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City of Hamilton

HIGHER ORDER TRANSIT NETWORK STRATEGY

WORKING PAPER

MAY 2007

MRC

IBI GROUP

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Note to Readers

This Working Paper was prepared in support of the City of Hamilton Transportation Master Plan Class Environmental Assessment. It is intended to provide information and discussion on the analysis and evaluation of alternative Transit Strategies and related policies. Where there are differences between this Working Paper and the Transportation Master Plan (Volume 1), the latter shall be the governing document.

1. INTRODUCTION

The City of Hamilton Transportation Master Plan is a major planning effort being undertaken in conjunction with the Growth Related Integrated Development Strategy (GRIDS) process. The overall purpose of the Transportation Master Plan is to develop policies and strategies for the transportation network over the next 30 years. This network includes roads, transit, cycling and waking facilities, public parking and the City's connections to marine and aviation facilities. Results of the Transportation Master Plan will be used during the City's Official Plan Review and the Development Charges Bylaw Review. It will also serve as a support document for the City's capital budgeting.

The Transportation Master Plan has been developed in three major components. The first phase consisted of the calibration of the existing transportation model to reflect current transportation conditions in Hamilton. The second phase focused on the development the underlying policies of the Transportation Master Plan, consisting of policies in 23 subject areas. The third phase is the preparation of the master plan itself, which was developed in an iterative manner in conjunction with the land use scenarios, developed through the broader GRIDS study.

The purpose of this working paper is to develop and recommend strategic improvements to the **higher order transit network**. "Higher order transit is bus or light/heavy rail that operates in its own right-of-way or in a priority situation, and therefore moves more efficiently than the regular flow of traffic and can carry large numbers of people quickly and comfortably"[1]. Examples include buses that have their own dedicated lanes and commuter rail, which operates on its own separate track.

As described further in this report, major enhancements to the transit network are required to ensure that future growth in the City can be accommodated in an economically, socially and environmentally sustainable manner. Higher order transit represents an opportunity to offer people a travel choice that is competitive with automobiles in terms of journey times and costs.

One of the key elements of the higher order transit network strategy for Hamilton is to develop a **Bus Rapid Transit (BRT)** Network, something that has been identified as a key need in numerous reports over the past few decades. Hamilton already has some of the initial elements of BRT with the east-west BLine[2] service, but significant improvements are required in both network coverage, including the establishment of one or more north-south lines, as well as in the operating characteristics, vehicle technologies and station amenities.

The purpose of this report is to review the history of enhanced transit initiatives in Hamilton, outline the features and elements of a BRT, and explore applications of BRT and enhanced transit service, including the identification of corridors and alignment characteristics. In keeping with the overall

[1] Central Ontario Smart Growth Panel, Interim Advice on Unlocking Gridlock and Promoting Livable Communities in Central Ontario, August 2002.
[2] Traditionally Route #10 has been referred to as the Beeline. Following recent re-branding efforts, this line is now known as the BLine.

goal of developing an integrated and seamless transportation system, this report also reviews and discusses opportunities for promoting park and ride, improving commuter rail and bus systems, and intercity rail. Although these latter two modes are the responsibility of other jurisdictions, they play an important role in serving Hamilton's travel needs.

2. POLICY CONTEXT

2.1 Previous Studies

The idea of establishing a higher order transit network in Hamilton is not new. In fact, Hamilton was built around an electric streetcar system which operated between 1892 – 1951. In more recent times, several studies have defined and proposed a variety of systems as discussed below. None of these studies achieved their Visions for Higher Order Transit, though remnants of the recommendations can be seen in the current Bee Line service, a limited stop east west route through the Downtown. A large part of the lack of implementation progress resulting from these studies can be explained by a lack of funding for transit in general over the last 30 years. Other factors included a much slower growth rate in population and employment than expected and in particular a reduction in Downtown employment.

2.1.1 HAMILTON RAPID TRANSIT DEVELOPMENT PROGRAME (1976)

The Hamilton Rapid Transit Development Programme of the mid-seventies identified a "recommended priority corridor" which had three primary objectives: "to delineate a basic rapid transit network, based on the 25 year growth forecast; to identify the priority rapid transit corridors for implementation and to develop broad performance specifications to provide guidelines in the selection of a suitable technology." The report recommended development of rapid transit along two corridors, the first along Upper James, linking the Mountain to the Downtown core, and the second toward McMaster. At the time (e.g. 1976), it was expected that population would increase by 50% and employment by 100% over the 25 year horizon, which would have made Hamilton much larger than it is today.

2.1.2 GO ALRT PROJECT

Between 1980 and 1985, the Ontario Government pursued the idea of building an advanced intermediate capacity transit system (ICTS) on dedicated rights-of-way in the Golden Horseshoe. The GO ALRT (Advanced Light Rail Transit) project proposed building ICTS lines to connect the outer terminal stations of the GO Transit Lakeshore train service with the cities of Hamilton and Whitby. At the time, GO Transit was having difficulty securing rail time to run its trains beyond Oakville and Pickering, so the proposal to secure separate rights-of-way seemed sound. Then Federal legislation upgraded the priorities of passenger trains, and it became cheaper to use standard rail equipment, and the GO ALRT projects were cancelled in 1985. The extension to Oshawa proceeded on right-of-way purchased for the ALRT project, but the Hamilton extension was not nearly so well developed, having encountered controversy over its alignment into Hamilton. (source, in part: Transit.Toronto.on.ca)

2.1.3 1984 SERVICE PLAN – URBAN TRANSIT SERVICES

The 1984 Service Plan was a major study prepared for what was then known as the Hamilton-Wentworth Regional Transit System. One of the major recommendations of this study was the development of a Bus Rapid Transit System. At the time, Bus Rapid Transit was being proposed as a more cost-effective and flexible alternative to Light Rail Transit (LRT). Once again, the report

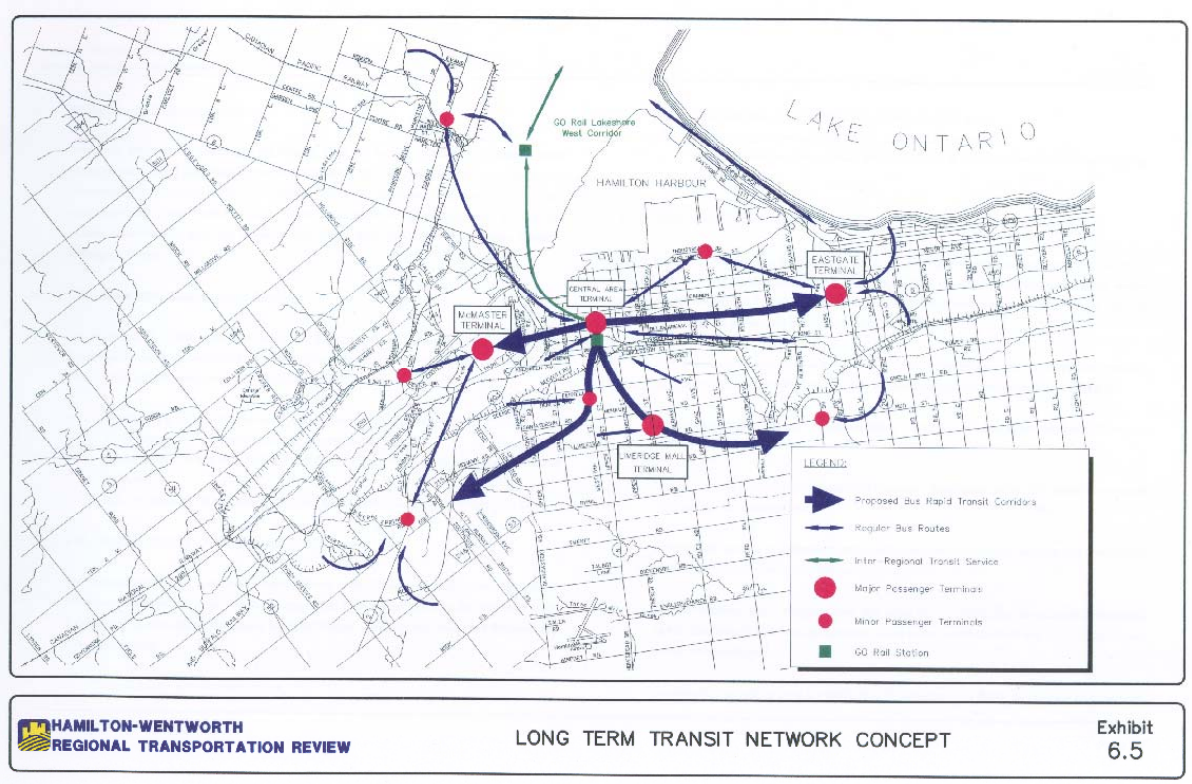
recommended an east-west corridor on King and Main Street, similar to the current Bee Line. However, two north-south routes were investigated, one on Upper James and one on Kenilworth below the Escarpment linking to Upper Ottawa above the Escarpment, the latter referred to as the "Mountain-Industrial Corridor". An east west route on Fennell was also discussed.

2.1.4 1996 REGIONAL TRANSPORTATION REVIEW (RTR)

The 1996 Regional Transportation Review's Transit Plan, shown on Exhibit 2.1, identified major transit access routes in the Downtown including Main and King, and James and John leading in turn to James Mountain Road for Mohawk College and the west Mountain, and to the Jolley Cut for Lime Ridge Mall and the east Mountain. The Review went on to recommend bus rapid transit service in three corridors:

- McMaster – Downtown – Eastgate Square
- Downtown – Lime Ridge Mall – East Mountain
- Downtown – Mohawk College – West Mountain

