto users time and money. Further, users who switch from auto to transit will save on vehicle operating costs.

6.11 However, a large proportion of the corridor will have a reduction in capacity for auto users. This will tend to increase congestion, and also increase travel times and distances from vehicles re-routing away from the corridor.

Auto travel time savings

6.12 Like the transit user time savings, the auto user travel time savings are derived from the model. The model outputs changes in journey times in the 3-hour AM peak for 2031.

6.13 The auto user travel time benefits are summarised in Table 6.2. The negative value for the travel time benefits indicates that average journey time increase, resulting in a disbenefit. This is because the time savings of reduced traffic through mode shift from auto to transit is outweighed by the reduced road capacity. Overall, the discounted present value of the auto user travel time disbenefits is $137m.

Table 6.2: Auto User Travel Time Benefits

Year	Auto User Time Benefits
2031 AM Peak in minutes	-16,000
2031 Annual total in hours	-0.3
2031 Annual total ($m)	$7.5m
Present Value Auto User Time Benefits ($m PV)	**-$137m PV**

Auto operating costs savings

6.14 Users who switch from autos to transit will save on vehicle operating costs. Those who continue to use autos will see change in auto operating costs, resulting from different trip pattern and

routings made as a result of changes in road conditions. The overall effect is assessed using the change in annual vehicle kilometres, which is derived from the model outputs.

6.15 The change in auto distance travelled is estimated at 10,100 vehicle kilometres in 2031 AM peak period. This is equivalent to 1,250 vehicles removed from the road in the peak period with an average trip length of 8km.

6.16 The auto operating costs are calculated by multiplying the change in vehicle kilometres by an average operating cost. The average operating cost is $0.571 per vehicle-km in 2012 prices, with a real growth rate of 2.0% p.a.

6.17 The vehicle operating cost savings are summarised in Table 6.3, which shows the net present value is $226m.

Table 6.3: Auto Operating Cost Savings

Year	Auto Operating Cost Savings
AM Peak reduction (vehicle-km)	10,100
Annual total (million vehicle-km)	14.4
Annual benefit ($m)	$12.0m
Present Value Auto User Time Benefits ($m PV)	**$226m PV**

Auto Safety Benefits

6.18 Auto use carries a higher risk of death or injury than transit use. Canada had 2,227 fatalities and over 11,000 serious injuries resulting from motor vehicle crashes in 2010[10], the most recent year for which detailed statistics are available. By contrast, the fatality and serious injury rate for transit users is effectively nil. Consequently, any reduction in auto usage will result in a safety benefit.

6.19 The safety benefit is monetised by taking the reduction in vehicle-km and multiplying it by a safety benefit rate of $0.075 per vehicle-km in 2012 prices. This rate assumed constant in real terms. The results are tabulated in Table 6.4, which shows the discounted present value is $21m.

Table 6.4: Auto User Safety Benefits

Year	Auto Safety Benefits
2031 AM Peak reduction (vehicle-km)	10,100
2031 Annual total (vehicle-km in millions)	14.2
2031 Annual benefit ($m)	$1.6m
Present Value Auto User Time Benefits ($m PV)	$21m PV

[10] Statistics Canada: Canadian Motor Vehicle Traffic Collision Statistics: 2010 **http://www.tc.gc.ca/eng/roadsafety/tp-1317.htm#2**

GHG Emission Benefits and Costs

6.20 The emission of greenhouse gases has a detrimental effect on the environment, and the monetary value of this effect can be calculated. This value was compiled from several literature sources, data from Transport Canada and Environment Canada, and from the values used in Metrolinx's Greater Golden Horseshoe Model.

6.21 After appropriate adjustments for inflation, the resulting value for GHG emission reductions was $0.011 per vehicle-km (in 2012 dollars). The result was scaled to reflect the bus and LRT greenhouse gas impacts. Over the 60-year evaluation period, the discounted total emissions savings is estimated at $4.2m in 2012 discounted present values.

Health

Active Transportation

6.22 A number of international studies have shown that improved transit encourages people to walk and cycle more compared to a car-based lifestyle. When people change their mode of transport from auto to transit, it typically requires additional walking between transit stops and their ultimate destination. Some may also choose to cycle to the nearest convenient transit stop to continue their journey.

6.23 It is assumed that the number of people who become new active transportation users is equal to the reduction in auto person trips (i.e. either driver or passenger) in the AM peak period as forecast by the transportation model; this is forecast at 1,987 per annum by 2031.

Health Benefits

6.24 In an article published in the American Journal of Preventive Medicine[11] researchers concluded that construction of a rapid transit system resulted in "increased physical activity (walking) and subsequent weight loss by people served by the LRT". In a review of the rapid transit in Charlotte, North Carolina researchers found that using LRT in this instance, resulted in reductions in body mass index equivalent to a relative weight loss of 6.45 lbs for a person who is 5'5". Rapid transit users were also 81% less likely to become obese over time.

6.25 These are but two examples of how active transportation can lead to material health benefits. The report Road to Health: Improving Walking and Cycling in Toronto, April 2012, sets out such health benefits in the context of the Greater Toronto region and how these benefits can be quantified. That approach has been adopted here to estimate the health benefits of HLRT.

6.26 In summary, these include:

- Welfare benefits to individuals and their social network due to:
  - Loss of life from reduced mortality
  - Loss of earnings from reduced mortality
  - Quality of life through reduction in illnesses
- Direct financial impact to the Government, including:
  - Direct medical costs; and

[11] http://www.ajpmonline.org/webfiles/images/journals/amepre/AJPM_Light_Rail_Usage_PR.pdf

- Loss of economic output due to short term absence from work.

6.27 Using the research provided in the Road to Health report, the estimated health benefits in dollars per new active user is set out in Table 6.5. The welfare benefits are associated with a permanent active lifestyle and are therefore one-off for each individual, while the cost to the Government is an annual cost.

6.28 It should be noted that some other health benefits have not been captured – such as reduction of stress and improvement of mental health.

Table 6.5: Health Benefit Rates per New Active User

Health Benefit	$ per new active user 2012 Prices
Welfare	
Reduced mortality - Loss of life	1,478
Reduced mortality - Loss of earnings	552
Reductions in illnesses	462
Direct Cost Saving to Government	
Direct medical costs (annual)	789
Short term absence from work (annual)	526
Total	**3,807**

6.29 These benefit rates assume that the new active user maintains his active transportation lifestyle over the course of his life. As such, the welfare benefit rates are applied to any new user that was previously an auto user. Direct cost savings to the Government is assumed to be incurred on an annual basis.

6.30 Based on the forecast number of new active transport users, the overall welfare and cost saving to the Government is $55.0m as set out in Table 6.6. This conservatively does not include further health benefits as a result of increased walking and cycling when urban realm improvements facilitated by HLRT are in place.

Table 6.6: Health Benefits over the Evaluation Period

Health Benefit	Benefit $m PV
Welfare	4
Direct Cost Saving to Government	51
Total	**55**

Safety and Security

Operating Safety Assessment

6.31 Statistics available from the United States Federal Transit Administration (FTA) to 2007[12] provide an insight into the relative levels of operating safety of different transit modes. In analysing this data, we considered three measures of safety, as follows:

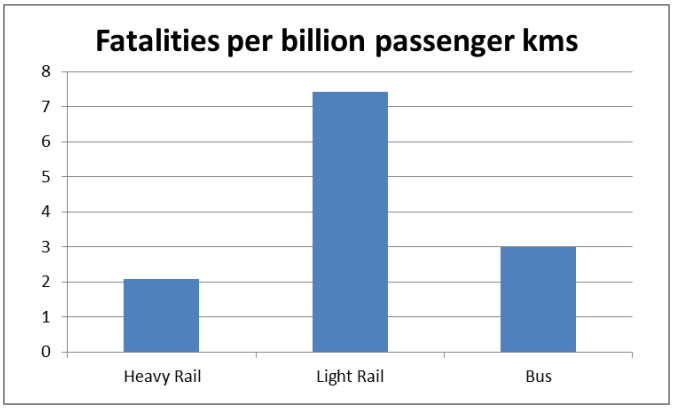
[12] Transit Safety and Security Statistics and Analysis (formerly SAMIS): **http://transit-safety.volpe.dot.gov/Data/Samis.asp**

- Annual fatalities per billion passenger kilometres;
- Annual injuries per billion passenger kilometres; and
- Annual collisions, derailments and running off the road incidents per million vehicle kilometres.

6.32 Figure 6.1, Figure 6.2 and Figure 6.3 show the performance of heavy rail, light rail and buses in the USA under these three measures averaged over a period between 2002 and 2007.

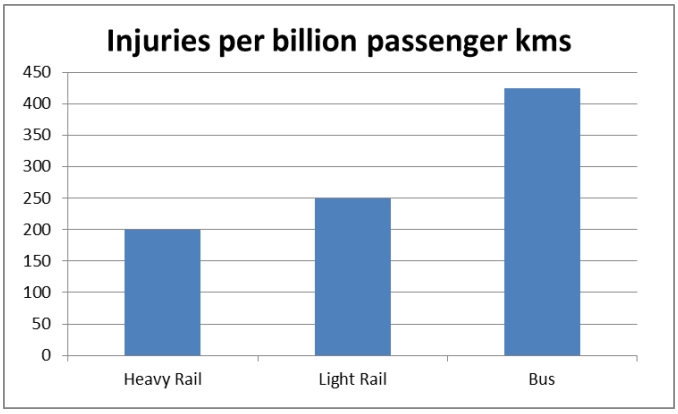
6.33 Although the historic injury rate on buses is higher than on light rail systems, the rates of fatalities and operational accidents are considerably lower. However, it is worth noting that most injuries and fatalities related to LRT systems are outside the vehicle and typically relate to other road users disobeying traffic control devices.

Figure 6.1: Fatalities per Billion Passenger Kilometres (USA, 2002-2007)



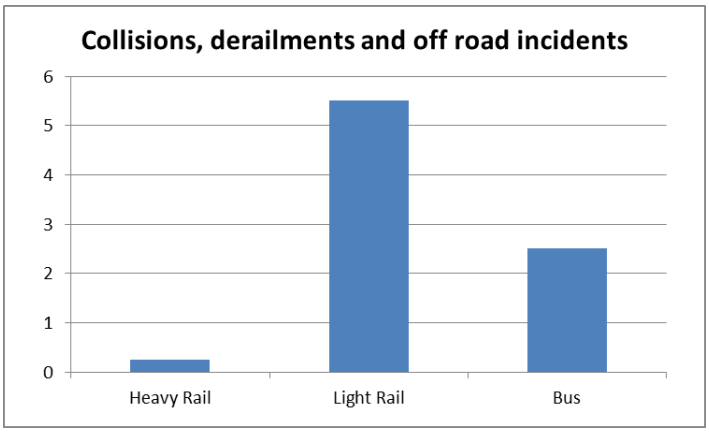
Source: US Federal Transit Administration

Figure 6.2: Injuries per Billion Passenger Kilometres (USA, 2002-2007)



Source: US Federal Transit Administration

Figure 6.3: Collisions, Derailments and Running Off the Road Incidents per Million Passenger Kilometres (USA, 2002-2007)



Source: US Federal Transit Administration

Safety Perception Assessment

6.34 There have been a number of studies into passenger personal safety perception in the USA and UK over the past decade, including quantitative and qualitative surveys by the UK Department for Transport (DfT) in 1996, 2002[13] and 2008[14] and a study of women's fear of transportation environments by the Mineta Transportation Institute in 2009[15].

