
Appendix A: Light Rail Transit

- A1: List of Associated Reports
- A2: List of Planning, Design and Engineering Reports
- A3: Hamilton B-Line Project Phasing Options
- A4: LRT Benefits and Cost Report
- A5: Comparative Summary of LRT Systems (CD)
- A6: McMaster Institute of Transportation and Logistics: The North American Light Rail Experience: Insights for Hamilton (CD)
- A7: Light Rail Transit in Hamilton: Health, Environmental and Economic Impact Analysis (CD)
- A8: Rapid Transit Workplans

A1. List of Associated Reports

RAPID TRANSIT FEASIBILITY PHASE 1

- Phase 1 Rapid Transit Feasibility Report
 - » Assessment of Rapid Transit Technologies
 - » Description of Representative Alignments
 - » Estimated Capital Costs
 - » Transit Supportive Development Policies
 - » Ontario Environmental Assessment Act

RAPID TRANSIT FEASIBILITY PHASE 2

- Phase 2 Rapid Transit Feasibility Report
 - » Terms of Reference: Preliminary Design Analysis and Environmental Project Report
 - » Staging Analysis
 - » Niagara Escarpment Crossing Functional Investigation
 - » Traffic Operations Analysis

RAPID TRANSIT FEASIBILITY PHASE 3

- Acoustic Assessment Report
- Air Quality Assessment Report
- Stage 1 Archeologically Assessment
- Cultural Heritage Assessment Report: Built Heritage Resources and Cultural Heritage Landscapes
- Community Impact & Economic Analysis of Light Rail Transit
- Economic Potential Study
- Functional Planning Analysis: B-Line Corridor
- Hydrogeology Report
- Water Resources Memo
- LRT Underground (Subsurface) Impact Study
- Maintenance Facility – Site Assessment Study
- Light Rail Technology Overview & Analysis
- Terrestrial and Avian Ecology Report

RAPID TRANSIT FEASIBILITY STUDY PHASE 1, 2 & 3 OVERALL SUMMARY

METROLINX BENEFITS CASE ASSESSMENT

RAPID TRANSIT FEASIBILITY STUDY PHASE 4

- McMaster University: LRT alignment and stop locations
- Rapid Transit Transition Study
- Parking and Loading Study
- Accessibility Implications Analysis
- Analysis of Innovation Park Options
- Preliminary Design Study
- Preliminary Assessment of LRT Operations
- A-Line BRT Feasibility Study
- B-Line Opportunity and Challenges Study
- Hamilton LRT – Underground Life Cycle Assessment Report
- B-Line Value Uplift Study

HAMILTON RAPID TRANSIT 70% DESIGN REPORT: PREPARATION OF ENGINEERING DRAWINGS FOR CONSTRUCTION COST ESTIMATE SUMMARY REPORT

MAKING THE CASE:

- Transportation Case Review – Working Paper
- B-Line Funding, Financing and Procurement Options – Final Working Paper
- Making the Case Summary Document

A2. List of Planning, Design and Engineering Reports

A-LINE REPORTS:

- Acoustic and Air Quality Report
- Built Heritage & Cultural Landscapes Inventory
- Consultation Report
- Economic Potential Report
- Initial Feasibility & Opportunities Report
- LRT Feasibility Assessment
- Natural Environment Inventory & Impact Identification
- Record of Public Consultation
- Stage 1 Archaeological Assessment
- Utilities Assessment Report

A AND B LINE REPORTS

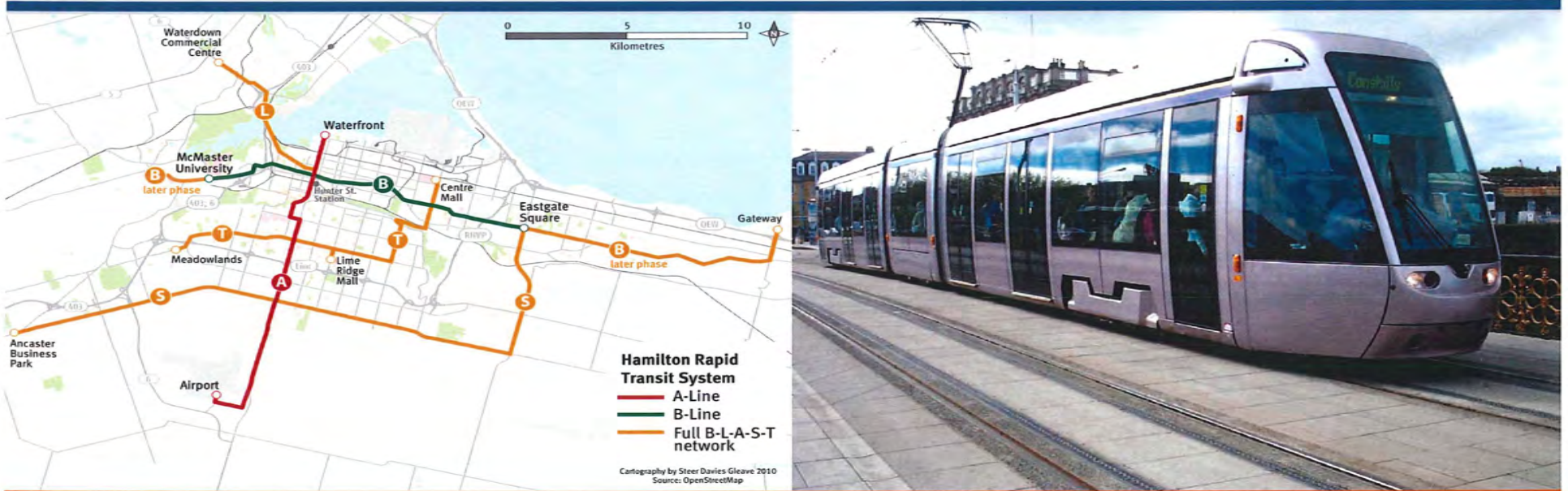
- System Design Guide
- Integrated Transit System Operations Plan

B-LINE REPORTS:

- Construction Phasing Strategy & Traffic Management Report
- Cost Estimate Report
- Environmental Project Report
 - » Appendix A
 - » Appendix B
 - » Appendix C
- Highway 403 Bridge Crossing Options
- Maintenance and Storage Facility Requirements and Location Analysis
- Post Consultation Alignment Changes Memo
- Preliminary Drainage Report
- Preliminary Operations & Maintenance Plan
- Project Constraints Assessment
- Project Implementation Plan
- Red Hill Valley Parkway Structural Design Brief
- Risk Assessment Report
- Safety and Security Plan
- Signalling System Design Brief
- Structural Assessment Design Brief
- Track Plan Report
- Trackwork Design Brief
- Traction Power Design Brief
- Traffic Lane Widths Report
- Utility Strategy Guidelines

Appendix A: Light Rail Transit

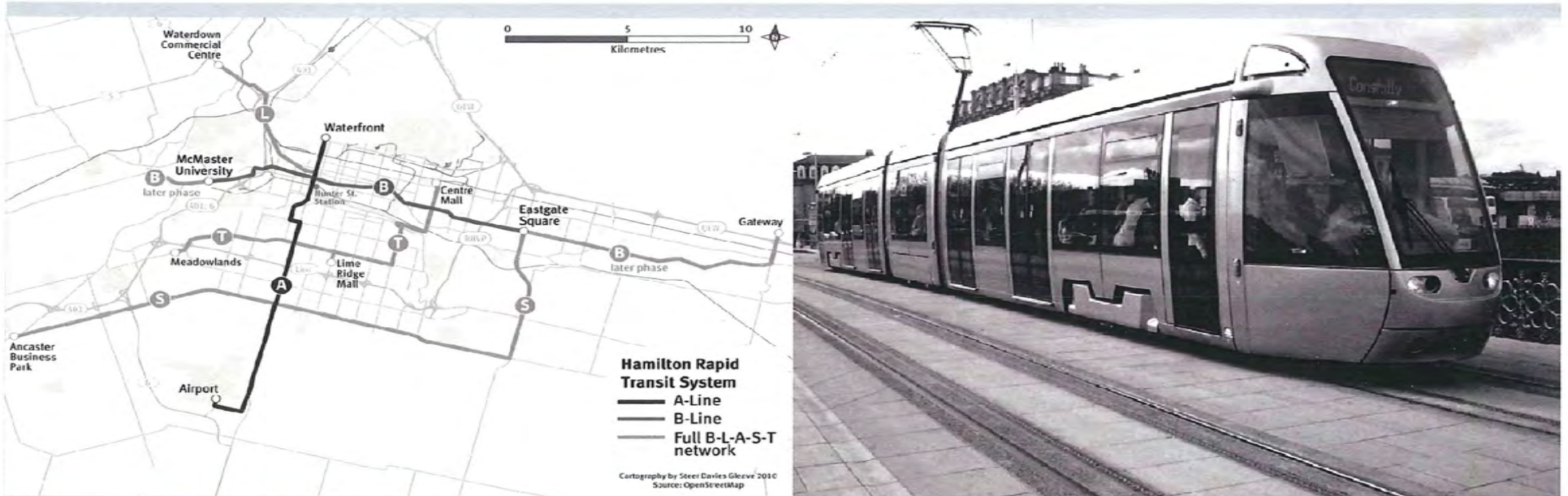
A3: Hamilton B-Line Project Phasing Options



Hamilton B-Line Project Phasing Options

December 11, 2012





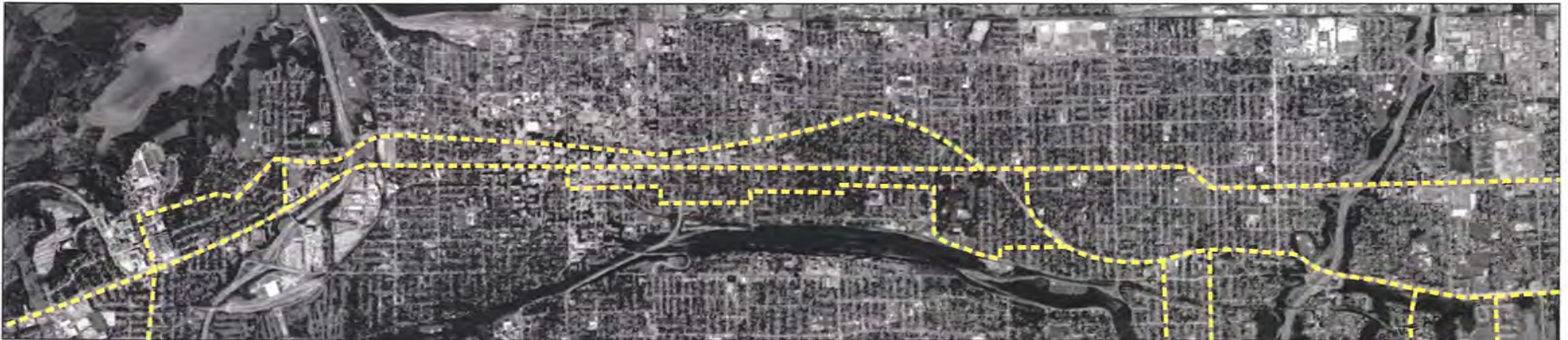
Phasing Scenarios

December 11, 2012





Scenario A: Business as Usual



HSR bus routes: 1, 1A, 5 group, 10, 10A, 51, 52, 55, 55A, 58

West anchor: McMaster University

- Major employment and service area (hospital) and educational institution
- Market driven by students, teaching staff, medical staff and hospital visits

East anchor: Eastgate Square

- Planned Sub-Regional node, major commercial centre and higher density residential
- Market driven by consumers and employees



Scenario B: TPAP Approved B-Line



Length: 13.8* km

West anchor: McMaster University

- Major employment and service area (hospital) and educational institution
- Market driven by students, teaching staff, medical staff and hospital visits

East anchor: Eastgate Square

- Planned Sub-Regional node, major commercial centre and higher density residential
- Market driven by consumers and employees

*Source: Hamilton Rapid Transit Preliminary Design and Feasibility Study (September 2011), Table 4.1



Scenario C: McMaster to Ottawa



Length: 9.1* km

West anchor: McMaster University

- Major employment and service area (hospital) and educational institution
- Market driven by students, teaching staff, medical staff and hospital visits

East anchor: Ottawa Street

- Established Business Improvement Area (BIA) for textile and home décor
- Market driven by consumers and employees

*Source: Hamilton Rapid Transit Preliminary Design and Feasibility Study (September 2011), Table 4.1



Scenario D: McMaster to Queenston Circle



Length: 10.8* km

West anchor: McMaster University

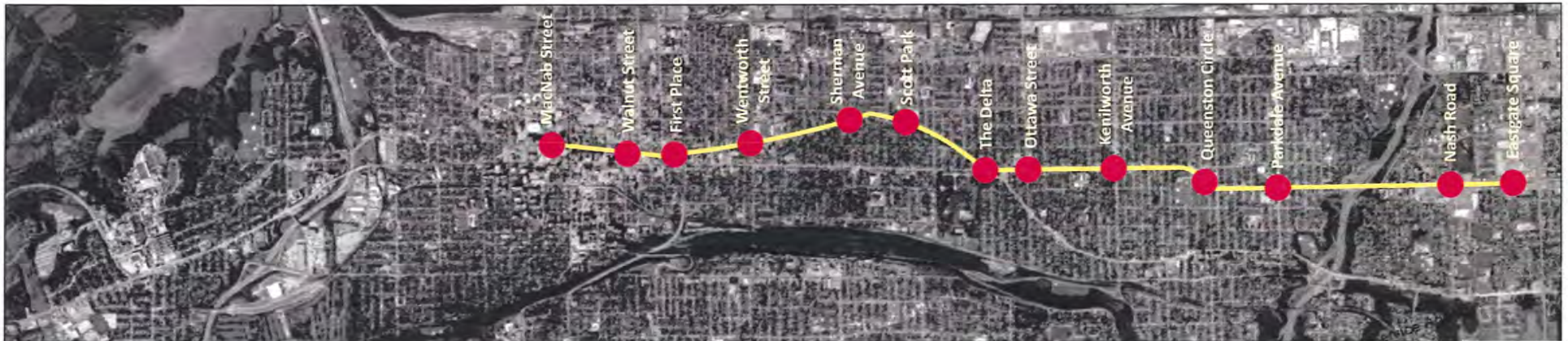
- Major employment and service area (hospital) and educational institution
- Market driven by students, teaching staff, medical staff and hospital visits

East anchor: Queenston Circle

- Major residential area with some commercial developments
- Market driven by consumers, employees and residents

*Source: Hamilton Rapid Transit Preliminary Design and Feasibility Study (September 2011), Table 4.1

Scenario E: Downtown to Eastgate Square



Length: 9.2* km

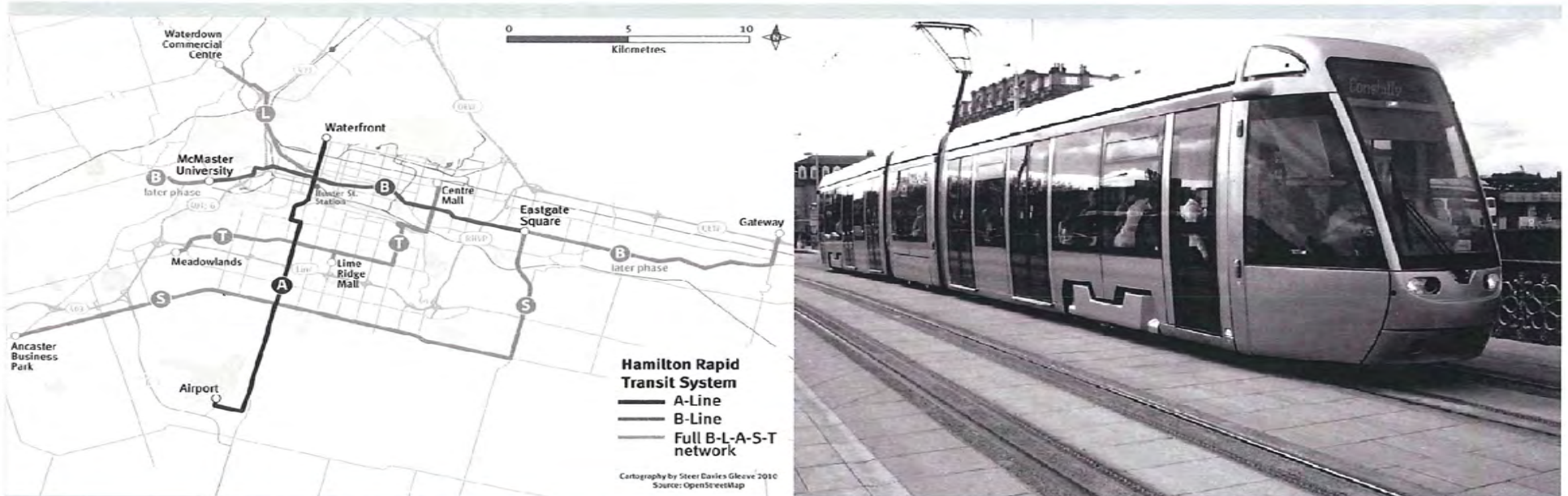
West anchor: Downtown (MacNab Street)

- Major employment area, commercial, civic and entertainment centre
- Market driven by employees and consumers

East anchor: Eastgate Square

- Planned Sub-Regional node, major commercial centre and higher density residential
- Market driven by consumers and employees

*Source: Hamilton Rapid Transit Preliminary Design and Feasibility Study (September 2011), Table 4.1



Multiple Accounts Evaluation

December 11, 2012





Multiple Accounts Evaluation – B-Line Phasing

Goal:

To develop a Multiple Account Evaluation (MAE) process:

- to identify the advantages, disadvantages and trade-offs involved with each phasing alternative under consideration, and;
- to inform and assist in the decision-making process utilizing quantitative and qualitative assessments for defined evaluation criteria.