Exhibit 2.1: 1996 RTR Long Term Transit Network Concept

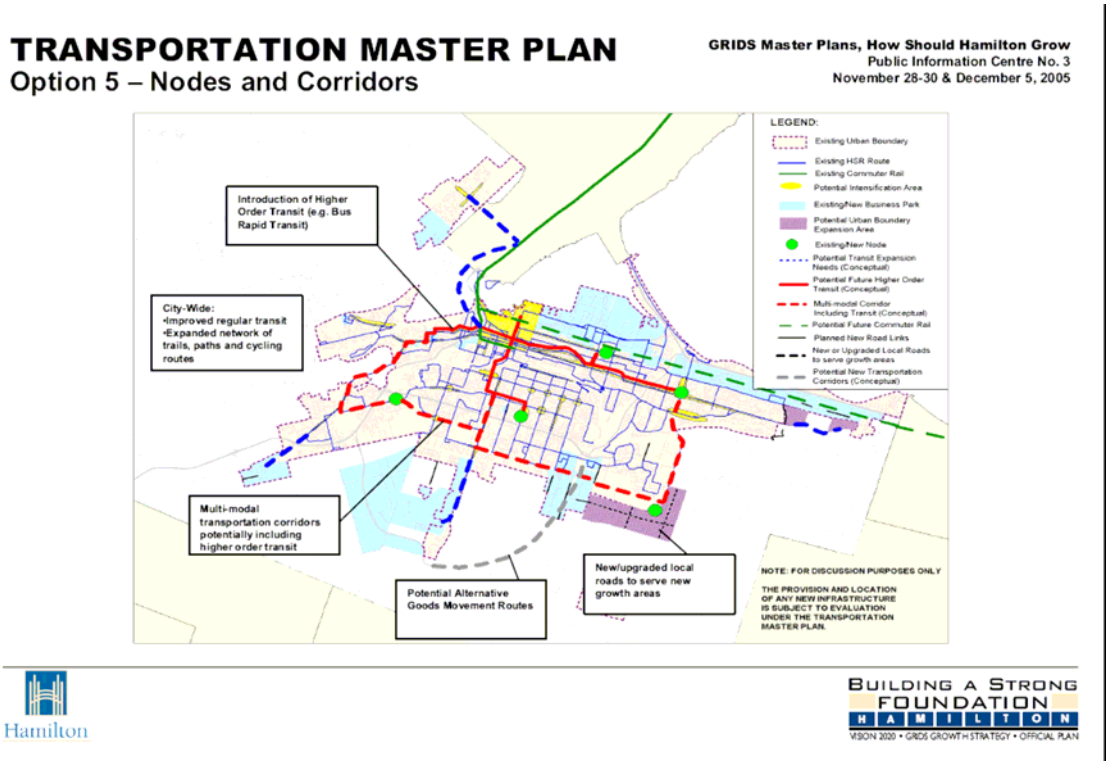


The terminal facilities at Lime Ridge Mall were subsequently enhanced, with the addition of a weather-protected terminal and suitable curb space for transit vehicles, located between the mall and the intersection of Upper Wentworth Street / Mall Road / central mall access road.

2.2 GRIDS

The Growth Related Integrated Development Strategy, or GRIDS, is the over-arching strategy for the Transportation Master Plan. In the late fall of 2005, an extensive round of public outreach was conducted. There were five options presented for "how should Hamilton grow", including Option 5 – Nodes and Corridors, shown in Exhibit 2.2 below.

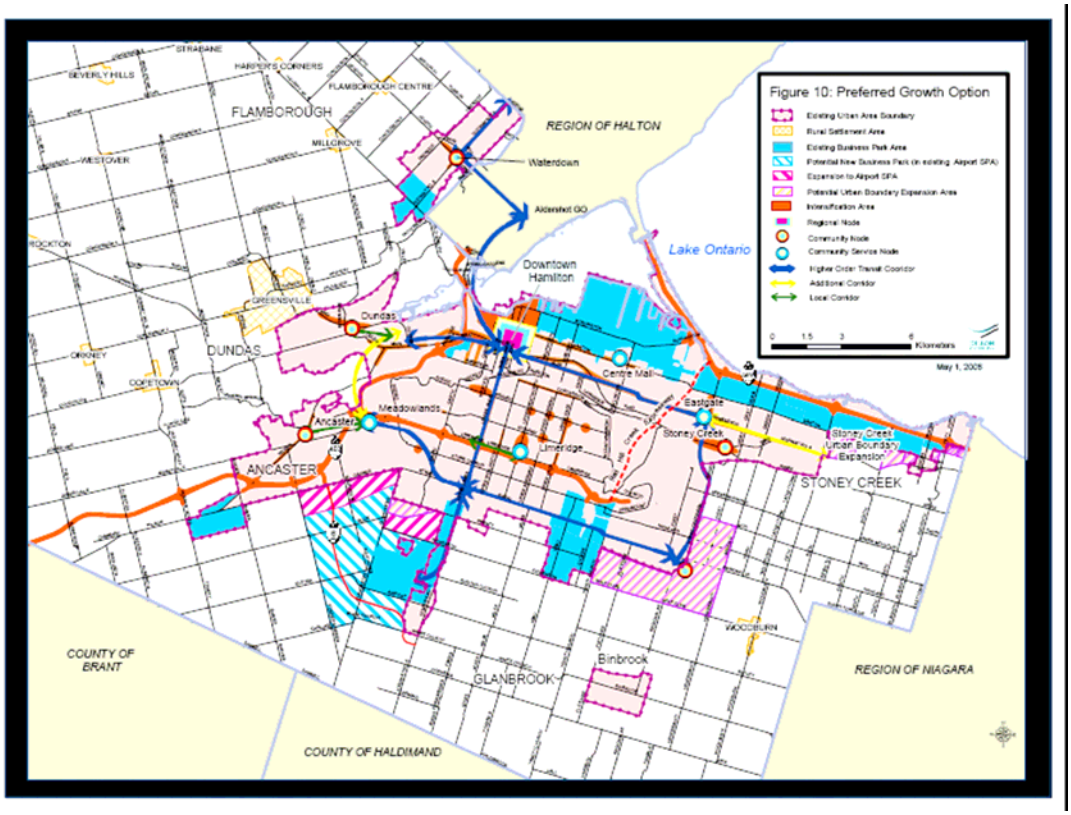
Exhibit 2.2: GRIDS Option 5 – Nodes and Corridors (Fall 2005)



The transit strategy set out in Option 5 called for a higher-order transit service between McMaster University and Eastgate Square (the BLine corridor), plus a link between the Downtown and Lime Ridge Mall. The option also proposed multi-modal corridors, potentially including higher-order transit, in the Rymal/Stone Church corridor and in the Wilson and Centennial Parkway corridors across the Escarpment.

Subsequent to adoption by City Council of the Policy Papers (Phase 2 of the Transportation Master Plan), and the public meetings and information centres that were held in November and December of 2005, the City's process to develop a Growth Related Integrated Development Strategy (GRIDS) advanced to the extent that a Preferred Growth Option was endorsed by City Council on May 24, 2006, as illustrated in the map from the report labeled Figure 10, and shown as Exhibit 2.3 below.

Exhibit 2.3: Preferred Growth Option (May 2006)



A triple bottom line (TBL) evaluation of growth options consistently identified the Nodes and Corridors Option as the best option to meet the needs of the community, protect the environment, and support economic well-being.

The Nodes and Corridors identified in the Preferred Growth Option included:

- Regional Node (Downtown Hamilton);
- Commercial Service Nodes (Lime Ridge Mall, Eastgate and Centre Mall);
- Community Nodes (historic downtowns of Stoney Creek, Waterdown, Ancaster, Dundas and a new node at Upper Centennial and Highway 20);
- Corridors (Barton Street, Centennial Parkway, Concession Street, James Street/Upper James Street, King Street, Main Street, Main Street West, Rymal Road and Queenston Road/Highway 8).

The higher-order transit corridors set out in the Preferred Growth Option include components that are largely self-evident as to where they would be located in practice, e.g. Rymal Road between Upper James Street and Upper Centennial Parkway, and Queenston Road between the Delta and Eastgate Square. However, other corridors are not self evident, e.g. the connection between the Meadowlands and the Rymal/Upper James intersection.

Corridors identified for intensification are envisioned to contain a broad mix of uses, including higher-density residential, retail, institutional and recreation uses. These corridors would also

contain some form of higher order bus transit services that links the nodes together, allowing people to move easily from place to place. The GRIDS report noted that a hierarchy of corridors will need to be identified, and at a later date, a more formalized approach will be required to develop a corridor hierarchy beyond the conceptual level. This current report represents the next step in the development of this hierarchy.

2.3 Transportation Policies and Targets

Targets for transportation demand have been established through the Phase 2 Policy Papers of the Transportation Master Plan. These targets reflect long-standing direction of the City of Hamilton to reduce its environmental impacts while increasing mode choice and accessibly for its residents.

These strategic targets have direct implications for public transit, namely:

- An increase in transit's share of daily trips from 5% in 2001 to 12% by 2021.
- An increase in annual transit trips per capita (city-wide) from 40 in 2001 to between 80 and 100 in 2021.

As discussed in Phase 2 of the Transportation Master Plan, establishing and designating corridors for higher order transit is seen as a critical step in achieving the transportation targets outlined in this paper as well as Vision 2020. Establishing transit corridors will achieve the following objectives:

- Provides the basis for more flexible zoning which could allow and promote more compact transit-supportive development adjacent to designated transit corridors.
- Enables more efficient operation of transit vehicles.
- Allows for a range of service types, including limited stop services, which can provide travel times between major nodes that are competitive with automobiles.
- Allows HSR to market the service as a "different -type" of service, improving the overall image of transit.

2.4 Transit Ridership Growth Plan

On May 3, 2006, the Provincial Gas Tax Transit Master Plan Steering Committee approved Report 06-004, which included the Transit Ridership Growth Plan Final Report (May 2006). One of the cornerstones of the ridership growth plan was to accelerate the concept of BRT, in conjunction with other services including express-type services. Recommendations to achieve this included:

<u>Short term</u>

- Finalize corridor selection (under TMP)
- Introduce articulated buses on BLine
- Develop off-board payment systems
- Develop image and marketing program for BRT
- Establish staff responsibility for planning, design and implementation·
- Initiate Individual Environmental Assessment for E-W and N-S corridors

Medium Term

- Construct BRT system components (physical improvements to accommodate dedicated transit lanes, station stops, terminals)
- Increase service levels in BRT corridors
- Initiate marketing and promotion
- Design and implement feeder services

Longer Term

- Increase degree of segregation between cars and buses, while ensuring access for commercial vehicles and emergency vehicles.
- Continued increase in frequencies
- Investigate conversion of BRT to electric power trolley bus or LRT

The plan also noted that the nature of travel patterns in Hamilton has changed over the past few decades with a number of significant nodes emerging besides the traditional Downtown node. A strategy was proposed to connect Hamilton's five existing major nodes (Downtown, McMaster, Eastgate, Lime Ridge, and Meadowlands) and at least three additional nodes (Mohawk College, Heritage Green and the Waterfront) and possibly a Stoney Creek Node and an East Mountain node, with limited stop express-type services. These services would complement the proposed BRT services in the King/Main and Upper James Street corridors.

The report also identified the defining features of a node and proposed that nodes should be that a "location of interchange for major transit/transportation services" and "a focal point for local transit services." An underlying philosophy should be that if you can get to a node, you can get anywhere on the transit system.

2.5 Places to Grow

The Province of Ontario has recently undertaken several planning initiatives that focus on projected growth in the area of southern Ontario extending west from Toronto through Hamilton to the region of Niagara commonly known as the Greater Golden Horseshoe. In its discussion paper Places to Grow: Better Choices, Brighter Future, the Province outlines a strategy and identifies the necessary tools for managing growth in the fastest-growing region in Canada.

In the Provincial strategy, Hamilton is identified as a designated Urban Growth Centre, which has several planning implications, one of which is that it will serve as a regional transit hub with well-developed transit infrastructure (See Exhibit 2.4).

The Province has also adopted a Greenbelt Plan aimed at permanently protecting greenspace and containing urban sprawl in the Golden Horseshoe.

