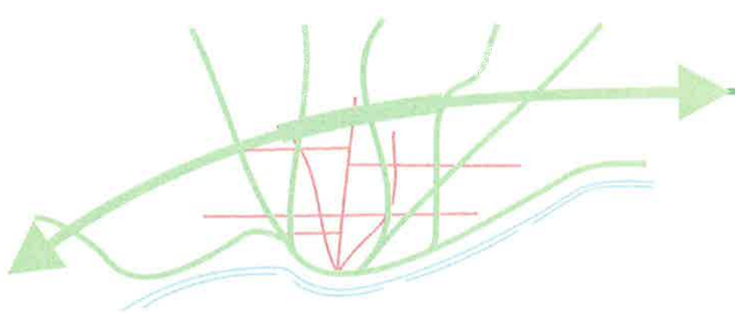
Ontario

407 TRANSITWAY

From East of Highway 400 to Kennedy Road

Environmental Project Report



Executive Summary

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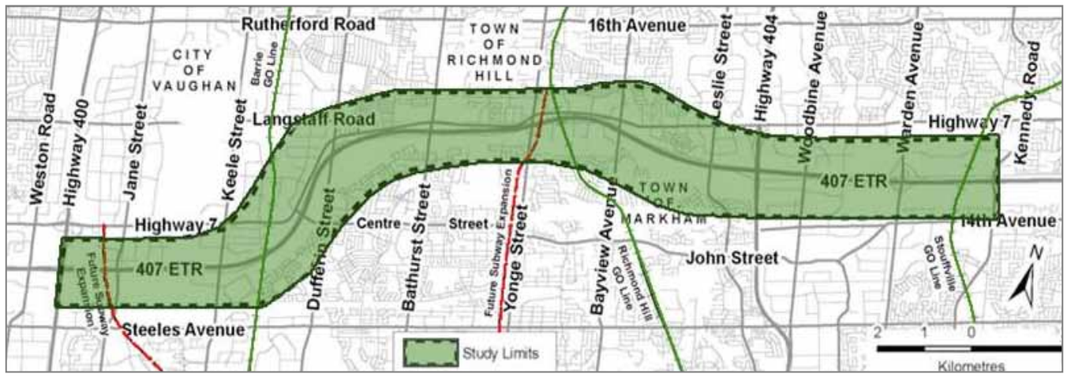
E. EXECUTIVE SUMMARY

E.1 Introduction

In 2007, the Ministry of Transportation of Ontario (MTO) initiated a planning, preliminary design and Environmental Assessment (EA) study for the Central Section of the 407 Transitway from east of Highway 400 to Kennedy Road, a distance of 23 kilometres. The study area, shown in **Figure E-1** is located within the City of Vaughan and Towns of Richmond Hill and Markham in York Region. It also falls within the Province's *Parkway Belt West Plan (1978)*, a multi-purpose corridor providing right-of-way (ROW) for freeways, regional transit, electric power transmission lines, utilities and public open space.

Figure E-1: Study Area



The scope of this study was the planning and preliminary design of the 407 Transitway, maintenance facilities and stations to accommodate an initial bus service with provision for future conversion to Light Rail Transit (LRT), including local bus access to and egress from the stations, platforms, access to and from the adjacent arterial road, parking, passenger pick-up and drop-off (PPUDO), buildings, shelters and other miscellaneous amenities.

The primary role of a major investment in rapid transit in the Highway 407 Corridor, as an integral element of the *Growth Plan for the Greater Golden Horseshoe (2006)* (Growth Plan), is to offer a viable alternative to fundamentally change travel behavior in the 905 area. The corridor's location within the Greater Toronto Area (GTA), as illustrated in **Figure E-1**, provides an ideal opportunity to enhance connectivity with the existing and future primarily radial transportation network thereby expanding travel choices. In this role, the continuous corridor will become the much-needed, second east-west spine across the GTA parallel to the Lakeshore corridor. Given the importance of this role, planning of high-order rapid transit in this corridor must focus on the objectives outlined below:

Transportation

- Enhance east-west cross-regional mobility for medium to longer distance trips greater than 10-15 kilometres;
- Offer a safe, high speed, more efficient way of moving people between GTA population and employment zones, north or south of the corridor;
- Improve connectivity and integration wit
- h the regional transportation network by promoting gateway opportunities with modal interchange facilities;
- Enhance the Ability to increase capacity to meet additional travel demand; and,
- Maximize the utilization of the protected Highway 407 Corridor.