6.35 The 1996 and 2002 DfT surveys consider the perception of safety of the following, in daylight and after dark:

- Waiting at bus stops, train stations and underground stations; and
- Travelling on bus, train and underground.

6.36 The surveys revealed that people perceived underground vehicles and stations as less safe than those above ground. This is discussed in the survey report, which states that

> "Subways and long flights of stairs are… often identified as places where people feel less secure, mainly because of a fear of entrapment, but also because they are also often poorly lit and dingy. Recesses and concealed corners, where another person could be hiding, also contribute to people's heightened sense of risk."

6.37 The features of vehicles and stops/stations identified[16] as important to passengers' feelings of security include:

---

[13] "People's Perceptions of Personal Security and Their Concerns About Crime on Public Transport": **http://webarchive.nationalarchives.gov.uk/+/http://www.dft.gov.uk/pgr/crime/ps/perceptions/researchfindings**

[14] "Experiences and perceptions of anti-social behaviour and crime on public transport": **http://webarchive.nationalarchives.gov.uk/20081230052355/http://www.dft.gov.uk/pgr/statistics/datatablespublications/trsnstatsatt/antisocialcrime**

[15] "How to Ease Women's Fear of Transportation Environments: Case Studies and Best Practice": **http://www.transweb.sjsu.edu/MTIportal/research/publications/documents/2611-women-transportation.pdf**

[16] **http://www.dft.gov.uk/webtag/documents/expert/unit3.4.2.php**

- Staff presence;
- CCTV coverage;
- Lighting of stops/stations;
- Proximity of stops and stations to the street;
- Visibility of stops and stations from the street;
- Help points on stops/stations and in vehicles;
- Real-time travel information in stops/stations;
- Cleanliness and general good condition of stops/stations and vehicles; and
- Landscaping features (design, plants, etc).

6.38 In the context of HLRT, the system will be designed to include a number of these features that enhance the perceived safety experienced by passengers.

6.39 The proposed HLRT may result in a slight increase in safety risk to unfamiliar road users during operations because of the specific traffic arrangements required. The improved stop and vehicle design has the potential to improve perceived safety and security for passengers.

Urban Realm

6.40 This criteria sets out the derivation and results of an estimation of the benefits which would result from applying a 'complete streets' approach to the design of the Hurontario-Main LRT corridor.

Literature Review

6.41 While there is a body of data supporting the health/fitness, safety and congestion reduction benefits of increased walking and cycling, it was found that a limited amount of work had been undertaken which explicitly quantifies the benefits of urban realm improvements for pedestrians and cyclists. Using the available evidence, it was found that the benefits could be divided among the categories of cycling facilities, walking facilities and trees.

Cycling Facilities

6.42 As summarized in the UK Department for Transport's "Transport Analysis Guidance on the Appraisal of Walking and Cycling Schemes" (2012), journey ambience benefits for cycling facilities relative to no facilities were developed by Hopkinson & Wardman (1996), and Wardman et al. (1997). These values were initially provided per minute of travel and have been adjusted assuming an average travel speed of 16km/hr.

Walking Facilities

6.43 "Valuing Walking: Evaluating Improvements to the Public Realm" (Heuman et al., 2005) uses stated preference research to examine how pedestrians value the walking environment. This paper focuses in particular on quality benefits and is also cited in the UK DfT TAG Guidance. The values provided below were used in the evaluation of the Strategic Walk Network in London.

Trees

6.44 "Western Washington and Oregon Community Tree Guide: Benefits, Costs and Strategic Planting" by McPherson et al. (2002) outlines the benefits and costs of planting trees with the objective of providing a tool for community decision making around tree programs. Of particular interest for

this review was the Guide's first research question: "What is the potential [of trees] to improve environmental quality, conserve energy and add value to communities?"

6.45 The document outlines a detailed methodology for determining these benefits and costs and concludes with a table that lists the breakdown for typical public and privately-owned trees of various sizes at 5-year intervals for 40 years after planting. This table breaks down the impact by energy, air pollution, hydrology and aesthetic/other benefits, as well as costs, and also provides a total average value per tree over a 40-year time horizon.

6.46 For this analysis the 40-year average value of aesthetic and other benefits was extracted for small and medium-sized publicly-owned trees. It is assumed that these benefits will translate to the southern Ontario context because they more general and are less dependent on climate-specific factors.

Summary of Literature Review

6.47 The values extracted from the literature for each type of urban realm improvement is provided in Table 6.7. Where required, values have been converted to $CAD2012 prices using average exchange rates for the evaluation year and inflation calculators for the respective currencies.

Table 6.7: Urban Realm Benefit Rates

Factor	Measures	Value ($CAD 2012)
Cycling Facilities		
On-road non-segregated cycle lane	Ambience- environmental quality, comfort, convenience	$0.20/km
Off-road segregated cycle track	Ambience- environmental quality, comfort, convenience	$0.46/km
Walking Facilities		
Street Lighting	Journey ambience impact	$0.07/km
Crowding	Journey ambience impact	$0.03/km
Curb Level	Journey ambience impact	$0.05/km
Information Panels	Journey ambience impact	$0.02/km
Pavement Evenness	Journey ambience impact	$0.02/km
Directional Signage	Journey ambience impact	$0.01/km
Benches	Journey ambience impact	$0.01/km
General		
Street Trees- small	Aesthetic/other benefit	$21.90/tree/year
Street Trees- medium	Aesthetic/other benefit	$29.12/tree/year
Street Trees- large	Aesthetic/other benefit	$51.80/tree/year

Quantum of Public realm users

6.48 Exposure to the public realm enhancements afforded by HLRT benefits those who live and work in the area, not just those who will use HLRT. On that basis, a broader approach to the in-scope catchment was made than the simple stop catchments outlined in paragraphs 6.72 et seq. This used a combination of 2006 walking and cycling trip data from the Transportation Tomorrow Survey (TTS) and 2031 corridor population and employment estimates from the HOT model using a constant 1km buffer along the corridor.

6.49 The number of walking and cycling trips made in 2006 in the Cities of Mississauga and Brampton was extracted from the TTS data and the number of daily trips was determined proportionate to the population and employment of each corridor segment. These values were then scaled to reflect growth in population and employment to 2031 (shown in Table 6.8) and scaled by an annualization factor of 300[17] to determine the number of annual walking and cycling trips. As shown in Table 6.9, average trip distances for each corridor segment were also derived from the TTS survey data which determined the number of kilometres walked and cycled per year.

Table 6.8: Forecast 2031 Population and Employment within 1km of the Corridor

Corridor Segment	Population, 2031	Employment, 2031
Steeles - 407	14,600	8,600
407 - 401	8,300	18,500
401 - 403	42,200	26,600
403 - Burnhamthorpe	33,400	27,500
Burnhamthorpe - Dundas	78,200	13,100
Dundas - QEW	25,300	13,100
QEW - Lakeshore	15,500	3,600
Total Corridor	217,500	111,000

Table 6.9: Average Trip Length (TTS, 2006)

Corridor Segment	Walking Trip Length (km)	Cycling Trip Length (km)
Steeles - 407	0.94	2.07
407 - 401	0.92	2.79
401 - 403	0.95	1.41
403 - Burnhamthorpe	1.08	6.8
Burnhamthorpe - Dundas	0.93	1.88
Dundas - QEW	0.9	1.4
QEW - Lakeshore	0.86	1.07

Table 6.10: Annual Walking and Cycling Trips and Distance Travelled

Corridor Segment	Walking Trips, 2031	Walking Km Travelled	Cycling Trips, 2031	Cycling Km Travelled
Steeles - 407	373,000	352,000	11,000	23,000
407 - 401	144,000	133,000	5,000	14,000
401 - 403	894,000	852,000	15,000	22,000
403 - Burnhamthorpe	495,000	533,000	48,000	323,000
Burnhamthorpe - Dundas	1,912,000	1,773,000	21,000	39,000
Dundas - QEW	749,000	674,000	5,000	7,000
QEW - Lakeshore	427,000	366,000	1,000	1,000

[17] A factor of 300 is considered reasonable to reflect active travel through the week and allowance for weekends across the year. TTS is undertaken during October and so is considered to reflect a reasonable annual average day, with active travel higher in the peak Summer period, but likely lower during the Winter period. Also, much of the benefit relates to walking, which is less susceptible to weather and seasonal variation.

Total Corridor	4,995,000	4,682,000	105,000	428,000

Future Corridor Character

6.50 Preliminary costs estimated for the corridor landscaping from PMA Landscape Architects were used to inform the development of a corridor character profile. Four corridor zone types are identified in this assessment which is set out in Table 6.11. These zone types were evaluated qualitatively and assigned values for each benefit factor identified in the literature review. The length of corridor which will be improved to the standard of each zone type is set out in Table 6.12.

Table 6.11: Corridor Zone Types by Benefit Factor

Benefits Factor	Urban-Typical	Urban-Enhanced	Greenway-Typical	Greenway-Enhanced
Street Lighting	3	3	3	3
Crowding	2	3	2	3
Curb Level	3	3	3	3
Information Panels	2	2	2	2
Pavement Evenness	3	3	3	3
Directional Signage	2	2	2	2
Benches	2	3	2	3

Quality Parameters: 0- Poor 1- Moderate 2- Good 3- Excellent

Table 6.12: Corridor Segment Length by Future Zone Type

Corridor Segment	Urban-Typical (km)	Urban-Enhanced (km)	Greenway-Typical (km)	Greenway-Enhanced (km)
Steeles - 407	1.01	0.58	0.5	-
407 - 401	1.06	0.46	1.33	-
401 - 403	1.46	1.07	1.19	0.44
403 - Burnhamthorpe	1.7	1.5	0.37	-
Burnhamthorpe - Dundas	0.7	0.11	0.74	0.11
Dundas - QEW	0.04	-	0.75	0.59
QEW - Lakeshore	0.59	0.27	1.25	0.13
Total Length	**6.56**	**3.99**	**6.12**	**1.26**

6.51 This preliminary estimate did not include cycling facilities, therefore the total of new on and off-road facilities were scaled according the length of each corridor segment. Proposed trees were also counted and assigned a size according to their planting location. It was assumed that street trees would be “small” in size while those planted on medians or adjacent to other roads are assumed to be “medium” in size.