The Places to Grow Concept identifies two higher order transit facilities intersecting Hamilton, one to Niagara Region and one to Brantford.

Exhibit 2.4: Places to Grow Concept

2.6 Hamilton Electric City

A report titled, Hamilton: The Electric City (April 13, 2006), also known as the Peak Oil Report, was received by City Council on May 10, 2006. An excerpt from the report is reproduced below.

"As the price of liquid transport fuels rises, the balance will shift in favour of electric vehicles. The first move towards reducing transport energy use in Hamilton could thus be replacement of existing bus routes by light rail or streetcars, or by trolley buses, according to levels of ridership. (A light rail route can carry more than three times as many passengers per hour as a trolley bus route, even if the latter is mostly operating in its own right-of- way.) The technologies could initially be introduced into the McMaster to Eastgate corridor and the Downtown to Lime Ridge corridor, both of which are identified in Phase 2 of the Hamilton's emerging Transportation Master Plan as potential higher order transit corridors.

The Plan includes a proposal for introduction of bus rapid transit or light rail (streetcars) along the designated transit corridors. The above rationale would support this direction except that bus rapid transit would not involve diesel buses but rather trolley buses, as are used in Edmonton and Vancouver and in numerous other cities around the world. If diesel buses are to be used, perhaps they should be diesel hybrids, of the kind being purchased by the Toronto Transit Commission."

On receiving the report, Council resolved, in part:

(c) That the General Manager of Public Works investigate the feasibility of using trolley buses as part of the HSR fleet.

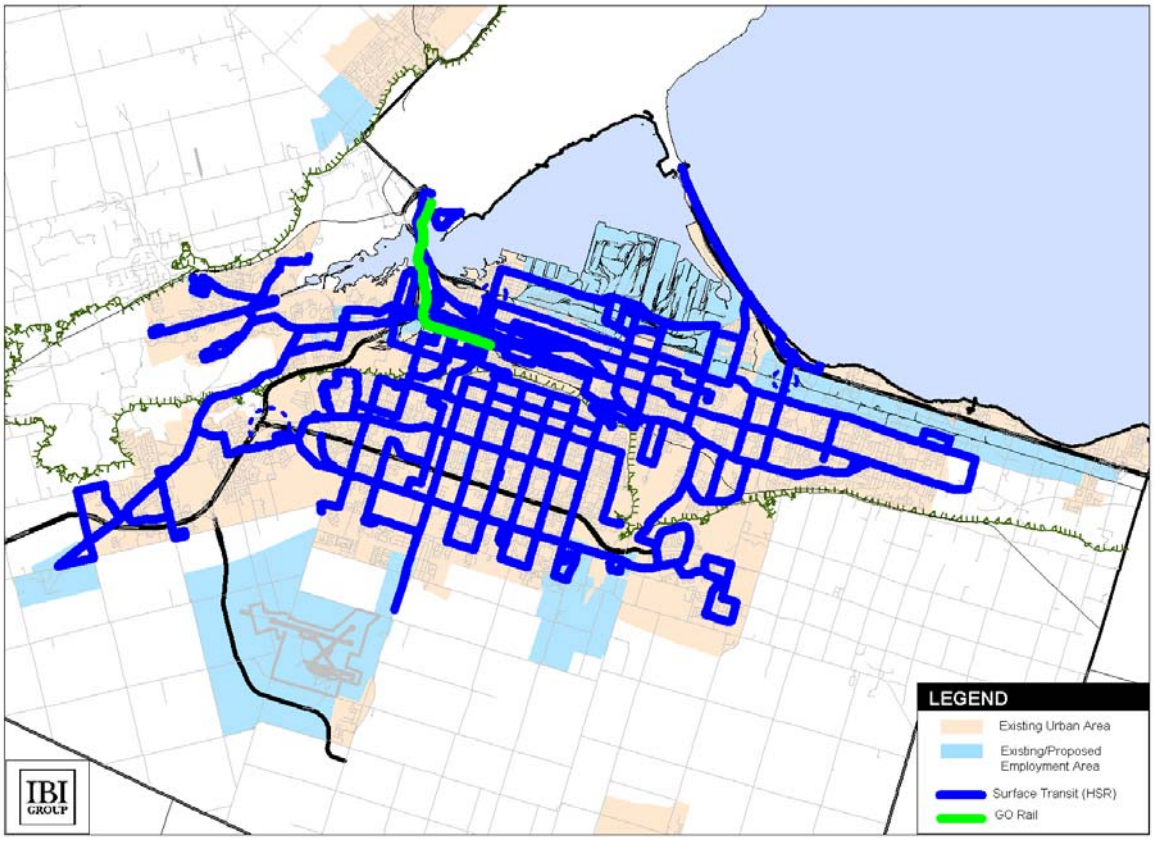
3. TRANSIT SYSTEM NEEDS AND OPPORTUNITIES

3.1 Existing Transit Systems

The Hamilton Street Railway (HSR) currently provides regular fixed route bus services in the former City of Hamilton and the communities of Dundas, Ancaster and Stoney Creek. HSR contracted shared-ride taxi service is provided in a portion of Glanbrook. No service is currently provided in Flamborough. The bus system is characterized by a small number of hubs, with most buses either originating in the Downtown core, or at one of several key suburban activity locations (Lime Ridge Mall, McMaster University, Eastgate Square, etc.) The HSR has approximately 200 standard buses in active service. Exhibit 3.1 provides an illustration of the existing transit system.

The City of Hamilton also operates a specialized para-transit service for aged or disabled persons, DARTS, that uses a fleet of lift equipped vans and contracted taxi services where appropriate.

Exhibit 3.1: Existing Transit Network



In addition to the municipal bus services, GO Transit provides inter-regional bus and rail services, which are presently focused on the Downtown GO Transit Terminal. Bus stops for GO Transit regional service are located at King and Dundurn, Main and Longwood, the GO Center and McMaster University. Go Rail service stops at Aldershot (Burlington) and at the GO Center. The Hamilton GO Centre is also located three blocks south of Jackson Square, facilitating connections

with HSR service. Bus service to and from Toronto operates 15 times a day, every hour in both directions.

GO Rail service to Hamilton's Downtown terminal is limited to peak period peak direction service only. There are currently 3 trains that leave Hamilton in the morning and four trains that return in the evening. During remaining periods, trains start or terminate at Burlington station. There are 28 trains in the day and evening per direction to and from Toronto along the Lakeshore West line that serve Burlington Station.

Hamilton does not currently have an intercity rail (VIA) station within the municipal boundary. The nearest stations are located at Aldershot, Grimsby and Brantford.

3.1.1 THE HSR BLINE

In 1986, the Hamilton Street Railway instituted an express bus service between McMaster University and Eastgate Square called the BLine (Route #10). The features of the service included:

- Enhanced terminal facilities at each end, at McMaster University and at Eastgate Square;
- A limited number of bus stops, such as at connections with other transit routes and at major destinations such as the Downtown – there are only ten to twelve stops between the start and finish;
- Unique bus shelters at BLine stops.

The details of the features of the BLine are very similar today as they were at startup. Even in years when transit ridership overall declined in Hamilton, ridership on the BLine generally increased or stayed relatively stable.

One of the past limitations of the service was that it only operates during peak periods (6 AM- 10 AM, 1 PM – 7 PM); however, service hours have recently been extended in conjunction with the introduction of new hybrid buses.

3.2 Existing Transit Demand Characteristics

On an average day, residents of Hamilton make a total of approximately 1 million trips, or 2.5 trips for every person over 11 years of age. Approximately 81% of trips made by residents stay within the City of Hamilton; however, this figure has been declining since 1986 when 86% of trips stayed within the City.

Like many other Canadian cities over the past two decades, the City of Hamilton saw a significant increase in the use of automobiles with corresponding decreases in the use of transit. Between 1986 and 2001, local transit went from handling 12% of morning peak period trips to 6%. Most of this was due to increases in the use of automobiles, which now handle about 85% of daily trips (driver and passenger combined). Part of decline in transit is a result of service cut-backs, but a large part is demographics, and the continuing suburbanization of the population, combined with higher levels of out-commuting from Hamilton.

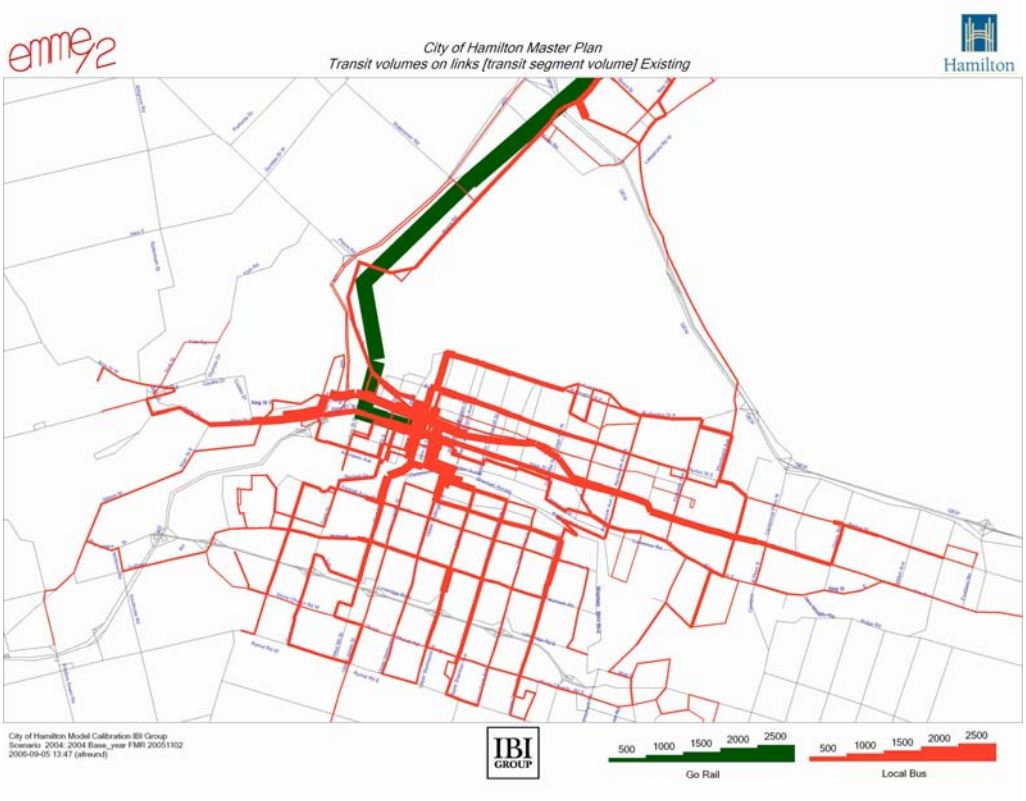
Exhibit 3.2 shows the existing trip density for local transit trips (HSR) and GO Rail based on an assignment of transit trips from the 2001 Transportation Tomorrow Survey (TTS)[3]. The Downtown

[3] Transit trips were extrapolated from 2001 to 2004 based on population projections.

core of Hamilton dominates as the major destination point. Most transit trips are made from the suburbs to the central area of Hamilton. This leads to a strong east to west peak period flow combined with a strong north-south flow across the Escarpment.