Land Use

- Improve accessibility to existing/planned major mixed-use urban centres/nodes in the corridor; and,
- Increase support for a more compact urban structure in the GTA by maximizing opportunities for transit-oriented development (TOD).

Natural and Social Environments

- Minimize adverse effects on the natural environment;
- Minimize adverse effects on the social environment; and,
- Reduce reliance on energy resources and reduce automobile dependence and gas emissions.

Costs

- Increased cost-effectiveness of moving people in the Highway 407 corridor.

E.2 Environmental Assessment and Consultation Process

The 407 Transitway study was carried out under the new Transit Project Assessment Process (TPAP). The new Transit Project Regulation process was approved by the Government of Ontario in June 2008. The process provides a framework for an accelerated and focused analysis and consultation process for completing the assessment of potential environmental impacts of a transit project.

This report provides a comprehensive summary of each step in the assessment study, including the assessment of the design alternatives, social and environmental impacts, and ways that such impacts can be mitigated.

The consultation process, which had begun in 2007, was undertaken to assist in the planning and impact assessment for the 407 Transitway. The process was initiated well before the formal declaration of the TPAP on August 26, 2010 through the issuance of the "Notice of Commencement". Consultation was conducted with government review agencies, technical agencies, local municipalities, property owners, the general public and Aboriginal communities. The process also included public notices, two Public Information Centres (PICs), and the management of the 407 Transitway public website.

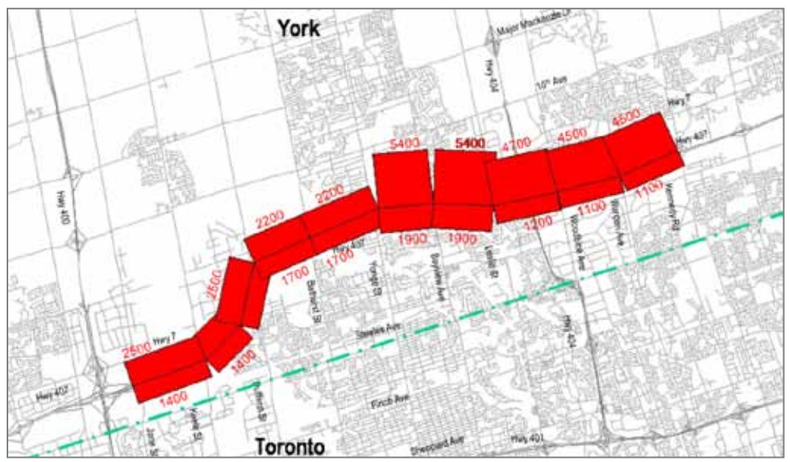
A Technical Resource Group (TRG), established to provide technical expertise to the Study Team, met and reviewed findings at several key milestones during the development of 407 Transitway design standards and at various stages throughout the Planning and Preliminary Design Stage. The TRG includes representatives from 407 ETR, York Region, City of Vaughn, Town of Richmond Hill and Markham, Metrolinx, York Region Transit (YRT)/Viva, Toronto Transit Commission (TTC), MTO and other affected provincial ministries and agencies, Hydro One, Toronto Regional Conservation Authority (TRCA) and Ontario Reality Corporation (ORC).

The majority of the general comments received from the members of the public were in favour of the 407 Transitway. Specific comments ranged from requests to implement the project sooner, concerns regarding noise and air pollution, screening to reduce noise and dust, and beautify the ROW.

E.3 407 Transitway Ridership Forecasts

Detailed ridership forecasts, based on the future demographics projected in the Growth Plan, were prepared for the seven-station scenario in 2031 using the Greater Golden Horseshoe (GGH) travel demand model discussed in **Section 2.2.1**. The resulting ranges of 407 Transitway ridership forecasts are presented in **Figure E-2** for the 2031 morning peak hour. Ridership is taken as the total of trips passing through any portion of the 407 Transitway. The transit demand forecasts for 2051 were also developed, and were used in the development of the transitway design.

Figure E-2: Ridership Forecasts



The highest peak point, peak direction load of 5,400 riders is located to the east of Yonge Street. Of the stations planned, Yonge Station and Kennedy Station have the highest boarding and alighting (disembarking) demands. Woodbine/Rodick Station and Bathurst Station have the lowest boarding and alighting demand of approximately 750 riders in the peak direction. Volumes illustrated in **Figure E-2** are for the Central Section from Jane Street to Kennedy Road.