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Scenario A: Business as Usual (For Reference Only)

Hamilton King-Main Benefits Case (February 2010)

- A MAE was undertaken for the following options with a comparison to the Do Nothing option:
 - Option 1: Full BRT
 - Option 2: Full LRT
 - Option 3: Phased LRT
- Report recommendations:
 - Option 2 provides the greatest benefits in all the accounts and supports the City of Hamilton’s broader objectives to revitalize, redevelop and reshape the B-Line corridor
 - ***Option 2 (Full LRT) to be carried forward for further review***

Scenario A will not be included in this comparative analysis as the original Benefits Case Study did not indicate that it should be carried forward for further review.



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MAE Accounts

Definition:

Measures:

Financial Account

An account of measures that take into consideration the revenue and expenditure implications.

- Capital costs
- Operating costs
- Cost effectiveness

User Benefit Account

An account of measures that take into consideration the benefit to the transportation user.

- Travel time cost

Environmental Account

An account of measures that take into consideration the impacts to community / social environment.

- Air quality (GHG)

Economic Development and Growth Account

An account of measures that take into consideration the increased tax revenue and increased employment opportunities along the B-Line corridor.

- Accessibility to employment areas
- Increased DC revenues

Social Account

An account of measures that take into consideration the benefits / impacts to the social fabric and the community adjacent to the B-Line corridor.

- Community accessibility and connectivity
- LRT construction mitigation

Urban Development Account

An account of measures that take into consideration the benefits / impacts development opportunities.

- Reurbanization potential
- Regional transit connectivity



Hatch Mott
MacDonald



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Financial Account Measure #1

Effectiveness of Capital Cost Investment

Capital costs required to implement the phasing scenario inclusive of infrastructure (vehicles and maintenance centre), construction, design, management and administration, insurance, property and contingencies.

Inputs:

- B-Line LRT capital cost estimate / phasing scenario
- Total scenario LRT kilometres
- EMME model peak period LRT Station boardings (includes transfers)
- Annual ridership (boardings)/ phasing scenario

Annual Ridership Adjustments:

- Peak period to annual factor: 909
- LRT ridership uptake - TPAP
 - Bus network update +16%
 - Vehicle operating costs + 4%
 - Parking charges +16%
 - LRT quality benefits +37%
 - Revised growth opportunities +47%

Measure:

Capital cost / Annual passenger km





Financial Account Measure #1

Capital Cost Estimate

Capital Cost Items	SCENARIO B TPAP	SCENARIO C McMaster to Ottawa Street	SCENARIO D McMaster to Queenston Circle	SCENARIO E Downtown to Eastgate Square
Length of LRT Service (km)	13.8	9.1	10.8	9.2
Preparatory works	\$95,578,021	\$63,026,086	\$74,800,190	\$63,718,681
Guideway	\$79,811,694	\$50,329,450	\$60,161,326	\$41,107,796
Trackwork and stations	\$115,586,465	\$84,590,225	\$96,988,721	\$84,590,225
Systems	\$90,750,250	\$57,842,556	\$71,021,935	\$60,500,167
Maintenance facility	\$48,480,143	\$48,480,143	\$48,480,143	\$48,480,143
Vehicles	\$110,000,000	\$72,536,232	\$86,086,957	\$73,333,333
Total Construction Cost (2011 \$)	\$540,206,573	\$376,804,692	\$437,539,271	\$371,730,344
Design and management (.22)	\$120,431,493	\$82,897,032	\$96,258,640	\$81,780,676
Property allowance (.06)	\$34,557,000	\$22,608,282	\$21,876,964	\$22,303,821
Total Estimate Before Contingencies (2011 \$)	\$695,195,066	\$482,310,006	\$555,674,874	\$475,814,841
Contingencies (17%)	\$116,190,893	\$81,992,701	\$94,464,729	\$80,888,523
Total Estimate With Contingencies (2011 \$)	\$811,385,959	\$564,302,707	\$650,139,603	\$556,703,364



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Financial Account Measure #1

2031 LRT Annual Ridership Estimates

Annual Ridership	SCENARIO B TPAP	SCENARIO C McMaster to Ottawa Street	SCENARIO D McMaster to Queenston Circle	SCENARIO E Downtown to Eastgate Square
Peak Period Boardings	10,154	6,947	8,122	7,588
Base annual ridership (peak period *909)	9,229,986	6,314,823	7,382,898	6,897,492
Base Annual Ridership (M)	9.2	6.3	7.4	6.9
Bus network update	0.16	0.16	0.16	0.16
Vehicle operating costs	0.04	0.03	0.03	0.03
Parking charges	0.16	0.11	0.08	0.06
LRT quality benefits	0.37	0.24	0.29	0.25
Revised growth	0.47	0.31	0.37	0.31
Total Uplift Factor	1.20	0.85	0.93	0.80
2031 annual forecast ridership (M)	20,305,969	11,655,882	14,258,344	12,427,307
Adjusted 2031 annual forecast ridership (0.93)	18,884,551	10,839,970	13,260,260	11,557,396
2031 Annual Ridership (M) - boardings	18.9	10.8	13.3	11.6

Note: Annual ridership includes transfers.



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Financial Account Measure #1

LRT Capital Costs (2011 \$) / 2031 Annual Passenger KM

	SCENARIO B TPAP	SCENARIO C McMaster to Ottawa Street	SCENARIO D McMaster to Queenston Circle	SCENARIO E Downtown to Eastgate Square
Capital costs (2011 \$) / 2031 Annual passenger km	\$8.39	\$9.43	\$8.76	\$10.49
% Change in relation to TPAP		12%	4%	25%
Capital costs	\$811,385,959	\$564,302,707	\$650,139,603	\$556,703,364
Annual LRT passenger km	96,736,325	59,812,927	74,229,149	53,071,783
Annual LRT passengers (boardings)	18,900,000	10,800,000	13,300,000	11,600,000

Financial Account Measure #2

Effectiveness of Operating Cost Investment

Costs required to operate the phasing scenario .

Inputs:

- Annual 2031 LRT operating costs
- Annual 2031 bus operating costs
- LRT scenario passenger km (includes transfers)
- Bus scenario passenger km

Assumptions:

- Gross cost per passenger:
 - \$2.93 per boarding passenger (B-Line specific 2012 cost)

Measure:

LRT + bus operating costs / annual passenger km



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Financial Account Measure #2

2031 Operating Cost Estimate

2031 Operating Cost Item per Annum	SCENARIO B McMaster to Eastgate Square	SCENARIO C McMaster to Ottawa Street	SCENARIO D McMaster to Queenston Circle	SCENARIO E Downtown to Eastgate Square
Labour costs (admin, operations, maintenance)	\$17,905,963	\$10,238,955	\$12,607,426	\$10,995,889
Vehicle maintenance costs	\$587,454	\$335,917	\$413,621	\$360,750
Track maintenance / rail replacement	\$125,206	\$82,563	\$97,987	\$83,471
Power costs	\$726,480	\$479,055	\$568,549	\$484,320
Cost for parts for maintenance of catenary and TPSS	\$89,157	\$58,792	\$69,775	\$59,438
Cost for parts for maintenance of communication and fare collection equipment	\$44,578	\$25,491	\$31,387	\$27,375
Office supplies	\$53,970	\$53,970	\$53,970	\$53,970
10% insurance, rates, property taxes, etc.	\$1,953,281	\$1,953,281	\$1,953,281	\$1,953,281
2031 LRT Operating Costs	\$21,486,089	\$13,228,024	\$15,795,996	\$14,018,494
Bus Operating Costs	\$5,975,839	\$24,330,203	\$17,073,827	\$29,879,197
Total 2031 LRT and Bus Operating Costs	\$27,461,928	\$37,558,228	\$32,869,823	\$43,897,691

Note: Bus operating costs are reflective of stops between McMaster University and Eastgate Square along the B-Line LRT alignment.



Financial Account Measure #2

2031 B-Line LRT + Bus Operating Cost / Passenger km

	SCENARIO B TPAP	SCENARIO C McMaster to Ottawa Street	SCENARIO D McMaster to Queenston Circle	SCENARIO E Downtown to Eastgate Square
Annual 2031 LRT operating costs	\$21,486,089	\$13,228,024	\$15,795,996	\$14,018,494
Annual 2031 bus operating costs	\$5,975,839	\$24,330,203	\$17,073,827	\$29,879,197
Total (LRT + bus) operating costs	\$27,461,928	\$37,558,228	\$32,869,823	\$43,897,691
Annual LRT passenger kms	96,736,325	59,812,927	74,229,149	53,071,783
Annual bus passenger kms	4,110,729	17,957,365	10,254,486	30,332,104
Total (LRT + bus) passenger kms	100,847,054	77,770,292	84,483,635	83,403,887
2031 LRT and bus operating costs / Annual passenger kms	\$0.27	\$0.48	\$0.39	\$0.53

Note: Bus operating costs are reflective of stops between McMaster University and Eastgate Square along the B-Line LRT alignment.



Financial Account Measure #3

Cost Effectiveness of B-Line Service

Annual forecast revenue for the 2031 horizon year based on forecast ridership compared to the annual operating costs.

Inputs:

- 2031 B-Line Corridor LRT and bus annual ridership (includes transfers)
- 2031 B-Line Corridor LRT and bus annual operating costs
- Average ridership fare

Assumptions:

- Annual B-Line corridor fare revenue (annual boardings *\$2.05)

Measure:

Annual passenger revenue / Annual operating cost



Financial Account Measure #3

Cost Effectiveness of B-Line Service

B-Line Corridor	SCENARIO B TPAP	SCENARIO C McMaster to Ottawa Street	SCENARIO D McMaster to Queenston Circle	SCENARIO E Downtown to Eastgate Square
Annual LRT passengers (boardings)	18,900,000	10,800,000	13,300,000	11,600,000
Annual LRT passengers less transfers (77% of total boardings)	14,553,000	8,316,000	10,241,000	8,932,000
Annual bus passengers (stops on B-Line LRT alignment only)	1,400,000	5,700,000	4,000,000	7,000,000
2031 total passengers (less transfers)	15,953,000	14,016,000	14,241,000	15,932,000
Average fare	\$2.05	\$2.05	\$2.05	\$2.05
LRT and bus annual revenue	\$32,703,650	\$28,732,800	\$29,194,050	\$32,660,600
Annual 2031 LRT and bus operating costs	\$27,461,928	\$37,558,228	\$32,869,823	\$43,897,691
2031 LRT and bus revenue / operating costs ratio	1.19	0.77	0.89	0.74



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Financial Account Summary

Financial Account Summary	SCENARIO B TPAP	SCENARIO C McMaster to Ottawa Street	SCENARIO D McMaster to Queenston Circle	SCENARIO E Downtown to Eastgate Square
LRT capital cost (2011 \$) /2031 Annual passenger km	\$8.39	\$9.43	\$8.76	\$10.49
Measure #1 Ranking	1	3	2	4
2031 LRT + bus operating cost / Annual passenger km	\$0.27	\$0.48	\$0.39	\$0.53
Measure #2 Ranking	1	3	2	4
2031 LRT + bus revenue / Annual operating costs	1.19	0.77	0.89	0.74
Measure #3 Ranking	1	3	2	4
Total Measure Ranking	3 Best	9	6 2nd Best	12



Community Accounts

	Definition:	Measures:
User Benefit Account	An account of measures that take into consideration the benefit to the transportation user.	<ul style="list-style-type: none"> ➤ Travel time cost
Environmental Account	An account of measures that take into consideration the impacts to community / social environment.	<ul style="list-style-type: none"> ➤ Air quality (GHG)
Economic Development and Growth Account	An account of measures that take into consideration the increased tax revenue and increased employment opportunities along the B-Line corridor.	<ul style="list-style-type: none"> ➤ Accessibility to employment areas ➤ Increased DC revenues
Social Account	An account of measures that take into consideration the benefits / impacts to the social fabric and the community adjacent to the B-Line corridor.	<ul style="list-style-type: none"> ➤ Community accessibility and connectivity ➤ LRT construction mitigation
Urban Development Account	An account of measures that take into consideration the benefits / impacts development opportunities.	<ul style="list-style-type: none"> ➤ Reurbanization potential ➤ Regional transit connectivity



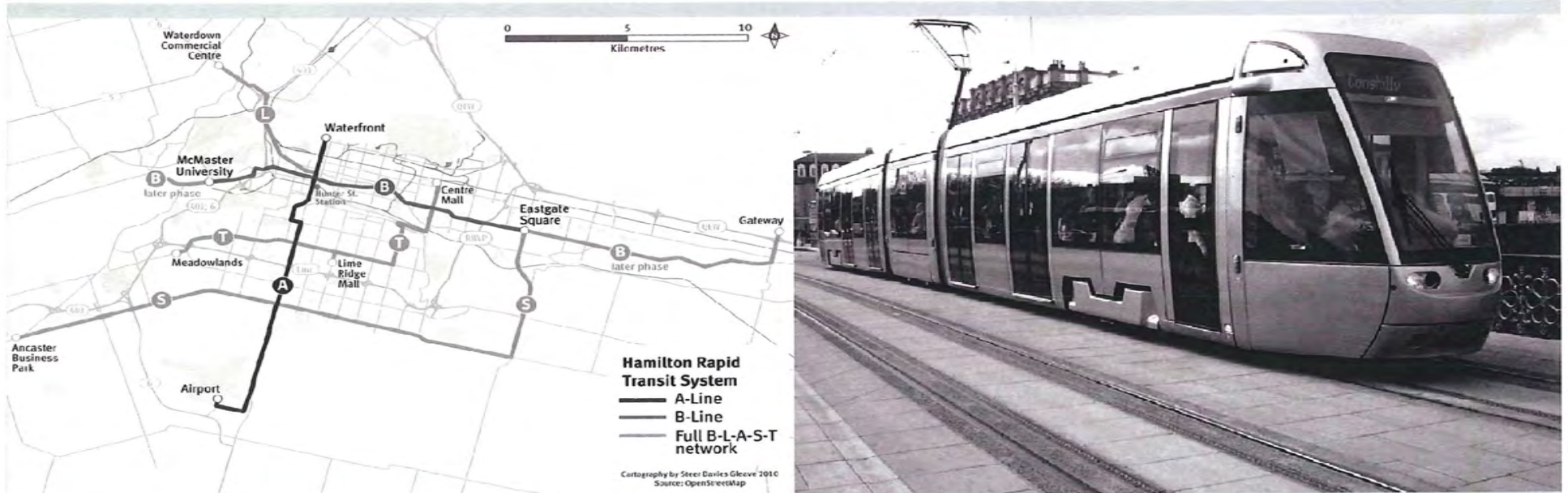
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Community Accounts Summary

Scenario	User Benefit Account	Environmental Account	Economic Development Account	Social Account	Urban Development Account	Overall Community Account
Scenario B: McMaster to Eastgate Square	1	1	1	2	1	1
Scenario C: McMaster to Ottawa Street	3	4	2	4	4	4
Scenario D: McMaster to Queenston Circle	2	2	2	3	3	2
Scenario E: Downtown to Eastgate Square	4	3	3	1	2	3

Legend:

1 – Best 2 – Good 3 – Average 4 – Poor



MAE Summary

December 11, 2012





Multiple Accounts Evaluation Summary Table - Financial

Scenario	Capital Account	Operating Account	Cost Effectiveness Account	Overall Financial Account
Scenario B: McMaster to Eastgate Square	1	1	1	1
Scenario C: McMaster to Ottawa Street	3	3	3	3
Scenario D: McMaster to Queenston Circle	2	2	2	2
Scenario E: Downtown to Eastgate Square	4	4	4	4

Legend:

1 – Best 2 – Good 3 – Average 4 – Poor





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Multiple Accounts Evaluation Summary Table - Community

Scenario	User Benefit Account	Environmental Account	Economic Development Account	Social Account	Urban Development Account	Overall Community Account
Scenario B: McMaster to Eastgate Square	1	1	1	2	1	1
Scenario C: McMaster to Ottawa Street	3	4	2	4	4	4
Scenario D: McMaster to Queenston Circle	2	2	2	3	3	2
Scenario E: Downtown to Eastgate Square	4	3	3	1	2	3

Legend:

1 – Best 2 – Good 3 – Average 4 – Poor



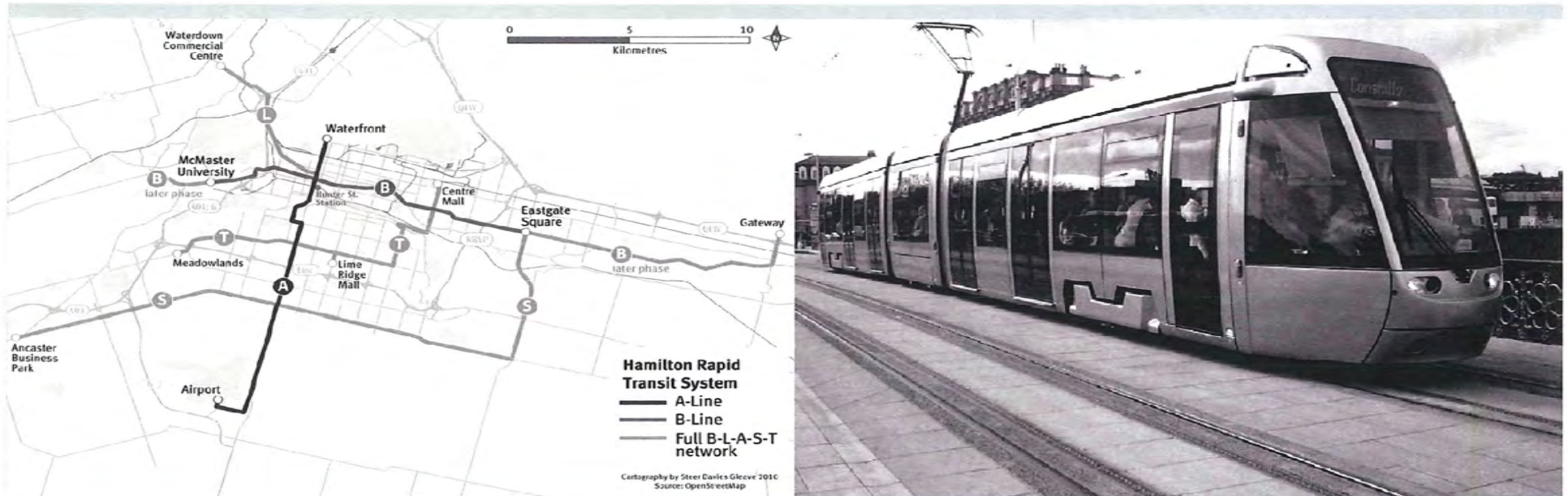


LRT Phasing – Overall Evaluation

Scenario	Financial Accounts	Community Accounts	Overall MAE Ranking
Scenario B: McMaster to Eastgate Square	1	1	1
Scenario C: McMaster to Ottawa Street	3	4	3
Scenario D: McMaster to Queenston Circle	2	2	2
Scenario E: Downtown to Eastgate Square	4	3	3