Table 6.13: Corridor Segment by Future Cycle Lanes and Trees

Corridor Segment	On-Road Cycle Lane (km)	Off-Road Cycle Lane (km)	Trees- Small	Trees- Medium
Steeles - 407	1.46	0.27	331	47
407 - 401	1.99	0.37	524	157
401 - 403	2.9	0.54	657	69
403 - Burnhamthorpe	2.49	0.46	2483	46
Burnhamthorpe - Dundas	1.16	0.22	298	8
Dundas - QEW	0.96	0.18	196	50
QEW - Lakeshore	1.56	0.29	165	0
Total	**12.5**	**2.3**	**4654**	**377**

Existing Corridor Character

6.52 It was necessary to scale the benefits factors to reflect the future change from the existing corridor character. Therefore, an inventory was undertaken of the present corridor's urban realm. For this exercise representative cross-sections from each corridor segment were qualitatively evaluated using the same scale used for the corridor zones.

Table 6.14: Corridor Zone Types by Benefit Factor

Benefits Factor	Street Lighting	Crowding	Curb Level	Information Panels	Pavement Evenness	Directional Signage	Benches
Steeles- 407	1	1	1	0	1	0	0
407- 401	1	0	1	0	1	0	0
401- 403	1	2	1	0	1	0	0
403- Burnhamthorpe	1	2	1	0	1	0	0
Burnhamthorpe-Dundas	1	1	1	0	1	0	0
Dundas-QEW	1	1	1	0	1	0	0
QEW- Lakeshore	2	1	2	0	1	0	0

Quality Parameters: 0- Poor 1- Moderate 2- Good 3- Excellent

6.53 For cycling benefits and trees, only new infrastructure was included in the inventory, therefore it was not necessary to survey the existing conditions.

Evaluation

Walking and Cycling Benefit

6.54 For each segment of corridor the difference between the future zone type and the existing conditions was used to scale each walking benefit factor. This step was not necessary for the cycling benefit because only new infrastructure was considered.

Tree Benefit

6.55 The literature found a benefit per tree that was calculated on an annual basis, thus this was a straightforward calculation based on the number of trees in each segment.

Summary

6.56 The overall annual benefit was calculated at $0.828 million for all corridor segments. A breakdown of benefits by type and corridor segment is provided below.

Table 6.15: Summary of Urban Realm Benefits ($CAD 2012)

Corridor Segment	Cycling Benefit	Walking Benefit	Tree Benefit	Total Benefit
Steeles - 407	$5,000	$129,000	$9,000	$142,000
407 - 401	$3,000	$17,000	$16,000	$36,000
401 - 403	$4,000	$96,000	$16,000	$117,000
403 - Burnhamthorpe	$64,000	$61,000	$56,000	$180,000
Burnhamthorpe - Dundas	$8,000	$214,000	$7,000	$228,000
Dundas - QEW	$1,000	$84,000	$6,000	$91,000
QEW - Lakeshore	$0	$31,000	$4,000	$34,000
Total	**$85,000**	**$632,000**	**$114,000**	**$828,000**

Considerations

6.57 There are a number of considerations to take into account in this assessment of the benefits of urban realm improvements.

6.58 Firstly, walking and cycling trips are generally underrepresented in the TTS survey data due to the propensity for survey respondents to 'forget' smaller trips such as walking to the store but accurately reporting commute trips via other modes. On that basis, a conservative 20% uplift has been applied.

6.59 Further, the existing urban realm along the Hurontario-Main LRT corridor is not conducive to encouraging walking and cycling trips. It is expected that streetscape improvements and increasing the variety of land-uses along the corridor will significantly increase trips by active modes over and above what is expected due to population and employment growth alone. Based on analysis of TTS data across the region (notably the City of Toronto) and the spread of walking and cycling trip rates, an uplift factor of 50% has been applied to the derived quantum of walking and cycling trips. 'Rule of a half' is then applied to the benefits from new users.

6.60 In addition, the value of the urban realm would be expected to increase in line with growth in the value of time (1.64% p.a.). Applying these uplifts gives an estimated $1.7m per annum in urban realm benefits in 2031 in 2012 prices. Over a 60-year evaluation period, this is worth $41m in 2012 present values.

Net Present Value

6.61 The capital, operating and renewal costs of the HLRT system and associated cost reductions in the bus system, along with the revenue impacts of HLRT, were set out in the Financial Case. The Economic Case combines these with the monetised benefits of the project to derive a Net Present Value and Benefit:Cost ratio.

6.62 The Economic Case applies a 1% p.a. real inflation to costs and revenues to 2031, with 0% thereafter. The discount rate applied to derive 2012 Present Values is 3.5%.

Present Value Costs

6.63 The HLRT capital cost spend profile is assumed as follows:

- 10% in 2015 and 2016;
- 20% in 2017;
- 25% in 2018 and 2019; and
- 10% in 2020.

6.64 The project is assumed to open in 2020, with full operating costs incurred from that year. A ramp up is applied to benefits and revenues for the first three years (60%, 75%, 90%).

6.65 The total life cycle costs are summarised in Table 6.16, showing that the total present value cost (PVC) is $884m. Negative values indicate savings in costs.

Table 6.16: Summary of Life Cycle Cost ($M in 2012 Present Values)

Item	Present Value Cost ($m)
LRT Capital Costs	1,038
LRT Renewal Costs	184
LRT Operating Costs	496
Bus Capital Cost Savings	-96
Bus Operating Cost Savings	-428
Incremental Revenues - Local Transit	-154
Incremental Revenues - GO Transit rail	-104
Healthcare and Productivity Savings	-51
TOTAL PRESENT VALUE COST (PVC)	**884**

Present Value Benefits

6.66 The present value benefits are summarised in Table 6.17, which shows the total present value benefit (PVB) is $1,096m.

Table 6.17: Summary of Life Cycle Benefits ($M in 2012 Present Values)

Item	Present Value Benefit ($m)
Transit User Time Savings	937
Auto User Time Savings	-137
Auto Safety Savings	21
Auto Operating Cost Savings	226
Emission Savings *(see Chapter 9)*	4
Urban realm *(see Chapter 11)*	41
Health - Quality of Life *(see Chapter 11)*	4
TOTAL PRESENT VALUE BENEFITS (PVB)	**1,096**

Net Present Value and Benefit:Cost Ratio

6.67 As shown in Table 6.18, the difference between present value costs and present value benefits, the net present value (NPV), is $212m. The benefit:cost ratio (BCR) is 1.24:1, demonstrating that the monetised benefits are greater than the monetised costs.

Table 6.18: Net Present Value and Benefit:Cost Ratio

Item	Present Value $m PV
Present Value Costs (PVC)	884
Present Value Benefits (PVB)	1,096
Net Present Value (NPV = PVB-PVC)	**212**
Benefit:Cost Ratio (BCR = PVB/PVC)	**1.24:1**

Economic Impacts of HLRT

Economic Impacts of Construction

6.68 It should be noted that the analysis presented here is based on the Metrolinx Benefits Case Analyses Report 2010 for this project. The economic development impacts during construction and operations were originally based on the Statistics Canada's input-output economic model which employed cost and benefits assumptions underpinning the BCA. The economic impacts have been updated in line with the latest construction costs and project benefits.

6.69 The implementation of the HLRT project will generate both direct (from construction) and indirect (from suppliers) economic benefits that are temporary in nature and span the schedule of construction.

6.70 As shown in Table 6.19, the construction is estimated to create 6,210 person-years of employment in total, leading to over $239m of wages. Overall, HLRT delivers up to $529m in GDP output for the region.

Table 6.19: Economic Impacts of Construction

Impact During Construction	Direct Impacts	Regional Impacts	Total
Employment (person years)	4,000	2,210	**6,210**
Wages ($m 2012 prices)	154	85	**239**
GDP ($m 2012 prices)	340	189	**529**

Economic Impacts of Long-term Operation

6.71 In the long-term there will be ongoing economic benefits as a result of the HLRT project. These benefits reflect both households' freed up vehicle operating expenditures and transportation cost savings to area businesses. The former effect is simply a redirected consumption demand by households away from purchases of gas, parking, automotive parts and services and into other consumer goods/services.

6.72 The latter reflects improved regional competitiveness for local businesses that now have lower costs of doing business; including access to a larger labour market and encountering less congestion on roadways because people are choosing to use the transit system instead of driving.

6.73 The impact of HLRT will be different for each business. Implementation of the project will also generate social benefits that can be monetized, including valuing time savings and emission benefits. These have already been captured above under transportation user benefits.

6.74 As shown in Table 6.20 the project is also expected to have an on-going and positive impact on jobs, wages and the GDP once it is in operation. HLRT is estimated to create around 211 person-years of employment. In terms of wages, this is worth nearly $8.1m in total, with HLRT delivering some $18m in GDP output for the region.

Table 6.20: Economic Impacts During Operations (Per Annum)

Impact During Operations	Direct Impacts	Regional Impacts	Total
Employment (person years)	149	62	**211**
Wages ($m p.a.)	5.6	2.6	**8.1**
GDP ($m p.a)	12.7	5.3	**18**

Land Value Uplift

6.75 There is evidence from a number of different jurisdictions around the world that investment in rapid transit can have a positive impact on property values in the general area of a new rapid transit line and particularly within close proximity to station areas. This evidence also suggests that the specific rapid transit technology is also a determining factor in the degree to which property values may be influenced. For example, a more permanent, rail-based, higher capacity technology such as LRT will typically capture a larger area of property within their area of influence than lower capacity bus-based transit facilities.

6.76 The catchment area around each at-grade LRT stop is typically 500 metres. As shown in Table 6.21, the introduction of rapid transit will provide a modest lift in percentage terms to land values within the applicable area of station impact.

Table 6.21: Property Value Uplift Factors

	Residential	Commercial
Low Scenario	2%	2%
High Scenario	4%	4%

6.77 Based on the ranges of value uplift found in research studies reviewed for this analysis, land uses along the proposed HLRT route and the current property value data obtained from the cities of Mississauga and Brampton, the potential land/property value uplift was estimated. Land value uplift is calculated by multiplying the percentage of value uplift typical for each land use by the total assessment of lands within station areas in each land use category.

6.78 The results presented here are based on the analysis undertaken in the Metrolinx Benefits Case Analyses Report 2010 for the previous project scope to downtown Brampton. Given the uncertainty in the values evidenced by the use of a range, these have *not* been adjusted for the reduction in corridor length. A simple pro-rata adjustment would imply values 13% lower.

6.79 As shown in Table 6.22, the potential uplift in assessment value arising from HLRT is in the range $200 million to $420 million.