The 407 Transitway would be accessible by transit (transfers from other services and no-transfer vehicles), park-and-ride facilities and by walking/bicycling. Transfers from other transit services would account for the majority (74%) of total demand in the 2031 a.m. peak hour. Among them, intermodal stations such as Jane Station, GO Barrie (Concord) Station, Yonge Station and Kennedy Station would have relatively higher transit access mode share reflecting large passenger volumes transferring from subways, YRT/Viva or GO Rail. It was assumed that there would not be an opportunity to provide a park-and-ride facility for the 407 Transitway users at the Yonge Station. As a result, extra parking spaces have been added at Bathurst Station and Leslie Station. The park-and-ride demand would represent approximately 19% of total 407 Transitway boardings.

E.4 Existing Policies and Planned Transit Projects in the Study Area

The study area is predominantly within the provincial *Parkway Belt West Plan (1978)*, which was implemented for the purposes of creating a multi-purpose utility corridor, urban separator, inter-urban transit corridor and linked open space system. Its purpose is to link urban areas providing space for the movement of people, goods, energy, and information, without disrupting community integrity and function.

In line with the Growth Plan, the York Region Official Plan identifies the Vaughan, Richmond Hill and Markham regional centres as future hubs of business, cultural, governmental and social activity. These regional centres are expected to contain the highest concentration and greatest mix of uses in the Region, including a range of employment and medium to high density housing opportunities.

Transit and land use policy directions outlined in the policies developed by York Region and the City of Toronto plans are consistent and align with the implementation of the 407 Transitway. With projected population and employment growth expected in the Greater Toronto and Hamilton Area (GTHA) municipalities, as outlined in the Provincial Province's Growth Plan, transit within the Highway 407 Corridor will be impacted significantly.

Currently, public transit services in the study area are comprised of local and Viva rapid transit services operated by YRT, as well as GO Transit inter-regional bus and radial commuter rail services intersecting the corridor at three locations within the Central Section. Also, a GO Transit east-west semi-express service operates along the 407 Express Toll Route through the corridor.

Recently, York Region, in partnership with the TTC and the City of Toronto completed a TPAP for a proposed extension of the Yonge Subway. The extension will begin from its current terminus at Finch Station in the City of Toronto and extend to Highway 7 Richmond Hill Centre (RHC) in the Town of Richmond Hill. In addition, the TTC, in partnership with York Region, has completed an Individual EA for a similar extension of the Spadina Subway northwards to Highway 7 from its current terminal, Downsview Station at Sheppard Avenue West. The EA study and funding for this project has been approved and construction commenced in 2010.

York Region has completed a number of Individual EAs for the provision of dedicated lanes for bus rapid transit (BRT) (with protection for conversion to LRT) on Highway 7 from Highway 50 in Peel Region to The Markham Bypass in the Town of Markham and Yonge Street from Highway 7 to Newmarket. Funding for certain segments of these projects is currently in place and construction is anticipated in 2011.

E.5 Transitway Technology Alternatives

Five candidate technology alternatives were considered in developing a response to the need for inter-regional rapid transit in the ultimate 160 kilometres of the Highway 407 Corridor. These technologies encompassed the full range of system capacities and vehicle/infrastructure configurations that could be considered compatible with the transportation service and implementation needs of the corridor. Very high-speed inter-city rail technology (over 200 kilometres per hour) is not applicable to serve the travel demand needs and patterns in the corridor and incompatible with the physical constraints of the Parkway Belt corridor. A description of the characteristics of each candidate technology as discussed in **Section 5 Table 5-1**, shows the general definition, vehicles,

runningway and station requirements, control and information systems, fare collection, system capacity and capital costs for each alternative. Specifically, the five candidate technology alternatives considered were:

- BRT;
- LRT;
- Automated Guideway Transit (AGT);
- Heavy Rail Transit (e.g. subway); and,
- Commuter Rail.

Figure E-3: BRT Vehicle

Each of the above candidate technologies was evaluated against four major criteria reflecting the near- and long-term needs and objectives for the Highway 407 Corridor. These included:

- Transit service quality encompassing capacity required, user convenience and comfort, service speed and reliability and network connectivity/interlining;
- Planning considerations addressing infrastructure integration and the system's support of Provincial growth and planning policies;
- Environmental compatibility covering effects on the natural and socio-economic environment and energy consumption; and,
- Implementation considerations including ROW property needs, cost effectiveness and implementation staging.