Legend:

1 – Best 2 – Good 3 – Average 4 – Poor



Thank You

December 11, 2012



Appendix A: Light Rail Transit

A4: LRT Benefits and Cost Report

City of Hamilton – LRT Benefit and Cost Report

Prepared by: City of Hamilton Rapid Transit Staff
Date: January 30, 2013

Table of Contents

1.0	Executive Summary	1
2.0	The Rapid Transit Vision.....	6
3.0	City of Hamilton Strategic Plan – 2012–2015	6
4.0	History of Rapid Transit in Hamilton	7
5.0	What is Light Rail Transit and What Can it Do?	8
6.0	LRT – Stimulating the Economy	9
7.0	B-Line Corridor – McMaster to Eastgate	13
8.0	Hamilton’s Rapid Transit Network.....	14
9.0	Background.....	16
10.0	Triple Bottom Line	18
11.0	B-LINE Corridor Capital Works – Status Quo.....	22
12.0	LRT Project Operating Costs / Cost per Passenger	24
13.0	Hamilton B-Line LRT Phasing Alternatives Analysis	31
14.0	Economic Uplift.....	32
15.0	Employment Growth.....	40
16.0	Health.....	42
17.0	Environment.....	43
18.0	Social / Tourism.....	44
19.0	LRT – Image • Connectivity • Community Pride.....	47
20.0	Conclusion - The Cost of Not Implementing LRT	48

Appendix A – Day One Operating Budget Impacts with/without LRT

Appendix B – 2031 Operating Budget Impacts with/without LRT

Appendix C – Canadian Urban Institute Report (CD)

1.0 Executive Summary

This report is provided to update Council on a motion emerging from the October 13, 2011 General Issues Committee meeting (Report CM11016/PW11064/PED11154/FCS11072), in which staff received direction to:

- Undertake a complete Light Rail Transit (LRT) project Benefit and Cost Report including the cost of not completing LRT and a triple bottom line analysis;
- Provide a full review of capital costs;
- Provide a recommended funding request to Metrolinx for capital and operating costs for LRT vs. the City’s existing HSR bus system including the cost per passenger.

This report will provide Council with a full breakdown of tangible and intangible benefits and costs (from existing consultant reports and other published sources) related to the possible construction and implementation of an LRT system along the B-Line in Hamilton.

The report also provides an overview of the LRT Phasing Strategy which focuses on several construction/implementation scenarios for the B-Line and related current activities. The report responds to Council’s request for further updated financial impact information on the costs and benefits associated with an LRT system for Hamilton.

The City’s Transportation Master Plan reflects the approved nodes and corridors land use structure for the City and relies on aggressive transit improvements and an urban fabric with a high degree of connectivity. Rapid Transit is a key element for implementing the City’s growth strategy and land use structure.

Hamilton’s current ridership in the B-Line corridor and its projected ridership growth, requires the development of a Rapid Transit system to ensure efficient and effective connectivity for citizens who want to move throughout the city and connect to inter-regional travel modes. Successful planning for higher order transit (i.e.: LRT, BRT) must be completed through an integrated approach which includes planning for other travel modes (walking, cycling, conventional transit, cars, goods movement), land use planning and financial analysis.

This report presents a summary of the work completed to date categorized by costs and benefits (Financial, Health, Environment, Social/Tourism).

Summary of Costs & Benefits (Full B-Line LRT McMaster to Eastgate)

Costs

- Project Capital is \$811 million - (plus/minus 20% \$649M to \$973M).
- City Capital cost is approximately \$1.8 million (includes articulated aerial device – Fire Department).
- Day One Stand-Alone Project Operating is \$14.5 million with an organizational structure of approximately 182 staff.
- Day One In-house Project Operating is a net levy increase of \$2.9 to \$3.5 million with the removal of redundant transit fleet and the use of in-house staff.
- City Operating costs (over and above LRT operating) are approximately \$8.7 million (e.g. winter control, parking, By-law services).
- Day One Startup: System-Wide Bus and LRT Net operating cost per passenger ranges from \$2.13 (no increase in ridership) to \$2.00 (with increase ridership). Current Bus System-Wide costs: \$2.00 per passenger.
- Day One Startup: B-Line only LRT Net operating cost per passenger ranges from \$1.80 (no increase in ridership) to \$0.45 (with increase ridership). This assumes an 8% increase in ridership plus the transfer of two-thirds of all passengers on the B-Line corridor route to the LRT (based on industry consultants). The \$1.80 cost per passenger assumes no ridership growth and the transfer of one-third of the King and Delaware passengers to LRT. Current B-Line only Bus costs = \$1.07 per passenger.
- Future Projections - Year 2031, indicates a Bus and LRT system may cost approximately \$7million less than the Bus only system, utilizing the existing fleet sizes. Net operating cost per passenger estimates are \$2.28 per passenger for the existing Bus system compared to \$1.51 per passenger for the Bus and LRT system. Net operating cost per passenger along the B-Line only are estimated at \$1.12 per passenger for the existing Bus system compared to \$(0.75) per passenger for the Bus and LRT system.

Benefits

Financial:

- B-Line Corridor Capital Works – a reduction of scheduled and unscheduled backlog of capital works in the order of approximately \$79 million.
- The Canadian Urban Institute (CUI) Study found:
 - that three times the number of developments were likely to occur (e.g. 108 projects vs. 32) within the same timeframe *with LRT* as compared to *without LRT*¹
 - Tax Benefit from new development by LRT estimated at \$22.4 million.²
 - Building permit fees and development charges (existing development exemptions removed) estimated at \$30.2 million.³
 - Residential property value premium estimated at \$29 million (Net Value \$0). This uplift premium increases the property taxes paid by property owners benefiting from the LRT and reduces taxes for all other tax payers.⁴
- Potential for 6,000 construction jobs (provincial); 3,500 directly in Hamilton.
- Potential for 1,000 permanent jobs (provincial); 300 jobs located in Hamilton to deliver regular operations and maintenance.
- B-Line LRT investment may result in an estimated increase of more than \$443 million in Ontario’s GDP.
- Annual accident costs are expected to reduce by \$3.48 million over 22 years.

Health

- Investments in public transportation such as LRT can help shape a city’s built environment into a more walkable, complete and compact community.
- Individuals who walk an additional kilometre per day reduce their chances of becoming obese by 5%, compared to motorists driving an additional hour daily who are 6% more likely to become obese.

¹ Hamilton B-Line Value Uplift and Capture Study, Canadian Urban Institute, June 2010, page 44

² Hamilton B-Line Value Uplift and Capture Study, Canadian Urban Institute, June 2010, page 66

³ Hamilton B-Line Value Uplift and Capture Study, Canadian Urban Institute, June 2010, page 68

⁴ Hamilton B-Line Value Uplift and Capture Study, Canadian Urban Institute, June 2010, page 69

Environment

- Public transportation produces on average (per person) 50-95% lower emissions than driving.
- A 30%-50% reduction in car traffic (GTA) can lower emission rates and have the potential to save an estimated 200 lives and \$900 million per year.
- Auto-dependent communities require 20-50 times more space than transit-friendly communities, resulting in storm water management challenges.

Social/Tourism

- LRT has the potential to connect people living in downtown neighbourhoods with job opportunities and amenities, including health and social facilities.
- Investment in LRT and transit can help reduce poverty by providing economical transportation options.
- In Hamilton, 17% of the existing population and 20% of employment opportunities are located within 800 metres of the B-Line Corridor. 80% of the city’s population is serviced by HSR transit routes that connect directly with the B-Line.
- High quality light rail systems have an iconic value that is attractive to tourists, commuters and residents because transportation is a key element in the visitor experience. An efficient public transportation system can significantly enhance a city’s reputation among travelers.

In conclusion, Light Rail Transit along the B-Line is a worthwhile investment. The benefits captured within this report have used conservative values (i.e. worst case scenario values to ensure that the benefits are cautious rather than optimistic). Summed up the City of Hamilton should see a direct benefit of approximately \$130M (reduction in backlog, building permits and tax benefits from development).

In addition, there are a number of spin off benefits associated with the construction of LRT. The Benefits Case Assessment estimates that 3500 temporary jobs will be created in Hamilton during the construction period and 300 permanent jobs. This also affects Ontario’s Gross Domestic Product providing a value of \$443 million.

Health, Environment and Social Tourism are difficult to quantify without extensive and costly studies. This report recognizes that LRT does provide benefits within these areas and offers enhanced quality of life for residents.

A fundamental consideration of the benefits of this type of project, which aligns with the findings of the McMaster Institute of Transportation and Logistics study, is the ability for LRT to refocus growth within the community. This is in keeping with Places to Grow, the City of Hamilton Official Plan and the City of Hamilton Transportation Master Plan and allows the City to capitalize on existing infrastructure while achieving population and employment growth.

2.0 The Rapid Transit Vision

In January 2009 (Report PW09007), Hamilton City Council adopted the following vision statement for Rapid Transit:

Rapid Transit is more than just moving people from place to place. It is about providing a catalyst for the development of high quality, safe, sustainable and affordable transportation options for our citizens, connecting key destination points, stimulating economic development and revitalizing Hamilton. Rapid transit planning strives to improve the quality of life for our community and the surrounding environment as we move Hamilton forward.

Council also directed that the Rapid Transit vision statement be applied as the guiding principle behind the planning for and delivery of a rapid transit system for Hamilton. As such, this vision statement has been used to guide decisions made in the development of the Planning, Design and Engineering work for B-Line Rapid Transit.

3.0 City of Hamilton Strategic Plan – 2012–2015

OUR Vision

To be the best place in Canada to raise a child, promote innovation, engage citizens and provide diverse economic opportunities.

OUR Mission

WE provide quality public services that contribute to a healthy, safe and prosperous community, in a sustainable manner.

OUR Values

Honesty - WE are truthful and act with integrity.

Accountability - WE are responsible for our actions ensuring the efficient, cost effective and sustainable use of public resources.

Innovation - WE are a forward thinking organization that supports continuous improvement and encourages creativity.

Leadership - WE motivate and inspire by demonstrating qualities that foster effective decision making and promote success at all levels.

Respect - WE treat ourselves and others as we would like to be treated.

Excellence - WE provide municipal services through a commitment to meeting and exceeding identified standards.

Teamwork - WE work together toward common goals, through cooperation and partnership.

Equity - WE provide equitable access to municipal services and treat all people fairly.

Cost Consciousness – WE must ensure that we are receiving value for taxpayer dollars spent.

4.0 History of Rapid Transit in Hamilton

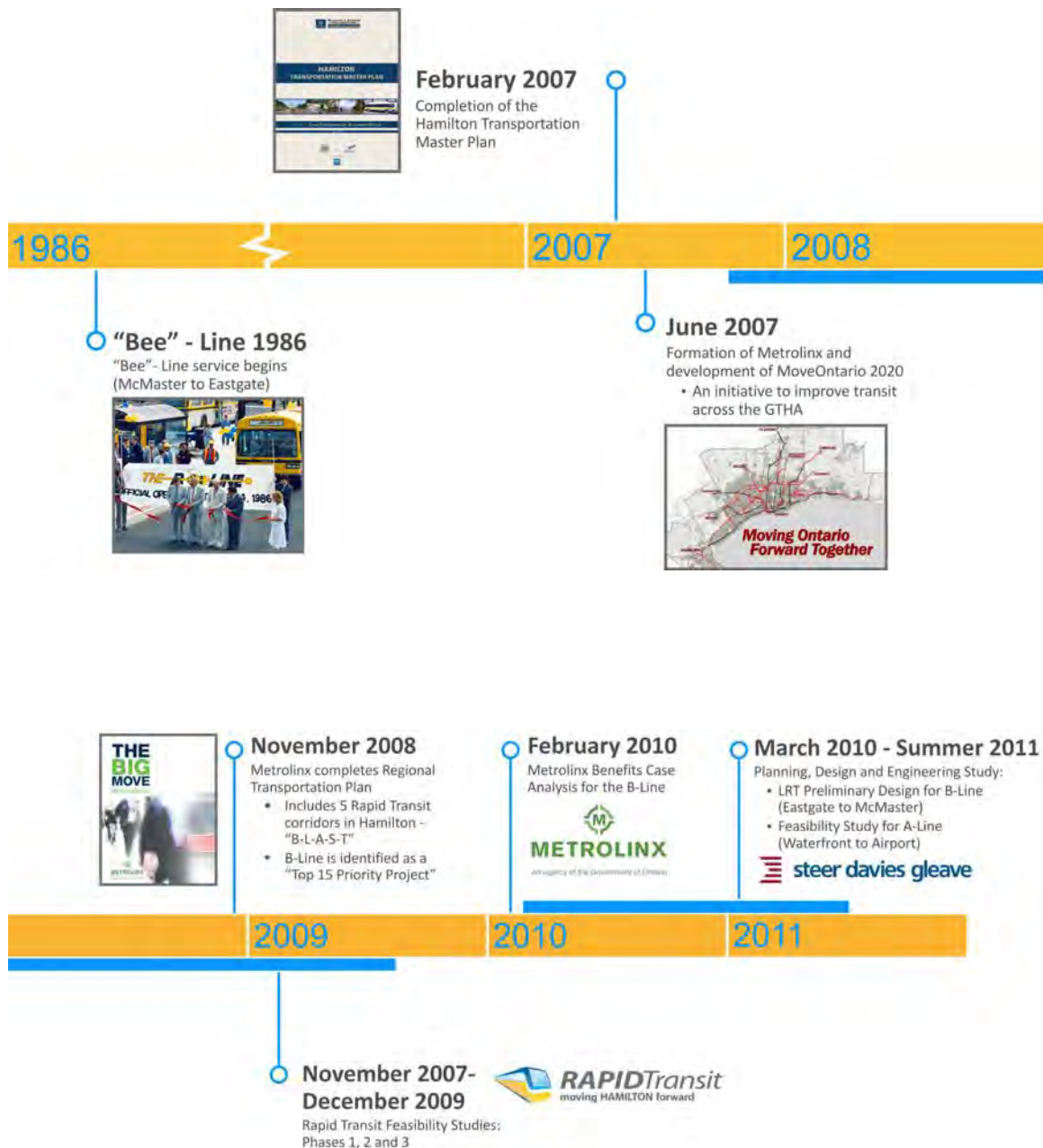


Figure 1 – Rapid Transit Timeline

5.0 What is Light Rail Transit and What Can it Do?

For Hamilton, Rapid Transit is more than just a transit project; it is a community shaping initiative and potentially the largest capital project the City will have ever constructed.

Modernized public transportation (including LRT) is a key, corporate strategic priority that supports the concept of community building and economic development while enhancing connections to the Greater Toronto Hamilton Area (GTHA) through improved transportation networks and linkages to the planned GO Transit expansions at James Street North and Confederation stations.

LRT infrastructure includes the following features:

- Electrically-powered, clean and green vehicles with no emissions at street level
- Bi-directional
- Provides predictable journey times
- Operates in dedicated transit lanes
- Offers a smooth, comfortable and quiet ride
- Fully accessible; level boarding with easy access for all
- High capacity
- Affordable
- Reliable – can operate even in heavy snow or icy conditions
- Integration with the current streetscape

LRT also provides a platform for future investments such as upgraded water and sewer infrastructure, roads, utilities, and public realm contributing to quality of life benefits.

In addition, LRT supports the City’s Strategic Priority of becoming *A Prosperous & Healthy Community* and enhancing Hamilton’s image, economy and well-being by demonstrating that Hamilton is a great place to live, work, play and learn.