Based on recent ridership data, the single point with the highest ridership was at the intersection of Upper Wellington and the Jolley Cut, through which pass approximately 11,000 weekday passengers. Detailed pairs of points must however be considered on Main and King, as each street carries a single direction of traffic. This yields loads of 11,500 and 13,250 passengers along the Main/ King axis, east and west of Jackson Square respectively. At these points, buses also frequently run with loads above capacity.

Exhibit 3.2: Existing Transit Flows (AM Peak Period)



These data confirm that the Downtown area is currently the single most important predominant transit hub. Access routes to and from the Downtown terminals (Gore Park and MacNab) are therefore key corridors for transit service. These corridors include:

- Main Street East and West (eastbound) and King Street East and West (westbound) – King, Delaware, BLine, and University lines.

- John Street (northbound) and James Street (southbound) extending up the Jolley Cut – Upper Ottawa, Upper Gage, Upper Wentworth, Upper Wellington, Upper Kenilworth, College, Upper Sherman, Upper James, and Sanatorium lines.

3.3 Future Transit System Needs and Opportunities

As discussed previously, there is a need to significantly increase transit use to achieve the mode split targets set out in Phase 2 of the Transportation Master Plan. Achievement of these targets is required to mitigate increases in auto usage and corresponding road infrastructure. As shown on Exhibit 3.3 below, assuming current auto mode share trends, most of the Escarpment crossings will be well over capacity in 2031 (shown as red). Conversely, if a 20% reduction in auto driver trips can be achieved through improvements to transit and other travel demand management strategies, most of these crossings will be able to operate within their capacity over the planning horizon (see Exhibit 3.4). Considering a new Escarpment crossing would cost in the order of $50 million, it is important that all options to moderate growth in auto trips be pursued.

Exhibit 3.3: Future (2031) Road Capacity Shortfalls (Current Mode Split Trends)

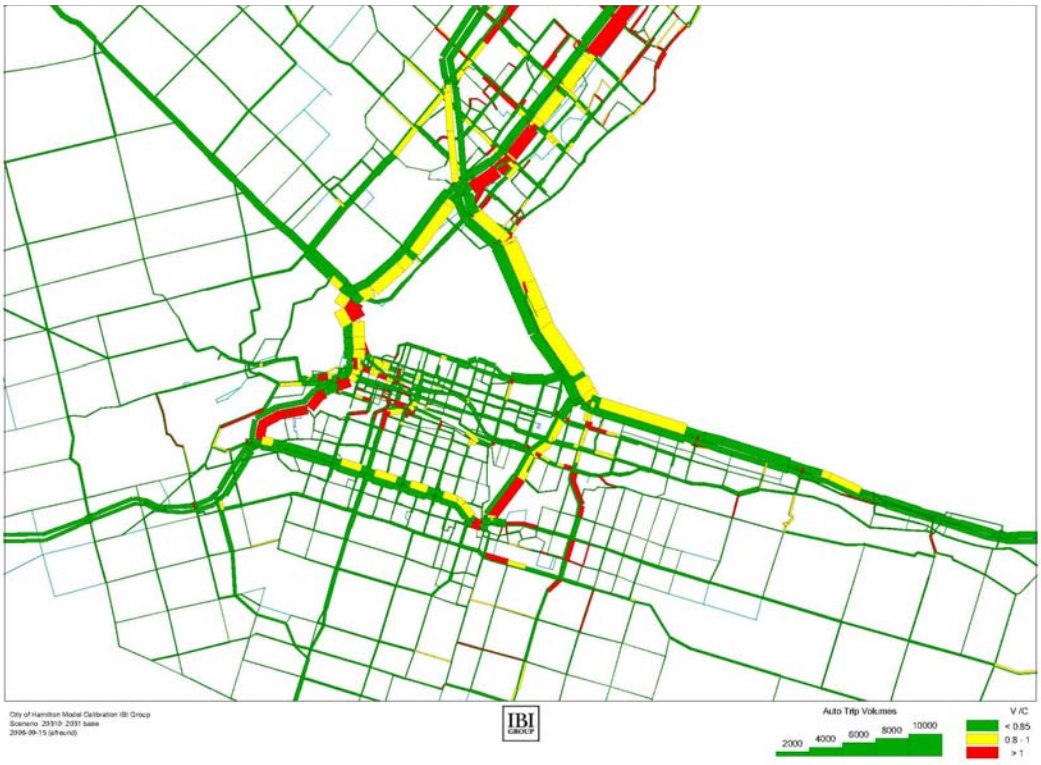
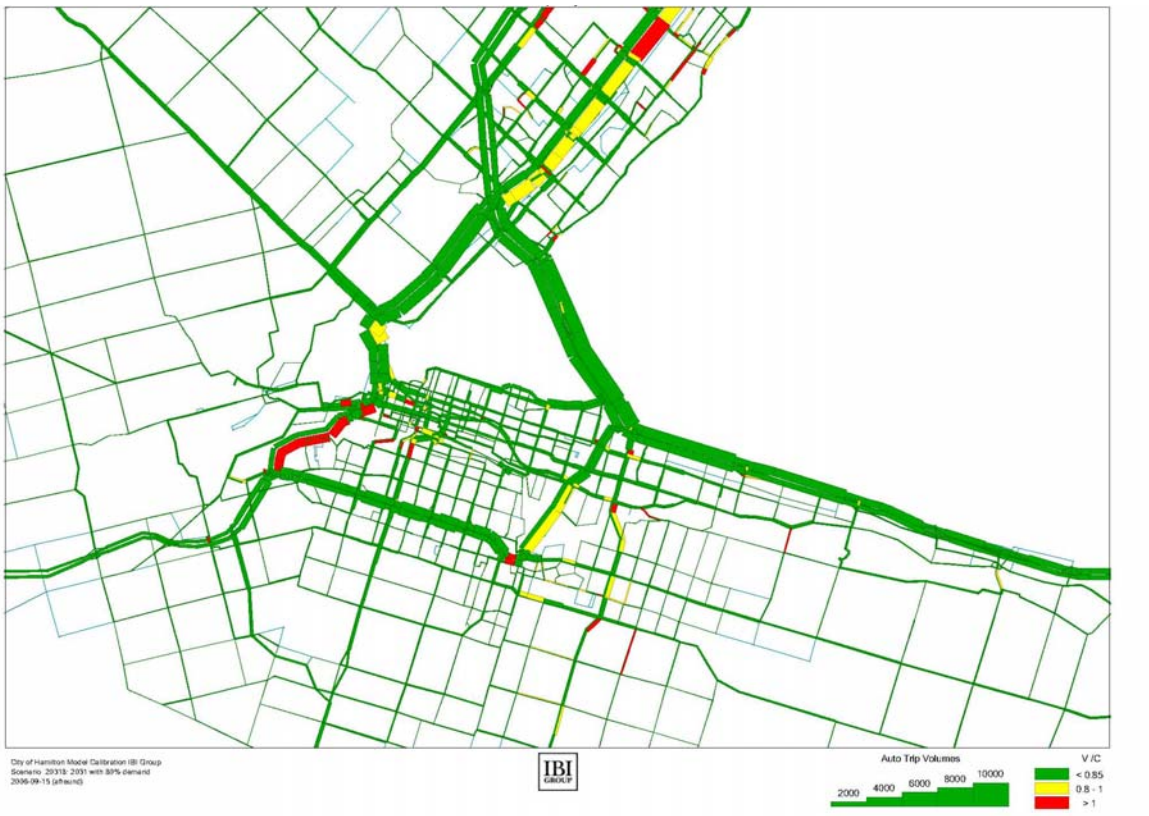
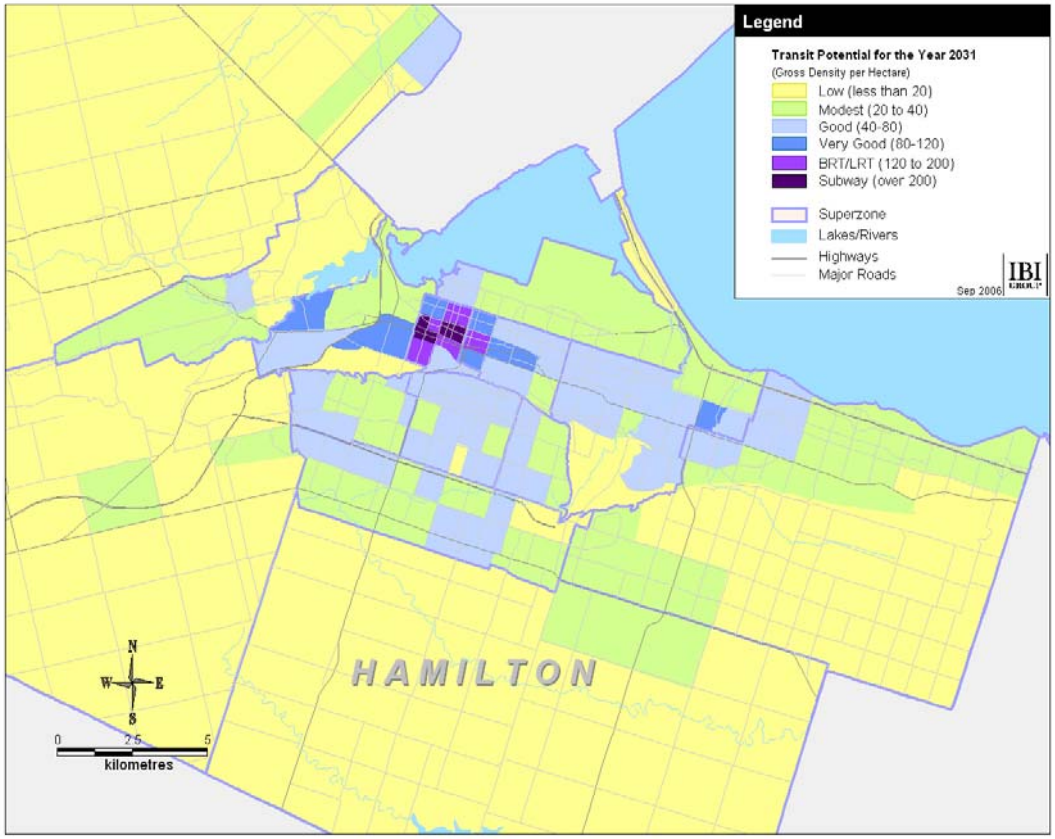


Exhibit 3.4: Future (2031) Road Capacity Shortfalls (20% reduction in Auto Drive Trips)



In terms of opportunities for improved transit, the intensification targets anticipated in the Preferred Growth Plan will result in most of the Lower City and parts of Stoney Creek and Dundas having significant potential for improved transit. A number of the areas in Hamilton's Downtown and central area are sufficiently dense to warrant some form of rapid transit (densities above 120 residents and jobs per hectare), as shown on Exhibit 3.5. These areas extend along an east–west axis below the Escarpment. Similarly, several areas on the Escarpment have densities that are close to supporting bus rapid transit. Newer development areas may not warrant similar levels of service, but it is important that these areas are connected to the primary transit network in order to provide travel options other than private automobiles and to help promote more transit-oriented forms of development. It is expected that densities will increase with the introduction of rapid transit.