Table 6.22: Property Value Uplift

	Property Value Uplift ($m)
Low Scenario	200
High Scenario	420

7 Deliverability and Operations Case

Overview

7.1 This case covers the following criteria:

- Impacts during construction;
- Constructability;
- Project Management;
- Delivery Strategy (Procurement, Capacity and Risk Allocation)
- Operating Strategy (Service Provider, Capacity and Risk Allocation)
- Governance, Organisational Structure and Roles;
- Intervention Implementation Plan;
- Approval Requirements and Milestones
- Communications and Stakeholder Relations;
- Risk Management and Contingency Arrangements; and
- Monitoring, Evaluation and Benefits Realisation Plan

7.2 Given the current stage of development, the focus in this BCA update has been to provide high level commentary for the first two criteria (impacts during construction and constructability). For the remaining criteria, development of the project approach to these areas is ongoing and will be reported in future BCA updates.

Impacts during Construction

General Construction Staging

7.3 The Hurontario-Main LRT system is anticipated as being constructed using a phased approach including a high likelihood of utility relocation contracts in advance of the main contract. Likely third party utilities (telecommunication, gas, oil etc.) may be included in 'early works' contracts. Similar systems have broken the alignment into zones and had multiple zones under constructions at any given time.

7.4 Construction in each zone will be sequenced. Typically as work commences in each area of the alignment, consisting of several blocks of roadway, the construction team's work will be staged within each area to provide constrained access along the route.

7.5 There are various options regarding staging that are available. The specific construction techniques and detailed related to specific means and method including but not limited to: equipment, number of zones, length of areas to be effected, and duration of impact will be at the

discretion of the awarded contractor within bounds established by the authority having jurisdiction.

Impacts on Businesses, Residences; and Institutions

7.6 In areas where businesses front directly onto the alignment the business will be impacted by constraints to both car access and vehicular access. The construction team will be required to maintain pedestrian access to business frontages. While construction is ongoing both individual businesses and local business associations may need to develop concerted communication and marketing efforts to ensure that existing and potential patrons are aware of that their business is still open and what their offerings are. Local businesses will have minimal ability to rely on impulse walk-in patronage.

7.7 Similarly access will be constrained to residential areas; however, it cannot be cut off. Other facilities which will need specific plans to maintain access include:

- Trillium Health Centre – Queensway Health Centre
- Brampton (Station 206) and Mississauga Fire Halls (Stations 101 and 110)
- Peel Regional Police – 22 Division Station
- Various schools and colleges

Impact of Noise & Vibration

7.8 During the construct there will be significant use of heavy equipment for all aspects of the works. As such the equipment will induce a certain level of vibration on the neighbouring structures. As part of the overall construction effort the construction team will be required to undertake preconstruction surveys of neighbouring properties to assess existing building conditions.

7.9 During the construction the contractors will need to maintain a well managed and documented noise and vibration monitoring program in order to keep within mandated vibration limits. At the end of the construction a verification of vibration impacts will be required and if damage is assessed as a result of excess vibration compensation paid to affected property owners.

Impacts on Traffic

7.10 During construction the project will produce local traffic issues. In the areas under construction traffic will be constrained as lanes are taken out of service with full road closures required for certain operations. During the period of construction the construction team should be required to develop a concerted traffic management plan in order to mitigate the impact of construction. One key difference in the LRT construction versus other road construction is that at the end of the construction period, with the exception of Mineola, the lane reductions experienced in construction will be made permanent. Overall, the impacts from the construction of HLRT is assessed as slight adverse.

Constructability

7.11 The Hurontario-Main LRT system is a conventional Urban Style Light Rail Transit system to be constructed at grade. The track construction methodology, and vehicle and signal control systems, are typical to other installations in service in North America, and around the world.

7.12 In terms of construction the primary areas of risk to the project which have a higher likelihood of cost increase or delay are related to crossings of controlled access highway structures, rail structures and the implementation of advanced multi check in Transit Signal Priority systems. The crossing of structure, although not unconventional has risks inherent to the condition of existing structures and the ability of the construction team to co-ordinate an approved schedule for the staging of construction works to support the overall construction effort.

7.13 The implementation of advanced multi check in Transit Signal Priority systems, has an inherent risk as it is a developing technology. Systems exist which employ the intelligent tracking of vehicles and modification of signal times to address vehicle movement, but the implementation of this maturing technology will place challenges when the system is being commissioned.

7.14 The other area of implementation risk is the proposed use of on board power systems to permit the removal of overhead wires through challenging areas. These systems do exist in service, but vehicle manufacturers will have to carry out additional analysis and provide service guarantees as part of procurement, and an extensive program of testing and commissioning will be required prior to placing the vehicles into revenue service. Overall, the qualitative assessment for constructability is moderate beneficial.

8 Summary

8.1 The MAE summary is set out in Table 8.1. Unless otherwise specified, monetised impacts are for the 60-year evaluation period, discounted at 3.5% per annum to 2012 present values.

Table 8.1: MAE Summary Table

Case / Account	Assessment
Strategic Case	
Incremental Transit Ridership (m trips in 2031)	2.9m
Accessibility - catchment within 800m of LRT in 2031	Population: 100,700 Employment: 58,800
Transit Mode Share	Increases from 24% to 49% along corridor
Integration with other modes	✓✓
Land use shaping	✓✓✓
Goods Movement Impacts	×
Change in 2031 Vehicle Kilometres Travelled	-14.4 million vehicle-kms
Road Network Impacts	×
GHG Emissions	3,964 tonnes in 2031
CAC Emissions (Tonnes in 2031)	CO: -21 tonnes, NOx: 5.6 tonnes, SO2: 77 kg
Financial Case	
LRT Capital Costs (2012 prices and values)	$1,194m
LRT 60-year Renewal Costs (2012 prices and values)	$609m
Bus 60-year Capital Costs (2012 prices and values)	-$194m
LRT 60-year Operating and Maintenance Costs (2012 prices and values)	$1,281m
Bus 60-year Operating and Maintenance Costs (2012 prices and values)	-$1,131m
60-year Incremental Revenues (2012 prices and values)	$703m
Economic Case	
Transit User Benefits – Time savings, reliability and quality (PV $m)	$937m
Auto User Benefits (PV $m)	-$137m
Auto Operating Cost Savings (PV $m)	$226m
Auto Safety Benefits (PV $m)	$21m
GHG Emissions (PV $m)	$4m

Case / Account	Assessment
Capital and Renewal Costs (PV $m)	$1,126m
Incremental Operating and Maintenance Costs (PV $m)	$67m
Incremental Revenues (PV $m)	-$258m
Incremental Operating Subsidy (2012 $m in 2031)	-$5.4m
Health – welfare	$4m PV
Health – quality of life and healthcare costs	$51m PV
Urban Realm	$41m PV
Present value Costs	$884m
Present value Benefits	$1,096m
Net Present Value	$212m
Benefit:Cost Ratio	1.24:1
Total Direct and Regional Economic Impacts	During Construction / Long Term pa
Employment (person years)	6,210 / 211
Wages ($2012m)	239 / 8.1
GDP ($2012m)	529 / 18
Development Potential/ Land Value Uplift ($m)	$200m-420m
Deliverability and Operations Case	
Impacts During Construction	×
Constructability	✓✓
Project Management	n/a
Delivery Strategy (Procurement, Capacity and Risk Allocation)	n/a
Operating Strategy (Service Provider, Capacity and Risk Allocation)	n/a
Governance, Organisational Structure and Roles	n/a
Intervention Implementation Plan	n/a
Approval Requirements and Milestones	n/a
Communications and Stakeholder Relations	n/a
Risk Management and Contingency Arrangements	n/a
Monitoring, Evaluation and Benefits Realisation Plan	n/a

9 TOD-Style Land Use Sensitivity Analysis

Introduction

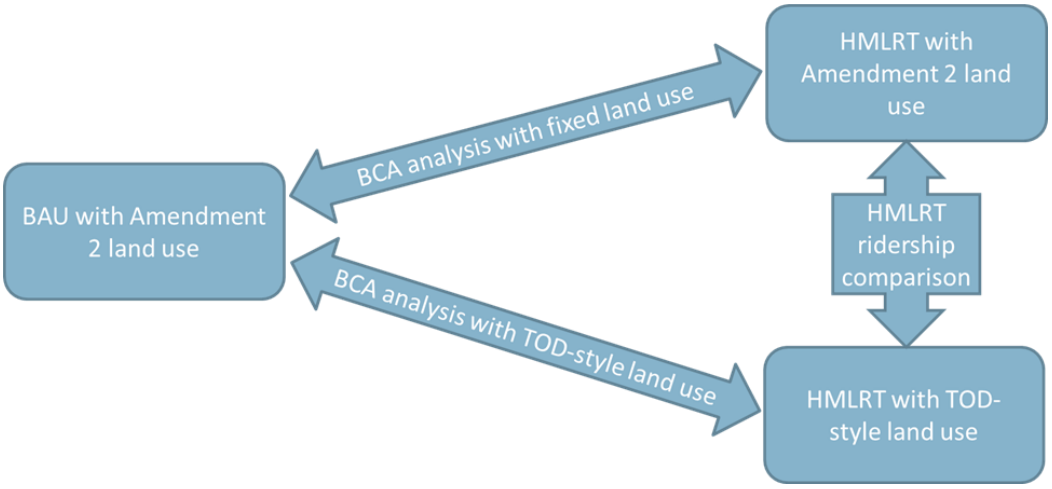
9.1 As part of the BCA optimisation analysis, an alternative land use test has been undertaken for the project to understand how the ridership and case for HLRT may be impacted by the forecast 2031 land use adopting a more transit-oriented development (TOD) pattern with HLRT in place. The increase in residents living adjacent to the HLRT and the clustering of new job opportunities is consistent with the vision for the HLRT corridor as set out in the initial HLRT Corridor Master Plan. As such, it could arguably be considered as the "central case" for the HLRT project.

9.2 This sensitivity has not been undertaken in the HOT model as it was not available, but an estimate was made using the TOD-style land sensitivity test undertaken for the full Port Credit to downtown Brampton project. It is considered that this approach is valid as the land use changes for this test only changed as far as Nanwood – near the termination point of the LRT at Steeles.

9.3 The demand matrices from the TOD test of the full project were assigned to the project option terminating at Steeles.

9.4 The TOD-style land use test has retained the overall totals for population and employment by city noted in Table 1.2, redistributing the growth to 2031 more along the HLRT corridor and less elsewhere in the respective cities. The Do Minimum, against which HLRT is compared for ridership and BCA impacts, retains the original land use distribution. Figure 9.1 illustrates how the comparison between the Do Minimum and the HLRT tests to undertake the BCA analysis is made.