This will be accomplished through a *Corporate Strategic Objective* that commits to improving the City’s transportation system to support multi-modal mobility and encourage interregional connections. As such, the *Strategic Actions* will focus on the following:

- Complete the design and develop an implementation and financial plan for the delivery of higher order transportation and enhanced transit service including all-day GO Transit service and rapid transit
- Develop an integrated, multi-modal, public transportation program including implementation of rapid transit, conventional transit, active transportation (e.g. pedestrian, cycling) and the associated transportation demand management (TDM) plan
- Develop a strategy to enhance conventional transit service levels within the A Line and B Line corridors

6.0 LRT – Stimulating the Economy

LRT is often a catalyst for stimulating the economy through investment in infrastructure. LRT has been found to stimulate the economy by:

- **Increasing land value** –In Hamilton, the increase is estimated from 8% to 14% within 800m of the B-Line, particularly within close proximity to station areas.⁵
- **Increasing assessment value** – High value, high density, mixed use land parcels may produce higher assessment which can assist in paying for capital and operating costs of the system.
- **Creating jobs** – In the initial design and construction stage and in the ongoing operations and maintenance phase. Estimates show that some 6,000 construction jobs would be created with more than 1,000 (provincial) permanent jobs (300 local) associated with regular operations and maintenance.⁶
- **Encouraging urban development** – Permanence of an LRT line allows both riders and developers to have a vision, plan ahead and helps create compact urban communities with confidence in long term viability.
- **Attracting private investment** – Focused on building new neighbourhoods and renewing those in need of improvement. Studies show that LRT may support local economic development attracting more consumers to local businesses.⁷

⁵ Metrolinx Benefits Case Analysis, February 2010, Land Value Changes, page 43

⁶ Hamilton Rapid Transit Initiative: Economic Potential Study, March 2009, page 3

⁷ Metrolinx Benefits Case Analysis, February 2010, Land Use Shaping, page 46

LRT has the potential to help Revitalize Hamilton by:

- **Supporting the concept of “community building” which will eventually lead to:**
 - A more attractive downtown core
 - A waterfront that continues to serve the growing needs of the community
 - Inner-city neighbourhoods that benefit from revitalization
 - Better integration and focus between the City and community groups
- **Increasing potential and concentration of community development** that will revitalize Downtown Hamilton resulting in a greater increase in property values and greater potential for economic spin-offs
- **Stimulating mixed-use, higher density communities** within walking distance of a transit stop making it convenient to travel to a multitude of destinations by walking, cycling or using public transit instead of a car.
- **Increasing populations and employment densities** adjacent to the LRT line specifically in the vicinity of LRT stations
- **Reducing auto traffic** in the downtown core
- **Transforming our community through spurring economic activity** by creating unique streetscapes that support adjacent neighbourhoods
- **Contributing to vibrant streets** where all road uses can co-exist
- **Promoting new development and investment** along its key corridors
- **Supporting opportunities to redevelop and intensify** existing developments
- **Attracting new residents and skilled workers** to develop creative and knowledge-based industries

LRT can potentially improve Quality of Life by:

- **Making Hamilton more accessible** – LRT will be located within 800 metres of 20% of Hamilton residents and employment ⁸
- **Offering time savings** of \$647 million annually for existing transit users, new transit users and auto users ⁹
- **Offering competitive journey times and reliability**
- **Increasing passenger comfort**
- **Increasing public access** to employment areas, residential properties, commercial districts and municipal services, increasing the connectivity and vibrancy of urban areas
- **Connecting Hamilton’s priority neighbourhoods** to more employment, educational, healthcare, recreational and cultural opportunities (as outlined in the Code Red Study¹⁰)
- **Encouraging healthier lifestyles** by promoting walking & cycling as regular daily commutes

⁸ Hamilton Rapid Transit Initiative: Economic Potential Study, March 2009, page 2

⁹ Metrolinx Benefits Case Analysis, February 2010, Travel Time Savings, page 33

¹⁰ The Hamilton Spectator, Code Red Special Report, May 11, 2010

- **Reducing collisions** as a result of declining automobile use with estimated savings of \$18 million over a 30-year period¹¹
- **A more reliable transit service** where riders do not need to consult a schedule, making their journey more convenient

LRT will lead to Environmental Benefits by:

- **Reducing air pollution** from vehicle emissions and greenhouse gases
- **A transit rider creating 65% fewer greenhouse gas emissions** compared to an auto user based on the same trip¹²
- **Decreasing total vehicle use**
- **Reducing the number of annual automobile traveled kilometres** by 17 million in 2021¹³
- **Contributing to clear air** helping meet Hamilton’s Clean Air and Green House Gas emissions targets¹⁴
- **Reducing noise pollution**

LRT will Connect Key Destination Points by:

- **Improving public access** to employment areas, residential properties, commercial districts and municipal services with the provision of faster, more frequent service (see figure 2).
- **Providing choice of travel modes** that support and interconnect to each other at the local level (trails, cycling and walking) and interregional transportation (GO Transit).

¹¹ Metrolinx Benefits Case Analysis, February 2010, Safety Benefits, page 34

¹² The Benefits of LRT Expansion in Edmonton, City of Edmonton, June 2010, page 4

¹³ Metrolinx Benefits Case Analysis, February 2010, Greenhouse Gas Emissions, page 39

¹⁴ Corporate Air Quality & Climate Change Strategic Plan Phase II, Clean Air Hamilton



Figure 2 – A-Line and B-Line Corridors

7.0 B-Line Corridor – McMaster to Eastgate

Hamilton’s B-Line is identified as a “Top 15 Priority Project” in the Metrolinx Transportation Plan, *“The Big Move.”* Metrolinx completed a Benefits Case Analysis (BCA) demonstrating full LRT (starting with the B-Line) as the option that would generate the highest benefits for Hamilton and also be capable of accommodating the long-term travel demand growth in the corridor. Full LRT is also the highest cost option. While full BRT may cost considerably less to build and can generate a strong benefits-cost ratio, the benefits of BRT are less extensive as compared to the potential benefits of LRT.

A \$3 million Planning, Design and Engineering (PDE) study was initiated in March 2010, funded by Metrolinx. The study produced the preliminary design for an LRT B-Line (see Figure 3 for study area) and a Preliminary Feasibility Study for the A-Line (Waterfront to Airport). The PDE study was completed in October 2011 and, in January 2012, staff completed the Environmental Process for rapid transit along the B-Line Corridor.



Figure 3 – B-Line LRT McMaster to Eastgate

8.0 Hamilton’s Rapid Transit Network

BLAST Network

Hamilton has focused its rapid transit planning (BRT/LRT) on a city-wide system referred to as B-L-A-S-T. This system includes five corridors (please see map of the B-L-A-S-T network – Figure 4.)

The B-Line corridor is the first part of the City of Hamilton’s rapid transit network. As part of the network, the A-Line would be the next line to develop operating from the Waterfront to the Airport.

The Planning, Design and Engineering (PDE) Study initiated in March 2010 included the pre-feasibility study for the A-Line, completed in March 2012. It is anticipated that a full feasibility study and Benefits Case Analysis for the A-Line will be completed in Q4 2013.

The City of Hamilton is committed to applying a strategic, forward thinking approach to all public transportation initiatives. Completing the A-Line in conjunction with the B-Line would create a strong connection between Hamilton’s interregional network connections (GO), Downtown, McMaster University, Mohawk College and the East end including Confederation. This strategic approach would significantly enhance the following benefits of LRT in Hamilton by:

- Stimulating the Economy
- Revitalizing Hamilton
- Improving Quality of Life
- Increasing Environmental Benefits
- Connecting Key Destination Points

Hamilton’ current ridership in the B-Line corridor and its projected ridership growth, requires the development of a Rapid Transit system to ensure efficient and effective connectivity for citizens who want to move throughout the city and connect to interregional travel modes. Successful planning for rapid transit must be completed through an integrated approach which includes planning for other travel modes (walking, cycling, conventional transit, car sharing, bike sharing , park-n-ride, cars, goods movement), land use planning and financial analysis.

The City of Hamilton’s public transportation network is comprised of five major components:

- Interregional integration (GO bus and rail, Burlington Transit, Niagara Region)
- Conventional HSR transit
- Specialized transit ATS/DARTS
- Rapid Transit
- Active Transportation (Walking, Cycling, Bike Share)

All network components, including Light Rail Transit, must be integrated to the greatest extent possible to provide the most effective and seamless public transportation system for the citizens of Hamilton.



Figure 4 – BLAST Network

9.0 Background

The Official Plan (glossary) defines Higher Order Transit as:

Transit that generally operates in its own dedicated right-of-way, outside of mixed traffic where possible, and therefore can achieve a speed and frequency of service greater than conventional transit. Higher order transit can include heavy rail (i.e.: subways), light rail transit and buses in dedicated rights-of-way and is typically referred to as rapid transit (Growth Plan, 2006).

Chronology

In 2007, the Province of Ontario announced that, through its MoveOntario 2020 Plan, Hamilton had emerged as a short-term candidate for Rapid Transit funding. Since then, evolving and shifting funding priorities have impacted the momentum of Rapid Transit development in Hamilton and other Greater Toronto and Hamilton Area (GTHA) municipalities.

At its October 7, 2008 meeting, the Public Works Committee approved a recommendation directing staff to study rapid transit with Light Rail Technology as the preferred option. Hamilton City Council endorsed Report PW08043D on **October 29, 2008**, approving the following recommendation:

- a) Request Metrolinx to undertake the appropriate benefits case analysis required in order to include the functional design, detailed design and construction of the B-Line Rapid Transit Corridor for the City of Hamilton in their 2009-2013 five year capital budget utilizing Light Rail Technology;
- b) Request Metrolinx to undertake the Rapid Transit Feasibility Study (Phase 3) in order to continue the planning and design for the A-Line Rapid Transit Corridor utilizing Light Rail Technology in conjunction with the design and construction of the B-Line Rapid Transit Corridor for the City of Hamilton as part of their 2009-2013 capital budget with design and construction funds to be included in a future five year capital budget;
- c) Continue its undertaking of required rapid transit initiatives studies and an aggressive public consultation program for rapid transit in Hamilton.

On April 1, 2009, the Province of Ontario included \$3 million in the Provincial Budget for the City of Hamilton to study Light Rail Transit on the B-Line and to determine the feasibility of rapid transit (either LRT or BRT) on the A-Line. Hamilton was the only municipality to receive such funding.

On October 13, 2009, Hamilton City Council gave its approval for the City of Hamilton to enter into a Contribution Agreement with Metrolinx for \$3 million in funding for Rapid Transit studies and for the General Manager of Public Works

and the City Treasurer to be authorized and directed to negotiate and sign the final terms of the Agreement in a form acceptable to the City Solicitor. (Report # PW09088).

On February 19, 2010, Metrolinx presented its Benefits Case Analysis (BCA) for Hamilton rapid transit to its Board of Directors.

Although the BCA identified full LRT as the highest cost option, it also noted that LRT in Hamilton would generate the highest transportation user benefits comprised of travel time savings, ridership attraction and overall qualitative travel experience. LRT also carries a stronger potential to reduce greenhouse gas emissions and generate more significant economic development impacts including employment, income, and Gross Domestic Product growth for the city and region. The BCA also identifies LRT as having greater potential to shape land uses and uplift land values along the King-Main corridor.

On September 22, 2011, a joint Metrolinx/City of Hamilton meeting was held for the purpose of providing a status update on the Planning, Design and Engineering (PDE) study and project benefit and cost report (Making the Case). At this meeting, Metrolinx indicated that it was encouraged with Hamilton’s progress on the Rapid Transit initiative and urged the City to complete the work plan outlined for 2012. This work provides further necessary information allowing Metrolinx to put forth a positive recommendation stating that Hamilton’s Rapid Transit initiative has reached a maximum state of implementation readiness.

On October 26, 2011, City Council approved recommendations in the report: *Conventional, Rapid and Inter-Regional Transit: Technical, Financial and Land Use Considerations* (CM11016/PW11064/PED1154/FCS11072). Included in the amended recommendations, Council directed staff to complete the project benefit and cost report including the cost of not doing LRT and a triple bottom line analysis and also that, in its report back, staff include firm capital costs and a recommended funding request to Metrolinx for capital and net change in operating costs in LRT vs. the existing HSR bus system including the cost per passenger. Also on October 26, 2011, staff presented the City of Hamilton contributions to the Rapid Transit initiative.

City of Hamilton Contributions to the Rapid Transit Initiative: The Rapid Transit Initiative began in 2008. Since that time, the City of Hamilton has spent over \$5,000,000. City Capital expenditures total approximately \$2 million which included earlier Rapid Transit Feasibility studies for the A&B Line, preliminary assessment of LRT Operations, economic potential study, development opportunities & model development. Operating expenditures have totalled approximately \$3 million which included staffing and resources of the rapid transit office. Yearly Rapid Transit budgets have been submitted to Council for approval, since 2008.

In January 2012, staff completed the Environmental Process for rapid transit along the B-Line corridor.

10.0 Triple Bottom Line

Economic/Financial

Project Capital

The following table provides the Capital Cost estimate for LRT on Hamilton’s B-Line as prepared by consultant, Steer Davies Gleave. Cost estimates were prepared in February 2012, based on 2011 dollars.

	TOTALS (\$2011)
Preparatory Works	\$ 95,578,021
Guideway	\$ 79,811,694
Trackwork & Stations	\$115,586,465
Systems	\$ 90,750,250
Maintenance Facility	\$ 48,480,143
Vehicles	\$110,000,000
Construction Sub-total	\$540,206,573
Design & Management	\$120,431,493
Property Allowance	\$ 34,557,000
Sub-total	\$695,195,066
Contingency (17%)	\$ 116,190,893
Total	\$811,385,960

Figure 5 – Project Capital

On October 26, 2011, City Council was presented with Project Capital Estimates totaling approximately \$875.5 million. The updated Project Capital estimates are approximately \$811.4 million. The reduction of approximately \$64.1 million is primarily due to \$27million in construction costs, \$16million in Design & Mgmt, \$20million in Contingency.

As summarized in the Steer Davies Gleave Cost Estimate report, the estimates pertain to the construction of a 13.8 kilometre LRT system from McMaster University to Eastgate Square on dedicated and shared right of way. Figures include construction of power sub-station buildings, power distribution through a catenary system, guideway, construction of an ‘LRT only’ bridge at the 403 crossing, modifications or removal of the skywalk pedestrian bridge (as required) and structural reconditioning of the Red Hill Valley Parkway bridge. The route accounts for eighteen LRT stops which include terminal stops at McMaster and Eastgate. Each cost category is described in detail below:

- **Preparatory Works:** Includes the removal of existing pavement surfaces along the corridor for the construction of the guideway, relocation of signs,

signal heads, controllers, etc. Also includes cost estimates to remove/relocate/install all structures for municipal services (water, sanitary & storm water) and the relocation of infrastructure for hydro, communications and gas.

- **Guideway:** This item includes the concrete guideway, guideway curb, track cross gutter drain and weep drain. In addition, the LRT-only bridge (at the 403 crossing) and structural reconditioning of the Red Hill Valley accounts for approximately \$14.5 million of the cost estimate.
- **Trackwork & Stations:** Includes cost of installing embedded track for the guideway and all special trackwork for the system. This includes an allowance for the guideway connection from a Maintenance Storage Facility to the main line (approximately 1.25 km). Also includes the cost for the construction of all eighteen stops (side running and centre) and the termini at McMaster and Eastgate.
- **Systems:** Includes the installation of the guideway electrical cable and catenary poles, major modification of 69 existing signals, construction of a system wide communications duct bank and street lighting. This also provides an allowance for the construction and equipping of seven (7) traction power sub stations buildings. This estimate also includes signaling, communications and fare equipment (ticket vending/validation machines).
- **Maintenance Facility:** A Maintenance Storage Facility is not defined in the preliminary engineering phase of the project. Therefore, this cost estimate is presented at a higher level and will be confirmed during the next phase of the project.
- **Vehicles:** Includes the provision of 22 low floor light rail vehicles and is based on a recent procurement cost of light rail vehicles for Metrolinx.
- **Design & management:** Includes the cost for final design, construction administration, insurance, permits, surveys, testing, investigation, inspection, and startup based on the consultant’s best estimate.
- **Property Allowance:** The purchase or lease of real estate may be required. This is an estimated cost of the property requirements for the construction of the project and is based on property values in Hamilton.
- **Contingency:** An overall price contingency is provided at approximately 17% of total costs.

These cost estimates are based on preliminary engineering at 30% detailed design and, as such, are subject to a plus/minus variance of 15% to 20%. Taking this into account, the Project Capital costs in 2011 dollars are estimated to range from \$649,108,768 to \$973,663,152 (as illustrated below).

Range of Project Capital Costs in 2011 dollars

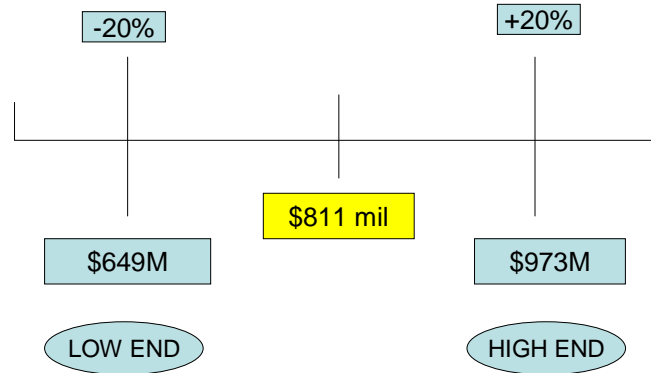


Figure 6 - Range - Project Capital Costs

Depending on the timing of construction, these figures would increase based on rate of inflation (assuming 2% annually) by a range of \$675 million in 2013 to \$1.2 billion in 2023 (as illustrated below).

Range of Project Capital Costs due to Construction Startup

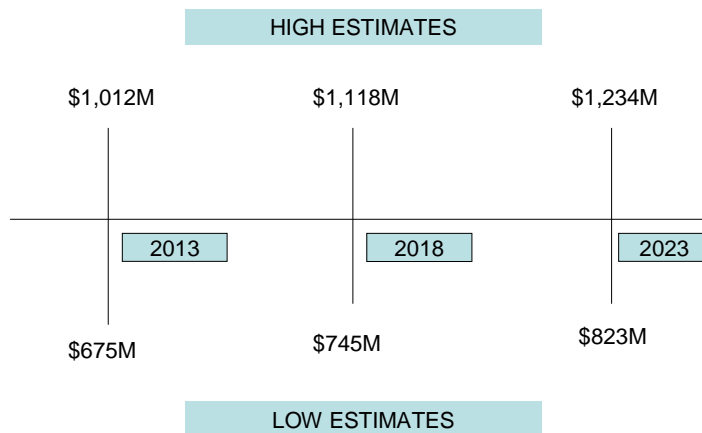


Figure 7 – Range of Project Capital Costs - Construction Startup

A recent example of another LRT system and its respective Project Capital Costs include:

Waterloo LRT/BRT Project:

19km of LRT + 17km of BRT = \$818 million (in 2014 dollars)

While the breakdown of costs remains confidential at this time, it is expected that a significant amount of the \$818 million is related to Waterloo Region's LRT. Assuming \$750 million (in 2014 dollars) is LRT related, this equates to approximately a cost of \$39.5 million per kilometre (in 2014 dollars).