Exhibit 3.5: Transit Potential (2031)



3.4 Summary of Challenges and Opportunities in Hamilton

Implementation of BRT and enhanced transit service in Hamilton will not be without its challenges. Some of the major challenges to implementing higher order transit on dedicated facilities include the following:

- The Niagara Escarpment, and the challenges with respect to the 50m +/- difference in elevation between the base and the top;
- Existence of low density suburbs (e.g. Ancaster, Waterdown, Stoney Creek) which were not designed with transit in mind;
- Lack of reliable and sustainable funding for both capital and operating, because of annual budgeting pressures;
- Narrow street rights-of-way in older parts of the City, especially in the Lower City;
- No unused or under-used corridors (utility, rail, etc.) available for separate BRT facilities, with one significant exception, that being the hydro corridor connecting the Meadowlands area and McMaster University (albeit subject to significant challenges);

- Legacy on-street parking restricts number of available lanes, especially in the Lower City;
- Current one-way street system restricts the ability for enhanced transit within a single corridor;
- Parking on some streets may be very difficult to remove;
- Use of Hwy 403 is at the discretion of the Province (MTO);
- Resistance to transit priority measures if they are at the expense of regular vehicles; and,
- New crossings of the Niagara Escarpment may be strongly resisted by the NEC and others.

On the other hand, there are numerous opportunities that can be used to build a case for higher order transit including BRT:

- High utilization of existing east-west routes through the Lower City, in some cases resulting in transit capacity shortfalls;
- Relatively higher densities in some parts of the city;
- Mature transit system with higher order routes such as the BLine in place;
- History of innovation in transit vehicles – first efforts with compressed natural gas buses;
- Generally less congestion than the GTA;
- Support of educational institutions, with season passes included in tuition;
- One-way street system results in higher average speeds and fewer conflicts with other traffic;
- Spike in gas prices has created a demand for improved transit;
- Completion of the GRIDS process and Provincial “Places to Grow” plans has set the stage for next steps;
- There is the potential for the use of higher speed facilities such as the LINC, the Red Hill Valley Parkway, and Highway 403; and
- The hydro corridor between the Meadowlands and McMaster University, notwithstanding the significant challenge in crossing the Niagara Escarpment and Hwy 403. (Note: although identified as an opportunity for the purpose of discussion, this alignment is not considered in the final plan).

4. DESCRIPTION OF BUS RAPID TRANSIT

As noted previously, based on previous studies and work undertaken as part of Phase 2 of the Transportation Master Plan, it is clear that there is a strong case for the implementation of Bus Rapid Transit in Hamilton. The purpose of this section is to define and describe BRT and review its application in other jurisdictions in order to help define what a BRT system for Hamilton could look like. Details on corridors and alignment characteristics are presented in the following chapter.

4.1 Elements of a BRT System

Descriptions in this section are largely draw from the FTA/USDOT report, "Characteristics of Bus Rapid Transit for Decision-Making" (August 2004).

BRT has been defined as:

> "A flexible, high performance rapid transit mode that combines a variety of physical, operating and system elements into a permanently integrated system with a quality image and unique identity."[1]

[1] Levinson et al., **Bus Rapid Transit - Implementation Guidelines**, *TCRP Report 90-Volume II*

The major elements of BRT include Running Ways, Stations, Vehicles, Fare Collection, Intelligent Transportation Systems, and Service Plans. System performance of BRT may be defined by how each BRT element contributes to transit objectives including reducing travel times, improving reliability, providing identity and a quality image, improving safety and security, and increasing capacity. Important BRT System Benefits may accrue in terms of ridership, economic development, and environmental mitigation. BRT system implementation also has an impact on two important categories of transit system performance — capital cost effectiveness and operating efficiency.

Descriptions of the major elements of BRT are:

- **Running Ways** - Running ways drive travel speeds, reliability and identity. Options range from general traffic lanes to fully-grade separated BRT transitways.

- **Stations** – Stations, as the entry point to the system, are the single most important customer interface, affecting accessibility, reliability, comfort, safety, and security, as well as dwell times, and system image. BRT station options vary from simple stops with basic shelters to complex inter-modal terminals with many amenities.

- **Vehicles** - BRT systems can utilize a wide range of vehicles, from standard buses to specialized vehicles. Options vary in terms of size, propulsion system, design, internal configuration, and horizontal/longitudinal control, all of which impact system performance, capacity and service quality. Aesthetics, both internal and external are also important for establishing and reinforcing the brand identity of the system.

- **Fare Collection** – Fare collection affects customer convenience and accessibility, as well as dwell times, service reliability and passenger security. Options range from traditional pay-on-board methods to pre-payment with electronic fare media (e.g., smart cards).

- **Intelligent Transportation Systems (ITS)** – A wide variety of ITS technologies can be integrated into BRT systems to improve BRT system performance in terms of travel

times, reliability, convenience, operational efficiency, safety and security. ITS options include vehicle priority, operations and maintenance management, operator communications, real-time passenger information, and safety and security systems.

- **Service and Operations Plan** – Designing a service plan that meets the needs of the population and employment centres in the area and matches the demand for service is a key step in defining a BRT system. How it is designed can impact system capacity, service reliability, and travel times, including wait and transfer times.

Descriptions of indicators of system performance follow:

- Travel time saving impacts of BRT systems are dependent on how each BRT element is implemented in the specific application and how they relate to each other and the rest of the BRT system. There are several different travel time components that BRT systems impact, including:
  - Running time - the time BRT vehicles and passengers actually spend moving, which is dependent on traffic congestion, delays at intersections, and the need to decelerate into and accelerate from stations
  - Station dwell time – the time vehicles and passengers spend at stations while the vehicle is stopped to board and alight passengers, with typical influences being platform size and layout, vehicle characteristics (e.g., floor height, number of doors and their width), fare collection processes and media, and the use of technologies to expedite the boarding process for disabled customers and other mobility-impaired groups (e.g., precision docking or facilitated wheelchair securement)
  - Waiting and transfer times - which are highly dependent on service frequency and
  - Route structure and the design of stations at transit terminals
- Reliability, is defined as the variability of travel times, and is affected by many BRT features. The three main aspects of reliability include:
  - Running Time Reliability - The ability to maintain consistent travel times
  - Station Dwell Time Reliability – The ability for patrons to board and alight within a set timeframe. Elements that contribute to Station Dwell time include: station platform height, vehicle types, fare collection process and fare media type
  - Service Reliability – The availability of consistent service (availability of service to patrons, the ability to recover from disruptions, availability of resources to consistently provide the scheduled level of service)
- Identity and image reflects the effectiveness of a BRT system's design in positioning it in the transportation marketplace and in fitting within the context of the urban environment. It is important both as a promotional and marketing tool for transit patrons and for providing information to non-frequent users as to the location of BRT system access points (i.e., stops and stations) and routing. Two major elements of BRT system image and identity capture its identity as a product and as an element of the urban form:

  - Brand Identity – A BRT system brand identity reflects how it is positioned relative to the rest of the transit system and other travel options. Effective design and integration of BRT elements reinforce a positive and attractive brand identity that motivates potential customers and makes it easier for them to use the system

  - Contextual Design **-** This measures how effectively the design of the BRT system is integrated with the surrounding urban environment

- Safety and security for transit customers and the general public can be improved with the implementation of BRT systems, where safety and security are defined as:

  - Safety – Freedom from hazards as demonstrated by reduced accident rates, injuries, and improved public perception of safety

  - Security - Actual and perceived freedom from criminal activities and potential threats against customers and property

- Capacity is defined as the maximum number of passengers that can be carried past a point in a given direction, during a given period along the critical section of a given BRT under specific operating conditions. Virtually all BRT elements affect capacity.

The following chart in Exhibit 4.1 identifies the elements of a BRT system and whether or not those elements have an impact on the indicators of system performance.

Exhibit 4.1: BRT System Performance Dependencies

	System Performance				
	Travel Time Savings	Reliability	Identity and Image	Safety and Security	Capacity
RUNNING WAY					
Running Way Segregation	●	●	●	●	●
Running Way Marking			●		
Running Way Guidance	●		●	●	
STATIONS					
Station Type	●		●	●	●
Platform Height	●	●	●	●	●
Platform Layout	●	●			●
Passing Capability	●	●			●
Station Access			●	●	
VEHICLES					
Vehicle Configurations	●	●	●	●	●
Aesthetic Enhancement			●	●	
Passenger Circulation Enhancement	●	●	●	●	●
Propulsion Systems	●		●		
FARE COLLECTION					
Fare Collection Process	●	●	●		●
Fare Transaction Media	●	●	●	●	●
Fare Structure	●		●		●
INTELLIGENT TRANSPORTATION SYSTEMS					
Vehicle Prioritization	●	●	●		●
Driver Assist and Automation Technology	●	●	●	●	●
Operations Management	●	●		●	●
Passenger Information	●	●	●	●	
Safety and Security technology				●	
Support Technologies					●
SERVICE AND OPERATING PLANS					
Route Length		●			
Route Structure	●		●		
Span of Service		●			
Frequency of Service	●	●		●	●
Station Spacing	●	●			

4.2 Examples of BRT Systems

There are a number of established, successful, and growing BRT systems in North America, and some of those systems are described briefly below:

- Ottawa – 60 km system that includes 26 km of bus-only roadway, with most of the remaining distance on reserved freeway or arterial lanes, initially opened in 1983. This type of system would be difficult to establish in Hamilton since there are almost no undeveloped corridors within the existing urban boundary with sufficient width for an entirely new transit right of way

Ottawa Transitway

- Vancouver - three routes providing 40 km of BRT service with varying levels of transit priority treatments, opened in 1996, 2001, and 2002

- Quebec City - Métrobus brand serves two routes running on reserved arterial bus lanes with some signal priority, with high frequency service connecting major activity centres in the City, opened in 1992

Vancouver B-Line

- Calgary - reversible curb HOV lane with signal priority, some mixed-traffic, standard buses, new stations with a distinctive design, $0.75M in 2004

- Mississauga – Funding for a BRT line, also known as the Mississauga Transitway, was announced in the spring of 2006. It will provide bus-only lanes from Winston Churchill Blvd. at the Mississauga-Oakville border to Highway 427-Renforth Dr., along Highway 403 and Eglinton Ave. and will be used by GO and city buses. Mississauga is responsible for building most of the section known as BRT East, from the City Centre (Hurontario St. and Rathburn Rd.) to 427/Renforth except for one short leg, from Hurontario to Cawthra Rd., which will be built by GO Transit. GO is also responsible for building all of BRT West, from Winston Churchill to the city centre