The evaluation showed that initially BRT, using either single or double-decker vehicles (**Figure E-3**), would be the preferred technology for the 407 Transitway. However, the evaluation found that conversion to LRT technology in the future should be protected to respond to the anticipated growth in ridership volumes beyond the 2031 planning horizon. In addition to significant implementation staging flexibility, in order to transition from operation in mixed traffic on the 407 ETR to higher speed service on a fully exclusive runningway, BRT would provide capacity for the projected demand at the desired level of convenience and comfort.

LRT technology is recommended as the best candidate technology for later implementation in the 407 Transitway to meet the potential future increase in service demand. LRT alignment geometric standards do not limit alignment planning options and can be implemented with adequate measures to mitigate most natural and socio-economic impacts. Further, it allows flexibility to stage implementation across the study area with convenient transfers along the ROW. However, LRT is only viable if the segments to be converted to LRT are at least 10 to 12 kilometres in length.

E.6 Evaluation of Alternatives

The process of evaluation of alternatives started with a station location assessment. The rational to determine the number and location of stations was based on: the role and function of the 407 Transitway as a regional transit service with maximum speed serving average trip distances of five to ten kilometres, and the role and function of each station. Characteristics for the candidate stations included strategic trip generation locations, such as the future multimodal hubs, proximity to urban centres or areas of existing and/or future high population density, and locations where important park and ride access demand is expected. These criteria were used to determine that a seven station scenario for this 23 kilometres section of the transitway was optimum. It would provide maximum access to the transitway while maintaining the level of express service required in the corridor. The seven stations locations and their characteristics are listed below:

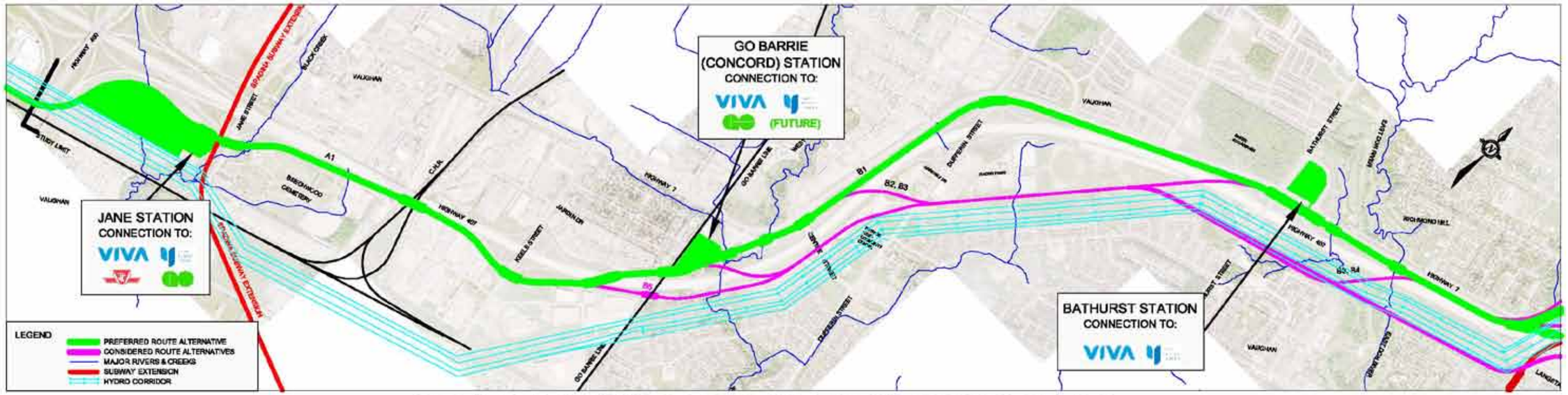
1. Jane Station – Major Gateway at the interchange of the future TTC Spadina Subway Extension's 407 Station, GO Transit and YRT/Viva bus services.
2. GO Barrie (Concord) Station – Intermodal Station at the crossing with the GO Barrie regional commuter rail line.
3. Bathurst Station – Important connection to YRT/Viva services, and park and ride opportunity (no transitway park and ride will be available at the Yonge Station).
4. Yonge Station – Richmond Hill-Langstaff Gateway at the interchange of the future TTC Yonge Subway Extension RHC Station, major YRT/Viva and GO Transit bus terminal and GO Transit Richmond Hill regional commuter rail Station, will serve the planned high density Gateway development.
5. Leslie Station – Will serve Beaver Creek Business Park and crossing with potential future north-south York Region rapid transit line.
6. Woodbine/Rodick Station – To serve Markham Centre (west) and the growing 404 Business District.
7. Kennedy Station – Intermodal Station at the interchange of a major YRT/Viva bus terminal; GO Transit Stouffville regional commuter rail Unionville Station. Will serve the planned high density Markham Centre (east).