Figure 9.1: Test Comparisons for Land Use BCA Analysis



9.5 Data for the TOD-style land use test was supplied by the cities of Mississauga and Brampton. The key changes include intensification in downtown Mississauga and around the Gateway Terminal in Brampton, a Metrolinx designated Gateway mobility hub, planned to integrate Rapid Transit and local bus service. In support, Brampton have a secondary plan for the area (the Hurontario-Main Corridor Secondary Plan, SPA55), which aims to densify land use in the area to provide TOD-style land use in support of HLRT. The resultant changes in population and employment distribution are illustrated in Figure 9.2 and Figure 9.3 respectively.

Figure 9.2: Change in Population Distribution with TOD-style Land Use

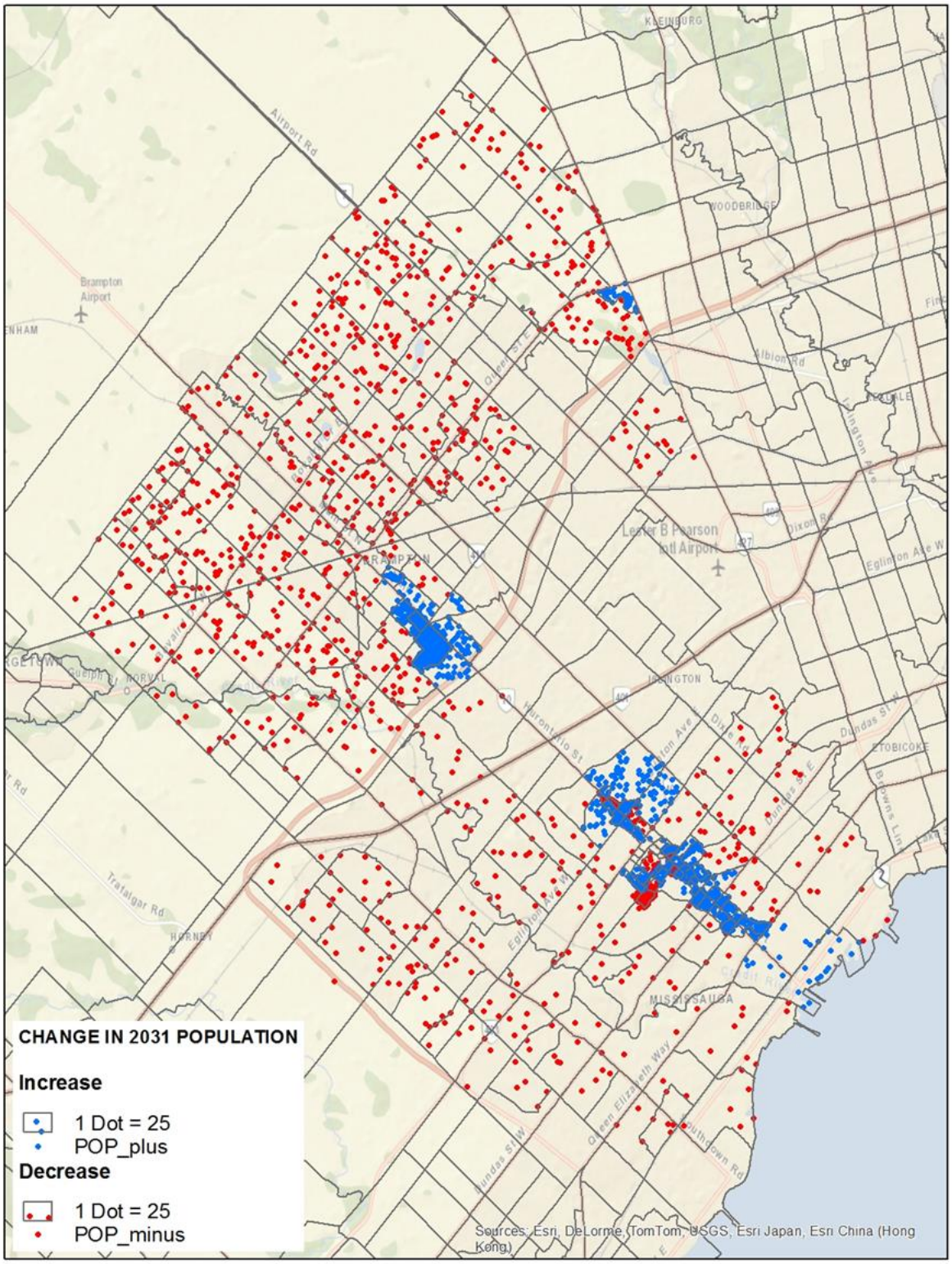
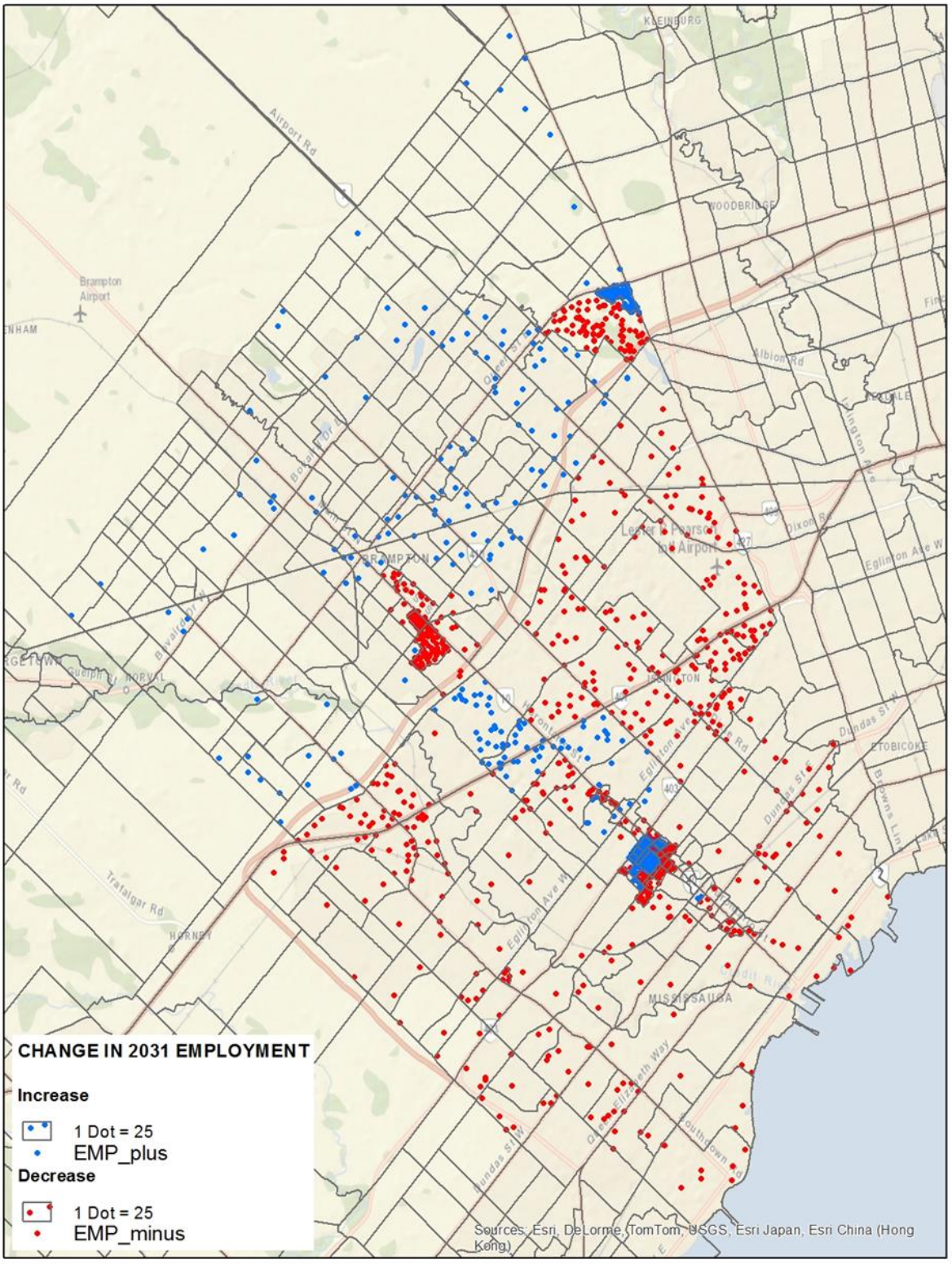


Figure 9.3: Change in Employment Distribution with TOD-style Land Use



9.6 The population density increases around Gateway Terminal in Brampton and in much of the HLRT corridor south of the 401 highway. To compensate, population distribution across the remainder of Mississauga and Brampton see a modest reduction in order to maintain the City wide control totals. The change in employment sees a similar pattern, but with the Gateway Terminal area seeing a reduction in employment as the land use is rezoned to housing use. (Note that the apparent anomaly at the eastern border of Brampton with York Region is due to a reallocation of land use data between adjacent zones and not a net change; no material impact on the BCA analysis will occur.)

9.7 The land use changes in the HLRT corridor (1km either side) by section is summarised in Table 9.1. The distribution of the changes reflects the pattern set out above, with the Brampton sections of the corridor experiencing gains in population, but modest reductions in employment. In Mississauga, population increases in all but one section, with employment increases concentrated around the downtown area (403 – Burnhamthorpe). The overall increase in population and employment along the corridor is modest, with a 7% increase.

Table 9.1: TOD-Style Land Uses in the HLRT Corridor

	Population		Employment	
	Original	TOD-style	Original	TOD-style
Steeles - 407	14,600	23,300	8,600	6,800
407 – 401*	8,300	8,400	18,500	18,800
401 - 403	42,200	44,500	26,600	26,400
403 - Burnhamthorpe	33,400	34,700	27,500	38,600
Burnhamthorpe - Dundas	78,200	76,800	13,100	11,700
Dundas - QEW	25,300	28,300	13,100	12,700
QEW - Lakeshore	15,500	15,900	3,600	3,500
Total	**217,500**	**231,900**	**111,000**	**118,500**
% change		7%		7%

* Includes a portion of residential units west of Fletchers Creek (Zone 1520).

BCA evaluation

9.8 This section provides a summary of the economic case for the TOD-style land use scenario. It does not represent a full BCA analysis; rather it focuses solely on the monetised costs and benefits of the project, culminating in a Benefit:Cost ratio.

9.9 A HOT model run for the full HLRT project has been used to estimate the benefits of adopting the more transit-oriented development pattern with HLRT in place. Along with estimates of capital and operating costs for the HLRT project, they form the inputs to the BCA assessment.

9.10 The only change made to the specification of the HOT model run was the TOD-style land use. All network assumptions remain unchanged.