- York Region – The VIVA service operates with 6 routes in 4 designated corridors. The initial service, implemented at a cost of $150 million involved the purchase of new buses which operate primarily in mixed traffic with transit priority and signal upgrades. The next phase will involve dedicated transit lanes and will cost between $1.5 billion to $2.2 billion

York Region (VIVA) Bus

- Halifax - Windmill Road BRT and Cole Harbour BRT, mixed-traffic operations, bus priority lanes, free flow right turn lanes, queue jumps, transit signal priority, $13.3M

- Gatineau - 36km of dedicated busway and a curbside reserved lane using standard buses, distinctive stations, opened 2005/2006, $100M

Proposed Gatineau BRT Station

- The GTA - 100 km BRT spine from the Oakville GO Station to the Pickering GO Station, 75% grade separated busway, 6% at-grade arterial busway, 15% bus lane, 4% mixed flow operations, 45 stations, 5,000 park & ride spaces, $965M, 2008 first phase

There are also some notable USA examples:

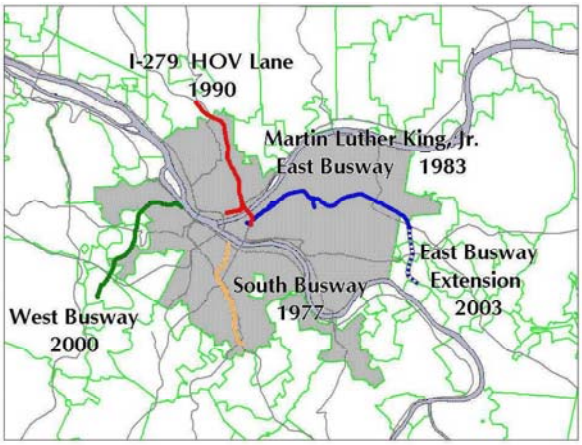
- Miami-Dade - 8.2 mile two-lane bus-only roadway constructed in a former rail ROW adjacent to a major arterial, US 1, with 16 at-grade intersections and 15 on-line stations, at a cost of US$21M. Planned southerly extension of 11.5 miles with 5 bridges and 12 stations

Miami-Dade BRT Station

Boston BRT

- Pittsburgh - 18.4 miles
service to/from Downtown, joint use BRT and LRT tunnel Downtown, BRT adjacent to operating rail ROW

- Boston - Phase 1: Dudley Square to Downtown, dedicated Lanes on Washington Street, opened July 2002 - Phase 2: Waterfront, underground from South Station to Silver Line Way, above ground to residential neighbourhoods and the Airport, opened summer 2005 - Phase 3: Downtown, underground tunnel linking Phase 1 and 2, estimated cost US$780M



Pittsburgh System Map

- Las Vegas - Southern Nevada's Metropolitan Area Express (MAX) system, 5 miles of dedicated lanes in shared ROW, Irisbus optically guided BRT vehicles, off-board electronic ticket vending machines
- Los Angeles - Metro Orange Line, 14 mile busway with 13 stations, off-board ticket vending machines, opened 2005, US$350M
- Eugene – four miles in the Franklin Corridor, 60% exclusive lanes, operational late 2006, six mile extension planned for Pioneer Parkway

Las Vegas Vehicle and Station

Los Angeles BRT Station

Eugene Vehicle and Station

5. DEVELOPMENT OF A PROPOSED STRATEGIC TRANSIT NETWORK

Desired elements of the proposed strategic higher order transit network include:

- A BRT network providing, at a minimum, an east-west spine and a north-south spine;
- BRT or express services connecting major transit hubs with frequent and fast service;
- Improved Intercity Transit services;
- Improved access to the passenger rail (VIA) system.

Each of these elements are discussed in the sections below, with the primary focus being on the BRT network.

5.1 Bus Rapid Transit Network Alternatives and Evaluation

Four primary corridors were identified in the preferred GRIDS option:

- Lower City East-West Corridor: An east-west corridor along King/Main between Eastgate and McMaster;
- Central Mountain North-South Corridor: A north-south corridor along James Street and Upper James;
- Upper Mountain East-West Corridor: An east-west corridor along Rymal Road connecting the proposed Elfrida growth node with Meadowlands;
- East-Mountain North-South Corridor: A potential north-south connection on Centennial Parkway between the Elfrida growth node and Eastgate.

These are used as a starting point for the assessment of the potential for BRT.

The use of the Hydro corridor crossing Highway 403 is also discussed in Section 5.2, but not carried forward for reasons of impact on the Escarpment.

5.1.1 INCREMENTAL CHANGE VERSUS A "BIG BANG" APPROACH

Some BRT system elements could be implemented in a progressive and incremental manner, e.g. upgrading stops and adding stations, reducing headways, or introducing transit priority on an as-required basis. However, other BRT system elements may require a substantial change at one point in time, e.g. contra-flow lane on a one-way street, or designating a road link for buses only.

It is important to consider all of the ramifications of adopting a "big bang" approach in the Hamilton context, in order to ensure that the potential effects of changes are well understood by decision-makers, especially with respect to the time lag that may be experienced between implementation of the change and its immediate impacts, and the benefits and ridership increases that will take time to build.

However, it is the experience of many transit providers that implementation of system additions or improvements that substantially improve the transit experience through improved travel time,

reliability, consistency, and passenger amenities results in significant increases in ridership. Incremental and modest changes in system performance do not tend to materially increase ridership.

5.1.2 ASSESSMENT OF AVAILABLE LANES

The GRIDS Preferred Growth Option sets out the framework for conceptual higher order transit corridors. Within that framework, there are elements that are obvious and self-evident in terms of the routes that would be followed, and there are elements where a number of alternatives are possible and must be explored. In order to properly assess the potential ability to implement BRT, an assessment of available traffic lanes within the corridors is necessary.

As noted in Section 3.4, there are a number of challenges associated with establishing BRT on the legacy road system in the older parts of Hamilton. Road allowances of Main Street and King Street in much of the Lower City are 20 m or less, and developments abutting those roadways in the older parts of the city historically provided little or no off-street parking, and have come to rely to a great degree on on-street parking and loading. The City of Hamilton had a long-standing program of removing on-street parking on arterial roads in the several decades leading up to about 1985, but in the last 20 years, a significant amount of on-street parking has been reinstated, especially in the Downtown area, in order to provide more of a balance between mobility, commerce, and pedestrian amenities

The higher order transit corridors contained in the GRIDS Preferred Growth Option that are directly affected by the limitations of restricted road allowances and on-street parking and loading that would be difficult to remove are the portion of the east-west corridor in the Lower City between the Delta (intersection of King and Main Streets) and Locke Street, and James Street South and John Street South (both recently converted to two-way traffic) between Main Street and St. Joseph's Drive.

The number of physical lanes available on King Street and Main Street in the Lower City is at least four lanes on each street, except for the section of King Street between Wellington Street and Mary Street, which has been physically narrowed to two lanes plus parking in bays on both sides, and the section of King Street through Westdale.

However, the legacy of narrow road allowances and on-street parking and loading becomes very relevant when assessing the numbers of available lanes in the peak and off-peak periods. In preparing these assessments, it has been assumed that long stretches of on-street parking and loading could not be readily removed without undue hardship on the abutting businesses and residents (such as on King Street between Victoria Avenue and the Delta), but that small pockets of on-street parking could be removed for the greater good with impacts limited to relatively few businesses (such as the four blocks on Queenston Road from Reid to Parkdale).

It is important to note that there are significant differences between the available lanes in the peak periods versus the off-peak periods, and this fact is reflective of the fine balance between the need for sufficient capacity on arterial roads and the need to support the businesses that rely on the on-street parking and loading to survive. It would be socially, economically, and politically impossible to reclaim all of the physical lanes on the city's arterial road system in the Lower City. The numbers of lanes available in the off-peak periods will also be a major factor in decisions respecting permanent BRT features such as stations.

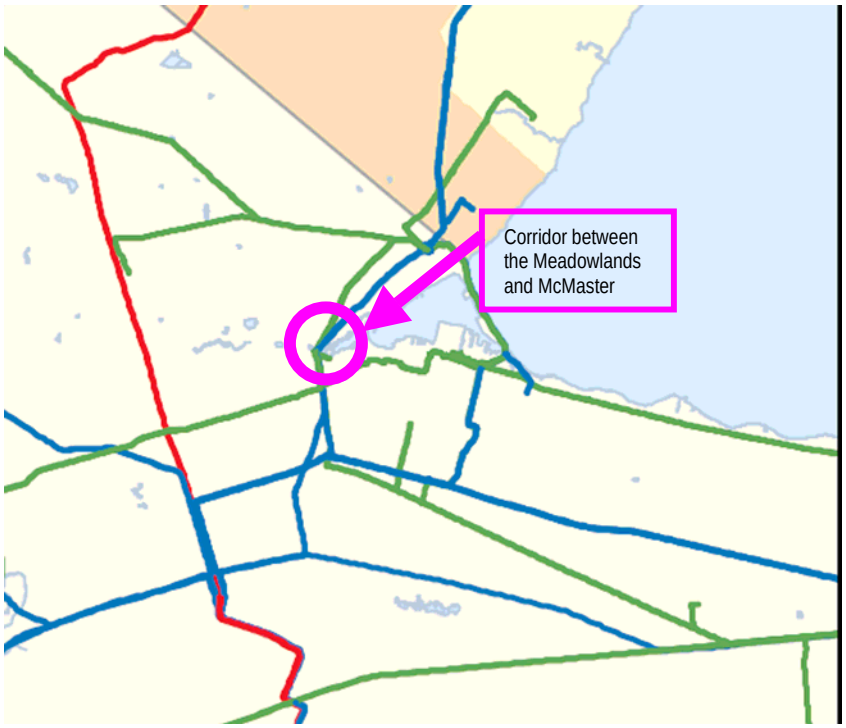
5.2 Alternative Off-Road Corridors

In considering alternatives, the question of whether or not there are any unused or under-used corridors (e.g. former rail corridors, utility corridors) must be addressed.

In Hamilton, former rail corridors have generally been quite narrow in terms of right-of-way, as they have been single track facilities like the Hagersville Subdivision that have been abandoned, and they have been converted to commuter/recreation multi-use trails that are considered unlikely candidates for conversion to separate BRT routes.

There are a number of Hydro One corridors in Hamilton, as shown on Exhibit 5.1 below. Only one of the corridors has any reasonable potential to fulfil a role as a BRT link, and that is the corridor that runs between the area of the Meadowlands and the west Limits of the McMaster University campus.