Following the station identification analysis, a two-step route and alignment alternatives analysis and evaluation process was adopted to determine the preferred technical alignment in each of the six segments making up the 23 kilometres project length. Initially, transitway route alternatives were developed and evaluated for each of the six segments making up the project's 23 kilometres length. In each segment the preferred station site(s) was determined and used in route selection based on each alternative's ability to attract ridership, quality of connectivity with other transit systems, effect on the natural and socio-economic environment, support for growth and urban form plans and finally, cost-effectiveness. Routes evaluated are shown in **Figure E-4** with evaluation findings summarized below.

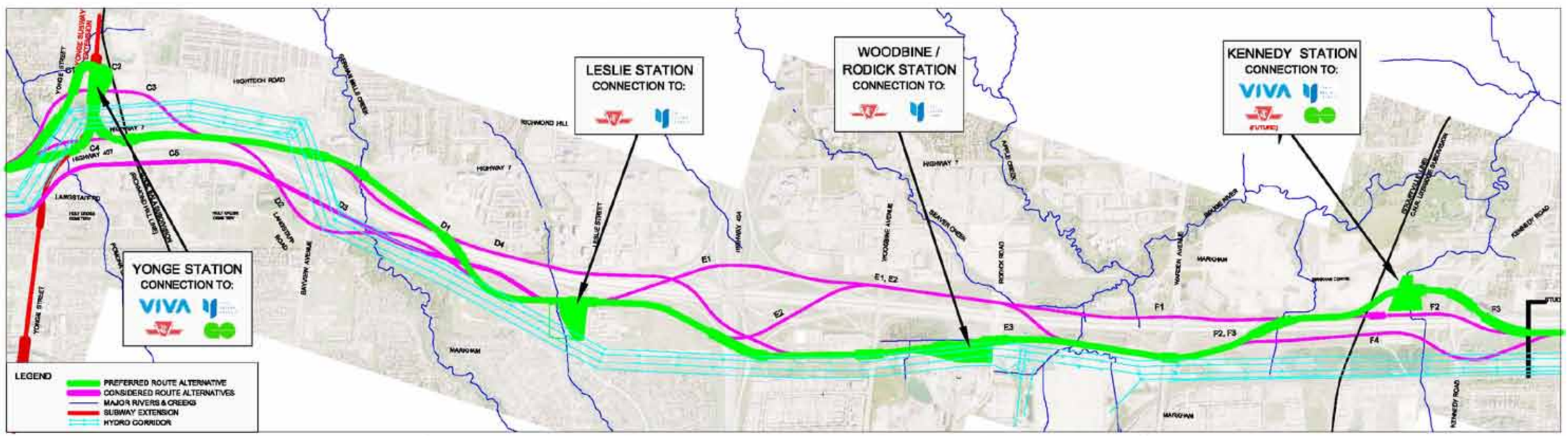
In the segment between Highway 400 and Keele Street, the route along the south side of Highway 407 and across ORC lands protected for transit use was selected as the optimum connection to the Spadina Subway Extension after screening out routes along Highway 7 and to Steeles Avenue as either impractical or less direct. The next segment evaluated, between Keele Street and Bathurst Street, compared routes on both the north and south sides of Highway 407, leading to the conclusion that the northern route allowed best connectivity with the GO Barrie Line, minimized the number of Highway 407 crossings and reduced the length of constrained ROW along the Hydro corridor while permitting mitigation of floodplain effects at the West Don River crossing.

For the route through the Richmond Hill-Langstaff Gateway, numerous routes on both sides of Highways 407 and 7 were developed and evaluated. The preferred route, north of Highways 407 and 7 was found to provide best connectivity with the potential Yonge Subway at RHC Station, the destination of a major portion of 407 Transitway riders. Located south of the subway station, it also supports the RHC's urban form, being part of the proposed linkage to the Langstaff lands alongside the GO Richmond Hill Line, with which it provides good connectivity.