Capital and operating costs

9.11 Capital and operating costs are unchanged; these are set out in Chapter 5.

Ridership impacts

9.12 The forecast AM Peak HLRT ridership is summarised in Table 9.2. The increase in HLRT ridership is consistent with the additional land use in the corridor, with ridership increasing 8%. Annual demand increases to 34.4m from 31.9m.

Table 9.2: 2031 AM Peak Ridership with TOD-Style Land Use

HLRT service	TOD-style land use	Amendment 2 land use	% change
Mississauga-Brampton	11,700	10,700	9%
Port Credit – Mississauga	12,500	11,800	6%
Total	24,200	22,500	8%
Annual	34.4m	31.9m	8%

9.13 The resulting 2031 AM peak hour demand profiles for the two HLRT routes are shown in Figure 9.4 for the northern route between Steeles and downtown Mississauga and Figure 9.5 for the southern route between Port Credit and downtown Mississauga. The peak load remains southbound on the section between Steeles and the 407, with the load level increasing by 15% to 1,900 in the AM peak hour.

Figure 9.4: Brampton – Downtown Mississauga Demand Profile with TOD-Style Land Use

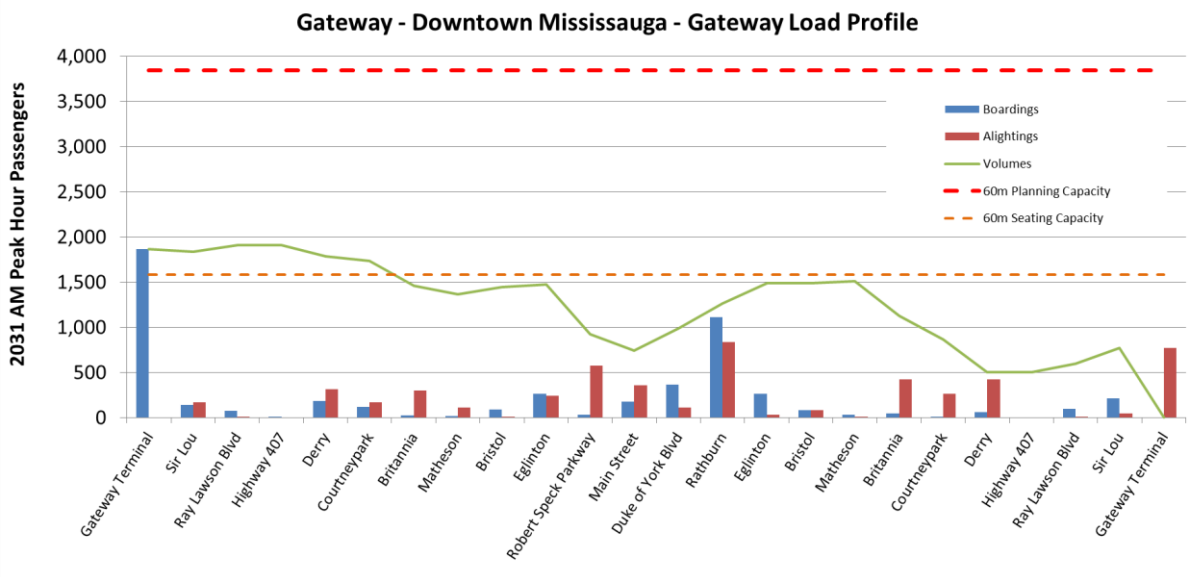
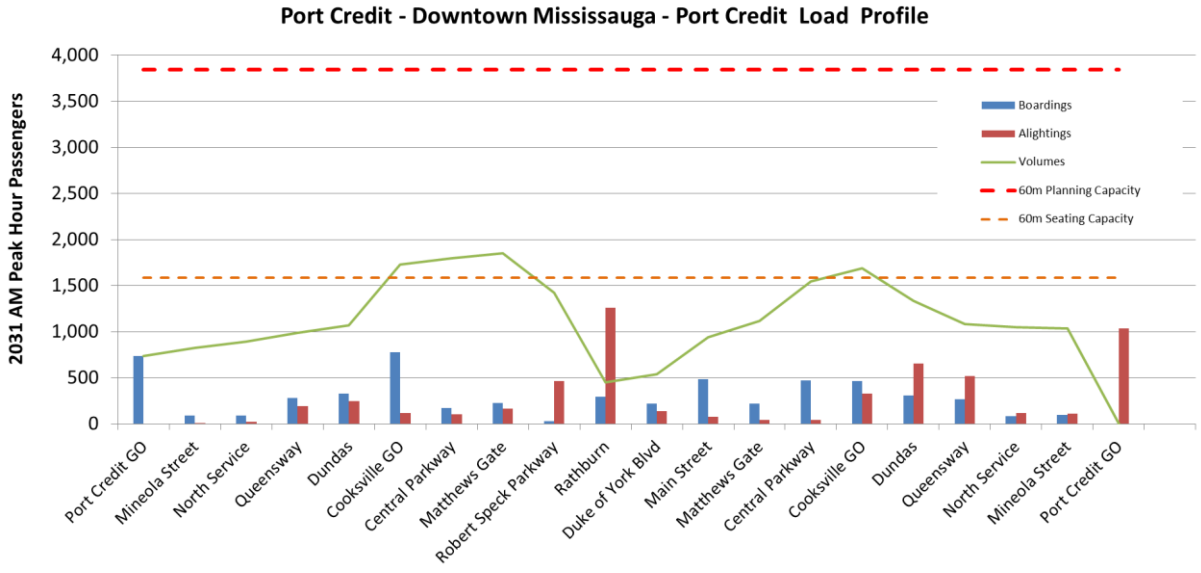


Figure 9.5: Port Credit – Downtown Mississauga Demand Profile with TOD-Style Land Use



9.14 The use of TOD-style land use has wider implications for trip patterns and mode across Peel and the wider GTHA than simply adding HLRT and assuming fixed land use. Table 9.3 shows the change from the Do Minimum in transit, auto person and auto vehicle trips for the standard Amendment 2 land use test and the TOD-style land use test. The TOD-style land use test has a bigger impact, with transit demand increasing 43% and auto use increasing (95% for person trips and 147% for vehicles). These changes will feed directly into changes in transit revenue and auto related benefits (notably auto operating costs) respectively.

Table 9.3: Change in Transit and Auto Trips from Do MInimum with TOD-Style Land Use

	TOD-style land use	Amendment 2 land use	% change
Transit	2,937	2,060	43%
Auto (person)	3,878	1,987	95%
Auto (vehicles)	3,127	1,264	147%

Benefit:Cost (BCR) analysis

9.15 The monetised benefits encompass changes in transit and highway user time, along with more modest benefits around urban realm, health and emissions. All the benefits are derived from the forecast ridership impacts and associated changes in transit and car use, with the exception of urban realm which is unchanged from the main BCA analysis.

9.16 The BCR analysis is shown in Table 9.4. On the cost side, the capital and operating costs are unchanged from the main BCA analysis. The increased transit use resulting from the TOD-style land use increases transit revenues and healthcare and productivity, reducing the net project cost by some 21%.

9.17 Journey time benefits to transit and auto users increase very modestly, essentially because the journey times on the network are not materially affected by the change in land use. The largest impact to benefits arises from the larger reduction in car usage as there is less travel by auto and hence vehicle kilometres travelled on the highway network, doubling or more the benefit items related to this (safety, auto operating costs, emissions and health).

9.18 Overall, the benefits increase 38%. The resulting BCR for the TOD-style land use test is 2.18:1, a material increase from the full project BCR of 1.24:1.

Table 9.4: HLRT TOD-Style Land Use BCR Analysis

$m in 2012 Present Values and Prices	TOD-style land use	Amendment 2 land use	% change
Costs			
LRT Capital Costs	1,038	1,038	0%
LRT Renewal Costs	184	184	0%
LRT Operating Costs	496	496	0%
Bus Capital Cost Savings	-96	-96	0%
Bus Operating Cost Savings	-428	-428	0%
Incremental Revenues - Local Transit	-254	-154	65%
Incremental Revenues - GO Rail	-144	-104	39%
Healthcare and Productivity Savings	-100	-51	95%
TOTAL COSTS (PVC)	695	884	-21%
Benefits		0	
Transit User Time Savings	987	937	5%
Auto User Time Savings	-139	-137	1%
Safety Savings	52	21	147%

Auto Operating Cost Savings	560	226	147%
Emission Savings	9	4	105%
Urban realm	41	41	0%
Health - Quality of Life	7	4	95%
TOTAL BENEFITS (PVB)	**1,518**	**1,096**	38%
Net Benefit (NPV)	**823**	**212**	289%
BENEFIT:COST RATIO (BCR)	**2.18:1**	**1.24:1**	

Conclusions

9.19 The assessment covered by this section provides an initial perspective on the potential benefits that an integrated strategy of investment in HLRT and coordinated policies to encourage Transit Oriented Development can realise. The results highlight a material improvement in the case for the HLRT project and demonstrate the value of the HLRT/Complete Streets/TOD future for the corridor as envisaged in the HLRT Corridor Master Plan, and developed through the PDE/TPAP stages of HLRT project development. The approach is also consistent with wider regional/provincial and Metrolinx goals for rapid transit to support sustainable growth policies in the GTHA. Given the increases in new residents and jobs within the HLRT stop catchments are relatively modest (7%), the case for HLRT could be further strengthened with further TOD intensification to fully exploit the city-shaping potential of the HLRT project.

steer davies gleave

Appendices

A Expanded Policy Context

Policy Context Review

A.1 The Context Review includes an in-depth appraisal of policy documents and reports from various levels of government that were available in 2012 and that impact the original extent of the proposed LRT, namely the Hurontario-Main corridor. Therefore none of the documents reviewed reflect subsequent policy changes, notably the City of Brampton Council's decision of October 2015 to not support the LRT north of Steeles to downtown Brampton.

A.2 Documents were reviewed from the following sources:

- Province of Ontario;
- Region of Peel;
- Metrolinx;
- City of Brampton;
- City of Mississauga; and
- Previous Hurontario/Main Street Corridor project documents.

A.3 This review will assess and understand previous work which has taken place and to determine current and future goals, objectives and targets which may impact the Hurontario/Main Street Corridor.

Province of Ontario

Places to Grow: Growth Plan for the Greater Golden Horseshoe (2006)

A.4 This document was created by the Province to guide the growth of the region through 2031. A major component of this plan is the creation of a multi-modal transportation network to support the intensification of existing built-up areas and maximize the use of existing infrastructure in the GGH. The plan designates the Hurontario/Main Street corridor as a proposed Higher Order Transit Corridor connecting two Urban Growth Centres - Downtown Brampton, and Mississauga City Centre.