Exhibit 5.1: Hydro One Corridors in Hamilton



It is a very wide corridor housing both 115kV and 230kV transmission lines, and may provide an opportunity for a separate BRT facility between the Meadowlands and McMaster, both of which are located at the end of a higher order transit corridor in the Preferred Growth Option. There are significant challenges with this alternative, including the crossing of the Niagara Escarpment and Hwy 403, and the proximity of the Coldwater Creek in the McMaster west campus. Despite the major benefits this corridor could provide in terms of relief to Hwy 403 and Wilson Street, the challenges due to the Escarpment would be difficult to overcome and hence, it is not carried forward.

There are no other obvious unused or under-used corridors that could be candidates for separate BRT routes.

5.3 Implications of BRT Lines on Legacy 20m Roadways

Much of King Street, Main Street, and a section of Upper James Street between the Mountain brow and Fennell Avenue have rights-of-way of 20m or less, and are characterized by abutting development with little or no setback from the road allowance and little or no off-street parking and loading.

A separate running way for a two-way BRT line would occupy approximately 11m of right-of-way, being comprised of a 3.0m median/transit station, two 3.5m bus lanes, and two 0.5m separations from other traffic. Obviously, the use of 11m of a 20m legacy roadway would not be reasonable if other traffic and pedestrians are still accommodated to some degree. BRT lines in other jurisdictions running in separate running ways are most often located in arterial road rights-of-way of 30m or greater. As there are no reasonable alternatives for a separate dedicated running way within the road allowance of these 20m legacy roadways, the BRT service would necessarily be operating in mixed traffic with a migration to operating in a dedicated BRT/transit/HOV/taxi lane in the longer term. In the interim, other transit priority measures such as traffic signal priority would be employed as necessary.

5.4 The Lower City East-West Corridor

The Lower City east-west higher order transit corridor identified in the Preferred Growth option is between McMaster University and Eastgate Square.

5.4.1 EASTGATE SQUARE TO THE DELTA

The only reasonable alternative for the specific route between Eastgate Square and the Delta (intersection of King Street East and Main Street East) is Queenston Road/Main Street East. The existing BLine operates on this section now. This roadway is characterized by two through lanes in each direction, with on-street parking that could be eliminated, or at a minimum restricted to outside of the hours of 7:00 a.m. and 6:00 p.m. There are no reasonable alternatives for a separate dedicated running way within the road allowance, as the right-of-way on the Main Street section is 20m, so the BRT service would necessarily be operating in mixed traffic with a migration to operating in a dedicated BRT/transit/HOV/taxi lane in the longer term.

5.4.2 THE DELTA TO WELLINGTON STREET

Between the Delta and Wellington Street, two alternatives were considered. One alternative is to maintain the current one-way street system and continue to operate the BLine and future BRT on the one-way streets in mixed traffic with a migration to operating in a dedicated BRT/transit/HOV/taxi lane in the longer term.

An second alternative to establish a contra-flow bus lane on Main Street was reviewed and rejected for the following reasons:

- The number of available lanes on Main Street/King Street in the peak and off-peak hours is 4/3 and 3/2 lanes respectively, with Cannon Street providing sufficient westbound capacity to rationalize the differences in the number of lanes. Concentrating BRT on Main Street would detrimentally affect the present lane balance.

- Creating a contra-flow lane on Main Street would require a “big bang” approach rather than staged implementation, and the present 10-minute headways and anticipated 6 –

8 minute headways are not sufficient to justify that approach for such a long section of roadway.

- Traffic signal progression would be affected to a degree, but because the signal spacing is generally at major intersections and mid-block locations, the impacts would be relatively minor.

- Current lane widths on Main Street are less than 3.0 m in some locations. Typically at least 3.75 m is considered a minimum lane with for normal curb-lane BRT and this would increase for contra-flow BRT lanes.

5.4.3 WELLINGTON STREET TO BAY STREET

Between Wellington Street and Bay Street there are two alternatives. One alternative is to maintain the current one-way street system and continue to operate the BLine and future BRT on the one-way streets in mixed traffic with a migration to operating in a dedicated BRT/transit/HOV/taxi lane in the longer term.

The advantages/disadvantages are as follows:

- The BRT system could be implemented in an incremental manner, with Cannon Street accepting additional westbound traffic as capacity is restricted on King Street, which has only two lanes available through the eastern portion of the Downtown.

- Buses would operate in a progressed traffic signal environment, and would not have to turn out of phase.

The other alternative is to establish a westbound contra-flow bus lane on Main Street between Wellington and Bay Streets, and to establish a dedicated lane adjacent to the curb in the eastbound direction at the same time, as illustrated in Exhibit 5.2.

Exhibit 5.2: East-West Contra-Flow Alternative

The advantages are as follows:

- The two-lane section of King Street would be avoided by the BRT system, facilitating its conversion to two-way traffic in accordance with the recommendations of the Downtown Transportation Master Plan.

- The available lanes on Main/King in the peak and off-peak hours are 5/2 and 4/2 respectively, and a contra-flow BRT lane would re-establish a closer lane balance.

The disadvantages would be as follows:

- There are 11 traffic signals within the section affected by the contra-flow lane, and establishing acceptable traffic progression for both directions will be a significant challenge.

- Operations of the MacNab Street terminal would be compromised.

On balance, it is considered preferable to maintain the transit vehicles on the one-way pair of King/Main rather than establishing a contra-flow lane on Main Street.

5.4.4 BAY STREET TO PARADISE ROAD

Between Bay Street and Paradise Road there is essentially only one alternative. That alternative is to maintain the current one-way street system and continue to operate the BLine and future BRT on the one-way streets in mixed traffic with a migration to operating in a dedicated BRT/transit/HOV/taxi lane in the longer term.

An alternative to establish a contra-flow bus lane on Main Street was reviewed and rejected for the following reasons:

- The number of available lanes on Main Street/King Street in the peak and off-peak hours is 4/4 and 4/3 lanes respectively, with 5/5 lanes just east of Hwy 403. Concentrating BRT on Main Street would detrimentally affect the present lane balance.

- Traffic signal progression would be affected to a degree, but because the signal spacing is generally greater than in the Downtown core, the impacts would be moderate.

- Implementing a contra-flow lane through the Hwy 403 interchange area would be very problematic, and would likely require a significant and expensive re-design of the Main/King interchange ramps.

5.4.5 PARADISE ROAD TO MCMASTER UNIVERSITY

Between Paradise Road and McMaster University there are three potential alternatives.

One alternative uses the same route as the existing BLine, i.e. in the westbound direction, King Street to Sterling Street to the front of the McMaster Medical Centre, and on the return trip in the eastbound direction, from the front of the McMaster Medical Centre to Sterling Street to King Street to Paradise Road to Main Street.

The advantages/disadvantages of this option are:

- The centre of Westdale Village and the centre of the McMaster Campus would be well served by two-way BRT service.

- Destinations along Main Street such as Columbia College would be approximately 400m from the BRT service.

A second alternative is to loop the service from westbound on King Street to Sterling Street, then through the McMaster Campus to Main Street eastbound.

The advantages/disadvantages of this option are:

- The centre of Westdale Village, the centre of the McMaster Campus, and destinations along Main Street such as Columbia College would be served by one-way BRT service.

- Main Street has a wider right-of-way than King Street, and provides good opportunities for BRT system elements.

A third alternative is to establish a two-way BRT service on Main Street, with buses westbound on King Street to Paradise Road to Main Street westbound to a loop in front of the McMaster Medical Centre to Main Street eastbound.

The advantages/disadvantages of this option are:

- The centre of Westdale Village and the centre of the McMaster Campus would be approximately 400m from the BRT service.

- Destinations along Main Street such as Columbia College would be well served by two-way BRT service.

On balance, each alternative would be viable, and it is recommended that a final decision be left to the detailed planning stage.

5.5 The Central North-South Corridor

The central north-south corridor shown in the final GRIDS Preferred Growth Option concept (Exhibit 2.3) is located on James Street and Upper James Street. In practice, without a tunnel, viaduct, or combination of the two for a crossing of the Niagara Escarpment, the direct connection is not physically possible. To illustrate, the Escarpment generates a disconnect between the major routes in the Lower City and on the Mountain. For example, Garth Street connects to Queen Street via Beckett Drive, West 5th Street connects to James Street via James Mountain Road, John Street connects to Upper Wellington Street via the Jolley Cut, and Wellington Street connects to Upper James Street via the Claremont Access. Realistically, in the central north-south corridor, a BRT system would utilize one of these Escarpment crossings.

There is merit in establishing a BRT route using James Street and Upper James Street to the greatest extent possible, linking the waterfront and the Downtown to the Upper James Street corridor, subject to the provision of good BRT connections to Lime Ridge Mall, the Meadowlands, and the proposed Community Node at Rymal/Regional Road 20/Regional Road 56.

Other north-south links in the Lower City such as Queen Street, John Street, Wellington Street, or Victoria Avenue do not provide the same focus on the Downtown core. The use of James Street in the Lower City would support the planning principles that have been espoused in the Downtown Transportation Master Plan and in the GRIDS process. In addition, James Street has recently been converted to two-way traffic, and motorists and other travelers to and from the Downtown would be more receptive to significant changes on James Street as a result of that recent experience. James Street is a good candidate for the “big bang” approach if the implementation of BRT with substantive transit priority measures is implemented soon.

On the Mountain, although the picture is a little less clear, there is support for establishing the north-south BRT on Upper James Street. Lime Ridge Mall is located on Upper Wentworth Street, is a Community Service Node in the Preferred Growth Option (Exhibit 2.2), and previous proposals for enhanced transit have shown a direct connection between the Downtown and Lime Ridge Mall. However, routes which are largely residential in nature such as Upper Wellington Street and Upper Wentworth Street would be the north-south link(s) required to connect to Lime Ridge Mall. Upper James Street, on the other hand, is an established commercial corridor with a wide right-of-way for most of its length, a legacy of its former role as Hwy 6.

The solution for connecting James Street in the Lower City and Upper James Street on the Mountain is to use the James Mountain Road, West 5th Street, and Fennell Avenue. James Mountain Road was reconstructed in the late 1990’s and provides an excellent Escarpment crossing albeit with fairly steep grades (+/-10 percent). West 5th Street between the Mountain brow and Fennell Avenue has institutional uses on the west side, and can fairly easily be widened to that side if required. The intersection of West 5th Street and Fennell Avenue is located at Mohawk College, which is a significant destination, and is in an intensification area identified in the Preferred Growth Option. Fennell Avenue between West 5th Street and Upper James is an arterial roadway abutted by 26 dwellings plus the City’s Auchmar Estate, but is a relatively short section of 420 m in length. Upper James Street south of Fennell Avenue does not have the restricted right-of-way and character of abutting development as Upper James Street north of Fennell Avenue.

In summary, the route using James Street to James Mountain Road to West 5th Street to Fennell Avenue to Upper James Street is superior to a route that would use James Street or John Street to the Jolley Cut to Upper Wellington Street to Upper Wentworth Street via Concession Street, Fennell

Avenue, or Mohawk Road to Lime Ridge Mall. In addition it is a good candidate for implementation in the short term.