Figure E-4: Route Evaluation



ROUTE ALTERNATIVES BETWEEN HWY 400 AND BATHURST STREET



ROUTE ALTERNATIVES BETWEEN BATHURST STREET AND KENNEDY ROAD

Route evaluation in Segment D led to a preference for the Leslie Station to be south of Highway 407, which resulted in a route crossing Highway 407 from north to south immediately east of Bayview Avenue. This preferred route avoids intrusion into developable lands, and remains remote from existing residential neighbourhoods to the south.

In Segment E, consideration of routes north and south of Highway 407 led to the preference to remain on the south side and locate a station midway between Woodbine Avenue and Rodick Road. This preferred rout serves both West Markham Centre and the Highway 404/7 business parks and uses the Hydro ROW for a park-and-ride facility, a key role for the station.

Segment F, the final eastern most segment of the study area, required an assessment of alternatives to optimize service to the Markham Centre, north of Highway 407, and connectivity with the GO Stouffville Rail line. Evaluation of options indicated that crossing Highway 407 to the north was essential and that transit attractiveness and convenience could be maximized through significant integration with and penetration into planned high intensity land uses in the area. An alignment and supportive surrounding land uses north of Highway 407 is recommended to achieve these primary objectives.

It is important to emphasize that the preferred transitway alignment and station locations were selected based on designated Urban Growth Centres (UGCs) identified in the Growth Plan, approved extra space municipal land use plans, and the location of existing and approved transit facilities including GO Transit Rail, Subway and YRT/Viva corridors. MTO recognizes that there are ongoing studies within this section of the transitway including Richmond Hill-Langstaff Gateway and Markham Centre. Should significant changes to land use plans and planned transit alignments be agreed to in the future by all parties, MTO will modify the 407 Transitway Environmental Project Report (EPR) as required.

E.7 Description of the Preferred Alternative

As illustrated in **Figure E-5**, the technically preferred transitway alternative has been planned for operation of an intermediate capacity, regional rapid transit service provided either as BRT using single or double-decker coaches, or, as LRT using electrified multiple-unit trains up to 100 metres in length. In both cases, the vehicle's maximum in-service speed will be 100 kilometres per hour and the spacing between the seven stations (as shown in **Figure E-5**), will produce travel time approximately 18 minutes between Markham Centre and the Spadina Subway in Vaughan. Peak BRT service would be at one minute intervals, while trains five minutes apart would provide the required capacity at the peak load point east of Yonge Street.

The primary component of the transitway infrastructure is the fully-grade separated runningway which, for BRT operation, is a two-lane runningway with paved shoulders and additional stopping lanes through station platforms. If the transitway is operated as a LRT system, the runningway will comprise a double-track mainline with crossover and storage tracks at regular intervals for operations and maintenance flexibility. The fully fenced runningway will incorporate access for emergency response vehicles at stations and appropriate intervals between.

Seven stations, spaced on average at 3.5 kilometres, are planned along this section of the transitway. These are comprised of four multimodal interchange stations connecting with the Yonge and Spadina Subway extensions and GO commuter rail: at GO Barrie (Concord) Station, Yonge Station and Kennedy Station. The remaining line stations at Bathurst, Leslie and Woodbine/Rodick provide access by local feeder bus services, PPUDOs and park-and-ride facilities serving surrounding business and residential communities. Station platforms, access facilities and waiting areas will be weather protected and conveniently located to be reached from all access modes with a focus on security.

Thirty-nine structures are required to fully grade separate the transitway from all crossing roads, railways and rivers. Made up of 18 underpasses and 21 overpasses, these structures are the largest component of the overall capital cost of the infrastructure. The study area preferred alignment requires three long-span bridges over Highway 407 and one over Highway 404 as well as cut-and-cover box sections at the Richmond Hill and Markham Centres. Construction methods will minimize the duration of traffic diversions on arterial roads and allow erection of bridge superstructures over traffic on the highway crossings.

Landscape treatments will accomplish a number of functions including slope stabilization, stream crossing restoration, providing naturalization planting sites, creating visual/wind buffers and generally improving the general aesthetics of the corridor. Landscaping around the station sites and parking facilities will complement the surrounding land uses and present the stations as a visual asset to the local area.