A.5 Centred on the Hurontario/Main Street Corridor, the Urban Growth Centres will be focal areas for investment in public services, accommodate and support major transit infrastructure, and serve as high density major employment centres. There is a target of at least 200 residents+jobs per hectare for these areas

Metrolinx

The Big Move (2008)

A.6 In order to manage the growth predicted in Places to Grow, Metrolinx created The Big Move Regional Transportation Plan, adopted in November 2008, which sets out many goals to improve the state of transportation across the Greater Toronto and Hamilton Area. The most notable of these is the construction of a "comprehensive regional rapid transit network". HMLRT was reconfirmed as a priority Next Wave project in the 2013 Investment Strategy[18].

A.7 The Big Move recognizes the Hurontario/Main Street Corridor between Port Credit in Mississauga to Downtown Brampton as a top priority corridor for the implementation of rapid transit within the next 15 years. Further, it identifies five Mobility Hubs (key intersections of the regional rapid transit network) along the corridor which provide access to important local and regional transit destinations.

Region of Peel

Peel Region Official Plan (1996 and subsequent amendments)

A.8 The Peel Region Official Plan emphasizes the integration of land use and transportation planning to create complete communities that are well serviced by multi-modal transportation systems. Key transportation principles/guidelines set out in the Peel Region Official Plan and which are relevant to this study include:

- Bringing together land use, transportation investment, and transportation planning that considers all modes of travel, with a focus on moving people by travel modes other than private automobile;
- Increasing travel choice to meet the diverse needs of the Region by developing a sustainable funding source for a multi-modal transportation system;
- Promoting and encouraging the use of public transportation and/or other modes that are financially and environmentally appropriate; and
- Working with the Provincial government and other surrounding municipalities to identify and plan for future multi-modal transportation corridors.

A.9 The Official Plan also identifies the Hurontario/Main Street corridor as a Regional Intensification Corridor that:

- Supports mixed use development, providing a variety of commercial, office, residential, and recreational use;
- Prioritizes transit use and is transit-supportive;
- Ensures a pedestrian-oriented urban realm; and
- Provides Peel residents the opportunity to live and work along the corridor.

A.10 The Official Plan directs the City of Mississauga and the City of Brampton to define the appropriate boundaries of the corridor in a manner, consistent with the Plan. The Official Plan also states that

[18] http://www.metrolinx.com/en/regionalplanning/funding/investment_strategy.aspx

Regional Council will work with the local municipalities to develop a stable, continual, and predictable funding source for a multi-modal transportation system.

Peel's Long Range Transportation Plan (2002)

A.11 The Region of Peel is one of the fastest growing regions in Canada, with the growth attributable to the Region's diverse economy and high quality of life. Over the next 30 years the Region's population is expected to continue to grow, bringing with it significant transportation challenges. Peel Region undertook a Long Range Transportation Planning (LRTP) study in 2002. This identified and addressed the expected transportation challenges. It also aimed to develop and promote policies that will serve to meet these challenges. Overall, the primary goal from the LRTP study was to create a coordinated and integrated multi-modal transportation system, supported by policy and all levels of government.

A.12 The LRTP study introduces a vision recognizing Peel's transportation needs, to be achieved through a set of goals and objectives:

> "Peel Region will have a safe, convenient, efficient, multi-modal, sustainable and integrated transportation system that supports a vibrant economy, respects the natural and urban environment, meets the diverse needs of residents and contributes to a higher quality of life."

A.13 There are several key principles and goals underpinning the LRTP study. Those that are relevant to this project are as follows:

- Promote and encourage sustainable modes of transportation (i.e. public transit, carpooling, etc.) to provide increased mobility and travel mode choice;
- Promote use of public transit to increase this modal share;
- Encourage sustainable transportation by creating a balance between population and employment distribution and land use designation; and
- Support transit-intensive development densities along designated transit corridors, transit nodes, and around GO Transit stations.

A.14 The LRTP study further outlines the long range transportation plans/strategies and policies that are intended to mitigate against future transportation challenges over the next 30 years. The LRTP study emphasis the need to develop and implement different transit and transportation demand management measures and a more balanced land use development pattern that can reduce future strain on the transportation system, while reducing roadway congestion.

A.15 To achieve this end, the LRTP study promotes policies that:

- Relate to and promote transportation demand management strategies, such as providing regional carpool parking lots;
- Encourage transit supportive strategies on all major roadways by implementing Bus Rapid Transit and giving priority to public transit;
- Promote land use and site design that encourages the alternative modes of transportation other than the private automobile; and
- Work with the provincial and federal government to secure appropriate funding and support in achieving these goals.

A.16 To ensure that the vision of the LRTP study is met in a timely fashion, the Region of Peel will encourage and work with Brampton Transit, Mississauga Transit, and GO Transit to increase transit efficiency, identify necessary infrastructure improvements, and develop policies and strategies that promote the use of public transit.

City of Brampton

Brampton Official Plan (2006)

A.17 The City of Brampton's Official Plan guides land use development and planning within the municipality for the next 25 years. The Plan sets forth six pillars of development as the main components of the Plan. These will guide the development and management of the City. The pillars will also ensure that the City develops in an environmentally conducive manner that supports both the social and economic needs of each community. The Plan acknowledges the City's primary method of transportation is auto-based, creating a strain on current transportation infrastructure and contributing to air pollution. As such, the Plan places great importance in promoting the integration of land use and transportation planning that is supportive of sustainable transportation modes both now and in the future.

A.18 Key transportation principles/guidelines set out in the City of Brampton's Official Plan and which are relevant to this study are detailed below.

- The City of Brampton will work to promote a 'Modern Transportation System' by:
  - Promoting transportation polices that integrate and support transportation, land use, and physical form in appropriate manner;
  - Integrating all modes of transportation that provide a 'balanced transportation system' that is accessible to all residents, including to people with disabilities;
  - Enhancing the capacity of the existing transportation system through the use of transportation system and demand management measures (such as the implementation of transit signal priority, and operational improvements to bus bays and HOV lanes);
  - Providing a safe, reliable, and universally accessible Brampton transit system, that promotes environmental sustainability and the increased use of public transit; and
  - Developing a rapid transportation system that appropriately integrates transit services connecting to Mississauga, Toronto, York Region, and other neighbouring locales.
- Regarding the Hurontario/Main Street corridor, the Plan denotes the corridor as an Intensification Corridor, whereby:
  - Brampton Bus Rapid Transit (BRT) is given priority;
  - Accommodates future growth through land infill and intensification that is transit-oriented; and
  - The City and the Plan promotes and works to develop BRT corridors to be operated as LRT corridors in the future.

Brampton Transportation & Transit Master Plan (2009)

A.19 Brampton's Transportation and Transit Master Plan (TTMP), updated in 2009, provides a guiding platform in which the transportation objectives and goals, as set out in Brampton's 2004 TTMP, are to be achieved. The TTMP works towards further developing a balanced transportation system that takes into consideration all travel modes. The TTMP places great importance on the

relationship between sound land use development and transportation planning, which when together work to create sustainable development, economic vitality, and healthy communities. The TTMP acts as a 'practical guide' for implementing appropriate transportation policies and actions, with an emphasis on transit development.

A.20 Key policies as outlined in the TTMP and relevant to this study are as follows:

- Support transit node and corridor development;
- Support higher density land use that is conducive to sustainable travel, including transit use;
- Ensure that public transit is the first priority for moving people; and
- Increase the modal share of public transit.

A.21 To ensure Brampton moves from a suburban to a more urban environment, the TTMP recommends that land use development support active and sustainable modes of transportation. To create a lively and urban environment, the TTMP puts forth several long-term transit network strategies, one of which includes transit corridor development. Transit corridors are to be primarily serviced by Bus Rapid Transit and eventually Light Rail Transit.

A.22 The City of Brampton is one of Canada's largest urban municipalities, and one that is expected to see continual employment and residential growth. By 2031 it is projected that the population of Brampton will exceed 300,000, and the City will be home to over 165,000 jobs. To ensure that the travel needs of those that live and work in Brampton are met in a sustainable manner the TTMP outlines a number of transportation policies and initiatives to be undertaken.

A.23 Key transportation recommendations set out in the TTMP and relevant to this study are detailed below.

A.24 To achieve a multi-modal transportation system that will service the needs of the City of Brampton, the TTMP recommends a long-term transit network that:

- Consists of transit nodes connected by high-order transit corridor;
- Ensures BRT corridors form the backbone of the overall transit system;
- Provides connection between Mobility Hubs and Downtown Brampton;
- Connects to GO Transit and other transit networks;
- Supports increased mix used and land use development;
- Ensures that pedestrian environments are well connected to transit facilities; and
- Ensures that the short- and medium- term transit network directly relates to long-term transit network.

A.25 Regarding the Hurontario/Main Street corridor, the TTMP recommends that:

- The corridor be considered for LRT development as opposed to BRT development;
- The City identify the appropriate transportation technology to be used throughout the corridor; and
- The City utilize appropriate transportation demand strategies that encourage personal mobility and travel choice.

A.26 The City of Brampton will work with the guiding transit development principles set out in provincial and federal planning policy documents (i.e. Places to Grow), Brampton's Official Plan, and the transportation plans of adjoining municipalities.

PathWays Master Plan (2002)

A.27 The City of Brampton is defined by its unique and vast open space infrastructure, a community asset that distinguishes Brampton from other municipalities in Ontario. The Pathways system, which brings together the City's valleys, parks, and trails, is a vital and valued component of the open space infrastructure throughout the City.

A.28 The Pathways system provides convenient pedestrian and cycling routes throughout the City. The Pathway's system is well used by Brampton's residences and is seen as source of community pride. As such, the Pathway's Master Plan works towards improving and conserving the pathways trail system, while setting forth core objective and strategic actions to meet Brampton's vision in creating a high quality of community life, a vibrant and thriving economy, and an efficient and well-integrated transportation system.

City of Mississauga

Mississauga Official Plan (2003)

A.29 Mississauga's Official Plan guides the current and projected growth as the City continues to evolve as an urban municipality. The Plan outlines and recommends policies that serve to manage and direct the land use development within the City, while taking into consideration the direct impacts on the economic, social, cultural and environmental spheres.

A.30 The Plan emphasises the need to build complete and sustainable communities. These will be achieved through strategic management of growth that seamlessly integrates land use, transportation, and physical design. The Plan supports a multi-modal transportation network that ensures that complete and sustainable communities are achieved by 2031 and beyond.