5.6 The Mountain East-West Corridor

The Mountain east-west corridor shown in the Preferred Growth Option (Exhibit 2.3) is comprised of Rymal Road between Upper James Street and the proposed Community Node at Rymal/Regional Road 20/Regional Road 56, and a conceptual connection between Upper James Street at Rymal Road and the Meadowlands.

In the Transit Ridership Growth Plan Final Report (May 2006), it is recommended in the longer term to implement BRT on one or more of the LINC, Stone Church Road or Rymal Road, including dedicated lanes.

It is suggested that route choice should have regard to the following criteria:

- Connect Community Nodes, Community Service Nodes, and other significant destinations
- Provide opportunities for implementation in the shorter term rather than the longer term
- Provide logical connections to other proposed BRT links
- Serve a large catchment area

Of the three east-west alternatives suggested in the Transit Ridership Growth Plan Final Report (May 2006), the route that best meets the criteria is the LINC. It directly connects Meadowlands and Lime Ridge Mall, could be extended to serve Downtown Ancaster and the Heritage Green Community, and can be readily connected to the proposed Community Node at Rymal Road/Regional Road 20/Regional Road 56. It also supports the concept to use Upper James Street as the central north-south connector because it provides a direct connection to Lime Ridge Mall without the need to use Upper Wellington Street, Upper Wentworth Street, or other Mountain east-west arterial road links.

Using the LINC as the east-west spine also has other advantages:

- High speed operation
- Opportunities for stations at Meadowlands and Lime Ridge Mall
- Opportunities for good connections with north-south HSR routes
- Opportunities to connect easterly via Trinity Church Road Extension to Rymal Road or Mud Street to Upper Centennial Parkway
- Opportunities for future expansion onto Highway 403 and the Red Hill Valley Parkway
- Opportunities for roadway expansion or for the use of bus shoulder lanes or other optimization alternatives – the road allowance is 60m
- Closer to intensification area on Upper Wentworth Street

5.7 Future Additions to a BRT System

With a spine of BRT service in place, consisting of a Lower City east-west corridor on King Street/Main Street/Queenston Road, a central north-south corridor on James Street/James Mountain Road/West 5th Street/Fennell Avenue/Upper James Street, and a Mountain east-west corridor on the LINC, future additions may be considered. It is suggested that route choice should have regard to the same criteria as set out in Section 5.6 listed previously.

Future additions that could best meet the criteria may include:

- An east north-south corridor on Centennial Parkway/Upper Centennial Parkway or on the Red Hill Valley Parkway. Centennial Parkway may be better suited to a secondary route with some transit priority measures
- A west north-south corridor on Hwy 403
- Integration with GO Transit service in the Lakeshore corridor, including connections to Waterdown
- Secondary routes with some transit priority measures on Fennell Avenue/Kenilworth Access/Ottawa Street/Barton Street
- Connections to Downtown Stoney Creek and Downtown Dundas

5.8 Preferred Long Term Higher Order Transit Network

The proposed primary BRT routes and potential secondary routes are illustrated on Exhibit 5.3 on the following page.

Specific alignments and cross-sections for BRT will be refined through subsequent phases of the Environmental Assessment Process and in consultation with HSR, the public and other stakeholders. Approaches will vary depending on available right of way, adjacent land use, traffic conditions and other factors.

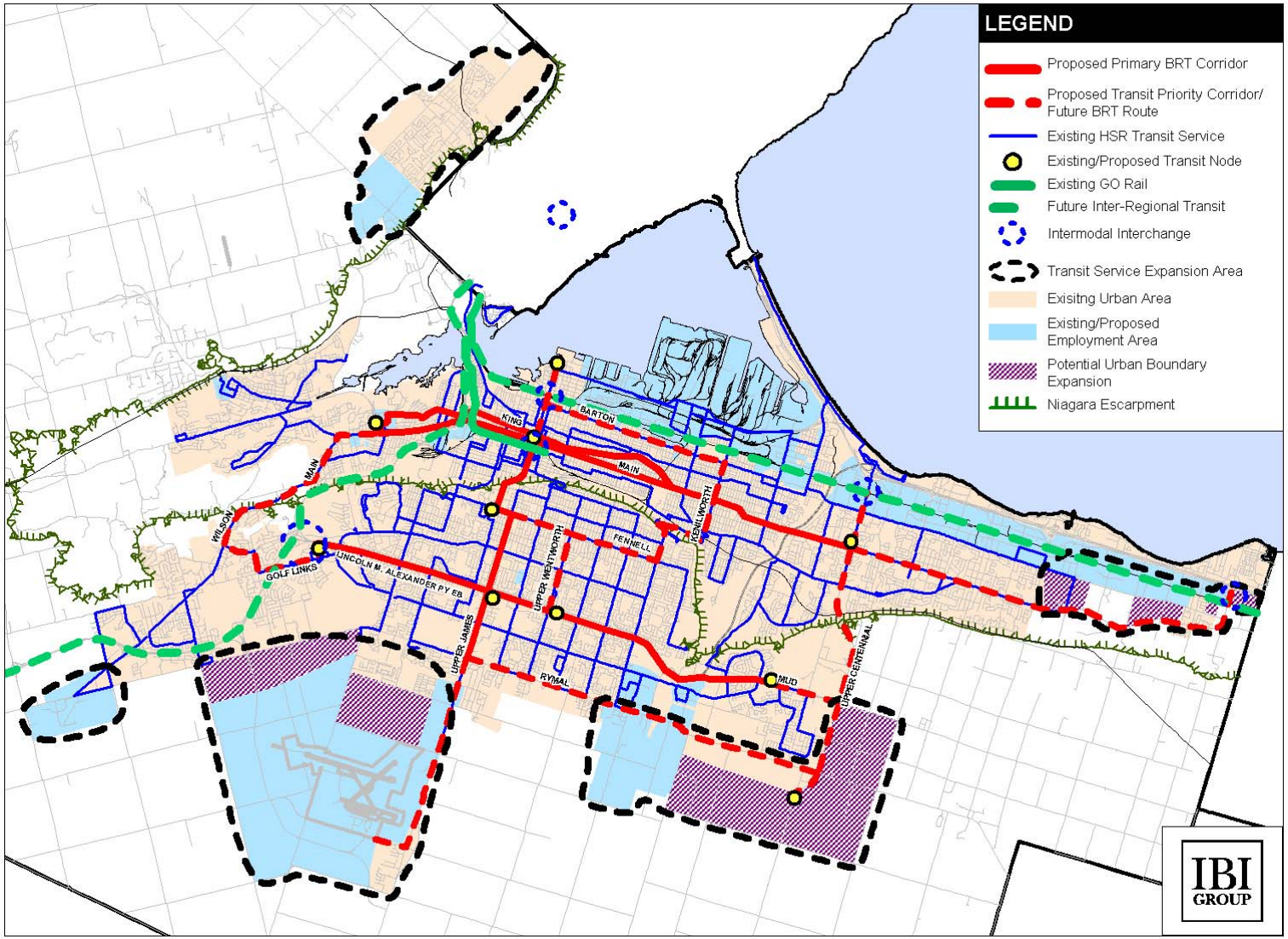
The advantage of BRT is that it can be implemented in a staged approach. The first stage of BRT implementation may include a spine consisting of three corridors:

- A Lower City east-west corridor on King Street/Main Street/Queenston Road, with operation of the BLine and future BRT on the one-way and two-way streets in mixed traffic with migration to operating in a dedicated BRT/transit/HOV/taxi lane in the longer term. In the interim, transit priority measures such as traffic signal priority and queue jumps would be employed. There would be stations at McMaster, in the Downtown, and at Eastgate. Two options are possible between Bay Street and Wellington Street – one-way operation on King and Main, or introduction of contra-flow transit lane on Main Street.
- A central north-south corridor on James Street/James Mountain Road/West 5th Street/Fennell Avenue/Upper James Street. From King Street southerly, the service could operate on dedicated BRT/transit/HOV/taxi lanes implemented in the short term, and with James Mountain Road limited to BRT / transit / HOV / taxi only. From King Street to the waterfront, the service would operate in mixed traffic with migration to operating in a dedicated BRT/transit/HOV/taxi lane in the longer term. In the interim,

transit priority measures such as traffic signal priority and queue jumps would be employed.

- A Mountain east-west corridor on the LINC or parallel facility in the short to medium term, initially between end stations at Meadowlands and Heritage Green, and with intermediate stations at Upper James Street and Lime Ridge Mall. Protected stops or stations could be provided at the intersecting north-south arterial roads on which HSR routes operate.

Exhibit 5.3: Proposed Higher Order Transit Network



6. SUPPORTING TRANSIT ELEMENTS

6.1 Park and Ride

There are presently no dedicated park-and-ride lots for HSR services, although many informal opportunities exist. For example, McMaster has an arrangement with Meadowlands Zellers allowing McMaster commuters to park in the Zellers lot in order to take the HSR to campus. Establishing dedicated parking facilities for transit riders near major transit terminals would encourage people from outlying areas to transfer to HSR for the remainder of their journey.

Establishing permanent park and ride lots at or near the following locations should be a key priority:

- Meadowlands area
- Eastgate Mall area
- Mount Hope (at or near Mountain Transit Terminal)
- Elfrida
- Winona

Formal arrangements with property owners would need to be established to ensure appropriate use of parking spaces. In addition, some locations, such as Mount Hope, would require land acquisition and funding to construct parking lots.

The Province of Ontario is also completing a Carpool Strategy for the GTA and Hamilton, which will identify potential carpool lots along Highway 403.

6.2 Commuter Rail and Bus

The two main intercity transit hubs in the Hamilton area are the Downtown GO Centre and Aldershot Station in Burlington. The Downtown GO Centre is well served by HSR while Burlington Transit operates a route between Downtown Hamilton and Aldershot.

The Provincial Growth Plan (Places to Grow) identifies a future intercity transit service to Niagara Region. Based on discussions with GO Transit, it is anticipated that this service will initially be implemented using buses, moving to commuter rail in the longer term. Logical connections to this system are at the following locations:

- James Street North (in the longer term in conjunction with intercity rail)
- Centennial Parkway at the QEW
- Stoney Creek, in conjunction with the development of the Stoney Creek Urban Boundary Expansion (SCUBE) development

The Provincial Growth Plan also shows an improved inter-regional corridor from Downtown Hamilton to Brantford, via Highway 403, with connections to Guelph and Waterloo. This service would initially be provided using GO buses.

6.3 Intercity Rail

The City recently competed a study to establish the location for one or more new passenger rail stations (VIA Rail) in Hamilton with a James Street (Liuna Station) location and East Hamilton location being the preferred locations. The VIA Rail Task Force has indicated a strong preference for the Liuna Station, given that it was the site of the previous VIA Rail Station. This station could be tied into the existing Hunter Street Station and the Downtown with frequent two-way HSR service on James Street.