Capital cost estimates provided for a Hamilton B-Line LRT system seem to be high in comparison to other systems. Assuming that \$811M (2011 dollars) is a reasonable estimate, a 13.8km LRT line would equate to \$860M in 2014 (based on 2% inflation), approximately \$61 million per kilometre. When considering the lower end estimate of \$675M (2013 dollars) and the respective increase to \$689M (2014 dollars), the resulting \$49 million per kilometre remains relatively high compared to other systems.

Included in the 2013 rapid transit work plan is an opportunity to undertake a Value Engineering assessment to review capital cost estimates. This evaluation may uncover savings not already accounted for in the current capital cost estimates. For example, a Value Engineering assessment undertaken by the Region of Waterloo for its LRT system resulted in a project cost savings of approximately 18%.

With the introduction of an LRT system on Hamilton's B-line corridor, there may be changes in the service delivery of other City services which could result in additional City capital costs of approximately \$1.8 million (as identified in report CM11016/PW11064/PED11064/FCS11072.) Much of the additional cost would be dedicated to the purchase of an articulated aerial device for the Hamilton Fire Department valued at approximately \$1.5 million. The remaining \$300,000 would be dedicated to such anticipated services as enhanced litter control and concrete curb repairs.

11.0 B-LINE Corridor Capital Works – Status Quo

LRT capital cost estimates include the removal of existing pavement surfaces along the corridor and the removal/relocate/install of municipal sewer and water services. LRT roads will have a life cycle of 35 years and LRT subsurface infrastructure will have a life cycle of 50 years. Assuming that all capital works associated with the implementation of Hamilton's LRT B-Line are funded by other levels of government, a reduction in the overall backlog of City rehabilitation, replacement and reconstruction needs along the corridor would be realized.

Due to budget constraints, all City capital works noted below are not necessarily programmed within the capital budget. The budget is determined based on risk assessment. However, these capital works are part of the overall backlog of rehabilitation and reconstruction needs contributing to the accumulation of the City's infrastructure deficit annually. The following summary is provided in order to quantify the backlog of capital works that would be reduced.

Roadworks

Capital works associated with Roads are identified as either road resurfacing or road reconstruction.

To determine which capital work is necessary on a segment of road, an overall condition index (OCI) is determined. The need for a road reconstruction is triggered when an OCI index of 0 to 20 is identified. When the OCI index is between 21 and 60, road resurfacing is required.

There are 157 road segments on the B-Line corridor, or approximately 58.6 lane kms. At present, ninety segments (or 35.3 lane kilometres) require road resurfacing. City staff recognizes that the B-Line corridor is a main artery in downtown Hamilton with significant road usage.

Within a 35 to 50-year period, it is anticipated that one (1) road reconstruction of the entire B-Line corridor would potentially be addressed. As noted in the chart below, this equates to approximately a \$38.1 million reduction in backlog of City road works.

Sewermain

Capital works associated with Sewermain are identified as either sewer Cured in Place Pipe (CIPP) Lining or sewer replacement.

Sewermain conditions are assessed by using a closed circuit television (CCTV) video. There are five condition levels : 1 (very good) through to 5 (critical). When a sewermain has a condition level of 3, 4 or 5, sewer lining is recommended provided that no capacity upgrades are required. A condition level-5 may require

full sewer replacement, depending on the severity of the structural defects that could prevent the installation of a liner.

There is approximately 37 kilometres of sewermain along the B-Line corridor. At present, 4 kilometres of sewermain have a need for full replacement. Once a sewer is replaced or relined, the life expectancy of that sewermain increases to the original 50 year life span. It is presumed that the remaining 33 kilometres of sewermain will require, at the very least, a relining over a 50-year period. These costs are illustrated in the chart below.

Watermains

Watermain capital works is primarily a replacement. Watermain conditions are determined by reviewing and analyzing the break history, pipe material and age of the infrastructure.

There is approximately 37 kilometres of watermain along the B-Line corridor. It is the assumption of City staff that, over a 50-year period, at least 19 kilometres of watermain (approximately half of the total kilometres) will have a need for replacement. The chart below quantifies the reduction in backlog that would be addressed.

CAPITAL WORKS	UNIT COST (2011 \$s)	LANE KMS OR KMS	Reduction in Backlog
ROADS			
Reconstruction	\$650,000 / lane km	58.6 lane kms	\$38.1 M
SEWER			
CIPP Lining	\$325,000 / km	33 kms	\$10.7 M
Replacement	\$1,625,000 / km	4 kms	\$ 6.5 M
WATER			
Replacement	\$1,250,000 / km	19 kms	\$23.7 M
		TOTAL	\$79 M

Figure 8 – Reduction in Backlog

As stated above, not all City Capital works noted are programmed within the Capital budget. However, these capital works are part of the overall backlog of rehabilitation, replacement and reconstruction needs accumulating and adding to the City's annual infrastructure deficit. The implementation of the LRT B-Line system will potentially address the future backlog of capital work totaling an estimated \$79 million (in 2011 dollars).

12.0 LRT Project Operating Costs / Cost per Passenger

LRT Project Operating Costs

A Preliminary Operations and Maintenance plan for the 13.8 kilometre LRT system along the B-line corridor was completed by Steer Davies Gleave.

The report highlights a preliminary organizational structure and estimated costs associated with labour, maintenance, power for the vehicles and the LRT system. This information is based on typical operations and maintenance practices used worldwide. The preliminary operations and maintenance plan assumes the LRT system is a direct operating division of the City of Hamilton.

The preliminary organizational structure identifies approximately 182 staff members. Current existing staff may be qualified to carry out some of the functions identified, therefore, reducing the number of staff required for the LRT. However, for the purposes of conservative costing, a stand alone structure has been maintained.

As illustrated below, the organizational structure is broken down into five departments that report to a General Manager.

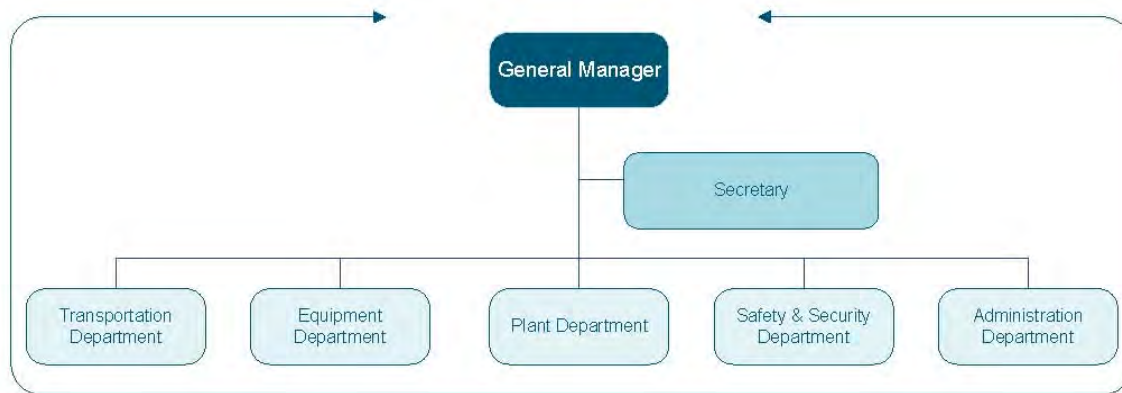


Figure 9 – Organizational Structure

The General Manager’s Office provides management direction, coordinates the activities of the Operations and Administration departments and is responsible for the performance of all aspects of the transit service. FTE = 2.

The Transportation Department is responsible for operating LRT vehicles and monitoring and controlling service from the Control Centre. FTE = 86.

The Equipment Department is responsible for vehicle maintenance and servicing. On a scheduled basis, all vehicles will undergo preventive maintenance, safety tests, major overhauls and inspections. Maintenance staff will handle LRT vehicle problems during revenue service. FTE = 27.

The Plant Department will look after the maintenance of all fixed assets including stops, tracks/right-of-way, offices and yards. FTE = 29.

The Safety and Security Department is responsible to ensure the safety and security of all passengers and staff of the transit system and its facilities. It will oversee the auditing, quality assurance and environmental monitoring for the transit system. FTE = 17.

The Administration Department will provide financial management, revenue collection, legal, human resources, procurement, marketing and IT support.

In summary, the report identifies a total operations and maintenance cost of approximately \$14,459,522 annually to include labour, maintenance, and power for the LRT vehicles and the LRT system.

COST ITEM	PER YEAR (\$2011)
Labour Costs	\$ 12,050,200
Vehicle Maintenance Costs	\$ 395,340
Track Maintenance	\$ 84,260
Power Costs	\$ 488,900
Cost for parts for maintenance of Catenary and TPSS	\$ 60,000
Cost for parts for maintenance of Communications & fare collection equipment	\$ 30,000
Office Supplies	\$ 36,320
SUB-TOTAL	\$ 13,145,020
10% (Contingency -insurance, rates, property taxes, etc)	\$ 1,314,502
TOTAL	\$ 14,459,522

The Labour component is primarily driven by the Transportation department accounting for 50% of the labour costs equating to \$6,045,000. Eighty six employees will work shifts seven days a week and provide services to meet the traveling demand of the public.

To accommodate a 4-minute headway for morning and afternoon peak periods, 22 LRT vehicles are required (19 operational, 3 stand-by spares). Non-labour maintenance costs per vehicle are estimated at \$17,970 per year.

Various components of the track system will need to be replaced at different periods of time. A Track Maintenance annual budget of \$84,260 will ensure the track is continuously maintained. If the track is neglected and maintenance deferred, higher costs will be incurred in a shorter time frame. This will result in replacement costs having to be capitalized.

Annual Power consumption costs are made up of a total of three components including:

- Traction Power Consumption
- Stop Power Consumption
- Maintenance Storage Facility Power Consumption

Based on estimated kWh for each component and published rates from Horizon Utilities, the resulting estimate is \$488,900 per year for Power Costs.

Similar to track maintenance, it is important that scheduled inspections and periodic replacements are carried out annually for the maintenance of the catenary, communications and fare equipment systems. If these systems are well maintained on an annual basis, replacement costs can be accommodated within the operations and maintenance budget.

Operating Budget Impacts and Operating Cost per Passenger

To determine estimated financial impacts LRT would have on the operating budget, staff prepared a comparable analysis of the existing Bus system (HSR) vs. Bus and LRT system.

The analysis included the following assumptions:

- LRT system is operated by the existing Transportation Division of the City of Hamilton
- Existing staff will be utilized where possible
- 18 buses are removed from service

As illustrated in Table-1, (Day 1 – Existing Ridership with LRT - LOW), the BUS column reflects current HSR expenditures and revenue actuals projected for 2012 with a net levy impact of \$44M (excluding Gas Tax Revenues). The current system-wide ridership is approximately 22 million. This results in a system-wide net operating cost per passenger of \$2.00. On the existing bus B-Line route only, a net operating cost per passenger is estimated at \$1.07. The detailed analysis can be found in Appendix A.

The BUS and LRT column represents the implementation of an LRT system along the B-Line corridor including HSR bus route integration on Day 1. This scenario accounts for an LRT headway of 6 minutes and a shift of one third of service hours and riders from the King and Delaware routes to the B-Line route. This results in a decrease to the operating costs for both the King and Delaware lines, and an increase to the operating cost of the B-Line route.

Assuming total ridership remains the same, the gross and net levy will increase by \$2.9 million. With a higher net levy compared to the existing bus system (i.e. \$44M to \$46.9M), the resulting net operating cost per passenger for both system-

wide and B-line-Only have increased to \$2.13 and \$1.80 respectively. The detailed analysis is provided in Appendix A.

It is worth noting that, if a decision is made to redeploy the 18 buses to other routes within the network, there would be an increase of \$6 million in gross operating costs. This figure does not include revenue from ridership which would occur and, to some degree, offset these costs.

TABLE 1
DAY 1 – EXISTING RIDERSHIP WITH LRT - (LOW)

	Existing BUS Service	BUS & LRT	VARIANCE	% VARIANCE
GROSS EXPENDITURES	\$79M	\$81.9M	\$2.9M	3.6%
REVENUES *	(\$35M)	(\$35M)	(\$0)	0%
NET LEVY	\$44M	\$46.9M	\$2.9M	6.5%
Ridership	22 M	22 M	0 M	0%
Net Operating Cost per passenger(System wide)	\$2.00	\$2.13	\$0.13	6.5%
Net Operating Cost per passenger(B-Line only)	\$1.07	\$1.80	\$0.73	68%

* Average Fare rate per passenger \$1.59 and does not include Gas Tax monies

Note: Assumes the existing \$6million bus B-Line costs are NOT redeployed.

Public transportation industry consultants have stated that two-thirds of ridership from the existing B-Line corridor can be expected to transfer to the LRT B-Line causing an immediate 8% city-wide ridership increase to potentially occur with the implementation of an LRT system.

As illustrated in Table-2, (Day 1 – Increase Ridership with LRT HIGH) these assumptions result in an increase of approximately 1.8 million riders. With the increased ridership along the B-Line, an LRT headway of 4 minutes would be implemented. This results in a net levy impact of \$3.5M or 7.9% increase to the current existing HSR Budget. Net operating cost per passenger system-wide remains the same as existing cost per passenger \$2.00, and the B-Line-Only net operating cost per passenger equates to \$0.45. The detailed analysis is provided in Appendix A.

TABLE 2
DAY 1 – INCREASE RIDERSHIP WITH LRT - (HIGH)

	Existing BUS Service	BUS & LRT	VARIANCE	% VARIANCE
GROSS EXPENDITURES	\$79M	\$85.3M	\$6.3M	7.9%
REVENUES *	(\$35M)	(\$37.8M)	(\$2.8M)	8.0%
NET LEVY	\$44M	\$47.5M	\$3.5M	7.9%
Ridership	22 M	23.8 M	1.8 M	8.0%
Net Operating Cost per passenger (System wide)	\$2.00	\$2.00	\$0	0%
Net Operating Cost per passenger(B-Line only)	\$1.07	\$0.45	\$(0.62)	(58%)

* Average Fare rate per passenger \$1.59

Note: Assumes the existing \$6million bus B-Line costs are NOT redeployed.

The above-noted analysis provides an estimate of net operating budget impacts and net operating cost per passenger for Day 1 with LRT for two ridership scenarios (Low & High). In summary, a Bus and LRT system would result in a system wide net operating cost per passenger ranging from \$2.00 to \$2.13 compared to the existing system-wide net operating cost per passenger of \$2.00. The LRT B-Line-Only would result in a net operating cost per passenger ranging from \$1.80 to \$0.45, compared to the existing B-Line-Only net operating cost per passenger of \$1.07. Net levy impacts on Day 1 would also range from \$2.9 million (no increased ridership) to \$3.5 million (increase in ridership).

While Table 1 and Table 2 examine a Day 1 scenario, it is also important to consider the future operations of the system. Table 3 compares the Existing Bus system and Bus and LRT system to year 2031. Gross Expenditures for each were inflated by 2% annually to year 2031. Revenues were determined by the ridership projections for 2031. The existing average Fare rate per passenger of \$1.59 has been increased by 40% to \$2.23 based on a 10-year historical average increase of 20%. The detailed analysis is provided in Appendix B. For the Bus system, consultant Hatch Mott McDonald recommended 16% ridership growth over the 20 year period which equates to less than 2% a year. For the Bus and LRT system, 2031 ridership projections were provided by Consultants

Steer Davies Gleave. The LRT ridership estimate includes a 30% uplift based on optimizing routes to complement LRT, 31% uplift based on quality and reliability associated with LRT and an additional 30% based on growth (assuming full 2031 GRIDS growth is achieved).

TABLE 3
FUTURE 2031 – INCREASE RIDERSHIP WITH LRT

	BUS - 2031	BUS & LRT- 2031	VARIANCE	% VARIANCE
GROSS EXPENDITURES	\$115M	\$126.6M	\$11.6M	10%
REVENUES*	\$(56.8M)	\$(75.3M)	\$(18.5M)	32.5%
NET LEVY	\$58.2M	\$51.3M	\$(6.9M)	(11.9%)
Ridership	25.5M	33.9M	8.4M	32.9%
Net Operating Cost per passenger (System wide)	\$2.28	\$1.51	\$(0.77)	(33.7%)
Net Operating Cost per passenger(B-Line only)	\$1.12	\$(0.75)	\$(1.87)	(167%)

* Estimated Average Fare per passenger \$2.23 in 2031 (based on 10-year history of rate increases)

The results indicate that a combined Bus and LRT system would operate at a lower net levy impact in year 2031, compared to existing Bus service in year 2031. Net operating cost per passenger for both system-wide and B-Line is also significantly lower. Consultants have reported that LRT will bring a greater increase in ridership to the system.

Other City Cost Impacts: With the implementation of a B-Line LRT system, consideration must be given to operating implications of all other divisions and City Departments. Winter control, street tree trimming, street lighting, water and sewer and parking/By-law services all contribute to the approximate \$8.7 million city operating cost implications from other areas (as identified in report CM11016/PW11064/PED11064/FCS11072) . These proposed changes would require Council approval and proceed through the normal operating budget process.

Ridership

The chart below shows LRT daily ridership displayed by TRK index. (**TRK index =daily ridership/route length (km) / 1000**)

Therefore, as illustrated in the chart below, Day 1 LRT ridership in Hamilton is within range of the majority of successful LRT systems. This analysis shows that B-Line LRT is viable from a ridership perspective.