A.31 Key transportation objectives and goals set out in Mississauga's Official Plan and relevant to this study are detailed below:

- The City of Mississauga will work to support a multi-modal transportation system that supports sustainable communities, by:
  - Emphasizing opportunities for transit and active transportation and making transit a viable travel mode by those residing and working in Mississauga;
  - Centring transit networks around transit nodes and anchor destinations (e.g. University of Toronto Mississauga);
  - Developing community nodes to reduce automobile use, and promote travel by way of walking, cycling and transit; and
  - Supporting, when appropriate, compact mixed land uses that are pedestrian focused along transit corridors.
- Regarding the Hurontario/Main Street corridor, the Plan denotes the corridor as Major Transit Corridor, whereby:
  - The corridor is given high order transit facilities located in relative proximity to Mississauga's Bus Rapid Transit corridor;
  - Serviced by frequent transit services and transit facilities that connect the corridor to additional destinations within the city;
  - Accommodates transit-supportive land uses, including the integration of residential and employment land use intensification along the corridor; and

- Supportive of other active transportation modes throughout the corridor.
- The City of Mississauga will work with the Province of Ontario, the Region of Peel, and neighbouring municipalities to create the City's multi-modal transportation system.

Mississauga Cycling Master Plan (2010)

A.32 The City of Mississauga's Cycling Master Plan guides the City's on-going efforts to better integrate and develop cycling opportunities for those who live and work in the region. Completed in 2010, the plan establishes a long-term strategy that works towards promoting cycling as alternative and viable transportation mode.

A.33 The plan highlights the many benefits of cycling, such as reduced transportation costs and increased health and well-being of residents, and therefore emphasizes that cycling should be 'a part of life for all citizens.' The Cycling Master Plan works within the greater framework set out by the Places to Grow Growth Plan and Metrolinx's Regional Transportation Plan , which promotes pedestrian, transit, and cycling friendly communities that promote more active and sustainable modes of transportation.

A.34 To capitalize on past successes, the plan introduces a cycling vision for the City:

> "Cycling will become a way of life in the City of Mississauga that supports vibrant, safe and connected communities. Mississauga will be a place where people choose to cycle for recreation, fitness and daily transportation needs enhancing our overall health and quality of life."

A.35 Regarding Hurontario Street, the plan recommends that on-going and future studies determine whether the corridor is the appropriate location for cycling routes and facilities.

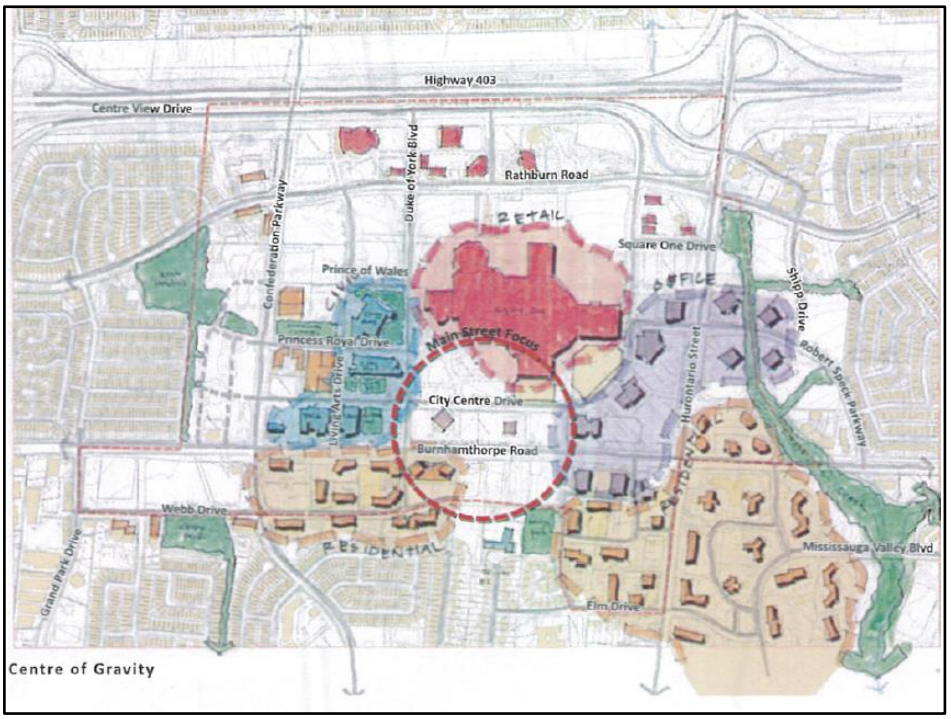
Downtown21 Master Plan (2010)

A.36 Through extensive engagement of the public and key stakeholders, the Downtown21 Plan has been developed around principles which support the continued evolution of a "livable, compact, accessible, sustainable downtown" in Mississauga. The Master Plan outlines a framework of character districts within the downtown, complete with a fine-grained network of new and existing streets.

A.37 Because of the large size of the downtown, the plan designates Burnhamthorpe Road south of Square One Mall as the focus for new development in the eight to ten year time horizon. The plan also supports the creation of a new "main street" at this location as an example of the potential of the area.

A.38 Of particular importance to the Main-Hurontario LRT project is a focus on 'building multi-modal' which supports the design of complete streets to encourage walking and cycling as part of a transit-friendly community.

Figure A.1: Mississauga Downtown Focus Area



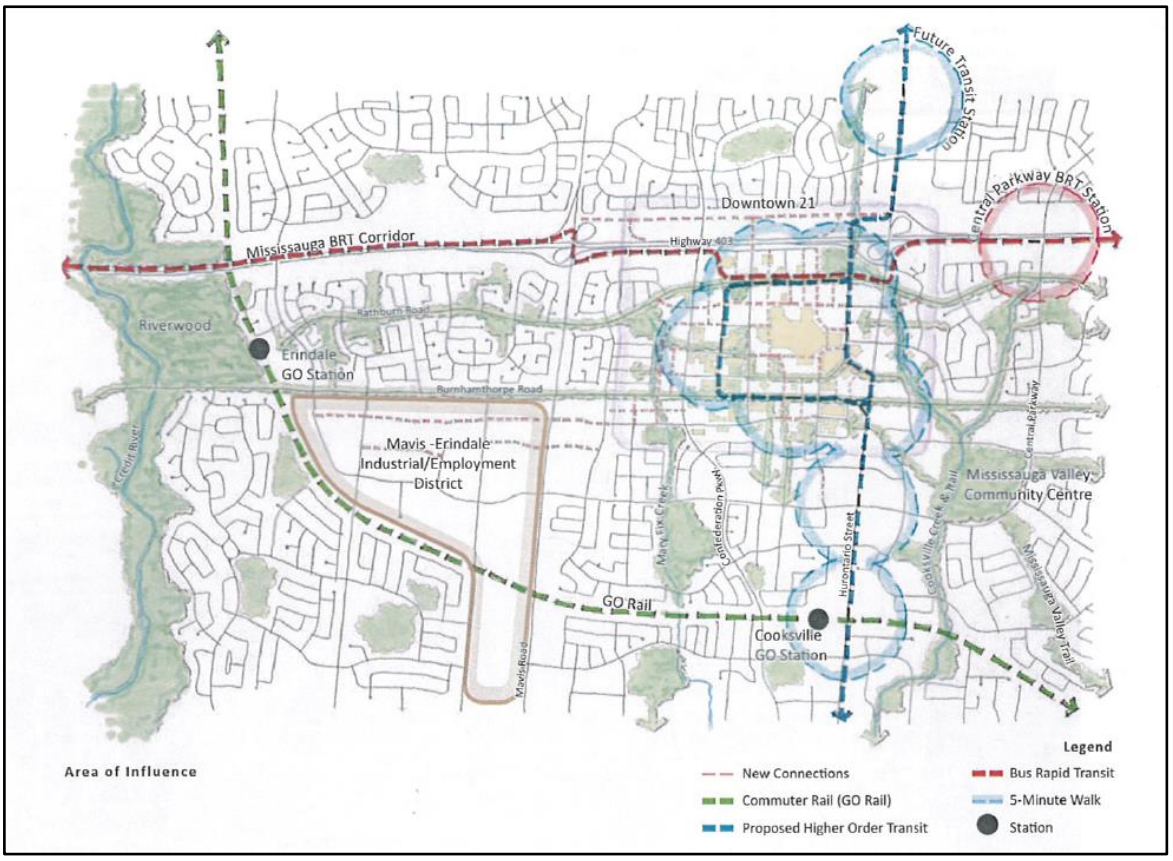
A.39 Key transportation objectives and goals set out in the Downtown 21 Master Plan and relevant to this study are detailed below:

- Requiring future development on small block sizes (400m perimeter) to maximize access and walking;
- Implementing higher order transit in a five minute walk of anywhere in the downtown;
- Adopting parking strategies that support urban design excellence, foster economic growth and implement transportation demand management; and
- Promoting development patterns that put jobs, housing, and services within a walking distance of each other.

A.40 Regarding the Hurontario/Main Street corridor, the Downtown21 plan envisions:

- A future downtown that may ultimately include over 70,000 residents and 70,000 jobs. Over the long-term, the intensification of Downtown Mississauga is dependent on it being served by higher-order transit.
- The preferred alignment of the Hurontario LRT passing through the core of the City and its crossing with the Mississauga BRT corridor. The proposed five stops ensure that all of Downtown Mississauga is within a five-minute walk (400m) of a transit station.
- The Mississauga BRT sharing a transitway with the LRT along Rathburn Road, whereby alternatives are identified should the capacity of this solution be insufficient.
- The Transit Terminal remaining in its current location in the short-term. However, as the role of the terminal changes with the implementation of LRT & BRT, the plan provides flexibility to redevelop and integrate the terminal into an adjacent development project.

Figure A.2: Downtown Mississauga Transit Service Area



Port Credit Review (2008)

A.41 The Port Credit Local Area Plan (Area Plan) provides direction for lands in south central Mississauga, as is outlined in the Mississauga Official Plan. The Area Plan pertains directly to lands designated as Community Node and Neighbourhood in the Plan. As is set out in the Area Plan, Port Credit is to be an urban waterfront village, complete with mixed land uses, compact form, pedestrian and cycling friendly, and a lively and inviting public realm. The intent of the Area Plan is to foster a dynamic mix of urban residential, commercial and institutional services and/or activities throughout the Port Credit community.

A.42 The Area Plan introduces a vision for Port Credit:

> "Significant elements that give Port Credit its sense of place are to be preserved and enhanced, such as the main street village character along portions of Lakeshore Road (east and west), heritage buildings, community facilities, stable residential neighbourhoods, open space, parks and marina functions along the waterfront. The Vision reinforces the importance of retaining and enhancing the built elements that provide residents with a sense of local community and social activity."

A.43 To achieve this, an emphasis is placed on supporting a multi-modal transportation system throughout the Hurontario Street Intensification Corridor, as identified in the Plan.

A.44 The Hurontario Street Intensification Corridor will:

- Play a fundamental role in connecting Port Credit to neighbouring municipalities;
- Provide connections between Community Nodes, thereby fostering connectivity between Port Credit neighbourhoods;
- Accommodate multi-modal transportation facilities, as the Plan has identified the corridor to be transit-oriented;
- Support the development of Port Credit's distinctiveness and character through improvements to the public realm.