E.8 Operations and Maintenance Facilities

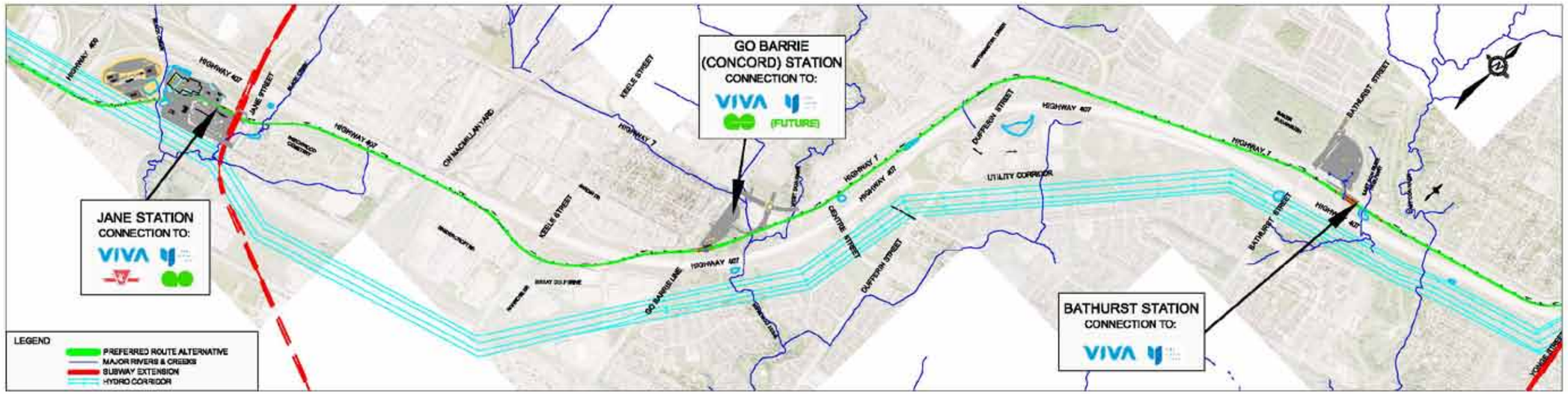
The 17 hectares property protected by MTO in 1998 for both BRT and LRT maintenance facilities remains the preferred location within the study area. This site will accommodate a BRT facility with capacity to service a fleet of 160 vehicles as well as a separate LRT facility to maintain and store up to 100 light rail vehicles (LRVs).

E.9 Assessment and Mitigation of Impacts

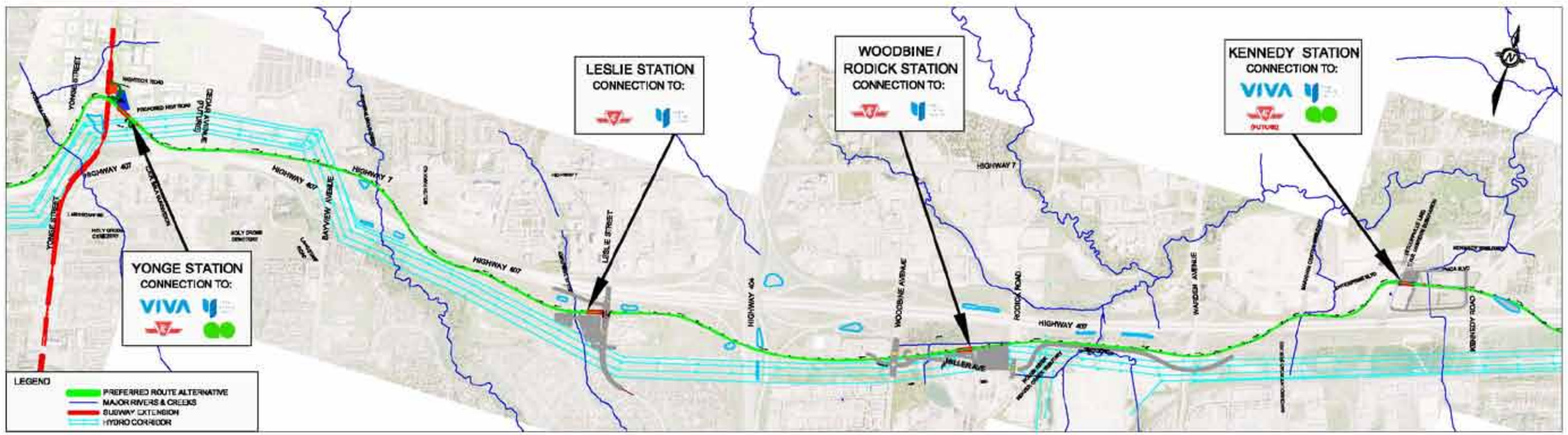
As required for a TPAP, the study scope included a comprehensive assessment of potential impacts of transitway implementation and operation on all aspects of the environment. Measures to mitigate any adverse effects were also identified and documented in **Section 7** of the EPR under three primary categories, namely footprint impacts, construction impacts and operation and maintenance (O&M) impacts.