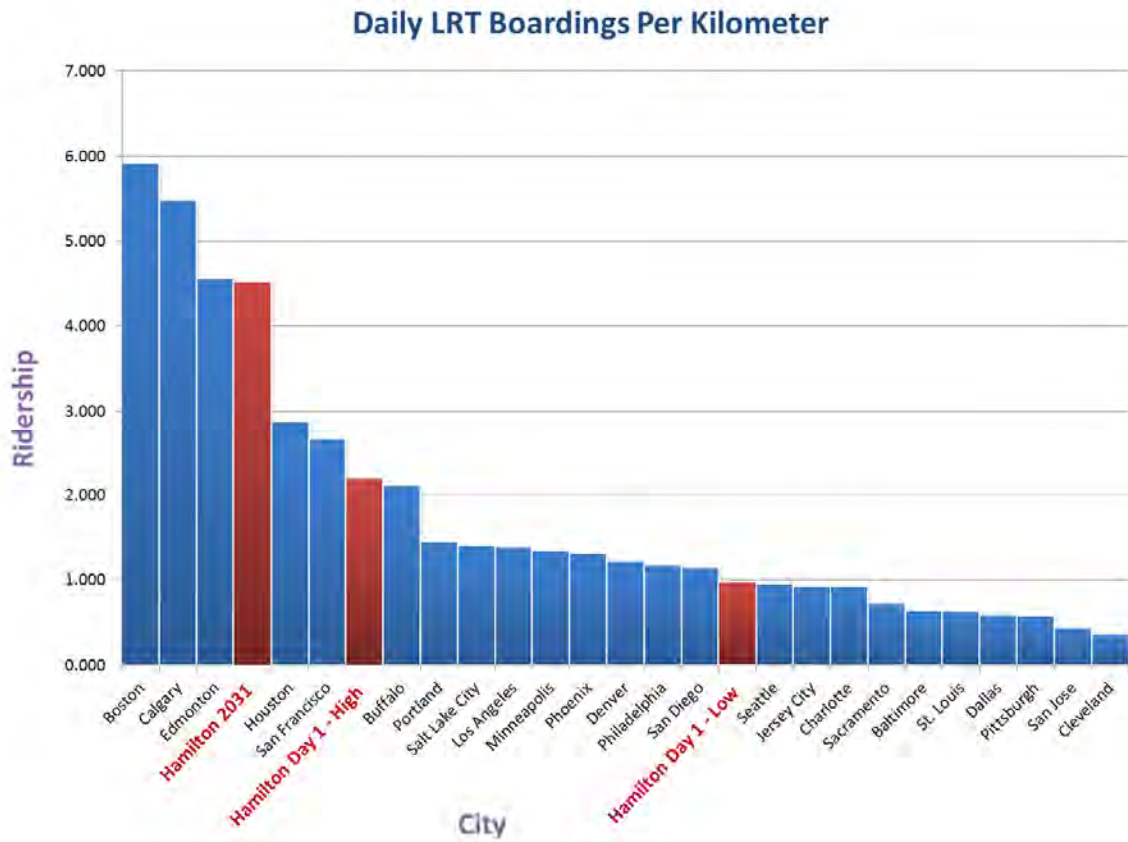


Figure 10 – LRT Boardings

13.0 Hamilton B-Line LRT Phasing Alternatives Analysis

As part of the 2012 Rapid Transit Work Plan, staff received direction to undertake an evaluation of phasing options for Hamilton’s B-Line LRT initiative to inform and assist Council in the decision making process related to B-Line LRT phasing alternatives.

The analysis will outline the advantages, disadvantages and trade-offs associated with a number of phasing alternative scenarios including:

- Scenario A - Business as Usual - Bus Routes: 1, 1A, 5 group, 10, 10A, 51, 52, 55, 55A, 58
- Scenario B - TPAP Approved – McMaster University to Eastgate Square – 13.8 km
- Scenario C - McMaster University to Ottawa Street – 9.1 km
- Scenario D - McMaster University to Queenston Circle – 10.8 km
- Scenario E – Downtown (MacNab Street) to Eastgate Square – 9.2 km

McMaster to Downtown option was not included since it does not connect to the potential Maintenance Storage Facility which was assumed to be 330 Wentworth Street North.

A multiple accounts evaluation (MAE) approach was applied including an assessment and evaluation of specific measures related to Community Benefits Account (User, Environmental, Economic Development, Community, and Urban Development) and Financial Considerations Account (e.g. Capital Costs, Operating Costs, Cost Effectiveness).

Findings from the MAE analysis show that Scenario B–McMaster University to Eastgate Square received the highest ranking for both the Community and Financial Accounts. Following closely behind is Scenario D–McMaster University to Queenston Circle.

Details of the Hamilton B-Line LRT Phasing MAE analysis and findings are included in the attached staff reports.

14.0 Economic Uplift

Land Value and Property Taxes

LRT is considered to be one of the fundamental elements in the successful redevelopment of downtown cores in urban centres. As identified in the Canadian Urban Institute’s (CUI) Hamilton B-Line Value Uplift and Capture Study (June 2010, see *Appendix C*), private investment often follows public investment. The fixed nature of LRT lines and stations attract investment by developers which often results in new infill development for mixed use, commercial or residential purposes. The heightened development supports regeneration by bringing people back to the core to live, work, learn and play. Revitalizing the core will attract creative talents by offering a high quality of life at a relatively low cost of living.

LRT stations in downtown cores often attract more office and retail development. According to the City of Hamilton Office Study (December 2009), the office vacancy rate in Hamilton was 15% and, while demand for office space has been strong, that is not the case in the downtown core. While neighbouring municipalities have experienced growth in their occupied space, Hamilton has struggled. Therefore, in order to compete, Hamilton needs to build amenities such as LRT to offer an urban form that will attract new office tenants.

Three of the key drivers supporting office development include:

- Clustering of services
- Economic factors (i.e.: competitive lease rates, operating costs, taxes)
- Amenities (i.e.: access to services, good quality housing, and recreational opportunities.)

LRT would contribute to these main drivers by enhancing mobility and making such amenities more accessible.

As noted in the Hamilton B-Line Value Uplift and Capture Study, “*higher order transit has the potential to enhance the value of land and lead to economic development along the transit corridor.*” The greatest increase in land value is focused on properties located within a reasonable walking distance from the station (e.g. 5 minute walk, 400m from station) and properties that are visible from the transit line. Conservative estimates indicate a 10-to-20% value premium for real estate located within easy access to the station.

To estimate an uplift value for Hamilton, the CUI study identified vacant and underused parcels of land within 400 metres of the B-line, likely to be redeveloped. This analysis included both vacant public and private parcels of land (e.g. surface parking lots).

Researchers identified prototypes of typical Hamilton buildings and determined future development potential for each of the vacant or underused parcels of land. A workshop was held with the participation of a wide cross section of City staff and Councillors to obtain feedback on the likelihood and timing of development.

The analysis of the development potential on the identified properties determined:

- 32 development projects were likely to proceed along the B-line corridor *without LRT*
- 108 development projects were likely to proceed along the B-line corridor *with LRT*

Three times the number of developments are likely to occur within the same timeframe *with LRT* than *without LRT*. Given current market conditions in Hamilton, it was determined that 60% of these developments would be residential buildings and 40% non-residential.

The study also shows that, over the coming 15 years, approximately 2.1 million square feet of development is likely to occur *without LRT*, compared to 5.7 million sq.ft of development that is likely to occur *with LRT*. The difference equates to 3.6 million square feet of additional development that could occur with a City of Hamilton public investment in LRT.

The two figures below highlight the difference in property tax assessment for the two scenarios, *Without LRT* and *With LRT*.

Figure 7 - Distribution of New Taxable Assessment “Without LRT” Per Square Metre



Figure 8 - Distribution of New Taxable Assessment “With LRT” Per Square Metre



Figure 11 – CUI - Distribution of New Taxable Assessment “With” and “Without” LRT¹⁵

¹⁵ CUI Analysis, page 46, Figures 7 & 8

More recently, the City’s Planning and Economic Development Department analyzed the potential for the properties along the corridor to transform into a different built form consistent with recent land use policy directions for the Main-King-Queenston corridor. Phase one of the Main-King Queenston Corridor Study (2012) looked at the properties within 400m on either side of the corridor and estimated that with a transformation of the properties to an appropriate built form (generally, multi-story mixed use buildings), the corridor would accommodate approximately a 1.2 million square feet increase in commercial space and 11.4 million square feet increase in residential space throughout the corridor (not including Downtown). These estimates assumed a certain percentage of the building stock would redevelop within the planning period (to 2031).

The CUI analysis was a more conservative approach, estimating 3.6 million square feet, compared to 12.6 million square feet estimated by the Main, King Queenston Corridor Strategy. The City’s development estimates are considered optimistic and may not occur within the 2031 period as it is recognized that redevelopment and transformation will require more than the construction of an LRT line. Pace of redevelopment will be affected by market trends, the demand for residential and commercial, availability of suitable sites for redevelopment along the corridor. A multifaceted strategy would have to be in place to encourage and facilitate intensification and development along the corridor.

To illustrate, note the more detailed work completed by the City’s Planning and Economic Development Department Nodes and Corridors study compared to the CUI Value Uplift and Capture Study:

To illustrate

Dundurn:

CUI: Total New Floor Space = 228, 110 sq. ft



Figure 12 – Total New Floor Space CUI – Dundurn

City of Hamilton: Total New Floor Space = 1,309,179 sq. ft



Figure 13 - Total New Floor Space – City Of Hamilton

To illustrate:

Nash Road:

CUI: Total New Floor Space = 184,600 sq. ft.

15 NASH

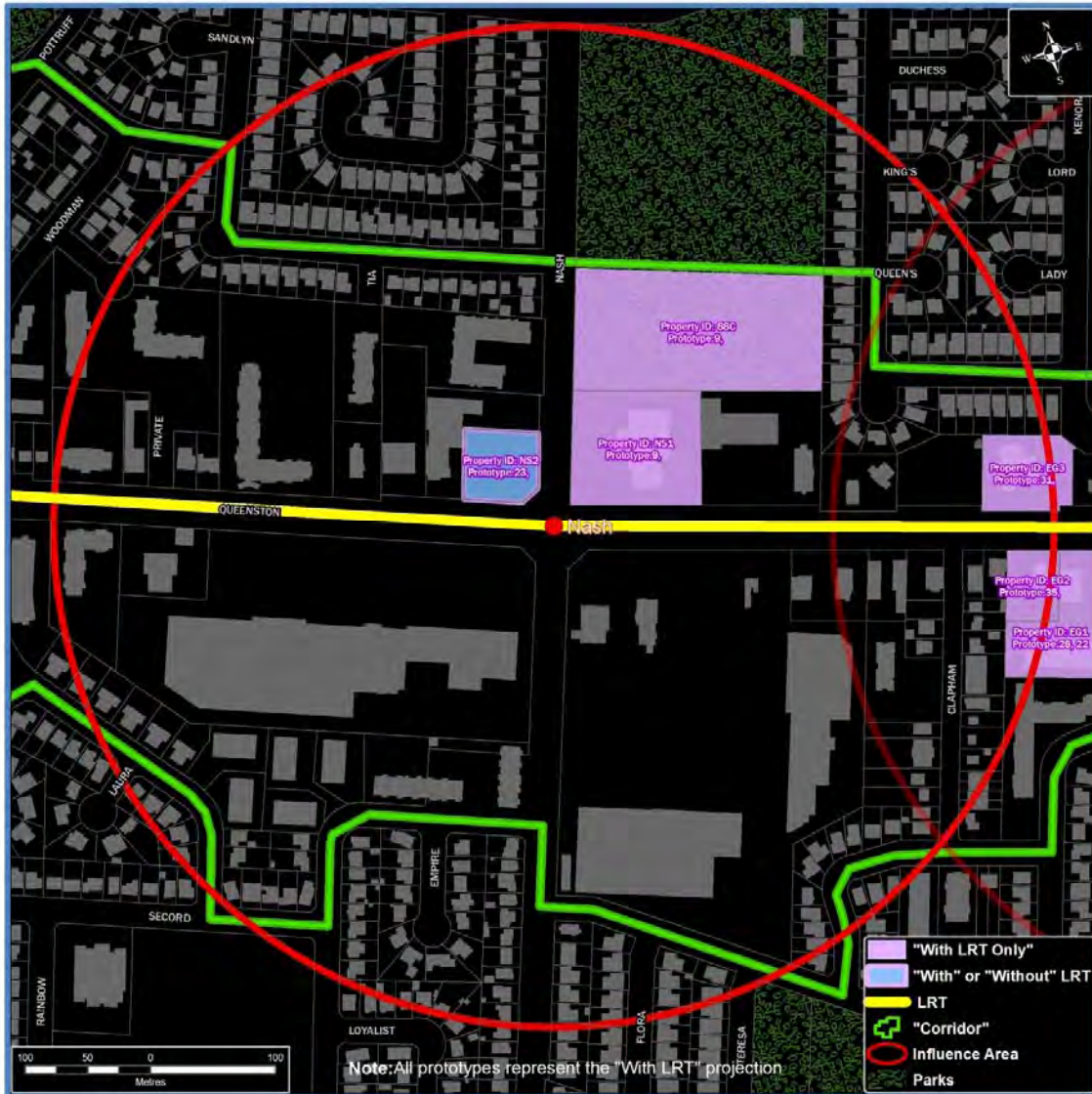


Figure 14 – Total New Floor Space CUI – Nash

City of Hamilton Total New Floor Space = 2,208,740 sq. ft.

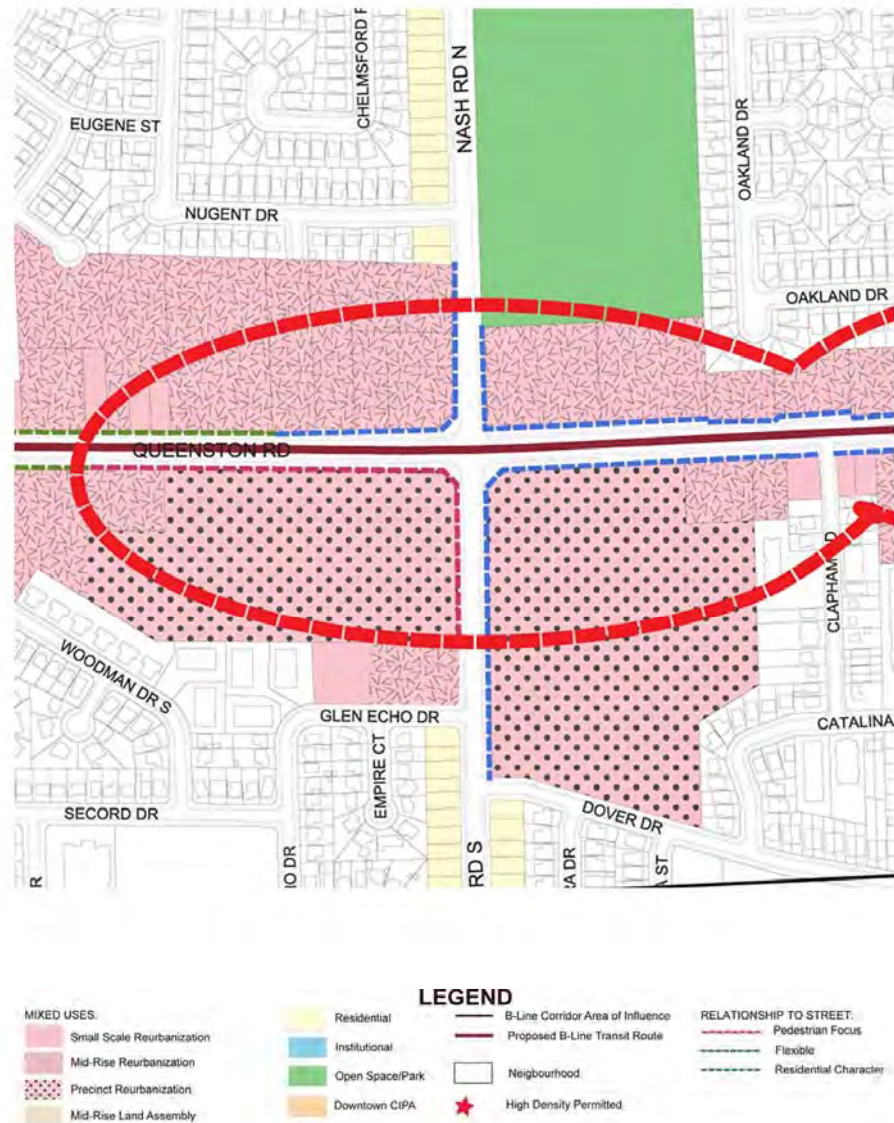


Figure 15 – Total New Floor Space City of Hamilton – Queenston

As noted previously, the CUI study shows very conservative development projections. CUI also used a conservative approach when determining the revenue estimates generated by the additional development.

CUI summarizes the estimates of the financial benefits of the B-line as follows:

Estimate of B-Line Financial Benefits

Source of additional tax benefit for Hamilton (based on 3.6 million sq. ft.)	Amount over 15 years
Tax Benefit from new development by LRT on evaluated vacant and underused parcels (New Tax \$s collected by the City)	\$22.4 million
Building permit fees and development charges for this new development (New \$s collected by the City)	\$30.2 million
LRT value premium – Homeowner Benefit \$29 million	Net Value \$0
TOTAL	\$52.6 million

The increase in taxable assessment and tax benefit resulting from new development (by location in the corridor) indicated that approximately 71% of the uplift occurred within a one block range for a total of \$16 million. The remaining \$6.4 million was beyond 1-block but within a 400 metre radius for a total of \$22.4 million.

Building permit fees and development charges for the new development equates to approximately \$30.2 million. This model assumed that existing development charge exemptions in the City of Hamilton were discontinued.

An LRT value premium was also calculated on properties within 400 metres of an LRT line because of its increased accessibility relative to other properties elsewhere in the City. This uplift premium increases the property taxes paid by the property owners benefiting from the LRT and reduces the taxes for all other taxpayers.



Blue = 2% LRT premium

Purple = 4% LRT premium

Figure 16 – LRT Premium areas

Of the \$29 million of LRT value premium, 60% is attributed to properties located within a 1-block depth (4% premium).

A total of **\$52.6 million** is an estimate of the financial benefits of the development potential of a B-line LRT system, based on the 3.6 million square foot increase in development as shown in the CUI study, *not* the City of Hamilton’s estimates.

The Hamilton B-line Value Uplift and Capture study suggests that, over time, LRT stations would become the focus of new development and economic activity, similar to what has occurred in Portland, Dallas and Minneapolis.

It is worth noting that “The North American Light Rail Experience: Insights for Hamilton” report, prepared by the McMaster Institute for Transportation & Logistics (MITL) concludes that LRT itself is “a tool to guide development more than a generator of development. Even in favourable locations, ridership increases and new developments associated with light rail may proceed slower than anticipated. Planning incentives will likely be necessary to induce new investment along the route. To that end, the City of Hamilton is currently engaged in land use planning in advance of rapid transit and appears to be adhering to sound principles for the most part.” MITL also concluded that light rail transit has the potential to succeed in Hamilton under the right set of circumstances.

15.0 Employment Growth

As stated previously, LRT is often a catalyst for stimulating the economy through investment in infrastructure. This includes job creation in both the initial design and construction stage and in the ongoing operations and maintenance phase.

Estimates show that approximately 6,000 construction jobs (provincial) would be created with the implementation of a B-Line system, 3,500 directly in Hamilton. Approximately 1,000 jobs (provincial) would be created to deliver regular operations and maintenance, including 300 jobs in Hamilton.¹⁶



¹⁶ Hamilton Rapid Transit Initiative: Hamilton Economic Potential Study

Employment generated by the LRT initiative would create further increases in spending which could have local (Hamilton) and provincial impacts. As noted in the *A-Line Economic Potential Impact* study (Steer Davies Gleave), such spending permeates through the economy by way of direct, indirect and induced impacts:

- Direct impact relates to the direct spending and employment created in each industry (i.e.: on-site construction jobs, rolling stock manufacturing jobs).
- Indirect impact relates to the spending and employment created in other industries further down the chain that would produce materials and services required for direct inputs.
- Induced impacts relate to additional spending generated by both direct and indirect impacts from higher wages and employment.

According to the *Hamilton Rapid Transit Initiative: Economic Potential Study*, a B-Line LRT investment is estimated to result in an increase of more than \$443 million in Ontario's GDP.

16.0 Health

Investments in public transportation such as LRT can help shape a city’s built environment into a more walkable, complete and compact community. Transit friendly communities have positive impacts on human health. For instance, a 2009 study states that *“80% of cardiovascular diseases and type 2 diabetes along with 40% of cancers could be avoided if major risk factors associated with the environment were eliminated.”*¹⁷

In fact, for each additional hour spent in a car per day, the likelihood of a person becoming obese increased by 6%.¹⁸ By contrast, people who each walked an additional kilometre per day reduced their chances of becoming obese by 5%.

According to Statistics Canada, the number of overweight and obese people in Hamilton is higher on average than levels in similar cities. This has become an increasingly greater public concern and is impacting the health care system.



In 2010, another study was conducted both before and after the construction phase of the Charlotte North Carolina Light Rail Line. The study concluded that *“public transit systems can generate positive health impacts by encouraging greater numbers of users to walk to station stops and maintain more physically active lives on top of the general transportation benefits accrued.”*¹⁹

According to the 2010 Hamilton B-Line Benefits Case Assessment completed by Metrolinx, annual accident costs are expected to be reduced by \$2.48 million over a period of 22 years, primarily because transit is found to be a safer mode of travel compared to driving. Upon further evaluation, Steer Davies Gleave estimates this cost savings to rise to \$3.48 million during the 2008 to 2031 evaluation period.

¹⁷ Metcalfe, O., & Higgins, C. (2009). Healthy public policy – is health impact assessment the cornerstone? *Public Health*, 123, 296-301

¹⁸ Frank, L., Andresen, M., & Schmid, T. (2004). Obesity relationships with community design, physical activity and time spent in cars. *American Journal of Preventative Medicine*, 27(2), 87-89.

¹⁹ MacDonald JM, Stokes RJ, Cohen DA, Kofner, A, Ridgeway GK. The Effect of Light Rail Transit on Body Mass Index and Physical Activity. *American Journal of Preventative Medicine*. 2010. 39(2)105-112.

17.0 Environment

Light rail transit has the ability to improve air quality by shifting mode choice from single occupancy vehicles to transit. Data collected by Clean Air Hamilton indicates that particulate matter and other toxins are most highly concentrated along roadways and intersections than compared to any other locations elsewhere in the city. This shows that transportation traffic in Hamilton contributes either as much or more significantly to air pollution than does surrounding industry. These emissions are directly related to acute and chronic heart disease.

According to Shapiro et al 2002, *“Moving a person a given distance by public transportation produces, on average, only about 5% as much carbon monoxide, less than 10% as much volatile organic compounds, and nearly half as much carbon dioxide and nitrogen oxides, as moving a person the same distance by private automobile, SUV, or light truck.”*²⁰

In terms of energy intensity, automobiles including cars, sport utility vehicles and light trucks required an average of 5,255 British Thermal Units (BTUs) per passenger mile, while transit BTUs ranged from 911 to 1,612 for heavy rail, light rail and commuter rail in 1998.²¹

In the Toronto area, taxpayers pay approximately \$2.2 billion in mortality related issues arising from traffic pollution. A 30% to 50% reduction in car traffic can lower emission rates, saving an estimated 200 lives and \$900 million per year.²²

According to Topalovic et al. 2012, local transit can reduce total vehicle use by 2% to 12%. However, LRT combined as an integral part of *“transportation planning, commute trip reduction, smart growth policy and parking management may be able to reduce total vehicle use by 18 to 58%.”*²³

According to the Victoria Transportation Policy Institute (VTPI 2007)²⁴, auto-dependent communities require 20 to 50 times more space than transit-based communities. That means 66 to 80% of the land must be devoted to roads and parking facilities. This pavement deflects rain water causing storm surges which places a large burden on the sewer system. This infrastructure also requires constant maintenance (resurfacing, lining, replacement and dredging), impacting the overall municipal budget.

²⁰ Shapiro RJ, Hassett KA, Arnold FS. Conserving Energy and Preserving the Environment: The Role of Public Transportation. Washington, DC: APTA: 2002;2. Available at: <http://www.apta.com/research/info/online/Shapiro.cfm> Accessed October 21, 2012

²¹ Zimmerman R. Mass Transit Infrastructure and Urban Health. Journal of Urban Health: Bulletin of the New York Academy of Medicine, Vol. 82, No.1. 2005

²² McKeown, D. (2007). Air pollution burden of illness from traffic in Toronto: Problems and solutions. Toronto: Public Health Office.

²³ Topolovic, P., Carter, J., Topolovic, M., Krantzberg, G. Light Rail Transit in Hamilton: Health, Environmental & Economic Impact Analysis. Soc Indic Res DOI 10.1007/s1 1205-012-0069-x

²⁴ VTPI. (2007). Transportation Costs and Benefit Analysis. Retrieved from the Victoria Transportation Policy Institute, <http://www.vtpi.org/tca>.

18.0 Social / Tourism

Within the Greater Golden Horseshoe area, Downtown Hamilton has been found to have the highest level of social need (dark purple as outlined in figure 17).



Figure 17 – Big Move Areas of Social Need Map

Category	Corridor	Hamilton	GTHA	Ontario	Canada
Government transfers as a proportion of total income	20.6%	12.9%	9.3%	9.8%	11.1%
Population over 65	14.8%	14.2%	12.2%	13.6%	13.7%
Single Parents	23.6%	14.7%	14.2%	15.8%	15.9%
No High School certificate	38.5%	28.7%	24.1%	22.2%	25.5%
Low Income	35.6%	16.2%	12.4%	14.7%	15.3%
Unemployment rate	10.4%	5.8%	5.2%	6.4%	6.6%

Comparison of Social Need Indicators (Source: Hamilton Rapid Transit Initiative: Economic Potential Study)

The proposed LRT corridor scores high in each category with the exception of population over 65 relative to the entire City of Hamilton, Greater Toronto and Hamilton Area, Ontario and Canada. Figures for the corridor are based on areas within an 800 metre radius of the proposed LRT route.

LRT has the potential to connect people living in downtown neighbourhoods with job opportunities and amenities, including health and social facilities which can lead to improved quality of life and accessibility benefits.

Access to high quality public transportation also increases travel reliability and can help reduce overall household transportation expenditures by reducing the need for multiple household vehicles. In 2011, the Canadian Automobile Association estimated the average annual cost of auto ownership to be approximately \$12,000 inclusive of insurance, depreciation, financing and costs for fuel and maintenance.

Low income or disadvantaged populations can be vulnerable when inadequate transportation options are available. This is because of greater dependence on automobile travel and ownership of older vehicles, which strengthens the need for a strong, integrated local and regional transportation system.²⁵

The proposed B-Line route connects a number of key destinations within the City. These include:

- McMaster University
- McMaster Innovation Park/West Hamilton Innovation District
- Westdale
- Locke Street
- Downtown/Central Business District
- Copps Coliseum
- Hamilton Farmers' Market
- Hamilton Public Library Central Branch
- Jackson Square
- International Village
- Ivor Wynne Stadium
- Ottawa Street
- Eastgate Square, and
- A number of existing neighbourhoods.

In Hamilton, 17% of the existing population and 20% of employment opportunities are located within 800 metres of the B-Line corridor. In addition, 80% of the city's population is serviced by HSR transit routes that connect directly with the B-Line.

“In order to attract new urbanite companies, Hamilton will have to respond to the needs of young graduates, who, through focus groups and web-based survey, shared their frustrations with the car dependant nature of the city and a lack of transit facilities and opportunities for active transportation.”²⁶

The City Manager of Cincinnati, Ohio summarized this by saying, “...today, young, educated workers move to cities with a sense of place and if businesses see us laying rail down on a street, they'll know that it is a permanent route that

²⁵ Murakami E, Young J. Daily travel by persons with low income. In: Proceedings from the Nationwide Personal Transportation Survey Symposium, October 29-31, 1997. Washington, DC: U.S. DOT; 1999:69

²⁶ Topolovic, P., Carter, J., Topolovic, M., Krantzberg, G. Light Rail Transit in Hamilton: Health, Environmental & Economic Impact Analysis. Soc Indic Res DOI 10.1007/s11205-012-0069-x

will have people passing by 7 days a week... Cincinnati has to compete with other cities for investment... talent and for a place of national prominence.”²⁷

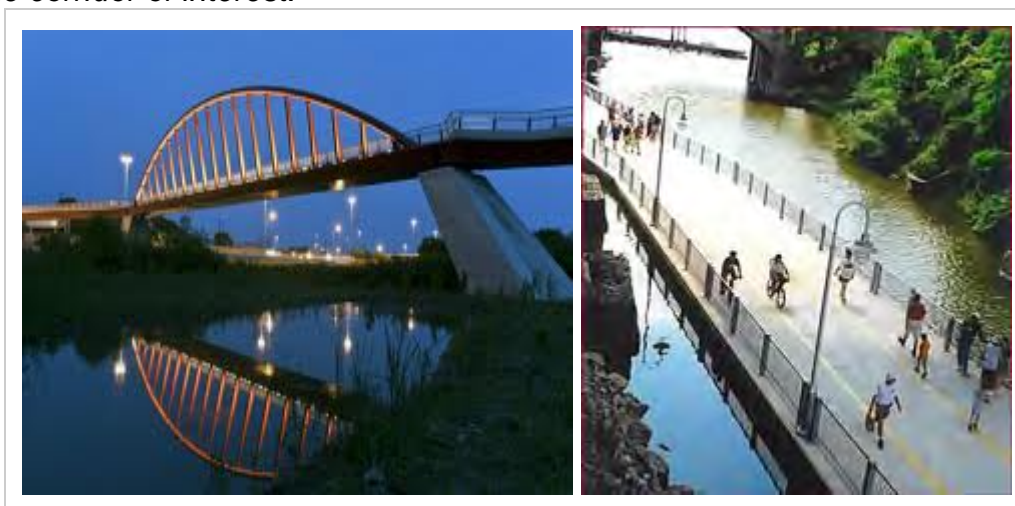
Research conducted by Richard Florida, professor and head of the Martin Prosperity Institute at the Rotman School of Management (University of Toronto) indicates that a number of strategies are required to attract and retain the creative workforce. These include downtown core renewal, heritage building preservation, smart growth, inner urban investment, space conversion, park and trail design, efficient rapid transit and growth in the entertainment sector.

Further, the 2012 study authored by Topolovic et al states that *“sustainable development is no longer just the right thing to do; it is a business decision motivated by financial interests and the need for community well being, and that the evidence indicates that LRT can be a key enabler of downtown renewal and sustainable urban planning and would therefore help to attract the creative class.”*

The report analysis also recommends *“that LRT be considered as:*

- *A viable and desirable transit option;*
- *A catalyst for transit oriented, high density, mixed use development;*
- *An economically sound investment opportunity, providing a return on investment to property owners, businesses and the municipality and;*
- *A catalyst for social change; improving the health, environment, sustainability and connectivity of the community.*

These recommendations hold true provided that supportive Smart Growth and Transit Oriented Development policies are in place and that there is significant population, transit ridership and development potential to warrant the investment in the corridor of interest.”²⁸



²⁷ Driehaus, B. (2008). Downtowns Across the US See Streetcars in Their Future. New York Times. Retrieved from: <http://www.nytimes.com/2008/08/14/US/14streetcar.html>

²⁸ Topolovic, P., Carter, J., Topolovic, M., Krantzberg, G. Light Rail Transit in Hamilton: Health, Environmental & Economic Impact Analysis. Soc Indic Res DOI 10.1007/s11205-012-0069-x

19.0 LRT – Image • Connectivity • Community Pride

High quality light rail systems often have an iconic value that is attractive to tourists, commuters and residents. While bus routes can sometimes be difficult for domestic and international visitors to navigate, LRT networks are often perceived to be simpler and more reliable, largely because routes are permanent and highly visible. Because transportation is a key element in the visitor experience, an efficient public transportation system can significantly enhance a city’s reputation among travelers.



Photographs courtesy of Dan Banko

Surrounded by nature, Hamilton is rich in history and culture. Exceptional in its distinctive urban feel and vibrant arts and culture, Hamilton has deep roots and a proud history. In order to create a livable city, people must first feel a sense of pride in where they live.²⁹



²⁹ Shaker, P., Centre for Community Study, Hamilton and the Creative Class

20.0 Conclusion - The Cost of Not Implementing LRT

The benefits captured within this report have used conservative values (i.e. worst case scenario values to ensure that the benefits are cautious rather than optimistic). Summed up the City of Hamilton should see a direct benefit of approximately \$130M (reduction in backlog, building permits and tax benefits from development).

In addition, there are a number of spin off benefits associated with the construction of LRT. The Benefits Case Assessment estimates that 3500 temporary jobs will be created in Hamilton during the construction period and 300 permanent jobs. This also affects Ontario’s Gross Domestic Product providing a value of \$443 million.

Health, Environment and Social Tourism are difficult to quantify without extensive and costly studies. This report recognizes that LRT does provide benefits within these areas and offers enhanced quality of life for residents.

A fundamental consideration of the benefits of this type of project, which aligns with the findings of the McMaster Institute of Transportation and Logistics study, is the ability for LRT to refocus growth within the community. This is in keeping with Places to Grow, the City of Hamilton Official Plan and the City of Hamilton Transportation Master Plan and allows the City to capitalize on existing infrastructure while achieving population and employment growth.