Given that the preferred transitway alignment is mostly confined to a well-established urban transportation and utility corridor, **footprint impacts** are limited firstly to, the effects on valley lands at major watercourse crossings and secondly on the configuration of and integration into, development lands at the Richmond Hill and Markham Centres. The former can be addressed by built-in design attributes typically adopted for bridge crossing works adjacent to, or in, floodplains and mitigation of impacts on sensitive vegetation on valley lands by configuring facilities to preserve natural features. In the case of impacts on future Regional Centre land development, considerable planning effort has been applied to minimize intrusion of transitway facilities onto developable parcels based on currently available land use plans. In each case, where an easement across private land is required, air-rights development over the easement, where feasible, could be used to minimize the effects. The implementation of the 407 Transitway requires 4.6 hectares of privately-owned commercial or industrial land, 116 hectares of publicly-owned crown land and approximately 4 hectares of easement across Canadian National (CN) Rail and Hydro One lands.

Figure E-5: Preferred Alternative from East of Highway 400 to Kennedy Road



PREFERRED ALIGNMENT BETWEEN HWY 400 AND BATHURST STREET



PREFERRED ALIGNMENT BETWEEN BATHURST STREET AND KENNEDY ROAD

Again, the availability of undeveloped lands within the Parkway Belt between and alongside Highway 407 and Highway 7 limits **construction impacts** to the accommodation of traffic during underpass construction at arterial roads and the four locations where Highways 407 and Highway 404 are crossed by long-span bridges. Built-in design methods and construction staging will mitigate the effects by maintaining peak direction capacity and minimizing delays to traffic. Other typical construction impacts such as noise, dust, erosion, water quality and surplus material disposal effects will be mitigated by requirements, in contract specifications and conditions, to adopt regulatory requirements and industry best practices.

Generally, **operations and maintenance impacts** are also minimized by the remoteness of a large portion of the transitway from sensitive neighbourhoods. While modelling of noise impacts indicates that increases to ambient levels will be imperceptible, local mitigation, particularly in the Regional Centres will be considered if warranted by the proximity of operations. The only other potentially significant impact will be on traffic circulation in the vicinity of transitway stations. This will be mitigated by design and control features at station entrances as described for specific stations in **Section 7** of the EPR. The effects of operations on surface water quantity and quality will also be mitigated by stormwater management (SWM) system design attributes.

E.10 Implementation of the Transitway

Implementation of this section of the 407 Transitway will likely entail several phases, the extent and timing of each being a function of funding availability, the need to maintain transit service reliability and priorities for transit investment in the GGH. In establishing the objectives for phased implementation of the transitway, the current availability of the 407 ETR for use by GO Transit services has been assumed as a baseline phase extending over the full 23 kilometres of the Central Section.

Segments that provide improved access to the (planned and likely completed) Yonge and Spadina subway extensions should be given priority and each phase implemented should not result in a significant increase in travel time transitioning from the 407 ETR to a new section of transitway. Sequencing should be responsive to the zones with highest ridership potential to maximize benefits and exposure of dedicated transitway service as well as allowing a contract cash flow that MTO, or the funding agency, can accommodate in annual budgeting. Construction staging, associated traffic diversion and delays should be limited to the number of locations that arterial road users will tolerate.

With a view to meeting the above objectives, potential Phasing Strategies being investigated include:

- A Baseline Strategy – Cross-regional Rapid Transit Service on the 407 ETR in mixed traffic;
- An Enhanced Baseline Strategy – Cross-regional Rapid Transit Service on 407 ETR with enhanced access to and/or additional off-line stops;
- Rapid Transit Service on newly-constructed 407 Transitway between Bathurst Street and Woodbine Avenue and on 407 ETR from Spadina Subway to Bathurst Street and from Woodbine Avenue to Markham Centre (Kennedy Road);
- Rapid Transit Service on 407 ETR from Spadina Subway to RHC and on newly-constructed 407 Transitway from RHC to Markham Centre (Kennedy Road); and,
- Rapid Transit Service on newly-constructed 407 Transitway from Spadina Subway Station to Markham Centre (Kennedy Station).

Approval of this TPA of the entire Central Section will enable the MTO or the proponent at the time, if responsibility for transitway implementation is transferred to another agency, to pursue any one or more of the above strategies, or variations of them, within the limits of this TPA.