DAY 1 - TODAY PROJECTIONS

Bus Only - DAY 1 - TODAY			
Annual Service Hours			
King	63,040	Annual service hours based on % of daily service hours per route	
Del	100,864		
B-Line	32,465		
Univ	25,846		
Dun	2,522		
St.Cr. Cent	17,336		
St.Cr. Loc	7,880		
HSR B-Line Corridor			
HSR Non-B-Line Corridor			
HSR System Wide			
Based on HSR Budgetted hours			
Annual Operating Costs			
King	\$ 6,822,107	Annual Operating Costs based on % of totals from above	
Del	\$ 10,915,371		
B-Line	\$ 3,513,385		
Univ	\$ 2,797,064		
Dun	\$ 272,884		
St.Cr. Cent	\$ 1,876,079		
St.Cr. Loc	\$ 852,763		
HSR B-Line Corridor			
HSR Non-B-Line Corridor			
HSR System Wide			
Based on 2012 Restated Budget/Projected Actuals			
Increase in Gross Cost over Bus only			
Annual Ridership (passengers)			
King	3,080,000	Based on actual % of ridership per route X system wide passengers	
Del	2,860,000		
B-Line	1,320,000		
Univ	1,320,000		
Dun	88,000		
St.Cr. Cent	440,000		
St.Cr. Loc	110,000		
HSR B-Line Corridor			
HSR Non-B-Line Corridor			
HSR System Wide			
Based on IBI report - Services review			
Annual Revenue			
King	\$ 4,900,000	Based on actual % of ridership per route X system wide revenues	
Del	\$ 4,550,000		
B-Line	\$ 2,100,000		
Univ	\$ 2,100,000		
Dun	\$ 140,000		
St.Cr. Cent	\$ 700,000		
St.Cr. Loc	\$ 175,000		
HSR B-Line Corridor			
HSR Non-B-Line Corridor			
HSR System Wide			
Based on 2012 Restated Budget(less Gas Tax Rev.)			
rate per passenger	\$ 1.59		
NET COST - TOTAL (System Wide)			
\$ 44,000,000			
Gross Cost per Passenger			
King	\$ 2.21	Annual Operating Cost / Annual passengers per route	
Del	\$ 3.82		
B-Line	\$ 2.66		
Univ	\$ 2.12		
Dun	\$ 3.10		
St.Cr. Cent	\$ 4.26		
St.Cr. Loc	\$ 7.75		
HSR B-Line Corridor			
HSR Non-B-Line Corridor			
HSR System Wide			
Net Cost per Passenger			
King	\$ 0.62	Annual Operating Cost - Annual Revenue per route / Annual passengers per route	
Del	\$ 2.23		
B-Line	\$ 1.07		
Univ	\$ 0.53		
Dun	\$ 1.51		
St.Cr. Cent	\$ 2.67		
St.Cr. Loc	\$ 6.16		
HSR B-Line Corridor			
HSR Non-B-Line Corridor			
HSR System Wide			

BUS & LRT - DAY 1 (Low)		
Transfer of 1/3 service hours from Delaware & King TO B-Line		
	42,026	Reduced by 1/3
	67,242	Reduced by 1/3
	93,600	As per SDG report - Capital/Operating pg. 10
	25,846	
	2,522	
	17,336	
	7,880	
	256,453	
	480,047	
	736,500	
\$	5,002,879	80% DIRECT COSTS REDUCED BY 1/3
\$	8,004,606	80% DIRECT COSTS REDUCED BY 1/3
\$	11,205,646	Reduced from \$14.5million. Reduced 22 vehicles to 16 vehicles. Increased headway from 4 mins to 6 mins.
\$	2,797,064	
\$	272,884	
\$	1,876,079	
\$	852,763	
\$	30,011,921	
\$	51,950,345	
\$	81,962,266	
\$	2,962,266	
	2,053,330	Reduced by 1/3 & transferred to B-Line
	1,906,670	Reduced by 1/3 & transferred to B-Line
	3,300,000	B-Line + 1/3 from Delaware & King
	1,320,000	
	88,000	
	440,000	
	110,000	
	9,218,000	
	12,782,000	
	22,000,000	
\$	3,266,662	
\$	3,033,338	
\$	5,250,000	
\$	2,100,000	
\$	140,000	
\$	700,000	
\$	175,000	
\$	14,665,000	
\$	20,335,000	
\$	35,000,000	
\$	1.59	
\$	46,962,266	
\$	2,962,266	
\$	2.44	
\$	4.20	
\$	3.40	
\$	2.12	
\$	3.10	
\$	4.26	
\$	7.75	
\$	3.26	
\$	4.06	
\$	3.73	
\$	0.85	
\$	2.61	
\$	1.80	
\$	0.53	
\$	1.51	
\$	2.67	
\$	6.16	
\$	1.66	
\$	2.47	
\$	2.13	
NOTE: INCREASE IN HEADWAY FROM 4 - 6 MINS NO INCREASE IN RIDERSHIP		

BUS & LRT - DAY 1 (High)		
Per SDG Assumptions: 2/3 of ridership from all routes TO B-Line Only route +8% city wide increase		
	42,026	Reduced by 1/3
	67,242	Reduced by 1/3
	93,600	As per SDG report - Capital/Operating pg. 10
	25,846	
	2,522	
	17,336	
	7,880	
	256,453	
	480,047	
	736,500	
\$	5,002,879	80% DIRECT COSTS REDUCED BY 1/3
\$	8,004,606	80% DIRECT COSTS REDUCED BY 1/3
\$	14,500,000	As per SDG
\$	2,797,064	
\$	272,884	
\$	1,876,079	
\$	852,763	
\$	33,306,275	
\$	51,950,345	
\$	85,256,620	
\$	6,256,620	
	1,108,800	1/3 of Bus only + 8% city wide increase
	1,029,600	1/3 of Bus only + 8% city wide increase
	7,112,113	Bus Only + 2/3 of routes + 8% city wide incr.
	475,200	1/3 of Bus only + 8% city wide increase
	31,680	1/3 of Bus only + 8% city wide increase
	158,400	1/3 of Bus only + 8% city wide increase
	39,600	1/3 of Bus only + 8% city wide increase
	9,955,393	
	13,804,560	Bus only +8% increase system wide
	23,759,953	
\$	1,764,000	Above ridership #s X \$1.59 per passenger which is based on Bus Only
\$	1,638,000	
\$	11,314,726	
\$	756,000	
\$	50,400	
\$	252,000	
\$	63,000	
\$	15,838,126	
\$	21,961,800	
\$	37,799,926	
\$	1.59	
\$	47,456,695	
\$	3,456,695	
\$	4.51	
\$	7.77	
\$	2.04	
\$	5.89	
\$	8.61	
\$	11.84	
\$	21.53	
\$	3.35	
\$	3.76	
\$	3.59	
\$	2.92	
\$	6.18	
\$	0.45	
\$	4.30	
\$	7.02	
\$	10.25	
\$	19.94	
\$	1.75	
\$	2.17	
\$	2.00	
NOTE: Increase in Ridership based on SDG assumptions		

2031 PROJECTIONS		\$79 Mil Exp & \$35mil Rev	
Bus Only - DAY 1 - TODAY			
Annual Service Hours		Annual service hours based on % of daily service hours per route	
King	63,040		
Del	100,864		
B-Line	32,465		
Univ	25,846		
Dun	2,522		
St.Cr. Cent	17,336		
St.Cr. Loc	7,880		
HSR B-Line Corridor		249,953	
HSR Non-B-Line Corridor		480,047	
HSR System Wide		730,000	
Based on HSR Budgetted hours			
Annual Operating Costs		Annual Operating Costs based on % of totals from above	
King	\$ 6,822,107		
Del	\$ 10,915,371		
B-Line		\$ 3,513,385	
Univ		\$ 2,797,064	
Dun		\$ 272,884	
St.Cr. Cent		\$ 1,876,079	
St.Cr. Loc		\$ 852,763	
HSR B-Line Corridor		\$ 27,049,655	
HSR Non-B-Line Corridor		\$ 51,950,345	
HSR System Wide		\$ 79,000,000	
Based on 2012 Restated Budget/Proj. Actuals			
Annual Ridership (passengers)		Based on actual % of ridership per route X system wide passengers	
King	3,080,000		
Del	2,860,000		
B-Line	1,320,000		
Univ	1,320,000		
Dun	88,000		
St.Cr. Cent	440,000		
St.Cr. Loc	110,000		
HSR B-Line Corridor		9,218,000	
HSR Non-B-Line Corridor		12,782,000	
HSR System Wide		22,000,000	
Based on IBI report - Services review			
Annual Revenue		Based on actual % of ridership per route X system wide revenues	
King	\$ 4,900,000		
Del	\$ 4,550,000		
B-Line	\$ 2,100,000		
Univ	\$ 2,100,000		
Dun	\$ 140,000		
St.Cr. Cent	\$ 700,000		
St.Cr. Loc	\$ 175,000		
HSR B-Line Corridor		\$ 14,665,000	
HSR Non-B-Line Corridor		\$ 20,335,000	
HSR System Wide		\$ 35,000,000	
Based on 2012 Restated Budget/Proj. Actuals			
rate per passenger	\$ 1.59	current average	
NET COST - TOTAL (System Wide)	\$ 44,000,000		
Gross Cost per Passenger		Annual Operating Cost / Annual passengers per route	
King	\$ 2.21		
Del	\$ 3.82		
B-Line	\$ 2.66		
Univ	\$ 2.12		
Dun	\$ 3.10		
St.Cr. Cent	\$ 4.26		
St.Cr. Loc	\$ 7.75		
HSR B-Line Corridor		\$ 2.93	
HSR Non-B-Line Corridor		\$ 4.06	
HSR System Wide		\$ 3.59	
Net Cost per Passenger		Annual Operating Cost - Annual Revenue per route / Annual passengers per route	
King	\$ 0.62		
Del	\$ 2.23		
B-Line	\$ 1.07		
Univ	\$ 0.53		
Dun	\$ 1.51		
St.Cr. Cent	\$ 2.67		
St.Cr. Loc	\$ 6.16		
HSR B-Line Corridor		\$ 1.34	
HSR Non-B-Line Corridor		\$ 2.47	
HSR System Wide		\$ 2.00	

Bus Only - 2031			
Annual service hours based on % of daily service hours per route			
63,040			
100,864			
32,465			
25,846			
2,522			
17,336			
7,880			
249,953			
480,047			
730,000			
Based on HSR Budgetted hours			
Annual Operating Costs based on % of totals from above			
\$ 9,938,522			
\$ 15,901,635			
\$ 5,118,339			
\$ 4,074,794			
\$ 397,541			
\$ 2,733,094			
\$ 1,242,315			
\$ 39,406,239			
\$ 75,681,844			
\$ 115,088,083			
Based on 2012 Budget/Actuals inflated by 2% -to 2031			
Based on actual % of ridership per route X system wide passengers			
3,572,800			
3,317,600			
1,531,200			
1,531,200			
102,080			
510,400			
127,600			
10,692,880			
14,827,120			
\$ 25,520,000			
Based on IBI report - Services review X 16% growth			
Based on ridership+ 16% growth (above) X \$2.23 per rider			
\$ 7,953,053			
\$ 7,384,978			
\$ 3,408,451			
\$ 3,408,451			
\$ 227,230			
\$ 1,136,150			
\$ 284,038			
\$ 23,802,351			
\$ 33,005,169			
\$ 56,807,520			
\$ 2.23			
\$ 58,280,563			
\$ 14,280,563			
Annual Operating Cost / Annual passengers per route			
\$ 2.78			
\$ 4.79			
\$ 3.34			
\$ 2.66			
\$ 3.89			
\$ 5.35			
\$ 9.74			
\$ 3.69			
\$ 5.10			
\$ 4.51			
Annual Operating Cost - Annual Revenue per route / Annual passengers per route			
\$ 0.56			
\$ 2.57			
\$ 1.12			
\$ 0.44			
\$ 1.67			
\$ 3.13			
\$ 7.51			
\$ 1.46			
\$ 2.88			
\$ 2.28			

BUS & LRT - Year 2031			
Reduced by 1/3			
42,026			
67,242			
93,600			
25,846			
2,522			
17,336			
7,880			
256,453			
480,047			
736,500			
Inflated to 2031 dollars - 2% annually			
\$ 7,434,015			
\$ 11,894,423			
Inflated to 2031 dollars - 2% annually			
\$ 21,546,237			
\$ 4,156,290			
\$ 405,492			
\$ 2,787,755			
\$ 1,267,162			
\$ 49,491,374			
\$ 77,195,480			
\$ 126,686,854			
same as Day 1 High riders + 16% growth			
1,286,208			
1,194,336			
14,553,000			
551,232			
36,749			
183,744			
45,936			
17,851,205			
16,013,290			
\$ 33,864,494			
Above ridership X \$2.23 per passenger			
\$ 2,863,099			
\$ 2,658,592			
\$ 32,394,978			
\$ 1,227,042			
\$ 81,803			
\$ 409,014			
\$ 102,254			
\$ 39,736,782			
\$ 35,645,583			
\$ 75,382,365			
\$ 2.23			
\$ 51,304,489			
\$ 7,304,489			
5.78			
9.96			
1.48			
7.54			
11.03			
15.17			
27.59			
2.77			
4.82			
3.74			
3.55			
7.73			
\$ (0.75)			
5.31			
8.81			
12.95			
25.36			
0.55			
2.59			
\$ 1.51			

Appendix A: Light Rail Transit

A8: Rapid Transit Workplans

2013 Workplan

Program

Light Rail Transit B-Line

Context and Purpose

The B-Line has been identified as a 15-year priority project within the Big Move (2008). Significant advancement has been made on the B-Line with the completion of the Environmental Project Report and Planning, Design and Engineering work; however, additional work is required to advance the project to an implementation ready project. Some items may only be taken forward pending a funding recommendation from the Metrolinx Board and are noted below.

Responsibility

Director of Transportation, Manager of Mobility Programs and Special Projects, Manager of Rapid Transit

Activities

- **LRT Vehicle Optimization Modeling** – optimization of LRT headways to maximize operational efficiencies
- **Value engineering of the B-Line** – A value engineering exercise will critically evaluate the costing and the items included in the LRT implementation plan. Other municipalities have been able to trim implementation costs by approximately 18 percent. Value engineering is a process where key city and technical staff review the plans through a series of workshops and determine the level of implementation detail outlined in the design plates to evaluate elements that can be reduced in scope or refined for overall cost reductions.
- **Modifications to the Overhead Power Supply Design** – Mitigation measures required for the Scanning Electron Microscope at McMaster may allow for the removal of overhead power at locations along the B-Line. Further work is required to determine where the overhead power supply could be removed and the cost savings
- **Advanced B-Line Utilities Coordination** – while consultation has occurred with utilities full agreements will be required and utility coordination requires a significant amount of lead time.
- **Additional B-Line Geotechnical Investigations** – to confirm areas that are missing borehole logs to minimize financial risk during the bid process.
- **Early enabling works (utility relocates before design build contract)** – Advanced utilities coordination can also save costs where utilities that are up for relocation prior to LRT construction are placed out of the LRT construction impact zone.
- **Environmental Project Report and Consultation (Maintenance Storage Facility)** – Completion of this component is required to obtain approvals for the construction of the facility.
- **Conduct property by property impact assessment (B-Line)** – general land-take requirements have been identified along the B-Line. This component further refines the land impact.
- **Power substation site selection** – The B-Line Environmental Project Report has identified general alignments for power substations. Further work is required to determine the exact location within the ranges provided.
- **Delivery model assessment strategy** – Infrastructure Ontario is completing a value for money exercise. The City of Hamilton should conduct its own assessment to ensure that Hamilton’s interests are protected in the preferred delivery model.

Internal Linkages

- Mobility Corporate Working Team
- SMT
- Divisions/Departments as required to support program areas
- Ward Councillors

Timelines

- **LRT Vehicle Optimization Modeling** – 4 months, Q1
- **Value engineering of the B-Line** – 4 months, Q1
- **Advanced B-Line Utilities Coordination** – 6 months, Q1
- **Modifications to the Overhead Power Supply Design** – 8 months, Q2
- **Additional B-Line Geotechnical Investigations** – 2 months, Q2
- **Early enabling works (utility relocates before design build contract)** – Ongoing
- **Environmental Project Report and Consultation (Maintenance Storage Facility)** – 7 months, starting Q3
- **Conduct property by property impact assessment (B-Line)** – 2 months, Q3
- **Power substation site selection** – 6 months, Q3
- **Delivery model assessment strategy** – 6 months, Q3

City Strategic Plan Link

- **1.4 Improve the City’s transportation system to support multi-modal mobility and encourage inter-regional connections.**
 - **i)** Complete the design and develop an implementation and financial plan for the delivery of higher-order transportation and enhanced transit service, including all-day GO Transit service and rapid transit
 - **iii)** Develop an integrated, multi-modal, public transportation program, including implementation of rapid transit, conventional transit, active transportation (e.g. pedestrian, cycling) and the associated transportation demand management (TDM) plan
 - **iv)** Develop a Land Use Strategy, Urban Design Guidelines and implementation plans for the lands surrounding the James Street GO Station and along the A and B-line transit corridors
 - **v)** Development of a strategy to enhance conventional transit service levels within the A Line and B Line corridors

Budget Impact

Staff Resource (Full time as well as partial staff support to administer the program), consulting (\$500,000 – to be approved through staff reports to Council)

Resources Required

- 1 FTE to manage the programs
- External consultants for technical components
- Assistance from 3 existing FTE’s

Performance Criteria

- **Maintain strong partnership with Metrolinx/Province**
- **Successful completion of 2013 work plan elements**
 - **LRT Optimization Report**
 - **Value Engineering Report**
 - **B-Line Utilities Memo Report**
 - **Overhead Power Modifications Report**
 - **Geotechnical Report and Borehole Logs**
 - **Terms of Reference Document for MSF Transit Project Assessment Process**
 - **Property Impact Assessment Document**
 - **Power Substation Location Report**
 - **Delivery Model Assessment Report**

2013 Workplan

Program

Rapid Transit A, L, S, T Lines

Context and Purpose

The A-Line has been identified as a 15-year project within the Big Move (2008), while the L, S, and T lines are each identified as 25 year + projects.

Responsibility

Director of Transportation, Manager of Mobility Programs and Special Projects, Manager of Rapid Transit

Activities

- **A-Line Technology and Route Development** – Feasibility study identified general routing and evaluated BRT and LRT technology and pros and cons. Further refinement is required following Council Reporting to determine the preferred technology for the A-Line
- **HSR Network Optimization to support integrated transit and future BLAST Rapid Transit** – Routing modifications are required to support rapid transit. Existing bus routes will be evaluated using systems optimization techniques to determine route modifications and headways to maximize system efficiency.

Internal Linkages

- Mobility Corporate Working Team
- SMT
- Divisions/Departments as required to support program areas
- Ward Councillors

Timelines

- **A-Line Routing and Technology Development** – 12 months, Q3
- **HSR Network Optimization to support integrated transit and future BLAST Rapid Transit**– 12 months, Q2

City Strategic Plan Link

- **1.4 Improve the City’s transportation system to support multi-modal mobility and encourage inter-regional connections.**
 - i) Complete the design and develop an implementation and financial plan for the delivery of higher-order transportation and enhanced transit service, including all-day GO Transit service and rapid transit
 - iii) Develop an integrated, multi-modal, public transportation program, including implementation of rapid transit, conventional transit, active transportation (e.g. pedestrian, cycling) and the associated transportation demand management (TDM) plan
 - iv) Develop a Land Use Strategy, Urban Design Guidelines and implementation plans for the lands surrounding the James Street GO Station and along the A and B-line transit corridors
 - v) Development of a strategy to enhance conventional transit service levels within the A Line and B Line corridors

Budget Impact

Staff Resource (Full time as well as partial staff support to administer the program), consulting (\$100,000)

Resources Required

- 1 FTE dedicated to managing the programs

Performance Criteria

- A-Line Technology and Route Development Report
- System Optimization Report